COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF ENERGY RESOURCES

THE STATE OF ENERGY STORAGE AND ITS FUTURE ROLE IN THE COMMONWEALTH	:	SEPTEMBER 1, 2023

FUELCELL ENERGY, INC.'S COMMENTS

FuelCell Energy, Inc. ("FCE") hereby submits comments regarding the Commonwealth of Massachusetts' Energy Storage Study in follow-up to the June 7, 2023 and August 16, 2023 stakeholder sessions.

I. INTRODUCTION

FCE is proud to be among the companies that have been dedicated to clean energy innovations since its inception five decades ago. The company was founded in the United States in 1969 by two scientists devoted to pursuing technological innovations that address a wide variety of energy priorities through patent-protected U.S. innovation, compound combinations that produce and use energy in ways that are smarter and cleaner.

FCE's current product portfolio includes two dynamic electrochemical platforms: molten carbonate and solid oxide. The platforms are similar in many ways, but they also have unique capabilities. Importantly, both can support power generation and combined heat and power ("CHP") applications from a variety of fuels, including natural gas, renewable biogas, or hydrogen. The strength of FCE's technologies is that they can be combined in ways to achieve multiple objectives and to provide a myriad of benefits, including cleaner and more reliable generation.

These fuel cells react with fuel electrochemically, which avoids emissions produced by fuel combustion. In the electrochemical process, fuel and air are reacted in separate chambers in

the fuel cell stack. As a result, the reactions producing CO2 happen before the fuel is mixed with air while the CO2 remains concentrated and easy to remove. FCE's molten carbonate and solid oxide fuel cell systems both benefit from this unique feature, with modifications enabling the capture of their own CO2 for use or sequestration before it is emitted into the air.

FCE's molten carbonate fuel cell is unique in its ability to also capture CO2 from an external source, such as a power plant or an industrial boiler. FCE's solid oxide fuel cell can operate on pure hydrogen as a feedstock, emitting zero CO2. FCE is also currently commercializing a solid oxide electrolyzer that will produce hydrogen from power and water, which will be well suited to partner with renewable energy projects and hydrogen storage infrastructure.

Each of these technologies have the added benefit of being able to deliver the continuous power needed to complement the intermittency of renewable technologies and ensure reliability. As a consequence, they offer a solution that can close the gap between the capabilities of existing renewable energy technologies and future system reliability needs and assist the Commonwealth in pursuing its plan to achieve net zero in 2050.

II. PROCEDURAL BACKGROUND

In December 2022, Executive Office of Energy and Environmental Affairs released the Clean Energy and Climate Plan for 2050 ("CECP"), which sets forth the Commonwealth's plan to achieve net zero in 2050.[1] In particular, the CECP requires overall greenhouse gas emission reductions of 85% from 1990 levels, including an electric sector reduction of 93%.[2] This will

[1] Stakeholder Session 1 Presentation (Jun. 7, 2023) ("Session 1 Presentation"), at 7; Stakeholder Session 2 Presentation (Aug. 16, 2023) ("Session 2 Presentation"), at 6.

[2] *Id*.

require over 50 GW of solar and wind – intermittent renewable resources.[3] Thus, storage will "play a critical role in renewables integration and in meeting CECP's Net Zero goal."[4]

Section 80 of Chapter 179 of the Acts of 2022 ("An Act Driving Clean Energy and Offshore Wind") requires the Department of Energy Resources ("DOER"), in consultation with the Massachusetts Clean Energy Center ("MassCEC"), to study the role of storage in a 2050 Net Zero Commonwealth, particularly mid- and long-duration storage technologies.[5] In December 2022, MassCEC issued a Request for Proposals (RFP) for consultants, and, subsequently selected Energy and Environmental Economics, Inc. (E3) to assist with the study.

MassCEC, DOER, and E3 conducted two stakeholder sessions to present interim work products, address technical questions, and collect feedback on the study. The first session was held on June 7, 2023, and the second was on August 16, 2023. FCE hereby submits its initial comments in follow-up to those stakeholder sessions.

III. COMMENTS

FCE agrees with the assessment that short-duration, battery storage is the best means by which to satisfy Massachusetts's short-term energy storage goals.[6] However, utility scale, long-duration battery storage will likely not be a feasible long-term option given raw material constraints and costs.[7] As part of the stakeholder process, it was recommended that the role of hydrogen be considered.[8] However, hydrogen is not being addressed as part of the study.[9]

[3] Session 1 Presentation, at 7; Session 2 Presentation, at 6.

