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Mr. Samuel Wade
Branch Chief, Transportation Fuels Branch
Industrial Strategies Division
California Air Resources Board
1001 I Street
Sacramento, California 95812

RE: Comments on Proposed Amendments to the Low Carbon Fuel Standard Regulation

Dear Mr. Wade:

Pacific Gas and Electric Company (PG&E) offers the following comments to the California Air Resources Board (CARB) in support of the proposed amendments to the Low Carbon Fuel Standard (LCFS) regulation. Advancing low-carbon fuels will play a key role in achieving the state's 2030 greenhouse gas emissions reduction targets, and we believe that the increased use of electricity, conventional and renewable natural gas, and hydrogen are critical fuels needed for the success of the LCFS program. We also believe that it is important that CARB establish carbon intensity (CI) reduction benchmarks that send a stable, long-term price signal to bring lower-carbon fuels into California.

PG&E and other utilities are in a unique position to offer broad solutions to our customers, including our brand-neutral 'Clean Fuel Rebate' program that returns LCFS credit revenue to residential electric vehicle (EV) owners, EV infrastructure programs like the EV Charge Network program for workplaces and multi-unit dwellings, and EV proposals like the 'FleetReady' and 'DC Fast Charge' that will build infrastructure for light- and heavier-duty vehicles. Additionally, our existing natural gas infrastructure provides access to renewable and conventional natural gas to support low and near-zero emission vehicles.

The General Comments below identify issues that we believe are important to the sustained success of the LCFS program. The subsequent comments offer additional details and specific comments that we believe will improve the regulation.

General Comments

I. Revisit the assumptions used to establish the 2030 CI target and interim benchmarks. Based on our analysis, PG&E believes that meeting the proposed 20% CI reduction target by 2030 will be challenging as it is sensitive to policy changes, macroeconomic trends, and biofuel supplies, among other factors. We suggest CARB revisit its modeling assumptions and model additional sensitivities to better assess compliance scenarios with a lower range of targets. Additionally, we believe that a LCFS credit price much higher than $115- $135 will be needed to drive a low-carbon fuel market to achieve the proposed reductions. Therefore, while we concur with CARB's

proposed changes to the near-term targets, we encourage CARB to reevaluate the 2030 target and the interim benchmarks.

II. Reduce barriers to encourage adoption of renewable natural gas. We encourage actions that will encourage rapid adoption of renewable natural gas, including establishing lookup table or Tier 1 CI's for known dairy bio-methane pathways and reducing administrative requirements in the early years to encourage market participation and increase liquidity in the LCFS credit market.

III. Simplify processes to encourage increased electricity use. We support the regulatory approach to generate credits from electricity as a transportation fuel and encourage CARB to clarify and simplify the processes to generate credits from electricity used for residential and non-residential EV charging.

IV. Amend the third-party verification requirements. We support CARB's proposal to improve the quality and accuracy of the LCFS program by requiring third-party verification. However, recognizing the success of the greenhouse gas Mandatory Reporting Regulation (17CCR§95100), we recommend that CARB require third-party verification starting in data year 2020 and implement credit validation starting in data year 2022. This approach will enable reporters and verifiers to focus on implementing the robust requirements of this complex regulation and support liquidity in the LCFS credit market.

Expanded Comments

1. Revisit the assumptions used to establish the 2030 CI target and interim benchmarks

PG&E supports the state's desire to create a LCFS that is achievable and sustainable over the long-term, and that can withstand changes in the broader economic and policy environment. In *§95484, Annual Carbon Intensity (CI) Benchmarks*, CARB has proposed to adjust the near-term benchmark schedule by linearly and annually increasing the CI reduction targets by 1.25%, from a 5% reduction in 2018 to the 20% value in 2030. This would change the 2020 target from a 10% reduction to a 7.25% reduction, which CARB notes would reduce the likelihood that the credit bank would be drawn down. We agree with CARB's near-term adjustment, as our analysis indicates that making this change would delay the depletion of the credit bank to the late 2020s. However, our analysis of CARB's proposal to increase the stringency of the benchmarks to reach a 20% CI target in 2030 indicates that the program risks not meeting the CI benchmarks; thus, we recommend CARB review the 2030 CI target. As we noted in our April 10, 2017 comments to CARB on the Scoping Plan and in our September 5, 2017 comments on the LCFS Concept Paper, we were concerned that an 18% reduction target was too aggressive. Therefore, we encourage CARB to maintain the changes to the near-term benchmarks, reconsider the 2030 benchmark, and adjust the interim benchmarks accordingly.

