
April 10, 2017

California Air Resources Board
1001 "I" Street
Sacramento, CA 95814

*Submitted electronically at www.arb.ca.gov/cc/scopingplan/scopingplan.htm*

**Re: Comments on the 2017 Climate Change Scoping Plan Update**

To the California Air Resources Board:

The Sierra Club, Natural Resources Defense Council, Solar Energy Industries Association, Sacramento Municipal Utilities District, Marin Clean Energy, Build It Green, Local Government Sustainable Energy Coalition, Association of Bay Area Governments, Bay Area Regional Energy Network, Carbon Free Palo Alto, Redwood Energy, and Design AVEnues submit the following comments on the January 20, 2017 Proposed Climate Change Scoping Plan Update ("Proposed Scoping Plan"). We appreciate the efforts of the Air Resources Board ("ARB") in preparing the Proposed Scoping Plan and accompanying materials.

In order to "spur the transformation of the California economy and fix its course securely on achieving an 80 percent reduction in greenhouse gas emissions by 2050,"[1] it is critical the

[1] Proposed Scoping Plan Update, ES3.

Proposed Scoping Plan set the appropriate expectations to scale up deployment of clean energy and build the momentum needed to reach long-term climate goals. In excluding specific expectations for building decarbonization from the default scenario, we are concerned that the Proposed Scoping Plan does not adequately address greenhouse gas ("GHG") emissions from fossil fuel use in residential and commercial buildings, which is a major source of GHG emissions and an important sector to decarbonize. Building decarbonization is widely recognized as a critical strategy to achieve long-term climate goals that will take time to fully implement.[2] While renewable gas, i.e. biomethane and power-to-gas, could be part of the solution to minimize emissions in the existing building stock and in end uses that will be hard or will take a long time to electrify, the ability to scale these fuel sources as the main pathway to achieve California's climate goals in an affordable and sustainable manner for buildings has not been demonstrated. In addition, the issue of fugitive emissions across the entire gas supply chain remains unsolved. Lastly, biomethane generates hazardous criteria pollution that can impair the state's ability to meet air quality goals. It is therefore critical for ARB to ensure that building electrification is developed as a viable, scalable and affordable pathway to achieve 2050 climate goals.

ARB should amend the Proposed Scoping Plan to:

(1) Establish specific targets in the Proposed Scenario, as previously included in the Alternative 1 scenario,[3] for electrifying space and water heating in residential and commercial buildings in 2020-2030;

(2) Conduct analysis on the timeline, pathway, and barriers to achievement of building decarbonization targets; and,

(3) Identify activities that are needed by key state agencies to both address policy and market barriers for building electrification and to spur market transformation and

[2] In a detailed analysis performed for the California Energy Commission, researchers at Lawrence Berkeley National Lab found that it was necessary to achieve full electrification of all space and water heating, in residential and commercial buildings, to meet the 2050 carbon goals. M. Wei et al., Scenarios For Meeting California's 2050 Climate Goals. Lawrence Berkeley National Lab (Sept. 2013), p. 80. https://eetd.lbl.gov/sites/all/files/ca-2050-climate-goals.pdf. Similarly, a report by the Deep Decarbonization Pathways Project corroborated this conclusion and found that electrifying natural gas end uses in buildings was essential in order to reduce greenhouse gas emissions to levels consistent with international climate goals. Williams, J.H., et al. (2014). Pathways to deep decarbonization in the United States. The U.S. report of the Deep Decarbonization Pathways Project of the Sustainable Development Solutions Network and the Institute for Sustainable Development and International Relations. Revision with technical supplement, Nov 16, 2015

[3] Proposed Scoping Plan Update, Appendix D, p.10

deployment in order to achieve above targets.

## 1) The Proposed Scenario Should Be Revised to Include Building Electrification and Decarbonization Targets for the 2020 through 2030 Timeframe.

