Bloomenergy

March 2, 2018

Dave Mehl
California Air Resources Board
1001 I Street
Sacramento, CA 95814
VIA Online submission

Dear Dave,

Bloom Energy (Bloom) thanks ARB staff for their work in developing the greenhouse gas (GHG) emissions reduction standard for the fuel cell net energy metering (FC NEM) tariff and for convening the February 13 working group to discuss the Avoided Cost Calculator (ACC). The ACC accurately calculates and forecasts the marginal emissions, accounting for renewables operating and procured, of the grid *prior to* multiplying the marginal emissions rate by a factor of (1-RPS%) to determine the "Long-run Emissions Factor". In addition to our previous comments filed December 22, 2017, Bloom provides the following evidence that the calculation without the Long Run (1-RPS%) factor appropriately takes into account both the operation and procurement of electrical grid resources, including renewable resources, for the purposes of this annual FC NEM GHG standard.

The Avoided Cost Calculator incorporates renewable resources in its market-based marginal emissions rate

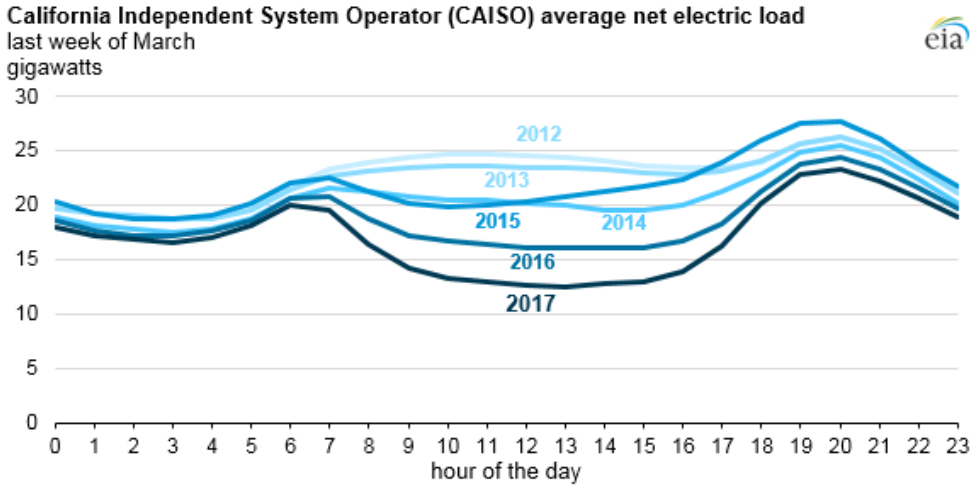
The ACC accurately incorporates the impact of operating and forecasted renewable resources on the marginal emissions rate in three ways: 1) through the impact of these resources on the overall market heat rate curve; 2) through the use of the CPUC RPS (Renewable Portfolio Standard) calculator to account for RPS procured renewable energy and 3) through the use of a zero marginal emissions rate in hours where overgeneration occurs, indicating that a zero emission resource is the CAISO market's marginal generation unit in that hour.

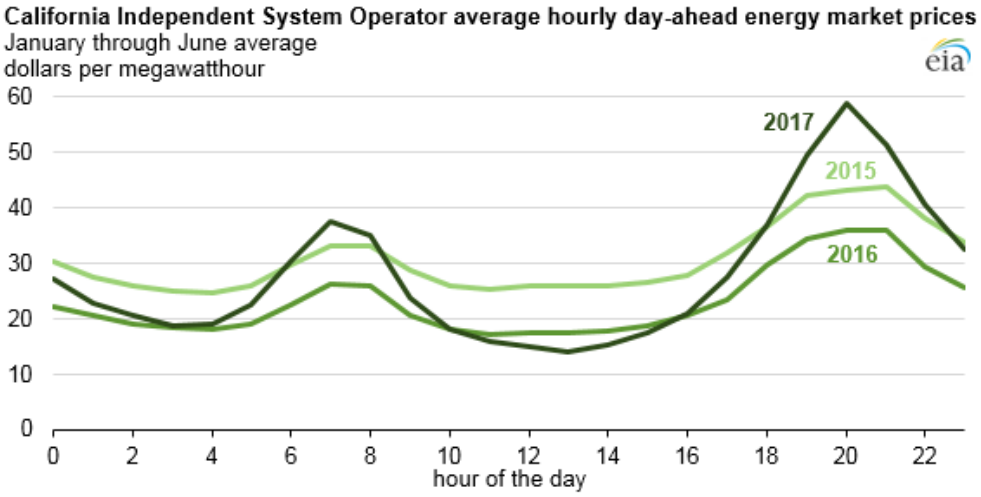
First, the overall market heat rate curve in the ACC incorporates renewable resources. This is the case because the heat rate curve is based on CAISO energy market forward prices through 2023.[1] CAISO energy market prices are based on the price bid by the marginal generator dispatched to meet load. This marginal generator reflects renewable generation already operating in the market because this generation reduces the need for the dispatch of other resources with higher heat rates, such as relatively inefficient natural gas.

