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Additional submitted attachment is included below.

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June 21, 2019

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

RE: Docket No. 19-MISC-03 (Decarbonization of Natural Gas System)

Dear Commissioners:

AdTra is pleased to submit comments on the California Energy Commission's work and draft report on decarbonizing California's natural gas infrastructure. AdTra appreciates the work that the Energy Commission is doing in this area.

AdTra comments cover five areas below. Our comments are based on in-depth analysis of carbon intensity impacts on the policy scenarios of the Energy Commission's study for Decarbonization of Natural Gas System and particularly elements related to Buildings Electrification. Additionally, AdTra literature review of renewable natural gas (RNG) cost and pricing data suggests there are economical paths to using low carbon RNG blends to decarbonize California's natural gas sector.

1) Fire-caused attributable indirect greenhouse gas emissions

Since the U.S. Department of the Interior found that the 2018 California wildfires released 68 million tons of CO2 to the atmosphere as much as the state's electricity sector for 2016, AdTra has conducted research to understand what impact, if any, CO2 emissions from wildfires attributed to California grid electrical equipment, might have on the carbon intensities of California grid electricity pathways. Multiple entities such as CAL FIRE and a federal court have established that utility equipment were ignition sources of multiple fires in California. AdTra characterizes ghg emissions effects from wildfires linked to utility electrical equipment as "fire-caused attributable indirect ghg emissions" (*ficai ghg emissions*). Drawing on earlier work in the literature and the clearly established link between some wildfires and electric grid equipment, it is our professional judgment that this is an informed treatment of these types of emissions.

With this in mind, AdTra analyzed California electricity pathways using the Energy Commission's AB 1007 Full Fuel Cycle Analysis and selected electricity pathways of the Air Resources Board's CAL GREET 3.0 to assess how pathways carbon intensities would change as adjusted for ficai ghg emissions. CAL GREET 3.0 is another iteration of the AB 1007 Full Fuel Cycle Analysis.

Ficai ghg emissions are nontrivial, with profound implications. AdTra research suggests ficai ghg emissions impacts are non-trivial. For example, AdTra analysis shows that, based on modeled attribution levels of 25 to 50 percent for ficai ghg emissions, 19.2 to 38.4 grams CO2e/MJ should be added, as an indirect component, to direct carbon intensities of California electricity pathways. *The implications of this finding are profound and wide-ranging because electricity is a major input to many fuel pathways.* We raise this issue for consideration by the relevant California agencies, especially the California Energy Commission and the California Air Resources Board.

From 174 electricity pathways evaluated, we present one set of our results (AdTra Insights 2j) in the attachment for the Energy Commission's consideration in the agency's present and perhaps future studies. This result also shows carbon intensities for battery-stored (*retransmitted*) electricity pathways for often cited condition of energy storage of excess renewables (solar, wind) generation.

Potential Impacts. To further understand the impacts of the ficai ghg emissions on California's decarbonization efforts, we evaluated how the Buildings Electrification and Transportation Electrification outcomes envisioned by different California policy objectives would express. We present one set of our results in the attached AdTra Insights 2k and 2l for the Energy Commission's consideration.

In general, AdTra analysis suggests that in the 2035 to 2050 period, when ficai ghg emissions are accounted for in California electricity pathways, about 165 million metric tons of CO2 emissions are added to the state's ghg inventory with the levels of buildings electrification modeled in the E3 study, and relevant transportation electrification studies. For comparison, the added ghg emissions is nearly equal to the "transportation fair share" ghg emissions reductions (176 million metric tons) required for California to meet its 80 percent reduction target below 1990 levels, plus other sectors.

Ficai ghg emissions need to be duly considered. Based on our analysis, it is our view that any credible assessment of policy actions and measures to decarbonize California's economy cannot ignore fire-caused attributable indirect ghg emissions. And although the AdTra research continues in this pioneering area and new insights might unfold, it is our professional judgment the information developed so far suggests ficai ghg emissions warrant a closer look by the California agencies. AdTra respectfully recommends that the Energy Commission gives the information and analysis supplied due consideration.

