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VIA EMAIL TO
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California Energy Commission
Dockets Office, MS-4
Docket No. 14-CHP-1
1516 Ninth Street
Sacramento, CA 95814-5512

Re: Docket No: 14-CHP-1: Comments of Pacific Gas and Electric Company on the Staff Paper: "Proposed Near-Term Method for Estimating Generation Fuel Displaced by Avoided Use of Grid Electricity."

I. INTRODUCTION

Pacific Gas and Electric Company (PG&E) appreciates the opportunity to provide comments on the California Energy Commission (CEC) Staff Paper entitled "Proposed Near-Term Method for Estimating Generation Fuel Displaced by Avoided Use of Grid Electricity," (hereinafter referred to as the Staff Paper).

The Staff Paper has proposed a near-term methodology to uniformly estimate the amount of greenhouse gas (GHG) emissions displaced by the avoided use of grid electricity over five years (2014 to 2018) by preferred resources such as energy efficiency, demand response and distributed generation. This near-term methodology is based on the regression analysis of the historical heat rate trends from gas-fired resources. The paper discusses the ongoing changes to the California electricity mix with the addition of more renewables, over-generation challenges, and future role of storage. The paper also summarizes stakeholders' comments, including PG&E's comments, on the initial summary draft paper published in July 2014. However, the paper stops short of recommending any uniform methodology for estimating displaced grid emissions in the long-term (10 to 15 years).

PG&E's comments highlight some key issues in the Staff Paper and provide answers to the questions posed in the Staff Paper. In summary, these issues include:

- PG&E encourages the CEC staff to adjust their model to account for future changes in the types of energy supplied to the grid (i.e., higher levels of renewables in utility portfolios mean fewer emissions are avoided when replacing grid electricity with preferred resources).

- The current format of illustrative examples listed in the summary table may be misleading. PG&E recommends making appropriate changes to the summary table.

II. PG&E ENCOURAGES THE CEC STAFF TO ADJUST THEIR MODEL TO ACCOUNT FOR FUTURE CHANGES IN THE GRID'S ELECTRICITY SUPPLY.

The Staff Paper is a good starting point to consider the GHG reductions from various preferred resources on a consistent basis. The paper provides a common denomination of "Average Avoided Carbon Intensity" to compare across these resources. However, one of the main outstanding issues that paper has not addressed is how such a comparison across resources can be made in the long-term (10-15 years). California has ambitious goals of reducing GHG emissions and comparing GHG reduction benefits across preferred resources would provide useful insights for the state's long-term planning. PG&E suggested in its initial comments that the Staff Paper should adjust the model to account for renewables and other GHG policies that may result in carbon neutral generation on the margin for significant parts of the year. The large increase in renewable generation in the utility portfolios has reduced, and will continue to reduce the fuel, and therefore GHG emission savings, that can be expected from incremental amounts of preferred resources. We recommend using the Production Cost Simulation model to benchmark this methodology and to estimate the GHG emission reductions from future preferred resource additions.

III. UPDATED ILLUSTRATIVE EXAMPLES ARE NEEDED

The Staff Paper provides illustrative examples for the GHG emissions avoided by renewables (export/onsite), Combined Heat and Power (CHP), Energy Efficiency (EE), and Demand Response (DR) in the Executive Summary and Chapter 4.[1] However, the illustrative examples, as shown on page 35's summary table, could be misleading for several reasons. PG&E provides recommendations to address this issue.

PG&E's concerns are as follows. First, the system configuration analyzed for renewables, CHP, EE and DR are of different capacity and capacity factors.[2] The summary table includes no description of the sample technologies' configuration and, as a result, could mislead readers to compare the GHG abatement potential of different resources on an equivalent basis,

[1] CEC Staff Paper, Table 2: Five-Year Displacement Totals and Average Carbon Intensity, page 4 and Table-19 Illustrative Calculation of Emissions Displacement (and Carbon Intensities) Using 2014 Heat Rates, page 35.

[2] Illustrative example of renewables generation is represented by 2,500 kW wind generator operating at 20% to 35% capacity factor, CHP system example is a 5,000 kW turbine operating at 80% to 100% capacity factor, Energy Efficiency example represents a 2,000 kW system with 10% equivalent capacity factor and Demand Response is represented by 1,000 kW system with 100% on-peak only capacity factor.

when in fact they are not. For example, 1000 kW of the example DR listed may not avoid the same emissions as 2,500 kW of renewables. The table currently reflects a large value of Avoided Grid Electricity (MWh) and a correspondingly large CO2 abatement for CHP because the capacity of the system analyzed is the largest of all examples considered (i.e., 5,000 kW turbine with a high capacity factor of 80% to 100%). In the Table, Renewables, EE and DR represent successively lower values of Avoided Grid Electricity (MWh) and correspondingly lower levels of CO2 abatement because the capacities (and capacity factors) of the illustrative examples considered are lower than that for the CHP example. PG&E recommends adding a column to describe the technology, including capacities and capacity factors, for the illustrative examples in the summary table to avoid such misrepresentation.

