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Joint Comments on Assembly Bill 3232 Building Decarbonization Assessment

Additional submitted attachment is included below.

Commissioner Andrew McAllister
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

September 14, 2020

Re: AB 3232: Fundamental Assumption Changes Are Needed to More Accurately Assess the Costs of Building Decarbonization

Dear Commissioner McAllister:

The Natural Resources Defense Council (NRDC), Sierra Club, Earthjustice, and Environmental Defense Fund (EDF) thank you for the opportunity to provide comments on the building decarbonization assessment that the California Energy Commission (CEC) is developing pursuant to Assembly Bill (AB) 3232.

Homes and buildings must be decarbonized in order for California to meet its climate and clean air goals. However, preliminary cost numbers shown in the AB 3232 Fuel Substitution Scenario Analysis Tool (FSSAT) draft results are one order of magnitude higher than they could be with the right policies and more accurate framing of the analysis.

While there are many assumptions that do not reflect the most cost-effective pathways to building decarbonization, the following three changes may have the biggest impact on the model:

1. Focus on Getting to Zero by 2045

Focusing exclusively on 2030 may not provide cost-effective pathways. The single biggest tool at our disposal for a cost-effective transition is to transform the market and leverage natural replacement cycles in installed equipment. This requires a longer-term horizon than just 10 years. While AB 3232 sets a 2030 timeline for the assessment, the intent of the law is long-term building decarbonization, with 2030 as an intermediate milestone to set the necessary level of ambition and urgency. While we agree that time is of the essence, it should not preclude the assessment of much more affordable pathways to fully decarbonize buildings by 2045 even though they may not achieve exactly 40% by 2030.

2. Incorporate Market Transformation into the Cost Estimation

The key to an affordable transition to clean energy in buildings is to transform the market so that equipment and installation costs come down by an order of magnitude, similar to what has happened and is still happening with other clean energy technologies like solar, LED, EVs, and batteries. The 20% and 30% cost reduction scenarios do not come close to the level of reduction that is achievable when effective market transformation policies are implemented.

A key objective of AB 3232 should be to model pathways that leverage market transformation as a primary strategy for an affordable transition. We recommend modeling high/medium/low scenarios for cost reductions of 80%, 50%, and 20% by 2030. As just one point of reference, according to LBNL's *Tracking the Sun* report, installed residential photovoltaic prices fell approximately 69% from 2002 to 2018 (from $12/W-DC to $3.7/W-DC on average). Levelized battery costs dropped 11 percent annually between 2015 and 2017, and 7 percent in 2018 and 2019.[1] BloombergNEF shows an 87% decline in battery prices from 2010 to 2019 (equipment only).[2]

We expect electrification technologies to share similar potential for cost declines: as with photovoltaic panels and batteries, installed costs for electrification are dominated by soft costs, and economies of scale in the workforce, efficiency improvements, and business model improvements can lead to significant soft cost reductions.

3. Bundle Space Heating Electrification with AC Replacements

FSSAT currently models space heating electrification as a standalone measure, independent from AC replacements. However, the most cost-effective opportunity for space heating electrification is to install a heat pump instead of an AC unit when replacing an existing AC unit on burnout, or when installing AC for the first time. The incremental cost of a heat pump versus an AC unit is marginal, making this an extremely cost-effective electrification opportunity. FSSAT needs to consider this opportunity as this could be driven by policies requiring that all AC replacement after a certain date must be heat pumps.

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[1] Lazard's Levelized Cost of Storage Analysis, 2015 to 2019

[2] BloombergNEF, 2019 Lithium-Ion Battery Price Survey, December 3, 2019

In addition to the above recommended three changes, below are other needed changes in assumptions in order to improve cost estimates in the analysis:

4. Factor in Natural AC Adoption

The model assumes a large incremental load in summer from the incremental use of AC resulting from the adoption of heat pumps. This ignores the natural adoption of AC irrespective of electrification: with the increasing frequency and severity of heat waves, the natural adoption of AC is increasing rapidly throughout the state, particularly with less efficient window and room AC units, and also including central AC. The model incorrectly attributes all of this summer load growth to electrification. Instead it should only attribute to electrification the incremental load growth after natural AC adoption. Electrification with efficient central heat pumps will actually offset some of this load growth from less efficient window and room AC units.

5. Include Scenarios that Reflect Future Load Shapes and Demand Flexibility

The model should include scenarios that account for increased envelope efficiency, and different heating operation practices such as lower thermostat setbacks and smart thermostats that spread the heating load during the night and reduce morning peak coincident load. Heat pumps operate differently from gas furnaces, they provide more continuous heat over longer periods of time instead of high quantities of heat over a short period of time to recover from a low temperature setback at 6 am. It is important to model these best practices because they can make a significant difference to winter peak load impacts.

It is also important that the model includes scenarios with significant demand flexibility, particularly for water heating and to some extent for space heating and cooling. There is significant policy momentum in this space (CEC's Load Management Proceeding, Load management developments in Title 20, the adoption of Title 24 Joint Appendix 13, the inclusion of HPWH demand flexibility in SGIP, EPIC funding for demand flexible water heating and HVAC), which make a significant level of load management a reasonable assumption by 2030, and even more so beyond 2030.

