STATE OF NEW YORK
LEGISLATIVE ASSEMBLY

JOINT PUBLIC HEARING: POWER AND COMMUNICATION FAILURES FROM TROPICAL STORM ISAIAS	:	NYS ASSEMBLY
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FUELCELL ENERGY, INC.'S
WRITTEN TESTIMONY

FuelCell Energy, Inc. ("FCE") hereby submits its written testimony in response to the New York State Assembly's request for written testimony issued on July 29, 2020.

I. INTRODUCTION

A. FCE Background.

FCE is in its 51st year of operation, with its worldwide corporate headquarters in Danbury, Connecticut, and its manufacturing facility located in Torrington, Connecticut. The fuel cell products FCE manufactures in Connecticut are exported all over the world. FCE currently has over 250 Megawatts ("MW") of stationary fuel cells installed or in backlog on three continents. FCE's clean, efficient fuel cells have generated over ten billion kWh of power. FCE's products, projects, and company as a whole help reduce emissions, improve resiliency of energy infrastructure, provide sales and tax revenue, and creates and retains jobs. More than 85% of FCE's supply chain is domestically based, and in the past five years, FCE has spent more than $63 million with New York-based suppliers and vendors to support its manufacturing and

power generation business. FCE is eager to continue and expand its fuel cell installations in New York in order to provide New Yorkers with clean, reliable and resilient baseload generation.

FCE's stationary SureSource carbonate fuel cells are well suited for many applications and are scalable for any project size. FCE's SureSource platforms are capable of installation in combined heat and power and microgrid applications and for grid-scale electricity. FCE's platforms are also capable of generating hydrogen for vehicle fueling and industrial applications.

FCE's installations form the backbone of several microgrids, to ensure continued power during grid interruption. These installations include a microgrid at the University of Bridgeport (Bridgeport, Connecticut), a microgrid at the University of California (San Diego, California), and a microgrid at the Santa Rita correctional facility located in Alameda County, California. The latter two FCE microgrids were recently showcased in an article for keeping the power flowing during California's rolling blackouts.[1] FCE's SureSource carbonate fuel cells were the preferred generation resource in the proposed NY Prize microgrid located in Huntington, Long Island.

B. FCE's Technology.

FCE's fuel cells are clean baseload generators that have unique benefits, which directly serve the policy goals of New York's Climate Act. FCE's MW-scale SureSource fuel cells cost effectively offer customers operating savings, improved resiliency through full grid-independent microgrid operation, achievement of environmental goals with near zero criteria pollutants and a low carbon footprint, fuel flexibility with the ability to run on hydrogen, natural gas, or anaerobic

[1] Elisa Wood, Microgrid Knowledge, It's Dark in California but the Message is Clear: More Microgrids Needed https://microgridknowledge.com/microgrids-california-power-outages/ (October 11, 2019).

digester gas, and additional benefits through heat recovery for combined heat and power applications.

Fuel cells emit negligible NO_X, SO_X, and particulate matter pollutants—which are leading causes of issues like acid rain and respiratory ailments. That is because fuel cell energy generation does not involve combustion, and instead, fuel cell technology efficiently generates energy from fuel through a chemical reaction. While fuel cells do emit a small amount of carbon dioxide, it is only a fraction of the carbon dioxide emitted by traditional grid generators because of the inherent efficiency of direct power conversion without combustion. As compared to the most efficient combined cycle natural gas plants currently under construction in the Northeast, FCE's SureSource fuel cells emit 7–20% less carbon dioxide (depending on configuration); 80% less NO_X; 99% less SO_X; and greater than 99% less particulate matter pollution. Unlike intermittent renewable zero carbon resources, fuel cells provide steady continuous clean power, avoiding the need for combustion backup diesel generators or peaking generation to solve intermittency issues or batteries, which carry their own end of life disposal issues.

FCE's SureSource fuel cells are between 47% and 60% electrically efficient, beating traditional average grid efficiencies. FCE can achieve greater than 80% efficiency in a combined heat and power mode. FCE's carbonate fuel cell technology is also a platform for cutting edge applications that represent the future of clean energy and the environment. FCE's carbonate fuel cells have the ability to take in the flue gas directly from coal and natural gas power plants or other industrial applications, and concentrate and remove from the flue exhaust up to 90% of the carbon, while also removing up to 70% of the harmful emissions of NO_X, which causes acid rain and smog. And, along with carbon capture, carbonate fuel cells produce electricity in the process, thus adding to the revenue stream, as opposed to other carbon capture technologies,

which consume a substantial amount of electricity and add cost. This is a new application for FCE's technology that FCE has been working on as part of a joint development agreement with ExxonMobil. FCE is also working to build out hydrogen fuel infrastructure in order to enable the deployment of emissions free vehicles. Additionally, FCE recently signed a contract with Toyota to install one of FCE's trigeneration carbonate fuel cells at the Port of Long Beach that, in addition to producing electricity and heat, will also produce the hydrogen needed by Toyota to fuel its hydrogen vehicles coming into the port. Water generated from the fuel cell will also be used for car washing operations.

