NATIONAL FUEL CELL RESEARCH CENTER

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VIA ELECTRONIC FILING

Samantha Meserve
Massachusetts Department of Energy Resources
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Re: APS Comments

Dear Samantha Meserve:

Please accept these comments on behalf of the National Fuel Cell Research Center in response to the Notice requesting comments on the draft changes to the Alternative Energy Portfolio Standard regulation in 225 CMR Section 16.00.

Respectfully Submitted,

__/s/___Scott Samuelsen____

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DRAFT REDLINE OF THE MASSACHUSETTS
ALTERNATIVE ENERGY PORTFOLIO STANDARD

Comments of the National Fuel Cell Research Center

I. Introduction and Background

The National Fuel Cell Research Center ("NFCRC") appreciates the opportunity to submit comments on draft regulations to include renewable thermal, fuel cells, and waste-to-energy thermal in the Massachusetts Alternative Portfolio Standard (APS) pursuant to Chapter 251 of the Acts of 2014 and Chapter 188 of the Acts of 2016.

The NFCRC facilitates and accelerates the development and deployment of fuel cell systems; promotes strategic alliances to address market challenges associated with the installation and integration of fuel cell systems; and educates and develops resources for global distributed generation and combined heat and power (CHP) stakeholders. The NFCRC is working with Bloom Energy; Doosan Fuel Cell America; Fuel Cell Energy; GE-Fuel Cells, LLC; and LG Fuel Cell Systems Inc.

Fuel cells are considered the cleanest, most efficient alternative energy source for firm power and utility procurement. Power generation produced through natural gas combined cycle (NGCC) combustion turbine power plants today meets the majority of electricity demand in Massachusetts, but with the emission of criteria pollutants (e.g., NOx) and efficiencies limited by heat engine constraints. When using natural gas, fuel cells reduce greenhouse gases (GHG), emit virtually zero criteria pollutant emissions, and operate with high efficiencies. Fuel cells also operate in a virtual water balance. To illustrate, the use of a 400 kilowatt (kW) fuel cell system to generate CHP for a building can save over one million gallons of water annually, compared to the water required to generate the same amount of electricity at a central power plant. When operated on renewable hydrogen, fuel cell systems produce dispatchable power with zero greenhouse gas and zero criteria pollutant emissions.

Stationary fuel cells have highly dynamic dispatch capabilities to (1) manage the diurnal

and seasonal power demand variations, (2) handle intermittencies associated with solar and wind power generators, and (3) increase the maximum penetration of renewable resources that can be accommodated in the utility grid network.[1,2] These capabilities, in conjunction with the additional integration of renewables with transportation electrification, will result in maximum sustainability and GHG reductions. Stationary fuel cells can also contribute to cleaner air and improved health of citizens as they are suitable for citing near or even inside buildings due to virtually zero pollutant emissions, and an acoustically benign attribute. They also avoid the challenges related to permitting and zoning.

Highly efficient electric and CHP fuel cell systems are today providing stable power and heat in Massachusetts, globally in microgrids, and at wastewater treatment plants, food and beverage plants, grocery stores, office buildings, telecommunication hubs, data centers, retail stores, universities, hospitals, hotels, and government facilities.

Fuel cells provide exceptional resiliency and have maintained power and heat for critical communication hubs, cell towers, data centers, emergency shelters and other essential services across the Northeast during and after Hurricane Sandy and other severe weather events. Fuel cells also help mitigate an over-reliance on the long-distance transmission of electricity from intermittent large-scale resources that are located far from load centers. In the event of a grid outage, fuel cell systems are able to seamlessly island (i.e., separate) from the utility grid network, and support key loads for customers who increasingly require an un-interrupted supply of electricity.

On the utility side of the meter, large-scale fuel cell systems are being deployed to create grid support solutions where transmission is constrained or increased reliability is sought. Examples range from a 15MW system in Connecticut, to a 30MW system in Delaware, to a 59MW system in Seoul, Korea. These resources are providing clean, firm (24/7, load-following) power generation to complement the increasing deployment of intermittent solar and wind resources and support grid reliability in locations where it is most needed.

