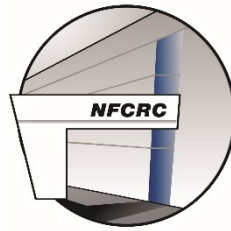


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NFCRC Comments on Docket 19-IEPR-10, Climate Adaptation

Additional submitted attachment is included below.



October 9, 2019

California Energy Commission
Dockets Office, MS-4
Re: Docket No. 19-IEPR-10
1516 Ninth Street
Sacramento, CA 95814-5512

**Subject: 2019 IEPR Joint Agency Workshop on Climate Adaptation:
Docket Number 19-IEPR-10**

The National Fuel Cell Research Center (“NFCRC”) submits these comments on the August 8, 2019 California Energy Commission (“CEC”) and California Public Utilities Commission (“CPUC”) Joint Agency Workshop on Climate Adaptation.

I. Introduction

The NFCRC facilitates and accelerates the development and deployment of fuel cell technology and fuel cell systems; promotes strategic alliances to address the market challenges associated with the installation and integration of fuel cell systems; and educates and develops resources for the various stakeholders in the fuel cell community. A primary mission of the NFCRC is to enable the improvement of air quality and reduction of greenhouse gas emissions through increased use of distributed generation and clean energy sources.

The NFCRC was established at the University of California, Irvine by the U.S. Department of Energy and the CEC with the goal of both developing and transitioning to a form of power

generation that is both energy efficient and environmentally sensitive. The DOE has recognized the significance of the NFCRC efforts in bringing government agencies, business and academia together to develop effective public-private alliances -- in the case of the NFCRC, in order to develop advanced sources of power generation, transportation and fuels.

The NFCRC appreciates the opportunity to provide these comments on the 2019 Integrated Energy Policy Report (IEPR) Climate Adaptation Workshop. We value the CEC leadership with the IEPR to provide “policy recommendations to conserve resources; protect the environment; ensure reliable, secure, and diverse energy supplies; enhance the state’s economy; and protect public health and safety.”¹ As California’s electrical load is projected to increase substantially to meet the State’s climate, clean energy and clean air goals, and address climate change impacts—e.g., Public Safety Power Shutoffs (PSPS), extreme heat, flooding, and wildfires—that precipitate power outages lasting up-to-five days or longer make this topic more critical than ever.

Summary of Recommendations

In this “new normal”² of climate change impacts, California needs a diverse suite of solutions to maintain critical energy services through multi-day grid outages. The NFCRC suggests the CEC examine and recommend solutions to meet these challenges in the forthcoming 2019 IEPR Climate Adaptation draft by:

- 1. Prioritizing fuel cells over dirtier, less-efficient technologies—such as diesel generators—during de-energization and other emergency events.**

¹ California Public Resources Code §25301(a).

² The recent series of catastrophic wildfires in California have been called “the new abnormal” by Governor Brown and others. <https://thehill.com/homenews/state-watch/416167-california-governor-on-wildfires-this-is-the-new-abnormal>; <https://www.ioes.ucla.edu/event/las-new-abnormal-mega-wildfires/>

- 2. Underscoring how fuel cells deployed in microgrids are a perfect complement to intermittent renewable electricity resources, such as solar and wind, and short-term (under 4-hour) storage technologies, such as lithium-ion battery energy storage systems – and how fuel cells are the most viable option for providing long-term electricity generation during power shut downs.**

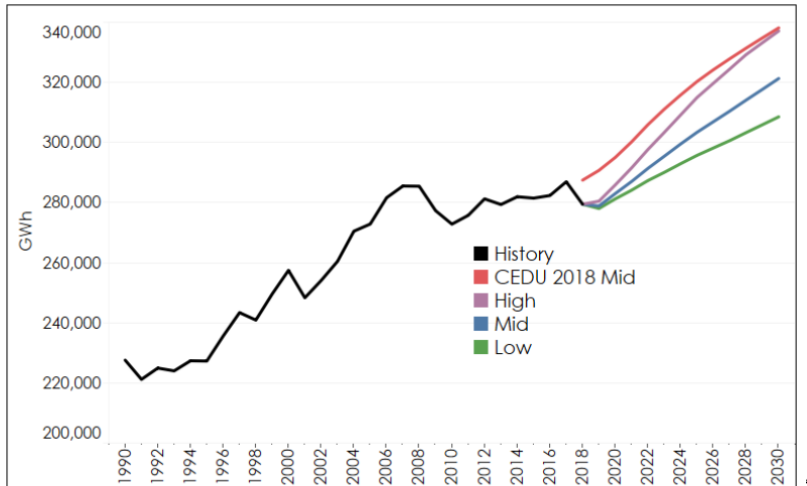
These solutions are necessary for California to meet the clean energy, climate, and equity mandates of SB 100, SB 1383 and AB 617—furthering California’s global leadership on these topics.