FCE's fuel cell platforms are also fuel flexible, with the ability to run directly on biogas after cleaning in FCE's proprietary fuel cleanup system. Thus, if an effective source of biogas is available, FCE's fuel cells are essentially carbon negative, by directly utilizing fuel that would otherwise be flared. FCE also has numerous installations at wastewater treatment plants running directly on biogas.

II WEATHER-RELATED POWER LOSSES AND THE CRUCIAL IMPORTANCE OF GRID RESILIENCY

New York has faced tremendous power outage difficulties resulting from adverse weather conditions over the years, most recently after Tropical Storm Isaias. On August 4, 2020, Isaias passed through New York within only a few hours—a relatively short storm—however hundreds of thousands of residents throughout Westchester, Long Island and parts of the outer boroughs of New York City were left without power for days, and in some cases, more than a week.[2] These outages, which coincided with a brutal heat wave, have resulted in health

[2] Kate King, The Wall Street Journal, Long Power Outages After Isaias Spark Calls to Overhaul Utilities, https://www.wsj.com/articles/long-power-outages-after-isaias-spark-calls-to-overhaul-utilities-11597858173 (August 19, 2020); Denis Slattery, New York Daily News https://www.msn.com/en-us/news/us/new-york-lawmakers-grill-utility-companies-following-outages-from-tropical-storm-isaias/ar-BB18cSCL (August 20, 2020).

emergencies that have impacted the lives of millions of New Yorkers.[3] During the power outage, the elderly and persons with respiratory issues were particularly at risk.[4] New York City Council Member Mark Treyger, who represents parts of Brooklyn, including Coney Island, recently emphasized these concerns stating that "[w]hen people ask me, are we prepared for another storm? The answer is no. . . . We're better informed, but we're not better prepared. We are simply managing crises day to day, we're not solving crises on a day to day basis."[5] Council Member Treyger also emphasized that the blackout piled on top of preexisting hardships and posed grave dangers to the large number of elderly residents in his district who rely on powered medical devices to breathe, and were at greater risk without power. Council Member Treyger also voiced his concern over the possibility of New Yorkers being forced to leave their homes in order to find a place with power and how that might put them at an increased risk of being exposed to COVID-19.[6]

Similar power disruptions are happening in California right now as well, but not from tropical storms. On August 14th and 15th, California's Independent System Operator ordered utilities to impose temporary blackouts for the first time in 19 years, which led to the loss of power for thousands of customers for one to two hours.[7] These rolling outages appear to be associated with a mix of California's recent brutal heat wave and the state's over-reliance on

[3] John Dias, CBSN New York, A Week After Storm, Long Island Residents Losing Their Cool Over Power Outages: 'Like Living In A Sauna', https://newyork.cbslocal.com/2020/08/11/long-island-extreme-heat-power-outages/ (August 11, 2020).
[4] Justine Calma, The Verge, Power outages after Tropical Storm Isaias were a warning to utilities: Utilities are scrambling after Isaias, and they should be worried about the next storm, https://www.theverge.com/21361751/tropical-storm-isaias-power-outages-tristate-utilities-energy-grid (August 10, 2020).
[5] Id.
[6] Id.
[7] Michael Liedtke, Associated Press, Q&A: California's new electricity-blackout challenge, https://www.msn.com/en-gb/finance/other/ap-explains-californias-power-outages-pose-new-challenge/ar-BB18a7Zg (August 20, 2020).

certain intermittent energy sources such as solar energy. It is also worth noting that the COVID-19 reduced electricity demand profile may have helped alleviate the severity of these blackouts, as California's overall electricity demand has been reduced 8% to 10%.[8] This means that these blackouts would likely have been even more severe in times of normal (non-COVID-19) energy demand.[9] Prior to these extreme heat waves, Californians were forced to endure "public safety power shutoffs" to mitigate the risks of wildfires.

