Liane M. Randolph, Chair
California Air Resources Board
September 3, 2021

Comments of 350 Humboldt Regarding the 2022 Scoping Plan Update – Scenario Concepts Technical Workshop Comments. Submitted to:
https://www.arb.ca.gov/lispub/comm2/bcsubform.php?listname=sp22-concepts-ws&comm_period=1

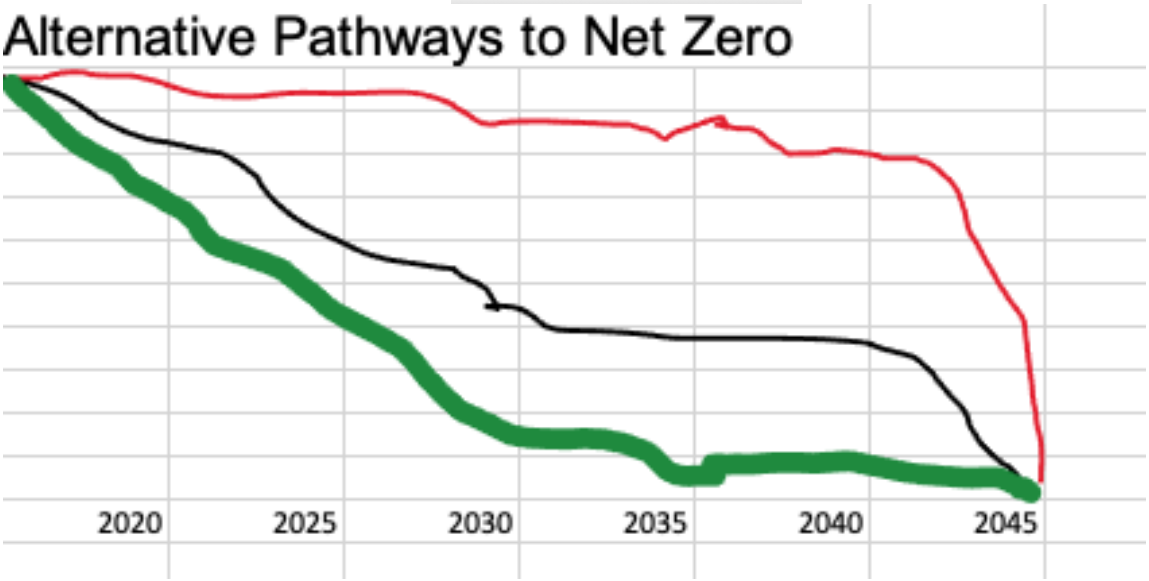
Dear Chairperson Randolph and Board Members,

350 Humboldt is a grassroots climate action group located in Humboldt County California. Thank you very much for the opportunity to comment on questions and staff options relating to the goals and overall content of the 2022 Scoping Plan Update.

CARB staff options are generally presented as four-fold tables. In the time dimension we can choose setting goals for 2030 or for 2045. And we get an intensity dimension with more intensity on the left, less on the right. This is a useful heuristic in some ways but misleading in others.

There are going to be some very difficult sectors to decarbonize, aviation and cement for example, so it is likely that some aspects of emissions reductions will be stretched out to 2045. We have drawn a line graph showing three possible paths to net zero in 2045. (In the graph each line is a combination of greenhouse gas emissions and sequestration.) What is crucial is to reduce as much as we possibly can as fast as we can. There is a huge cost to meeting the 2045 goal by doing it all in the last five years, as shown with the red line. Correspondingly there is a huge benefit to getting as much done as quickly as possible, as shown by the green line. (The black line is our rough interpretation of the current path.) The most important changes to make quickly, as will be documented below, are those of short-lived climate pollutants, particularly methane but also refrigerants. If we can virtually eliminate them by 2030 and make the grid 100% powered by renewables shortly thereafter, the long tail to 2045 will not have grave consequences.