6. Adjust Electric Panel Upgrade Requirements and Costs

Electric panel upgrades appear to be a significant share of the cost of electrification. The thresholds for panel upgrade requirements should factor in innovation such as 120-volt plug-in heat pump water heaters that are currently being developed and should be in the California market within 1 to 2 years. As with AC, panel upgrade costs should not be attributed solely to electrification, when there are many other reasons for upgrading electric panels, including safety, solar, battery, and EV installations. The model should attribute only part of panel upgrade costs to policy-driven electrification. In addition, panel upgrade costs should also reduce over time, as the volume increases and economies of scale drive efficiencies in equipment and installation costs.

7. Ensure the Electric Resource Portfolio is Consistent with the California Public Utilities Commission (CPUC)'s Integrated Resource Plan (IRP)

The resource plans used for this modelling should match that in the CPUC's IRP proceeding. It is not clear what electric resource portfolios were assumed in the FSSAT or whether users can modify these assumptions; the slides state only that the model uses "resource plans that satisfied reliability criteria." The latest IRP requires load-serving entities to present portfolios based on both a 46 MMT 2030 target for the electric sector and a 38 MMT target (see D. 20-03-028 at p. 41 and p. 46). The CEC should model both resource plans in this analysis.

Additionally, the FSSAT states that "battery storage capacity was added to satisfy reliability criteria" but the assumptions about capacity and cost are not clearly disclosed. The IRP contemplates significant additional renewable procurement under both the 46 and 38 MMT scenarios, so it is unclear what, if any additional renewable procurement is needed to meet RPS requirements.

8. Update the FSSAT to Reflect Future Electricity and Gas Rates

FSSAT modeling of rates is crude and does not reflect either current policy progress, trends, and CEC's own research findings on the Future of Retail Gas. SCE has already adopted heat pump friendly rates (TOU-D-PRIME) that reward off-peak use with much more favorable rates than average. CPUC has ordered PG&E and SDG&E to do the same and such rates are expected to go into effect in 2021. In addition, CEC's recent study on the Challenges of Retail Gas in California make it clear that gas rates are projected to increase much faster than electric rates as gas use declines due to energy efficiency, a warming climate, economic and policy-driven electrification, and the cost impacts of an increasing mix of alternative gas in the gas supply.

In contrast, vehicle and building electrification is expected to slow the increase in electric rates. This must be included in FSSAT to appropriately reflect the long-term cost benefits of electrification vs. a decarbonization scenario relying more heavily on alternative gas. Even in an electrification scenario, we expect that some level of fossil gas alternatives will be blended in the pipeline, per both voluntary initiatives by gas companies such as SoCalGas green gas tariff, and policy-driven developments, and these increases should be reflected as avoided cost in electrification scenarios.

9. Consider Higher Efficiency Packaged Heat Pump Options

FSSAT seems to assume very low efficiency packaged HP replacements to gas rooftop units which are the largest opportunity for gas emissions reduction in the commercial sector. The analysis should consider higher efficiency packaged heat pump options, and include Variable Refrigerant Flow (VRF) units as well. VRF is a rapidly growing and relatively affordable technology. Recent developments such as hybrid VRFs being introduced in the US market by Mitsubishi, show the potential for rapid market growth in this lower cost and much higher efficiency technology. This opportunity should be included in FSSAT scenarios.

10. Better Account for Methane Emissions

Methane emissions associated with gas use in buildings are vastly underestimated. Staff's scenarios assume only 0.475% behind the meter leakage, no upstream leakage, and a 100-year global warming potential. This is inconsistent with CARB and Title 24 policy which use 20-year GWP, and it ignores the elephant in the room of the much higher upstream emissions at the wellhead, processing, transmission and distribution of fossil gas, particularly for out-of-state emissions associated with the 90 percent of gas that California imports.

As California transitions away from gas in buildings, less gas wells will be drilled, pipelines built, and gas leaked. It is critical that AB 3232 properly accounts for this GHG reductions, just like CARB accounts for out-of-state emissions from electricity imported into California.

11. Include Cost Savings from New Construction

All-electric new construction can result in net savings as compared to dual fuel homes. Homeowners and builders save directly by avoiding the cost of gas pipelines. A 2019 CASE Report estimates the up-front savings as $5,350 for single-family construction and $2,300 per unit for multi-family construction.[3] Furthermore, these costs underestimate total societal savings from all-electric new construction as they do not include the cost of gas line extensions that is paid for in-utility rate base and shared by all customers. The FSSAT model should include these up-front cost savings.

Additionally, all-electric new construction also avoids the costs of electrical upgrades and additional installation labor associated with retrofits. It is unclear if, or how, the

[3] California Energy Codes and Standards Report, *2019 Cost Effectiveness Study: Low Rise Residential New Construction* (August 1, 2019) at 33-34. https://www.sanjoseca.gov/home/showdocument?id=39074

FSSAT tool takes these potential cost savings into account: While the FSSAT Scenario Definitions differentiate between new construction, replacement on burnout, and early replacement, the spreadsheet of selected input assumptions appears to only identify appliance costs, characteristics, and standard values, *without* differentiating between the type of replacement. Costs of electrical upgrades and the installation labor associated with retrofits should not be associated with any all-electric new construction.

If the model does not account for the savings of new construction, it will overstate electrification costs and fail to provide meaningful policy guidance on the electrification pathways that will reduce overall costs.

Conclusion

Affordable building decarbonization is possible, but the analysis must reflect best policy practices and most cost-effective pathways. We greatly appreciate the opportunity to offer our comments for improving the analysis. The CEC must design a roadmap to lay out for the state how to transform the market affordably and effectively, aligning all building efforts towards meeting the state's 2045 goals.

Thank you for your consideration,

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