Even with the changes to the near-term benchmarks, PG&E has identified some plausible scenarios in which entities would not be able to comply with the more stringent long-term benchmarks and put the LCFS program as a whole would be in jeopardy. For example, with a 20% target, the LCFS program is particularly sensitive to macroeconomic trends that impact gasoline demand. If gasoline demand does not drop as quickly as CARB forecasts, the program may not meet the target CI benchmarks. The program is similarly sensitive to federal policy changes to the Renewable Fuel Standard or the vehicle emission

standards; revisions to these policies in ways that do not support low-carbon fuel and vehicle adoption in line with CARB's forecasts could also result in not meeting the LCFS targets.

PG&E also has concern with a number of assumptions on which CARB relies in its development of a 20% CI target. For example, in CARB's recent illustrative compliance scenario, CARB assumes the deployment of around 1.35 billion gallons of renewable diesel by 2030 in addition to 500 million gallons of biodiesel. This would require roughly 35% displacement of petroleum diesel by 2030 – a significant amount since in the same scenario, CARB also assumes an additional 275 million gallons of alternative jet fuel consumed by 2030. Because renewable diesel and alternative jet fuel use similar waste-based feedstocks, PG&E is concerned that insufficient feedstock supply could threaten meeting the targets.

CARB also rapidly decreases the CI of electricity in its modeling from about 30 g/MJ (after adjusting for an energy efficiency ratio (EER) of 3.4 for light duty vehicles) to 10 g/MJ by 2022. While PG&E fully plans to meet the state's requirement of a 50% Renewables Portfolio Standard by 2030 and provide increasingly clean electricity to our EV customers, PG&E requests CARB further explain the change in the 2022 electricity CI.

While one recent report indicates that a "Steady Progress" scenario could reach and even exceed a 20% CI target without drawing down the LCFS credit bank, PG&E cautions that this scenario is based on several optimistic assumptions, which if not realized, could result in the credit bank being completely drawn down and several years of annual net deficits. For example, the report's "Delayed Progress" case changes just two variables from the "Steady Progress" case: cellulosic biofuel production and EV deployment.[1] As a result, the credit bank in this case is drawn down by 2023, and the program is in a persistent deficit until 2030. The report contains two other plausible scenarios in which the program's bank is depleted and persistent deficits occur.[2]

CARB's illustrative compliance scenario calculator also provides the opportunity to investigate several scenarios in which this situation occurs, at both 18% and 20% 2030 CI targets.[3] For example, under a "Project/Low Demand/Low ZEV/18%" fuel supply scenario at an 18% reduction target, the simulator shows a depleted credit bank by 2020 and net deficits for several years in the near future. Changing the demand scenario to "High Demand," which is not implausible given the strength of California's economy and forecasts of continued low fossil fuel prices, creates a persistent negative credit bank from 2020-2030.

While neither of the models noted in the above paragraphs consider market effects like price responsiveness to supply and demand, it is important to note that a LCFS credit price much higher than the $115-$135 that CARB estimated in Table C1 of Appendix E[4] would be needed to drive the low carbon fuel uptake necessary to meet an 18% CI target in 2030, let alone a 20% target. CARB's macroeconomic analysis should take these higher prices into account. The cost of biofuels in particular is

[1] In the "Delayed Progress" scenario, cellulosic biofuel production volumes stay low, with 19 million gallons of cellulosic ethanol and 62 million gallons of drop-in cellulosic fuels supplied by 2030. At the same time, electric vehicle deployment reaches the 4.2 million 2030 Scoping Plan target but not the Governor's 5 million target.

[2] i.e., the cases where passenger vehicle miles traveled (VMT) is reduced more slowly, and where the credit generation performance of liquid diesel fuel substitutes (biodiesel and HVO) is reduced by the inclusion of an indicative term for indirect emissions in the lifecycle carbon intensity values.

[3] CARB, Illustrative Compliance Scenario Calculator, March 6, 2018, available at https://www.CARB.ca.gov/fuels/lcfs/2018-0306_illustrative_compliance_scenario_calc.xlsx

[4] CARB, Appendix E, Table C1: Estimated Annual Credit Price for Baseline and Proposed Amendments (2016$), page 43, March 6, 2018, available at https://www.CARB.ca.gov/regact/2018/lcfs18/appe.pdf

largely driven by the cost of their feedstock, and as competition for waste-based feedstocks increases, one would anticipate feedstock costs to remain flat or increase slightly over time.

