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Setting an Emissions Baseline and Targets for AB 3232 Report

I. Purpose

This memo explores various approaches for maximizing the value of the AB 3232 report in helping California plan for building decarbonization, including the baseline, scope and targets for building sector greenhouse gas (GHG) emissions reductions.

II. Background on AB 3232 Requirements

AB 3232 requires the Commission to assess the potential to reduce GHG emissions from residential and commercial buildings by at least 40 percent below 1990 levels by January 1, 2030. The AB 3232 Report ("the Report") will evaluate the cost effectiveness of strategies to decarbonize buildings. It will identify challenges associated with reducing emissions, potential load management strategies, and impacts to ratepayers. Language in AB 3232 sets a goal of "at least 40 percent below 1990 by 2030" for the AB 3232 assessment. The bill reads:

> *By January 1, 2021, the commission, in consultation with the Public Utilities Commission, the State Air Resources Board, and the Independent System Operator, shall assess the potential for the state to reduce the emissions of greenhouse gases in the state's residential and commercial building stock* ***by at least 40 percent below 1990 levels by January 1, 2030****.*

There are two key takeaways from this language that inform the development of an emission baseline. First, the law requires the Commission to assess the potential to reduce emissions by "at least" 40 percent below 1990 baseline levels by 2030.[1] The Commission can choose to exceed the 40 percent minimum and propose an additional target for the AB 3232 report that aligns with California's 2045 goal of carbon neutrality (EO B-55-18).

Second, the law does not specify whether the commission should account for "direct" emissions or "holistic" emissions when conducting this assessment. Direct emissions analysis includes on-site fuel combustion (like gas and propane), substitutes for ozone-depleting substances (hydrofluorocarbons and HFCs from refrigeration and air conditioning), and onsite fugitive methane emissions. Holistic emissions analysis includes all emissions attributable to buildings, including emissions from electricity generation, fugitive methane emissions from upstream natural gas production and distribution infrastructure, and behind the meter methane emissions from leaks and incomplete combustion.

At the August 27th "IEPR Joint Agency Workshop on Energy Efficiency and Building Decarbonization," CEC staff presented two different methodologies to establish a baseline building

[1] Section 25403 (a) reads "By January 1, 2021, the commission, in consultation with the Public Utilities Commission, the State Air Resources Board, and the Independent System Operator, shall assess the potential for the state to reduce the emissions of greenhouse gases in the state's residential and commercial building stock by at least 40 percent below 1990 levels by January 1, 2030." https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB3232

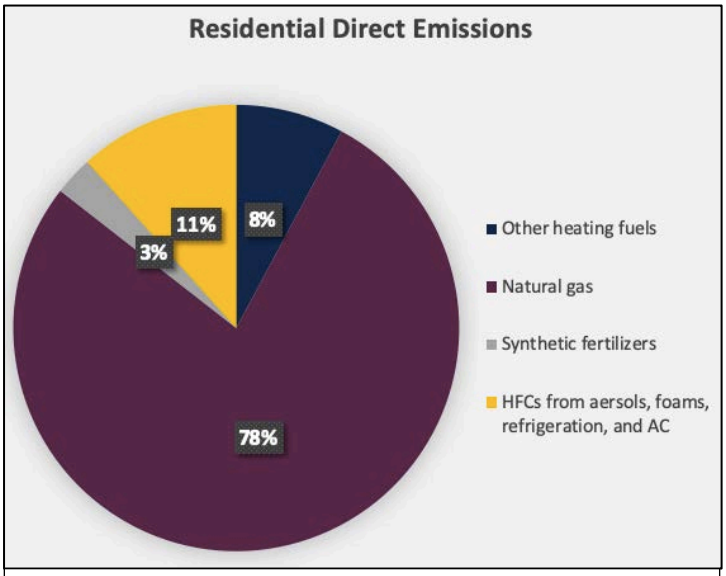
emissions estimate. CEC staff said they are exploring a direct emissions approach and propose coordinating with CARB to verify baseline calculations and handle increased electricity loads.