2) Truck portfolio (Low-NOx HD natural gas engines/trucks and battery electric trucks)

In light of ficai ghg emissions and the added transportation electrification ghg burdens (AdTra Insights 2l), AdTra finds that a balanced emphasis on low-NOx natural gas heavy-duty trucks powered by blends of renewable natural gas is an attractive option for decarbonizing California's economy. Rising energy costs means commercial fleets should retain fuel choice flexibility.

3) Price of renewable natural gas versus *transmitted electricity* prices

The E3 study suggests relying on low carbon RNG may be a costly option to decarbonize buildings. We find market data exist that indicate under innovative business models and contract mechanisms, RNG can be supplied at competitive price points which make RNG blends serving buildings to be economically attractive. Furthermore, in consideration of rising electricity costs in California, the study does not persuasively establish that, for *transmitted electricity* or grid-sourced electricity, that Buildings Electrification is necessarily economic. AdTra envisions other scenarios where economic, Buildings Electrification may be realized. These are not addressed in the draft contractor's report but could be in future work.

4) Methane leaks

Studies of methane leaks (fugitive methane emissions) have found that keeping such emissions below 2% of production volume should be an effective solution even as more innovation is implemented to further reduce methane leaks. Therefore, we do not find that methane leaks, or concern about methane leaks as a driver of Buildings Electrification, is sufficient.

5) Renewables Portfolio

The state's substantial reliance on its renewables portfolio comes with risks that many analysts have identified. The state is addressing these risks to make resilient, a California electricity grid dominated by renewables.

Potential new risks. We identify a new risk of potentially overstating the benefits of the state's renewables portfolio where impacts of ficai ghg emissions for *transmitted electricity* are not properly considered and accounted for. An additional risk is the uncertainty that failure to account for ficai emissions might introduce into ghg emission reduction outcomes from various California decarbonization policies.

During my time at the Energy Commission, I was privileged to lead the work that customized the U.S. Department of Energy's GREET model for use in California's Low Carbon Fuel Standard, the selection of Purdue University's GTAP model for indirect land use change emissions modeling, as well as early use of carbon intensities for projects ghg performance evaluation and program funding. Following adoption by the Energy Commission, CAL GREET was transferred to the Air Resources Board for LCFS implementation. The Energy Commission also sponsored GREET training of Air Resources Board staff as part of the handover and agencies' collaboration. This background and experience also inform the AdTra comments here.

It is hoped that the Energy Commission's leadership in full fuel cycle analyses will be exercised in addressing non-trivial effects of fire-caused attributable indirect ghg emissions on the carbon intensities of fuels as the Energy Commission evaluates strategies to decarbonize California's natural gas system that may include buildings electrification.

The AdTra team is available to provide additional insights to Energy Commission staff on these topics. I can be reached by email at adtra.us@att.net.

