State of California
AIR RESOURCES BOARD

**Final Statement of Reasons for Rulemaking,
Including Summary of Comments and Agency Response**

PUBLIC HEARING TO CONSIDER FUEL CELL NET ENERGY METERING GREENHOUSE GAS EMISSION STANDARDS REGULATION

Public Hearing Date: December 12, 2019
Agenda Item No.: 19-12-9

GENERAL

The Staff Report: Initial Statement of Reasons for Rulemaking (Staff Report), entitled Fuel Cell Net Energy Metering Greenhouse Gas Emission Standards Regulation (Regulation), released October 22, 2019, is incorporated by reference herein. The Staff Report, which is incorporated by reference herein, contained a description of the rationale for the proposed amendments. On October 22, 2019, all references relied upon and identified in the Staff Report were made available to the public. The October 22, 2019, Notice of Public Hearing to Consider the Fuel Cell Net Energy Metering Greenhouse Gas Emission Standards Regulation initiated a 45-day public comment period, which began on October 25, 2019, and ended December 9, 2019 (45-day Public Notice).

At its December 12, 2019, public hearing, the California Air Resources Board (CARB or Board) approved for adoption the proposed sections 95408 to 95412, Title 17 California Code of Regulations, which comprise the Fuel Cell Net Energy Metering Greenhouse Gas Emission Standards Regulation.

The Board directed the Executive Officer to determine if additional conforming modifications to the regulation were appropriate and to make any proposed modified regulatory language available for public comment, with any additional supporting documents and information, for a period of at least 15 days as required by Government Code section 11346.8. The Board further directed the Executive Officer to consider written comments submitted during the public review period and make any further modifications that are appropriate available for public comment for at least 15 days, and present the Regulation to the Board for further consideration if warranted, or take final action to adopt the regulation after addressing all appropriate modifications. Furthermore, the Board directed the Executive Officer to finalize the Final Statement of Reasons (FSOR) for the Regulation and submit the final rulemaking package to the Office of Administrative Law for review.

On February 10, 2020, staff released the First Notice of Public Availability of Modified Text (15-day Public Notice). Comments that were received during the formal 15-day comment

period for the modified text, as well as further staff analysis, were reflected in the modifications made in the Second Notice of Public Availability of Modified Text (30-day Public Notice) that was released on April 27, 2020, for a 30-day public comment period. This FSOR provides written responses to all comments received on the proposed regulation in response to the 45-day Public Notice, 15-day Public Notice, and 30-day Public Notice.

MANDATES AND FISCAL IMPACTS TO LOCAL GOVERNMENTS AND SCHOOL DISTRICTS

The Board has determined that this regulatory action will not result in a mandate to any local agency or school district the costs of which are reimbursable by the state pursuant to Part 7 (commencing with section 17500), Division 4, Title 2 of the Government Code.

CONSIDERATION OF ALTERNATIVES

As noted in the Economic Analysis found in the Staff Report, the Regulation is not anticipated to have adverse economic impacts on small businesses. Therefore, staff has not identified any reasonable alternatives that would lessen any adverse impact on small business.

For the reasons set forth in the Staff Report, in staff's comments, and responses at the hearing, and in this FSOR, the Board determined that no alternative considered by the agency would be more effective in carrying out the purpose for which the regulatory action was proposed, or would be as effective and less burdensome to affected private persons, or would be more cost-effective to affected private persons and equally effective in implementing the statutory policy or other provisions of law than the action taken by the Board.

II. MODIFICATIONS MADE TO THE ORIGINAL PROPOSAL

A. MODIFICATIONS APPROVED AT THE BOARD HEARING AND PROVIDED FOR IN THE 15-DAY AND 30-DAY COMMENT PERIODS

As directed by the Board at the December 12, 2019, Board Hearing, staff revised the annual average greenhouse gas (GHG) emission standards to reflect a more aggressive annual percent reduction. Staff originally proposed a 2.5 percent annual reduction of the standards to align with 2030 electricity-sector integrated resource plan (IRP) GHG emissions targets set pursuant to Senate Bill (SB) 350 (de León, Chapter 547, Statutes of 2015), and taking into consideration the 2030 Renewables Portfolio Standard (RPS) target set by SB 100 (de León, Chapter 312, Statutes of 2018). In the 15-day Public Notice, staff proposed that the reductions be based on the GHG emissions reduction goals of SB 32 (Pavley, Chapter 249, Statutes of 2016), and revised the annual reduction percentage to be 3.85 percent, starting in 2018, based on the equivalent of reducing the fuel cell net energy metering (NEM) 2017 GHG emission standard (409 kilograms (kg) carbon dioxide equivalent (CO_2e) per Megawatt hour (MWh)) 40 percent by 2030.

Based on comments received in response to the 15-day Public Notice, staff reevaluated the annual reduction of the standards and determined that the 2017 to 2020 standards should retain a 2.5 percent annual reduction, as proposed in the Notice of Public Hearing to Consider Proposed Fuel Cell Net Energy Metering Greenhouse Gas Emission Standards Regulation (45-day Public Notice). For years 2021 and beyond, however, the annual reduction is based on the GHG emissions reduction goals of SB 32. To achieve a 40 percent reduction by 2030 (245 kg CO_2e/MWh), an annual reduction of 13.4 kg CO_2e/MWh is applied to the standard starting in 2021. CARB staff proposed an annual linear reduction in response to stakeholder concerns that larger reductions would be required in the early years under a percentage-based approach. A linear approach happens to be consistent with the 2017 to 2020 standards proposed in the 45-day Public Notice because the annual reductions of 2.5 percent are linear when rounded to the nearest whole number.

Beginning with calendar year 2021, the standard moves from rounding to the nearest whole number to rounding to the tenths place (00.0) to accommodate the new annual reduction amount of 13.4 kg CO_2e/MWh, which was developed to achieve a 40 percent reduction in the standard by 2030. The 2021 and 2022 average annual GHG emission standard values have been modified to reflect these changes. After the close of the 30-day comment period, the Executive Officer determined that no additional modifications should be made to the Regulation.

III. DOCUMENTS INCORPORATED BY REFERENCE

The regulation adopted by the Executive Officer incorporates by reference the following documents:

United States Environmental Protection Agency. Mandatory Reporting of Greenhouse Gases; Final Rule. Title 40 Code of Federal Regulations, Part 98, Subpart A, Table A-1. October 30, 2009. https://www.govinfo.gov/content/pkg/FR-2009-10-30/pdf/E9-23315.pdf, Section 95410(a)(4).

United States Environmental Protection Agency. Mandatory Reporting of Greenhouse Gases; Final Rule. Title 40 Code of Federal Regulations, Part 98, Subpart A, Table A-1. December 11, 2014. https://www.govinfo.gov/content/pkg/FR-2014-12-11/pdf/2014-28444.pdf, Section 95410(a)(4).

These documents were incorporated by reference because it would be cumbersome, unduly expensive, and otherwise impractical to publish them in the California Code of Regulations. The incorporated documents were made available by CARB upon request during the rulemaking action and will continue to be available in the future. The documents are also available online and from college and public libraries.

IV. SUMMARY OF COMMENTS MADE DURING THE 45-DAY COMMENT PERIOD AND DECEMBER 12, 2019 BOARD HEARING AND AGENCY RESPONSE

Written comments were received during the 45-day comment period in response to the December 12, 2019, public hearing Notice, and written and oral comments were presented at the Board Hearing. Listed below are the organizations and individuals that provided comments during the 45-day comment period, the date and form of their comments, and the abbreviation assigned to each. The dates in the table below are the dates that feedback was received, which for written testimony is the date it was "Added to Database" in the rulemaking comment log.

Note that some comments which follow were scanned or otherwise electronically transferred, so they may include minor typographical errors or formatting that is not consistent with the originally submitted comments. However, all content reflects the submitted comments. All originally submitted comments are available here: https://www.arb.ca.gov/lispub/comm/bccommlog.php?listname=fcnem2019

A. LIST OF COMMENTERS

Abbreviation	Commenter
AEE	Amisha Rai, Advanced Energy Economy Written Testimony: 12/9/2019
AEE2	Priscilla Quiroz, Advanced Energy Economy Oral Testimony: 12/12/2019
Altergy	Eric Strayer, Altergy Systems Written Testimony: 12/9/2019
BAAQMD	Mark Tang, Bay Area Air Quality Management District Oral Testimony: 12/12/2019
BAC	Julia Levin, Bioenergy Association of California Written Testimony: 12/9/2019
BAC2	Josiah Young, Bioenergy Association of California Oral Testimony: 12/12/2019
Ballard	Rob Campbell, Ballard Power Systems Written Testimony: 12/9/2019
Bloom	Erin Grizard, Bloom Energy Written Testimony: 12/9/2019
Bloom2	Erin Grizard, Bloom Energy Oral Testimony: 12/12/2019
BREATHE	Marc Carrel, BREATHE California of Los Angeles County Written Testimony: 12/9/2019
CalBio	N. Ross Buckenham, California Bioenergy LLC Written Testimony: 12/9/2019
CalHydrogen	Emanuel Wagner, California Hydrogen Business Council Written Testimony: 12/9/2019
CalHydrogen2	Vincent Wiraatmadja, California Hydrogen Business Council Oral Testimony: 12/12/2019
CalRetailers	Steve McCarthy, California Retailers Association Oral Testimony: 12/12/2019

CEERT	John White, Center for Energy Efficiency and Renewable Technologies Oral Testimony: 12/12/2019
CEJA	Mad Stano, California Environmental Justice Alliance Written Testimony: 12/5/2019
Collaborative	William Gary, CA Stationary Fuel Cell Collaborative Written Testimony: 12/9/2019
CR&R	Paul Relis, CR&R Environmental Services Written Testimony: 12/10/2019
Delgado	Mario Delgado, Private citizen Written Testimony: 11/4/2019
Earth-NRDC-Sierra-Union-Vote	Matthew Vespa, Earthjustice Alex Jackson, Natural Resources Defense Council Katherine Ramsey, Sierra Club of California Jason Barbose, Union of Concerned Scientists Ed Smeloff, Vote Solar Written Testimony: 12/3/2019
Earth	Paul Cort, Earthjustice Oral Testimony: 12/12/2019
FC Energy	Jennifer Arasimowicz, FuelCell Energy Written Testimony: 12/9/2019
Lingbloom/Friedman-etal	Lawrence Lingbloom, Assembly Natural Resources Committee, submitting a letter from: Assemblymember Laura Friedman Assemblymember Chris Holden Assemblymember Mark Stone Senator Scott Wiener Written Testimony: 12/9/2019
Low	Assemblymember Low Written Testimony: 12/3/2019
Low2	Christopher Mair, Office of Assemblymember Low Oral Testimony: 12/12/2019
Low-etal	Assemblymember Evan Low Assemblymember Jacqui Irwin Assemblymember Susan Talamantes Eggman Senator Jim Beall Senator Connie Leyva Assemblymember Kevin Mullin Written Testimony: 12/10/2019
NFCRC	Dr. Jacob Brouwer, National Fuel Cell Research Center Written Testimony: 12/9/2019
NRDC	Alex Jackson, Natural Resources Defense Council Oral Testimony: 12/12/2019
Ramar	Primo Quesada, Ramar Foods Oral Testimony: 12/12/2019
Reimagine	Allie Detrio, Reimagine Power Inc.

	Written Testimony: 12/9/2019
Sierra	Daniel Barad, Sierra Club of California Oral Testimony: 12/12/2019
South Coast AQMD-CAPCOA	Philip Fine, South Coast Air Quality Management District Oral Testimony: 12/12/2019
SoCalGas	Tim Carmichael, Southern California Gas Company Oral Testimony: 12/12/2019
TechNet	Courtney Jensen, TechNet Written Testimony: 12/7/2019
TechNet2	Courtney Jensen, TechNet Oral Testimony: 12/12/2019
UC Irvine	Jack Brouwer, University of California, Irvine Oral Testimony: 12/12/2019

B. GENERAL SUPPORT FOR PROPOSED REGULATION

B-1 Support for the Proposed Regulation

Comment:
TechNet supports ARB's proposed greenhouse gas (GHG) standard for fuel cell net energy metering (FC NEM) projects. It is a rigorous, data-driven standard that will give our members the policy certain to continue investing in fuel cell projects that reduce GHGs, improve air quality, and provide unparalleled resiliency.

In recent years, California has taken major policy steps toward achieving its air quality goals. The extension of FC NEM and the passage of AB 617 demonstrate the state's commitment to combating criteria air pollutant emissions through the deployment of new energy technologies, such as fuel cells. These policies are further cementing California's status as the global leader in the development and deployment of distributed generation fuel cells.

All of this progress, however, could be threatened by California's new normal: Public Safety Power Shutoffs, wildfires, and extreme heat. Indeed, many of our members were negatively impacted by the unprecedented PSPS events that occurred this October, resulting in significant loses for their businesses and lost wages for their employees.

Non-combustion fuel cells provide a unique way to solve these challenges. This innovative technology is a key option for our members who want to move beyond traditional diesel generators, while reducing GHGs and improving air quality. We commend ARB for developing an accurate, continually improving GHG standard that will give our members the confidence to invest in fuel cell projects to power their operations moving forward. (TechNet)

Comment:
We support ARB's proposed Greenhouse Gas Standard for Fuel Cell Net Energy Metering projects. It is a rigorous data-driven standard that will give our members the policies

certain to continuous investing in fuel cell projects that reduce GHG's, improve air quality, and provide unparalleled resiliency.

In recent years, California has taken major policy steps toward achieving its air quality goals. But all of this progress could be threatened by California's new normal of Public Safety Power Shutoffs, wildfires, and extreme heat.

Many of our members and their customers were negatively impacted by the unprecedented PSPS events that occurred this October. Non-combustion fuel cells provide a unique way to solve these challenges. This innovative technology is a key option for our members, who want to move beyond traditional diesel generators, while reducing GHGs and improve air quality.

We commend ARB for developing an accurate, continually improving GHG standard that will give our members the confidence to invest in fuel cell projects to power their operations moving forward. And we ask that the Board approve this rule. (TechNet2)

Comment:
AEE supported AB 1637, the enabling legislation that extended the Fuel Cell Net Energy Metering program and specified CARB's pivotal role in helping foster this technology by creating an accurate GHG emissions standard. AEE is similarly supportive of the data-driven, technically sound methodology that CARB has developed in the proposed regulation. It will reduce GHGs, improve air quality, and provide clear guidance to California customers who wish to choose fuel cells instead of diesel generators for their clean energy, resiliency, and sustainability needs.

At a time when California is facing unprecedented challenges—Public Safety Power Shutoffs, wildfires, extreme heat—to its electrical infrastructure, this standard is key to driving further innovation in California's advanced energy economy to solve these challenges. The entrepreneurial spirit and technological innovation woven into the fabric of California culture combined with a supportive policy infrastructure have contributed to a robust advanced energy economy in the state. As the Golden State confronts the reliability and resiliency challenges of heightened wildfire and climate risk, along with the demands of a quick-evolving electricity system, AEE believes this GHG methodology is another key to enabling technology solutions that will lead to a clean, resilient, secure, and affordable energy future. This proposed regulation is well-crafted and will result in overall benefits to the state's emissions reduction, economic prosperity, and innovation goals. (AEE)

Comment:
AEE supported AB 1637, which extend the Fuel Cell Net Energy Metering Program and specified CARB's pivotal role in helping foster this technology by creating an accurate greenhouse gas emissions standard.

AEE is similarly supportive of the data-driven technology sound methodology that CARB has developed in the proposed regulations. It will reduce GHGs, improve air quality, and

provide clear guidance to California customers who wish to choose fuel cells instead of diesel generators for their clean energy, resiliency, and sustainable needs.

As the State confronts the reliability and resiliency challenges of heightened wildfire and climate risk, AEE believes this GHG methodology is another key to enabling technology solutions that will help -- that will lead to clean resilient, and secure, and affordable energy future. This proposed regulation is well crafted and will result in overall benefits to the State's emission reduction, economic prosperity, and innovation goals. (AEE2)

Comment:
Ballard supports ARB's proposed greenhouse gas (GHG) emission standard for fuel cell net energy metering (FC NEM) projects. This rigorous, data-driven standard will reduce GHGs, improve air quality, and provide unparalleled resiliency through the use of fuel cells.

In recent years, California has taken major policy steps toward achieving its air quality goals. The extension of FC NEM and the passage of AB 617 demonstrate the state's commitment to combating criteria air pollutant emissions through the deployment of new energy technologies, such as fuel cells. These policies are further cementing California's status as the global leader in the development and deployment of distributed generation fuel cells.

All of this progress, however, could be threatened by California's new normal: Public Safety Power Shutoffs, wildfires, and extreme heat. Indeed, many were negatively impacted by the unprecedented PSPS events that occurred this October, resulting in significant loses for their businesses and lost wages for their employees. In many situations, combustion-based backup generators were employed, contributing further to the climate and air challenges the state has made a priority to solve.

Non-combustion fuel cells provide a unique way to solve these challenges, and viable option to move beyond traditional diesel and combustion gas generators, while reducing GHG and improving air quality. We commend ARB for developing an accurate, continually improving GHG standard that will have the important co-benefit of criteria pollution reductions and resiliency. (Ballard)

Comment:
California Bioenergy LLC ("CalBio") is a leading developer of dairy methane capture projects in California with over forty projects throughout the Central Valley currently in development.

Several of these projects are being developed in conjunction with Bloom Energy to efficiently and cleanly convert captured dairy biogas directly into electricity to power the dairies and electric vehicles. Our Bloom produced electricity will be substantially carbon negative since it is both i) renewable and ii) is destroying previously vented methane. We are excited to be merging Bloom's Silicon Valley technology with our Central Valley renewable fuel, providing energy resiliency to the dairy, reducing greenhouse gas emissions and cleaning the air.

We appreciate the opportunity to comment on your Fuel Cell Net Energy Metering GHG Standard proceeding. CalBio supports policies that reduce greenhouse gases and air pollution. As such, we support ARB's proposed greenhouse gas standard for fuel cell net energy metering projects.

Encouraging the use of non-combustion fuel Bloom fuel cells and encouraging the use of renewable gas will reduce GHGs, improve air quality, and provide resiliency through the use of an on-site non-combustion generator.

We commend ARB for developing an accurate, continually improving GHG standard that will have the important co-benefit of criteria pollution reductions and resiliency. (CalBio)

Comment:
Altergy supports policies that reduce greenhouse gases and air pollution, and therefore supports the California Air Resources Board (CARB) proposed greenhouse gas (GHG) emission standard for fuel cell net energy metering. This rigorous, data-driven standard will reduce GHG emissions, improve air quality, and provide necessary resilience through the use of fuel cell systems.

With the recent passage of AB 617 and the extension and expansion of the fuel cell net metering program, California has facilitated short-term options to address criteria air pollutant and GHG emissions. Altergy is witnessing significant threats to California program on air emissions and using clean technologies like fuel cell systems for emissions reduction and resilient power; Public Safety Power Shutoffs and extreme weather events have engendered an unprecedented use of combustion diesel generators for backup power in Altergy's customer sectors, as well as in communities across California. This use of combustion for backup power is reversing significant gains that California has made in air quality improvement, as well as carbon reduction, and non-combustion stationary fuel cell resources are an immediate solution to mitigate this damage. These deployments not only impact our air quality today, but present long term impacts due to the investment of these installed pollution sources for up to 10 years of planned operation.

Altergy supports the data-driven and continually improving standard that has been proposed by the CARB staff, and will support the achievement of California's significant air quality, GHG reduction, and resilient power objectives. (Altergy)

Comment:
For over 115 years, BREATHE LA has addressed Southern California's serious air quality and lung-related public health challenges. We strongly support the need to move to zero-emission technologies to both reduce the significant public health harm caused by diesel emissions, and so that the South Coast Air Basin can achieve national ambient air quality standards. As such, we support ARB's proposed greenhouse gas (GHG) standard for fuel cell net energy metering (FC NEM) projects. This standard will reduce GHGs, improve air quality, and provide unparalleled resiliency through the use of fuel cells.

In recent years, California has taken major policy steps toward improving air quality and reducing public health disparities in disadvantaged areas. The extension of FC NEM and the passage of AB 617 demonstrate California's commitment to combating emissions of criteria air pollutants through the deployment of new energy technologies such as fuel cells. These policies reinforce California's status as the global leader in developing and deploying distributed generation fuel cells.

Unfortunately, these efforts could all be threatened by ongoing consequences of the Climate Crisis: extreme heat, an increase in the quantity and severity of wildfires, and the resultant public safety power shutoffs. Recent power shutoffs caused significant economic losses for businesses and lost wages for workers. To withstand losing power, many businesses utilized back-up diesel generators, which only created more diesel exhaust pollution, thereby adding to the state's climate and air quality challenges.

A major source of air pollution, greenhouse gases, and diesel particulate matter, diesel exhaust includes more than 40 substances listed as hazardous air pollutants by the U.S. Environmental Protection Agency and the Air Resources Board. In 1990, diesel exhaust was declared a carcinogen, and in 1998, ARB identified diesel particulate matter as a toxic air contaminant based on published evidence of a relationship between diesel exhaust exposure and lung cancer. Air pollution and associated illnesses are particularly prevalent in disadvantaged communities, which experience a disproportionate amount of air pollution from diesel sources. Zero-emission technologies reduce toxic air pollutants by over 90 percent, helping to clean our air and dramatically reduce health impacts, like asthma, in children and adults.

Non-combustion fuel cells are a perfect zero-emission solution to move beyond traditional diesel generators to reduce GHGs, reduce public health impacts, and improve air quality. We commend ARB for developing continually improving GHG standard that will promote the use of cleaner technologies, reduce criteria pollution, and move our state toward climate resiliency. (BREATHE)

Comment:
Fuel cells, clean generators, and other advanced backup power solutions are a critical tool to mitigating the devastating impacts of Public Safety Power Shutoffs (PSPS) and ensuring greater resiliency for California businesses, public agencies, and communities. This standard will ensure that fuel cells and other advanced distributed power generation technologies continue to reduce emissions relative to the grid and accelerate the transition to a decarbonized energy future. It will also guide consumers to choose cleaner backup power options instead of relying on inefficient, polluting, and potentially unsafe diesel generators.

Resilient energy solutions that rely on clean generation resources should be deployed as quickly as possible across the state. In order to ride through multi-day outages caused by PSPS, wildfires, extreme heat, or any other outages, California's critical facilities, public agencies and essential services need clean energy technologies that are flexible, dispatchable, and reliable. The proposed Fuel Cell NEM GHG standard will ensure fuel

cells continuing reducing GHGs while simultaneously providing Californians with clear guidance to choose cleaner options instead of diesel generators.

For these reasons, Reimagine Power is in full support of the standard and urges its passage to help achieve California's clean energy, resiliency, equity, safety, and sustainability goals. (Reimagine)

Comment:
The NFCRC commends CARB for developing a robust, thorough record that spans three years of workshops, comments, and analysis. The NFCRC supports the data-driven methodology. Fuel cell systems are critical to displacing diesel generators and meeting California air quality, carbon reduction and resilient energy objectives.

Fuel Cells Displace Diesel Generators

With ever-increasing extreme weather events and grid outages, diesel generator use is rising steeply as millions of Californians lose power for multiple days.[1] This expanding utilization of polluting, combustion-based generators is threatening California's world-leading clean energy and clean air goals.

Non-combustion fuel cell systems are uniquely designed to address multiple resilience needs related to electricity production and power generation. As distributed, onsite resources, fuel cell systems produce virtually no criteria air pollutants, provide uninterruptible power for prolonged outages, can be paired with other technologies (for example: solar, battery storage, wind), and serve as the mainstay of microgrids in rural, vulnerable, and disadvantaged communities.

The adoption of the proposed fuel cell NEM GHG emissions standard will strengthen these benefits to the State by ensuring fuel cells can provide this resilient and clean power while continuing to reduce GHG emissions compared to the grid. With the declining GHG emissions standard proposed, stationary fuel cell systems will continuously reduce GHG emissions as they operate into the future.

Fuel Cell NEM is Critical to Achieving the State's SB 100 and AB 617 Goals

As recognized at the July 8 workshop, finalizing this fuel cell NEM standard is important to enable the further deployment of fuel cell systems. Because of their non-combustion operation and high capacity factor, fuel cell systems decrease GHG emissions more than the grid and other renewable resources. In order to achieve the zero emission objectives in SB 100, California needs multiple resources that can balance intermittent renewables while also reducing GHG emissions.

As non-combustion distributed energy resources, fuel cell systems also greatly improve air quality in local communities and are critical to meet the goals of AB 617. The generation of

[1] https://sanfrancisco.cbslocal.com/2019/10/12/air-quality-concern-generators-power-shutoffs/

continuous power, with zero criteria air pollutant emissions, is especially critical given that the majority of California currently suffers from poor air quality and faces major challenges in achieving clean air for the many citizens that live and work within these areas, including in economically disadvantaged communities that are often disproportionately burdened by air pollution.

The Proposed Fuel Cell NEM Emission Standards Presented by CARB are Data-Driven and Technically Validated via a Thorough Record

Over the past three years, CARB staff has developed a very complete record for the development of the methodology. As California's lead agency with air quality expertise, the agency has held multiple workshops to solicit stakeholder input on what metric(s) should be used to determine the fuel cell NEM GHG annual emission standards, considered several iterations of written comments, and comprehensively analyzed multiple datasets to arrive at this methodology.

The resulting proposed standard follows the legislative intent of AB 1637, which calls for a declining annual standard to be applied to a project each year. Because eligibility is not automatic for the lifetime of a project, an annual view of marginal emissions is appropriate for this standard. By decreasing the annual fuel cell NEM standard every year based upon actual marginal emissions rates, the standard as proposed accounts for the evolving dispatch profiles of load-following combined cycle and simple cycle power plants operating in concert with renewables for each year.

The Proposed Methodology Supports a Transition To Zero-Emission Generation

The Staff Proposal extensively demonstrates that CARB has properly accounted for the variables considered in the development of the regulation. On December 2, 2019, the joint environmental groups filed comments expressing specific concerns about the proposed methodology.[2] These concerns have been thoroughly and previously addressed on the record of this proposed regulation. The CARB proposal demonstrates that the Staff has deeply considered the previous methodologies used to calculate emissions standards, such as the Avoided Cost Calculator (ACC) and improved upon the accuracy of these now outdated methods. Please see responses in Appendix A. Non-combustion fuel cell systems reduce GHG emissions and improve air quality, on any fuel.[3] Again, the proposed GHG emission standard that decreases every year supports increasingly renewable fuel cell systems – the orderly transition to completely zero emissions over time, which the environmental justice community seeks.

Conclusion

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[2] https://www.arb.ca.gov/lists/com-attach/2-fcnem2019-WzVUNVU7WVULbgBv.pdf

[3] *SGIP 2016-2017 Self-Generation Incentive Program Impact Evaluation Report.* Submitted by Itron to Pacific Gas & Electric Company and the SGIP Working Group, September 28, 2018. Available at: https://www.cpuc.ca.gov/General.aspx?id=7890

The proposed GHG standard for the net energy metering of fuel cell systems demonstrates thorough technical development and consideration by the CARB staff and will ensure that fuel cells displace diesel generators while simultaneously reducing emissions compared to the resources that would otherwise have produced that same electricity for the electric grid. The NFCRC appreciates CARB's recognition of unique fuel cell attributes that help address California's emissions reductions and resilient power priorities today, and into the future. We appreciate the opportunity to comment on the proposed methodology for a Fuel Cell Net Metering GHG Standard to force fuel cell systems to continually reduce GHG emissions compared to the electric grid over time while improving air quality and resilience. We look forward to implementing the program in the coming months; to ensure availability of a clean, non-combustion, reliable power sources before next fire season…..

