NATIONAL FUEL CELL RESEARCH CENTER

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VIA ELECTRONIC FILING

Massachusetts Department of Energy Resources
Attention: Darchelle Petion
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Re: APS Straw Proposal Comments of the National Fuel Cell Research Center

Please accept these comments on behalf of the National Fuel Cell Research Center in response to the July 20, 2021 Department of Energy Resources Alternative Energy Portfolio Standard Straw Request for Comments.

Respectfully Submitted,

__/s/___Jack Brouwer____

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MASSACHUSETTS DEPARTMENT OF ENERGY RESOURCES
COMMENTS OF THE NATIONAL FUEL CELL RESEARCH CENTER
ON THE ALTERNATIVE ENERGY PORTFOLIO STANDARD STRAW PROPOSAL

I. Introduction and Background

The National Fuel Cell Research Center ("NFCRC") appreciates the opportunity to submit comments to the Massachusetts Department of Energy Resources ("DOER") on the Alternative Energy Portfolio Standard ("APS") Straw Proposal, released on July 20, 2021.

The National Fuel Cell Research Center facilitates and accelerates the development and deployment of fuel cell technology and 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 decarbonization of power and energy storage sectors. The NFCRC was established in 1998 at the University of California, Irvine by the U.S. Department of Energy and the California Energy Commission in order to develop advanced sources of power generation, transportation and fuels and has overseen and reviewed thousands of commercial fuel cell applications.

In these comments, the NFCRC respectfully recommends that the DOER ensure that program designs stimulate the market for the cleanest energy options, per the goals of the APS. The primary recommendation of the NFCRC is that the APS distinguish between Combined Heat and Power (CHP) technology, which releases combustion-related pollutants and harms air quality and Fuel Cell Generation, which in all cases is non-combustion and does not harm air quality, whether producing electricity only or combined heat and power.

II. Comments on the APS Straw Proposal

The Fuel Cell component of the APS program remains an important way for the DOER to address the immediate and future needs for improved air quality, decarbonization and resilient, reliable electricity. Fuel cell systems generate power (and heat) without combustion thereby avoiding criteria air pollutant and air toxic emissions. When fueled by biogas or hydrogen these same fuel cell systems emit no net carbon. These are important benefits of fuel cells systems in helping Massachusetts achieve its objective to reduce emissions to 50% below 1990 levels by 2030.[1] Today, fuel cell systems are providing clean and resilient power to medical facilities, microgrids, communications infrastructure, data centers, multi-unit residential complexes, campuses and traffic and railroad crossing signals, in communities across the U.S.

With ongoing air quality issues,[2] and increased, extended power outages,[3] in the Commonwealth of Massachusetts, the NFCRC strongly recommends that the DOER use the well-established APS to address these issues by prioritizing the use of non-combustion resources that also provide greater resilience. Fuel cell systems are an ideal resource to avoid the use of diesel generators and combustion generation, which only exacerbate the Commonwealth's air quality issues and related health impacts.

[1] Commonwealth of Massachusetts, *An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy.* Available at: Session Law - Acts of 2021 Chapter 8 (malegislature.gov)

[2] United States Environmental Protection Agency *Green Book,* data current as of July 31, 2021. Available at: Massachusetts Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants | Green Book | US EPA

[3] Power Outage Report, *Power Outages in Massachusetts From 2000 to 2020*. Available at: • Massachusetts Power Outage Statistics (2000 - 2020)

The APS should give greater consideration and support to non-combustion distributed energy resources.

DER that emit criteria air pollutants have the potential to introduce new sources of emissions into urban airsheds with large populations and thereby cause risks to human health. Many areas of Massachusetts currently suffer from poor air quality and face major challenges in achieving clean air for the many citizens that live and work within these areas. This is particularly true for economically disadvantaged communities that are often disproportionately burdened by local air pollution. Therefore, DER such as fuel cells that provide clean, efficient energy conversion produce a wide range of energy, environmental, and economic benefits for many different industries and applications that should be preferentially adopted because of the significant value they provide to the Commonwealth. The NFCRC encourages the DOER to change the proposed phasedown of support for fuel cells that are helping the Commonwealth to meet its air quality, equity, and climate goals.

Local air quality and greenhouse gas emissions reductions should be valued by the DOER across regulatory processes and programs.

