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## **Sierra Club Comments on 2019 Draft TDV Updates**

*Additional submitted attachment is included below.*



July 29, 2016

*Via electronic submittal/e-commenting*

California Energy Commission

**Subject:** Sierra Club Comments on the 2019 Title 24 Draft Time Dependent Valuation of Energy Updates (Docket #16-BSTD-06)

The Sierra Club appreciates the opportunity to provide these comments to the California Energy Commission (“CEC” or “Commission”) on the 2019 Time Dependent Value (“TDV”) of Energy, as presented and discussed at the Staff Workshop on July 15, 2016.

## **I. Introduction**

The Sierra Club supports the Commission’s ongoing effort to achieve cost-effective energy savings and greenhouse gas emission reductions through the adoption of updates to the Title 24 Building Energy Efficiency Standards (“Title 24” or “standards”). We appreciate the significant amount of work that went into updating the TDV metric for the 2019 code cycle and the workshop on July 15, 2016 to discuss E3’s Data Sources and Inputs Methodology Report.

However, the Sierra Club is concerned that the current structure and use of the TDV metric will entrench the state on a path of constructing high-polluting mixed-fuel buildings despite the lower-carbon and cleaner electric building alternatives. Continuing to construct buildings with gas heating will prevent the state from achieving greenhouse gas and air quality goals in a cost effective and timely manner. As California continues to decarbonize its grid, the Commission should ensure that residential and commercial buildings optimize use of clean energy resources as they come online and transition away from direct combustion of natural gas and propane.

Our comments focus on five specific concerns related to TDV:

- The current use of the TDV metric and natural gas as the baseline fuel impedes the construction of low-carbon electric buildings.
- The TDV metric does not accurately account for greenhouse gas emissions or the cost of greenhouse gas abatement associated with fuel choice in buildings.
- The natural gas TDV values do not reflect the full cost of gas consumption.
- Natural gas should not be assumed to always be the marginal unit for electricity generation in the electricity TDV calculation.

- The electricity TDV value should reflect an increase in renewable energy and energy efficiency beyond 2030 instead of the current assumption of zero growth after 2030.

The Sierra Club is concerned that these limitations in the calculation and application of TDV will hinder the Commission's ability to align Title 24 with California's overarching climate goals.

## **II. The current use of the TDV metric and natural gas as the baseline fuel impedes the construction of low-carbon electric buildings.**

The TDV metric and the general use of natural gas as the baseline fuel create a barrier to building lower emissions electric buildings in California. Most new construction in California complies with Title 24 using the performance path, where the proposed building design needs to have an equal or lower TDV energy use than the reference building, which is most often based on natural gas end uses. Currently, the baseline fuel for water heating is gas for both new construction and retrofits, and is gas for space heating in retrofits. TDV values for electricity range from approximately two to over 100 times greater than those for natural gas. The combination of the drastically higher electric TDV values *and* the predominant use of gas to determine the TDV budget create a structural bias in the code toward natural gas space and water heating despite the potential to significantly cut greenhouse gas emissions with efficient electric heating. If Title 24 continues to base building compliance on TDV budgets from natural gas, then the state will forgo important and timely opportunities to make large reductions in emissions in the buildings sector.

Recent analyses by the Natural Resources Defense Council (NRDC), E3, and Enercomp demonstrate the disconnect between TDV energy use and greenhouse gas emissions from mixed-fuel and electric buildings. In *NRDC Comments on the 2019 Title 24 Draft Time Dependent Valuation of Energy Updates (Docket #16-BSTD-06) June 3, 2016*, NRDC provided results of analysis of the average annual emissions and TDV energy use from water heating in a prototype home modelled in CBECC-Res 2013 in five representative California climate zones. The analysis shows that only the most efficient electric heat pump water heater complies with the TDV baseline set by the reference gas water heater, even though *all* of the electric heat pump water heaters modeled have lower emissions. These results suggest that TDV is not an appropriate metric for determining fuel choice in buildings from a climate or environmental perspective.

In E3 and Enercomp's preliminary investigation<sup>1</sup> of the impacts of the proposed 2019 TDV values on residential electrification, they modeled three prototype buildings (both single and multi-family) and one combination of building measures and features across all 16 climate zones. Their analysis and NRDC's analysis arrive at a similar and important finding: Across all climate zones, electric homes have consistently lower lifecycle greenhouse gas emissions but higher lifecycle TDV consumption values than mixed-fuel homes. For space heating, buildings

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<sup>1</sup> Results of analysis were presented by E3 at the CEC Staff Workshop on 7/15/16.

with gas space heaters typically produced roughly twice the lifecycle emissions of buildings with electric space heating. While buildings with gas space heating had lower lifecycle TDV values than electric space heating, the difference in most climate zones (except CZ 16) was negligible. These results were even more pronounced for water heating. Buildings with gas water heaters produced *more* than twice the emissions of buildings with electric water heaters (see Figure 1).