Appendix A: Technical Response to December 2, 2019 Comments

In comments filed December 2, 2019, the joint environmental groups filed comments expressing several concerns with the proposed methodology.[4] Most of these points have been thoroughly and previously addressed in the record. Additionally, these concerns are addressed in the Initial Statement of Reasons produced by CARB. The NFCRC respectfully responds to the five concerns below, in an attempt to ensure that the record correctly reflects how CARB arrived at the current standard.

Statements re: Biomethane

In their December 2, 2019 comments, the joint environmental groups—including Earthjustice and Sierra Club—state that: "Limited Biomethane Supplies Should Not Be Squandered on Stationary Fuel Cells."[5]

Two years previously, in comments dated December 20, 2017, many of the same groups argued that: "To ensure the FC-NEM program achieves meaningful GHG reductions, Sierra Club and Earthjustice recommend CARB make the following changes to the proposed GHG standard: Require FC-NEM Resources to Increasingly Utilize Renewable Natural Gas."[6]

CARB responded to their initial requests in the Initial Statement of Reasons (ISOR) and explains that "switching to eligible biofuels" is one pathway to comply with the standards.

Fuel Cell NEM and SGIP are Different Programs

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[4] https://www.arb.ca.gov/lists/com-attach/2-fcnem2019-WzVUNVU7WVULbgBv.pdf
[5] See pg 7 of https://www.arb.ca.gov/lists/com-attach/2-fcnem2019-WzVUNVU7WVULbgBv.pdf
[6] See pg 2-3 of https://www.arb.ca.gov/lists/com-attach/1-nemghgstandards-ws-USJXOFYyBSQEcAJj.pdf

There are clear distinctions made on the record between the Self-Generation Incentive Program (SGIP) and FCNEM that account for the difference between methodologies.[7] To reiterate, those distinctions are:

- SGIP is an incentive program; FCNEM is a tariff.
- SGIP is available to all technologies, including intermittent resources that are not baseload generators and consequently do not displace dirtier marginal generators (e.g., the combined and simple cycle natural gas plants) in the same way.
- The SGIP number is set once, formalized in the SGIP Handbook, and does not have a regular update schedule. In contrast, as this FCNEM methodology clearly states, CARB will update the standard every three years to reflect changing grid and market conditions, consistent with the 2017 request of the environmental organizations. The "living" standard that CARB has developed is innovative and reflective of operations, thus making it more accurate and superior to a "fixed time" SGIP model.

Consideration of Line Losses

The joint environmental groups suggest that methane leaks from the distribution system should be accounted for in the methodology, and that doing so would increase the standard by 18 kgCO2e/MWH per year.[8] The ISOR specifically states that the current reliance on combustion gas plants based hundreds of miles from where the electricity they generate is consumed results in line losses. To wit from the ISOR:

> *Transmitting electricity over transmission and distribution lines results in some of the electricity being lost, a concept known as line losses. Because of line losses the amount of electricity delivered to consumers is less than the electricity generated at the generator's site. The reality of line losses means that a greater amount of electricity must be generated to meet a certain level of demand, and if the electricity is generated by a generator that uses fossil fuel, more GHG emissions will occur. When the electricity is generated and consumed on-site, as in the case of fuel cell electrical generation resources in the Fuel Cell NEM Program, line losses are zero, and there is a GHG benefit to siting a fuel cell on-site. The CPUC uses a California line loss average of 8.4 percent, including in SGIP. Incorporating this factor in CARB's proposed methodology would result in a 2017 fuel cell NEM GHG emission standard of 443 kgCO2e/MWh, as opposed to the baseline of 409 kgCO2e/MWh that staff are proposing.*

If CARB were to accommodate the suggestion to increase the standard by 18 kgCO2e/MWH per year as the environmental groups suggest, when line losses are accounted for, the resulting number would be higher than the current proposal: 443

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[7] See pg 1 here: https://www.arb.ca.gov/lists/com-attach/7-fuelcellnemmethod-ws-UzFdNwRqAz8BagJd.pdf

[8] See pg 4: https://www.arb.ca.gov/lists/com-attach/2-fcnem2019-WzVUNVU7WVULbgBv.pdf

kgCO2e/MWh – 18 CO2e/MWh = 425 CO2e/MWh for 2017. This is substantially higher than the current proposal of 409 CO2e/MWh in 2017. This well-established data should be considered.

The Entire Record Justifies the Proposed Methodology. Other expressed concerns of the joint environmental groups have been previously addressed on the record including:

- "This [fuel cells operating 24/7] decreases grid flexibility and increases hours of renewable curtailment." The ISOR provides an accurate and compelling explanation—based on CAISO data—on why curtailment data is not a suitable proxy to assess when renewables are on the margin.[9]
- "The reason the 2018 ACC did not include an RPS adder was because the passage of SB 350 made the need to achieve GHG reductions, rather than the need to meet RPS goals, the binding constraint on the electric sector." The CPUC resolution that adopted this change to the ACC model makes no mention of SB 350 or anything related to this claim.[10] The ISOR does clarify that, "CARB was advised by E3 staff [designers of the ACC model] that, because of fundamental changes to how the model calculated emissions, the 2018 ACC model was no longer appropriate for the purposes of the fuel cell NEM GHG emission standards."[11] Further, WattTime - the leading expert on marginal grid emissions - stated in 2017 comments that "The marginal emissions rate calculated in the ACC was reduced by a factor equal to the RPS standard during that year. WattTime believes this adjustment factor does not accurately reflect the actual operation of the grid and associated emissions at any point in time."[12]

CARB should consider the vast technical background work that has been conducted by CARB Staff over the past three years to develop an accurate and justifiable GHG emission reduction standard. This work has been sufficiently detailed on the record, and in the October 2019 ISOR, and should be strongly considered in the decision to approve this standard. (NFCRC)

Comment:
I am writing on behalf of the Bioenergy Association of California to urge the California Air Resources Board to adopt the Fuel Cell Net Energy Metering GHG Regulations released on October 22, 2019. The proposed regulations will help to transition fuel cells to utilizing renewable biogas, which will help to meet the state's Short-Lived Climate Pollution Reduction Strategy, the requirements of SB 32, and numerous clean energy and air quality policies.

The Bioenergy Association of California (BAC) represents more than 70 local governments, public agencies, private companies, utilities, community development and

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[9] See pg 29: https://ww3.arb.ca.gov/regact/2019/fcnem19/isor.pdf
[10] See pg 6: http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M218/K010/218010890.PDF
[11] See pg 29: https://ww3.arb.ca.gov/regact/2019/fcnem19/isor.pdf
[12] https://www.arb.ca.gov/lists/com-attach/6-fuelcellnemwrkgrp-ws-AnVXMAF0V3ALeVM6.pdf

environmental groups working to promote sustainable bioenergy development in California. BAC's public sector members include cities and counties, air quality and environmental agencies, wastewater and solid waste agencies, research institutions, non-profit environmental and economic development groups, and municipal utilities. BAC's private sector members include energy and waste companies, technology providers, investors, agricultural and food processing companies, an investor owned utility and private investors. BAC members are building sustainable bioenergy projects to provide flexible generation and baseload renewable power, renewably hydrogen for fuel cells, low carbon and carbon negative transportation fuels, pipeline biogas, and combined heat and power.

BAC supports the proposed regulations for several reasons, described below.

California has ample biogas potential from organic waste sources.

Numerous studies have assessed California's potential to generate biogas from organic waste feedstocks. UC Davis has maintained the state's organic waste database for many years as part of the California Biomass Collaborative. More recent studies by E3 and Lawrence Livermore National Lab have also assessed the state's biogas potential from technically available organic waste feedstocks. According to the E3 study, which has been prepared for the California Energy Commission, relatively low-cost RNG could provide almost half of the gas needed in 2050.[13] Assessments from UC Davis and Lawrence Livermore National Lab also conclude that California can generate substantial biogas supplies from organic waste.

Unfortunately, several environmental groups in their December 2 comment letter mistakenly relied on a much more limited study to conclude that there is not sufficient biogas to provide renewable hydrogen for fuel cells. The environmental groups rely on a biogas study that was limited to a small number of biogas facilities in just a few organic waste sectors. The purpose of the study, which the lead author presented to the California Energy Commission as part of the *2017 Integrated Energy Policy Report* development, was to assess which types of biogas were economically viable under the policies and incentives that existed at the time (the study was developed in 2016). The lead author, Dr. Amy Myers Jaffe, stated to the CEC in its IEPR workshop, that the study was not intended to provide an assessment of total biogas potential in California. The *2017 Integrated Energy Policy Report* makes this clear in presenting the Jaffe study for economic analysis and presenting the broader assessment by UC Davis as the more accurate assessment of total biogas potential.

The environmental groups' reliance on the Jaffe study to argue that there is not enough biogas is misguided. The Jaffe study only looked at a small fraction of the potential for anaerobic digestion in three waste sectors: landfill gas, wastewater, and dairy digesters. The study did not consider the potential for biogas from agricultural, forest, or urban wood waste. Together, these three sectors can provide 80 percent or more of the total instate

[13] Draft Report at page 29.

biogas production. The Jaffe study was intended for economic analysis, not total biogas potential. The study also stated clearly that its assessment of economic viability was based on policies in existence in 2016 and could change with the adoption of new policies and incentives. Since the Jaffe study was completed:

- California has enacted SB 1383, which requires 75% diversion of organic waste and 40% reductions in methane and anthropogenic black carbon, all of which will increase available feedstocks for biogas production.
- California has enacted SB 901 and numerous emergency and executive orders calling for increased forest fuel removal and other vegetation removal to reduce wildfire hazards.
- California has adopted the *Forest Carbon Plan*, which calls for a tripling of forest fuel removal and conversion of that fuel to bioenergy.
- The state has allocated hundreds of millions of dollars in Cap and Trade revenues and other funding to incentivize new biogas projects.

For all of these reasons, the environmental groups' claim that there is not sufficient biogas for fuel cells is not supported by the studies that they cite and contradicts more complete studies conducted for the California Energy Commission and others, in particular the E3 study and a more recent assessment by Lawrence Livermore National Lab.

Increasing the use of biogas will help to meet the state's climate, air quality, waste diversion, and wildfire reduction goals.

Increasing the use of biogas in fuel cells will help California to meet its Short-Lived Climate Pollutant reduction goals and broader clean energy, air quality, and wildfire reduction goals. In the state's *2030 Climate Change Scoping Plan*, SLCP reductions make up more than one-third of all the climate reductions needed to meet the requirements of SB 32. As the *Short-Lived Climate Pollutant Reduction Strategy* states, we need to quickly accelerate conversion of organic waste to bioenergy and organic soil amendments to meet our SLCP reduction goals. The SLCP Strategy states that:

> "The State's organic waste should be put to beneficial use, such as for . . . electrical generation, transportation fuel, and pipeline-injected renewable natural gas. . . . Practical solutions must be developed and implemented to overcome barriers to waste gas utilization for pipeline injection and grid interconnection."[14]

California is currently only using a small fraction of its organic waste. To meet the requirements of SB 1383 and the *California Forest Carbon Plan*, California must quickly increase the conversion of organic waste to energy, including renewable biogas for fuel cells. Production and use of biogas is one of the most effective tools we have to reduce SLCP emissions, which is in turn, the most urgent step we need to take to tackle climate change, since it is one of very few measures that can begin to reverse climate change right

[14] Short-Lived Climate Pollutant Reduction Strategy, adopted March 2017, at page 3.

away. Instead of trying to restrict biogas end uses, we should be looking for as many potential markets as possible so that California can meet its SLCP reduction goals.

Fuel Cells are an Important Part of California's Clean Energy Future.

Fuel cells using biogas can also play a critical role in California's clean energy future. Fuel cells natively produce DC power, meaning they are able to efficiently charge electric vehicles, buses, and other DC loads during a grid outage while reducing efficiency losses that occur when converting to AC power. Underground fuel lines reduce the risk of sparks from traditional poles and wires infrastructure, and provide a valuable power diversification strategy to guard against outages. With their modular design, fuel cells are able to continue operating even while individual components are being repaired or replaced. Their leading power density and quick time-to-power can displace expensive grid infrastructure investments at space constrained sites—urban downtowns, ports, bus depots. Fuel cells can provide load following (flexible or backup generation) power and other services to increase grid reliability. They can also help to make microgrids more reliable by providing power when solar or wind are not available and when batteries are not sufficient. And they can provide these essential services without combustion, resulting in virtually zero criteria air pollutants, which will benefit air quality generally and, especially, in disadvantaged communities.

For all these reasons, BAC supports the proposed Fuel Cell NEM GHG regulations. By annually declining, this data-driven standard will ensure that fuel cells transition to greater use of biogas, thus realizing all the benefits enumerated above. As such, BAC urges the Air Board to adopt this standard on December 12. (BAC)

Comment:
Bloom Energy (Bloom) appreciates the ARB's ongoing efforts to advance this shared vision through the technically rigorous, data-driven methodology used to arrive at the proposed emission standards as required by AB 1637. In the new normal of Public Safety Power Shutoffs (PSPS), wildfires, and other climate change caused disruptions to electricity, this proposal creates the certainty for non-combustion, always-on fuel cells like Bloom's Energy Servers to continue playing an integral role in reducing GHGs and criteria air pollutants, displacing dirty diesel generators, increasing resiliency, and achieving the state's clean and renewable energy goals.

Legislative Goals of AB 1637

Assembly Bill 1637 (Low, 2016), effective January 1, 2017, extended the California Public Utilities Commission's (CPUC) Fuel Cell Net Energy Metering (FC-NEM) program through 2021.[15] This legislation specified that:

> *(1) Not later than March 31, 2017, the State Air Resources Board, in consultation with the Energy Commission, shall establish a schedule of annual greenhouse gas*

[15] California Assembly Bill No. 1637, Chapter 658, September 26, 2016.

emissions reduction standards for a fuel cell electrical generation resource for purposes of clause (iii) of subparagraph (A) of paragraph (3) of subdivision (a) and shall update the schedule every three years with applicable standards for each intervening year.

(2) The greenhouse gas emissions reduction standards shall ensure that each fuel cell electrical generation resource, for purposes of clause (iii) of subparagraph (A) of paragraph (3) of subdivision (a), reduces greenhouse gas emissions compared to the electrical grid resources, including renewable resources, that the fuel cell electrical generation resource displaces, accounting for both procurement and operation of the electrical grid.

As the enabling legislation and accompanying legislative analysis make clear, AB 1637 directs ARB to establish a standard for fuel cell generators running on natural gas to reduce GHG emissions as compared to the procurement and operation of electrical grid, and specifically indicates renewables be included in the comparison between the grid and the fuel cell generation.[16] These standards are required to be set annually and this analysis is to be updated every three years.

ARB Proposed GHG Standard and Methodology Meets this Directive

ARB's October 22, 2019 proposed FC-NEM Greenhouse Gas Emission Standards Regulation accurately and effectively complies with this statute.[17] Specifically, the standard utilizes a data-driven methodology that is consistent with the statutory directive.

- Current grid emissions: The 2017 estimated emissions from California Energy Commission (CEC) data for combined and simple cycle power plants are the most-up-to-date estimates of the marginal emissions for the generation resources that always-on fuel cells displace.

- Renewables: Using California Independent System Operator (CAISO) pricing data when the cost of generation is zero is an effective estimate for when renewables are on the margin and properly reflects the current operation of the grid.

- Annual updates: The proposed standard is set annually and updated every three years to incorporate new grid operations and market realities.

- Increasing performance requirement: The 2.5% annual reduction in the emission standard through 2022 will drive innovation and accurately reflects the trends expected in future grid operation, including plant retirement, additional curtailment, and technology innovation with new generators coming online.

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[16] https://leginfo.legislature.ca.gov/faces/billAnalysisClient.xhtml?bill_id=201520160AB1637#, Pg. 7
[17] https://ww2.arb.ca.gov/index.php/sites/default/files/2019-07/fcnem_discussiondraft_20190710.pdf

ARB should be applauded for rigorously evaluating multiple other methodologies—using curtailment data, SGIP numbers, or third-party models—and ruling them out due to various data inconsistencies and/or inappropriate application to setting this standard. Please find Bloom's technical comments on why this data-driven standard represents the best in public policy design and emissions reduction strategies for more details.[18]

The Proposed Standard and Methodology Fosters Increased Benefits from Fuel Cells

This GHG standard will provide the accurate, clear guidance necessary for California's hospitals, universities, data-centers, and other commercial and industrial customers to deploy fuel cells to achieve their clean energy goals while simultaneously supporting the state's GHG reduction, air quality, and resiliency goals, including:

- *Reducing GHGs*: Thanks to their non-combustion process, fuel cells generate clean electricity at the highest efficiencies of any technology commercially available. This feature, combined with the fact that fuel cells are located onsite, lessens the state's reliance on large combustion power plants that inefficiently burn gas and result in further waste due to losses caused by transporting the electricity long distances to load centers. Indeed, the third party impact evaluation of the Self-Generation Incentive Program—a CPUC program established in the wake of the 2001 energy crisis to reduce reliance on centralized grid resources—found that all-electric fuel cells reduced GHGs more than any other technology: over 100,000 metric tons of CO2e reduced in 2016 and 2017 combined.

- *Virtually eliminating criteria air pollutants*: AB 617 provided additional impetus to a key state objective: addressing criteria air pollutants. Due to its non-combustion electricity generation process that results in negligible NOx, SOx, and VOCs, ARB has certified Bloom's Energy Servers under its Distributed Generation regulation. With over 140 installations that total more than 70 MW in SB 535 designated Disadvantaged Communities, Bloom is proud to efficiently generate clean electricity while protecting air quality for all Californians. Fuel cells are uniquely able to provide these benefits, which align with California's commitments to environmental justice and equity, including SB 350, AB 617, and SB 535.

- *Providing unparalleled resiliency*: Fuel cells are the only technology able to meet the 24-7-365 energy demands for critical facilities like hospitals and emergency centers, as well as for commercial and industrial customers—sectors that are particularly difficult from which to reduce emissions. With their modular, redundant architecture, all-electric fuel cells offer multiple resiliency benefits, including indefinite operation, undergrounded fuel supply lines, and in-situ maintenance. Additionally, fuel cells serve as the always-on backbone for microgrids that integrate numerous distributed energy resources such as solar, wind, and batteries. Bloom has installed microgrids to provide data centers, hospitals, and emergency centers with truly resilient power.

[18] https://www.arb.ca.gov/lists/com-attach/7-fuelcellnemmethod-ws-UzFdNwRqAz8BagJd.pdf

These benefits have directly translated into resilient performance in real-world disaster and grid interruption events. Bloom fuel cells have powered through over 500 grid outages, including carrying critical load for an industrial facility in California during the historic Public Safety Power Shutoff episode in early October of this year. Further, fuel cells supplied critical load power to a healthcare facility during triple-digit temperature heat waves that triggered outages for 57,000 customers in Southern California in 2018; Bloom systems also withstood the Sonoma fires in 2018, the 6.0 magnitude Napa earthquake in 2014, and even when a bulldozer was accidently dropped on them at a customer site in 2016.

With the new normal of climate caused extreme weather events, combined with California's unprecedented reliance on Public Safety Power Shutoffs that proactively de-energize lines for multiple days for nearly 2 million customers this Fall, the resiliency benefits of fuel cells are more critical than ever.

- *Advances California's long-term energy and climate goals.*

  In addition to the GHG reduction, criteria air pollutant elimination, and resiliency benefits fuel cells have already provided, this innovative technology is foundational to assisting California in reaching its world-leading climate reduction, air quality, and clean energy goals in the future.

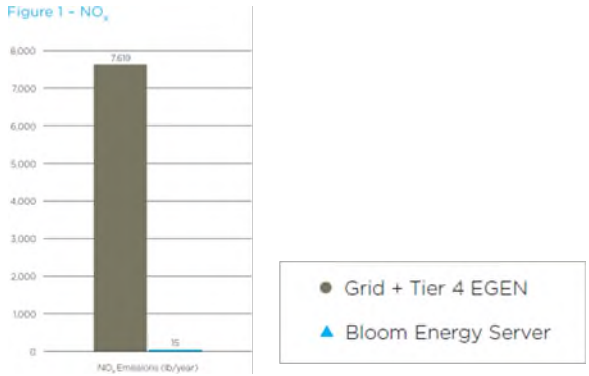
  - *SB 1383*: This seminal legislation requires a 40 percent reduction in methane (CH4)—a potent GHG that has a global warming potential 56 times greater than CO2 over a 20 year time frame—by 2030.[19] Methane currently accounts for approximately 9 percent of California's overall GHG emissions, largely from agricultural, landfill, wastewater treatment, and food separation sources.[20] Methane is the main feedstock for fuel cells. Rather than flaring, venting, or burning this resource, fuel cells can convert this potent GHG into renewable electricity, virtually without criteria air pollutants.

  - *AB 617*: Passed in 2017, this legislation requires statewide reductions in criteria air pollutants, especially in historically disadvantaged and heavily impacted communities across the state.[21] Given their modular architecture, microgrid capabilities, and clean air benefits, fuel cells are the perfect match to displace diesel generators—one of the dirtiest and most inefficient sources of electricity generation—in the overarching strategy to accomplish AB 617's goals. On average, each 1 MW of diesel generators that Bloom Energy Servers displaces results in substantial air quality benefits—see Figure 1. To date, Bloom has displaced more than 6.5 MW worth of emergency diesel

[19] https://unfccc.int/process/transparency-and-reporting/greenhouse-gas-data/greenhouse-gas-data-unfccc/global- warming-potentials
//leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1383
[20] https://ww3.arb.ca.gov/cc/inventory/data/graph/bar/bar_2016_by_ghg.png
[21] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB617

generators (EGEN) at customer sites across California, resulting in more than 1 million pounds in CO2 reductions, in addition to the criteria air pollutants avoided. By displacing diesel generators plus electricity from the grid, Bloom reductions in criteria air pollutants are substantial.

Figure 1



In some areas of California, demand for backup generators has spiked as much as 1,400% in the wake of PSPS events.[22] ARB has warned against diesel usage in order to avoid against increased risk of cancer.[23]

- *SB 100*: Requiring retail electricity purchases to be 100 percent clean (60 percent renewable and 40 percent zero carbon) by 2045, SB 100 continues California's leadership in decarbonizing the electricity sector. Fuel cells help California integrate additional intermittent renewables—such as wind and solar—onto the grid. The variable production nature of these resources is a reliability challenge; baseload resources are essential to smoothing the peaks and valleys. Fuel cells are the only non-combustion baseload generator, and as such, have a critical role to play in reaching SB 100's goals.

Conclusion

Bloom commends ARB for the rigorous process to accurately determine the GHG emissions reduction standard appropriate for an always-on, behind-the-meter fuel cell. In the face of PSPS, wildfires, and other climate caused disruptions to California's electricity grid, this standard is key to ensure that fuel cells running on natural gas continue to help the state and customers reduce GHGs, achieving our climate change goals. Without this policy certainty, fuel cell projects that reduce GHGs will almost certainly be delayed or even stopped—meaning that California businesses and communities must turn to dirty, higher-emitting combustion resources to supply both always-on and back-up electricity to meet their needs. Additionally, without this

[22] https://www.sfchronicle.com/business/article/Demand-for-generators-lights-up-as-PG-E-power-14054242.php#
[23] http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.441.1007&rep=rep1&type=pdf

certainty, fuel cell manufacturers will lose critical resources necessary to scale existing solutions and pursue emerging opportunities: higher efficiencies, biogas, renewable hydrogen, and microgrids. This standard exemplifies a best practice in policy design: a data-driven, continually updated performance standard that incentivizes innovation for a technology that is foundational to meeting California's ambitious methane reduction, air quality, clean and renewable energy, and environmental justice goals. (Bloom)

Comment:
Fuel cells are an important part of the solution to the dual challenges of fighting climate change and air pollution, which is why the state has taken steps to support their deployment and use, including through net energy metering. CHBC appreciates CARB's deliberative process and data-driven standard, and strongly supports staff's proposed greenhouse gas standard for fuel cell net energy metering projects.

As the state grapples with the impacts of increased wildfire threats and resulting public safety power shutoffs, California residents and businesses are flocking to purchase diesel generators. This only exacerbates the challenges we face. We can, and must, do better. Fortunately, we can provide energy reliability and resiliency in better ways, including through the use of fuel cells – which reduce greenhouse gas emissions compared to the grid, avoid harmful air pollution (including toxic diesel particulate matter), and provide resiliency to the grid and California communities.

Over time, fuel cells will only become even cleaner, if the state supports renewable gas development. While current state policies largely limit access to renewable gas to the transportation sector, a number of promising activities at state agencies promise to enable increased access to clean fuels like renewable and zero carbon hydrogen, which would further amplify the benefits of fuel cells. In particular, the implementation of SB 1383 regulations at CalRecycle, SB 1440 standards at the Public Utilities Commission, pipeline injection standards for hydrogen under development, standardized interconnection tariffs for renewable gas, among other potential policies across state agencies, including CARB, can ensure widespread access in all sectors to the cleanest fuels, including zero-carbon and renewable hydrogen. These policies can be game-changers in our fight against climate change and air pollution, and hold keys to rapid transitions to clean energy in all sectors of our economy.

We strongly support CARB's proposed, continually improving greenhouse gas standard for fuel cell net energy metering, which will help to deploy fuel cells to improve resiliency and air quality while reducing greenhouse gas emissions in California. We hope CARB and other agencies will then take additional steps to support broad market access and cost reductions for renewable gas, including zero-carbon and renewable hydrogen, to fulfill the promise of fuel cell technology and more completely support the state's goals and international leadership.(CalHydrogen)

Comment:
I am writing on behalf of CR&R Environmental Services (CR&R) to urge the California Air Resources Board to adopt the Fuel Cell Net Energy Metering GHG Regulations released

on October 22, 2019. The proposed regulations will help to transition fuel cells away from fossil fuel-based hydrogen to renewable hydrogen from biogas, which will help to meet the state's *Short-Lived Climate Pollution Reduction Strategy*, the requirements of SB 32, and numerous clean energy and air quality policies.

Founded in 1963, CR&R is a Southern California-based waste and recycling collection company, serving more than 3 million people and over 25,000 businesses through Orange, Los Angeles, San Bernardino, Imperial, and Riverside counties. We operate the state's largest anaerobic composting facility and power our vehicle fleet from renewable natural gas derived from organic waste.

CR&R supports the proposed regulations for several reasons, described below.

California has ample biogas potential from organic waste sources.

Numerous studies have assessed California's potential to generate biogas from organic waste feedstocks. UC Davis has maintained the state's organic waste database for many years as part of the California Biomass Collaborative. More recent studies by E3 and Lawrence Livermore National Lab have also assessed the state's biogas potential from technically available organic waste feedstocks. According to the E3 study, which has been prepared for the California Energy Commission, relatively low-cost RNG could provide almost half of the gas needed in 2050.[24] Assessments from UC Davis and Lawrence Livermore National Lab also conclude that California can generate substantial biogas supplies from organic waste.

Recently, several groups submitted comment letters that relied on a limited study to conclude that there is not sufficient biogas to provide renewable hydrogen for fuel cells. These groups rely on a biogas study that was limited to a small number of biogas facilities and in just a few organic waste sectors. The purpose of the study, which the lead author presented to the California Energy Commission as part of the *2017 Integrated Energy Policy Report* development, was to assess which types of biogas were economically viable under the policies and incentives that existed at the time (the study was developed in 2016). The lead author, Dr. Amy Myers Jaffe, stated to the CEC in its IEPR workshop, that the study was not intended to provide an assessment of total biogas potential in California. The *2017 Integrated Energy Policy Report* makes this clear in presenting the Jaffe study for economic analysis and presenting the broader assessment by UC Davis as the more accurate assessment of total biogas potential.