[4] *Id.*

[5] Session 1 Presentation, at 6, 7.

[6] *See* Session 1 Presentation, at 19.

[7] *Cf.* Session 2 Presentation, at 17 ("Current revenue streams are not enough to support deployment of mid-duration batteries today or in 2030.").

[8] Session 2 Presentation, at 22.

[9] *Id.*

As New York has recognized:

> Hydrogen-based firm capacity could effectively provide a form of storage to the system on the order of hundreds of hours, as large quantities of fuel can be produced during the spring and summer during times of high renewable output and relatively low electricity demand, and then utilized over the course of the winter if there is sufficient fuel storage.[10]

Hydrogen offers one of the only economic, modular, and geographically flexible means for zero emission long-duration (e.g., seasonal) storage of renewable power.[11] In addition, hydrogen is a powerful tool that will help integrate renewable energy across our economy and society leading to a cleaner and more resilient future.[12] In fact, hydrogen does a much better job storing energy over days, weeks, and months than batteries. By storing energy as hydrogen, the power of wind or sun can be held until needed – providing a powerful tool to enhance grid reliability while reducing carbon emissions.

One of the additional benefits of the use of hydrogen is "reduction of criteria pollutants (e.g., sulfur, particulates, and nitrogen oxides) and grid reliability and resilience, especially in combination with fuel cell use to convert hydrogen back to electricity and heat without pollution."[13] Moreover, fuel cells offer a useful alternative to lithium-ion battery storage technologies in applications requiring larger scale or longer-term energy storage, with the added

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[10] New York's 6 GW Energy Storage Roadmap Policy Options for Continued Growth in Energy Storage (*available at*: https://documents.dps.ny.gov/public/MatterManagement/MatterFilingItem.aspx?FilingSeq=297549&MatterSeq=55960), at 70.

[11] *See* U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, Hydrogen and Fuel Cell Technologies Office Webinar, "H2IQ Hour: Long-Duration Energy Storage using Hydrogen and Fuel Cells: Text," https://www.energy.gov/eere/fuelcells/h2iq-hour-long-duration-energy-storage-using-hydrogen-and-fuel-cells-text (last visited Aug. 30, 2023).

[12] *Cf.* Session 1 Presentation, at 31 ("Mid- and long-duration energy storage has potential to provide reliability in future high-renewables systems through intra- and inter-day load shifting.").

[13] Columbia University School of International and Public Affairs, Center on Global Energy Policy, "Green Hydrogen in a Circular Carbon Economy: Opportunities and Limits" by Zhiyuan Fan, Emeka Ochu, Sarah Braverman, Yushan Lou, Griffin Smith, Amar Bhardwaj, Dr. Jack Brouwer, Dr. Colin McCormick, Dr. Julio Friedmann August 2021, https://www.energypolicy.columbia.edu/publications/green-hydrogen-circular-carbon-economy-opportunities-and-limits (last visited Aug. 30, 2023).

advantage of avoiding waste and supply-chain concerns associated with batteries. Thus, FCE recommends that the study recognize that hydrogen can "play a critical role in renewables integration and in meeting CECP's Net Zero goal."[14]

The study should also recognize that one of the biggest barriers to advancing long-duration energy storage is the lack of programs to support technology advancements in long-duration energy storage.[15] Given the current state of long-duration energy storage technology, one way the Commonwealth can help move more nascent technologies toward commercialization is to authorize funding for demonstration projects.[16] In order to advance multiple technologies and provide environmental and reliability benefits where they are needed most, FCE recommends that the Commonwealth authorize funding for smaller size demonstration projects that are scalable.

First, smaller, scalable demonstration projects will provide opportunities to advance multiple technologies toward commercialization sooner. By investing in a single, large-scale project, Massachusetts would be making a choice about which technology it believes will best meets its needs and will invest only in that technology. As a consequence, other technologies that may be more efficient, cost-effective, or better suited for the Commonwealth's particular needs may not be developed or commercialized. Moreover, if the single demonstration project is unsuccessful, valuable time and resources will have been lost; thereby, unnecessarily increasing the time and costs necessary to find viable technology solutions. Conversely, investing in smaller but scalable demonstration projects will allow Massachusetts to deploy the limited funds it has

[14] *Cf.* Session 1 Presentation, at 7; Session 2 Presentation, at 6.

[15] Session 2 Presentation, at 42 ("State (and utility) programs and incentives are critical to supporting these projects, but provide little incentive to extend storage durations beyond 2-4 hours.").