Grassroots Climate Action



RESPONSES TO SPECIFIC QUESTIONS

• 2030 TARGET IN SB 32:
•Emissions 40% below 1990 levels **• Increase ambition in 2030?**
• Science calls for carbon neutrality (CN) by mid-century; **• Achieve CN in 2045, 2035, or other year?**

Initially we have to say that there are two goals for 2030, deriving from the two most recent IPCC reports, that dwarf all others. First, is to do everything possible to reduce emissions from short-lived climate pollutants, namely methane, refrigerants (primarily HFCs), and black carbon. Since at least 2017 the state has recognized that the greatest payoff in slowing warming will come from limiting these emissions that have a greenhouse warming potential many times higher than CO2 itself. Here are three quotations, one from 2017 and two from 2021 making this point:

- From the 2017 SLCP report at: https://ww2.arb.ca.gov/resources/documents/slcp-strategy-final
  Scientific research indicates that an increase in the global average temperature of 2°C (3.6°F) above pre-industrial levels, which is only 1.1°C (2.0°F) above present levels, poses severe risks to natural systems and human health and well-being. Deploying existing technologies and resource management strategies globally to reduce SLCP emissions can cut the expected rate of global warming in half and keep average warming below the dangerous 2oC threshold at least through 2050. We can slow sea level rise significantly, reduce disruption of historic rainfall patterns, and boost agricultural productivity by reducing crop losses to air pollution. Cutting global SLCP emissions immediately will slow climate feedback mechanisms in the Arctic and elsewhere that would otherwise further accelerate global warming and make climate change far more difficult to solve and far more costly to live with—as more resources would be required for disaster relief, conflict management, and adaptation. Most importantly, we can dramatically reduce global air pollution, saving millions of lives each year. Many of these benefits will primarily accrue in regions and populations disproportionately impacted by climate change, including the developing world. Using cost-effective and available technologies and strategies, worldwide anthropogenic

sources of SLCP emissions can be largely controlled by 2030 and the global benefits of a collective commitment to substantially reduce SLCP emissions would be profound.

- Daniel M Kammen, Teenie Matlock, Manuel Pastor, David Pellow, Veerabhadran Ramanathan, Tom Steyer, Leah Stokes, Feliz Ventura. Accelerating the timeline for climate action in California. Submitted to *Environmental Research Letters, March 13, 202.* *Click here*.

  Their prescription:

  1. The first lever, of course, is zero emissions of CO2.
  2. The second lever involves drastic reductions in super pollutants that are short-lived—black carbon, methane, tropospheric ozone, and hydrofluorocarbons (HFCs). These super-pollutants are about 30 to 2000 times more potent than CO2 in trapping infrared heat. Collectively these super pollutants are responsible for about 40% of warming globally. Reducing methane emissions by half, reducing soot emissions by 80% with soot-free vehicles such as electric vehicles, replacing currently used HFCs with zero- to low-warming potential refrigerants, and decreasing sources of methane emissions such as leaks from natural gas pipes, food, and other landfilled organic waste, if implemented now, can cut the rate of warming over the next 2 to 3 decades by half."

- Also Ocko, et al, say (about methane):

  "Overall, strategies exist to cut global methane emissions from human activities in half within the next ten years and half of these strategies currently incur no net cost. Pursuing all mitigation measures now could slow the global-mean rate of near-term decadal warming by around 30%, avoid a quarter of a degree centigrade of additional global-mean warming by midcentury, and set ourselves on a path to avoid more than half a degree centigrade by end of century." https://www.dropbox.com/s/cm5jdj5rg7hgyei/OCko%20world%20methane%20all%20sectors%20if%20fast%20action.pdf?dl=0

- The other overarching goal is to decarbonize the electric grid by 2030, replacing all fossil fuel energy sources with renewables. This is the means to unleash decarbonized transportation, housing, industry and almost all other sources of CO2e emissions. Since this is the main plank in every major climate plan, including President Biden's, it does not seem to be necessary to document it. However, two very reputable scientific resources are:

  The UC Berkeley 2035 report: https://www.2035report.com/electricity/ and the Rewiring America report https://www.rewiringamerica.org

- Finally, dealing with SLCP and making our power 100% from renewable sources will more than pay for the rest of the changes that are needed by eliminating the health and mortality costs of air pollution.

  "We find that approximately 14,000 premature deaths can be avoided in California in 2050 and that these health co-benefits are disproportionately higher in disadvantaged communities (that is, 35% of avoided deaths will come from 25% of the state's population). The annualized monetary benefits (US $215 billion) exceed the GHG abatement cost (US $106 billion) by US $109 billion." Wang, T., Jiang, Z., Zhao, B. *et al.* Health co-benefits of achieving sustainable net-zero greenhouse gas emissions in California. *Nat Sustain* **3,** 597–605 (2020). Click here.