The reliance on the Jaffe study to argue that there is not enough biogas is misguided. The Jaffe study only looked at a small fraction of the potential for anaerobic digestion in three waste sectors: landfill gas, wastewater, and dairy digesters. The study did not consider the potential for biogas from agricultural, forest, or urban wood waste. Together, these three sectors can provide 80 percent or more of the total instate biogas production. The Jaffe study was intended for economic analysis, not total biogas potential. The study also stated

[24] Draft Report at page 29.

clearly that its assessment of economic viability was based on policies in existence in 2016 and could change with the adoption of new policies and incentives. Since the Jaffe study was completed:

- California has enacted SB 1383, which requires 75% diversion of organic waste and 40% reductions in methane and anthropogenic black carbon, all of which will increase available feedstocks for biogas production.
- California has enacted SB 901 and numerous emergency and executive orders calling for increased forest fuel removal and other vegetation removal to reduce wildfire hazards.
- California has adopted the *Forest Carbon Plan*, which calls for a tripling of forest fuel removal and conversion of that fuel to bioenergy.
- The state has allocated hundreds of millions of dollars in Cap and Trade revenues and other funding to incentivize new biogas projects.

For all of these reasons, the claim that there is not sufficient biogas to provide renewable hydrogen for fuel cells is not supported by the studies that they cite and contradicts studies more complete studies conducted for the California Energy Commission and others, in particular the E3 study and a more recent assessment by Lawrence Livermore National Lab.

Increasing the use of hydrogen from biogas will help to meet the state's climate, air quality, waste diversion, and wildfire reduction goals.

Increasing the use of biogas-based hydrogen in fuel cells will help California to meet its Short-Lived Climate Pollutant reduction goals and broader clean energy, air quality, and wildfire reduction goals. In the state's *2030 Climate Change Scoping Plan*, SLCP reductions make up more than one-third of all the climate reductions needed to meet the requirements of SB 32. As the *Short-Lived Climate Pollutant Reduction Strategy* states, we need to quickly accelerate conversion of organic waste to bioenergy and organic soil amendments to meet our SLCP reduction goals. The SLCP Strategy states that:

> "The State's organic waste should be put to beneficial use, such as for . . . electrical generation, transportation fuel, and pipeline-injected renewable natural gas. . . . Practical solutions must be developed and implemented to overcome barriers to waste gas utilization for pipeline injection and grid interconnection."[25]

California is currently only using a small fraction of its organic waste. To meet the requirements of SB 1383 and the *California Forest Carbon Plan*, California must quickly increase the conversion of organic waste to energy, including renewable hydrogen for fuel cells. Production and use of biogas is one of the most effective tools we have to reduce SLCP emissions, which is in turn, the most urgent step we need to take to tackle climate change, since it is one of very few measures that can begin to reverse climate change right

[25] *Short-Lived Climate Pollutant Reduction Strategy*, adopted March 2017, at page 3.

away. Instead of trying to restrict biogas end uses, we should be looking for as many potential markets as possible so that California can meet its SLCP reduction goals.

Fuel Cells are an Important Part of California's Clean Energy Future.

Fuel cells using renewable hydrogen from biogas can also play a critical role in California's clean energy future. Fuel cells can provide load following (flexible or backup generation) power and other services to increase grid reliability. They can also help to make microgrids more reliable by providing power when solar or wind are not available and when batteries are not sufficient. And they can provide these essential services without combustion, which will benefit air quality generally and, especially, in disadvantaged communities.

For all these reasons, CR&R supports the proposed Fuel Cell NEM GHG regulations and urges the Air Board to adopt them on December 12. (CR&R)

Comment:
We, the undersigned, are writing to express our support for the California Air Resources Board's (CARB) efforts in the implementation of the Fuel Cell Net Energy Metering (FCNEM) provisions of AB 1637 (Low, 2016). The proposal put forward by CARB staff is a strong standard that strictly adheres to the intent of AB 1637 by ensuring that fuel cell generation will continue to reduce greenhouse gas (GHG) emissions compared to the State's electrical grid. In adopting the staff proposal, CARB will ensure the State can leverage every available technology in its effort to combat climate change and criteria air pollutant emissions, while also providing California's residents and businesses clean energy generation options that help mitigate the impact of climate-related disasters.

Now, more than ever, customers must be empowered to tap into clean energy choices to protect themselves as they grapple with the impacts of wildfire-induced public safety power shutoffs (PSPS), which have impacted tens of thousands in recent weeks. These PSPS events have prompted an exponential increase in the purchase and usage of dirty, 20th century diesel back up generators (BUG). Adoption of this standard ensures that fuel cells will remain a strong alternative to BUGs by providing clean and reliable on-site electricity generation without emitting noxious criteria air pollutants. Any other outcome would be an abject policymaking failure and result in the acquisition of even more diesel generators in the next fire season.

The intent of AB 1637 was made clear to CARB in a May 28, 2019 letter from the bill's author that called for the GHG standard to be benchmarked against present day grid emissions, not against projected or modeled emissions in 2030. It was pointed out that hypotheticals would "unnecessarily stifle the fuel cell industry's growth in California and remove an important clean energy tool when all are needed to achieve the ambitious climate and air quality goals we must achieve." The proposed standard developed by CARB staff is in keeping with the author's legislative intent.

The GHG reduction standard methodology proposed by CARB is not only sound and informed by an all-encompassing public stakeholder process that lasted more than two

years, it is consistent with a parallel policy developed by the California Public Utilities Commission (CPUC). As part of its regular update to the Self-Generation Incentive Program (SGIP), the CPUC independently derived a methodology that is remarkably similar to CARB's methodology. As both agencies' experts have separately come to the same conclusion on the fundamental methodology, we firmly support CARB's proposal.

CARB has engaged in an extensive, data-driven public process supported by a robust record. We support CARB's efforts and believe that the proposed standard fulfills the spirit and letter of AB 1637 by systematically driving fuel cells toward lower GHG emissions, thereby complementing the state's immediate efforts to mitigate the impacts of wildfires and PSPS events, while also supporting the broader goals related to decarbonizing the grid. We strongly encourage the Board to adopt the proposed standard. (Low-etal)

Comment:

I work for Assembly Member Evan Low. He wishes he could be here today, but had a prior commitment and asked me to read the following statement on the item currently before the Board.

In 2016, I authored Assembly Bill 1637, which extended, expanded, and modified the Fuel Cell Net Energy Metering Program, which is implemented by the CPUC and is intended to encourage substantial private investment in these energy resources in California, in recognition of the multiple benefits associated with this technology.

Not only can fuel cells reduce greenhouse gas emissions, fuel cells are a non-combustion technology, so they emit significantly less particulate matter and oxides of nitrogen. As this Board knows well, these criteria pollutants are public health threats that California is obligated to reduce under both federal and State law.

AB 1637 requires the Board to adopt an annually declining standard for Fuel Cell Net Energy Metering to ensure that fuel cells reduce greenhouse gas emissions compared to the electrical grid resources, including renewable resources that the fuel cell electrical generation resources -- resource displaces, accounting for both procurement and operation of the electrical grid.

My legislation was intended to ensure that fuel cells are cleaner than the energy that they displace. And that is what the staff proposal accomplishes. Moreover, given their air quality benefits, fuel cells provide a benefit to communities and ratepayers beyond the greenhouse gas reductions.

For these reasons, I am in strong support of the proposed standard before you today.

I would also like to address claims that have been made that the Legislature intended that this standard to be set so strictly that fuel cells would essentially have to operate in a carbon neutral fashion, a hundred percent renewable gas, in order to qualify for the cell -- for the Fuel Cell Net Energy Metering benefits.

I think all of us would like to see fuel cells be carbon neutral eventually, but that is not achievable by the industry as a whole today, which is why such a requirement was not included in my legislation.

The reason the bill called for an increasingly stringent standard was to provide for fuel cells to transition to renewable gas as its fuel and eventually renewable hydrogen.

I am pleased to see that the Board has faithfully proposed a standard consistent with both the unambiguous language my bill put into statute and the obvious intent of the Legislature. The proposed standard will help ensure that the air quality and climate change benefits that fuel cells offer can be realized by displacing more polluting resources through the encouragement of growth and innovation within the California fuel cell industry. In the new normal of Public Safety Power Shutoffs and wildfires, this standard will give California additional clean options that to keep their lights on. For these reasons, I respectfully encourage the Board to approve the proposed standard without modification. (Low2)

Comment:
And I have been fortunate to work with a very talented group of graduate students over the last 22 years, essentially to study the methods by which we can get to zero emissions in our society. And as a result, we have used various methodologies for determining how can we actually reduce emissions, both greenhouse gas emissions and criteria pollutant emissions so that we can get to totally zero by our -- by 2050 or sooner than 2050.

Because of that, we have looked at this analysis that the CARB staff has come up with and have compared it to our own analysis methodologies and understand it to be the technically accurate methodology for determining whether or not any technology would reduce emissions compared to the grid. And this marginal emissions analysis is the appropriate technically accurate way to do it.

So we know by looking at these numbers then, if fuel cells are installed and meet these standards, they will reduce greenhouse gas emissions.

In addition, I'm speaking in support of the declining schedule of emission reductions. These emission reductions are consistent with California policy and will enable us to get to our policy goals of zero emissions by the 2045 goal that is established in law today, so -- and finally, the air quality benefits that these stationary fuel cells will also provide us in the end are very important to consider. It's not only air quality benefits that are in comparison to the grid, which they will do as well, but they are also in comparison to diesel gen sets.

So Professor Sperling is exactly correct in noting that displacing dirty combustion-based back-up power is one of the most important contributions that these fuel cells systems will make….

[In response to a question from Board Member Balmes about the number of diesel generator sets that would be replaced by fuel cells under the Fuel Cell NEM Program:]

The law calls for, I think, 500 megawatts of installations. Typical installations are order of magnitude 200 kilowatts or so. If you -- I can't do the math very well in my head here, but that sounds to me like about a thousand diesel generators or so that could be displaced by this law….

[In response to a question from Board Member Mitchell about the potential for fuel cells to power neighborhoods via microgrids:]

Thank you for that question. Yes. Today fuel cells are being installed in other jurisdictions, for example, in the east coast, in Japan, in Korea in microgrids that are enabling them to serve multiple customers, so to actually serve senior centers, public health facilities like hospitals, together with police departments and fire stations. And they're enabled in these microgrids to not only provide lower emissions and higher efficiency power, but also to ride through grid outages.

And they've proven this in many different circumstances. The presentation that we submitted together with our comments shows these examples of resilience that has been introduced by stationary fuel cell systems in these applications.

And these zero-emissions goals that we have as a state, I have not found another technology, other than hydrogen and fuel cells that can complement solar energy storage, wind, okay, and give us zero emissions throughout society.

So we not only need them in the immediate short-term for PSPS events and things like this, but we also need them for those zero-emissions long-term goals, because they're the only zero-emissions technology that can, for example, operate for weeks on end, right, when the grid goes down.

And there are examples of weeks of outages that microgrids containing fuel cells, but also containing solar and batteries, okay, have been able to ride through.

[In response to a question from Board Member Mitchell about the potential for microgrids to reduce the need for distribution wires that can trigger wildfires:]

Yes. Very interesting point. In New York, for example, the Brooklyn/Queens Demand Response Demand Management Program is a utility program that enabled utilities to invest in local generation, including solar, and batteries, and fuel cell technology to avert their need to invest otherwise in grid infrastructure to meet that same growing demand. So they did exactly that in this demand response program in Brooklyn. They are doing it in other places too, in Connecticut, for example.

So instead of investing in utility infrastructure, like upgrading power lines, upgrading transformers, and substations, and things like this, you can install solar, install storage, and

install stationary fuel cells to otherwise -- to meet that demand in a different way. And in a way that ends up being more resilient and can avert then also the stress on the system associated with wildfires in the state.

[In response to a request from Board Chair Nichols for the commenter's view on staff's proposed methodology based on marginal generation:]

Yes. So the difference between the Fuel Cell Net Energy Metering Program and the Self Generation Incentive Program of the PUC, there are many differences. And I thought that the staff presentation slide - I think it was slide number four. Not sure -- staff presentation slide, which had four major points of difference elucidated that quite well.

And just -- so let me just make a couple of points of difference. The SGIP is a -- an incentive program, not a tariff program. And it included many different technologies, not just fuel cells. And it established a one-time number of GHG emissions rate, for which the technologies -- technologies must meet to qualify and then allowed those systems to be used throughout their entire life. So it was a one-time number to cover the entire lifetime of operation. So the number had to be lower than current emissions. It had to be something that accounted for the lifetime of the operation.

The current standard that CARB is setting is actually, I think, more strict than the SGIP standard, because it has this declining schedule and the need to every three years check it against the data. So you can always go back and say now we need to make it even more strict, and always assure that GHG emissions are being reduced[.]

[In response to a question from Board Chair Nichols about comparing the proposed GHG standard to the standard adopted by the PUC for SGIP:]

Yeah, because the [SGIP] number is lower, it looked better -- but it's a lifetime number.

And as a result, I think it doesn't reduce GHG as much in reality.
(UC Irvine)

Comment:
And I just wanted to briefly state on behalf of our retail members our support for the proposed standard for Fuel Cell Net Energy Metering standards. These standards will help our retail members -- provide our retail members with much needed options. And I wanted to echo the comments particularly earlier with regard to Public Safety Power Shutoffs. This is a challenge for our members and the standards will help us move forward in that area.

(CalRetailers)

Comment:
CHBC is an organization that represents over a hundred companies involved in the hydrogen industry ranging from producers to end users and is in strong support of the staff

proposal. We appreciate staff's very deliberate and data-driven process and thank them for all their work.

As staff noted, the declining standard will cause fuel cells to become cleaner over time. And through the use of -- through the use of cleaner fuels, including hydrogen.

As fuel cells see greater deployment, hydrogen can be used to decarbonize the gas system and support making fuel cells cleaner, as staff noted in their comments. This will be especially critical as the state grapples with Public Safety Power Shutoffs and seeks to find ways to mitigate the use of diesel generators, while still providing safe and reliable power for the state's residents impacted by PSPS.

Fuel cell NEM will ensure that these advanced clean energy generation technologies will continue to provide air quality benefits and GHG reductions. The hydrogen industry stands ready to help in this effort and strongly supports the standards. (CalHydrogen2)

Comment:
My name is Josiah Young. I represent the Bioenergy Association of California, known as BAC, B-A-C. BAC represents more than 70 public agencies, local governments, utilities, and private companies working to convert organic waste to energy to help the state meet its climate, clean energy, and air quality goals.

BAC does support this proposed Fuel Cell Net Energy Metering Regulations. The reason behind that, that we want to point out is that California has a lot of in-state biogas potential from diverted organic waste sources, dairy waste, wastewater, biogas, landfill gas, agricultural, and forest waste. So using in-state biogas in fuel cells will help reduce the short-lived climate pollutants emissions and air pollution, while providing important benefits for the grid that solar, wind, and batteries can not along provide. (BAC2)

Comment:
We support the staff proposal. I want to echo the comments of Professor Brouwer, and the Hydrogen Business Council and won't repeat their points, which we agree with.

Supporting the adoption of the proposal before you will facilitate the adoption of microgrids that can provide resilience and reliability to utility customers in general, not just during power safety shutoffs. I think many of you know that our company several years ago established a renewable gas team and then just last we established a hydrogen team.

We are bullish on renewable gas, and hydrogen, and have made public commitments to investing and expanding our use to decarbonize our system over time. We really believe in that potential. And fuel cells fit right into that longer term vision.

There's opportunities today, as several people, and including your staff, have highlighted, but we see more opportunity in the future.

We have -- consistent with that, we have announced I believe the strongest commitment to renewable gas usage of any utility in the country. We support the strengthening of these -- the proposal before you over time. But I want to caution you as you deliberate on this, we have a challenge in pushing so hard in California sometimes that we don't fully appreciate how much work is being done in this very moment to deploy successful low-emission reduction technologies.

And sometimes, if we set our immediate standard so stringently, it actually works against us getting the best available deployed today. And I just -- we are committed to reductions over time, as I think everyone that's testified today is. But I caution you on when we -- there's examples. When we go too far too soon, we work against the investments and the deployment that we all want to see happen right away.

And there's great promise for this program and for this technology. And we're very supportive and very much appreciate all the staff time on this program. (SoCalGas)

Comment:
Thank you for the opportunity to testify in support of the proposed fuel cell GHG regulation. My comments are on behalf of both the South Coast AQMD, as well as the California Air Pollution Control Officers Association, or CAPCOA.

As you know, our region, along with many other areas of the state face a daunting challenge in meeting upcoming federal air quality standards, requiring aggressive reductions in NOx emissions. Fuel cells can help by displacing diesel generators used for emergency or portable power applications, engines that are a significant source of NOx, PM, and toxic emissions.

Concern around public health impacts from diesel generator emissions has been brought to the fore in the wake of the numerous Public Safety Power Shutoffs, also known as PSPS events, that have occurred in this state since the start of the fire seasons.

This Fuel Cell NEM will encourage the use of cleaner technologies in lieu of diesel fire engines in our response to those emergencies. As [fuel cells] are deployed, we agree with CARB staff that reductions in GHG, criteria, and toxic emissions will be realized. In addition to helping us move towards improving regional air quality, fuel cells align well with other strategies that districts and community groups have identified in progressing towards the community health goals of AB 617.

Eventually, as fuel cells are able to transition to renewable natural gas and hydrogen, they will provide significant GHG emission benefits. Because fuel cells are much more efficient and cleaner than gas turbines or internal combustion engines at producing electricity, we believe they could also play a key role in the State's need to address renewable integration challenges.

We believe that the Fuel Cell NEM is a step in the right direction in ensuring cleaner technologies are deployed to address the state's overall electricity climate and air quality needs.

Finally, speaking solely on behalf of South Coast AQMD, where we have the worst ground level ozone pollution in the country, we cannot afford to leave a technology with significantly lower criteria pollutant emissions out of our overall attainment strategy. An overly stringent standard that restricts the use of fuel cells could further perpetuate the use of diesel engines for backup and portable power applications, counter to both air quality and GHG emission goals.

In Summary, both CAPCOA and the South Coast AQMD staff support this proposed regulation that will encourage additional deployment of fuel cells and ask that you adopt it. (South Coast AQMD-CAPCOA)

Comment:
I'm here to express the Air District's support of the proposed Fuel Cell Net Energy Metering Greenhouse Gas Emissions Standards Regulation.

Fuel Cells are critical to displacing diesel generators and meeting California's air quality carbon reduction and resilient energy objectives. With increasing extreme wildfire events and grid outages, diesel generator use is rising in the Bay Area.

The increasing prolonged use of combustion based generators in the Bay Area is threatening our air clean and greenhouse gas reduction goals. Non-combustion based fuel cells can provide uninterruptible clean power during outages producing virtually no criteria air pollutants.

Further, co-locating fuel cell systems with battery storage and local renewable energy generation, also known as microgrids, displaces fossil fuel based energy generation, improving air quality in our rural, vulnerable, and disadvantaged communities, and supports the goals of AB 617.

Finally, the Air District believes non-combustion fuel cells are an important component to meeting California’s zero-emission objectives and we encourage you to adopt this rule today. (BAAQMD)

Comment:
I'm going to be a little bit different than a lot of the other people you've heard today, because, for one, I actually have a fuel cell installed at my business. Two, at age five, I was diagnosed with asthma, severe asthma. And anybody that has ever experienced a severe asthma attack knows the trauma of not being able to take your breath for granted.

My name is PJ Quesada. I'm the Vice President of Ramar Foods, and third-generation family business based in Pittsburg, California. We have offices also in Huntington Park,

California. We're known throughout the Filipino community as the makers of the delicious purple ice cream. Some people know it as Ube. We're also –

Okay. Selfless plug

We also make the most Lumpia out of anyone on this side of the planet.

I'm quite proud of that. Now, all this food is frozen. And the whole industry is trying to move away from preservatives. So naturally temperature is what we use to keep our products safe and delicious throughout the supply chain. And powering refrigeration is probably the most capital intensive type of industry you can hope -- can you hope to even get into. I think the oil and gas industry is the only one that's more capital intensive than frozen food.

That being said, in 2013, we made the decision to install a 200 kilowatt fuel cell onsite that was actually itself made here in the Bay Area -- well, here in California.

And since its installation, we've avoided over a million pounds -- or almost a million pounds of CO2 from being released in the atmosphere. At the same time, we're sending a clear message to our employees, our City of Pittsburg, and our community, and our competitors that we take this type of thing seriously.

Important also, in addition to the clean air standards that this helps enforce, there's actually a very compelling economic reason for businesses like mine. We're a small business, about 200 employees in California. We need more reasons for businesses like mine to get on board with the clean energy future and enable us to do it without making us uncompetitive, because California is not a cheap state to run a business and every little bit helps. These standards will help the cost of renewable fuels come down, because the -- when we re-upgraded our fuel cell system earlier this year - basically, we're now in round two we like it so much - we found that the cost of the equipment is now approaching a competitive cost against other onsite generation like cogen.

So I believe that this standard will help support the installation of more of this technology and will help drive down the cost of biofuels moving forward. (Ramar)

Comment:
First, thank you to the staff. We appreciate the staff's three-year commitment of time hard work and subject matter expertise that has led to a thorough, complete, and robust record. We must also acknowledge the considerable contributions of the CEC and CAISO expertise developing the methodology that is before you today.

Given the in-depth analysis taken in developing this standard, we support the staff proposal for four key reasons. First, ARB meticulously evaluated multiple methodologies. The standard declines over time and will be reevaluated in 2023. The declining standard will drive the adoption of renewable fuel from biogas.

The various comments and positions raised by parties have been exhaustively analyzed over a three-year process. The ARB and CEC staffs' expertise and detailed public processes should give the Board confidence in adopting this regulation today. The fact that the rules must be revisited in 2023 will provide ample opportunity to account for the evolving nature of California's complicated energy system.

Adoption of the standard will further enumerate state policies, including many mentioned today, SB 100, SB 350, AB 617, SB 1383, and others. Fuel cells are an alternative to combustion and diesel for customers during PSPS and other climate change events.

The fact of the matter is that we need real pragmatic solutions to both the cause and consequences of climate change. Without fuel cells, California hospitals, business, and manufacturers are forced to choose between losing power for days and using a polluting diesel generator. This is a terrible decision.

Thanks to the staff's work, this standard gives them another critical option to both keep their operation running and reduce GHGs. This standard will also support the development of real -- resilient microgrids. So far in 2019, Bloom systems have avoided 645 outages for our customers, the longest of which was over five days.

In California, we have 89 customer microgrids in operation and 26 of those microgrids are in the service areas subject to PSPS. Finally, fuel cells provide a pathway to 2045 carbon and criteria air pollution reduction goals with renewable fuels including biogas and hydrogen. Earlier this year, Bloom announced a partnership with CalBio that would result in our non-combustion fuel cells generating power from dairy methane that will charge zero-emission electric vehicles. This standard is a key ingredient to facilitating more of these projects.

In the face of increasing disruptions to California's aging electricity grid, this standard provides a data-driven, continually updated performance standard that incentivizes innovation for a technology that is foundational to meeting California's ambitious methane reduction, air quality, clean energy, and environmental goals.

For these reasons, we ask for you to support the staff proposal. (Bloom2)

Agency Response:
CARB appreciates the commenters' support of the proposed Regulation.

One commenter implies that CARB will amend the Regulation in 2023. CARB staff notes that the Regulation outlines a methodology for updating the GHG emission standards starting in 2022 for the 2023–2025 standards, and every three years thereafter. No regulatory changes are needed for those updates.

C. OPPOSITION TO THE PROPOSED REGULATION

C-1. Proposed Standards Are Too High and the Rate of Decline Is Too Low

Comment:
We write to bring to your attention our concerns that ARB's long-overdue implementation of Assembly Bill 1637 (Low, 2016) appears to be offtrack and may not be consistent with the requirements of the statute or the intent of the Legislature.

AB 1637 extended and revised the statute requiring investor-owned electric utilities to offer a net energy metering (NEM) tariff to customers using eligible fuel cell generators. Among its provisions, AB 1637 required ARB, not later than March 31, 2017, to establish a schedule of annual greenhouse gas (GHG) emissions reduction standards for a fuel cell electrical generation resource. This replaced the prior statute's requirement that eligible fuel cells meet the GHG emission factor established by the Public Utilities Commission (PUC) for purposes of the Self Generation Incentive Program (SGIP).

We were surprised to learn that ARB staff has proposed a GHG emissions standard for fuel cells that allows for more GHG emissions than any prior standard established by the PUC, dating back to 2011, and which appears to be higher than the emission rates for existing natural gas fuel cells. If adopted, the standard will have the perverse effect of forcing ratepayers to subsidize natural gas use by as much as 603 megawatts of fuel cell generation that is no more efficient than any number of recently-constructed natural gas power plants subject to ARB's cap and trade regulation.

We do not think the statute permits, or the Legislature intended, ARB to set the bar so low. In place of the prior SGIP standard, AB 1637 requires the GHG standards set by ARB to "ensure that each fuel cell electrical generation resource... reduces greenhouse gas emissions compared to the electrical grid resources, including renewable resources, that the fuel cell electrical generation resource displaces, accounting for both procurement and operation of the electrical grid."

We agree with our colleague Assemblymember Low that ARB should adopt a strict GHG standard that ensures fuel cell operations are cleaner than the grid. We also recognize that the annually-adjusting standard required by AB 1637 justifies a different approach than the PUC has adopted for the SGIP, particularly in future years. However, the starting point must be significantly more stringent than the current staff proposal to comply with the statute and assure ratepayers' support of fuel cells through NEM spurs increased efficiency and cleaner fuels.

In addition to the plain language in the statute, there is an abundant record in the analyses and hearing testimony prior to votes on AB 1637, as well as the related bills that preceded AB 1637 (AB 1530 and AB 674) to support the common-sense conclusion that the new standard established under AB 1637 should be more stringent than the SGIP standard the Legislature chose to replace.

The Legislature's decision to give the job to ARB was intentional. From our perspective, it was motivated by our confidence in ARB and our expectation that ARB would do a better job than the PUC.

For context on this point, please see the attached letter sent to PUC President Michael Picker in 2015 regarding a proposed decision to adopt a GHG emission factor of 360 kg/MWh. The PUC ultimately adopted a more stringent, declining standard, which remains in effect for purposes of SGIP eligibility. The same concerns outlined in the 2015 letter apply today, only more so because we have since enacted laws to increase the Renewables Portfolio Standard and advance building decarbonization.

We expect ARB to set a standard that will promote innovation, requiring fuel cells to improve efficiency and/or use low-carbon fuels to achieve GHG emissions rates that keep pace with our broader efforts to decarbonize the grid.

Why is CARB proposing a "GHG reduction" standard for fossil fuel cells that actually increases allowable GHG emissions?

AB 1637 requires CARB to adopt GHG emissions reduction standards to ensure that each fuel cell participating in the Fuel Cell Net Energy Metering (FCNEM) tariff reduces GHG emissions compared to the electrical grid resources, including renewable resources, the fuel cell displaces, accounting for both procurement and operation of the electrical grid.

Issues with CARB's proposed FCNEM GHG Emission Standards Regulation:

1. CARB staff proposes a GHG standard of **409 kg/MWh** in 2017, declining thereafter at 2.5%/year (i.e., 399 in 2018, 389 in 2019, 379 in 2020, 370 in 2021, and 360 in 2022).

2. CARB's GHG standard replaces the Self Generation Incentive Program (SGIP) GHG factor set by the CPUC, which was **334 kg/MWh** in 2016 (the most recent year prior to AB 1637), and is **325 kg/MWh** in 2019.

3. CARB's proposed standard reverses a decade of increasingly stringent GHG standards for distributed generation subsidy programs, dating back to SB 412 (Kehoe, 2009). Pursuant to SB 412, the CPUC adopted an initial GHG factor for SGIP of **379 kg/MWh**. (Prior to AB 1637, the SGIP GHG factor also served as the GHG standard for FCNEM.)

4. Following March 2014 Assembly oversight hearings re: poor performance/value of SGIP, SB 861 (Budget, 2014) required the CPUC to update the SGIP GHG factor.