II. Comments on the August 8 Workshop

A. Increasing Loads + Public Safety Power Shutoffs (PSPS): The Challenge

After decades of flat load profiles, the CEC is forecasting that electricity demand in California is climbing rapidly,³ driven by electric vehicle charging, building electrification, and increased demand for heating and cooling during more extreme temperatures caused by climate change events. This increased electricity consumption must be properly managed for the State to ensure reliability, affordability, and GHG and pollutant emission reductions in the electricity sector.

³ CED 2019 Preliminary Forecast; Summary of Statewide Results available at:
<https://efiling.energy.ca.gov/GetDocument.aspx?tn=229424&DocumentContentId=60830>



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This reliance on electricity, however, increases the State’s vulnerability to climate caused events. Californians have been warned to prepare for PSPS events that will last for longer than 48 hours.⁵ Additionally, extreme heat leads to rolling blackouts⁶; while wildfires and severe flooding threaten electricity infrastructure. Narrowly, with respect to ratepayer impacts, the CEC estimates that over the past 16 years, California’s wildfires have cost electrical utilities over \$700 million to repair damaged transmission and distribution lines.⁷ This total does not include the loss of life, damage to property, loss of productivity, increased insurance premiums, or harm to critical infrastructure caused by these fires. Perhaps more importantly, the health and safety implications of these long duration outages are stark:

- Medical baseline customers are at risk of losing power to respirators;
- Hospitals cannot perform operations while running on generators;

⁴ Ibid, pg 11.

⁵ https://www.pge.com/en_US/safety/emergency-preparedness/natural-disaster/wildfires/public-safety-power-shutoff-faq.page

⁶ <https://www.washingtonpost.com/news/capital-weather-gang/wp/2018/07/09/record-heat-put-thousands-of-californians-in-the-dark-friday-scientists-predicted-this-from-climate-change/>

⁷ http://www.climateassessment.ca.gov/techreports/docs/20180827-Energy_CCCA4-CEC-2018-002.pdf

- Water agencies that lose power may be unable to pump water for drinking, bathing, and/or fighting fires;
- 911 center and emergency response organizations will be grounded;
- Cell phones will lose service when the telecom towers lose electricity;
- Businesses will lose millions (even billions) of dollars in revenue from spoiled inventory, lost customers, and damaged reputations;
- Workers will forego critical wages if they cannot work; and
- EV drivers may be stranded.

Unfortunately, Californians currently have scant options other than relying on dirty, combustion-based diesel generators during these prolonged outages. This makes a bad situation even worse: according to the California Air Resources Board, operating an uncontrolled one-megawatt diesel engine for only 250 hours per year results in a 50 percent increase in cancer risk to residents within one city block.⁸ Demand for diesel generators has, in some cases, spiked 1,400% since the policy to rely on PSPS to manage electric system infrastructure impacts went into effect.⁹ The City of Lathrop (population 22,000) is preparing for five day PSPS events and expects to burn 10,000 gallons of diesel per day to power the city's critical facilities during these outages.¹⁰ In the Bay Area, if the 7,600 permitted diesel generators were fired up to ride through a PSPS event, they would release the equivalent amount of CO₂ as burning over 2,000 tons of coal and emitting tens-of-thousands of pounds of toxic air pollutants—enough to increase the public risk of asthma and cancer.

⁸ Santa Barbara County Air Pollution Control District: <https://www.ourair.org/do-you-really-need-a-diesel-generator/>

⁹ <https://www.sfchronicle.com/business/article/Demand-for-generators-lights-up-as-PG-E-power-14054242.php>

¹⁰ <https://www.mantecabulletin.com/news/local-news/pge-will-cost-lathrop-40k-daily-fuel/>

B. Solutions: Fuel Cells and Microgrids Instead of Diesel Combustion Generators

Fuel cell systems are uniquely designed to address these challenges. By virtue of their non-combustion process, fuel cells generate electricity that reduces GHGs. Importantly, whether running on natural gas or renewable gas, a recent third-party impact evaluation of California’s Self-Generation Incentive Program found that fuel cells running on natural gas generated the largest reductions in GHG and criteria pollutant emissions of any technology category—see Figure 1 below.¹¹ And when operating on biogas, this technology is net carbon neutral.