Of the staff options, 350 Humboldt would choose Option A: exceed SB32 goal by 2030. Try for neutrality by 2035. However we recognize there are some very difficult to decarbonize sectors and the likelihood of

continuing forest fires makes the task **Sisyphusian** . However, it is necessary to go farther than net zero, as the August 2021 IPCC report states, and plan when net negative reductions would start (both anthropogenic and natural)

• CARBON CAPTURE AND SEQUESTRATION

- **With fossil fuel combustion (e.g., industry, electricity generation, refineries). Yes or no?**

Carbon capture when used in the fossil fuel industries or in refineries or when power is being generated by fossil fuels does not contribute to the solution but on the contrary extends the life of fossil fuels. There may be technological solutions in which, at least temporarily, carbon capture would be useful, for example in biomass power generation. We don't think it should be supported by public funds or that achieving our goals should depend on it.

- **With industrial process emissions (e.g., cement). Yes or no?**

Yes if *necessary*; developing processes that use less carbon and using clean renewable hydrogen for energy is preferable. On replacing Portland cement with lower carbon innovative materials see: https://www.dropbox.com/s/csdd7k9j03hp2gv/Green%20cement%20review.pdf?dl=05

- **Refrigerant emissions and other sources of non-CO_2 emissions may remain.**

We don't believe refrigerant emissions should "remain." There are technologically feasible ways of addressing virtually all of them. Refrigerants make up (now) less than 3% of greenhouse gases. There may be a few technological uses that cannot be replaced, but overwhelmingly the majority can be replaced with natural refrigerants. However, we will not achieve this goal if CARB continues on its path of allowing "lower" GWP refrigerants. Lower in this case means 1400 times as damaging as CO2 (or in the case of air conditioners 750 times). The 2022 regulations from CARB on refrigerants are estimated in the staff report to achieve 40% of the SB 32 goal of 40% reduction. That is 16%, a woeful failure. CARB must raise its sights. Natural refrigerants can be used almost everywhere, we just need incentives and rules so that people make that choice by 2030.

There are a few highly specialized uses of HFCs, such as anesthetics, with very high GWP that may be in the "long tail" rather than replaced with natural refrigerants. Substituting lower GWP is at least a minimum, but this is not an area where consensus is currently available. See: Anaesthetic gases, climate change, and sustainable practice - The Lancet Planetary Health

• Compensate for these remaining emissions with direct air capture with sequestration? Or, what is the alternative?

We will need DAC to get back down to 350 PPM or lower between 2050 and 2100; the IPCC is very clear about that. However, the more we can sequester in forests and other lands the easier the DAC task becomes. At this point DAC is too expensive and small-scale to count on in California's plans and we should try to maximize the decrease in GHC emissions through regulation and energy efficiency.

•SB 350 calls for a 2030 Renewables Portfolio Standard (RPS) of 60% SB 100 requires 100% retail sales of electricity be zero carbon by 2045

- **Do we accelerate the 2030 RPS target?**

Yes. RPS goal of 100% by 2035 at latest, with 85% by 2030. See citations above.

- **Any role for biomass combustion to generate electricity?**

Absolutely not for trees or anything that requires more than 3 years for regrowth to capture the carbon released. Burning releases large amounts of CO2 and other pollutants, especially the ancient power-plants in use in California today. Burning salvaged trees or mill waste is unnecessary because there are other processes that can sequester the carbon in them for long periods including composting, biochar, and nanocellulose. See the reference here. In addition combustion of biomass is a dirty process, releasing >2.5PM at great health costs

- **Any role for combustion of renewable natural gas (RNG) or renewable hydrogen to replace fossil gas for reliability?**
  =89*-12

Yes for electrolytic hydrogen made from water using solar or wind power. At this point we need experimentation and research in both hydrogen and biogas. For hydrogen the existing capacities are not great (despite lots of hype from the fossil fuel-oriented hydrogen lobby), but there is much potential. Public monies should not be used for research that uses fossil fuel feedstocks or for energy.