In order to lay the groundwork to achieve long-term climate goals, the Proposed Scoping Plan needs to establish targets for building decarbonization and provide further direction for how to dramatically reduce GHG emissions in buildings in line with California's climate goals. Water and space heating in residential and commercial buildings is a major source of GHG emissions, on par with the emissions from all in-state power plants.[4] As California decarbonizes electricity generation, the buildings sector's share of California's emissions will only grow.

Decarbonizing buildings is not a "turn-key" strategy, but rather requires significant planning, policy reform, and market transformation. State agencies and other key actors need to begin to plan now to ensure market and policy barriers can be overcome in a timely and cost-effective manner. Absent action today to support and signal building electrification, California can expect the continuation of current construction trends, further entrenching an almost exclusive dependency on natural gas. The building infrastructure and gas distribution pipelines that California invests in over the next 13 years will be major sources of GHG emissions well beyond 2030. Instead of investing in infrastructure that may be inviable with long-term climate goals, the Proposed Scoping Plan should prompt clean energy infrastructure planning for the long-term. ARB can trigger this longer term planning by including building electrification targets in the Proposed Scenario.

Despite the importance of achieving progress in building electrification within the 2020 to 2030 timeframe in order to meet long-term 2050 emission reduction targets, the Proposed Scoping Plan includes no expectations for building electrification. Instead, electrification targets, which include increases in the proportion of residential and commercial water heater sales that are electric heat pumps, are only included in Alternative 1.[5] We ask that ARB include these same electrification expectations in the Proposed Scoping Plan Scenario.

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[4] California Air Resources Board (CARB) GHG Inventory data shows that over the last five reported years (2010-2014) emissions from the residential and commercial sectors averaged 51 MMT CO2e annually, compared to 48 MMT CO2e for in-state power plants. In the residential sector 90 percent of these emissions were from fuels burned on-site, versus 63 percent for the commercial sector.

[5] Proposed Scoping Plan, Appendix D, pp 6, 10.

**2) The Proposed Scenario's Exclusion of Targets for Building Electrification is Counter to AB 197.**

Under AB 197, ARB is required to "prioritize . . . rules and regulations that result in direct emission reductions."[6] Because electrifying heating and household appliances eliminates emissions from smaller point sources, this sector should be prioritized. Yet even though ARB's own AB 197 analysis indicates that building electrification is relatively cost-effective when compared with the other measures in the Proposed Scenario, specific expectations for building electrification are only included in the Alternative Scenario. To comply with AB 197, the building electrification measure should also be included in the Proposed Scenario.

The following Table compares the cost of building electrification to other measures in the Proposed Scenario.

| Measure | Cost/metric ton in 2030 |
|---|---|
| 50% RPS | $100 to $300 |
| Mobile Sources CFT and Freight | <$50 |
| Liquid Biofuels (18% Crabon Reduction Target - LCFS) | $250 |
| 20% Refinery Measure | $70 to $200 |
| Short-Lived Climate Pollutant Strategy | TBD |
| 10% of residential and commercial electric space heating, water heating, A/C and refrigeration are assumed to be flexible by 2018 | -$500 to -$300 |
| 2x additional achievable EE in the 2015 IEPR | -$550 to -$300 |
| *Building electrification: 2.5x additional achievable EE in the 2015 IEPR, electrification of buildings (heat pumps & res. electric stoves) and early retirement of HVAC* | *$100 to $200* |

Table 1: Estimated 2030 Cost Per Metric Ton by Measure[7]

[6] Cal. Health & Safety Code § 38562.5.