[1] Maton, Jean-Paul, Zhao, Li, and Brouwer, Jacob, *Dynamic modeling of compressed gas energy storage to complement renewable wind power intermittency*, International Journal of Hydrogen Energy, Volume 38, pp. 7867-7880, 2013.

[2] Shaffer, Brendan, Tarroja, Brian, Samuelsen, Scott, *Dispatch of fuel cells as Transmission Integrated Grid Energy Resources to support renewables and reduce emissions*, Applied Energy, Volume 148, 15 June 2015, pp. 178-186.

II. Comments

While the NFCRC applauds the expansion of the Massachusetts APS to include GHG-reducing fuel cell systems and other clean technologies, contradictory performance requirements presented in the redline document should be streamlined to enable the full benefit of increased fuel cell deployment.

A. The Net Carbon Dioxide Emission Rate Should Determine APS Eligibility and Incentives

In accordance with the Global Warming Solutions Act of 2008 (GWSA), the goal of the DOER is to enable achievement of a greenhouse gas reduction goal of 25% by 2020 through the full implementation of the policies contained in the recent update to the Clean Energy and Climate Plan for 2020, and to include policies beneficial to achieving greater reductions for 2030 and beyond. Section 16.05(1)(e) of the draft regulations states that APS generators must comply with a net carbon dioxide emissions rate to be established by the DOER at least every two years: "*A Generation Unit shall not exceed a net carbon dioxide emissions rate of 890 pounds per MWh, including all net carbon dioxide emission equal to the average emissions rate of existing natural gas plants in Massachusetts at the time when the Generation Unit is qualified.*"[3]

Section 16.05(1)(a)(7)(b) of the draft Alternative Energy Portfolio Standard regulation contains a new redline requirement that fuel cell generation must "*meet an overall efficiency of 60%.*"[4] The NFCRC recommends that the DOER use the defined **emissions** standard, and eliminate the proposed **efficiency** standard as it (1) causes different provisions for fuel cell technology in contrast to other technologies, and (2) detracts from a focus on the more critical standard of emissions.

Additionally, the NFCRC recommends that the DOER use metrics such as capacity factor, the reduction and elimination of greenhouse gases, and criteria air pollutants (nitrogen dioxide, sulfur dioxide, and particulate matter) to more appropriately map the contributions of fuel cell systems to APS goals. A capacity factor metric provides a more

[3] Massachusetts Alternative Portfolio Standard Rulemaking, 225 CMR 16.00 (with Tracked Changes) – June 2, 2017, page 18.
[4] Id., at page 16.

relevant measure of the performance of fuel cell systems than electrical efficiency because it ensures maximum power production and the maximum reduction of emissions. Measuring electrical efficiency would require fuel cell installations to be based on the electric and thermal loads of the customer, requirements that would need to closely correspond, which is generally not the case. Customers for whom the thermal and electric loads correspond and are well-matched are already eligible to participate in the APS Combined Heat and Power program.

B. Legislative Intent Should be Followed

The legislative intent of these APS amendments is to create a more inclusive Standard that maximizes emissions reduction and provides consumers with a clean technology choice that will best suit their energy needs--either the production of electricity only or electricity and heat. The legislative intent was to recognize the capacity of a fuel cell system to provide a reduction of carbon and criteria pollutants, and not to create an efficiency requirement that would limit fuel cell installations to a single technology of combined heat and power.

III. Conclusion

The NFCRC values the Commonwealth's commitment to grid modernization and the expansion of clean distributed energy resources to meet energy and environmental goals. The NFCRC fully supports the inclusion of fuel cell, renewable thermal, and waste-to-energy thermal technology in the APS with a focus on emissions reduction requirements and metrics, and the removal of the 60% overall efficiency requirement. This will help ensure that an appropriate focus is placed on performance and emissions reduction for APS technologies and that fuel cell deployment expands in Massachusetts.