Second, most of the technologies considered in the examples in the Staff Paper have no GHG emissions associated with them (e.g., renewable and energy efficiency have no emissions). The Total CO2 numbers could theoretically represent overall emissions abated from these resources. However, the conventional CHP system uses natural gas to produce heat and power and has associated GHG emissions. The net overall GHG emission reductions in California from a fossil-fueled CHP unit would be quite different from the Total CO2 numbers listed in this Paper. The Staff Paper briefly notes this issue at page 35. However, no such explanation is included upfront in the Executive Summary and summary table. The results of the illustrative examples could be misread as representing the net emission reductions from illustrative examples including CHP technology. This is misleading and could lead users of the CEC's proposed methodology to reach the wrong conclusion. To present a clear picture to users, PG&E recommends the Staff Paper list gas-fired CHP separately from carbon-neutral forms of CHP (such as bottoming-cycle CHP or renewable CHP) and other zero carbon preferred resources.

Finally, there is an error in the Total CO2 column labelling of the summary table. The CO2 values listed represent annual emissions as discussed in example calculations in Chapter 4. However, the summary table shows these values as Five-Year Total CO2. This error should be corrected. Moreover, both avoided grid electricity and CO2 emissions should be listed for the same number of years: annual or five-year average. This will help users to easily derive the avoided carbon intensity.

PG&E's proposed edits to the summary table are shown below. Proposed additions to the table are underlined.

Table 1: Updated Staff Paper Summary Table for Illustrative Examples

Illustrative Example	Technology Description	~~Five-Year~~ Annual Total Avoided Grid Electricity (MWh)	~~Five-Year~~ Annual Total CO2 conversion (metric tonnes CO2)	Average Avoided Carbon Intensity (kg CO2/MWh)
Renewables (export)	2,500 kW wind turbine; 20% - 35% capacity factor	~~37,885~~ 7,577	2,920	386
Renewables (onsite)	2,500 kW wind turbine; 20% - 35% capacity factor	~~37,885~~ 7,577	3,167	418
Energy Efficiency	2,000 kW system with 10% equivalent capacity factor	~~8,765~~ 1,753	737	420
Demand Response	1,000 kW system with 100% on-peak only capacity factor	~~1,227~~ 245	149	605
Combine Heat and Power*	5,000 kW turbine; 80% - 100% capacity factor	~~176,523~~ 35,305	14,299*	405

* Note: Conventional gas-fired CHP systems have associated CO2 emissions to generate electricity and heat. The five-year total CO2 conversion (metric tonnes CO2) value listed above only represents the displaced emissions from the grid. This should not be considered net of GHG savings benefit from a conventional CHP system. Such analysis would require additional information not included in this paper.

IV. PG&E'S RESPONSE TO CEC STAFF QUESTIONS

1. *Is a uniform statewide method appropriate for evaluating emissions displacement factors over a long-term (10-15 year) planning horizon? If not, please explain.*

Yes, it is appropriate to have a uniform statewide method for evaluating emissions displacement over a long-term (10 to 15 year) planning horizon. However, the Staff's proposed methodology focuses on the near-term (through 2018) and does not include a uniform methodology over the long-term. As discussed above, major ongoing changes in the state's electricity resource mix are reducing grid emissions over time. The large increase in renewable generation has reduced, and will continue to reduce, the fuel and therefore emission savings that can be expected from incremental amounts of preferred resources. PG&E encourages the CEC staff to adjust the model to account for renewables and other GHG reduction policies that may result in carbon neutral generation on the margin for significant parts of the year, thus, gas-fired generation will no longer be displaced in those periods as it was in the past. We also recommend using the Production Cost Simulation model to benchmark the CO2 emission reductions from future preferred resource additions.