We recommend the World Resources Institute report for governments regarding renewable natural gas. https://files.wri.org/d8/s3fs-public/renewable-natural-gas-climate-strategy.pdf
Renewable natural gas makes sense when the feedstock is waste and when it results in large, measurable reductions in methane. But it is only likely to be able to replace 7% of current fossil natural gas use.

In California, legislation requires elimination of methane from landfills, but implementation is slow to non-existent. So, there is potential. However, renewable natural gas should not be used in homes or buildings because of the health hazards. In fact, because renewable natural gas is limited in quantity and much more expensive than fossil natural gas, it should be limited to use where there are virtually no other options, such as some industrial processes.

•THE RECENT AB 74 TRANSPORTATION CARBON NEUTRALITY PAPER ASSUMED A 15% REDUCTION IN PER CAPITA VMT IN 2045.

• Increase ambition of per capita VMT reductions?

This will depend on whether the Legislature can get it together to solve California's housing problem. Infill, multi-family residences, and public transit to serve them might allow greater than a 15% reduction. Passage of SB 9, which allows duplexes in areas zoned for single families, if the Governor signs it, is a small beginning.

There are many actions possible that directly affect VMT, such as remote work policies; these must be very carefully designed as many have not yielded net reductions. (https://www.dropbox.com/s/vxl3hu6frbnzozt/Sweden%20%20Telework%20and%20daily%20travel%202020.pdf?dl=0).
See also policies designed for Humboldt County at:
http://hcaog.net/sites/default/files/2021.0318_board_draft__rtp_ghg_targets_table.pdf

•Vehicle fleet electrification.

Staff option B is the best choice, but it needs to build-in incentives to scrap fossil fueled vehicles before end of life.

GOVERNOR NEWSOM DIRECTIVE TO CARB TO EVALUATE A PHASE OUT OF CRUDE OIL EXTRACTION IN CALIFORNIA BY 2045, RECENT LETTER TO EVALUATE CARBON NEUTRALITY BY 2035

• Change extraction phase out date, what date?

Change to 2030. CA oil is dirty, perhaps worse than tar sands oil. Even if we can't phase out oil altogether by 2035, we don't need CA's oil and the health costs of the pollution it causes dwarf the costs of eliminating oil. *The other important factor is that the oil/gas lobby is now the biggest obstacle to California making needed changes. Close that industry down and we can make progress.* Because of legacy vehicles we will need some imported oil probably until 2035.

• Do we produce any renewable fuels from waste biomass in-state at converted refineries?

No. There is very little "waste" biomass and all these processes produce carbon dioxide. See comments on biomass above.

• Should there be limits on imported crude?

Yes, these limits must be in synchronization with the electrification of everything. And because imported oil comes with problems of its own, ending imports from entities that violate human rights or compromise highly productive carbon sinks should be prioritized even over ending fossil fuel extraction in CA.

- **METHANE**
  - **How should we use biogas captured from dairies and landfills - electricity generation, industrial heat, transportation fuel, other?**
  - **What would be the long-term operations for dairies in the state?**

For several years at least we need digesters, and we need a lot more. However, they don't work for small operations. There are alternatives for smaller operators that need much more investment. For enteric methane the law needs to be changed to explicitly allow regulation by CARB and we need to move much faster. There are already proven additives to feed that reduce methane greatly and others under research that can almost eliminate it. California should lobby the FDA to get them approved quickly. The recent CARB report on progress on cattle-generated methane shows that we will achieve about half of our

existing goal of a 40% reduction by 2030. (https://ww2.arb.ca.gov/sites/default/files/2021-06/draft-2030-dairy-livestock-ch4-analysis.pdf)
So far, we have relied only on incentives, not regulation. But this is another area where both a carrot and stick are needed to change methane emissions to the extent we desperately need to.

NEW BUILDINGS

• All new buildings use electric appliances only starting in what year?

The new Title 24 Building Energy Efficiency Standards get us part way there. In the next revision, we should change to electric only for new buildings.

EXISTING BUILDINGS

• In what year should sales of gas appliances be phased out?
• Even with a gas appliance ban for new purchases, we may need to retrofit existing buildings to replace existing gas appliances. What percent of existing buildings are retrofitted to be all electric and by what year?
• While transitioning to electric appliances, do we keep fossil gas or RNG or both?