III. Quantifying Baseline Emission Approaches: Direct vs. Holistic

There are pros and cons of both approaches for determining a 1990 baseline for building emissions. NRDC compared the direct and holistic emission data for different 2030 and 2045 scenarios. To complete emission calculations, NRDC used CARB statewide greenhouse gas inventory data and IEPR electricity demand forecasts.[2]

- **Direct emissions analysis:** Direct emissions are reported by CARB in their annual greenhouse gas inventories. NRDC summarized residential and commercial building emissions using the 1990 and 2017 greenhouse gas inventory data. This includes onsite fuel combustion, behind-the-meter fugitive methane emissions, use of substitutes for ozone-depleting substances (HFCs), and fertilizer use.[3] Of residential emissions, 86 percent are due to natural gas combustion or other heating fuel combustion.

Figure 1 Direct Emissions



2017 Inventory Residential Emissions

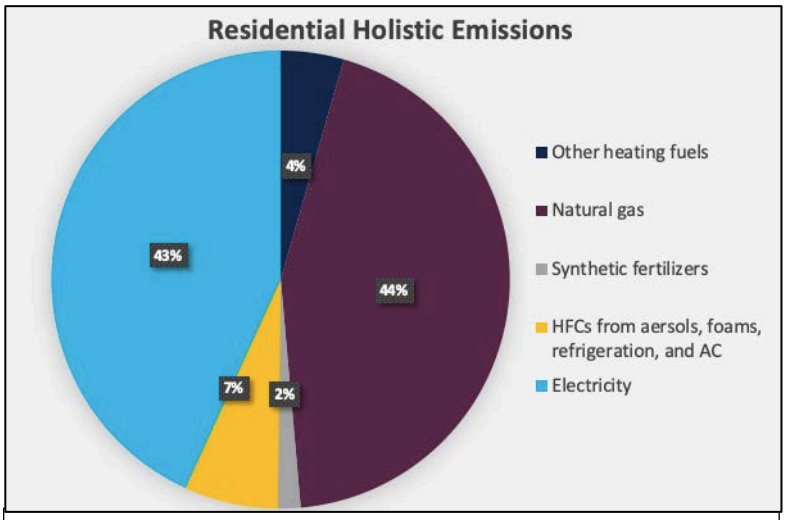
- **Holistic emissions analysis:** To estimate electricity emissions associated with building energy consumption, NRDC used the 1990 and 2017 greenhouse gas inventory data and 2017 IEPR Mid-Energy Demand forecasts by sector. NRDC estimated the portion of electricity

[2] https://ww2.energy.ca.gov/2017_energypolicy/documents/#demand & https://ww2.arb.ca.gov/ghg-1990-to-2004 & https://ww2.arb.ca.gov/ghg-inventory-data

[3] "Residential post-meter natural gas leaks" https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2017/ghg_inventory_00-17_method_update_document.pdf

consumed by residential and commercial buildings.[4] NRDC then applied those proportions to the total calculated emissions from electricity generation, both in-state and imported, from the 1990 and 2017 inventories. Including electricity, about 48 percent of residential building emissions are from natural gas combustion and other heating fuels. 43 percent of emissions are from electricity consumption. Note that these estimates do not include lifecycle emissions associated with natural gas production, distribution, or behind-the-meter leakage.

Figure 2 Holistic Emissions



2017 Inventory Residential Emissions

To assess the direct versus holistic approach, NRDC modeled how each methodology would track towards meeting the 2045 target of carbon neutrality.

2030 Scenario Model	2030 Emissions
Existing Policy Scenario – forecasts emissions based on PATHWAYS data for residential and commercial direct emissions and electricity emissions.[5]	This PATHWAYS model forecasts emissions accounting for SB 350, doubling energy efficiency, a 50% RPS, and reductions in short-lived climate pollutants.[6] With existing policy goals, we will reduce **direct emissions by 27 percent** by 2030. We will reduce **direct and electricity emissions 46 percent** by 2030.