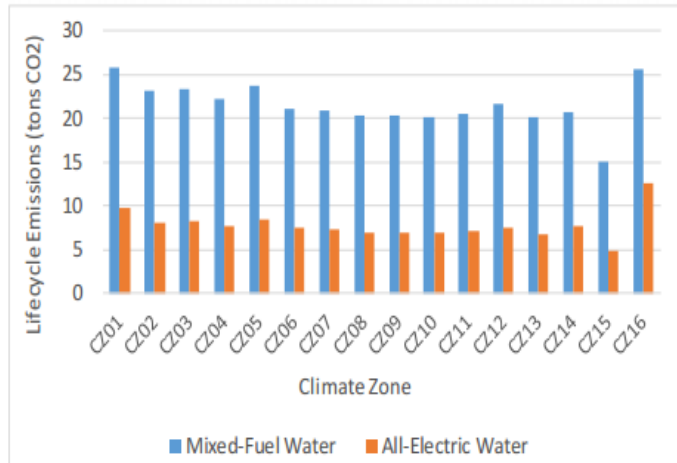


Figure 1: Lifecycle CO2 Emissions from Mixed-Fuel and All-Electric Water Heating (E3 2016).

Again, while buildings with gas water heating had lower TDV consumption, the difference in most cases (except CZ 16) was marginal (see Figure 2).

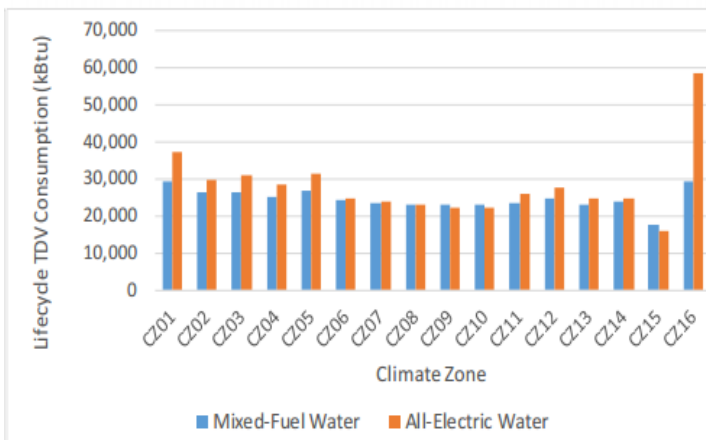


Figure 2: Lifecycle TDV Consumption from Mixed-Fuel and All-Electric Water Heating (E3 2016)

California would be misguided to allow such negligible differences in TDV consumption to be the sole determinant of fuel choices in new building construction and in renovations. It is critical that this is addressed in the 2019 code cycle so we can ensure that Title 24’s measure of cost effectiveness does not preclude climate- and environmentally-beneficial infrastructure investments.

**Recommendation:** The Commission should solicit and consider recommendations for how it can better align Title 24 and the Warren-Alquist Act’s cost effective energy savings mandate

with the broader state directive to support policies that will contribute to a 40 percent and 80 percent reduction in greenhouse gas emissions below 1990 levels by 2030 and 2050 respectively. We recognize that such an endeavor will require time and significant attention and may be beyond the scope or timeline of the 2019 code cycle. Therefore, in the interim, we urge the Commission to reconsider its use of gas as the baseline fuel for water heating in new construction and retrofits, and for space heating in retrofits. Specifically, we recommend the Commission establish a same fuel baseline for the TDV budget of a reference building and proposed design in the 2019 code cycle. For water heating, the baseline for buildings designed with electric water heating should be a minimum standard 55 gallon electric water heater. While changing the baseline fuel will not necessarily incentive construction of lower-emission buildings, it will at least remove a major barrier to the construction of low- or zero-emissions electric buildings.