2. *Are the assumptions used to calculate the avoided generation for energy efficiency, demand response, renewables, and combined heat and power (and other distributed generation) correct? If not, what changes need to be made?*

The Staff Paper's illustrative examples are fairly simplistic and could provide an approximation for the displaced grid emissions for long-term planning if the model incorporates the ongoing changes in the state's resource mix. However, these simplistic examples do not capture the granularity needed for the near-term *ex-post* evaluation of the programs. For example, the energy efficiency example included in the Staff Paper uses a simplified assumption that the load shape for all energy efficiency measures is flat. This is not reflective of reality and it should be considered for further refinement.[3] If detailed load shape analysis is not feasible, an alternative approach could be to examine recent energy efficiency portfolios to determine how closely these assumptions align with the example considered in the paper.

3. *Is the treatment of onsite generation and associated electric grid displacement appropriate? Please explain.*

The Staff Paper generally treats onsite generation and associated electric grid displacement appropriately. The line loss benefit of 7.8 percent for generation serving onsite load is within the range to be expected. Further, the application of the line loss benefit only to onsite portion of electricity is appropriate. Any exports to the grid should receive the same treatment as any other generation that is exporting to the grid, including merchant generation. It should not receive the line loss benefit.

PG&E does note, however, that the results in Table 2 for onsite and exported renewable generation were derived from an example of a customer with a wind installation. Even assuming that the wind technology assumptions are correct, it should be noted that wind comprises only a tiny portion of the onsite customer-side renewable generation installed in California. Solar PV is a common technology for customer-side renewable generation.

4. *How might this method be applied in program planning and comparison or program impacts? In what circumstances do you see the State using a method like this?*

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[3] Past research has enabled the development of load shapes for a large number of energy efficiency products and end uses. These are currently used in the cost-effectiveness evaluation of the programs falling under CPUC jurisdiction and are included in the DEER database and E3 calculator. These, along with the Additional Achievable Energy Efficiency scenarios used in the California Energy Demand, could be leveraged as part of additional analysis in this area.

California has ambitious plans to reduce GHG emissions across all sectors of the economy.[4] A uniform GHG abatement comparison across demand-side and supply-side resources can provide useful insights for the state's long-term planning. It can help in evaluating the cost-effectiveness of the GHG abatement options and associated trade-offs. However, the current proposed methodology by the Staff Paper does not address the long-term planning need as it does not account for changes in the grid operations over time. The proposed methodology in the Staff Paper is a good starting point; however, it should be further adjusted to account for renewables and other GHG reduction policies that may result in carbon-neutral generation on the margin for significant parts of the year.

5. *What programs and/or situations would this method be inappropriate to apply? (For example, would it be inappropriate to use this method to estimate emissions avoided by geothermal plants that operate as base load?)*

In the near-term, there is limited use for the Staff Paper's proposed methodology. The existing near-term methodologies for various demand-side and supply-side program evaluations are fairly sophisticated. There will be little additional value in estimating GHG savings using this methodology. For example, for energy efficiency programs, until the analysis described in question 2 is performed, it would be inappropriate to apply this methodology.

6. *Do you think the approach (as a whole or specific elements of the method) will result in accurate estimate, or will it overestimate/underestimate grid displacement? Please explain.*

In the long-term, this methodology will overestimate the GHG benefits associated with displacement electricity unless the model is adjusted to account for future changes to the grid electricity mix from the addition of more renewables.

In the near-term, the answer will depend on the mix of technologies and the end-use they serve. For example, for energy efficiency, if the mix of technologies is weighted to measures that are typically used at peak times (e.g., HVAC), this approach will underestimate grid displacement. However, if the mix is weighted to measures that aren't used at peak times, the Staff Paper proposed methodology could overestimate grid displacement.

7. *What do you think are the appropriate levels of granularity necessary in order to provide a reasonable estimate of electric grid fuel displacement? Please use the discussion of Method Parameters section in Chapter 5 as a starting place for discussion.*

This answer will depend on the intended use of the proposed methodology. As discussed above, if it is to be used to aid near-term program evaluation, more granularity is needed. For

[4] Governor Brown's Executive Order calls for reductions in California GHG emissions by 40% below 1990s level by 2030.

example, factors such as modelling corresponding load shape of the resource type, peak/off-peak hours of operations, and seasonal variation of heat rates will be important. If this approach is to be used for guiding long-term state policy, the model needs to be adjusted to account for future changes to the grid. We recommend using Production Cost Simulation model to benchmark the CO_2 emission reductions from future preferred resource additions.

VI. Conclusion

PG&E thanks the CEC for the opportunity to review and provide comment on the Staff Paper. PG&E would be happy to discuss these issues with CEC staff and to answer any questions they may have.

Sincerely,

/s/

Valerie Winn

cc: Bryan Neff by email (bryan.neff@energy.ca.gov)