Respectfully,

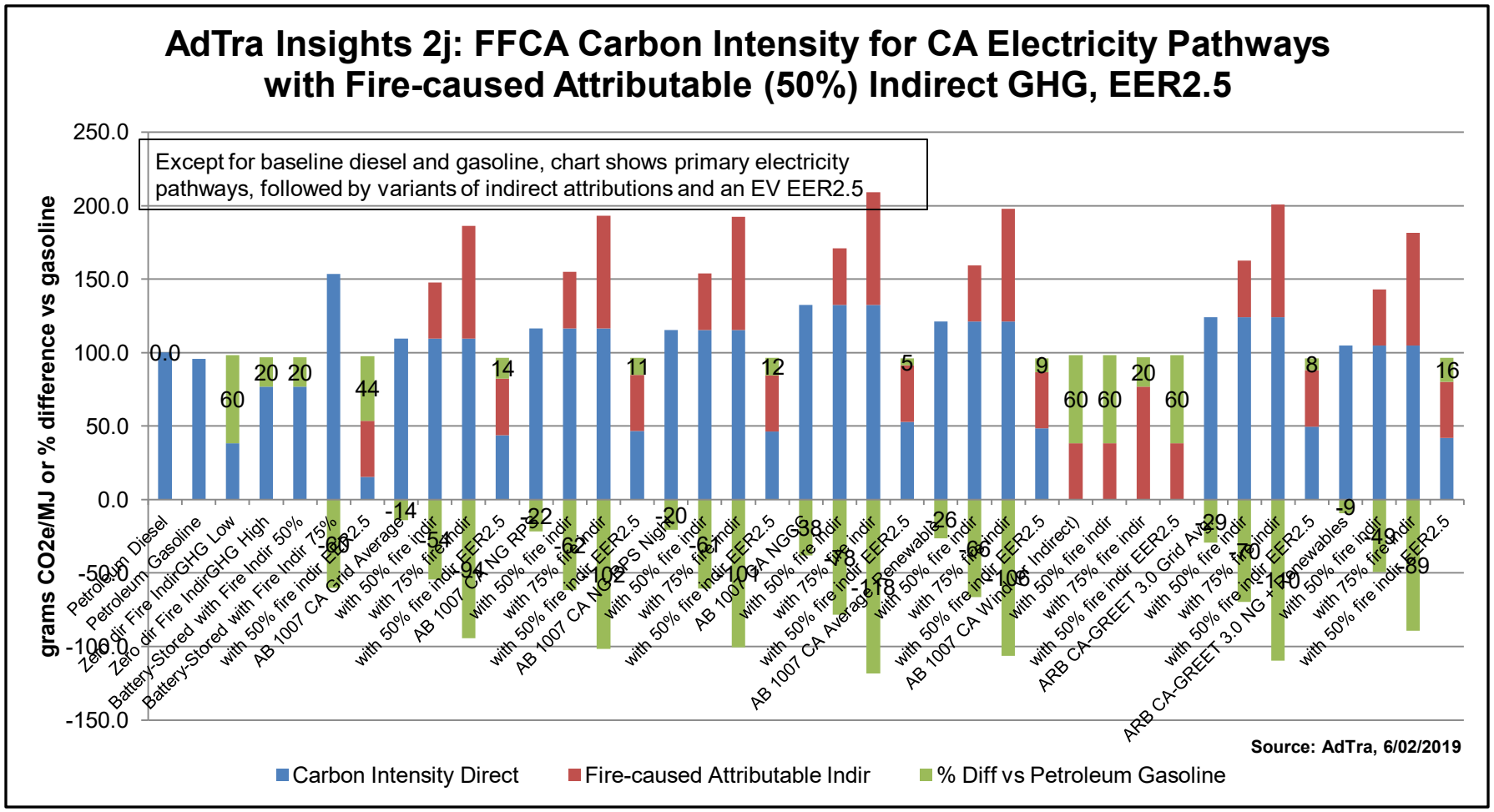
McKinley

McKinley Addy, P.E.
Vice President

CC: Chairman Mary Nichols, California Air Resources Board
Mr. Tim Olson, California Energy Commission
Dr. Daniel M. Kammen, University of California, Berkeley