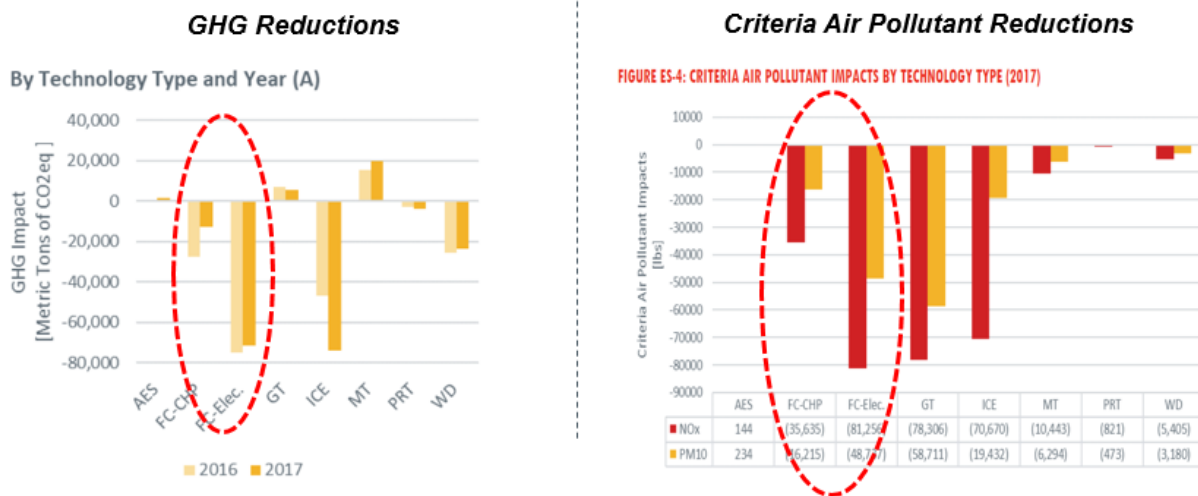


Figure 1: GHG and Criteria Air Pollutant Reductions from Fuel Cell Systems

¹¹ SGIP 2016-2017 Impact Report, Figure 6-1: GHG Impacts by Technology Type and Year and Figure ES-4 Criteria Air Pollutant Impacts By Technology Type (2017)

In addition, fuel cells produce virtually no criteria air pollutants—in contrast to unreliable diesel generators, as shown in Figure 2 below:

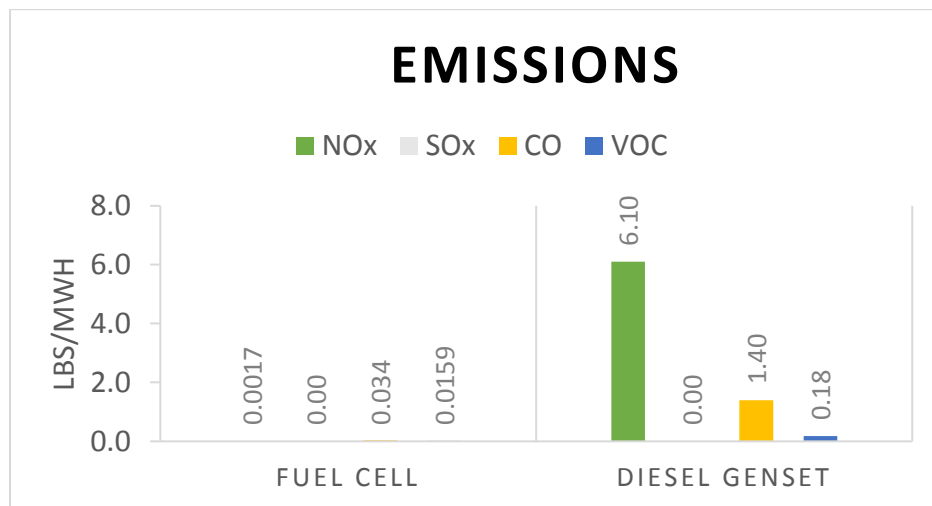


Figure 2. Fuel Cell Criteria Air Pollutant Emissions compared to Diesel Genset Emissions¹²

With respect to resiliency, fuel cell systems address multiple needs:

- Continuous power in the event of a grid outage or PSPS event;
- Baseload power in communities with constrained transmission or distribution infrastructure, including disadvantaged communities or rural locations;
- Long-duration (longer than 24 hours) generation for emergency service centers, telecommunications and critical services such as hospitals, gas stations, and grocery stores. Indeed, the City of Hartford installed a fuel cell-powered microgrid to provide continuous power to these facilities that are co-located on the same block;¹³

¹² Calculations based upon EPA Potential to Emit Calculator for Boilers and Emergency Engines and Bloom Energy Spec Sheet: <https://www.bloomenergy.com/datasheets/energy-server-es5-300kw>