5. Pursuant to SB 861, the CPUC adopted a GHG factor of 334 kg/MWh for 2016, declining to 321 kg/MWh for 2020. The Legislature was well aware

of this when it chose to replace SGIP as the GHG standard for FCNEM and instead require CARB to set the standard via AB 1637. The Legislature's explicit and reasonable expectation was that CARB would set a more stringent standard than the CPUC. Fuel cell advocates were aware of this as well. In fact, they resisted the switch to CARB, proposing the standard be set by the CEC or remain at the CPUC.

6. In April 2016, Bloom Energy itself proposed to set a GHG standard of 379 kg/MWh in statute instead of the provision requiring CARB to set the standard (see April 26, 2016 version of AB 1530). This version of AB 1530 was rejected, and Bloom Energy was required to restore the prior language approved by Assembly Natural Resources Committee, which was later inserted into AB 1637 in a gut and amend on August 18, 2016.

7. The GHG standard CARB staff proposes is such a huge step backwards, it is unlikely to have any binding effect, even in the sixth year, 2022, when it is 360 kg/MWh.

8. According to the CPUC, 106 fuel cell projects were interconnected under the FCNEM tariff in 2016 (the most projects in the program's history) when the SGIP standard was 334 kg/MWh.

9. According to the CEC, at least 19 natural gas power plants emitted GHG at a *lower* rate in 2017 than the 2017 "GHG reduction" standard of 409 kg/MWh proposed by CARB for fuel cells. Of course, these plants are not considered GHG reducing relative to the grid. They are considered major GHG emitters, subject to cap and trade. Allowances must be obtained to cover their GHG emissions, which generates revenue for utility climate credits and GHG reduction projects.

10. The FCNEM tariff may induce the installation of up to 603 MW of natural gas fuel cell generation through 2021, which will continue to operate, becoming less efficient with age, over the same 10-20 year span when the state has committed to achieve at least 60% renewables and push toward 100% zero-carbon electricity….

2017 GHG emissions rates (kgCO2/MWh)

CARB staff proposed "GHG reduction" standard for fuel cells	*409*
CPUC Self Generation Incentive Program eligibility	332
PG&E grid average	95
SCE grid average	249

SDG&E grid average 208

Recent gas plants[26]:

- Inland Empire 373
- Cosumnes 376
- Pastoria 376
- Sunrise 377
- Elk Hills 378
- Palomar 378
- Moss Landing 381
- Blythe 383
- Lodi 383
- Magnolia 386
- Russell City 387
- Colusa 388
- Otay Mesa 388
- Gateway 389

(Lingbloom/Friedman-etal)

Comment:
The proposed Fuel Cell GHG Standard sets a 2017 GHG standard of 409 kg CO2/MWh, which would decrease by 2.5 percent annually to 360 kg CO2/MWh in 2022. To put ARB's proposed standard in context, 409 kg CO2/MWh is over *four times* the grid average in PG&E's service territory. The 409 kg CO2/MWh GHG standard is also significantly greater than the analogous 332 kg CO2/MWh 2017 GHG threshold adopted by the California Public Utilities Commission ("PUC") under the Self-Generation Incentive Program ("SGIP") and exceeds the emissions rate of many of California's gas plants.[27] Because the proposed Fuel Cell GHG Standard would subsidize fuel cells over 20 percent more polluting than the standard adopted by the PUC, it contravenes the legislative intent of AB 1637, which is clear that ARB's Fuel Cell GHG Standard should "be lower than the existing [SGIP] standard at the outset."[28] Indeed, assuming

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[26] These combined-cycle gas turbines, constructed in the past 20 years, are considered major GHG emitters and subject to mandatory reporting and cap and trade. However, all are more efficient (i.e., lower CO2 emissions rate) than the "GHG reduction" standard proposed by CARB staff for fuel cells. Source: California Energy Commission, 2017 Quarterly Fuel and Energy Reports (QFER).

[27] Decision 15-11-027, *Decision Revising the Greenhouse Gas Emission Factor to Determine Eligibility to Participate in the Self-Generation Incentive Program Pursuant to Public Utilities Code Section 379.6(b)(2) as Amended by Senate Bill 861*, Rulemaking 12-11-005, at Appendix B (Nov. 19, 2015), http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M156/K044/156044151.PDF. For example, based on information provided in CEC permitting, the emissions rate of the Blythe Energy Project is 383 kg CO2/MWh, 392 kg CO2/MWh for La Paloma Energy Center and 378 CO2/MWh for the Palomar Energy Center.

[28] Bill Analysis Before the Assembly Committee on Natural Resources at 2 (Aug. 30, 2016), https://leginfo.legislature.ca.gov/faces/billAnalysisClient.xhtml?bill_id=201520160AB1637.

continuous 2.5 percent declines in the Fuel Cell GHG Standard, which is not assured under the proposed methodology, the Fuel Cell GHG Standard would not be lower than the PUC's 2017 GHG threshold until 2026. The discrepancy is more glaring given the PUC adopted its fuel cell GHG standard in 2015, before laws such as SB 100 and SB 32 accelerated California's renewable energy and greenhouse gas reduction requirements.

As detailed in the appendix, the Staff proposal contains omissions, overly conservative assumptions and methodological flaws that collectively function to inflate the proposed Fuel Cell GHG Standard significantly…. Properly accounting for these concerns will result in a more accurate and appropriately stringent GHG Standard that, consistent with the legislative intent of AB 1637, is lower than the analogous PUC fuel cell GHG threshold adopted four years ago. (Earth-NRDC-Sierra-Union-Vote)

Comment:
Earthjustice today recommends that the proposed standards be rejected or at least revised to include a steeper rate of decline. And this is not fuels cells versus no fuel cells. This is about what kind of fuel cells we want to subsidize.

The proposed standard is significantly weaker than an analogous standard -- fuel cell standard adopted by the Public Utilities Commission over two years ago. And while CARB's standard declines over time, the decline rate is so slow that the CARB standard would not catch up to the PUC standard until 2026…. (Earth)

Comment:
We'd like to align our comments with those made by Earthjustice. The proposed Fuel Cell Net Energy Metering Standard is not strong enough. We would like for the Board to reject the measure as proposed. But at a minimum, the Board should direct staff to create a standard decline rate that is faster and therefore more in line with the State's climate goals. (Sierra)

Comment:
And I think in my view, staff has lost sight of that step here, because it is not reasonable to end with a standard in 2019 that is 20 percent higher than what the PUC employed for SGIP, when the Legislature gave ARB this job precisely to set a more stringent one….

And it is not reasonable when recent gas power plants permitted by the CEC, which we treat as major carbon polluters, under Cap-and-Trade emit greenhouse gases at a lower rate than what's being proposed here for a subsidy.

But here we are, and I'm mindful this Board has other bigger fish to fry. So at a minimum, I'd like to endorse the suggestion from Chair Nichols that staff at least set a more steeper decline rate than the proposed two and a half percent. I'd offer that our greenhouse gas emissions statute should be the appropriate benchmark. This is an emission reduction performance standard after all. So looking at our SB 32 goals would

perhaps get us to that shared vision we have of running our fuel cells off lower carbon fuels and off of natural gas.

[In response to a request from Board Member Takvorian for the commenter's view on whether the proposed GHG standard is less stringent than the SGIP standard:]

Yes. And I think it is a different program. And the legislation was clearly moving, you know, this task to ARB from the PUC. I mean, our view of the legislative history, and it is in the Committee analysis, one of them, is that the intent was to set a standard that was more stringent than SGIP. Now, this is an annual standard. You have to meet it annually to qualify for the tariff.

But in our view, that means it's more important to get a good standard, because there's real questions about verification. You know, how are you going to enforce that annual requirement? It has to be more than just customer attestation….

So we just – we were a little mystified that at multiple points along the way, the statute afforded staff discretion to set a higher standard, still using a data-driven approach. But we ended up with standard that we felt starts too high and declines too slowly, and is not going to move us to that lower carbon fuel future that we want fast enough.

[In response to a question from Board Vice Chair Berg about whether PUC determined the SGIP standard based on average rather than marginal generation, and about how to understand or reconcile the two approaches:]

I believe so, but I was not part of the SGIP proceeding, so I'm not fluid entirely on how they set their standard….

Yeah, I think – to be clear, I mean, we agree with staff. We should be looking at the marginal emissions test. So I think SGIP is kind of context and it's relevant for the legislative history in our view, because that was very much part of the discussion and why this task was given to CARB and not the PUC.

But, in our view, assessing the marginal emissions rate the way staff did the test, they only looked at renewable on the margin – this is going to get, you know, very technical - when CAISO day ahead prices are negative, which is, you know, only 110 hours a year. And I think as other commenters have explained, our understanding of that is going to get much more refined in the years ahead. But, we're concerned this essentially locks in that methodology. It's just picking a two and a half percent reduction rate from a fairly high number.

And it's just a question I think for this Board of – from a policy standpoint, what sort of -- it's about, you know, speed. It's about how quickly do we want this standard to move us towards renewable feedstocks, knowing again that this isn't about whether people are going to fall -- install fuel cells. It's about to enjoy a subsidy in the form of a NEM tariff what emissions performance should we demand of those projects? (NRDC)

Comment:
No reason reductions should be at minimum of 20 percent per year.

The commenter made hand-written comments on the proposed Regulation to support this point, replacing “0.975” with “0.80” and “2.50 percent” with “20 percent” in sections 95412(a)(2), 95412(a)(3), and 95412(a)(4) and replacing the 2018-2022 GHG emission standards in the table in section 95411 with numbers that reflect a 20 percent reduction. (Delgado)

Agency Response:
The commenters indicate that the proposed fuel cell NEM GHG emission standards are too high, that the annual rate of decline of the standards is too low, and that therefore the proposed standards fail to meet AB 1637 requirements. AB 1637 (Low, Chapter 658, Statutes of 2016) requires that CARB develop GHG emission standards that fuel cell generation resources must meet in order to be eligible for the CPUC Fuel Cell NEM Program. By statute, the GHG emission standards must reduce “greenhouse gas emissions compared to the electrical grid resources, including renewable resources, that the fuel cell electrical generation resource displaces, accounting for both procurement and operation of the electrical grid.” (Public Utilities Code section 2827.10.) CARB is to “establish a schedule of annual GHG reduction standards...” and “…update the schedule every three years with applicable standards for each intervening year.” (Public Utilities Code section 2827.10.)

In consultation with CEC staff, and per stakeholder feedback during an extensive informal public process, CARB staff determined that the “electrical grid resources, including renewable resources, that the fuel cell electrical generation resource displaces, accounting for both procurement and operation of the electrical grid[,]” are marginal (as opposed to baseload) generator resources. CARB staff also determined that marginal generators would either be simple-cycle gas turbines, combined-cycle gas turbines, and, for a small percentage of hours in the year, renewable generators like wind and solar power plants.

During the informal public process, CARB staff informally proposed and considered four possible methodologies to set fuel cell NEM GHG emission standards that would reduce GHG emissions compared to marginal generation, as directed by AB 1637. The Regulation uses an equation that incorporates data from CEC and CAISO to calculate the fuel cell NEM GHG emission standards for 2017. Using a 2017 baseline calculated with 2017 CEC and CAISO data, CARB staff developed a methodology to set the GHG emission standards for future years. This methodology is rooted in the idea that fuel cell electrical generating resources should reduce their GHG emissions in line with State policy expectations regarding future GHG emission reductions. The Regulation establishes fuel cell NEM GHG emission standards for the years 2017 through 2022, and lays out the process by which the Executive Officer would update the standards every three years, beginning in 2022.

Data on the operation of California's electrical grid indicates that, for 2017, natural gas power plants are the marginal generator more than 98 percent of the time, and renewable power plants are the marginal generator the rest of the time. Natural gas power plants in California are a mix of the less efficient so-called "peaker plants" with an average 2017 emission rate of 560 $kgCO_2e/MWh$, as well as the more efficient combined cycle plants, as mentioned in the comment. For 2017, the average marginal GHG emission rate for all natural gas plants in California was 414 $kgCO_2e/MWh$. This represents emission rates of both peaker plants and the more efficient natural gas combined cycle power plants, weighted by the number of hours each operates. The proposed 2017 fuel cell NEM GHG standard takes into account the amount of time that natural gas generators and renewable generators were on the margin in 2017, and the calculated standard is 409 $kgCO_2e/MWh$.

Some commenters also state that the proposed standards are too high and that the legislative intent is that standards be lower than SGIP standards. Commenters mention that the proposed Regulation has a higher starting GHG emission rate than the SGIP GHG emission rate and that therefore the proposed Regulation is not "binding" and will not result in efficiency improvements or the use of clean fuels quickly enough. Similarly, one commenter states that the "starting point" for the staff proposal must be "more stringent than the current staff proposal to comply with the statute and assure ratepayers' support of fuel cells through NEM spurs increased efficiency and cleaner fuels."

The language in AB 1637 itself does not specify a level at which the standard must be set, and does not state or imply any connection between fuel cell NEM GHG emission standards and those set by CPUC in SGIP. CPUC's SGIP and Fuel Cell NEM Program are different programs with different mandates, scope, and approach. The SGIP GHG emission standard, which served as the applicable fuel cell NEM standard prior to AB 1637, was set with very general direction from the Legislature to "achieve reductions of greenhouse gas emissions pursuant to the California Global Warming Solutions Act of 2006." The SGIP standard is based on a point-in-time equation developed in 2015, which is not replicated in any other programs. Further, AB 1637 specified that CARB should set the fuel cell NEM GHG emission standards starting in 2017, thus completely separating the fuel cell NEM standard from the SGIP standard. For these reasons, CARB staff does not agree that SGIP is a relevant benchmark against which one should compare the fuel cell NEM GHG emission standards. AB 1637 does not include statutory language that the GHG emission standard set by CARB should "be lower than the existing [SGIP] standard at the outset[,]" and includes other directives for CARB's determination of the GHG emission standard.

One such directive is that CARB set annual GHG reduction standards, and the standards proposed in the Regulation decline each year. Because fuel cell NEM eligibility is based on meeting the GHG emission standards every year, and because fuel cells will experience expected and normal degradation in efficiency, and hence emissions performance, over time, in order to qualify for fuel cell NEM,

GHG emissions from fuel cell electrical generation resources must also decrease over time, meaning they must get more efficient or switch to biofuels. CARB staff is not directed by statute to set a standard that is "binding" or to otherwise evaluate or impact when that switch will occur.

A commenter states that at least 19 power plants that operate on natural gas have a lower GHG emission rate than the 409 kg CO_2/MWh proposed in the Regulation. In response to AB 1637 direction, CARB staff determined that the "electrical grid resources, including renewable resources, that the fuel cell electrical generation resource displaces" are marginal generator resources, and that marginal generators would either be simple-cycle gas turbines, combined-cycle gas turbines, and, for a small percentage of hours in the year, renewable generators like wind and solar power plants. The GHG emission standards reflect the operation of the electricity grid, including combined and simple-cycle generator GHG emission rates and the number of hours that renewable generators are operating on the margin. Combined-cycle gas turbines generators use one or more natural gas turbines along with one or more steam turbines, and the waste heat from the natural gas turbine is used to create steam for the steam turbine, making them more efficient than simple-cycle gas turbines. A simple-cycle gas turbine emits more GHGs per unit of electricity and is more expensive to operate than a combined-cycle gas turbine because it generates less electricity per unit of fuel. Because the fuel cell NEM GHG emission standards reflect the average emissions from the operation of all marginal generators, some of which have higher and some of which have lower GHG emissions rates, it is to be expected that the standards may be higher than some more efficient natural gas power plants, and lower than less-efficient plants. The declining annual standard will ensure that the standard continues to reduce emissions relative to the average marginal generator over time.

The commenters also reference the standard being higher than the grid average as another argument that it is too high. Grid average, whether in PG&E's territory or for all of California, is not a relevant benchmark because grid average accounts for the emissions from all power plants that operated during the year, whether they are running all the time (and thus would be unaffected by the addition of a fuel cell electrical generating resource) or not. The electricity generating unit that is most likely to be displaced by the fuel cell is the marginal generator, which will adjust its load when there is an incremental change in electricity demand.

CARB's Regulation follows the specific direction in AB 1637 to relate the GHG emission standards to the resource that will be displaced by the fuel cell, which is the marginal generator. Of note, the idea of a marginal generator is not a new one. It has been used for about a decade in the Mandatory GHG Reporting Regulation and Cap-and-Trade Program in the form of the unspecified electricity import emission factor, which has a calculated value of 428 kgCO_2e/MWh.[29] This number

[29] *See* Cal. Code Regs., title 17, sec. 95111.

represents the average GHG efficiency of a natural gas combined cycle plant operating within the broader western electricity grid.

A comment indicates that "there is abundant record in the analyses and hearing testimony prior to votes on AB 1637, as well as the related bills that preceded AB 1637 (AB 1530 and AB 674) to support the common-sense conclusion that the new standard established under AB 1637 should be more stringent than the SGIP". Both AB 1530 and AB 674 predate AB 1637; they do not direct CARB to set an annual standard nor do they provide any indication of the intent of AB 1637, and AB 1637 does not reference these bills as a source of information regarding setting the GHG emission standards. Moreover, the plain language of AB 1637 instructs CARB to develop the FC NEM GHG standard using other factors and considerations. Therefore, CARB did not consider them relevant to the development of the Regulation.

CARB recognizes that a legislative analysis of AB 1637 expressed anticipation that the FC NEM standard would be lower than SGIP. The section reads:

> **Each eligible fuel cell must reduce GHG emissions compared to electrical grid.** For NEMFC, this bill establishes more stringent GHG standards to assure eligible projects remain cleaner than the grid each year of operation. The bill establishes a new GHG standard, established by ARB, rather than the existing PUC/SGIP standard, which is expected to be lower than the existing standard at the outset, and get progressively lower each year as the overall GHG emissions from the grid decrease due to implementation of a 50% Renewables Portfolio Standard, reduction of coal imports, and other factors. The bill's new GHG standard applies to existing installed fuel cells, as well as future installed fuel cells, requiring all NEMFC participants to meet annual GHG reduction standards, to be adopted by ARB, to remain eligible for NEMFC.[30]

The analysis itself acknowledges that, while the standard set by CARB "is expected to be lower than" the SGIP standard, this is not required by or indicated in the bill text. Rather, the statutory text requires that the fuel cell NEM GHG emission standards reduce "greenhouse gas emissions compared to the electrical grid resources, including renewable resources, that the fuel cell electrical generation resource displaces, accounting for both procurement and operation of the electrical grid." (Public Utilities Code section 2827.10.) CARB staff has determined that the fuel cell electrical generation resource displaces marginal generation and has set the fuel cell NEM GHG emission standards on this basis, rather than by comparison to a separate standard that is not referenced in the statutory text.

Some commenters suggest that the annual rate of decline for the fuel cell NEM standard be increased to something above the 2.5 percent decline proposed at the

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[30] Assem. Com. on Natural Resources, Analysis of Assem. Bill No. 1637 (2015-2016 Reg. Sess.) as amended Aug. 18, 2016, p. 2.

December 12, 2019 Board Hearing, including that the standard should annually decline up to 20 percent. At the Board Hearing, as captured in Board Resolution 19-36, the Board directed CARB staff to evaluate whether an increase in the annual rate of decline for the fuel cell NEM standards is warranted. CARB staff originally proposed the 2.5 percent annual reduction of the standards to align with 2030 electricity-sector GHG emission IRP targets set pursuant to SB 350 and taking into consideration the updated RPS target set by SB 100.

In the 15-day Public Notice, staff proposed an accelerated annual decline to align with the GHG emissions reduction goals of SB 32, which calls for statewide GHG emissions to be 40 percent below the State's 1990 GHG emissions level by 2030, resulting in a proposed annual reduction rate of 3.85 percent. Based on comments received in response to the 15-day Public Notice, staff reevaluated the annual reduction of the standards and released a revised proposal via a 30-day Public Notice. The final proposed Regulation combines the approaches proposed in the 45-day Public Notice and 15-day Public Notice. The 2017 to 2020 standards retain a 2.5 percent annual reduction, as proposed in the 45-day Public Notice. For years 2021 and beyond, staff proposed that the reduction be based on the GHG emissions reduction goals of SB 32 to achieve a 40 percent reduction by 2030 (245 kg CO_2e/MWh), with an annual reduction of 13.4 kg CO_2e/MWh applied to the standard starting in 2021. Further, because the standard is re-evaluated every three years and the calculation ensures that the standard continues to decrease, the future calculated GHG emission standards could decrease more dramatically should publicly available data used in the calculation result in an even lower emission factor. It should be noted that no State policies support an annual decline of 20 percent, as requested by one of the commenters.

The Regulation complies with legislative direction in AB 1637 and meets the Board request that the annual decline of the standards be accelerated, while also ensuring that the rate of decline matches those expected in other State GHG emissions reduction policies. Furthermore, CARB believes that this approach will encourage efficiency increases and emissions reductions in a manner consistent with other State policies.

A commenter states that the “FCNEM tariff may induce the installation of up to 603 MW of natural gas fuel cell generation through 2021,” and that fuel cells will become less efficient over the 10-20 year span that the State plans to have at least 60 percent of retail electricity generated by renewable generation and then drive to zero carbon electricity. With respect to the 603 Megawatt (MW) reference, the CPUC NEM webpage indicates that as of March 2017, 135 MW of fuel cells were installed under the Fuel Cell NEM Program,[31] and AB 1637 expanded the statewide limit to allow an additional 500 MW. This Regulation does not impact or alter the amount of fuel cells already installed or authorized under the Fuel Cell NEM Program by AB 1637. The proposed annual reductions in the fuel cell NEM GHG emission standards, as set in this Regulation, mean that fuel cell electrical

[31] https://www.cpuc.ca.gov/NEM/

generating facilities must decrease their GHG emissions over time in order to meet the declining standards and continue receiving benefits from the tariff. The required decrease in GHG emissions is counter to the expectation that, over time, degradation of the fuel cell stacks occur, as mentioned by the commenter. The implication is that, as the fuel cell NEM GHG emission standard declines at the same time the fuel cell is becoming less efficient, over time the fuel cell will need to improve efficiency or supplement with eligible biofuel to continue receiving fuel cell NEM benefits.

One of the commenters stated that the implementation of the standards is "long-overdue." CARB staff has been working since 2017 to meet the legislative direction in AB 1637 to develop fuel cell NEM GHG emission standards. This informal process to solicit public input on the methodology lasted from May 2017 through July 2019, during which time CARB staff held a working group meeting and three workshops, and proposed four possible methods for calculating the emission standards.[32] While one result of this extensive process was that the issuance of the Regulation was delayed, CARB staff views this extensive process as necessary to develop an adequate public record and give necessary time to the examination of the highly varying perspectives and feedback received from stakeholders.

Finally, a commenter mentions verification and enforcing the annual "requirement," which CARB staff assumes is the annual GHG emission standards. Under Section 2827.10 of the Public Utilities Code, CPUC must apply the GHG emission standards annually to determine eligibility of fuel cell electrical generation resources to participate in the Fuel Cell NEM Program. Section 2827.10 of the Public Utilities Code limits CARB's role to adopting fuel cell NEM GHG emission standards only.

C-2. Opposition to the Use of CAISO Market Data and the Proposed Methodology to Calculate the GHG Emission Standards

Comment:
Price shall not be a calculating factor for tracking FCNEM progress each year.

The commenter made hand-written comments on the proposed Regulation to support this point, crossing out the definition of "$HR0_{y-1}$" and replacing "$HR0_{y-1}$ HR/HR" with "HR" in section 95412(a)(1).
(Delgado)

Comment:
As detailed in the appendix, the Staff proposal contains omissions, overly conservative assumptions and methodological flaws that collectively function to inflate the proposed Fuel Cell GHG Standard significantly. These include…2) reliance on a methodology that understates the hours when renewables are the marginal grid resource…

[32] See Section X.I. for a description of the public process that preceded this rulemaking.

The Proposed GHG Fuel Cell Standard Locks In a Methodology That Substantially Understates Hours Where Renewables Are the Marginal Grid Resource.

The proposed GHG Fuel Cell Standard understates the hours that renewable resources operate as the marginal grid resource by assuming renewables are the marginal resource only when day-ahead electricity prices are at or below zero dollars. The basis for this assumption is generators that "[w]hen the electricity price is zero, renewable generation is likely on the margin becaue generators that require fuel (e.g. CCGT, SCGT) are not likely to bid into the market when electricity prices are at or below zero. This is because their operational costs are always greater than zero because of the greater fuel."[33] Operational costs of gas-fired generation are also greater when day ahead market prices are above zero dollars due to fuel costs. A more accurate way to determine hours when renewables are the marginal resource is to determine the Implied Market Heat Rate ("IMHR"). A methodology for doing so was provided by PG&E in the 2018 Rate Design and is excerpted below.[34]

PACIFIC GAS AND ELECTRIC COMPANY
ATTACHMENT 1
INVESTOR-OWNED UTILITY (IOU) DISCUSSION OF MARGINAL GREENHOUSE GAS (GHG) EMISSION CALCULATIONS

Both Energy and Environmental Economics, Inc.'s Avoided Cost Calculator (ACC) Model and Itron's 2016 Self-Generation Incentive Program (SGIP) methodology (used in the 2016 SGIP GHG Evaluation) calculate marginal GHGs as a function of Implied Market Heat Rates (IMHR) in the California Independent System Operator (CAISO). For ratesetting applications, the IOUs advocate for using Day-Ahead (DA) prices to calculate heat rates.

The IMHR is defined as: (Price – VOM[1])/(Gas price + transport cost + GHG price*0.0532)
Marginal GHG emissions in t/MWh[2] = IMHR * 0.0532 t/MMBtu

For both methodologies:

- IMHRs less than or equal to (≤) zero (i.e., prices ≤ the non-zero VOM) are set to zero;
- IMHRs greater than an assumed "low-efficiency" gas heat rate are set to the low-efficiency rate; and
- IMHRs between zero and a heat rate for an assumed "high efficiency" gas generator are set to the high-efficiency rate.

Thus, when the IMHR is below the high-efficiency threshold, efficient thermal generation is assumed to be on the margin; once the IMHR gets down to, or less than zero, renewables are assumed to be on the margin.

Assumptions regarding the hours when renewables are the marginal resource have a significant impact on the outcome of the GHG Standard. As the Statement of Reasons

[33] Staff Report: Initial Statement of Reasons at 9.
[34] A.17-12-011, PG&E 2018 Rate Design Window, Supplemental Testimony on Calculation of Cost Estimates and GHG Reductions (Sept. 26, 2018).

acknowledges, using all hours renewable resources are curtailed would reduce the GHG Standard from 409 to 308 kgCO2e/MWh.[35] While this includes curtailment due to localized congestion, a converse methodology that only looks at hours where market prices are at or below zero dollar inflates the GHG standard by underestimating the number of hours where renewable are the marginal resource. To more accurately identify marginal grid resources, the IMHR methodology should be utilized.

Moreover, the proposed Fuel Cell GHG Standard locks-in this flawed methodology in perpetuity. Under the proposed regulations, ARB would apply the same formula every three years until 2047.[36] This precludes accounting for more accurate modeling on determining hours when renewables are the marginal resource. Because IMHR is a more accurate means of identifying the marginal resource at a given hour of the year, ARB at a minimum should ensure its regulations permit it to be incorporated in the next update…. (Earth-NRDC-Sierra-Union-Vote)

Agency Response:

The first commenter is referring to section 95412 of the Regulation where the equation for the triennial update is explained. One of the factors used in the equation ($HR0_{y-1}$) is based on the price of electricity from the CAISO day-ahead market. This factor accounts for the effect that renewable generation has on marginal GHG emissions. When the CAISO day-ahead market system marginal price (electricity price) is at or below $0 (zero), renewable generation is likely on the margin. This is because generators that require fuel (e.g., combined cycle gas turbine, simple cycle gas turbine) are not likely to bid into the market when electricity prices are at or below zero because their operational costs are always greater than zero due to the cost of fuel. On the other hand, due to subsidies and zero-cost fuel, renewable generation can be profitable at an electricity price of zero or less. Renewable generators are assumed to have zero GHG emissions because hydroelectric, wind, and solar generators do not produce GHG emissions when generating electricity. Therefore, the "price" referenced by the commenter is being used to determine the number of hours renewables were operating as the marginal generator in 2017. This is used in the calculation so that the operation of marginal renewable generation is accounted for in estimating the marginal emission rate, as required by AB 1637. Because AB 1637 requires that CARB take into account renewable generation, replacing this portion of the equation with "HR" (the number of hours in a year), as suggested by the commenter, would not meet statutory requirements.