The fact that renewable generation impacts CAISO market energy prices can be seen in the chart below produced by the U.S. Energy Information Administration (EIA).[2] The first shows that the CAISO's average hourly "net load" fluctuates during

[1] Energy and Environmental Economics, Inc. *Avoided Costs 2017 Interim Update.* September 11, 2017. pp. 14-16. (E3 ACC Overview)
[2] See https://www.eia.gov/todayinenergy/detail.php?id=32172

the day depending on 1) customer load and 2) the level of renewable generation output. Net load, therefore, is relatively low both during the night, when most customers are asleep, and during the afternoon hours, when solar generation output is greatest. Critically, the second chart shows that CAISO energy prices are also low during the hours of greatest solar generation output, reflecting the relatively low demand for natural gas generation and the relatively high efficiency of the marginal natural gas-fired generator during those hours. Market prices and market heat rates derived from those prices, therefore, clearly reflect renewable generation operating in the market.





The specific market prices used in the ACC reflect renewable generation in that, without existing renewable generation operating, a higher heat rate/higher emission resource would have been used and would have led to higher market prices. The E3 overview of the ACC summarizes this link between market prices and marginal emissions: “The link between higher market prices and higher emissions rates is

intuitive: higher market prices enable lower-efficiency generators to operate, resulting in increased rates of emissions at the margin."[3]

Secondly, in addition to capturing the effect of operating renewable resources in the market by using CAISO energy market forward prices, the ACC includes "adjustments to the hourly energy price profile using the CPUC RPS Calculator to account for projected increases in renewable generation. The RPS calculator implied heat rate changes by month/hour are incorporated into the price shape for 2020. Adjustments prior to 2020 are linearly interpolated, and adjustments after 2020 are held at the 2020 levels."[4]

Thirdly, the ACC also explicitly accounts for the hours in which renewables generation (or another zero emission resource) is the marginal generator. The ACC documentation states that, "if the implied heat rate is calculated to be at or below zero, it is then assumed that the system is in a period of overgeneration and therefore the marginal emission factor is correspondingly zero as well."[5] In other words, the ACC accounts for hours in which renewables generation drives the marginal emission rate to zero, and these zero marginal emission hours are reflected in the market-based annual marginal emission rate results produced by the model (i.e. prior to application of the (1-RPS%) factor).

Thus, the market heat rate curve from which the ACC derives the marginal emission rate not only includes existing renewables generation implicitly embedded in the market energy prices (i.e. operation), it also includes additional forecasted RPS resources that will be added to the grid in the coming years (i.e. procurement), and overgeneration/curtailment happening now and forecasted into the future as renewables penetration increases (i.e. operation and procurement). The operation and procurement of renewables that are displaced by new generation (fuel cells) is accounted for in the ACC marginal calculation, and as the grid evolves over time and the ACC is updated, each new set of standards (released every three years) will reflect the most recent data available on grid operation and procurement.

The Fuel Cell NEM program will not affect future procurement decisions

Investor owned utilities require customers with on-site generation to pay monthly "reservation capacity" standby charges for the right to use power from the utility grid when necessary, unless exempt under specific Net Energy Metering tariffs. Such a policy implies that utilities are assuming they will need to provide the capacity to serve these customers. Insofar as Bloom is aware, the capacity is still procured despite the fee treatment of the tariff.

