FuelCell Energy (FCE) has been an active participant in the Air Resources Board's (ARB) proceedings to establish a greenhouse gas (GHG) emission standard for the fuel cell net energy metering (FC NEM) provisions established by AB1637. FCE has challenged the ARB's calculation of grid emissions, its methodology and its processes employed to determine the standard. FCE stands by all of its previous comments filed in this proceeding and incorporates them herein by reference. FCE has also reviewed the February 10, 2020 Proposed Modification to the FC NEM Greenhouse Gas Emission Standards Proposed Regulation Order ("Summary of Proposed Modifications") purporting to impose a more aggressive annual standard reduction on small (less than 5MW) behind-the-meter fuel cell installations that emit virtually no NOx, no SOx and no particulate matter and could contribute to the resiliency and reliability of California's electric grid, especially in this time of "public safety power shutoffs," if they were valued as a resource by the ARB. FCE warned in its last set of comments that the initial standard proposed by CARB threatened the 5.0MW Bolthouse Farms CHP project in Bakersfield. As reported in FCE's January Annual Report on Form 10-K filed with the Securities and Exchange Commission, that project has been cancelled as a result of this standard.

In reiterating its opposition to the FC NEM proposed emissions reduction rate and levels, and now the more aggressive annual percent reductions, FCE requests that the levels be modified to comply with the year-by-year CARB Scoping Plan 2017 that was created and adopted specifically to fulfill the legislative mandate to reduce GHG emissions set forth by SB 32.

As previously pointed out, the emissions levels in the proposed regulation for FC NEM require greater GHG reductions from fuel cells than are required for large fossil fueled power plants on a kg CO2e/MWh basis (that also emit the NOx, SOx and particulates the fuel cells do not) and also do not account for avoided GHG emissions from transmission and delivery not required for onsite generation fuel cells. Therefore, the proposed regulation does not comply with the CARB Scoping Plan 2017 which requires accounting of all GHG emissions.

**CARB Scoping Plan 2017 defines the pace of Electric Sector GHG reductions to meet SB 32**

As stated in the Summary of Proposed Modifications, *"Staff has reevaluated the annual reduction of the standards and is proposing that the reduction should be based on the GHG emissions reduction goals of Senate Bill (SB) 32 (Pavley, Chapter 249, Statutes of 2016), which calls for* ***statewide GHG emissions to be 40 percent below the State's 1990 GHG emission level by 2030.*** *CARB staff calculated the new annual reduction percentage based on the equivalent of reducing the fuel cell NEM 2017 GHG emission standard (409 kg CO2e/MWh) by 40 percent by 2030 (245 kg CO2e/MWh).* ***An annual reduction rate of 3.85 percent is needed to achieve this level of reductions****, and this new percentage is used to calculate the GHG emission standards starting in the year 2018. Each year's emission standard is rounded to the nearest whole number before the subsequent year's emission factor is calculated. For instance, to calculate the 2018 emission factor, staff multiplied 409 CO2e/MWh by .9615 (i.e., 1 minus 0.0385), resulting in a value of 393.2535. Staff rounded this to the nearest whole number, which is 393, and staff then used that value to calculate the 2019 emission factor (and so on). The 2018 to 2022 average annual GHG emission standard values have been modified to reflect these changes."*

CARB adopted its Scoping Plan 2017 to comply with Executive Order B-30-15 and SB 32. (See https://ww3.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf)

- On page ES1 (Executive Summary): "The 2030 target of 40 percent emissions reductions below 1990 levels guides this Scoping Plan, as the economy evolves to reduce greenhouse gas (GHG) emissions in every sector."
- On page ES4 (Executive Summary): "This Plan draws from the experiences in developing and implementing previous plans to present a path to reaching California's 2030 GHG reduction target. The Plan is a package of economically viable and technologically feasible actions to not just keep California on track to achieve its 2030 target, but stay on track for a low- to zero-carbon economy by involving every part of the state…….This Plan highlights the fact that a balanced mix of strategies provides California with the greatest level of certainty in meeting the target at a low cost while also improving public health, investing in disadvantaged and low-income communities, protecting consumers, and supporting economic growth, jobs and energy diversity."

To accompany the Scoping Plan 2017, CARB has published its PATHWAYS and scenarios to achieve the SB32 reduction of 40 percent below 1990s levels. The PATHWAYS output is publicly available at https://ww3.arb.ca.gov/cc/scopingplan/meetings/meetings.htm

The table below shows the PATHWAY scenarios for the electric sector from 2017 to 2022, years which match the FC NEM Summary of Proposed Modifications years. FCE has included the calculated PATHWAY scenarios, which decrease from the previous year for both the "Updated Scope" and "60% RPS Updated Scoping Plan."

Table 1 below very clearly shows that CARB's Summary of Proposed Modifications discriminates against stationary fuel cell generators inasmuch as it does not follow the Scoping Plan PATHWAY for the electric sector. CARB's Summary of Proposed Modifications requiring an annual reduction of 3.85% is much greater than Scoping Plan percentage reduction of at most 3.18% and on average 1.86%, thus requiring fuel cells to reduce direct GHG emissions far more and much faster than competitive electric generating technologies that also emit NOx, SOx and particulates that fuel cells do not.