The second commenter refers to IMHR, which is a methodology used to calculate the marginal heat rate of a natural gas power plant. This methodology was proposed by Pacific Gas and Electric (PG&E) in CPUC's rate design window proceeding. IMHR is defined by the following equation: (Price - variable operation and maintenance cost)/(gas price + transportation cost + GHG price * 0.0532). In addition, PG&E was advocating for using the CAISO day-ahead prices in the IMHR

[35] Initial Statement of reasons at 29.
[36] Proposed Reg. § 95412

equation, which can be used to determine the average marginal GHG emission rate.

CARB staff received this proposal during the informal public process, and looked into the feasibility of using IMHR to calculate the average marginal GHG emission rates. While CARB staff did not have an issue with the proposal on a theoretical level, CARB staff found that the data necessary to perform such an analysis was not publicly available and therefore not appropriate to use for this process.

The commenters also discuss the fact that renewable energy generation output is reduced or curtailed under certain conditions. While curtailment is a recognized issue on California's electricity system (grid), renewables curtailment provides no clear indication of when renewable generators are on the margin. As noted in the Staff Report, curtailment of renewable electricity can occur due to any number of reasons, including lower than expected electricity demand and constraints in the transmission system. As such, curtailment hours were not considered and CARB staff instead uses a methodology that represents the number of hours in the year when renewables were clearly on the margin (i.e., day-ahead market prices are $0 or less).

C-3. Proposed Methodology Does Not Adequately Reflect Impacts on Renewables Procurement

Comment:
And I feel like -- I was reflecting on how we got here today, because so much of the discussion seems like we're being boxed on a methodological approach. And just to clarify, per our comments, we agree it's a marginal test. No one is suggesting it should be an average test. We disagree on how staff has applied that marginal test.

But naturally -- or not naturally, but I should say I was thinking back to my high school physics teacher, Mr. Saxby, that -- that was naturally…. He taught us that, you know, we should be applying these detailed formulas that try to solve these complex problems. But also before we submit and answer, step back and assess how reasonable it looks in context.

And the context here is greenhouse gas emissions performance. And we came to call that lesson from Mr. Saxby, the Saxby step….

It is not reasonable when cities like Santa Clara are banning the interconnection of gas powered fuel cells, because their increased usage runs counter to our clean energy goals. And this proposal would subsidize them….

And finally, it is not reasonable when, at multiple points, in developing this methodology, staff chose not to use other data-driven approaches that could have set a higher bar by more accurately accounting for the impact on reduced renewable procurement, assessing when renewable are on the margin…

[In response to a request from Board Member Takvorian for the commenter's view on whether the proposed GHG standard is less stringent than the SGIP standard:]

So it is different programs, but we think the comparison is germane. It's apt. That was definitely part of the legislative discussion. We agree it is a marginal test. That's what we should be evaluating here. You know, what is the emissions performance of the resource on the margin that this is displacing…?

But we know that as we add more renewables to the grid, our grid is getting cleaner. That marginal equation is going to change, and we should be assessing the other impacts per our comment letter on reduce renewables procurement, to the extent these are behind the meter resources. That means it's fewer retail sales utilities are providing....
(NRDC)

Comment:
As detailed in the appendix, the Staff proposal contains omissions, overly conservative assumptions and methodological flaws that collectively function to inflate the proposed Fuel Cell GHG Standard significantly. These include:…3) inadequate support for the elimination of the 1-RPS Factor to account for avoided renewable procurement from decreased retail sales that result from deployment of 500 MW of behind the meter gas generation contemplated under the Fuel Cell Net Energy Metering ("NEM") program;...

The Proposed GHG Fuel Cell Standard Does Not Adequately Support the Elimination of the 1-RPS Factor to Account for Avoided Renewable Procurement that Results from the Fuel Cell NEM Program.

California's Renewable Portfolio Standard ("RPS") requirements are determined based on retail sales of electricity. Accordingly, the reduction in demand from the 500 MW of baseload behind-the-meter gas resources permitted under the FC-NEM program will reduce RPS procurement obligations on load serving entities. AB 1637 expressly requires ARB to account for the impact of reduced RPS procurement in determining the FC-NEM GHG standard.[37] In both the PUC's GHG threshold under SGIP and ARB's earlier proposed 324 kgCO2/MWh GHG standard this was done using a 1-RPS Factor. The Initial Statement of Reasons excludes the 1-RPS Factor on the grounds that "IOUs are procuring more renewable generation than is required by the RPS" and cites to the exclusion of the 1-RPS Factor in the PUC's 2018 Avoided Cost Calculator ("ACC").[38] The reason the 2018 ACC did not include an RPS adder was because the passage of

[37] Pub. Util. Code, § 2827.10(b)(2) (FC GHG standard established by ARB "reduces greenhouse gas emissions compared to the electrical grid resources, including renewable resources, that the fuel cell electrical generation resource displaces, *accounting for both procurement* and operation of the electric grid") (emphasis added).
[38] Initial Statement of Reasons at 7-8.

SB 350 made the need to achieve GHG reductions, rather than the need to meet RPS goals, the binding constraint on the electric sector. It is therefore not appropriate to look to ACC assumptions in determining a GHG Standard for fuel cells. In addition, the 2018 ACC was adopted prior to the passage of SB 100, which increased 2030 RPS requirements from 50 to 60 percent. ARB has made no demonstration that California is currently over-procured to meet a 60 percent RPS. Indeed, many newly formed Community Choice Aggregators are under-procured.[39] Therefore, additional BTM baseload generation will reduce future RPS procurement and ARB must account for this impact in determining the Fuel Cell GHG Standard. (Earth-NRDC-Sierra-Union-Vote)

Agency Response:

The commenters state that the proposed GHG emissions standard calculation does not adequately take renewables into account, and that it should include a "1-%RPS" factor since the CPUC previously used that factor in the SGIP GHG emission factor calculation in its Avoided Cost Calculator (ACC).[40] While SGIP and the proposed fuel cell NEM GHG emission standards both estimate marginal electricity generator emissions, the SGIP standard is discounted by this "1-%RPS" factor to account for the decreased retail electricity load that accompanies a new distributed generation resource, thus resulting in a decrease in the amount of renewables procured per the SB 350 and SB 100 RPS requirements. SB 350 set a 2030 RPS target of 50 percent and SB updated the 2030 RPS to 60 percent.

As stated previously, the language in AB 1637 itself does not state or imply any connection between fuel cell NEM GHG emission standards and those set by CPUC in the SGIP; they are different programs with different mandates, scope, and approach. Therefore, the suggestion that the fuel cell NEM GHG emission standards must use the same principles as SGIP is not consistent with statutory requirements. Further, CARB staff notes that the SGIP approach, developed in 2015, assumed that, as a result of a new distributed generation resource, the IOUs would procure fewer kWh of renewable energy to comply with RPS. CPUC has since moved away from the assumption that new distributed generation resources will result in commensurate decreases in renewables procurement.

The 2019 CPUC report "California Renewables Portfolio Standard Annual Report" states that the IOUs are currently over-procuring renewable generation and are expected to continue to over-procure renewable generation until at least 2024. Because IOUs are over-procuring renewable generation, it can be assumed that the Fuel Cell NEM Program, which requires that fuel cells be operational by the end of 2021, will not have any effect on renewable generation procurement in the near

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[39] *See, e.g,* D.19-09-007, *Decision on New Community Choice Aggregators' 2018 Renewables Portfolio Standard Procurement Plans and Liberty Power Holdings' Request for Waiver* (Sept. 12, 2019), http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M313/K975/313975474.PDF.

[40] Energy and Environmental Economics, Inc (E3). 2017. 2017 Avoided Cost Calculator. "Emissions" tab. Available at: https://ww2.arb.ca.gov/sites/default/files/2020-06/2017acc.xlsm. Accessed July 21, 2020.

future. In addition, the 2018 and 2019 versions of ACC do not account for RPS procurement based on the assumption that the cost of carbon, and not RPS Program requirements, appears to be the factor causing the IOUs to procure renewable generation above the RPS requirement.[41] [42] Per the comment that it is "not appropriate to look to ACC assumptions in determining a GHG Standard for fuel cells," CARB is not looking to the ACC to determine the fuel cell NEM GHG emission standards. Rather, mention of the ACC serves to underscore the point that CPUC has not utilized the "1-%RPS" factor since the 2015 SGIP calculation.

The Regulation meets AB 1637 statutory requirements to account for renewables in two ways. First, using publicly available data, the standard adjusts the marginal generator emissions by the amount of time during the year that renewables were on the margin. Second, the standards reduce annually in alignment with State GHG emissions reduction targets, including the IRP GHG emission targets set by CARB in response to SB 350, which also set a 2030 RPS target of 50 percent. The IRP emission target utilized in the development of this Regulation also considers the fact that SB 100 updated the 2030 RPS to 60 percent.

The commenters stated that community choice aggregators (CCA) are under-procuring renewable generation. The Fuel Cell NEM Program applies to the three largest IOUs and not to CCAs. However, if a fuel cell customer generator takes service from a CCA that offers a Fuel Cell NEM Tariff under a Time-of Use rate and has an eligible fuel cell electrical generating facility that is interconnected and operates in parallel to an IOU electrical system, the fuel cell customer generator is eligible to participate in the CCA Fuel Cell NEM Tariff. It is expected that very few CCAs will offer a Fuel Cell NEM Tariff. In addition, the fuel cell customer generator has the option of opting out of receiving service under a CCA. These facts make the prospect of a significant number of fuel cell customer generators using a CCA Fuel Cell Tariff unlikely.

C-4. Proposed Fuel Cell NEM Emission Standards Will Subsidize Fossil Fuel and Result in Pollution, and Are Thus Inconsistent With State Policy

Comment:
Because CARB's standard is so lax, it will allow the most inefficient and polluting fuel cells to operate off fossil fuels and still qualify for public subsidies. The pollution from these technologies and their inconsistent with -- inconsistency with greenhouse gas reduction goals are why places like the City of Santa Clara has banned the use of some of these fuel cells.

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[41] Energy and Environmental Economics, Inc (E3). 2018. 2018 Avoided Cost Calculator. "Emissions" tab. http://ww2.arb.ca.gov/sites/default/files/2020-06/2018acc.xlsm. Accessed July 21, 2020.
[42] Energy and Environmental Economics, Inc (E3). 2019. Avoided Costs 2019 Update. June 26, 2019. Available at: http://ww2.arb.ca.gov/sites/default/files/2020-07/2019acc_update.pdf. Accessed July 22, 2020.

CARB's standard should not support these inefficient technologies. And I haven't heard anything in the staff justification that says setting a higher standard would somehow preclude the use of these fuel cells that are more efficient. (Earth)

Comment:
The California Environmental Justice Alliance writes to express our strong opposition to the proposed Fuel Cell Net Energy Metering Greenhouse Gas Emission Standards Regulation ("Fuel Cell GHG Standard"). CARB's proposed Fuel Cell GHG Standard wrongly allows for a substantial subsidy of dirty fossil-fuel GHG-intensive fuel cell projects. This proposal should be rejected because it is inconsistent with State policy requiring reduction of GHG emissions across the electric sector, it may increase harmful air pollution, and it would divert money away from more deserving zero-emission projects. We urge the Board to reject this significant step backwards.

Environmental justice communities are on the frontlines of climate change. As Senate Bill ("SB") 32 states, "disadvantaged communities are affected first, and most frequently by the adverse impacts of climate change."[43] The communities where CEJA's members and partners work are already facing the impacts of climate change, from suffering most acutely during the impacts from extreme weather events to bearing the burden of drought. California's roadmap to addressing climate change by 2030 is not only required by law to mitigate these impacts as well as safeguard against future burdens, it is also a moral imperative.

Incentivizing new fossil fuel generation like this rule proposes is inconsistent with this moral imperative and numerous important mandates. In particular, SB 100 requires an orderly transition away from fossil fuel-powered electricity, and Executive Order B-55-18 requires California to achieve carbon neutrality by 2045. Allowing new fossil facilities to be procured is also inconsistent with SB 32, which requires an economy-wide reduction of greenhouse gases.

Subsidizing new fossil fuel generation may also increase air pollution due to the use of fossil fuel. Notably, even the Staff Report admits that this proposed "[r]egulation is not anticipated to provide direct GHG or other pollution emission reduction benefits."[44] Our communities already breathe some of the most polluted air in the country. The American Lung Association's 2019 "State of the Air" report shows that many California cities rank within the highest ozone levels or worst particulate contamination in the nation.[45] The proposed subsidy could result in more pollution in communities already breathing unhealthy air.

This subsidy money would be better spent supporting the transition to zero-emission generation resources, including batteries and zero-emission fuel cells. The intent of AB 1637 was to reduce the GHG intensity on the grid, not to increase it. Incentives should not

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[43] SB 32, Section 1(c) (2016).
[44] Staff report, p.3.
[45] *See* https://www.lung.org/assets/documents/healthy-air/state-of-the-air/sota-2019-full.pdf.

be allowed for any generation resources that produce GHG emissions given the amount of GHG-free resources such as wind, solar, and energy storage currently available on the grid.

For all these reasons, we strongly urge the Board to reject authorizing subsidies to fossil fuel generation facilities. (CEJA)

Comment:
And we are here regretfully in opposition today to the proposed standard for the simple reason that it would enable the substantial public subsidy of electricity generation from a fossil fuel for years to come.

And I think I -- you know, I take issue with some of some the framing here today that this is, you know, not a referendum on fuel cells and their application, their potential benefits for air quality or wildfire resilience. This is about what degree of emissions performance we're going to ask of our fuel cell projects to meet to enjoy a public subsidy that will be paid for by other ratepayers. And we think we should ask our incentive programs to set a higher bar and speed that transition to lower carbon fuels. (NRDC)

Comment:
Earthjustice, Sierra Club, the Natural Resources Defense Council, Vote Solar and the Union of Concerned Scientists write to express our strong opposition to the proposed Fuel Cell Net Energy Metering Greenhouse Gas Emission Standards Regulation ("Fuel Cell GHG Standard"). As the climate crisis deepens and the need for meaningful action grows more urgent, municipalities such as the City of Santa Clara have prohibited interconnection of gas-powered fuel cells because "fuel cells use natural gas, a non-renewable energy source that continuously emit GHG when they generate power. As a result, their increased usage would run contrary to the clean energy goals set by the city and State."[46] Yet ARB staff propose going in the opposite direction, using a flawed and incomplete methodology to calculate a Fuel Cell GHG Standard that enables the substantial public subsidy of inefficient and GHG-intensive fuel cell projects. We urge its rejection by the Board. (Earth-NRDC-Sierra-Union-Vote)

Comment:
It is inconceivable that CARB would endorse subsidizing customers to make long-lived investments in natural gas generation (in place of IOU/CCA-provided electricity subject to

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[46] City of Santa Clara, *Silicon Valley Power Advances Commitment to Renewables* (May 9, 2019), http://santaclaraca.gov/Home/Components/News/News/38964/ (emphasis added); City of Santa Clara Resolution No. 19-8701 at 2 (May 7, 2019) (limiting "the interconnection of Parallel Generation to facilities meeting the state criteria for renewable electrical generation facilities for the purpose of limiting greenhouse gas emissions in the City"), https://santaclara.legistar.com/LegislationDetail.aspx?ID=3936721&GUID=54E8FC8C-CE96-4231-A280-479191255D80. In response to the City's efforts to take this necessary action to meet its clean energy goals, Bloom Energy, a primary beneficiary of the $100 million in public subsidy under Fuel Cell NEM, filed a lawsuit. https://www.mercurynews.com/2019/06/13/bloom-energy-sues-santa-clara-for-undermining-its-technology/.

RPS and SB 100) that is significantly dirtier than the grid on average and even dirtier than prevailing market-based gas generation technologies (i.e., combined-cycle gas turbines). (Lingbloom/Friedman-etal)

Agency Response:
The commenters indicate that the proposed fuel cell NEM GHG emission standards will result in subsidies and increased reliance on fossil fuels, as well as increased pollution, both of which are inconsistent with State policies.

The Fuel Cell NEM Program was established by the Legislature in 2003 and has been extended and expanded over the years, most recently by AB 1637 in 2016. The Fuel Cell NEM Program is a voluntary tariff, administered by the CPUC, that allows fuel cell customer generators to avoid some non-bypassable charges. AB 1637 directed CARB to develop a GHG standard for the Fuel Cell NEM Program. CARB is following the requirements laid out in statute, and otherwise is not connected to the Fuel Cell NEM Program.

In terms of continued use of natural gas, the CPUC-administered Fuel Cell NEM Program allows for the use of natural gas, and CARB does not have statutory direction to set a Fuel Cell NEM GHG standard that would exclude fuel cells that use natural gas. However, the annual reductions in the fuel cell NEM GHG emission standards, as set in this Regulation, mean that fuel cell electrical generating facilities must decrease their GHG emissions over time in order to meet the declining standards and continue receiving benefits from the tariff. The required decrease in GHG emissions is counter to the expectation that, over time, degradation of the fuel cell stacks occur, causing efficiency declines and increased GHG emissions. The implication is that, as the fuel cell NEM GHG emission standard declines at the same time the fuel cell is becoming less efficient, over time the fuel cell will need to improve efficiency or supplement with eligible biofuel to continue receiving fuel cell NEM benefits. This drive towards greater efficiency or a switch to eligible biofuels is aligned with the goals outlined in the 2017 Scoping Plan Update.

CARB staff's Regulation complies with legislative direction in AB 1637 and assures emission reductions by declining every year in line with other State GHG emissions reduction policies. The 2017 through 2020 standards have a 2.5 percent annual reduction in line with 2030 electricity-sector IRP GHG emission targets set pursuant to SB 350 and taking into consideration the updated the RPS target set by SB 100. For years 2021 and beyond, the annual reduction is 13.4 kg CO_2e/MWh, which is based on the GHG emissions reduction goals of SB 32.

One commenter references a statement made in the Staff Report that the proposed Regulation "is not anticipated to have a direct emission reductions." This statement was made because the Regulation only sets GHG emission standards, and emissions reductions will not occur until CPUC's implementation of the Fuel Cell NEM Program. However, in terms of impacts to local air quality (including in

environmental justice communities), fuel cells, which utilize but do not combust natural gas, have the potential to reduce significantly criteria pollutants, which is a critical priority in the State. Per the U.S. Department of Energy's 2015 Quadrennial Technology Review Technology Assessments (Chapter 4),[47] fuel cells with combined heating and power (CHP) technology emit about 75 percent to 90 percent less nitrogen oxides (NOx) and about 75 percent to 80 percent less particulate matter than other CHP technologies on a life-cycle basis. Fuel cells have the potential to provide a benefit for air quality relative to even the "cleanest" natural gas generator that utilizes combustion. CARB staff estimated that generating electricity from 500 MW of fuel cells can result in up to 200,000 pounds of avoided NOx emissions per year when compared to the cleanest natural gas-combustion generator; air quality benefits would increase even further if the fuel cell were to replace dirtier electricity generators.

Finally, a commenter argues that the Fuel Cell NEM Program diverts money from zero emission projects. In terms of zero-emission projects, the Fuel Cell NEM Program applies to fuel cells that use natural gas, so to consider other technologies is outside the scope of the Program and the directive given to CARB in AB 1637.

C-5. Standards Should Take Into Account Combined Heat and Power (CHP), Should Not Decline, and Should Not Be Applied Annually

Comment:
Assembly Bill 1637 (Low, 2016), which became effective January 1, 2017, extended the CPUC's fuel cell net energy metering (NEM) tariff through 2021. The NEM program was designed to continue market growth and encourage the deployment of on-site fuel cell electrical generation and enable microgrid applications that improve grid reliability while ensuring that fuel cells continue to contribute to the reduction in greenhouse gas (GHG) emissions, the reduction of NOx, SOx and pollutants, and attainment of Air Resource Board's (ARB) Distributed Generation Certification Program requirements for criteria pollutants.

Fuel cells have played and can continue to play an important role in helping California achieve its ambitious GHG and criteria pollutant reduction goals while keeping reliable baseload power connected to the California electric grid. Recent power interruptions in California have wreaked havoc on businesses and residents, costing millions of dollars. Multiple articles and news reports have focused on microgrids that kept the power on when the grid was shut down, and two of the four microgrid installations highlighted in one article are powered by FuelCell Energy fuel cells.[48] Onsite generation and microgrid

[47] The Quadrennial Technology Review can be found at: https://www.energy.gov/sites/prod/files/2015/12/f27/QTR2015-4Q-Stationary-Fuel-Cells.pdf

[48] See It's Dark in California but the Message is Clear: More Microgrids Neededhttps://microgridknowledge.com/microgrids-california-power-outages/ , which spotlights FCE's installations at The University of California San Diego and the Santa Rita Jail.

applications significantly reduce the risk and devastation associated with high voltage power lines across California. Enabling deployment of fuel cells through the NEM tariff will not only keep the lights on, but will also benefit disadvantaged communities where both criteria air pollutants and GHG emissions are highest, as compact urban sites with high energy intensity loads are the perfect profile for fuel cell applications.

The NEM tariff applies to on-site, behind the meter installations. For these types of installations at universities, hospitals, industrial facilities and wastewater treatment plants, FuelCell Energy (FCE) deploys its combined heat and power (CHP) or cogeneration system for the highest overall efficiency and greatest emissions reductions. FuelCell Energy installations also provide the service assurance California residents depend on from hospitals, universities, waste water treatment plants and industrial facilities that contribute to stable employment across California.

The CHP feature of the FCE systems enable GHG reductions 24/7 from energy intensive thermal systems, i.e. industry boilers, by displacing natural gas usage. The combination of reducing GHG's and clean air emissions make FuelCell Energy systems a good fit for improving a site's environmental footprint, especially in disadvantaged communities with high polluting facilities operating 24/7. Improving the environmental footprint of these "high polluting facilities" is essential to these communities as they offer high paying employment opportunities for thousands of Californians.

However, the standard being proffered by the ARB will stifle fuel cell deployment and make financing fuel cell installations practically impossible, thus negatively impacting California's clean energy goals. Fuel cell efficiency varies over the life of a project, declining slightly over years of operation and returning to the original level when stacks are refurbished. The annual declining standard could result in a fuel cell project that meets the standard the first year of installation, falling out of the standard as the standard gets stricter. As most fuel cell projects have a 20 year life, it is impractical to think that any financier will finance such a project knowing (1) that the project will be unable to meet the standard in later years and (2) when the standard has only been issued for the first three years, and it is anybody's guess what the standard will be in the future. This will certainly chill investment in clean and energy and fuel cell projects, and make it more difficult for California to achieve its broader clean energy goals.

The standard as promulgated directly threatens two critical fuel cell projects for FCE - one of which is in construction (5.0MW Bolthouse Farms CHP project in Bakersfield) and one of which is commercially operable (2.8MW Tulare CHP project) - that have interconnected under the NEM tariff. These projects were contracted for, construction commenced and the Tulare CHP project completed in good faith on the practical assumption that the standard would not be designed to exclude the vast majority of fuel cells from participation under the NEM tariff. Implementation of a standard that will terminate these projects from the NEM will lead to severe economic consequences for offtakers and financiers, and will have the likely unintended consequence of discouraging investment in California clean energy projects. In addition to simply being impracticable, FCE submits that the standard proffered by ARB fails inasmuch as it does not account for heat recovery in fuel cell systems and

employs a marginal emission rate that does not fairly compare fuel cell emissions to the generation being displaced by fuel cells, namely IOU cogeneration systems, thermal plants and diesel generators. Ample data supports FCE's position that fuel cells are far cleaner than the generation systems they displace.

While fuel cells may offer lower emissions reductions per rated kW compared to pure renewables, the 24x7 operation of fuel cell systems means they typically avoid more emissions than intermittent renewables, and they provide reliable capacity that is ready to serve during grid outages.

- Statutes and investor owned utility (IOU) tariffs include CHP systems with the published tariffs including heat recovery equipment in the fuel cell definition.
- Comparison to cogeneration systems under contract to IOUs is more appropriate emissions standard, especially since the IOU cogeneration systems are meeting their GHG reduction goals.
- CEC data and staff reports prove that thermal plant heat rates are increasing year over year, and this increase must be included in the emissions standard.
- FCE plants greatly reduce GHG emissions and criteria pollutants, when compared to combustion power plants and diesels.
- FCE plants have a minimal environmental footprint. The compact design, simple maintenance, low sound and ultra-low emissions deliver direct benefits the local community. FuelCell Energy's fuel cell plants are 95% recycled and placed right back into the supply chain fully delivering on the circular economy.

SCE, PG&E, SDG&E (IOU's) Fuel Cell NEM Tariff Definitions Include Heat Recovery Equipment

Each of the IOUs' Fuel Cell NEM tariffs includes a specific definition that recognizes CHP (emphasis added): an "*Eligible Fuel Cell Electrical Generating Facility: A Generating Facility used to produce electricity by a fuel cell, that meets all applicable safety and performance standards in accordance with the Utility's Electric Rule 21 and pursuant to PU Code Section 2827.10 includes*

1) *an integrated power plant system containing a stack, tubular array, or other functionally similar configuration used to electrochemically convert fuel to electric energy;*
2) *an inverter and fuel processing system where necessary, and*
3) *other plant equipment, including heat recovery equipment necessary to support the plant's operation or its energy conversion."*

The FCE systems meet this definition and "include[s] heat recovery equipment". Since the FCE CHP feature is required for the behind the meter site integration and energy conversion, the CHP aspect of the fuel cell systems (as applicable) must be included in the emissions standard.

FCE believes this can be accomplished by using the State Average Heat Rate when fuel cell systems are sited with their "included heat recovery equipment necessary to support plant's operation of its energy conversion".

FCE proposes that a separate table in the CARB regulation establishing a CHP system emissions standard and recognizing the benefits of CHP be included.

Comparison of FCE CHP Systems to Reported Cogeneration Heat Rate in CEC's Thermal Efficiency of Gas-Fired Generation in California: 2018 update (CEC 2018)
As discussed above, the CHP feature of the FCE systems is included in the already published tariffs. FCE believes that CHP must be taken into consideration as part of this proposed regulation to fully comply with the definitions and the already established tariff. The proper GHG comparison is the FCE CHP system heat rate and the reported Cogeneration heat rate (CEC Thermal Efficiency report as referenced in the CARB Staff ISOR;
https://ww2.energy.ca.gov/almanac/electricity_data/Thermal_Efficiency_reports.html)

The CEC's Thermal Efficiency Report Table 1, page 5 lists the 2017 Cogeneration heat rate as 11,929 Btu/kWh (11.9 MMBtu/MWh). The reported Cogeneration heat rate has increased over 1% per year (4% total) between 2014 through 2017.

The Table 1 below includes the CEC Thermal Efficiency Report heat rates and calculated year over year increases. The CEC data based Cogeneration Heat Rate is increasing each year. This increase should be accounted in FCE's request to compare fuel cell CHP directly to Cogeneration Heat Rates in the regulation.