### **III. The TDV metric does not accurately account for greenhouse gas emissions or the cost of emissions abatement associated with fuel choice in buildings.**

The TDV metric does not accurately reflect the quantity or cost of greenhouse gas emissions. Currently, the TDV values for electricity, natural gas, and propane are built up from a variety of components. The electricity TDV is based on the hourly marginal wholesale cost of electricity, system capacity, ancillary services, CO<sub>2</sub> emissions costs of the marginal resource, an adder to reflect the cost of complying with California's RPS, and a retail rate adder. The natural gas TDV is based on a long-run monthly forecast of retail and wholesale gas prices, transmission distribution costs, and emissions costs. The propane TDV is based on forecasted monthly retail costs and emissions costs. Electricity's higher retail price forecasts and the large peak costs associated with summer electricity use are the main drivers in the difference between electricity TDV values and gas and propane TDV values. The CO<sub>2</sub> emissions price in the TDV values gets overshadowed by the large retail price differential and does not currently end up having a meaningful impact on the TDV values of electricity, gas, or propane. The inclusion of CO<sub>2</sub> emissions price in TDV values is essentially a drop in the bucket and does signal climate-friendly fuel decisions for buildings.

Moreover, the actual costs of greenhouse emissions embedded in the TDV values do not reflect the cost of greenhouse gas abatement needed to achieve the state's long-term climate goals. Currently, the proposed emissions price forecast for the 2019 code is from the 2015 IEPR for 2020-2030, and then extrapolated to 2049 using a linear trend (see Figure 3).

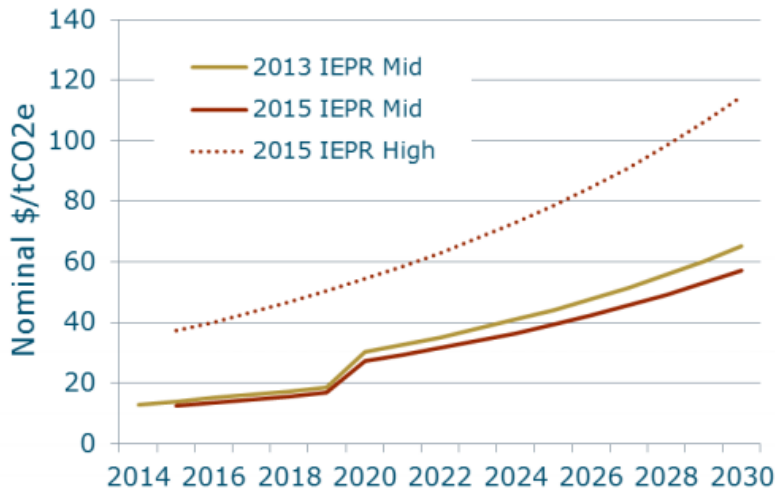


Figure 3: CO2e Emissions Price Forecast from 2015 IEPR (E3 2016)

The emissions price forecast from the 2015 IEPR is too low and will not lead to responsible fuel choice decisions for the future building stock. These carbon prices do not reflect the cost of the infrastructure changes needed to meet California’s 2030 and 2050 climate goals.

**Recommendation:** The Commission should establish a greenhouse gas emissions metric for Title 24 code compliance. Introducing a greenhouse gas metric and budget would shed light on the emissions impact of various fuel choice and design options, and also help align Title 24 with California’s greenhouse gas reduction goals. The Energy Commission could consider various options for how the greenhouse gas emissions budget relates to Title 24 compliance. For example, we support 350 Bay Area’s recommendation<sup>2</sup> that a proposed building design could comply with Title 24 by meeting the TDV budget or a weighted average of the TDV and greenhouse gas emissions budget.

The calculation of the greenhouse gas emissions metric should include not only the projected CO2 emissions of the marginal fuel source, but also the fugitive methane emissions of the fuel source. Ignoring fugitive emissions drastically underestimates the greenhouse gas impacts of fuel choices in buildings. The calculation of fugitive methane emissions associated with use of electric appliances should include methane leaks from natural gas extraction, processing, storage, and transmission to the power plant *when* the marginal electric resource powering the appliance is gas generation. The greenhouse gas calculation for electric end uses should also account for the varying carbon intensity based on the projected time of use *and* the expected overall reduction in carbon intensity of electricity over the 15 and 30-year forecast. For natural gas fueled appliances, the estimated fugitive emissions should include methane leakage from gas extraction, processing, storage, transmission, distribution, and appliance end use. While complicated to accurately estimate methane leakage, particularly over the 15- and 30-year lifecycle of the building, the Commission can leverage findings in IEPR’s recent Joint Agency

<sup>2</sup> 350 Bay Area, *Updates to the 2019 Time Dependent Valuation of Energy (16-BSTD-06)*, 6/3/16

Workshop on Methane Emissions from California's Natural Gas System<sup>3</sup> and other relevant proceedings.

We also recommend the Commission update its emissions price forecast to more accurately reflect the cost of achieving long term climate goals. The Commission should consider using a social cost of carbon as an input for the emissions cost in the TDV calculation.

