Pacific Gas and Electric Company

Mark C. Krausse
Senior Director
State Agency Relations

1415 L Street, Suite 280
Sacramento, CA 95814
(916) 386-5709
Fax: (916) 386-5720
mark.krausse@pge.com

October 24, 2014

Mike Waugh
Chief, Transportation Fuels Branch
California Air Resources Board
1001 "I" Street
Sacramento, CA 95814

Re: Pacific Gas and Electric Company's Comments on the Air Resources Board's Draft California Modified Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation

Dear Mr. Waugh,

Pacific Gas and Electric Company (PG&E) appreciates the opportunity to provide comments on the draft version of the California Modified Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (CA-GREET2.0) model, Version 2.0. The ARB's release of the CA-GREET2.0 model follows a workshop held by the ARB on August 22 at which PG&E participated and filed comments.[1]

I. OVERVIEW

PG&E supports the ARB's effort to re-adopt the Low Carbon Fuel Standard (LCFS), which is intended to address the State of California Court of Appeals, Fifth Appellate District's (Court) opinion in *POET, LCC vs. California Air Resources Board*. The combustion of transportation fuels is the single largest source of greenhouse gas (GHG) emissions in California and the LCFS is an important, market- based program transitioning the state to lower carbon intensity transportation fuels. Re-adoption will provide the regulatory certainty necessary for continued development of alternative fuels.

In addition to addressing the Court's ruling, the ARB staff is updating critical technical information, including the CA-GREET2.0 model. While PG&E supports the continued update of the CA-GREET model to reflect changes in industry practice, regulatory requirements, and the best available scientific research, an ICF International (ICF) technical review[2] of the draft CA-GREET2.0 model uncovered numerous technical errors, as described in Section III. These errors must be corrected prior to adoption of the CA-GREET2.0 model.

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[1] Krausse, M. (2014). PG&E Comments on Air Resources Board's August 22 Workshop on the CA-GREET2.0 Model Update. Pacific Gas and Electric Company. Website: http://www.arb.ca.gov/fuels/lcfs/regamend14/pge_09222014.pdf

[2] ICF International (2014). Technical Review of CA-GREET 2.0 Model.

With the imminent release of the 45-day package, PG&E recommends that ARB separate the CA-GREET2.0 model update from overall LCFS Re-Authorization. As described in detail in Section II, PG&E is concerned that, if adopted, the numerous errors in the draft CA-GREET2.0 model would mischaracterize the carbon intensity (CI) of natural gas fuel pathways and send incorrect signals to the alternative fuels market. PG&E is concerned that there will not be time to provide sufficient input to staff prior to LCFS re-adoption.

II. ARB SHOULD SEPARATE CA-GREET2.0 UPDATE FROM LCFS RE-ADOPTION

As stated above, the ARB's LCFS re-adoption effort is intended to address the Court's opinion in *POET, LCC vs. California Air Resources Board*. While it is reasonable to also consider additional LCFS regulatory and programmatic changes, like enhanced LCFS credit provisions, PG&E recommends that ARB separate the CA-GREET2.0 model update from overall LCFS re-adoption and initiate a comprehensive stakeholder process, extending into 2015.

The CA-GREET model is an indispensable component of the LCFS program. In developing the LCFS the ARB rightly chooses a crediting approach to incentivize transportation fuel providers to achieve the program's goals: *i.e.*, at least a 10 percent reduction in the CI of transportation fuel by 2020. In this context, the CA-GREET model, in conjunction with the Indirect Land Use Change (iLUC) estimates from the GTAP model, estimates the CI of each fuel pathway, ultimately dictating which fuels generate credits and deficits, and how transportation fuel providers comply.

If done correctly, the CA-GREET model sends a clear investment signal to transportation fuel providers, consumers, and the market, causing a shift to alternative fuels and spurring innovation. However, with the clear technical errors and methodological problems detailed below (Section III) and in ICF's analysis, PG&E is concerned that the draft GREET2.0 model would send the incorrect market signals for certain fuels, stalling the innovation and investment that the LCFS is designed to promote.

It is infeasible to accomplish this task before the ARB considers the 45-day LCFS re-adoption package. The CA-GREET2.0 model is incredibly complex. Accurate and scientifically sound results would require multiple public workshops, industry working groups, and one-on-one stakeholder and staff interaction. To date, ARB staff has provided stakeholders with a short amount of time to review and comment on the draft CA-GREET2.0 model. While this is insufficient time for an exhaustive review, several significant errors in the model have been uncovered. Moreover, there are likely other serious errors that have escaped stakeholders' and ARB staff's notice.

With the imminent release of the 45-day package, there will not be time to provide further input to staff and ensure the modeling is accurate. Accordingly, PG&E recommends that ARB separate the CA-GREET2.0 model update from overall LCFS re-adoption and initiate a comprehensive stakeholder process, extending into 2015.