Residential and Commercial Building Decarbonization – Options*

Carbon Neutrality by 2035	
Option A	Option B
• All new buildings use electric appliances by 2026 • 100% all-electric appliance sales for all buildings by 2030 • All buildings retrofitted to electric appliances by 2035	• All new buildings use electric appliances by 2026 • 100% all-electric appliance sales for residential buildings by 2035 and for commercial by 2045 • Not all existing buildings retrofitted to electric appliances
Carbon Neutrality by 2045	
Option C	Option D
• All new buildings use electric appliances by 2026 • 100% all-electric appliance sales for residential buildings by 2035 and commercial by 2045 • Some existing buildings retrofitted to electric appliances	• All new buildings use electric appliances by 2029 • Less existing buildings retrofitted to electric appliances

*Represents staff initial thinking. Requesting additional options for consideration.

We prefer Option A and believe it is doable.

• WHAT TO DO WITH INDUSTRIES THAT CAN'T ELECTRIFY DUE TO TECHNOLOGY AVAILABILITY? (CEMENT, GLASS, STEEL, ETC.)

- **What would be their energy source (RNG, renewable hydrogen, natural gas, some combination)?**

- **What would be their long-term operations in the state?**
- **How do we meet the statutory requirement to minimize leakage?**

This is an area where the technology is not clearly defined or available yet. Hydrogen is a good bet in the long run, but there are other solutions (for cement, say) that change the materials and process to being less carbon intensive and don't just involve replacement of electricity sources. Funding research will pay off. Long-term choices should be those that minimize greenhouse gas emissions, which certainly would not be natural gas. Your question about leakage makes it clear that California cannot make these changes alone, nor should it. We need stronger rules nationwide. Perhaps public funding for candidates who adopt very strong climate platforms?

Other measures that are necessary to develop the Scoping Plan

Social cost of carbon. One other very important measure CARB can take is change the way you calculate the social cost of carbon. All your cost-benefit calculations are now way off, assigning far too little value to changes that affect the future. There are two issues, the social cost of carbon and the discount rate. The discount rate should really be less than zero because the value of the changes we are making will be of *much greater value* in 100 years than their costs to us today. The social cost of carbon should be at least what the federal government decides in January 2022. Because of drought and fire, California is already much more caught up in the consequences of CO2e emissions than many parts of the country. So, it would make sense to adopt a social cost of carbon figure on the high end, like the $130 by 2030 that Canada has adopted already or Norway's current $135. This rate should be incorporated into the Cap and Trade and Low Carbon Fuels systems as well.

Carbon intensity index. CARB's 'carbon intensity' (CI) index is incomplete and should be revised. Currently, 'carbon intensity' measures the GHG emissions associated only with the production of a unit of fuel energy; it ignores the rest of the life cycle of the fuel, in particular the return of the spent fuel to its originating reservoir. Any policy for sustainability or climate change mitigation must consider the complete earth cycles of associated resources. For the carbon cycle, for each fossil fuel carbon extracted, an equivalent number must be returned to its geologic reservoir, and this part of the cycle must be accounted for in any correct measure of carbon intensity.

Some industry groups have called for the current color-based rating system for hydrogen to be replaced by CARB's CI measure. The former, albeit limited and more cumbersome than a numeric index, is still much preferable to CARB's current CI, which fails to differentiate between fuels (or components thereof) produced from fossil sources vs. those from terrestrial carbon reservoirs. CARB should revise its CI to be based on full lifecycle emissions. This complete lifecycle CI measure should be applied to fuels currently covered by CI and would also be applicable to hydrogen.

Conclusion

If we go back to the graph at the beginning showing potential pathways to net zero by 2045, it is clear California is not in good shape. On refrigerants and agricultural and landfill methane, we are way behind when we should be way ahead. We are only beginning, nationally and in California, to deal with methane in the oil and gas industry. Please modify the Scoping Plan to put the needed resources and authority into

achieving near 100% reductions for short-lived climate pollutants by 2030 and generating at least 85% of our power from renewables by 2030.

Thank you for considering our input.

Daniel Chandler, PhD
Hayley Connors-Keith
Diane Ryerson
350 Humboldt Steering Committee