#### **IV. The natural gas TDV values do not reflect the full cost of gas consumption.**

The monthly TDV values for natural gas do not reflect current conditions and are unrealistically low. As described above, the gas TDV values for the 2019 code cycle are built up based on three components: commodity cost and retail rate adjustment, transmission and distribution costs, and the cost of CO2 emissions. The gas TDV values neglect to include the cost of gas infrastructure upgrades and safety measures, the cost of gas accidents and leakage events like Aliso Canyon, and the costs of decarbonizing natural gas which will be necessary to achieve 2030 and 2050 greenhouse gas reduction goals if we do not electrify buildings.

E3's presentation on 2019 TDV Updates at the workshop on July 15, 2016 notes the removal of a NOx adder to natural gas, which lowers the gas TDVs. However, E3's *Time Dependent Valuation of Energy for Developing Building Efficiency Standards: 2019 Time dependent Valuation Data Sources and Inputs (July 2016)* does not mention or describe the reasoning for dropping the NOx adder. NOx emissions are a significant source of air pollution in California and should be accounted for when determining the fuel choice for buildings. It is unclear why the NOx adder was removed, and the decision may warrant further discussion and consideration.

**Recommendation:** The Commission should ensure that gas TDV values reflect the true costs of forecasted gas consumption over the 30-year time horizon. We recommend the Commission include the following costs in the 2019 TDV calculation for natural gas:

- Cost of decarbonizing gas to achieve an 80 percent reduction in greenhouse gas emissions by 2050
- Cost of gas infrastructure upgrades and safety measures
- Cost of gas accidents and leakage events (like Aliso Canyon) and associated mitigation measures
- Cost of hazardous air pollution from natural gas use.

#### **V. Natural gas should not be assumed to always be the marginal unit for electricity generation in the electricity TDV calculation.**

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<sup>3</sup> *Joint Agency Symposium/IEPR Workshop on Methane Emissions from California's Natural Gas System: Challenges and Solutions*, (16-IEPR-02) June 6 and 7, 2016, [http://www.energy.ca.gov/2016\\_energypolicy/documents/index.html#06172016](http://www.energy.ca.gov/2016_energypolicy/documents/index.html#06172016)



While the Sierra Club appreciates the Commission’s intent to include SB 350 related conditions in the 2019 TDV update, there are several limitations to the data inputs and assumptions. These limitations should be corrected in the rulemaking. The 2019 electricity TDV values assume that natural gas is the marginal fuel in all hours and in all seasons from 2019 - 2049.<sup>4</sup> Based on the assumption that natural gas is the marginal fuel, the electricity TDV metric includes an emissions rate associated with a low or high efficiency natural gas plant. However, natural gas generation is *not* always the marginal unit today, nor is it forecasted to be the marginal unit in every hour for the next 33 years. The type of marginal generating unit depends on the time of the day, season, and year, as well as on state energy policies and energy markets.

Given the increasing penetration of renewables and energy storage, which are propelled by both state mandates and the improving economics of these technologies, there will be a significant number of hours from 2019-2049 where renewable energy is the marginal generation unit, not natural gas. The California Independent System Operator has already seen the need to curtail wind and solar in the afternoon hours in the spring, and estimates that by 2024 (under a 40 percent RPS scenario) that there will be 822 hours of renewable energy curtailment occurring mostly but not solely in the spring (Figure 4).<sup>5</sup>