Finally, CARB's analysis looks at the macroeconomic impact of the LCFS in relative isolation;[5] PG&E recommends CARB investigate the impact of the LCFS in the context of the other relevant Scoping Plan measures to reach the state's 2030 GHG reduction goal. Assessing the cost impacts of the LCFS in conjunction with the many other policies that impact transportation fuel prices would provide a fuller view of potential cost impacts. For example, the Cap-and-Trade Program also impacts fuel prices, and will produce higher allowance prices if the LCFS fails to meet its goals.

2. Reduce barriers to encourage adoption of renewable natural gas

In *§95482, Fuels Subject to Regulation* fossil compressed natural gas (fossil-CNG) is removed as an opt-in fuel, and in the mid-2020s, fossil-CNG becomes a deficit-generating fuel. We anticipate renewable natural gas (RNG) supplies to increase in order to substitute for fossil-CNG, and encourage CARB to encourage adoption of this fuel through the LCFS program. Since state programs[6] are driving ambitious reductions of greenhouse gas emissions, we encourage CARB to establish a lookup table or Tier 1 CI for dairy digester biomethane sources from known fuel pathways. This will encourage natural gas suppliers in the state to opt-in to the LCFS program, generate credits and increase market liquidity.

We also recommend that in *§95486, Generating and Calculating Credits and Deficits*, CARB incent entities to opt-in to the LCFS program by allocating credits to a generator as opposed to moving credits to a buffer account in instances where an entity verifies that they had a lower CI than the CI listed in the annual Fuel Pathway Report.

3. Simplify processes to encourage increased electricity use

We offer the following comments related to *§94583, Fuel Reporting Entities* to streamline the reporting of electricity use as a transportation fuel:

a) *§95483(c)(1), Fuel Reporting Entity For Electricity Used as a Transportation Fuel, Residential EV Charging* – PG&E supports the electrical distribution utility (EDU) as the credit generator for base credits from EV charging. An entity that chooses to claim incremental EV credits may propose a method to CARB and utilize that method to make a claim. Furthermore, we believe that any entity generating incremental residential credits should meet the requirements of section §95491(d)(3)(A)(2) – (5).

[5] Table VIII-1 in Section VIII-4 of the ISOR presents a range of potential LCFS credit price pass-through for gasoline and diesel due to the proposed amendments relative to the baseline. From 2019 to 2022, the proposed amendments are projected to reduce gasoline and diesel costs, as potentially lower LCFS credit prices are estimated for these years relative to the baseline scenario. These lower credit prices result from the smoothing of the compliance target trajectory resulting in lower compliance targets, as compared to baseline, for years 2019 through 2021. From 2025 onwards, the proposed amendments are projected to potentially increase the price of gasoline by up to $0.36 per gallon and potentially increase the price of diesel by up to $0.44 per gallon, based on the change in estimated annual LCFS credit price and annual deficits from 2025 through 2030.

[6] The 2017 Climate Change Scoping Plan update: https://www.CARB.ca.gov/cc/scopingplan/2030sp_pp_final.pdf
2017 Short-lived Climate Pollutant Reduction Strategy:
https://www.CARB.ca.gov/cc/shortlived/meetings/03142017/final_slcp_report.pdf

b) *§95483(c)(2), Fuel Reporting Entity, For Electricity Used as a Transportation Fuel, Non-residential EV Charging* – We disagree with the proposal that any entity may generate credits. We are concerned that this provision could result in eligible LCFS credits not being generated by entities such as electric vehicle supply equipment (EVSE) owners. Instead we recommend that the EVSE owner is the first fuel reporting entity, as described in the section for gaseous fuels, or contractually allow another party to serve as the first fuel reporting entity.

c) *§95483(c), Fuel Reporting Entity, For Electricity Used as a Transportation Fuel* – We recommend that CARB provide and update a list that includes the electric vehicles (e.g. electric motorcycles, ground support vehicles, etc.) that are covered by the regulation and that would be eligible to generate LCFS credits.

4. Amend the third-party verification requirement

We support the requirements in §9549, *Fuel Transactions and Compliance Reporting*, in order to maintain a valid fuel pathway code for use in reporting fuel transactions for credit generation. We agree that third-party verification will assure material accuracy and conformance with the regulation. However, we also recognize that this amendment introduces numerous data collection, recordkeeping, reporting and accuracy requirements for entities that may have varying levels of maturity, particularly when applied to alternative fuels, and are concerned that some of the Tier 1 and 2 fuel pathways applicants may require additional time to ensure that adequate operational and instrument controls are installed and maintained to ensure compliance with the LCFS regulation. We are also concerned that the risks and enforcement consequences for not meeting the standards established in the regulation may serve as a deterrent to entry for some credit generators. An unintended consequence of reduced participation would be a reduction in the number of credits available, which in turn would put pressure on the state's ability to achieve its CI reduction target and annual benchmarks.