III. ARB SHOULD CORRECT TECHNICAL ERRORS IN NATURAL GAS PATHWAYS PRIOR TO APPROVAL OF CA-GREET2.0 MODEL

The ARB's draft CA-GREET2.0 model shows a dramatic increase in the CI for natural gas fuel pathways. For illustration purposes, Table 1 shows the increase in compressed natural gas (CNG) by lifecycle stage; however the results are comparable for other natural gas pathway fuels. Overall, the CI for CNG increases by approximately 25 percent from GREET1.8b to GREET2.0. The majority of the change can be attributed to an increase in vehicle tailpipe emissions values, and fugitive emissions from transmission and distribution. As discussed below, the tailpipe emissions values used are outdated and inaccurate.

Table 1

Lifecycle Stage		GREET1.8b[1]	GREET2.0	Change
Upstream	Recovery	3.50	4.02	+0.52
	Processing	3.70	3.44	-0.26
	Transportation and Distribution	0.97	6.39	+5.42
	Compression	2.14	3.71	+1.57
Tailpipe	Embedded Carbon Content	55.20	55.20	--
	Emissions	2.50	12.21	+9.71
Total		68.00	84.97	+16.97

Notes: 1. Units are in g CO2e/MJ.

While PG&E supports the continued update of the CA-GREET model to reflect changes in industry practice, regulatory requirements, and the best available scientific research, PG&E is concerned that this large shift, which, if approved, will have a lasting impact on the alternative fuel market, appears to stem from a number of fundamental technical errors and methodological mistakes. These issues, described in detail in ICF's technical report, should be corrected prior to approval of CA-GREET2.0 model. PG&E highlights the following:

- **The CA-GREET2.0 model should incorporate forthcoming studies on fugitive emissions:** As illustrated in Table 1, the draft CA-GREET 2.0 model significantly modifies the fugitive methane emission values used in natural gas fuel pathways. Most of the analysis has been based on the United States Environmental Protection Agency's (EPA) GHG inventory, which does not adequately represent California.

  Specifically, ARB should incorporate: four studies by the Environmental Defense fund covering natural gas gathering, processing, transmission, storage, distribution, fueling station, and vehicle methane emissions; a Gas Technology Institute study updating 20-year old methane leakage factors for transmission and distribution pipeline infrastructure; a joint California Energy Commission and UC-Davis study of methane leakage; and a joint study between CARB and the Gas Technology Institute.

- **The adjustment factors used to calculate tailpipe emissions in the CA-GREET 2.0 model are outdated and should be revised to better reflect the efficiency of today's natural gas vehicles:** Various stakeholders and Industry studies have focused on

accurately measuring tailpipe emissions. To ensure the most consistent and accurate data is used, ARB should engage these stakeholders and industry experts for updated data. For example, West Virginia University recently completed a study of in-use emissions for on-road heavy-duty engines operating on various duty cycles representative of the goods movement sector, which is a good proxy for how natural gas vehicles operate in California. Furthermore, Cummins Westport engine certification data submitted to the EPA are available for consideration, which represent the most updated technology for natural gas engines.

- **Additionally, tailpipe emissions for both CNG and Liquefied Natural Gas (LNG) vehicles are determined incorrectly:** To arrive at the tailpipe emissions, ARB applied an emissions factor from the US Environmental Protection Agency's (EPA's) GHG Inventory incorrectly, leading to a significant miscalculation.

  Furthermore, it is unclear why the GREET 2.0 model incorporates fuel economies of light-duty trucks to determine the emissions factors of both medium- and heavy-duty trucks that run on CNG and LNG. This practice contradicts with the existing industry-wide LCFS reporting requirements, which separate light and medium duty vehicles from heavy duty applications.

- **Model Calculation Errors:** Finally, ICF has identified at least twelve areas in the model where formulas are incorrect or internally inconsistent. These are only the errors that have been identified for natural gas pathways, within the very short timeframe allotted for public review and comment. The number and types of errors suggest that the model would benefit from a more-thorough ARB review followed by a longer period for the vetting process.

IV. CONCLUSION

Thank you for the opportunity to submit these comments on the ARB's release of the draft CA-GREET 2.0 Model. PG&E is looks forward to continuing to work with ARB to ensure the successful implementation of the LCFS program.

Sincerely,

Mark C. Krausse
Senior Director, State Agency Relations

Cc: Wes Ingram (wes.ingram@arb.ca.gov)
Katrina Sideco (katrina.sideco@arb.ca.gov)
Hafizur Chowdhury (hafizur.chowdhury@arb.ca.gov)
Chan Pham (chan.pham@arb.ca.gov)
Todd Dooley (todd.dooley@arb.ca.gov)