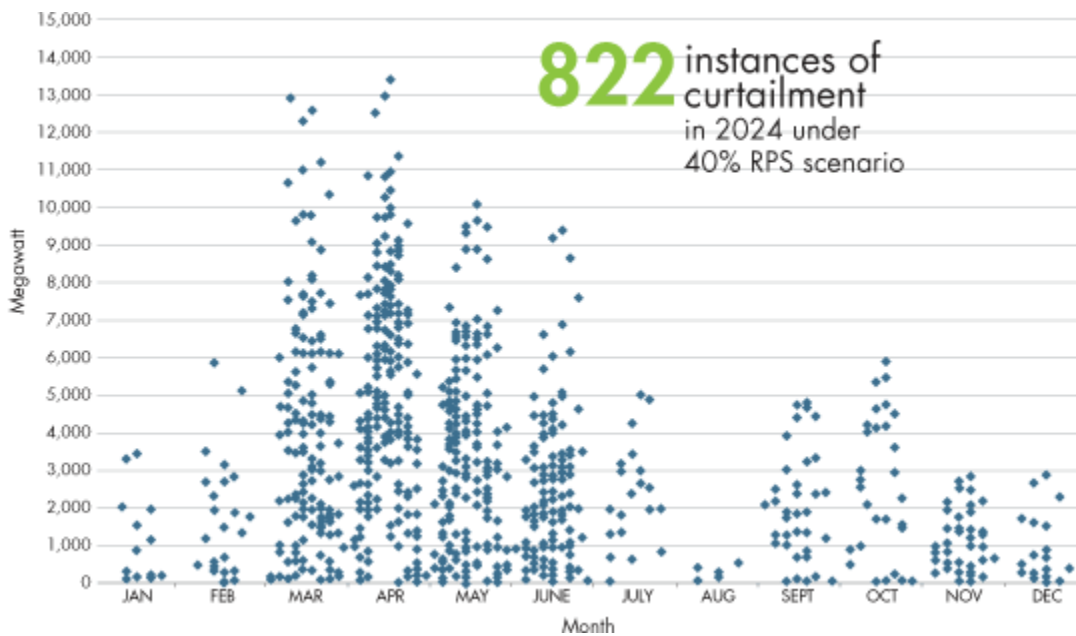


Figure 4: Forecasted Curtailment of Renewable Energy in 2024 (CAISO 2014)

This means that in *at least* 822 hours in 2024 alone, renewable energy is at the margin, not natural gas.

<sup>4</sup> E3, *Time Dependent Valuation of Energy for Developing Building Efficiency Standards: 2019 Time Dependent Valuation (TDV) Data Sources and Inputs*, July 2016.

<sup>5</sup> CAISO, *State of the Grid: A Review of 2014*, <http://publications.caiso.com/StateOfTheGrid2014/RenewablesIntegration.htm>

The current assumption that gas generation is the marginal unit for electricity is not only inaccurate, but problematic from both a greenhouse gas accounting and cost-effectiveness perspective. On the greenhouse gas side, this natural gas assumption means that the proposed 2019 electricity TDV value overestimates the cost of emissions when renewables is the actual marginal resource. More significantly, during periods of overgeneration, the cost of producing electricity can drop significantly and even become negative (with a price floor of -\$300/MWh).<sup>6</sup> Thus, electricity consumption in periods of overgeneration is a cost-effective way for building occupants to benefit from carbon-free electric services while supporting renewables integration. However, the proposed 2019 electricity TDV metric does not account for these price drops or for the role that electric buildings can play in supporting renewables integration.

**Recommendation:** The Commission should more accurately reflect marginal generation forecasts for electricity over the relevant 30-year period. Marginal units should vary based on the time of day, month, and year. We are likely to see a growing penetration of renewable energy on the margin as we move further out in time. The Commission should evaluate whether the emissions component of the electricity TDV values and the cost of electricity adequately reflect the share of renewable energy resources at the margin for each hour of the day over the 30-year time horizon.

## **VI. The electricity TDV value should reflect an increase in renewable energy and energy efficiency beyond 2030 instead of the current assumption of zero growth after 2030.**

Title 24 seeks to achieve cost effective energy savings over a 15- and 30-year period. As such, the economics for the 2019 TDV metrics are based on long-term forecasts that should reflect both state policies and energy market trends for 2019-2034 for the 15-year analysis and for 2019-2049 for the 30-year analysis. The Sierra Club sees value in the long-term approach to energy and infrastructure planning, but finds fault with the input assumptions that are used in the proposed 2019 update. The 2019 update reflects SB 350's target of a 50 percent RPS and a doubling of energy efficiency by 2030. However, the 2019 update includes zero growth in renewable energy and energy efficiency from 2030-2049, thereby ignoring both the historical trend of increasing renewable energy and energy efficiency services in California *and* the state's goal to reduce greenhouse gas emissions by 80 percent below 1990 levels by 2050.

**Recommendation:** The Commission should work with stakeholders to establish more realistic levels of renewable energy and energy efficiency to be included in the electricity TDV values from 2030-2049.

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<sup>6</sup> David Howarth and Bill Monsen, *Renewable Energy Faces Daytime Curtailment in California*, [http://www.nawindpower.com/online/issues/NAW1412/FEAT\\_04\\_Renewable-Energy-Faces-Daytime-Curtailment-In-California.html](http://www.nawindpower.com/online/issues/NAW1412/FEAT_04_Renewable-Energy-Faces-Daytime-Curtailment-In-California.html)

**VII. Conclusion**

Thank you for your consideration of the concerns raised in these comments. We would welcome the opportunity to discuss any of these issues further.

Dated: July 29, 2016

Respectfully submitted,

    /s/

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