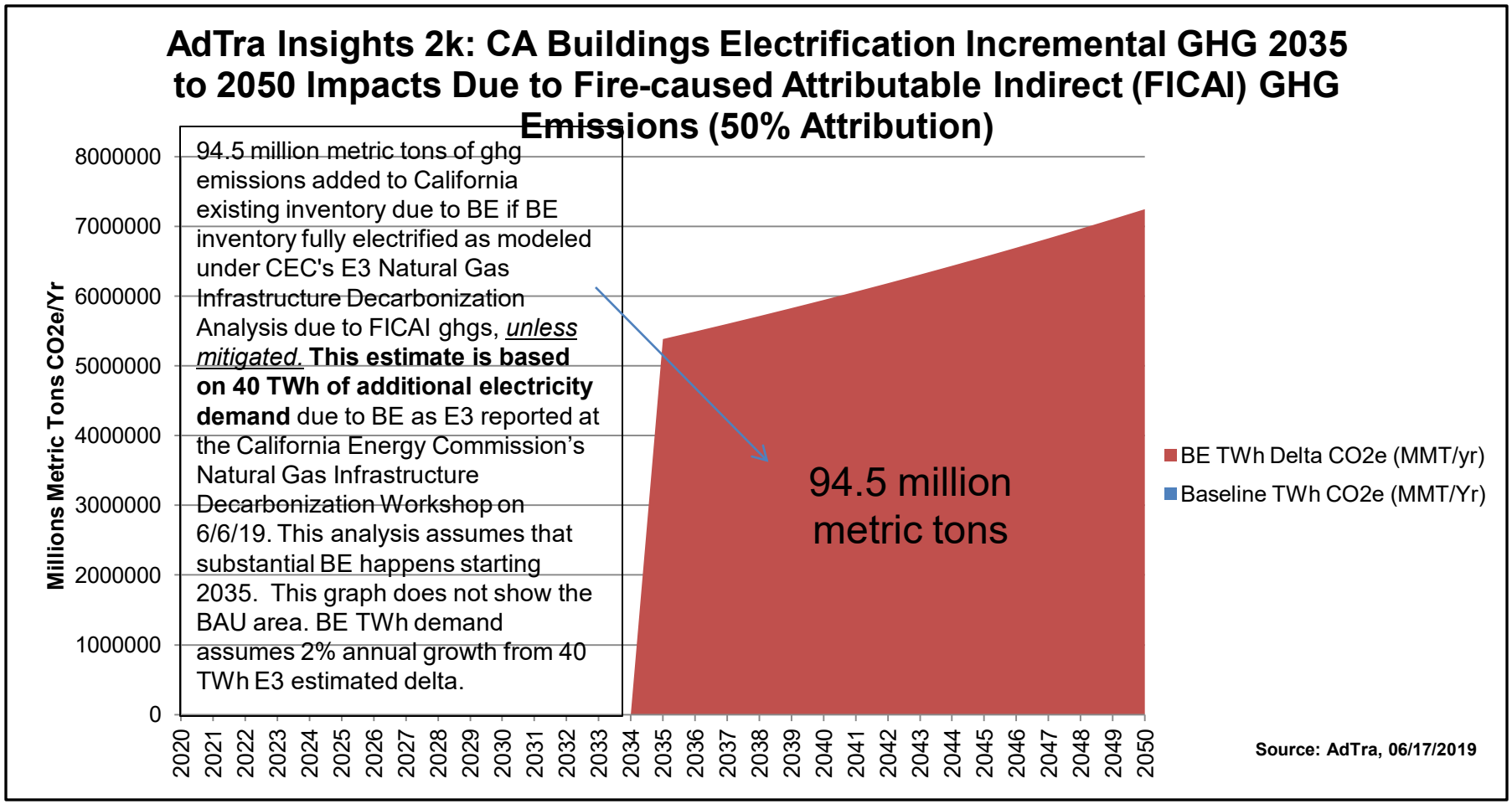
Attachments: (1)

AdTra Insights: Full Fuel Cycle Analysis



Note: Results based on AdTra modeling of carbon intensity of fuels indicated using California Full Fuel Cycle Analysis models. AdTra adapted the California Energy Commission's AB 1007 GREET Model to include effects of fire-caused attributable indirect ghg emissions to direct ***transmitted electricity*** ghg emissions. It is assumed ghg emissions due to California wildfires with ignition sourced to grid electrical equipment need to be accounted for in the full fuel cycle analysis. Such attributable indirect ghg emissions cannot be zero. Two indirect ghg values are estimated and used to show a lower bound and upper bound. 20-year horizon used per IPCC. Such indirect ghg emissions are not likely to apply to on-site generation. Notice, there is not much difference between the ARB GREET 3.0 values and the AB 1007 GREET values.