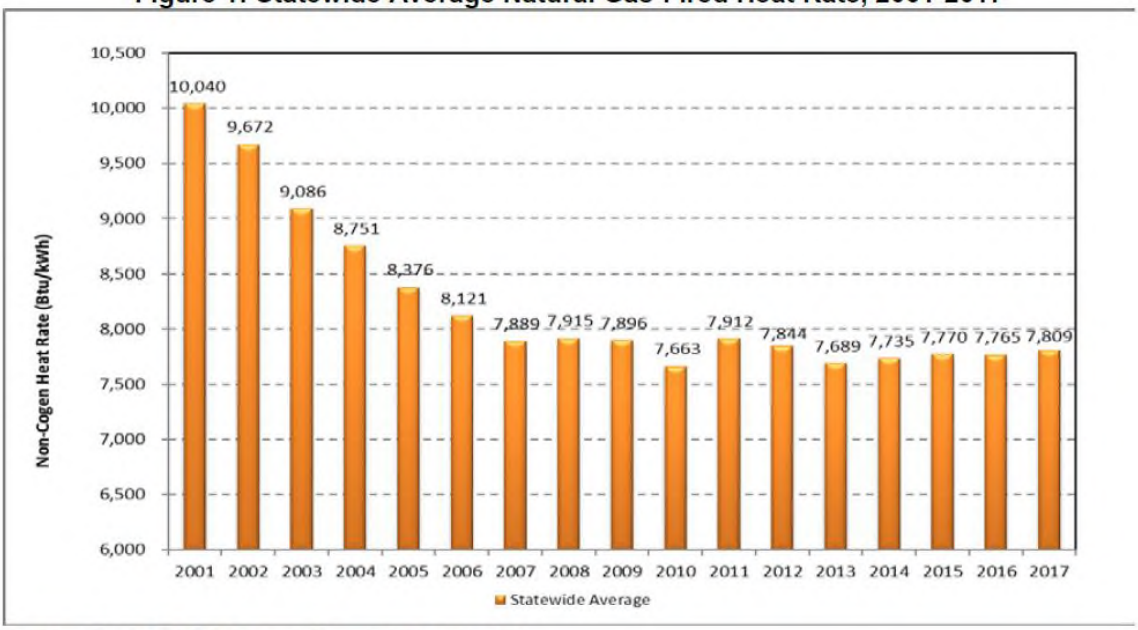
Table 1: **CEC Reported Cogeneration, State Average Heat Rate (with & without cogeneration)**

	Cogeneration		State Average		State Average w/o Cogen	
	Heat Rate Btu/kWh	Year over Year % Increase	Heat Rate Btu/kWh	Year over Year % Increase	Heat Rate Btu/kWh	Year over Year % Increase
2014	11,445	N/A	8,552	N/A	7,735	N/A
2015	11,461	0.14%	8,557	0.06%	7,770	0.45%
2016	11,621	1.40%	8,683	1.47%	7,765	-0.06%
2017	11,929	2.65%	8,817	1.54%	7,809	0.57%

The state also has reported data on the GHG reductions attributed to Cogeneration. PG&E, SCE and SDG&E completed their procurement of 3000 MW of CHP capacity in 2018 as required by the QF/CHP settlement (https://www.cpuc.ca.gov/General.aspx?id=5432). The program as reported by the IOUs has achieved approximately 93% of the targeted GHG reductions. These reductions have been achieved with heat rates significantly higher than FCE system heat rates.

Expected Increase in Combined Cycle Heat Rates Due to Operations Integrating Renewables
The CEC Thermal Efficiency Report (Page 3) shows the trend for the non-cogeneration heat rate (Btu/kWh). "Figure 1" below is copied and pasted from the CEC report.

Figure 1: Statewide Average Natural Gas-Fired Heat Rate, 2001-2017



Source: QFER CEC-1304 Power Plant Data Reporting

"*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).

As renewables integration continues, natural gas power plant cycling will continue to degrade the heat rate (i.e., increase heat rate). This fact from the CEC staff report proves that the natural gas heat rate will not decrease year to year as assumed by the ARB declining standard, but rather increase. Thus a declining standard is not an

accurate representation of the real operation of thermal power plants, even to more efficient combined-cycle plants.

A simple way to fix this fundamental flaw and ensure California grid reliability would be to provide that a fuel cell installation that meets the required standard for its first year of commercial operation is eligible under NEM for the duration of the life of the plant.

Extension of Aging Power Plants for Reliability
The operation and renewables integration on the California grid is an on-going process. The recent proposed decision by the CPUC, proposes to keep these "Aging Power Plants" online to support the grid as more renewables are integrated. (CPUC Rulemaking 16-02-007; DECISION REQUIRING ELECTRIC SYSTEM RELIABILITY PROCUREMENT FOR 2021-2023; http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M319/K349/319349071.PDF)

FCE assumes these plants are in the "Aging" category since the plants listed in the Table 2 below are once-through cooling (OTC) and have scheduled retirement dates of December 31, 2020.

Table 2: OTC Power Plants from CPUC Proposed Decision November 2019

Gas Generation Station	Unit(s)	Power Plant Type	Extension	Approx. Capacity	CEC Reported net MWh	CEC Reported Fuel Use MMBTU	Calculated Heat Rate (Btu/kWh)
Alamitos	3, 4, 5	Steam Turbine	up to 3 years	1,200 MW	686,924	8,629,270	12,562
Huntington Beach	2	Steam Turbine	up to 3 years	200 MW	132,445	1,520,210	11,478
Redondo Beach	5, 6, 8	Steam Turbine	up to 2 years	850 MW	180,635.1	2,522,270	13,963
Ormond Beach	1, 2	Steam Turbine	up to 1 year	1,500 MW	186,016.1	2,218,100	11,924
Moss Landing	1, 2	Combine Cycle	temporary extension	1,020 MW	4,183,625	29,433,380	7,035

Note: Moss Landing is included for completeness even though it is a combined-cycle plant, thus its CEC heat rate category would be Combined-Cycle, not Aging.

These Aging power plants have capacity of 3,750 MW and an average heat rate of 12,482 Btu/kWh using 2018 Operating Year CEC published data. The 2018 average heat rate for the Alamitos, Huntington Beach, Redondo Beach, and Ormond Beach plants are about 4% higher than their 2017 combined average heat rate of 12,104 Btu/kWh using CEC published data for those same plants.

With the potential extension through 2023, the Aging plants will have higher heat rates each year. Again, this supports the CEC staff finding that thermal plant heat rates will

increase due to cycling to integrate renewables. This data for Combined Cycle and Aging plants supports FCE's position that the FC NEM standard should be at least a level standard or even increasing, but certainly not declining.

NOx Reductions Compared to CA ISO (EGRID 2016) and Diesel Generators (PSPS events)

FCE systems are able to help disadvantaged communities with air quality, especially those which struggle with air pollution from local industrial facilities. As noted above, FCE's fuel cell systems are able to run connected to the grid and then can transition to grid independent operation during a grid outage (i.e., Public Safety Power Shutoff (PSPS) event). NOx emissions are near zero in both grid connected and grid independent modes and are much cleaner than the reported utility grid NOx and diesel generators deployed during PSPS events. FCE will enable these industrial facilities to continue their operations, meet California's air standards and continue to provide high paying employment opportunities for thousands in the California communities in which they operate.

Table 3 below compares the FCE NOx emissions factors to the US EPA eGRID 2016 data. (https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid)

Table 3: NOx Emissions Factors and FCE Project Reductions: CA ISO Grid and FCE Systems

	NOx Emissions Factor lb/MWh	Annual NOx Emissions 1.4 MW Project Tons per Year	Annual NOx Emissions 2.8 MW Project Tons per Year
eGRID 2016 for CA ISO	0.500	2.8	5.5
FCE	0.01	0.1	0.1
Annual NOx Avoided by FCE Project (Individual 1.4 MW and 2.8 MW projects)		2.7	5.4
Total NOx Avoided by FCE 20 year Project		54	108

Table 4 below the Diesel Generator and FCE Emissions Factors. The Diesel Generator emissions factor is the averaged emissions factor from the South Coast AQMD certified emergency generator list.

The South Coast AQMD has certified certain models/families of equipment as meeting all applicable air quality requirements and have issued permits to the dealer/distributor of these engines. A list of dealers/distributors that are participating in this program is available on South Coast AQMD's website. (http://www.aqmd.gov/home/permits/emergency-generators#Fact1). FCE's fuel cells are markedly cleaner than all of these providers.

Table 4: Diesel Generator and FCE Emission Factors

	Diesel Generator and FCE Emissions Factors		
	NOx lb/MWh	PM lb/MWh	CO2 lb/MWh

Tier 2 Diesel	11.623	0.265	1614*
Tier 3 Diesel	7.935	0.284	1614
FCE System	0.01	0.00002	725**

*Calculated from average diesel generator fuel consumption of 0.072 gallons/kWh

**Assumes FCE CHP system

Table 5 and Table 6 below summarize the emissions reductions (emissions avoidance) during a 48 hour PSPS event where the FCE system switches from grid connected to grid independent operation to maintain the critical facility operation, displacing the need for a much dirtier generator.

Table 5: Emissions Comparison for 1.4 MW Project Operating During PSPS Event

	Emissions for 1.4 MW supplied during 48 hours grid outage		
	NOx lbs	PM lbs	CO2 lbs
Tier 2 Diesel	781	18	108,480
Tier 3 Diesel	533	19	108,480
FCE System	0.67	0.001	48,720*
FCE Reduction	99.90%	99.99%	55%

*pipeline natural gas supplied. Biogas or Biomethane fuel supply would result in higher offset of CO2 emissions.

Table 6: Emissions Comparison for 2.8 MW Project Operating During PSPS Event

	Emissions for 2.8 MW supplied during 48 hours grid outage		
	NOx lbs	PM lbs	CO2 lbs
Tier 2 Diesel	1562	36	216,961
Tier 3 Diesel	1066	38	216,961
FCE System	1.34	0.003	97,440*
FCE Reduction	99.90%	99.99%	55%

*pipeline natural gas supplied. Biogas or Biomethane fuel supply would result in higher offset of CO2 emissions.

FCE calculations use an individual site (1.4 MW or 2.8 MW) for this analysis. Greater emissions savings/avoidance would be achieved with higher MWs of FCE systems deployed.

These emissions reductions are permanent and naturally achieved with the FCE clean electro-chemical power plant. Yet, despite the clear benefit to emissions reductions from fuel cells, the standard proffered by ARB fails to take these points into consideration.

Conclusion

FuelCell Energy has been a participant for many years in California's clean energy programs and has made meaningful contributions to California's emissions reduction goals. However, the standard proffered by ARB threatens continued participation in the California market by clean, reliable base load fuel cells and will result in the continued proliferation of

other forms of CHP, to the detriment of the very clean energy goals California is trying to obtain. FCE respectfully suggests that the ARB once again revisit its methodology, taking into consideration the above comments. Absent a revisiting of the standard, FCE respectfully suggests that the standard be set at the appropriate level recommended by ARB and that a fuel cell project meeting the standard at the time of installation be deemed qualified for NEM for the duration of the project in order to provide the certainty needed for planning and financing.

FCE has two critical fuel cell projects, Bolthouse Farms CHP project in Bakersfield and Tulare CHP project in Tulare, that have interconnected under the NEM tariff These projects, based on the above comments, provide emissions reduction and improved air quality, especially for the local disadvantaged communities. FCE respectfully suggests that projects interconnected under the NEM tariff before the establishment of the GHG standards should be grandfathered. Grandfathering fuel cell NEM projects installed before the standard is fair, and it will ensure continued progress toward these important emission reductions, protect investment and encourage further local clean energy project investment. FCE believes revisiting the standard is also critical to ensuring California continues to have robust industrial manufacturing, reliable continuous power and less reliance on imported power via high voltage power lines. (FC Energy)

Agency Response:
The commenter states that a declining fuel cell NEM standard will prevent fuel cells from being installed and is not representative of electricity sector GHG emission rates, including thermal power plants and efficient combined-cycle gas turbines. The commenter notes that thermal plant heat rates are increasing and therefore so should the fuel cell NEM GHG emission standards. AB 1637 directs CARB to develop fuel cell NEM GHG emission standards that reduce "greenhouse gas emissions compared to the electrical grid resources, including renewable resources, that the fuel cell electrical generation resource displaces, accounting for both procurement and operation of the electrical grid." AB 1637 does not mandate that the GHG emission standards reflect the rates of specific generators. CARB staff determined the electrical grid resource most likely to be displaced by fuel cells is the marginal generator, which for 2017 was natural gas power plants more than 98 percent of the time, and renewable power plants the rest of the time. With respect to the suggestion that the emission standards should increase over time, during the Board Hearing, the Board directed staff to evaluate steeper decline rates than the 2.5 percent proposed in the 45-day Public Notice. Therefore, the possibility of annually increasing, rather than decreasing, the GHG emission standards was not evaluated. If heat rates do increase in the future, this will be reflected in the heat rate values that will be used every three years to update the standards. The requirement that the fuel cell NEM GHG emission standards cannot increase as a result of each three-year update will ensure that fuel cells are encouraged to be more efficient, in line with State electricity and GHG policies.

The initial fuel cell NEM GHG emission standard meets the AB 1637 requirement that the GHG emission standards represent a reduction relative to the resource that

is displaced, and the annual decrease in the standards aligns with the State's legislatively mandated State and electricity sector GHG emissions reduction goals. CARB staff set a standard that meets legislative requirements, and AB 1637 does not require that the standard be an "accurate representation of the real operation of thermal power plants." Rather, the standard is intended to *reduce GHG emissions* relative to the average marginal generator in the State.

The commenter states that setting a declining standard will prevent the installation of fuel cells since, over time, fuel cells installed in the field will not be able to meet the standards. CARB has developed declining annual GHG emission standards (that are required to receive the FC NEM tariff) in compliance with AB 1637 and Board direction. While the ability of individual fuel cell installations to meet the GHG emission standards is outside the scope of the Regulation, staff note that any fuel cell should be able to meet the standard by utilizing biogas or biomethane.

The commenter suggests that the GHG emission standards should take into account the amount of waste heat that is captured from some fuel cells and utilized in CHP technologies, referencing statutes and IOU tariffs include CHP systems, and stating that comparison to cogenerations is a more appropriate emission standard reference. Section 2827.10 of the Public Utilities Code limits CARB's role to adopting fuel cell NEM GHG emission standards, and that those standards must be set relative to electricity. The statute does not provide for CARB to take any further role in the Fuel Cell NEM Program. Under Section 2827.10 of the Public Utilities Code, CPUC must apply the GHG emission standards annually to determine eligibility of fuel cell electrical generation resources to participate in the Fuel Cell NEM Program. Further, AB 1637 directs CARB to set GHG emission standards relative to the "electrical grid resources…that the fuel cell electrical generation resource displaces" and so consideration of emissions associated with thermal generation within the emission factor itself would not comply with AB 1637.

CPUC will engage in its own process to determine which fuel cell technology meets the GHG emission standards, including accounting determinations (*e.g.,* what, if any, consideration to provide to fuel cells that utilize CHP). Both agencies recognize that CHP can increase energy efficiency and reduce GHG emissions relative to separately using grid electricity and a natural gas boiler. As noted in the Staff Report, per CARB and CPUC staff discussions, CARB staff understands that CPUC staff will consider the GHG emissions reducing benefits of CHP.

The commenter also suggests that the GHG emission standards should not be assessed annually, that a fuel cell should only have to qualify for the GHG emission standards once for the entire life of the fuel cell, and that existing fuel cells should continue to receive the FC NEM tariff regardless of the GHG standard. AB 1637 directs CARB to "establish a schedule of annual GHG reduction standards" for the FC NEM Program, and does not give CARB authority to exclude existing fuel cell installations from those standards. Under Section 2827.10 of the Public Utilities Code, CPUC must apply the GHG emission standards annually to determine

eligibility of fuel cell electrical generation resources to participate in the Fuel Cell NEM Program. The Fuel Cell NEM Program annual assessment is mandated in statute and performed by another agency, so it is out of the scope of this Regulation. Further, AB 1637 does not give CARB any role in determining fuel cell installations' compliance with the Fuel Cell NEM Program. This role is within CPUC's purview.

The commenter also references the 20-year life of fuel cell projects and that projects won't get financing if it is not clear that they will be able to meet the standard in later years because the standard is only certain for the first three years. CARB has specified fuel cell standards for the years 2017 through 2022. Beyond that, CARB cannot specify the standards because AB 1637 requires that CARB update the standard every three years. As such, CARB has provided an equation that can be applied every three years to update the standard, in compliance with AB 1637 requirements. Because the equation and the inputs to the equation are publically available, it is possible to estimate maximum possible standards for future years. To the extent that fuel cell installations that qualify in the early years later would cease to qualify, they have the option of increasing their efficiency or using biogas to continue to meet the fuel cell NEM GHG emission standards.

Comment:
And I wanted to provide a little historical context for how we got here. The Self Generation Incentive Program began in the aftermath of 2000/2001 energy crisis, when we were trying to promote generation.

One of the things over time that ARB and we have worked on is to gradually strengthen and stiffen the requirements governing self-generation, so that we cannot have high emissions. We don't have diesel generators and we want to push the standards forward.

I think what's important about this rule, however, and it's especially important, given the behavior and actions of the Public Utilities Commission, is that I'm here to tell you I have some -- with some background and analysis that the grid is not as clean as some folks think it is. And in fact, there's some evidence it's going the other direction.

The Public Utilities Commission failed to anticipate for some reason the retirement of the once-through cooling plants. And so now, we're seeing an application to extend the deadline. And those coastal boilers are not natural gas combined cycles. They're not clean peakers. They're very, very dirty.

And so I think what's on the margin, given where we're headed, we're likely to see the margin be getting dirtier in the next few years.

Secondly, there's other things that are counterintuitive going on with some of these incentive programs. The PUC had a study done of the SGIP program and found that the battery storage systems that were being installed under the incentive, and over time SGIP has migrated away from fuel cells to battery storage as getting most of the money.

But it turns out the way these batteries were being deployed had more to do with saving the customers money than saving greenhouse gases emissions. And, in fact, some of these projects are increasing greenhouse gas emissions. So what we know about fuel cells is that they're steady state, that they run all the time, and they have zero criteria emissions. And the danger that this delay has caused…

So we've had three years of uncertainty overlaying this program and it's been very difficult for people to sell units not knowing what these standards were going to be. So we're glad to get this done….

But I would urge you to use this experience and conversation we've had today to stay on top of what's actually happening on the grid. You know, we want to see what the actual emissions are not what the model says, okay? Because in the case of the integrated resource plan reference plan at the PUC, the actual emissions were higher than the assumed emissions in the model, because the power plants are running differently.

The other thing, in 2030, we actually have an increase in criteria pollutants. So I would urge the staff to stay on this issue, keep working it, and understand how clean is the grid and how do we make it cleaner. (CEERT)

Agency Response:
The commenter states that the GHG emission rate of the marginal generator is higher than what is proposed in the regulation and will be increasing in the future.

AB 1637 directs CARB to develop fuel cell NEM GHG emission standards that reduce "greenhouse gas emissions compared to the electrical grid resources, including renewable resources, that the fuel cell electrical generation resource displaces, accounting for both procurement and operation of the electrical grid." CARB staff used actual data on the operation of California's electrical grid in the development of the GHG emission standards. The data indicate that, for 2017, natural gas power plants are the marginal generator more than 98 percent of the time, and renewable power plants are the marginal generator the rest of the time. Natural gas power plants in California are a mix of the less efficient so-called "peaker plants" with an average 2017 emission rate of 560 $kgCO_2e/MWh$, as well as the more efficient combined cycle plants, as mentioned in the comment. For 2017, the average marginal GHG emission rate for all natural gas plants in California was 414 $kgCO_2e/MWh$. This represents emission rates of both peaker plants and the more efficient natural gas combined cycle power plants, weighted by the number of hours each operates. The proposed 2017 fuel cell NEM GHG standard takes into account the amount of time that natural gas generators and renewable generators were on the margin in 2017, and the calculated standard is 409 $kgCO_2e/MWh$.

AB 1637 also directs that CARB "shall update the schedule every three years with applicable standards for each intervening year." The Regulation specifies a methodology by which the GHG emission standards will be updated, using the

latest State data, every three years starting in 2022. The Regulation specifies a day in November (second Monday of November) to 1) maximize the chance that the most recently available data that is used in the update is from reports published in the same year that the update is occurring, and 2) balance this with providing enough advance notice of what the standard will be in the following year (e.g., the 2022 update sets the 2023 GHG emission standard). Through this provision, CARB staff have developed a rigorous system of updates that will rely on the most recently available data and will therefore reflect the operation of the grid on an on-going basis. Therefore, if emissions levels do increase in the future, this will be reflected in the data that will be used every three years to update the standards. The requirement that the fuel cell NEM GHG emission standards cannot increase as a result of each three-year update will ensure that fuel cells are encouraged to be more efficient, in line with State electricity and GHG policies.

Finally, commenter references a delay in the issuance of the standards. CARB staff has been working since 2017 to meet the legislative direction in AB 1637 to develop fuel cell NEM GHG emission standards. This informal process to solicit public input on the methodology lasted from May 2017 through July 2019, during which time CARB staff held a working group meeting and three workshops, and proposed four possible methods for calculating the emission standards.[49] While one result of this extensive process was that the issuance of the Regulation was delayed, CARB staff views this extensive process as necessary to develop an adequate public record and give necessary time to the examination of the highly varying perspectives and feedback received from stakeholders.

C-6. Miscellaneous Opposition to the Proposed Regulation

C-6.1 Comment:
I think there's still some things you might want to look at, including counting the heat that's displaced and not just the electricity, which is an issue for some of the technologies. (CEERT)

Agency Response:
The commenter suggests that the GHG emission standards do not take into account the amount of waste heat that is captured from some fuel cells and utilized in another process (a process called combined heat and power (CHP)). This commenter also suggests that the applicable fuel cell NEM standard for the year that the fuel cell is installed should remain the fuel cell's standard for the life of the fuel cell.

The commenter suggests that the GHG emission standards should take into account the amount of waste heat that is captured from some fuel cells and utilized in CHP technologies, referencing statutes and IOU tariffs include CHP systems, and stating that comparison to cogenerations is a more appropriate emission standard reference. Section 2827.10 of the Public Utilities Code limits CARB's role to

[49] See Section X.I. for a description of the public process that preceded this rulemaking.

adopting fuel cell NEM GHG emission standards, and that those standards must be set relative to electricity. The statute does not provide for CARB to take any further role in the Fuel Cell NEM Program. Under Section 2827.10 of the Public Utilities Code, CPUC must apply the GHG emission standards annually to determine eligibility of fuel cell electrical generation resources to participate in the Fuel Cell NEM Program. Further, AB 1637 directs CARB to set GHG emission standards relative to the "electrical grid resources…that the fuel cell electrical generation resource displaces" and so consideration of emissions associated with thermal generation within the emission factor itself would not comply with AB 1637.

CPUC will engage in its own process to determine which fuel cell technology meets the GHG emission standards, including accounting determinations (*e.g.,* what, if any, consideration to provide to fuel cells that utilize CHP). Both agencies recognize that CHP can increase energy efficiency and reduce GHG emissions relative to separately using grid electricity and a natural gas boiler. As noted in the Staff Report, per CARB and CPUC staff discussions, CARB staff understands that CPUC staff will consider the GHG emissions reducing benefits of CHP.

C-6.2. Comment:
Limited Biomethane Supplies Should Not Be Squandered on Stationary Fuel Cells.

The Initial Statement of Reasons' claim that the proposed Fuel Cell GHG Standard will facilitate the switch to biofuels is fundamentally misplaced.[50] Fuel cells operating off renewable fuel already qualify for the more generous incentives under the existing NEM program (as opposed to FC-NEM) and for incentives under SGIP. Accordingly, a declining GHG threshold under the FC-NEM program in no way functions to incentivize increased use of renewable gas.[51] Moreover, the *potential* supply of biomethane represents less than four percent of total gas demand in California.[52]

Limited biogas supplies should be directed at existing difficult to electrify applications rather than to incentivize new, gas-dependent stationary power sources to meet building energy demands that could otherwise be served by an increasingly decarbonized grid. (Earth-NRDC-Sierra-Union-Vote)

Agency Response:
The commenters state that fuel cell customer-generators using biofuel will qualify for NEM incentives available through the SGIP Program that are substantially

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[50] Initial Statement of Reasons at 14.
[51] Pub. Util. Code, § 2827(b)(11); Pub. Resources Code, § 25741.
[52] *Compare* Amy M. Jaffe *et al., The Feasibility of Renewable Natural Gas as a Large-Scale, Low Carbon Substitute*, STEPS Program, Institute of Transportation Studies, UC Davis, at ix (2016), https://ww3.arb.ca.gov/research/apr/past/13-307.pdf (finding 82 bcf/y of biomethane sources "attractive for private investment," after accounting for substantial state and federal incentives) with U.S. Energy Information Administration, *Natural Gas Consumption by End Use* (Release Date: June 28, 2019), https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_SCA_a.htm (California gas use in 2017 over 2,110 bcf/y).

higher than the Fuel Cell NEM Program. The fuel cell customer-generator would then choose to participate in SGIP over the Fuel Cell NEM Program and that CARB should not imply that the standards will incentivize increased use of renewable gas.

Staff clarifies that the referenced Staff Report coverage of biofuel is simply stating a potential outcome of the proposed GHG emission standards. The fact that the fuel cell NEM emission standards reduce over time, combined with the AB 1637 requirement that the CPUC assess Fuel Cell NEM Program eligibility annually, means that fuel cell electrical general resources must decrease GHG emissions over time to continue to receive Fuel Cell NEM Program benefits, and that this can occur either through increasing efficiency or through switching to eligible biofuels.

The comment expresses concern that biogas supplies will be directed away from "difficult to electrify applications" The proposed Regulation sets fuel cell NEM GHG emission standards per the requirements in AB 1637; it does not specify biogas use or otherwise dictate where biogas would be used in the State.

C-6.3. Comment:
As detailed in the appendix, the Staff proposal contains omissions, overly conservative assumptions and methodological flaws that collectively function to inflate the proposed Fuel Cell GHG Standard significantly. These include…1) failure to account for additional methane leakage resulting from fuel cells' location behind the meter;…

The Proposed GHG Fuel Cell Standard Fails to Account for Additional Methane Leakage Resulting from Deployment.

Unlike centralized gas generation which is typically connected to the gas transmission system, fuel cells subsidized under the Fuel Cell NEM program are located behind a customer's meter and connected to the gas distribution system. This means that additional methane leakage will occur as methane moves through the gas distribution system, behind a customer's meter, and to the fuel cell. In comments on the Discussion Draft, we provided ARB Staff with a methodology using ARB's own leakage estimates to account for this additional GHG impact.[53] Yet the proposed Fuel Cell GHG Standard continues to ignore this concern.

A joint analysis by ARB and the PUC on natural gas leakage estimates the leakage rate of the distribution system at 0.14%[54]. Using a 20-year global warming potential ("GWP")

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[53] Appendix B: Staff Report: Initial Statement of Reasons, Public Process for Development of the Proposed Regulation at 146, *https://ww3.arb.ca.gov/regact/2019/fcnem19/isorappb.pdf*.
[54] 7 ARB & PUC, *Joint Staff Report-Analysis of the Utilities' June 15, 2018, Natural Gas Leak and Emission Reports* (Dec. 21, 2018), https://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Safety/Risk_Assessment/Methane_Leaks/2017%20NGLA%20Joint%20Report%2012-21-18.pdf. According to Table 2: Total Emissions by System Category, 2015-2017, in 2017, the volume of methane emissions from Distribution Mains &

for methane to properly reflect the urgency of the climate crisis, as ARB has used to justify past actions,[55] accounting for methane leakage reduces the GHG standard by approximately 18 kg CO2e/MWh GHG per year.[56] Accordingly, the proposed GHG Fuel Cell GHG Standard should be reduced by 18 kgCO2e/MWh to properly account for methane leakage…. (Earth-NRDC-Sierra-Union-Vote)

Comment:
And finally, it is not reasonable when, at multiple points, in developing this methodology, staff chose not to use other data-driven approaches that could have set a higher bar by … accounting for methane leakage in the distribution system….