The recent power outages in New York, the Northeast, and California collectively serve to remind us of the tremendous importance of grid resiliency and reliability. Unfortunately, for New York residents and business owners, storm-related outages are not a new concern, but are rather the new normal (as New York City Council Member Mark Treyger stated to The Verge "*This is crisis after crisis*" (emphasis added)).[10] And the future outlook for storm events does not appear any less severe: recent studies have shown that the Northeast specifically will be more likely to experience larger and more frequent storm events and that Northeast Atlantic Coast sea level is projected to be greater than the global average.[11] Indeed, recently the National Oceanic and Atmospheric Administration updated its forecast for the 2020 hurricane season, estimating the most storms that it has ever predicted.[12] The updated forecast calls for 19 to 25 named storms, seven to eleven of these storms are forecasted to become hurricanes, and three to six of

[8] Michael Liedtke, Associated Press, Q&A: California's new electricity-blackout challenge, August 20, 2020.
[9] https://www.msn.com/en-us/news/us/q-26a-californias-new-electricity-blackout-challenge/ar-BB18aeZl
[10] Justine Calma, The Verge, Power outages after Tropical Storm Isaias were a warning to utilities: Utilities are scrambling after Isaias, and they should be worried about the next storm, https://www.theverge.com/21361751/tropical-storm-isaias-power-outages-tristate-utilities-energy-grid (August 10, 2020).
[11] WILLIAM V. SWEET ET AL., GLOBAL AND REGIONAL SEA LEVEL RISE SCENARIOS FOR THE UNITED STATES, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (January, 2017), HTTPS://TIDESANDCURRENTS.NOAA.GOV/PUBLICATIONS/TECHRPT83_GLOBAL_AND_REGIONAL_SLR_SCENARIOS_FOR_THE_US_FINAL.PDF.
[12] NOAA August 6, 2020, routine update to Atlantic Hurricane Season Outlook.

these forecasted hurricanes are expected to attain major hurricane status with sustained winds of 111 mph or greater.[13]

All of which underscores the critical importance of grid reliability and resiliency. Grid reliability and resiliency are important far beyond our personal comfort—they are inextricably linked to the health of our residents and economy, and are vital for the proper functioning of our most crucial public safety measures.

III FUEL CELLS CAN HELP IMPROVE NEW YORK'S GRID RELIABILITY AND RESILIENCY

Fuel cells provide clean generation and grid support at the distribution level and can provide 24/7, baseload power generation (using any gaseous fuel) to complement a high penetration of intermittent, diurnal and seasonal varying wind and solar.

Fuel cells can also help alleviate many of the issues associated with the power losses attributed to extreme weather events or transmission failure. First, rather than costly transmission upgrades (*e.g.*, undergrounding distribution wiring), fuel cells can be sited in dense urban areas precisely where power is needed to provide reliable primary non-intermittent service on a local basis. As a versatile distributed energy resource, fuel cells can contribute to the efficient delivery of power where it is needed most, generating power close to the load center, thereby avoiding line-loss of power, which is unavoidable when energy is delivered across long distances, and when compared with diesel back-up generators—fuel cells are far more efficient.

The benefits of reducing load on transmission cannot be overstated. From both a cost and reliability perspective, the resiliency benefits of fuel cell generation is unsurpassed by any other

[13] Id.

clean energy technology. As noted above, FCE's fuel cells have kept power flowing during multiple rolling blackouts in California. FCE's fuel cells also kept power flowing to the University of Bridgeport and the Pfizer campus during Tropical Storm Isaias and multiple snow storms in the Northeast. And FCE's fuel cell in Sonoma County California operated through a wildfire, which destroyed most of the surrounding area. Unlike wind turbines, which need to be shut off during severe storms and high winds, or solar farms, whose panels are easily dislodged and destroyed by high winds and need to be cleared of snow and debris in order to operate, FCE's clean generating fuel cells will simply continue to run.

With regard to prior successful resiliency policy implementations in New York, a noteworthy relevant example of forward planning in Long Island was the proactive development of fuel cell resources by the Long Island Power Authority ("LIPA") (and PSEG-LI), which established the Fuel Cell FIT IV feed-in tariff. Conceived in 2015, and authorized by the Department of Public Service and LIPA's Board in 2016, this LIPA plan sought to procure clean reliable resources, which would be placed at critical locations on Long Island and grid connected with secure underground feeders.

This forward looking plan by LIPA identified ten Zones (Peconic, Amagansett, Roslyn, New South (Jerico), Massapequa, Patchogue, Wildwood (Brookhaven), Riverhead, New Cassel, and Sayville) and nine key substation (North Bellport, William Floyd, West Yaphank, Yaphank, Holtsville, Holtsville LNG, Quogue, Suffolkaire and Eastport) at which fuel cell power resources would deliver local energy, capacity, reliability, and avoided transmission and distribution expenditures. This long-term plan for grid-hardening and non-wires alternatives is consistent with the NY REV. This LIPA plan was also conceived in the difficult post-Sandy world, yet it is exactly the type of resource strategy needed as New York debates the impact of Tropical Storm

Isaias in 2020 and future climate-related threats in 2021 and beyond. It is important to note that many of the above-identified zones were impacted by Isaias.