AdTra Insights: Full Fuel Cycle Analysis



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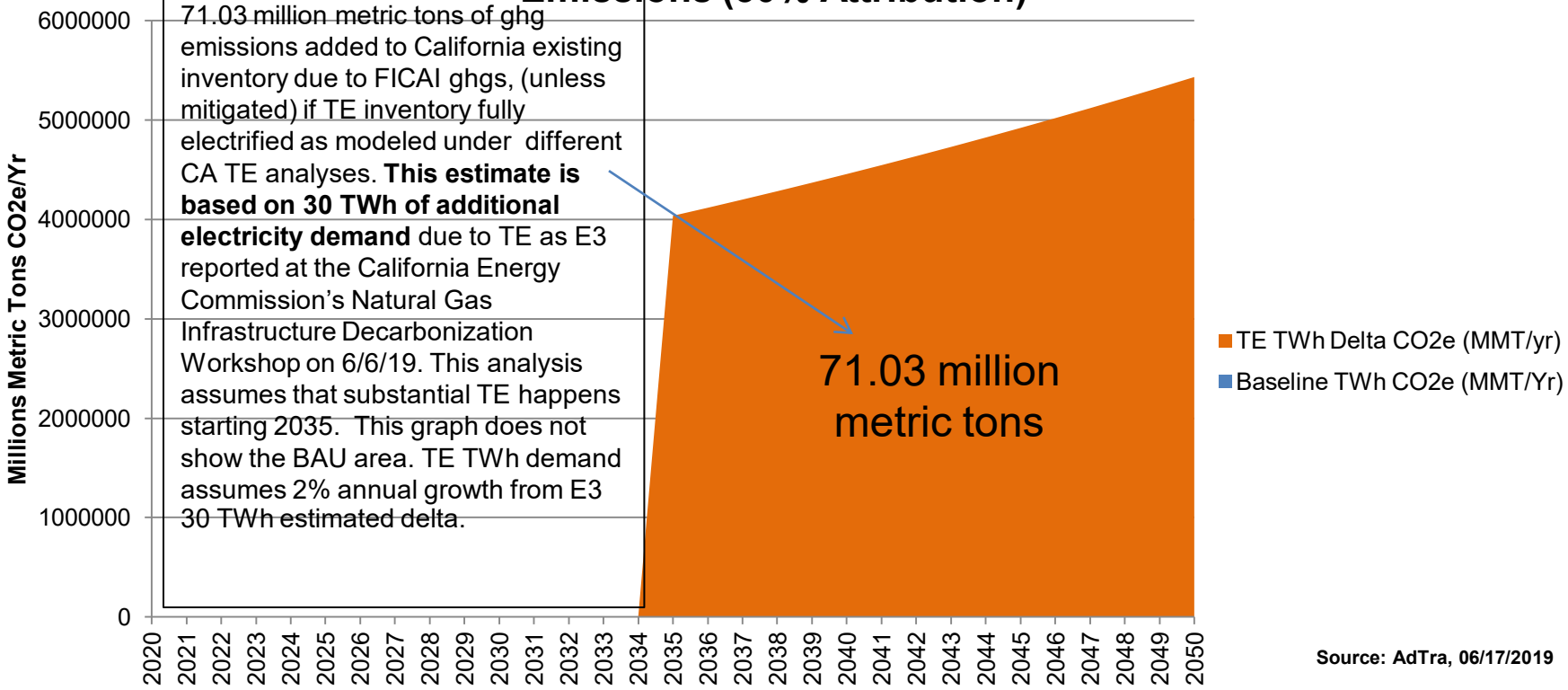
AdTra Insights: Full Fuel Cycle Analysis

AdTra Insights 2I: Transportation Electrification Incremental GHG 2035 to 2050 Impacts Due to Fire-caused Attributable Indirect (FICAI) GHG Emissions (50% Attribution)



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