[In response to a request from Board Member Takvorian for the commenter's view on whether the proposed GHG standard is less stringent than the SGIP standard:]

And there's also methane leakage for the distribution system. Given the fact that these are behind the meter again, they don't connect at the higher transmission level like gas plants. (NRDC)

Agency Response:
The commenters are suggesting that, because fuel cells are connected to the natural gas distribution pipeline system instead of the transmission pipeline system that connects to centralized generation like natural gas combined cycle plants, there is additional methane leakage that is not, and should be, accounted for in the proposed methodology. In the case that methane leakage were to be ascribed to fuel cells, it would occur only as a result of the operation of the fuel cell. Therefore, any consideration of methane leakage would fall under CPUC's discretion in

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Services was 1,420 MMscf, and the volume from Distribution Metering and Regulating ("M&R") Stations was 1,334 MMscf, equaling a total of 2,754 MMscf methane leaked from the distribution system. According to Table 5: System-wide Emissions – Throughput Categories, 2015-2017, total gas throughput in 2017 equaled 2,017,306 MMscf. Total distribution system leakage (2,754 MMscf) divided by total throughput (2,017,306 MMscf) equals the 2017 distribution system leakage rate: 0.00136, or 0.14%. This is a conservative estimate. Total distribution system leakage *and* Customer Meter leakage (1,656 MMscf in 2017, according to Table 2) equals to 4,410 MMscf. Divided by total throughput, the combined distribution and customer leakage rate is 0.00218 or 0.22%.

[55] *See, e.g.*, ARB, *Aliso Canyon Methane Leak Climate Impacts Mitigation Program* at 7 (Mar. 31, 2016) ("With this mitigation program, ARB uses the 20-year GWPs for SLCPs assigned by AR 5. These figures properly incorporate current scientific knowledge, underscore the influence of SLCPs as immediate climate-forcing agents, and emphasize the need for immediate action on climate change."), https://ww3.arb.ca.gov/research/aliso_canyon/arb_aliso_canyon_methane_leak_climate_impacts_mitigation_program.pdf?utm_medium=email&utm_source=govdelivery; https://www.arb.ca.gov/regact/2016/oilandgas2016/oilgasatt2.pdf at 8 (discussing cost per ton of CO2e reductions using 20-year methane GWP).

[56] The CO2e associated with leakage is calculated by assuming 0.14% of leakage per therm. The amount that would leak per MWh is calculated using the average gas heat content and heat rate of a combined cycle unit (EIA, 2017). The heat rate for a combined cycle unit is used to present a conservative estimate based on the most efficient gas-fired power plant technology. The formula used to arrive at the 18 kg CO2e/MWh of GHG pollution from methane leakage in the distribution system is: 0.230139 (kg CO2e/therm) * 76.71 (therms of gas used by combined cycle therm/Mwh). The assumptions supporting this calculation are attached.

developing the methodology for the annual evaluation to determine if the fuel cell meets the fuel cell NEM GHG emission standard. Another way to state this is that any such natural gas emissions that do not occur at the marginal generators should be considered as part of the fuel cell emissions, which is an implementation consideration for the CPUC, and not a component of this Regulation.

C-6.4. Comment:
As detailed in the appendix, the Staff proposal contains omissions, overly conservative assumptions and methodological flaws that collectively function to inflate the proposed Fuel Cell GHG Standard significantly. These include:…4) failure to account for the impact of these same resources on increasing renewable curtailment….

The Proposed GHG Fuel Cell Standard Fails to Account for the Impact of 500 MW of Baseload Fuel Cells on Renewable Curtailment and Foreclosures Any Future Consideration of this Impact

Fuel cells typically operate on a 24/7 baseload basis. This decreases grid flexibility and increases hours of renewable curtailment. Deployment of 500 MW of additional baseload resources envisioned under the Fuel Cell NEM program is not trivial. Yet the proposed Fuel Cell NEM Standard fails to account for this impact. This omission functions to further inflate the GHG standard. While it is currently difficult to determine how to measure the impact of additional baseload generation on renewable curtailment, methodologies to do so will likely develop in the future as our understanding of grid operations becomes more sophisticated. But because the proposed regulations lock-in the application of the same methodology through 2047, the proposed Fuel Cell GHG Standard makes it impossible to incorporate this important consideration in future updates. (Earth-NRDC-Sierra-Union-Vote)

Agency Response:
The commenter suggests that the proposed Regulation fails to account for the impact of fuel cell installations on increasing renewable curtailment, and therefore on GHG emissions of marginal generation. While curtailment is a recognized issue on California's electricity system (grid), renewables curtailment provides no clear indication of when renewable generators are on the margin. Curtailment of renewable electricity can occur due to any number of reasons, including lower than expected electricity demand and constraints in the transmission system. As such, curtailment hours were not considered and CARB staff instead uses a methodology that represents the number of hours in the year when renewables were clearly on the margin (i.e., day-ahead market prices are $0 or less).

The commenter also suggests that it is problematic that the Regulation extends through 2047, thus precluding the opportunity to improve the GHG emission standard calculation methodology. CARB staff is proposing a methodology that is based on a rigorous public process and data that is currently available regarding operation of the electricity system. If a better methodology for determining GHG

emissions of the marginal generator becomes available in the future, CARB could consider modifying the Regulation in response to that.

C-6.5. Comment:
100% FC renewables exist now. (Delgado)

Agency Response:
AB 1637 sets no requirements about the use of renewable fuels by fuel cells. However, because eligibility under CPUC's Fuel Cell NEM Program is based on meeting the GHG emission standards each year, and because fuel cells will experience expected and normal degradation in efficiency, and hence emissions performance, over time, in order to qualify CPUC's Fuel Cell NEM Program, GHG emissions from fuel cell electrical generation resources must also decrease over time, meaning they must get more efficient or switch to biofuels.

C-6.6. Comment:
In 2016 I authored Assembly Bill 1637, which extended, expanded and modified fuel cell net metering (FC NEM). Fuel cells are reducing greenhouse gases and toxic air pollutants while also meeting the energy demands of some of CA's most important sectors: hospitals, technology, data centers and manufacturers. In passing AB 1637 the legislature gave its support for the continued growth and advancement of this advanced, clean, resilient technology.

One of the modifications to FC NEM was to require fuel cells installed after the effective date of the bill (January I, 2017) to meet a strict greenhouse gas emissions (GHG) standard developed by the California Air Resources Board (CARB). This standard is to be an annual standard, the first ever annual adjusting GHG standard in California, that will ensure fuel cell operations are cleaner than the grid as it changes over time.

It has come to my attention that the GHG standard currently under consideration may ignore the fundamental nature of an annually adjusting standard and incorporates assumptions that result in requiring today's installations to be cleaner than projections of future grid emissions. Asking fuel cells to be cleaner than the 2030 grid today is illogical and runs counter to the legislative intent. The legislation was passed to encourage clean fuel cells to be deployed to achieve GHG reductions today, and to drive innovation for future GHG reductions as the grid gets cleaner. A proposal that sets an unreasonable benchmark against the projected emissions of a future grid will unnecessarily stifle the fuel cell industry's growth in California and remove an important clean energy technology tool from our toolbox when all arc needed to address the ambitious climate and air quality goals we must achieve.

Importantly, AB 1637 was passed in 2016, effective January I, 2017. A full two years have passed and the GHG standard as not yet been finalized. I kindly ask for your attention to this matter and ensure that the standard that is set meets the intent of this law. (Low)

Agency Response:

This comment is from a May 28, 2019 letter to Mary Nichols, Chair of the California Air Resource Board, from Assemblymember Low, that was resubmitted during the comment period. The letter references the draft fuel cell NEM GHG emission standards calculation methodology that was proposed at the February 13, 2018 working group meeting. At that time, the Regulation methodology was based on using ACC[57] to calculate the GHG emission rate for the marginal generator. This resulted in a proposed 2017 standard of 324 kg CO_2/MWh and the standard would decrease annually from that point. Based on comments received and new information that was provided by the creators of ACC, staff reevaluated the methodology and instead proposed to use an equation that incorporates CEC and CAISO data to calculate the fuel cell NEM GHG emission standards for 2017. The new methodology is incorporated in this Regulation, and resulted in a 2017 standard of 409 kg CO_2/MWh and declines annually from that point. In response to the proposed Regulation, on December 10, 2019, CARB received a letter in support from Assemblymember Evan Low, Assemblymember Jacqui Irwin, Assemblymember Susan Talamantes Eggman, Senator Jim Beall, Senator Connie Leyva, and Assemblymember Kevin Mullin, which is presented in section B-1.

The commenter also points out the Regulation had not been finalized a full two years after AB 1637 was effective. CARB staff has been working since 2017 to meet the legislative direction in AB 1637 to develop fuel cell NEM GHG emission standards. This informal process to solicit public input on the methodology lasted from May 2017 through July 2019, during which time CARB staff held a working group meeting and three workshops, and proposed four possible methods for calculating the emission standards.[58] While one result of this extensive process was that the issuance of the Regulation was delayed, CARB staff views this extensive process as necessary to develop an adequate public record and give necessary time to the examination of the varying perspectives and feedback received from stakeholders.

C-6.7. Comment:
As you know, we are working with Governor Brown and our colleagues in the Legislature to establish long-term targets and measures to reduce greenhouse gas emissions, including specific measures to increase renewable energy and reduce emissions from the electricity and natural gas sectors. As a primary regulator of the electricity and natural gas sectors, the Public Utilities Commission plays an integral role in this effort, and the Commission's commitment to use its authority to achieve greenhouse gas emission reductions is essential to address climate change.

Last year, the Legislature reauthorized the Self-Generation Incentive Program (SGIP) until 2021, which represents a commitment of an additional $415 million in ratepayer funds to support the installation of new distributed energy resources which are expected to be in operation through 2030 and beyond.

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[57] Energy and Environmental Economics, Inc (E3). 2017. 2017 Avoided Cost Calculator. “Emissions” tab. Available at: https://ww2.arb.ca.gov/sites/default/files/2020-06/2017acc.xlsm. Accessed July 21, 2020.
[58] See Section X.I. for a description of the public process that preceded this rulemaking.

Prior to including the reauthorization of SGIP in SB 861, the Legislature held multiple hearings and reviewed the performance of the program. Among other things, we found that the program was delivering minimal greenhouse gas emission benefits at extremely high costs, representing a poor value for ratepayers and not meeting the intent of prior SGIP reauthorization legislation. One of the reasons for the program's lackluster performance has been a greenhouse gas emission factor based on irrelevant and outdated emissions data and assumptions.

For these reasons, SB 861 included a series of SGIP "reforms," including requiring the Commission to update the greenhouse gas emission factor "based on the most recent data available to the State Air Resources Board for greenhouse gas emissions from electricity sales in the self-generation incentive program administrators' service areas as well as current estimates of greenhouse gas emissions over the useful life of the distributed energy resource, including consideration of the effects of the California Renewables Portfolio Standard."

In light of all this, we are deeply disappointed with your proposed decision, which meets neither the letter nor the spirit of the statute. Rather than updating SGIP with an eye toward achieving direct GHG emission reductions from the $415 million investment, as well as supporting innovations that will produce additional reductions and other public benefits, the decision requires a paltry five percent reduction in GHG emissions compared to the existing standard which is outdated and ineffective. In fact, the decision appears to be skewed to maintain eligibility for existing technologies operating on percent conventional natural gas. We don't think this is consistent with the state's long term climate and energy goals.

We also note that existing natural gas technologies could meet a more stringent standard and produce significant greenhouse gas emission reductions, even with no improvements in efficiency, if they were required to use renewable directed biogas from in-state sources.

Not only does the result not meet the Legislature's intent, your process has apparently disregarded the plain requirements of the statute. Based on a review of the record, as well as reports of Commission and ARB staff, the Commission has not meaningfully consulted with ARB, has not requested the most recent data available to ARB, even though ARB has confirmed its availability, and has not adjusted the standard according to emissions in each SGIP administrator's service area.

If your decision is adopted, SGIP continue the increasingly absurd practice of subsidizing natural gas consumption, supporting existing technologies that have already taken hundreds of millions of dollars from SGIP and other public subsidies without producing substantial efficiency improvements, cost reductions, or general benefits to ratepayers, squandering the $415 million ratepayer investment authorized by SB 861 and undermining our collective efforts to clean the grid and transition away from fossil fuels.

Let's do better for our ratepayers and our climate. We urge you reconsider your proposed decision and lead the Commission to adopt a stronger standard. (Lingbloom/Friedman-etal)

Agency Response:
This comment is from an August 4, 2015 letter to Michael Picker, President of the CPUC, and was attached to an October 21, 2019 letter to Chair Mary Nichols of CARB signed by Assemblymember Laura Friedman, Assemblymember Chris Holden, Assemblymember Mark Stone, and Senator Scott Wiener. Because this letter was drafted in 2015, prior to the passage of AB 1637 and prior to the development of the Regulation, it is considered out of scope of this Regulation.

C-6.8. Comment:
This commenter provided a presentation that was used by the Fuel Cell Collaborative to brief Board members on the benefits of fuel cells. (Collaborative)

Agency Response:
The presentation that was submitted covers fuel cells in general, and does not address the proposed Regulation. This comment is therefore considered out of scope of this Regulation.

V. SUMMARY OF COMMENTS MADE DURING THE 15-DAY COMMENT PERIOD AND AGENCY RESPONSE

Chapter V of this FSOR contains all comments submitted during the 15-day comment period that were directed at the proposed 15-day changes together with CARB's responses. The 15-day comment period commenced on February 10, 2020 and ended on February 25, 2020.

Note that some comments which follow were scanned or otherwise electronically transferred, so they may include minor typographical errors or formatting that is not consistent with the originally submitted comments. However, all content reflects the submitted comments. All originally submitted comments are available here: https://www.arb.ca.gov/lispub/comm/bccommlog.php?listname=fcnem2019

Written comments were received during the 15-day comment period in response to the February 15, 2020 Notice of Public Availability of Modified Text. Listed below are the organizations and individuals that provided comments during the 15-day comment period, the date and form of their comments, and the abbreviation assigned to each. The dates in the table below are the dates that feedback was received, which for written testimony is the date it was "Added to Database" in the rulemaking comment log. One group comment letter from Earthjustice, NRDC, and the Sierra Club, was submitted late and is therefore not included in this document.

A. LIST OF COMMENTERS

Abbreviation	Commenter
Biogas	Neill J. Goodfellow, Boise Biogas Thomas A. Mulholland, Carbon Cycle Energy, LLC Will Charlton, Digester Doc Dave Jones, DMJ Gas Peter Wachtell, G2 Energy LLC Written Testimony: 2/25/2020
Bloom3	Erin Grizard, Bloom Energy Written Testimony: 2/25/2020
FC Energy2	Paul Fukumoto, FuelCell Energy Written Testimony: 2/25/2020
Reimagine2	Allie Detrio, Reimagine Power Inc. Written Testimony: 2/25/2020
TechNet3	Courtney Jensen, TechNet Written Testimony: 2/25/2020
Urbenex	Raymond Hart, Urbenex Written Testimony: 2/25/2020
Waste Management	Alex Oseguera, Waste Management Written Testimony: 2/25/2020

B. GENERAL SUPPORT FOR PROPOSED REGULATION

There were not any comments received within the 15-day comment period that were in support of the changes made to the Regulation.

C. OPPOSITION TO THE PROPOSED REGULATION

C-1. Opposition to the Proposed Methodology

C-1.1 Comment:
TechNet appreciates the Board's efforts to propose a GHG standard for FC NEM and commends ARB for its leadership in creating a biogas policy for electricity generation through the use of fuel cells. However, TechNet and its members advocate for a set of policies that are both consistent and achievable so as to maximize use and benefits of fuel cells. Specifically, TechNet encourages the Board to consider aligning the GHG standard implementation timeline in such a way that it aligns with the assumptions of SB 32 reductions, as well as aligning with CARB's own biogas policies and GHG emissions reduction methodology. Doing so will allow the State to fully realize all of the positive benefits of the program, including improved air quality, reduced GHG emissions, enhanced electrical reliability and resiliency, and continued support for California's unparalleled innovation economy.

Of particular concern is the idea of imposing stringent, retroactive standards that may impact the ability of companies with existing fuel cell systems to continue using them. We

appreciate the direction of the Board and the intent of the law to ensure that fuel cell systems are always cleaner than the grid – indeed, that is the motivation of many of our member companies for installing them in the first place. However, retroactive standards set dangerous precedent that harms the ability of businesses to plan for the state's climate targets and could punish early adopters of clean technologies. We urge ARB to adopt standards that apply from 2020 forward, rather than retroactive standards. If the Board wishes to aim for a particular target in 2030 as part of FCNEM, such as 40% below the 2017 level, it should set stringent annual reductions in the target from 2020 forward to meet the same 2030 goal, rather than less stringent annual declines that begin three years in the past….

TechNet applauds the Board for seeking to align the FCNEM GHG regulation with the goals of SB32. However, the alignment to SB32 should be consistent with *both* the timing of SB32 *and* the practicalities of implementation. As SB32 uses 2020 as a baseline in calculating GHG reductions and generally assumes constant annual reductions from one year to the next between target dates. FCNEM should deploy this strategy as well, starting with constant annual reductions in stringency moving forward from 2020. Consistency between these policies will result in GHG emissions reductions that are both aggressive enough to meet the intentions of the law and the Board, ensuring fuel cells remain cleaner than the grid, yet achievable enough so as to not hinder the continued development of resilient technologies like fuel cells or renewable resources like biogas and hydrogen. With these modifications, the ARB can help the State to simultaneously meet their resiliency and air quality goals. (TechNet3)

Comment:
California needs resilient and reliable electricity from technologies like microgrids and fuel cells now more than ever. FCNEM is a tariff that can help unlock the full value of microgrids that leverage these technologies to ensure California's businesses, public agencies, and communities do not have to make the choice between having electricity during blackouts – whether caused by a wildfire or a preventative measure like a Public Safety Power Shutoffs – and having electricity from clean generation resources. With FCNEM, many customers have already installed fuel cells, clean generators, and other advanced backup power solutions that provide resilient and reliable electricity while simultaneously reducing harmful local air pollutants and GHG emissions. The state should be welcoming this and empowering customers to make investments that advance our decarbonization and resiliency goals.

Reimagine Power encourages CARB to set policies that are both consistent and achievable so as to maximize use and benefits of fuel cells. There are two opportunities in the draft regulation to provide more policy clarity.…Second, we urge ARB to adopt standards that apply on a going forward basis. Given the length of time is has taken for this regulation to move forward, it would create market confusion to set standards for prior years that are more stringent than required.

Innovations in fuel cells, biogas technologies and other advanced power generation solutions will accelerate our transition to adopting even cleaner fuels in the future such as

hydrogen and other bioenergy resources that help us further diversify our clean energy portfolio. Reimagine Power commends the Board and Staff for their work in these proceedings and helping to ensure that electricity produced under FCNEM becomes even cleaner through the use of these advanced fuels. (Reimagine2)

Comment:
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. (FC Energy2)

Comment:
Bloom supports the California Air Resources Board's (ARB or Board) efforts to fulfill the statutory requirements of AB 1637 (2017 Low) to develop a fuel cell greenhouse gas emissions standard. AB 1637 requires the ARB to adopt a standard that "reduces greenhouse gas emissions compared to the electrical grid resources, including renewable resources, that the fuel cell electrical generation resource displaces, accounting for both procurement and operation of the electrical grid."[59]

[59] California Public Utilities Code Section 2827.10.

Following two years of informal rulemaking activity, on October 22, 2019, the ARB formally noticed a proposed standard that meets these and other statutory requirements, such as the SB 32 emissions target for 2030. This standard was based on the best available modeling and state integrated resource planning targets for electric sector emissions through 2030, which account for the state's range of climate and clean energy policies. The October 22nd methodology remains the most robust and rational framework for estimating the composition and emissions of the future electricity grid in California, given current information and policies. The October 22 standard was considered at the December Board hearing, and the Board issued Resolution 19-36, directing the ARB staff to determine if additional modifications are appropriate.[60] If no additional modifications are appropriate, Resolution 19-36 directs the Executive Officer take final action to adopt the Regulation. Bloom appreciates the intent of Resolution 19-36 was to further evaluate the consistency of the standard with SB 32 emission reduction goals.

The February 10, 2020 proposed modifications would set a far stricter standard, particularly in light of the current availability and cost of renewable gas. The February 10th methodology would exponentially reduce emissions requirements from 2017 to 40 percent below 2017 levels by 2030. This standard has no basis in the state's modeling or regulatory framework. If the Board adopts the February 10th standard, California businesses would be limited in their ability to access fuel cell technologies that reduce GHG emissions and criteria and toxic pollutants. This is particularly concerning for those companies with a near term electric resiliency needs and companies currently relying on backup diesel generators.

The ARB should avoid adopting a standard that would frustrate the broader program goals of AB 1637, as well as the Board's stated policy interest in the use of renewable gas in fuel cell installations. As explained in these comments, the October 22, 2019 methodology fulfills the statutory requirements of AB 1637, as well as SB 32, SB 350, and SB 100. If the ARB declines to adopt the October 22, 2019 standard, it should at least modify the February 10, 2020 standard to apply a 409 g/kWh standard on a prospective basis and then apply a deeper linear reduction starting in 2021. As detailed below, this proposal would lead to more stringent annual reductions from this point forward than the February 10th standard (an average annual reduction of 16.4 g/kWh, or 5% per year, compared to 11.8 g/kWh, or 3.8% per year). This alternative approach would allow the fulfillment of the intention of the legislation: the deployment of GHG reducing, resilient fuel cells in California....

The October 22, 2019 Methodology Is Supported By a Robust Analysis and Consistent with SB 32.

Bloom Energy supports the ARB staff's efforts to develop a reasonable emissions standard that fulfills the broad statutory direction of AB 1637. Section 2827.10(b)(2) of

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[60] See Board Resolution 19-36, available at: https://ww3.arb.ca.gov/regact/2019/fcnem19/finalres1936.pdf.

the Public Utilities Code requires that "greenhouse gas emissions reduction standards . . . reduces greenhouse gas emissions compared to the electrical grid resources, including renewable resources, that the fuel cell electrical generation resource displaces, accounting for both procurement and operation of the electrical grid." The law also requires the ARB to update the methodology, presumably to account for the fact that developing a future emissions standard that accounts for GHG emissions benefits, which are in turn governed by the actual dispatch of generating units, is an inherently speculative exercise.

In the absence of data on future dispatch and the associated emissions rates, "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)." [61] The effect of selecting 2017 the starting point is that the reductions in the standard will apply retroactively, making the February 10th methodology overly restrictive in the first few years. The February 10th notice asserts that this alternative methodology is needed to maintain consistency with SB 32. However, nothing in SB 32 requires an annual 3.85% emissions reduction rate from 2017 emissions levels. While Bloom does not refute the ARB's analysis identifying 409 kg CO_2e/MWh as an avoided emissions rate in 2017, the selection of 2017 as the starting point for a rate of decline is arbitrary and inconsistent with a plain reading of SB 32. Health and Safety Code Section 38566 requires the ARB to adopt regulations that are consistent with a 40% below 1990 levels by 2030 standard, not 2017 emissions level by 2030.

Greenhouse gas emissions in the electricity sector are already nearly 50 percent below estimated 1990 levels. According to the most recent ARB inventory, emissions in the electricity sector have declined by almost half since 2008.[62] Thus, hypothetically, the selection of a constant, non-declining emissions standard that was established from 2021 to 2030 (subject to 3 year review) based on 2017 observed data would be consistent with the statutory language of SB 32.

Bloom acknowledges the ARB's intent to develop a declining standard based on expectations of electric grid decarbonization. The best way to estimate the implications of SB 32 and other existing statutory requirements on future system dispatch is through the state's energy and climate modeling efforts. The IRP modeling provided the foundation for the October 22, 2019 proposed standard. As explained in the October 22, 2019 Initial Statement of Reasons, "[t]his methodology is rooted in the idea that fuel cell electrical generating resources should reduce their GHG emissions at the same rate

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[61] See February 10, 2020 Notice of Public Availability of Modified Text, available at: https://ww3.arb.ca.gov/regact/2019/fcnem19/15daynotice.pdf

[62] See 2019 California Greenhouse Emissions Inventory 2000 – 2017, at p. 5, available at: https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2017/ghg_inventory_trends_00-17.pdf

as California's electricity sector."[63] The methodology evaluated the rate of decline based on data available from the state's implementation of the Integrated Resource Planning ("IRP") process (i.e., SB 350 and SB 100). As noted in the ARB's July 2018 IRP GHG target range, SB 350 requires the IRP targets to be consistent with the SB 32 emission reduction goals.[64]

The October 22, 2019 methodology reduced the annual emissions rate in proportion to system-wide electricity sector emission reductions contemplated in the IRP proceedings, which included SB 100 requirements. Thus, the ARB's adoption of the October 22, 2019 proposal remains the best methodology for estimating the future trajectory of the electricity sector. It will ensure that the ARB fulfills its obligations under SB 32 with respect to developing regulations that are consistent with the states goal to reduce economy-wide emissions 40 percent below 1990 levels by 2030. If new modeling or policy provides a different trajectory than we currently understand, the 3-year review cycle included in AB 1637 provides the appropriate forum for considering that information and modifying the standard…

In the context of the FCNEM tariff, the ARB should ensure that a reasonable volume of fuel cell systems can be deployed in the near term, which will enable technology costs to decline and additional renewable gas supplies to come online. This should be done through two modifications. First, the standard should be modified to create a smoother initial trajectory, as detailed in Section 3 of these comments below….

If the ARB Does Not Adopt the October 22, 2019 Methodology, then at a Minimum, the ARB Should Revise the February 10, 2020 Methodology to Create a Linear Rate of Decline Starting in 2021.

A standard that enables a smoother transition should be created with the understanding that fuel cell systems will only become cleaner over time, in line with the Board's standards. The ARB should align the FCNEM standard with the ARB's policy objectives stated in Resolution 18-51. A smooth trajectory would provide developers and customers with sufficient time and regulatory clarity to adjust to a stringent FCNEM standard. Board Resolution 19-36 provides the ARB Executive Officer with discretion in determining whether additional modifications to the October 22, 2019 proposed modifications are appropriate. As explained above, Bloom does not believe the February 10th modifications are appropriate or consistent with SB 32, AB 1637, or the state's other climate and energy policies. The retroactivity and the exponential rate of reduction proposed in the February modifications could hamper the deployment of the most efficient, reliable, combustion-free fuel cells in California. However, Bloom

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[63] See October 22, 2019 Staff Report, ISOR, at p. 2, available at: https://ww3.arb.ca.gov/regact/2019/fcnem19/isor.pdf

[64] California Public Utilities Code Section 454.52(a)(1)(A) and Public Utilities Code Section 9621(b)(1); See July 2018 ARB IRP Staff Report, available at https://ww3.arb.ca.gov/cc/sb350/staffreport_sb350_irp.pdf.

appreciates the need to respond to Board direction to evaluate modifications, including a more significant annual decline in the emissions rate moving forward.

If the ARB rejects the October 22, 2019 methodology, it should ensure that any modifications to the methodology apply on a prospective basis and provide enough time to adapt to a much lower emissions standard, including development of supplies of renewable gas outside of the transportation sector. There is precedent for such an approach in the ARB's Cap-and-Trade Regulation, which includes numerous provisions for "transitional assistance."

Both the October 22, 2019 and February 10, 2020 methodologies envision applying annual reductions on a percentage basis. This leads to exponential declines in the annual standards, rather than linear declines. For example, in the proposed February 10, 2020 standard, the standard declines initially by 16 g/kWh per year in 2018, but only 9 g/kWh per year in 2030. This is inconsistent with how the state often applies standards, and doesn't appear to be justified either by the modeling the ARB originally relied on in its October 22, 2019 proposal, or with any requirements of SB 32. Regardless of the standard set by ARB, it should apply constant, linear reductions in the greenhouse gas targets, rather than percentage-based, exponential reductions. For example, to reach the same endpoint in 2030, instead of 2.5 percent per year, as proposed in October 22, 2019, a linear version of the October 22, 2019 standard would decline by about 8.5 g/kWh per year from 2021 onward. Instead of 3.85 percent per year in the February 10, 2020 standard, a linear standard would decline by about 11.8 g/kWh per year from 2021-2030.