[7] Proposed Updated Scoping Plan, Table III-3. Estimated 2030 Cost Per Metric Ton by Measure

Moreover, from a social cost of carbon perspective, ARB's analysis projects that the building electrification measure could yield large climate benefits ranging from $115-$800/metric ton.[8]

In addition, building electrification also comports with ARB's narrative criteria used to assess the Proposed Scenario and alternate scenarios.[9] Below we evaluate building electrification using ARB's metrics to demonstrate that it is a promising addition to the larger state climate strategy.

| Criteria | Details for Increased Electrification of Residential and Commercial Buildings |
|---|---|
| Ability to Reduce GHGs to Meet the 2030 Target | ● Incorporates new commitments to reduce emissions from fossil fuel use in buildings, which is a relatively untapped but significant opportunity. As new and existing generation resources that will serve the new load from building electrification become increasingly renewable, the GHG savings of electrification will increase. This is also a critical component of reducing GHGs beyond the 2030 timeline. |
| Air Quality Co-Benefits | ● Lower fossil fuel use and increased electrification will reduce criteria pollutants and toxic air contaminants. |
| Prioritize Rules and Regulations for Direct Emission Reductions | ● Direct use of fossil fuels in buildings is a major source of GHGs and other pollutants, on par with all in-state power plants. Electrification is a primary strategy to achieve direct emission reductions from the buildings sector. |
| Potential to Protect Against Emissions Leakage | ● Electrification of buildings will reduce the need to develop new natural gas infrastructure, thereby reducing fugitive methane emissions across the entire gas supply chain. Replacing fossil gas use in buildings with renewable natural gas, however, does not. |
| Support the development of integrated and cost-effective regional, national, and international GHG reduction programs | ● Provides leadership on how to reduce fossil fuel use in buildings using high efficiency electric technologies. Spurs market transformation and innovation in California. Could provide a policy model for other states to adopt similar measures. Investment in high efficiency electric infrastructure in California will increase the |

[8] Proposed Updated Scoping Plan, Table Ill-2. Estimated Climate Benefits (Avoided Economic Damages) by Policy or Measure in 2030

[9] Proposed Updated Scoping Plan, p.57

| | |
|---|---|
| | availability of cost effective high efficiency electric equipment across the country as well. |
| Funding | N/A |
| Public Health Benefit | ● Reduces GHGs, NOx, VOCs, particulate matter, and other hazardous pollutants. Improves safety by decreasing or eliminating combustion of fossil fuels inside homes and buildings. |
| Compliance Flexibility and Cost-Effective | ● Several cost-effective building electrification practices exist today for residential and commercial buildings. The number of cost-effective applications will increase with policy reform and market transformation. |
| Support the Clean Power Plan and federal climate programs | ● Distributed energy resources like high-efficiency electric heating can help California integrate higher levels of renewable energy by providing demand response and energy storage, thereby supporting the state's ability to decarbonize the grid. |

Accordingly, given its consistency with both AB 197, narrative objectives for prioritizing measures in the Proposed Scenario, and the importance of achieving progress in this sector to meet 2050 emission reduction goals, there is no legitimate basis for excluding building electrification from the Proposed Scenario as currently contemplated in the Scoping Plan.

**3) The Scoping Plan Should Also Include Analysis on the Timeline, Pathway and Barriers to Achievement of Building Decarbonization Targets.**

In addition to including building electrification goals in the Proposed Scenario, the Scoping Plan should provide analysis on the timeline, pathway, and barriers to building decarbonization to ensure goals are achieved by 2030. The timeline and pathway analysis could include various scenarios exploring different mixes of electrification, decarbonized fuels, pace of deployment of these technologies, by sub-sector (residential/commercial), and by end use (space heating, water heating, other gas end uses). Beyond electrification, ARB should conduct analysis on the scalability, affordability, air quality impacts, sustainability, and strategic uses of biomethane and power-to-gas to achieve 2030 and 2050 climate goals in the building sector.