¹³ <https://microgridknowledge.com/microgrid-and-fuel-cell-hartford/>

- By natively producing DC power, fuel cells are able to efficiently charge electric vehicles, buses, and other machinery during a grid outage and do so while minimizing the efficiency losses that occur when converting to AC power;
- Underground fuel lines eliminate the vulnerability to weather and risk of sparks from traditional poles and wires infrastructure;
- Modular design allows the system to continue operating even while individual components are being repaired or replaced;
- Time-to-build, uptime, and recovery time are all faster than the electric utility grid network can achieve;
- Leading power density: Fuel cells produce the largest quantity of zero emissions electricity in proportion to their equipment footprint compared to any technology currently on the market.

Additionally, fuel cell systems can be a key anchor in microgrid configurations to provide long-duration, clean, reliable power. California Public Utilities Code Chapter 4.5 defines microgrids as: *“an interconnected system of loads and energy resources, including, but not limited to, distributed energy resources, energy storage, demand response tools, or other management, forecasting, and analytical tools, appropriately sized to meet customer needs, within a clearly defined electrical boundary that can act as a single, controllable entity, and can connect to, disconnect from, or run in parallel with, larger portions of the electrical grid, or can be managed and isolated to withstand larger disturbances and maintain electrical supply to connected critical infrastructure.”*¹⁴ The

¹⁴ Available at: https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=PUC&division=4.1.&title=&part=&chapter=4.5.&article=

State has repeatedly recognized the resiliency benefits of microgrids, including through the Microgrid Roadmap process¹⁵, SB 1339¹⁶ and the 2018 IEPR¹⁷, which all encourage the development and commercialization of microgrids to increase resiliency, ensure public safety, and adapt to climate change.

Fuel cells paired with storage, wind, solar, demand response, or other technologies, can serve as the backbone for microgrids that integrate numerous distributed energy resources and controls. Microgrids that use fuel cell systems as baseload power are able to immediately disconnect from the grid and island (operate autonomously) from the larger grid when circumstances demand (e.g., during grid outages or PSPS events). The fuel cell installation innately operates as an energy management system, with critical loads for backup power already identified and immediately followed in the case of an outage. A fuel cell system can smoothly transition from grid parallel operation to fully power the load during a grid outage, without interruption to the end user, and to seamlessly re-connect to the utility grid network when its power is restored.

These benefits have directly translated into resilient performance in real-world natural disaster and grid interruption events. During the four storms that buffeted the East Coast from March 2-22 in 2018, millions of customers lost power, including those served by the electric grid in the vicinity of nine fuel cell microgrid sites. Despite the combined 26 electric utility outages, all nine fuel cell microgrids maintained power throughout these events. Other fuel cell systems in the Northeast powered critical

¹⁵ <https://www.energy.ca.gov/research/microgrid/>

¹⁶ Senate Bill No. 1339, Stern. Electricity: microgrids: tariffs. Filed September 13, 2018. Available at: http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB1339

¹⁷ California Energy Commission, *Toward A Clean Energy Future, 2018 Integrated Energy Policy Report Update Volume II*, Adopted February 20, 2019, at 147.

communications and emergency shelters in the aftermath of these storms. Fuel cells also supplied critical load power to a healthcare facility during the triple-digit temperature heat waves that triggered outages for 57,000 customers in Southern California in 2018. Additionally, fuel cells withstood the Sonoma fires in 2018, the 6.0 magnitude Napa earthquake in 2014, and even the accidental bulldozer that was dropped upon a fuel cell system at a customer site in 2016. Whether natural- or human-caused outages occur, fuel cells have a critical role in providing valuable resiliency and lower emissions to all Californians.

III. Closing Comments

The NFCRC respectfully encourages the CEC and CPUC to tackle the challenge of long-duration outages (48+ hours) caused by climate change in an increasingly electrified state.

Specifically, the 2019 draft IEPR Climate Adaptation chapter should:

- 1. Address low carbon, efficient alternatives to dirtier, less-efficient technologies—such as diesel generators—during de-energization and other emergency events.**
- 2. Explicitly identify fuel cell systems as an ideal component of microgrids that perfectly complement intermittent renewables, such as solar and wind, and short-term (4 hour) storage, and create long-duration continuous power.**
- 3. Support opportunities to increase use of renewable gas, including biogas and renewable hydrogen.**

The NFCRC thanks the CEC for the opportunity to provide feedback and look forward to continuing to collaborate to chart a resilient, prosperous, sustainable, and equitable energy future for all Californians.

Respectfully submitted,

 /s/ Jack Brouwer

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