In addition, unlike the implications of E3's statement "When a distributed resource saves a kWh of electricity, the utility consequently procures 0.5 kWh less renewable energy (under a 50% RPS)… and so the resulting net GHG impact must be adjusted by (1 minus the RPS%),"[6] future procurement of renewable energy by

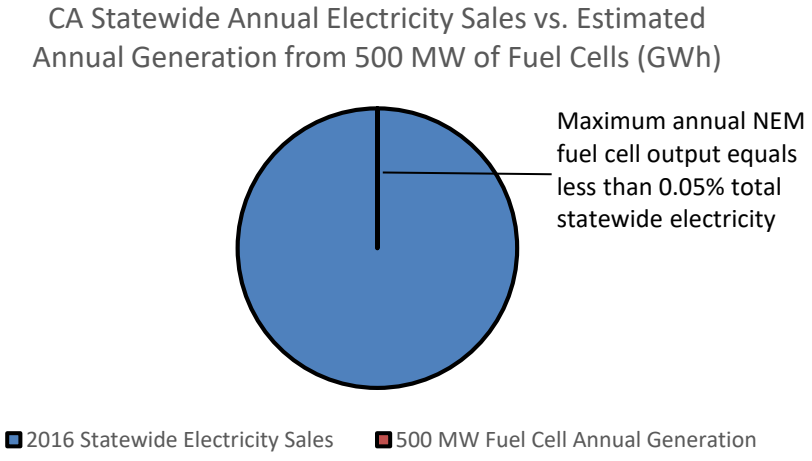
[3] E3 ACC Overview, pp. 34-35.
[4] E3 ACC Overview, pp. 90-91.
[5] E3 ACC Overview, p. 35.
[6] E3 ACC Overview, p. 39.

load serving entities is not simply a function of sales and the RPS percentage, with banked RECs carrying forward indefinitely until being used to meet a future RPS obligation. In practice, the timing and quantity of procurement of new renewable energy supplies depends on multiple factors and uncertainties. As described in PG&E's 2017 RPS Procurement Plan:

> In addition to retail sales forecasts,… PG&E's long-term demand for new RPS-eligible project deliveries is driven by: (1) PG&E's current projection of the success rate for its existing RPS portfolio, which PG&E uses to establish a minimum margin of procurement; and (2) the need to account for PG&E's risk-adjusted need, including any Voluntary Margin of Procurement ("VMOP") as determined by PG&E's stochastic model.

PG&E employs a stochastic model to determine its risk-adjusted need to procure renewable energy to meet its RPS obligations. PG&E's stochastic model considers the following impacts on its RPS position: 1) Retail Sales Uncertainty, 2) Project Failure Variability, 3) Curtailment, and 4) RPS Generation Variability. The resulting stochastically-adjusted gross RPS position, which PG&E uses to inform its application of REC bank balances and potential additional renewable energy procurement is redacted from public RPS Plan documents, but presumably differs from the physical net short position calculated without considering these risks.

To put the potential impact of the Fuel Cell NEM program on future renewable energy procurement in context, 250 MW of fuel cells operating at a 90% capacity factor would reduce statewide electricity sales by less than 1% (2 GWh/yr vs 260 TWh/yr in 2016).[7]



[7] See California Energy Commission. *Mid Case Revised Demand Forecast*. Submitted January 22, 2018. http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-03/TN222323_20180122T142259_CEC_2017_Revised_Baseline_STATEWIDE_Mid_Demand_Case.xls

It is likely that this impact, or even twice as much assuming 500 MW of fuel cells (the entire size of newly authorized installations under the program through 2021), falls within the range of risk-adjusted needs estimated using a stochastic modeling approach. The effect of fuel cells being eligible for net energy metering is likely to be within the noise of factors determining the renewable energy procurement decisions of load serving entities and will not impact their procurement decisions.

Conclusion

Taken together, these arguments point to removal of the Long Run (1-RPS%) factor from the emissions calculation. In compliance with the statute, using the ACC to calculate marginal emissions, and releasing standards every three years which allows for updated data and forecasts to be incorporated, does provide an accurate "compar[ison] to the electrical grid resource, including renewable resources, that the fuel cell electrical generation resource displaces, accounting for both the procurement and operation of the electrical grid."[8]

Bloom thanks the Board for the opportunity to submit these comments and will continue to engage and provide resources that will lead to the development of an accurate, data-driven GHG standard for the FC NEM tariff to ensure that the GHG-reducing contributions of fuel cell installations in California continue to be accurately accounted for as they help the state meet its GHG reduction goals.

Respectfully,

Erin Grizard
Senior Director, Regulatory and Government Affairs

[8] Fuel Cell Net Energy Metering Statute, PU Code 2827.10 (b)(2).