Technologies that increase local air pollution anywhere and especially in disproportionately impacted disadvantaged communities should be explicitly excluded from DOER programs, consistent with the intent of the Climate Act, RPS and APS. All combustion-based technologies have emissions of criteria pollutants, such as NOx, SO_2, and particulate matter (PM). To reduce - but not eliminate - these emissions, many of these combustion-based technologies deploy post-combustion clean-up technologies such as selective catalytic reduction (SCR) to reduce nitrogen oxide emissions or particulate traps to reduce PM emissions. However, these technologies do not eliminate emissions and must be maintained to be effective and can

emit other compounds such as ammonia, which is a PM precursor leading to an additional air quality burden; often directly into disproportionately impacted communities. The full lifecycle benefits of fuel cell systems also reduce community impacts; over 90% of fuel cell systems can be recycled at end of life and do not end up in landfills.

Fuel cells are zero-emission with respect to nitrogen oxides, carbon monoxide, sulfur oxides, and particulate matter, and they emit less GHG when operating on natural gas (as compared to the combustion of natural gas), and fuel cells produce zero GHG emissions when operating on renewable fuels.

Fuel cells reduce emissions of both criteria pollutants and GHGs compared to traditional power generation options including the grid and CHP energy systems. Figure 1 compares fuel cell manufacturer's specifications for NO_x emissions to various technologies and electricity generation sources. Federal standards (Tier III and Tier IV) for diesel generator emissions are shown since the definition of non-road diesel engines includes stationary engines sold in California. Natural gas generator set emissions are shown without post combustion exhaust treatment (selective catalytic reduction ("SCR")). The SCR is added to gas generator sets to reduce the NO_x emissions to meet permitted levels. Fuel cell exhaust is clean and substantially exceeds central powerplant best available control technology ("BACT") and distributed generation certification levels with direct exhaust, i.e., no after-treatment needed to achieve near-zero NO_x emissions.

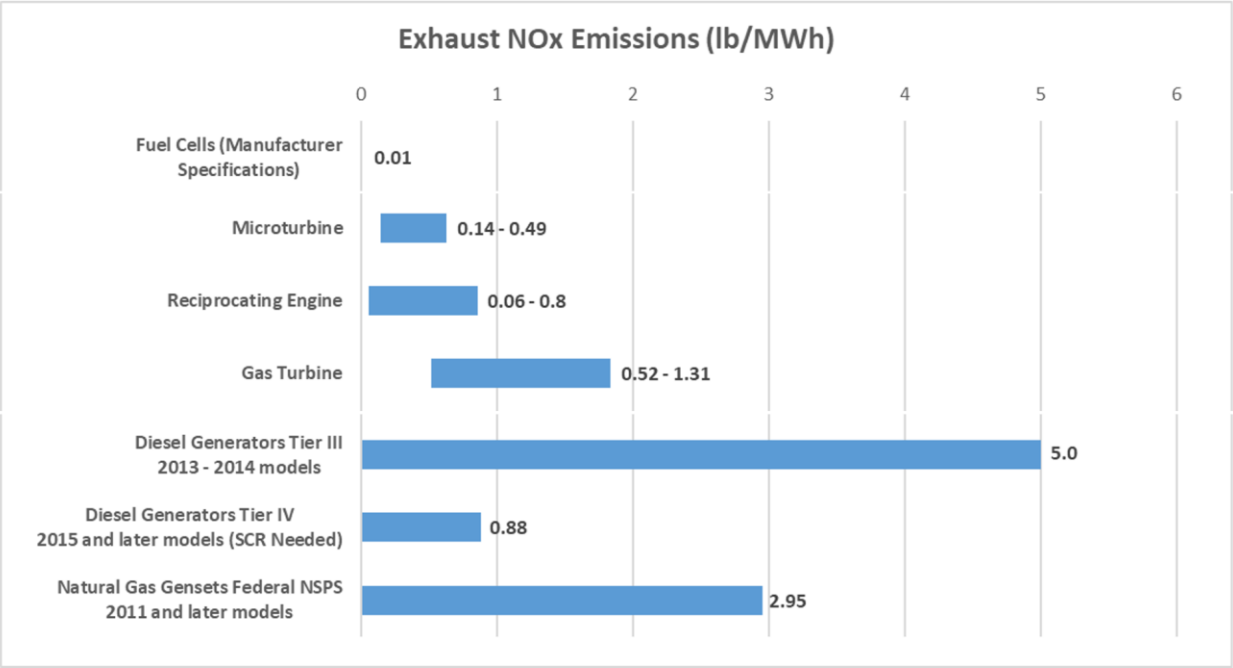

Figure 1. Emissions from Fuel Cells Relative to other forms of self-generation.[4]

In June of 2021, the California Public Utilities Commission approved a Decision[5] in the Self-Generation Incentive Program that includes the following requirements:

> …to ensure that incentives are not awarded to facilities that could exacerbate exceedances of air quality standards, we prohibit award of SGIP incentives for internal combustion projects located in a county listed as a severe or extreme federal nonattainment area for particulate matter (PM_{10} or $PM_{2.5}$) or eight-hour ozone (O_3) in the U.S. Environmental Protection Agency Green Book in any of the three years prior to the SGIP application date.[6]

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[4] U.S. EPA, *Emissions and Generation Resource Integrated Database (eGRID)* https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid, *2014 Summary Tables*, 2017, eGRID2014v2. Available: https://www.epa.gov/sites/production/files/2017-02/documents/egrid2014_summarytables_v2.pdf; U.S. EPA, *Catalog of CHP Technologies.* Microturbine, reciprocating engine and gas turbine data from Catalog chart https://www.epa.gov/sites/production/files/2015-07/documents/catalog_of_chp_technologies_section_1._introduction.pdf; Dieselnet. *United States: Nonroad Diesel Engines*. Available at: https://www.dieselnet.com/standards/us/nonroad.php#tier3 [cited 2017]; Dieselnet. *United States: Stationary Engines: SI Engines (NSPS)*. [New Source Performance Standards] Available at: https://www.dieselnet.com/standards/us/stationary_nsps_si.php#reg [cited 2017].

[5] California Public Utilities Commission, *Decision Revising Self-Generation Incentive Program Renewable Generation Technology Program Requirements and Other Matters*, June 3, 2021. Available at: https://apps.cpuc.ca.gov/apex/f?p=401:56:0::NO:RP,57,RIR:P5_PROCEEDING_SELECT:R2005012

[6] See the U.S. Environmental Protection Agency Greenbook list of nonattainment counties by year, available here: https://www3.epa.gov/airquality/greenbook/anayo_ca.html.

The NFCRC recommends that the DOER consider such an approach in the interest of both customers and local communities that are adversely exposed to poor air quality.

Additionally, the APS is the only energy program in Massachusetts that provides consistent support for microgrids. The phase out of support for fuel cell systems, together with solar power, energy storage, and other technologies deployed in microgrids would effectively phase out support for the resilient power they provide for critical infrastructure and services, and the avoidance of emissions from diesel generators that would otherwise be used for microgrids and resilience.

Most backup power demands can be met with fuel cell systems because of the small footprint required for the energy conversion equipment and no need for fuel delivery (when fueled by the gas system). Fuel that is supplied via underground gas pipelines is significantly more reliable than the above-ground electric grid. Pipeline gas delivery thus effectively has less space required compared to diesel generators and diesel fuel storage. In addition, on-site stored diesel fuel has the potential to leak and contaminate soils and groundwater. If the fuel cell systems are built into the site, then they both offset the grid power (and related GHG and criteria air pollutant emissions) and achieve a seamless transition to backup power during grid outages.

Fuel cell systems are fuel flexible. While hydrogen is the ideal fuel for fuel cells, fuel cells can also operate on natural gas, biogas, methanol, or propane. While the longer-term goal for Massachusetts should be to operate fuel cells on renewable hydrogen, a viable approach for now and for the transition, is the clean and efficient utilization of natural gas today, together with investments to transform the gas system over time to 100% renewable gas. The high availability and reliability of the gas system is commercially delivered at very low cost, and the high

efficiency and reduced emissions of fuel cell systems operating on gas compared to combustion systems leads to climate and air quality benefits. In addition, over time, the natural gas system will evolve to increasingly deliver renewable fuels (renewable biogas and hydrogen).

A recent study of the Gas Technology Institute demonstrates greater than five-nines performance of 0.9999957 average reliability/availability of the gas system. Most gas system outages are due to planned maintenance and gas systems often remain operational during extreme weather events. In most regions, North American gas distribution systems should have intrinsic reliability levels equal to, or better than, onsite liquid fuel storage—a key consideration for emergency and standby generators.[7] The reliability of gas infrastructure thus far outweighs that of the delivery of diesel fuel; a fuel source that is often not available during an emergency such as a wildfire or grid outage, as was proven during hurricane Katrina.

III. Conclusion

The NFCRC appreciates the continued inclusion of fuel cell systems in the APS Straw Proposal and requests that the DOER take the simple steps of prioritizing incentives for technologies that decrease emissions to ensure an equitable and transparent program.

[7] Gas Technology institute, Assessment of Natural Gas and Electric Distribution Service Reliability July 19, 2018. Available at: https://www.gti.energy/wp-content/uploads/2018/11/Assessment-of-Natural-Gas-Electric-Distribution-Service-Reliability-TopicalReport-Jul2018.pdf