In order to achieve building electrification targets, it is critical that ARB also identify

current barriers and challenges, as it has historically done to support the deployment of other technologies like electric vehicles. Construction of all-electric buildings and replacing natural gas appliances with efficient electric alternatives like heat pumps face major implementation barriers, including: (1) higher upfront and operating costs, (2) misaligned state policies and regulations, and (3) awareness and behavioral change.[10] On the policy side, the state's building energy code is biased in favor of natural gas use in buildings and discourages building electrification, even when that might be the most cost-effective, most efficient, and lowest emissions option.[11] Additionally, utility programs to incentivize fuel substitution from gas to more efficient electric appliances are hampered by the California Public Utilities Commission's "3-prong test," which has vague requirements and lacks guidance on which test should be performed. Since the market for heat pump water heaters and heating and cooling systems is still at an early stage in California, the economics are also a challenge. These electric technologies are in general more expensive than their natural gas versions. Many contractors do not have significant experience with installation, making them less likely to recommend electric appliances, and more likely to need extra time (and extra wages) to learn. The current Cap and Trade framework and existing policies like SB 350 will not be sufficient to lift electrification over these hurdles. As the state agency responsible for GHG policy implementation strategies, ARB has a critical role to identify the key market and policy barriers and facilitate coordinated action at the agency level to achieve building decarbonization targets in a timely and efficient manner.

**4) The Scoping Plan Should Identify Policies and Activities Needed by Key State Agencies to Achieve Building Electrification Targets.**

Building electrification will not occur at the scale described in the Alternative 1 scenario without a strong policy framework. While building electrification using high efficiency heat pumps is technologically feasible today and common in parts of the Pacific Northwest, Europe, and Japan, there are currently only a handful of cost-effective applications in California, mostly

[10]Energy Transitions Commission, "A new electricity era: How to decarbonize energy systems through electrification" January 2017. Also see Sierra Club *Comments on the Second Update to the Climate Change Scoping Plan*, December 16, 2016, for description of market transformation challenges.

[11]For example, Title 24 of the state building code's cost effectiveness test is based on consumer cost projections which do not include societal costs of energy, and do not account for the actions that will be required to achieve the state's climate goals, such as building decarbonization.

in new construction and large-scale retrofits.[12] In order to expand and accelerate building electrification as a GHG mitigation strategy and to achieve the targets in Alternative 1, ARB needs to signal the need for policy support from other regulatory agencies, mainly the CPUC and CEC.

Agency support will be critical to overcome policy and market transformation barriers and to unlock the potential of building electrification to curb GHG emissions. As has happened with rooftop photovoltaic, and is currently happening with electric vehicles, incentive programs and other supportive policies from ARB, CEC, CPUC, and other regulatory agencies can help to accelerate market development and transformation. With similar policies for building electrification in place, we expect equipment and installation costs to come down and performance to improve. In addition, policy reform is needed to ensure that thermal storage and demand flexibility of electric heating appliances can help with grid balancing, renewables integration, and the optimization of power plant capacity factors. The inclusion of these grid and carbon benefits in customer rates, and the reduction in equipment and installation costs as the market transforms, have the potential to make electrified buildings a very cost-effective climate mitigation strategy. By both including building electrification targets in the Scoping Plan and by identifying key activities and policy opportunities at state agencies, ARB will mobilize the level of broad support and momentum that is needed to realize our climate and air quality goals. ARB has a critical role to play to set a vision and a roadmap that the other agencies can support in order to make substantive progress on building decarbonization in the 2020 to 2030 timeframe.

We appreciate the opportunity to submit these comments and look forward to working with ARB to achieve California's 2030 greenhouse gas reduction requirements.

[12] Low-income retrofits with fuel-switching:
-Sonoma Court, 60 family apts, Escondido (HVAC and Cooking + solar)
-Monterrey Pines, 324 family apts, Richmond (Domestic Hot Water + solar)
-Deliverance Temple Phases I and II, 82 family apts, Richmond, CA (Domestic Hot Water + solar)
-Ethan Terrace, 92 senior apts, Sacramento (HVAC)
-St. Marks, 117 senior apts in a nine stories tall historical hotel, Sacramento (Domestic Hot Water)
-The Crossings, 100 family apts, Rialto (Domestic Hot Water + solar)
-The Eureka Lodge, 50 senior apts, Eureka (HVAC, DHW, Cooking)

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