[4] https://ww2.energy.ca.gov/2017_energypolicy/documents/#demand

[5] Residential and commercial direct emissions were aggregated, so we disaggregated by residential and commercial using 2016 proportions.

[6] https://www.ethree.com/wp-content/uploads/2018/06/Deep_Decarbonization_in_a_High_Renewables_Future_CEC-500-2018-012-1.pdf

Reference Scenario – forecasts emissions based on PATHWAYS data for residential and commercial direct emissions and electricity emissions.[7]	This PATHWAYS "Reference" model forecasts emissions only applying pre-SB 350 policy and is a business as usual (BAU) model that does not meet climate goals.[8] Under BAU, we will reduce **direct emissions by 23 percent** by 2030 and **holistic emissions 34 percent** by 2030.
SB 100 Scenario – forecasts emissions using the PATHWAYS reference scenario and the SB 100 requirement for carbon neutral electricity by 2045.	This model uses the PATHWAYS reference model for residential and commercial direct emissions and electricity emissions estimates using a linear projection from 2017 to zero emissions in 2045, as required by SB 100. With SB 100, **direct emissions are reduced by 23 percent** by 2030 and **holistic emissions are reduced by 55 percent** by 2030.
On-track to 2045 Scenario – calculates emissions reductions needed in 2030 to be on track (linearly) to meet our 2045 target of carbon neutrality from the 2017 inventory.	To be on track to meeting 2045 goals, we would need to reduce **direct emissions by 46 percent** by 2030. We would need to reduce **holistic emissions 62 percent** by 2030.

IV. Discussion

a. Benefits and drawbacks of a direct emissions approach

There are several key benefits of using a direct emissions approach. The Report can directly address these emissions sources while electricity emissions are in part dealt with through supply-side policies, and reducing emissions 40 percent by 2030 is ambitious compared to the Reference Scenario which would only result in a 23 percent reduction by 2030.

If the Report's emissions goals and strategies are based on direct emissions, strategies can concentrate on reducing direct fuel combustion in buildings through energy efficiency and efficient electrification. California has yet to develop a plan to achieve deep carbon reductions in building fuel use, and the Report is an opportunity to guide statewide action. In contrast, greenhouse gas impacts of the electricity grid are addressed through a variety of other means, including SB 100, related CEC and CPUC proceedings, and utility actions.

Reducing direct emissions 40 percent below baseline by 2030 would be more ambitious than the Existing Policy and Reference Scenarios. **The rate of reduction (between 2017 and 2030) aligns well with the rate of reduction needed to meet the 2045 goal of carbon neutrality (28%)**. See **Figure 1.** below.

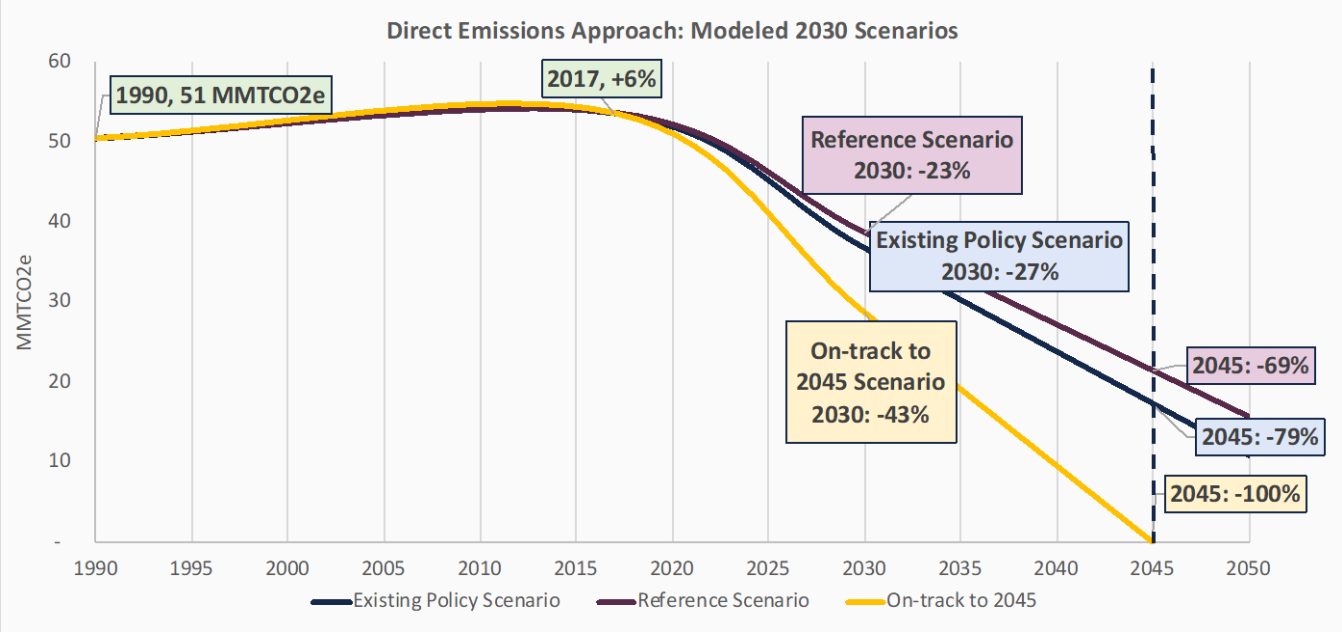
There is a significant drawback to using the direct emissions approach. Without measuring electricity emissions, we will not have a complete picture of building emissions and will not be