[16] *Cf.* CECP, at 117 ("Innovation can be encouraged by direct funding of RD&D or pilot projects . . . .").

available to help advance numerous technologies and to determine how to most effectively and efficiently use those technologies. In this way, Massachusetts can evaluate different technologies and determine which projects provide the most benefit.

Second, smaller, scalable demonstration projects can be sited in areas where they are needed most. For example, in Boston, "[a]bout 256,000 people live within one mile of [peaker] power plants, and 1.45 million people live within three miles of a peaker."[17] Given the limited real estate available in Boston, a large scale demonstration project will necessarily need to be located in another part of the state. Conversely, smaller, scalable projects could be built in areas where they are needed most and where they could provide the most benefit to Environmental Justice ("EJ") communities. For example, FCE's SureSource fuel cells occupy much less than an acre of land per 10 MW installed making it easier to site in areas with limited real estate and higher population densities like Boston, Worcester and Springfield. By siting demonstration projects in these areas, the Commonwealth can deploy the limited resources available to bring "environmental benefits"[18] to EJ communities sooner.[19]

In establishing the operating parameters for demonstration projects, the Commonwealth should ensure that the projects are operated in a manner that provides the most opportunities to learn about the technology under various operating conditions. To that end, the projects should be operated regularly to determine optimum performance. For example, a hydrogen-based, long-

[17] Clean Energy Group/Strategen, "The Peaker Problem: An Overview of Peaker Power Plant Facts and Impacts in Boston, Philadelphia, and Detroit" (Jul. 27, 2022) (*available at*: https://www.cleanegroup.org/wp-content/uploads/The-Peaker-Problem.pdf) (last visited Aug. 31, 2023), at 21.

[18] *See* Mass. Gen. Laws Ch. 30, § 62 (defining environmental benefits as: "access to clean natural resources, including air, water resources, open space, constructed playgrounds and other outdoor recreational facilities and venues, clean renewable energy sources, environmental enforcement, training and funding disbursed or administered by the executive office of energy and environmental affairs.").

[19] CECP, at xiv ("The Commonwealth will ensure that EJ neighborhoods and low-and moderate-income residents are not left behind in the energy transition, which will require prioritizing investments in clean energy in EJ neighborhoods.").

duration energy storage project should be cycled (i.e., creating hydrogen from energy and creating energy from hydrogen) fairly frequently. Operating such a project once a year will not provide sufficient data. Instead, the facility should be cycled a couple times a month whereby it generates hydrogen for several days per month and then consumes hydrogen and generates power for several days per month. This will help identify the optimum cycling window for the technology. Operating demonstration projects at regular intervals and under different operating conditions will also help to identify what level of performance optimizes reductions in emissions and the reliability benefits of the project.

Ultimately, the data and learnings from the demonstration projects should be shared with the University of Massachusetts who can take the data and evaluate how to most effectively and efficiently use the technologies.[20] The learnings from these projects can also educate students about these evolving technologies and help build the future job base for the industry.[21]

IV. CONCLUSION

FCE appreciates the opportunity to offer these comments regarding the Massachusetts Energy Storage Study and looks forward to continuing to partner with Massachusetts as it pursues its clean energy goals.[22]

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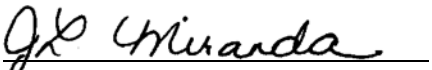
[20] *Cf.* CECP, at xv ("The Commonwealth will continue to play an important role in supporting clean energy companies, particularly in helping companies establish commercial viability while ensuring that historically under-represented investors participate and lead in advancing clean energy technologies. Massachusetts will further establish partnerships to help expand technology transfer programs at Massachusetts universities.").

[21] *See id.* at 32 ("The path forward will require Massachusetts to expand the clean energy labor pool by prioritizing attracting diverse candidates, bolstering industry awareness, scaling up workforce and education programs, and improving alignment with employers' and participants' needs.").

[22] FCE is one of the partners selected in the consortium to develop a proposal to become one of at least four regional clean energy hydrogen hubs designated through the federal Regional Clean Hydrogen Hubs program included in the Bipartisan Infrastructure Investment and Jobs Act. *See* "Governor Hochul Announces Multi-State Agreement Signed with Major Hydrogen Ecosystem Partners to Propose a Regional Clean Energy Hydrogen Hub," https://www.governor.ny.gov/news/governor-hochul-announces-multi-state-agreement-signed-major-hydrogen-ecosystem-partners (last visited Aug. 30, 2023).

Respectfully submitted,
FUELCELL ENERGY, INC.

By: 

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