Using 409 g/kWh as a starting point and then applying the reductions on a prospective basis (starting in 2021) is an appropriate starting point for the FCNEM standard. While not required by SB 32, to achieve a 40 percent reduction from 2020 levels, the ARB would need to adopt a greater annual average decline rate than even envisioned in the February 10, 2020 proposal (i.e., an average annual reduction of 16.4 g/kWh vs. 11.8 g kWh from 2021-2030, or a 5% average annual reduction, compared to 3.8%). Even though this alternative proposal is more stringent on a prospective basis, it avoids stringent and unfounded retroactive reductions to the standards and will nevertheless facilitate the policy goals articulated above by providing time for the market to adapt to the new methodology. This would be consistent with the intention of AB 1637, SB 32, and – we believe – the direction of the Board.

The table below compares the October 22 and February 10 proposals to this "alternative methodology"

	October			
2017	409	409	409	409

2018	399	393	396	409
2019	389	378	384	409
2020	379	364	371	409
2021	370	350	359	393
2022	360	336	346	376
2023	351	323	333	360
2024	342	311	321	344
2025	334	299	308	327
2026	325	287	295	311
2027	317	276	283	294
2028	309	266	270	278
2029	302	255	258	262
2030	294	246	245	245
Avg. reduction, 2020-2030 (%)	2.5	3.8	4.0	5.0
Avg. reduction, 2020-2030 (g/kWh)	8.5	11.8	12.6	16.4

…

Conclusion

The ARB should not adopt the February 10, 2020 modifications because the methodology is not consistent with a plain reading of SB 32 and would create a retroactively reduced standard that would be inconsistent the ARB Board's policy to encourage the use of clean fuel cells and renewable gas. The October 22, 2019 methodology is consistent with SB 32 and the policies underpinning the Cap-and-Trade Regulation. The October 22, 2019 methodology would create a much smoother transition to long-term GHG targets by providing fuel cell customers and developers time to adjust to the standard and develop and integrate renewable gas as the primary fuel stock. If the ARB departs from the statutory direction in SB 32 and uses some year after 1990 as the starting point for measuring emissions levels, the ARB should at least ensure that the emission rate decline is constant (linear) and applies on a prospective basis (i.e., starting in 2021). While Bloom believes the October 22, 2019 proposal is based on the most appropriate and currently achievable methodology, the ARB could adopt a modified methodology that achieves a similar reduction in the standard by 2030 as included in the February 10 proposed standard without limiting the achievement of the broader AB 1637 policy objectives in the near term…. (Bloom3)

Agency Response:
The commenters find the revised GHG emission standards proposal to be arbitrary and retroactive in that it applies the SB 32 baseline back to 2017, and state that, to maintain consistency with SB 32, deeper emission rate declines should not begin until 2021. Further, at least one commenter states that the emission rate should not decline at all until 2021, and one commenter states that the proposed Regulation is not consistent

with SB 32 since the "Health and Safety Code Section 38566 requires the ARB to adopt regulations that are consistent with a 40% below 1990 levels by 2030 standard, not 2017 emissions level by 2030." They also suggest that the steeper decline rates should be undertaken with linear, constant reductions to the standard rather than exponential reductions that are higher in the early years. One commenter compares the proposed GHG emission standard declines to the 2017 Scoping Plan and advocates for a lower level of decline.

CARB staff agrees with commenters that steeper decline rates should not begin until after 2020. The final proposed Regulation retains the 2.5 percent annual rate of decline for the 2017 to 2020 GHG emission standards, as originally proposed in the 45-day Public Notice, and only begins the steeper decline in 2021. Staff reevaluated the proposed annual reduction of the standards for years 2021 and beyond, and proposed an annual linear reduction in response to stakeholder concerns that larger reductions would be required in the early years under a percentage-based approach. To achieve a 40 percent reduction from 2020 levels by 2030 (245 kg CO_2e/MWh), an annual reduction of 13.4 kg CO_2e/MWh is applied to the standard starting in 2021. This new approach aligns with SB 32 requirements that the State's GHG emissions be reduced 40 percent relative to 1990 GHG emission levels by 2030; 1990 emissions are equivalent to 2020 emissions per AB 32 requirements that the State's GHG emissions be reduced to 1990 levels by 2020. A linear approach happens to be consistent with the 2017 to 2020 standards proposed in the 45-day Public Notice because the annual reductions of 2.5 percent are linear when rounded to the nearest whole number.

Several commenters state that the Regulation should only include GHG standards for years 2020 and beyond since CARB should not create "retroactive" standards. One commenter suggests that the rate should not decline after 2017. AB 1637 requires CARB to set GHG standards for the Fuel Cell NEM Program starting in 2017. Therefore, as statute requires, CARB must set GHG standards starting in 2017. In terms of the decline rate, CARB staff proposed in the 45-Day Public Notice that the decline rate be 2.5 percent. At the Board Hearing, the Board directed staff to consider a steeper decline rate, which staff proposed in the 15-Day Public Notice. In response to comments received, the final Regulation retains the original 2.5 percent decline rate from 2017 to 2020, and only begins the steeper decline rate in 2021. The proposed decline rates match electricity sector and statewide reduction targets and follow Board direction, and the resulting GHG emission standards comply with the AB 1637 requirement that standards reduce GHG emissions relative to the resources being displaced.

With respect to the commenter that advocated for a reduction rate that matched their analysis of the 2017 Scoping Plan, CARB staff notes that Board directed staff to evaluate steeper decline rates than the 2.5 percent proposed in the 45-day Public Notice, and so the possibility of reducing the decline rate to under 2 percent was not evaluated. However, as noted above, CARB staff responded to commenters' suggestions by retaining the originally proposed 2.5 percent annual decline through 2020, and proposing the steeper decline only beginning in 2021, utilizing a constant

linear decline to minimize exponential impacts that an annual percentage decline would have.

This commenter suggests that the Scoping Plan requires GHG reductions from large fossil fueled power plants and the GHG emission standards should “follow” the electric sector PATHWAYS modeling. The Scoping Plan PATHWAYS modeling serves only to project the emissions reductions that certain programs would achieve, and is not a requirement for electricity sector emissions reductions. SB 350 set a 2030 RPS target of 50 percent for the electricity sector, and mandated the setting of IRP GHG emission targets for the sector overall and individual load-serving entities. SB 100, which came after adoption of the 2017 Scoping Plan, set a 2030 RPS target of 60 percent. Neither the Scoping Plan, SB 350, nor SB 100 requires GHG reductions from individual power plants.

This commenter also suggests that the Scoping Plan requires accounting of all emissions and that the Regulation does not comply because it does not account for avoided GHG emissions from electricity transmission and delivery. CARB staff believes this is referring to line losses, the concept that transmitting electricity over transmission and distribution lines results in some of the electricity being lost. Because of line losses the amount of electricity delivered to consumers is less than the electricity generated at the generator’s site. This means that a greater amount of electricity must be generated to meet a certain level of demand, and if the electricity is generated by a generator that uses fossil fuel, more GHG emissions will occur. When the electricity is generated and consumed on-site, as in the case of fuel cell electrical generation resources in the Fuel Cell NEM Program, line losses are zero, and there can be a GHG benefit to siting a fuel cell on-site.

The 2017 Scoping Plan identifies how the State can reach our 2030 climate target to reduce GHG emissions by 40 percent from 1990 levels, and substantially advance toward our 2050 climate goal to reduce GHG emissions by 80 percent below 1990 levels. The Scoping Plan comprehensively evaluates emission reductions in line with the AB 32 requirements. The Scoping Plan does not mention line losses specifically, but does reference State programs that target emission reductions in the electricity sector, including the Renewables Portfolio Standard, which sets targets for renewable electricity as a percent of retail sales, and Integrated Resource Planning, which sets GHG emission targets for the individual load serving entities and the electricity sector as a whole. Per AB 1637 requirements, the fuel cell NEM standards must ensure that fuel cells participating in the Program reduce GHG emissions relative to the resources being displaced. CARB staff determined the electrical grid resource most likely to be displaced by fuel cells is the marginal generator, which for 2017 was natural gas power plants more than 98 percent of the time, and renewable power plants the rest of the time. CARB staff developed the 2017 GHG emission standard of 409 kg CO2e/MWh by calculating state average natural gas-fired electric generation GHG emissions, and reducing it by the number of hours that renewables were on the margin. Incorporating the line loss factor in CARB’s proposed methodology would result in a 2017 fuel cell NEM GHG emission standard of 443 kg CO2e/MWh. Because this is much higher than

the marginal generator emission rate, and because AB 1637 required that the standards *reduce* GHG emissions relative to the electrical grid resources that the fuel cell electrical generation resource displaces, CARB staff opted not to include line losses to ensure that the GHG emission standards meet legislative requirements.

One commenter states that the proposed Fuel Cell NEM standards would limit California businesses' access to fuel cell technologies. The Fuel Cell NEM Program is a voluntary tariff administered by CPUC and implemented by IOUs. The Regulation does not set any requirements that other entities must implement. Therefore, the Regulation does not prevent the installation of fuel cells.

One commenter suggests aligning the fuel cell NEM standard with the Board Resolution 18-51 policy objectives. The Resolution is linked to CARB's Cap–and-Trade Program and CARB staff believes the commenter is referring to the following paragraph:

> "BE IT FURTHER RESOLVED that the Executive Officer will return to the Board with proposed amendments to exempt through 2030 fuel cells connected to existing natural gas infrastructure where there are demonstrated local air quality benefits. The Executive Officer will evaluate and propose any necessary transition assistance for fuel cells that meet these requirements and incur a compliance obligation for emissions years 2018 through 2020."

The Cap-and-Trade Regulation establishes a declining limit on major sources of GHG emissions throughout California. The Fuel Cell NEM Program is a voluntary tariff program that provides a financial benefit to fuel cell customer generators. The two programs have completely different requirements and AB 1637 does not mandate that the GHG standards for fuel cell NEM be linked to Cap-and-Trade Program policies. However, when the staff proposes any updates to the Cap-and-Trade Program to address the direction in Resolution 18-51, staff will evaluate if only fuel cells that meet the fuel cell NEM GHG emission standards should be exempt from a compliance obligation. This would further align and incent the installation of fuel cells that are cleaner than the electricity grid.

C-2. Proposed Fuel Cell NEM Regulation Should Include a Biogas Requirement for Compliance

Comment:
CARB's efforts in developing this standard have led to a first-of-its-kind biogas policy for fuel cells. Commercial and industrial customers choose to install fuel cells because they provide resilient and reliable baseload electricity and reduce harmful local air pollutants. Fuel cells are unique amongst behind-the-meter electricity generation technologies because they can actually help to reduce GHGs when they run on biogas.

We commend the Board and Staff for recognizing this and for wanting to push the limits of the standard beyond simply addressing the consequences of climate change to

actually addressing the causes of it. Rules that will require the use of biogas in fuel cells show the progressive thinking of CARB and the agency's commitment to improving the State's air quality for all of its citizens.

CARB should explicitly allow fuel cells in the State the ability to use Cap and Trade compliant biogas to meet GHG requirements for FCNEM compliance. Doing so would serve to reduce air pollution while simultaneously expanding the overall market for biogas, which is consistent with the Board's mission.

Not only can biogas be a key renewable resource, but it is unique in that it is substantially carbon negative. By converting organic materials such as animal or food waste, municipal waste, and landfill gases into fuel, the production of biogas is actually destroying previously vented methane – a GHG that is itself at least 21x more potent than carbon dioxide.

The development of a robust and stable biogas market is critical to meeting California's goals of improving air quality and reducing GHGs. The key to developing a healthy market for biogas is a clear set of rules that are consistent across jurisdictions. CARB's own policy on the use of biogas under the Cap and Trade program can and should be applied here. Consistency will ensure long-term market viability and result in less price volatility. Biogas projects are long-term investments and our members look for stable market conditions when deciding where to develop projects.

CARB has the unique opportunity to provide the regulatory framework for a biogas market that provides certainty and long-term stability. Doing so will maximize the number of market participants and projects that are developed, which will ultimately result in more GHG reducing projects and better air quality in the State.

For these reasons, the undersigned biogas developers encourage CARB to explicitly ensure that fuel cell installations in the State can also use Cap and Trade compliant biogas to meet the increasingly stringent GHG requirements for FCNEM compliance. Doing so will help increase the market for biogas by creating additional customer demand and ultimately, help support the decarbonization of the gas being used in the State. (Biogas, Urbenex, Waste Management)

Comment:
California needs resilient and reliable electricity from technologies like microgrids and fuel cells now more than ever. FCNEM is a tariff that can help unlock the full value of microgrids that leverage these technologies to ensure California's businesses, public agencies, and communities do not have to make the choice between having electricity during blackouts – whether caused by a wildfire or a preventative measure like a Public Safety Power Shutoffs – and having electricity from clean generation resources. With FCNEM, many customers have already installed fuel cells, clean generators, and other advanced backup power solutions that provide resilient and reliable electricity while simultaneously reducing harmful local air pollutants and GHG emissions. The state should be welcoming this and

empowering customers to make investments that advance our decarbonization and resiliency goals.

Reimagine Power encourages CARB to set policies that are both consistent and achievable so as to maximize use and benefits of fuel cells. There are two opportunities in the draft regulation to provide more policy clarity. First, implement a clear and consistent biogas policy in order to maximize the number of projects installed under FCNEM. CARB already has such a policy and it should explicitly allow these resilient technologies the ability to use Cap and Trade compliant biogas to meet GHG requirements for FCNEM compliance…. (Reimagine2)

Comment:
TechNet appreciates the Board's efforts to propose a GHG standard for FC NEM and commends ARB for its leadership in creating a biogas policy for electricity generation through the use of fuel cells….Specifically, TechNet encourages the Board to consider aligning the GHG standard implementation timeline in such a way that it aligns with the assumptions of SB 32 reductions, as well as aligning with CARB's own biogas policies and GHG emissions reduction methodology….

Another critical concern is access to biogas. Again, like the Board, TechNet member companies want to deploy the cleanest, resilient energy systems – including the use of biogas or hydrogen in fuel cells. However, access to renewable gas is currently limited, and the market for renewable gas is distorted toward the transportation sector due to the Low Carbon Fuel Standard. We urge ARB to consider market access of renewable gas in the development of its FCNEM standard, and to take steps to support increased use of renewable gas, including outside of the transportation sector.

ARB already has a clear and consistent set of policy guidance on the use of biogas in its Cap and Trade regulation. The Board should explicitly allow fuel cells the ability to use Cap and Trade compliant biogas to meet GHG requirements for FCNEM compliance. If ARB does not do this, the number of projects developed under FCNEM may suffer due to unclear, and potentially competing, regulatory policies. If this were to occur, both the State and TechNet's members would be forced to choose between the need for resilient and reliable electricity, and their sustainability goals…, (TechNet3)

Comment:
The adoption of the October 22nd standard or the alternative methodology proposed below would ensure consistency with the ARB Board's direction in the Cap-and-Trade program, to facilitate the use of renewable gas in California. The methodologies would provide a smoother trajectory to stringent GHG emissions standards thereby enabling developers and customers time to develop renewable gas supplies. In addition to using the FCNEM standard to facilitate achievement of these policy goals, the ARB should also clarify its intent that the standard be consistent with other programs adopted pursuant to SB 32. Specifically, the FCNEM regulation should follow the precedent of the Cap-and-Trade program by clarifying that procurement of renewable gas qualifying under Section 95852.2

of the Cap-and-Trade Program will adjust the application of the FCNEM standard accordingly.

The ARB Should Consider the October 22nd and February 10th Methodologies in the Context of the ARB's Broader Policy Objectives for Renewable Gas.

The ARB should evaluate its implementation of the FCNEM tariff in conjunction with other related programs implemented pursuant to SB 32. The Cap-and-Trade Regulation is one of the key "sector measures" identified in the 2017 Scoping Plan. By setting a cap on all emissions, including conventional natural gas used in fuel cell installations, the Cap-and-Trade program ensures the environmental performance of the SB 32 targets. In 2019, the ARB amended the Cap-and-Trade program to list natural gas used as the feedstock in fuel cells an emissions source with a compliance obligation. In adopting those amendments, the ARB evaluated the importance of fuel cells as a GHG-reducing technology. The Board also considered the importance of using renewable fuels in fuel cell installations as a key measure that can drive cross-sectoral emission reductions. Encouraging the increased future use of renewable fuels in fuel cells is not only consistent with SB 32, but also the Short Lived Climate Pollutant (SLCP) law, SB 1383, which requires 40% reductions in SLCPs by 2030. As part of deciding to extend the Cap-and-Trade program to 2030 (consistent with SB 32), Resolution 18-51 made the following finding:

> WHEREAS, in addition to providing a pathway for the use of renewable natural gas, natural gas fuel cells provide immediate reductions in GHG emissions and other criteria pollutants when displacing higher carbon intensity energy supplies.

The adopted Cap-and-Trade Regulation specifically lists emission from biomethane and biogas as an emissions source without a compliance obligation.[65] By excluding these fuel sources from a compliance obligation, the Cap-and-Trade program enables on-site and pipeline-directed renewable gas to be used in fuel cell operations. Fuel cells using conventional natural gas are covered under the cap and subject to cap-and-trade compliance costs. Currently, the avoided costs of compliance with the cap-and-trade regulation do not provide an adequate price signal to shift biogas away from other competing uses (e.g., the LCFS). While we don't expect this situation to change in the near term, Bloom is optimistic that greater quantities of renewable gas will become more broadly available outside of the transportation sector in the coming years….

Second, just as the Cap-and-Trade enables a source to proportionately reduce its cap-and-trade compliance obligation, the application of the FCNEM tariff to individual fuel cell installations should be similarly clarified. The application of the standard is clearly within the ARB's broad authority under Public Utilities Code Section 2827.10(b)(2), to develop a standard that "reduces GHG emissions." To ensure that the standard actually reduces GHG emissions, the application of the standard is as important as the development of the standard itself. Consistent with ARB Board direction in Resolution 18-51, the ARB should

[65] Title 17, California Code of Regulations Section 95852.2(a)(8).

clarify that the standard should apply to emissions associated with qualifying systems conventional natural gas use only. The regulation should be clarified that renewable gas procurement qualifying under Section 95852.2 of the Cap-and-Trade and Section 95131 of the Mandatory Reporting Regulation reduce the emissions of a qualifying installation in proportion to the quantity of renewable fuel procured on an annual basis. Appendix A of this comments includes recommended amendments to make this clarification….

Finally, as detailed in Appendix A of these comments, Bloom recommends that the ARB clarify that in the application of the standard, any renewable gas that meets the requirements of the Cap-and-Trade and Mandatory Reporting Regulation will proportionately reduce a fuel cell installation's assessed emissions rate.

APPENDIX A

§ 95409. Applicability

The provisions of this Article apply to fuel cell electrical generation resources that participate in fuel cell net energy metering under section 2827.10 of the Public Utilities Code. <u>The provisions of this Article solely apply to the use of fossil fuels in fuel cell electrical generation resources. The provisions of this Article shall not apply to the partial or full use of any biogas or biomass derived fuel in a qualifying fuel cell installation that meets the requirements of Sections 95852.2 and 95131 of this Title.</u> (Bloom3)

Agency Response:
The commenters recommend that CARB include in the Regulation a provision that specifies that operating on eligible biofuel will be considered in assessing a fuel cell NEM customer-generator's compliance with the GHG emission standards.

Section 2827.10 of the Public Utilities Code limits CARB's role to adopting fuel cell NEM GHG emission standards, including a process to update and publish new standards every three years. The statute does not provide for CARB to take any further role in the Fuel Cell NEM Program, and the comments therefore cover matters that are out of scope relative to this Regulation. Under Section 2827.10 of the Public Utilities Code, CPUC must apply the GHG emission standards annually to determine eligibility of fuel cell electrical generation resources to participate in the Fuel Cell NEM Program. CPUC will engage in its own process to determine which fuel cell technology meets the GHG emission standards, including accounting determinations (*e.g.,* whether the use of eligible biofuel will be considered in evaluating the fuel cell GHG emissions against the standards).

As discussed in the Staff Report, the declining fuel cell NEM emission standards, and the AB 1637 requirement that Fuel Cell NEM Program eligibility is assessed annually, mean that fuel cell electrical general resources must decrease GHG emissions over time in order to continue to meet the standards; this can occur either through increasing efficiency or through switching to eligible biofuels. This drive towards greater efficiency

or a switch to eligible biofuels is also aligned with the goals outlined in the 2017 Scoping Plan Update, which states that while "natural gas is an important energy source, we must move toward cleaner heating fuels…" Therefore, while CARB does not have the authority to specify how to consider eligible biofuels under the Fuel Cell NEM Program, CARB staff acknowledges that eligible biofuel has no compliance obligation under the Cap-and-Trade Regulation. CARB staff strongly encourages CPUC to adopt a definition of biogas and biomethane that is consistent with the exempt biofuel standards in section 95852.1.1 of the Cap-and-Trade Regulation. Use of these provisions will ensure that the biofuels utilized in the Fuel Cell NEM Program not result in GHG emissions leakage, and will further amplify the signal that we want GHG-efficient fuel cells installed in-State.

C-3. Standards Calculation Should Include Line-Losses in the Emission

Comment:
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	8.4%	8.4%	8.4%	8.4%	8.4%

(Reference: CPUC SGIP program)					
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

(FC Energy2)

Agency Response:
The commenter states that the proposed standards should take into consideration transmission line losses, which would increase the GHG emission standards. The commenter references SGIP's use of a line loss factor and mentions that the Scoping Plan includes all emissions, making the point that the proposed fuel cell NEM GHG emission standards are therefore inconsistent with these programs.

Transmitting electricity over transmission and distribution lines results in some of the electricity being lost, a concept known as line losses. Because of line losses the amount of electricity delivered to consumers is less than the electricity generated at the generator's site. The reality of line losses means that a greater amount of electricity must be generated to meet a certain level of demand, and if the electricity is generated by a generator that uses fossil fuel, more GHG emissions will occur. When the electricity is generated and consumed on-site, as in the case of fuel cell electrical generation resources in the Fuel Cell NEM Program, line losses are zero, and there can be a GHG benefit to siting a fuel cell on-site.

As the commenter noted, the CPUC uses a California line loss average of 8.4 percent, including in SGIP. The 2017 Scoping Plan identifies how the State can reach our 2030 climate target to reduce GHG emissions by 40 percent from 1990 levels, and substantially advance toward our 2050 climate goal to reduce GHG emissions by 80 percent below 1990 levels. The Scoping Plan comprehensively evaluates emission reductions in line with the AB 32 requirements. The Scoping Plan does not mention line losses specifically, but does reference State programs that target emission reductions in the electricity sector, including the Renewables Portfolio Standard, which sets targets for renewable electricity as a percent of retail sales, and Integrated Resource Planning, which sets GHG emission targets for the individual load serving entities and the electricity sector as a whole.

CARB staff agrees that referencing other state policies is useful, and set the GHG emission standards decline rate in line with the Integrated Resource Planning targets for the electricity sector and with the SB 32 statewide GHG targets. CARB staff disagrees with the assertion that the exclusion of line losses from the fuel cell NEM GHG emission standards somehow favors one technology over another or is otherwise discriminatory. AB 1637 is focused exclusively on the Fuel Cell NEM

Program, and requires CARB only to set GHG emission standards that reduce "greenhouse gas emissions compared to the electrical grid resources, including renewable resources, that the fuel cell electrical generation resource displaces, accounting for both procurement and operation of the electrical grid." (Public Utilities Code section 2827.10.)

Per AB 1637 requirements, the fuel cell NEM standards must ensure that fuel cells participating in the Program reduce GHG emissions relative to the resources being displaced. CARB staff determined the electrical grid resource most likely to be displaced by fuel cells is the marginal generator, which for 2017 was natural gas power plants more than 98 percent of the time, and renewable power plants the rest of the time. To develop the 2017 GHG emission standard of 409 kg CO2e/MWh, CARB staff used CEC data to calculate the state average natural gas-fired electric generation GHG emissions, and reduced it by the number of hours in 2017 that electricity price for the day-ahead market was less than or equal to zero during the year (110 hours). Incorporating the line loss factor in CARB's proposed methodology would result in a 2017 fuel cell NEM GHG emission standard of 443 kg CO2e/MWh. Because this is much higher than the marginal generator emission rate, and because AB 1637 required that the standards *reduce* GHG emissions relative to the electrical grid resources that the fuel cell electrical generation resource displaces, CARB staff opted not to include line losses to ensure that the GHG emission standards meet legislative requirements.

VI. SUMMARY OF COMMENTS MADE DURING THE 30-DAY COMMENT PERIOD AND AGENCY RESPONSE

Chapter VI of this FSOR contains all comments submitted during the 30-day comment period that were directed at the proposed 30-day changes together with CARB's responses. The 30-day comment period commenced on April 27, 2020 and ended on May 27, 2020.

Note that some comments which follow were scanned or otherwise electronically transferred, so they may include minor typographical errors or formatting that is not consistent with the originally submitted comments. However, all content reflects the submitted comments. All originally submitted comments are available here: https://www.arb.ca.gov/lispub/comm/bccommlog.php?listname=fcnem2019

Written comments were received during the 30-day comment period in response to the April 27, 2020 Second Notice of Public Availability of Modified Text. Listed below are the organizations and individuals that provided comments during the 30-day comment period, the date and form of their comments, and the abbreviation assigned to each. The dates in the table below are the dates that feedback was received, which for written testimony is the date it was "Added to Database" in the rulemaking comment log.

A. LIST OF COMMENTERS

Abbreviation	Commenter

Bloom4	Erin Grizard, Bloom Energy Written Testimony: 5/26/2020

B. GENERAL SUPPORT FOR PROPOSED REGULATION

B-1. Comment:
I am writing on behalf of Bloom Energy to support the proposed modifications to the Fuel Cell Net Energy Metering Greenhouse Gas Standards Regulation. We appreciate the thoughtful and deliberative approach taken by the Board and staff to develop stringent standards that provide clarity to the market and policymakers that fuel cells will continue to always provide cleaner power than the grid electricity they displace.

Bloom Energy continues to believe that the original staff proposal from October 2019 provides the most reasonable methodology to estimate future emissions from the electricity sector under the state's existing suite of climate and energy policies. Nonetheless, we understand the Board directed staff to develop a proposal to use fuel cells to achieve even greater emissions benefits moving forward. The most recent proposed amendments strike the right balance, by applying a more stringent standard from 2020 forward, and in a manner that strengthens the standard in a constant, linear fashion each year.

As we continue along our shared path to make ever cleaner, affordable and reliable power ubiquitously available, Bloom Energy looks forward to working with CARB on additional policies to support the widespread availability of renewable gases, including biogas and hydrogen, so that we can make zero-carbon – and even negative-carbon – energy widely available to anyone who wants it. (Bloom4)

Agency Response:
CARB appreciates the commenter's support of the Regulation.

C. OPPOSITION TO THE PROPOSED METHODOLOGY

There were not any comments received within the 30-day comment period that were in opposition to the 30-day changes made to the Regulation.

VII. PEER REVIEW

Health and Safety Code Section 57004 sets forth requirements for peer review of identified portions of rulemakings proposed by entities within the California Environmental Protection Agency, including CARB. Specifically, the scientific basis or scientific portion of a proposed rule may be subject to this peer review process. Here, CARB determined that the rulemaking at issue does not contain a scientific basis or a scientific portion subject to peer review, and thus no peer review as set forth in section 57004 was or is needed to be performed.