[7] Residential and commercial direct emissions were aggregated, so I disaggregated by residential and commercial using 2016 proportions.

[8] https://www.ethree.com/wp-content/uploads/2018/06/Deep_Decarbonization_in_a_High_Renewables_Future_CEC-500-2018-012-1.pdf

able to comprehensively evaluate the contribution of building sector strategies towards meeting 2045 climate goals, including the efficiency and grid-friendliness of electric technologies. Additionally, some strategies that reduce direct emissions, like electrification, may in turn increase electricity consumption. Analysis of strategies in the Report will need to account for emissions impacts of electrification, arguing for aligning the baseline emissions quantification with strategy analysis.

*Figure 3. Direct Emissions Scenarios**



*note that graph does not include reported, annual emissions between 1990 and 2017. Update before finalizing.

b. Benefits and drawbacks of a holistic emissions approach

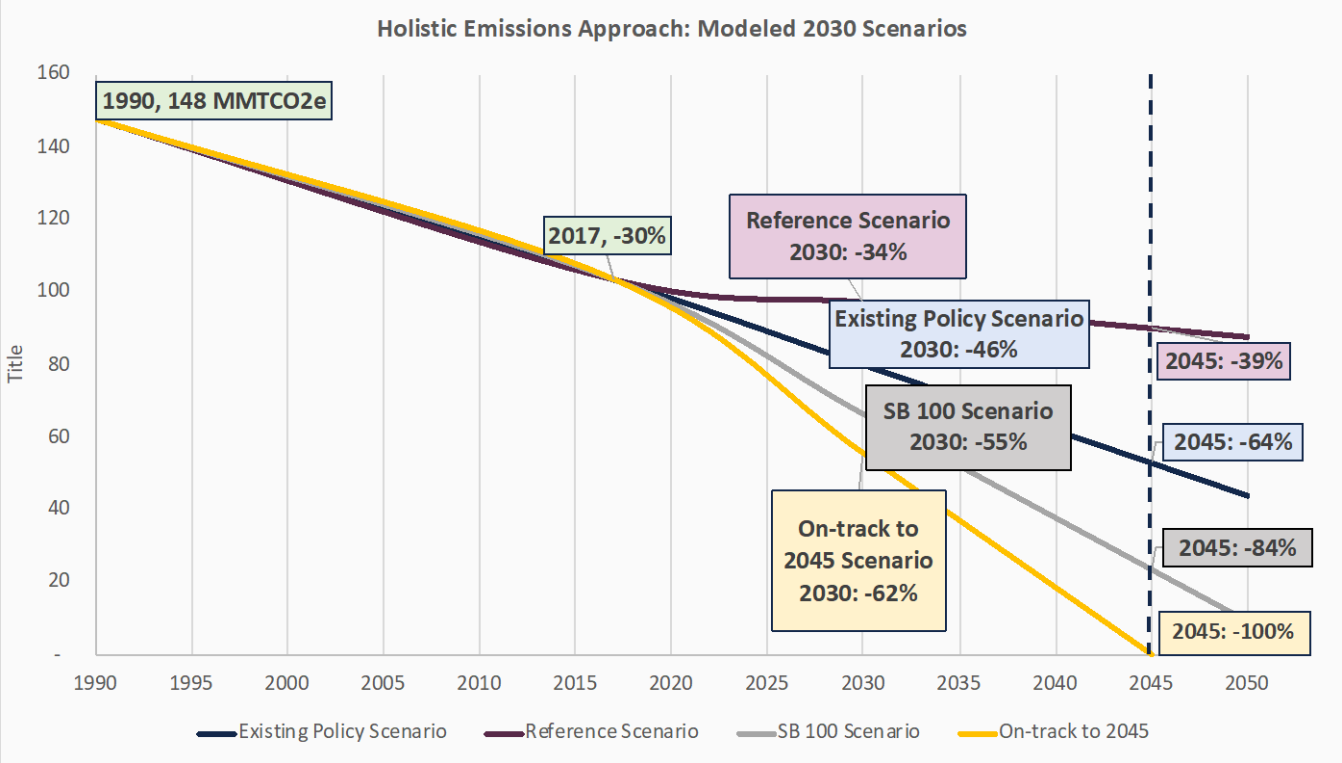
A holistic emissions approach presents a complete picture of building sector contributions to CA economywide emissions and better aligns with the bill's intentions. Language from AB 3232 defines the need to assess potential reductions from building emissions in support of 2030 climate goals. "…the state has not assessed the potential for cost-effectively reducing **total** greenhouse gas emissions from buildings by an amount that is consistent with the state's greenhouse gas reduction target of 40 percent below 1990 levels by 2030."[9] Electricity demand is a key part of building emissions; residential and commercial buildings account for 80 percent of statewide electricity consumption.[10] Additionally, this approach helps assess the interacting impacts of policies that address efficiency, electrification, and load management together.

[9] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB3232
[10] Of electricity demand resources included in IEPR forecast.