In order to balance a need for a robust LCFS program and encourage sufficient market liquidity, we recommend that CARB retain the requirement for third-party verification starting in 2021 for 2020 data and implement *§ 95495. Authority to Suspend, Revoke, or Modify, or Invalidate* starting in 2023 for 2022 data. This will allow both regulated entities and verifiers the time needed to meet the detailed requirements of this complex regulation and ensure sufficient liquidity in the LCFS credit market.

5. Additional Comments

We offer the following comments to address specific sections in the proposed regulation that we believe are important for CARB to consider:

§95483.2, LCFS Data Management System

§95483.2(a)(8)(F), Registration of Fueling Supply Equipment (FSE), metered residential EV charging - We disagree with the requirement to provide the serial number assigned to the FSE by the original equipment manufacturer (OEM) for metered residential EV chargers. PG&E has fewer than 350 customers (<1%) who have separately metered residential EV chargers. Although we do have access to their meter details, we do not have access to the FSE information, which is owned by the resident. We believe that collecting and separately reporting this customer-specific data will add an administrative burden and not increase the number of credits that will be generated.

In addition, we recommend that the regulation not require the EDUs to provide specific customer information for separately metered residential EV charging, in order to reduce administrative burden and protect customer privacy.

§95488.1 Fuel Pathway Classifications

To support additional LCFS credit generation, PG&E appreciates the inclusion of additional fuel pathways in section 95488.1(b)(2)(A) through (F).[7] However, regarding sections 95488.1(b)(2)(A) and (F), we are concerned that CARB's proposal is overly narrow, technology-specific and not fuel-neutral. We recommend that these fuel pathways be made broader to include other sources of zero-carbon electricity consistent with how CARB determines the CI of the California grid, so that the section reads:

> "(A) Electricity (100 percent solar~~, or~~ wind, geothermal, biomass, hydroelectricity, or other zero-GHG-emissions resources, or any combination thereof)
>
> …
>
> (F) Hydrogen (gaseous) from electrolysis using electricity generated from 100 percent solar~~, or~~ wind~~,~~, geothermal, biomass, hydroelectric or other zero-GHG-emission resources, or any combination thereof) ~~generated electricity~~

§95488.5 Lookup Table Fuel Pathway Application Requirements and Certification Process

PG&E supports CARB's proposed changes to the Lookup Table and specifically its proposal to annually update the California grid electricity pathway to better recognize the decarbonization of the electricity sector. Establishing a single, annually updated statewide CI is preferable to sub-grid or individual source-type CIs, will provide sufficient incentive for statewide adoption of EVs, and will support clearer accounting of incremental LCFS credits from CARB's proposed zero-carbon electricity and time of use (TOU) electricity pathways.

In *§95488.5(f) Time-of-Use Lookup Table Pathways,* CARB proposed an option to recognize and reward "the GHG benefits of shifting EV charging and electrolytic hydrogen load to the periods of time when intermittent renewable electricity might otherwise be wasted (curtailed)." PG&E supports this option and concurs that it could produce incremental credits while aiding renewable energy integration and managing EV load, particularly for non-residential entities. However, we recommend that CARB address two important issues to prevent EV charging and electrolytic hydrogen load being shifted to times when their impact on GHGs is worse than if a California grid-average value were used (i.e., if no TOU table were used): a) TOU pathway CIs should accurately reflect actual curtailment and marginal heat rates, and b) TOU Carbon Intensities should align with EV Charging Rates.

a) TOU pathway CIs should accurately reflect actual curtailment and marginal heat rates: CARB notes in *§95488.5(d)(2) Update to Time-of-Use Electricity Pathways* that, "In order to reflect the seasonal variation of electricity generating resources in California and to maintain accounting consistency with the CI of the California Average Grid Electricity pathway, the Executive Officer will use the methodology

[7] (A) Electricity (100 percent solar or wind)
(B) Electricity associated with time-of-use pathways for EV charging and hydrogen production through electrolysis
(C) Hydrogen (gaseous and liquefied) from central SMR of North American fossil-based natural gas
(D) Hydrogen (gaseous and liquefied) from central SMR of biomethane
(E) Hydrogen (gaseous) from electrolysis using California grid-average electricity
(F) Hydrogen (gaseous) from electrolysis using solar- or wind-generated electricity

described in the supporting document specified in section 95488.5(e) and the public comment process described in 95488.5(d)(2) to update the time-of-use pathway CIs in Table 7-2."