The Fuel Cell FIT IV competitive solicitation considered numerous proposals and LIPA approved three FCE facilities totaling nearly 40MW, which will be directly connected to three substations: (1) North Bellport, (2) Yaphank, and (3) William Floyd. All three of these substations are located along the critical central spine of the Long Island power network. The first facility is under construction; the remaining two just completed a lengthy two-year NYISO review. FCE looks forward to the completion of those remaining two facilities in order to be on-line and contributing the New York's grid storm reliability prior to the next devastating natural event that impacts Long Island. The FIT-IV model should be expanded beyond the 40MW initial phase, in order to fully develop the resiliency potential for the critical zones and substations.

The foregoing examples highlight some mechanisms by which the New York Assembly can improve grid resiliency and reliably; and why fuel cell systems are especially well suited to serve key grid and microgrid applications given their small footprint, ease of siting, round-the-clock nature, and inherent resiliency[14]—which ensures that power is provided to critical infrastructure such as police and fire services, and hospitals during times of unexpected outages like those that occurred during Tropical Storm Isaias. Therefore, given the aforementioned, FCE strongly urges the New York Assembly to consider encouraging the installation of fuel cells and implementing a new incentive and/or procurement program(s) for fuel cell development. Additionally, during the August 20, 2020, hearing in connection herewith

[14] FCE's installed fuel cells are robust industrial power plants with an average of greater than 95% availability that have survived and continued to operate providing steady, reliable power through hurricanes, earthquakes, blizzards, and the California wildfires.

(the "August Hearing"), Senator Leroy G. Comrie, Jr. stated the following with regard to the importance of resiliency:

> losing power . . . throughout the entire community and throughout this state is just totally unacceptable in this day and age. The modern utility pole was invented before the Civil War—this is 2020. We need to do better. *We need to find ways to create resiliency—we need to find ways to create safety*. . . . We need to not accept anything less than a total transformation of the system. Burying lines, flood-proofing infrastructure, making the grid smarter so that communities can never go dark again.[15]

FCE agrees with this sentiment and urges the New York Assembly to consider taking steps to incentivize resilient clean distributed power generation through fuel cell development, and the deployment of fuel cells generally, as part of New York's transformation, modernizing, and smartening of its grid.

IV CONCLUSION

During the August Hearing, Assembly Member Amy Paulin posed an insightful question concerning possible solutions to New York's repeated storm resiliency deficiency and asked "what are going to be some of the outside-the-box recommendations that [the New York Public Service Commission] is going to be looking at, for example . . . are you going to be revisiting the issue of incentives as part of REV for behind-the-meter generation to protect critical facilities?"[16] FCE strongly supports this policy concept, and submits that a responsible, resilient, reliable solution does not have to be "out-of-the-box"—as this solution already exists in the form of locally manufactured fuel cells. Given the severe power outages that have occurred in New York, and the concurrent issues that were experienced in California related to intermittency, FCE

[15] NYS Legislature - Joint Public Hearing: Power Failures from Tropical Storm Isaias; August 20, 2020, at 36:06 to 36:49, https://www.youtube.com/watch?v=UmC2aW8JXCk.
[16] Id at 0:20:20 to 0:20:48.

respectfully suggests that the New York Assembly consider the many benefits of fuel cells to improve resiliency, which include: (1) availability of reliable primary power locally; (2) back-up power for critical facilities (e.g., hospitals, schools, wastewater and water treatment facilities, and telecommunications and internet providers), which facilities could lose power as a result of increasingly likely major storm events; (3) increasing energy efficiency in New York by reducing transmission losses and replacing diesel generators; and (4) easy adaptability for microgrid applications, which can help decentralize the grid—further improving grid resiliency. In addition to the customer benefits above, fuel cell facilities provide a reliable resource that often offset the need for utilization of costly transmission systems as well as providing ancillary benefits such as capacity. New York should also not overlook the economic development benefits of supporting U.S. manufacturing that provides millions of dollars annually to New York based vendors, suppliers and contractors. Accordingly, for the foregoing reasons stated herein, FCE urges the New York State Assembly to consider the aforementioned written testimony.

Respectfully submitted,

FUELCELL ENERGY, INC.
By Its Counsel

Jennifer D. Arasimowicz, Esq.
Executive Vice President, General Counsel
Chief Administrative Officer &
Corporate Secretary

Samuel R. Volet
Associate Counsel

3 Great Pasture Road
Danbury, CT 06810
Tel: (203) 825-6070

E-mail:jarasimowicz@fce.com
svolet@fce.com