The drawback of this approach is that renewable portfolio standards and existing legislation already provide emissions reductions of at least 46 percent by 2030, exceeding the 40 percent below baseline target. See the Existing Policy Scenario in **Figure 4.** This would provide no incentive to invest additional resources to address building emissions through 2030. However, to achieve long-term, deep carbon reductions by 2045, we need to take action to reduce building emissions now. **Figure 4.** shows that the Reference Scenario (-39% below baseline), Existing Policy Scenario (-64% below baseline), and SB 100 Scenario (-84% below baseline) fail to achieve zero or near zero emissions by 2045.

To be on-track to achieve 2045 carbon-neutrality targets, holistic building emissions would need to be reduced by **62 percent** by 2030. Although using a holistic emissions approach with a 40 percent by 2030 target is not a strong incentive to take action, the report could use a holistic approach but analyze strategies to achieve greater reductions by 2030, in line with 2045 carbon neutrality goals. The bill language requires "at least" a 40 percent goal, but the report could recommend a more ambitious reduction goal.

*Figure 4 Holistic Emissions Scenarios**



*note that graph does not include reported, annual emissions between 1990 and 2017. Update before finalizing.

V. Recommendation

The Commission should consider using a holistic emissions approach and analyzing strategies to support a target of 62 percent reduction that is aligned with the state's goal of carbon neutrality by

2045. The Report provides an opportunity to assess the cost effectiveness of strategies to decarbonize buildings. Both electricity and heating fuel emissions are significant contributors to building carbon footprints. To best achieve long-term climate goals, the Report should analyze strategies that address holistic emissions in support of a 2030 target that aligns with the 2045 goal of carbon neutrality.