**Table 1: CARB Scoping Plan 2017 PATHWAYS for Electric Sector**

| | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| PATHWAYS - Updated Scoping Plan (Millions of metric tons for electric sector) | 66.8 | 65.5 | 64.3 | 62.2 | 61.4 | 60.8 |
| Percent Reduction from previous year | N/A | 1.90% | 1.92% | 3.18% | 1.39% | 0.91% |
| PATHWAYS - 60% RPS Updated Scoping Plan (Millions of metric tons for electric sector) | 66.8 | 65.5 | 64.3 | 62.2 | 61.4 | 60.5 |
| Percent Reduction from previous year | N/A | 1.91% | 1.91% | 3.21% | 1.40% | 1.38% |
| CARB FC NEMS Regulation Adjustment to Reduce Annual GHG standard (reduction from previous year) | N/A | 3.85% | 3.85% | 3.85% | 3.85% | 3.85% |

The Scoping Plan resolution states: (https://ww3.arb.ca.gov/board/res/2017/res17-46.pdf)

> *"The Final Plan prioritizes rules and regulations for direct GHG reductions, and includes policies to require direct GHG reductions at some of the State's largest stationary sources and mobile sources in a manner consistent with AB 197;"*

Fuel cells are small stationary sources and eligible FC NEM facilities are limited to 5 MW by statute. The Summary of Proposed Modifications does the exact opposite of the Scoping Plan resolution. It imposes direct emission reductions on small fuel cell facilities that do not emit NOx, SOX or particulates while aging power plants and fossil imports that do emit harmful NOx, SOx and particulates continue to supply California without reducing their direct GHG emissions.

**CARB Scoping Plan 2017 includes all electric sector GHG emissions, thus avoided delivery losses must be included in FC NEM**

The CARB Scoping Plan 2017 was proffered as a comprehensive plan to reduce GHG emissions in every sector. Thus, all GHG emissions are modeled and accounted for in the detailed CARB PATHWAYS scenarios.

With the change espoused in CARB's Summary of Proposed Modifications to comply with SB 32, CARB must be consistent with its Scoping Plan 2017 and account for *all* GHG emissions reductions. Every FCE FC NEM facility will be behind the meter directly serving customer load. This avoids the transmission and distribution losses associated with delivering power from a central or remote location to the customer site that must be accounted for.

The California Public Utility Commission (CPUC) uses a California line loss average of 8.4 percent, including in the Self Generation Incentive Program (SGIP). This line loss factor must be included as an avoided GHG emission in order for the FC NEM to be aligned with the CARB Scoping Plan 2017.

If the line loss factor is not included, the actual FC NEM proposed regulation imposes much greater emissions reduction requirements on fuel cells than on any other generation technology in the electric sector. The table below shows that the FC NEM proposed regulation imposes a 61% GHG reduction overall, for fuel cells during the period 2018 through 2022.

**Table 2: FC NEM Proposed Regulation Reduction plus Line Loss Factor**

| | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|
| CARB FC NEM Regulation Adjustment to Reduce Annual GHG standard (reduction from previous year) | 3.85% | 3.85% | 3.85% | 3.85% | 3.85% |
| Line Loss Factor (Reference: CPUC SGIP program) | 8.4% | 8.4% | 8.4% | 8.4% | 8.4% |
| Effective Total Reduction by Fuel Cells | 12.25% | 12.25% | 12.25% | 12.25% | 12.25% |

Not including the CPUC Line Loss Factor further evidences the discriminatory treatment afforded fuel cells under the FC NEM program as compared to large power plants and cogeneration plants. (Reference: Thermal Efficiency of Gas-Fired Generation in California: 2018 update (CEC 2018) – page 3) https://ww2.energy.ca.gov/almanac/electricity_data/Thermal_Efficiency_reports.html)

*"The small increases in the system wide average heat rate for 2014 through 2017 as shown in Figure 1 are the result of natural gas-fired power plants adjusting their power output to accommodate fluctuations in available renewable generation within California's electrical grid.*

*There are, however, practical limits to the state's ability to reduce its system wide heat rate. The primary factor is related to how often the fleet of gas-fired power plants operate over their available hours. Cycling or ramping refers to gas plants altering output levels, including shutdowns and restarts, in response to changes in system load and the availability of renewable generation on the electrical grid. Cycling results in increased fuel consumption during those periods when a plant is not operating at the highest efficiency level, a result of the large temperature and pressure changes that take place in plant equipment. For those power plants designed to operate most efficiently at constant output levels, cycling leads to greater wear and tear and reduced lifespan of the equipment, along with reduced thermal efficiency. Studies have found that cycling results in a* ***1 percent permanent degradation*** *in the heat rate of a generating unit over four to five years.* (N. Kumar, P. Besuner, S. Lefton, D. Agan, and D. Hilleman. National Renewable Energy Laboratory. July 2012. Power Plant Cycling Costs. https://www.nrel.gov/docs/fy12osti/55433.pdf.)" (emphasis added).

**GHG Emissions Year by Year Reductions Consistent with CARB Scoping Plan 2017 and CPUC Line Losses**

The table below reflects FCE's calculated FC NEMS emissions factors consistent with these comments, but does not address FCE's earlier comments concerning CARB's methodology. FCE submits that the far right column is consistent with CARB's Scoping Plan 2017 that has already set the pathway to achieving SB 32 goals for statewide GHG emissions reductions. CARB should not piecemeal pick and choose standards and methodologies for achieving GHG emissions reductions that favor one technology over another, especially when the results of such actions serve to exclude fuel cells, which are the cleanest form of fossil generation.

**Table 3: FuelCell Energy calculated FC NEMS Table consistent with CARB Scoping Plan 2017**

| | Average Annual GHG Emission Standards (kg CO2e/MWh) | | |
|---|---|---|---|
| Year | CARB Proposed Modification | Adjustments Compliant with 60% RPS PATHWAY slope | Adjustments Compliant with 60% RPS PATHWAY plus CPUC 8.4% Grid losses |
| 2017 | 409 | 409 | 443 |
| 2018 | 393 | 401 | 435 |
| 2019 | 378 | 394 | 427 |
| 2020 | 363 | 381 | 413 |
| 2021 | 349 | 376 | 407 |
| 2022 | 336 | 370 | 402 |