CARB then provides the TOU pathway CIs in *§95488.5(f) Time-of-Use Lookup Table Pathways*, and notes that for the California grid electricity that may be used for reporting EV charging and hydrogen produced via electrolysis, the Executive Officer will calculate TOU carbon intensities each quarter and provide them on the LCFS web site.

PG&E is concerned that the TOU pathway CIs does not accurately reflect curtailment and marginal heat rates, and therefore mischaracterize the CI of electricity at certain periods in the table. Specifically, the simplified curtailment data source used[8] does not distinguish between periods of *local curtailment* (during which EV charging and electrolytic hydrogen load outside the local curtailment pocket result in increased GHG emissions) and periods of *system curtailment* (during which EV charging and electrolytic hydrogen load result in zero marginal GHG emissions). The curtailment data used in these calculations therefore over-estimates the impact of curtailment on marginal GHG emissions, and under-estimates the marginal emissions during the middle of the day (when local curtailment is most prevalent).

At the same time, the TOU pathway CIs do not accurately reflect the differences between marginal heat rates of thermal generation (and therefore the CI of electricity) at different times of the day and different seasons. For example, during the middle of the day (9 AM-3 PM) and the middle of the night (midnight-6 AM), efficient combined cycle generators are typically running, so the CI of electricity should be low even when renewables are *not* being curtailed. In contrast, during the late afternoon and evening (4 PM-9 PM), less efficient 'peaker plants' may be running, so the CI of electricity should be higher then. This is in alignment with current or proposed TOU rates for all three investor-owned utilities (IOUs), which have a peak period between 4 and 9 PM based primarily on marginal generation costs, which are driven by these same heat rate factors. The TOU pathway CIs actually have a *higher* CI between midnight and 6 AM than between 4 PM and 9 PM, and if implemented would incent EV charging when GHG emissions are high and the grid is more stressed.

We recommend that CARB consider adopting the methodology for calculating marginal GHG emissions described in the 2016 Itron/E3 SGIP Evaluation Study[9] to calculate the marginal emissions impact of EV charging and electrolytic hydrogen production. This methodology was used in all three IOUs 2018 Rate Design Window (RDW) applications to model the impact of default rates on GHG emissions[10] and is also being used by the GHG Signal Working Group that was established by CPUC Ruling 12-11-005[11]. The calculation of marginal GHG emissions is expected to be updated once a quarter as part of the process pursuant to this Working Group, which could support CARB's quarterly updates to the TOU Pathway CIs.

b) TOU Carbon Intensities should align with EV Charging Rates: PG&E is concerned that the TOU pathway CIs listed in Table 7-2 do not align with the TOU periods established in the IOUs EV charging rates (e.g., the peak CI in the table is in the early morning when the TOU customer rates are the lowest). To support consistency between the times with the lowest CIs and the times with the lowest rates, we suggest that CARB compare the TOU pathway CIs with the utilities' EV rates whenever the CIs are updated (i.e., quarterly).

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[8] http://www.caiso.com/Documents/HistoricalProduction-CurtailmentDataNowPosted-ISOWebsite.html

[9] http://www.cpuc.ca.gov/General.aspx?id=7890

[10] The impact of default rates on GHGs was modeled using day-ahead rather than real-time heat rates, due to the long-term nature of customer load shifts. PG&E's 2018 Rate Design Window application - http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M212/K893/212893197.PDF

[11] http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M202/K276/202276301.PDF

§95489 – Provisions for petroleum-based fuels

PG&E supports CARB's proposal to remove limiting restrictions on refiners' ability to generate and trade credits from innovative refinery investment projects and renewable hydrogen projects. For example, the proposed changes to the Refinery Investment Credit Pilot Program and the Renewable Hydrogen Refinery Credit Pilot Program would support refiners' ability to generate credits by substituting RNG for fossil natural gas. RNG can be used in existing refinery equipment without any process changes while providing CI reductions. PG&E encourages CARB to explore additional credit generation options like these to the fullest extent to support the ambitious LCFS targets.

We hope that you will find these comments beneficial as you work to improve and extend the LCFS program. Please let me know if you have additional questions.

Sincerely,

/s/

Linus Farias