

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

Proceeding on Motion of the Commission
to Implement a Large-Scale Renewable
Program and a Clean Energy Standard

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Case 15-E-0302

**FUELCELL ENERGY, INC.’S SUPPLEMENTAL COMMENTS RE
ZERO EMISSION TARGET**

FuelCell Energy, Inc. (“FCE”) hereby submits comments in response to the New York Public Service Commission’s (“Commission”) October 20, 2023 Notice Seeking Further Comment¹ in the above-captioned proceeding.

I. BACKGROUND

In 2019, the New York legislature passed the Climate Leadership and Community Protection Act.² The CLCPA requires, among other things, that the Commission develop “a program to ensure that (1) by 2030, at least 70% of electric load is served by renewable energy (70 by 2030 Target), and (2) by 2040, there are zero emissions associated with electrical demand in the State (Zero-Emission by 2040 Target).”³ To date, the Commission’s efforts have “focuse[d] on options for procuring sufficient renewable energy resources to meet CLCPA requirements”⁴ but have not addressed how the intermittency of many of those resources will affect electric system reliability as traditional fossil-fuel generation is retired.⁵

On May 18, 2023, the Commission commenced a process “to identify technologies that can close the gap between the capabilities of existing renewable energy technologies and future

¹ Notice Seeking Further Comment (Oct. 20, 2023) (“Notice”).

² See Chapter 106 of the Laws of 2019 (“CLCPA”).

³ See generally, Order Initiating Process Regarding Zero Emissions Target (May 18, 2023) (“Order”), at 1-2.

⁴ *Id.* at 2.

⁵ See *id.*

system reliability needs, and more broadly identify the actions needed to pursue attainment of the Zero Emission by 2040 Target.”⁶ As an initial step, the Commission invited interested persons to submit comments on several questions to assist the Commission in addressing these issues.⁷ FCE submitted initial comments in response to the Order.⁸

On October 20, 2023, in response to the initial comments received from stakeholders, the Commission issued the Notice offering an opportunity to further comment on a list of questions developed by Department of Public Service staff (“Staff”).⁹ As required by the Commission, Staff convened a technical conference on December 11 and 12, 2023 (“Technical Conference”) to examine the issues and questions set forth in the Order.¹⁰ During the Technical Conference, Staff invited participants to file comments regarding the materials discussed during the conference. FCE hereby submits its comments in response to the Notice and regarding the materials presented at the Technical Conference.

II. COMMENTS

In order to ensure that all resources that can assist the State in meeting its climate goals are considered on an equal basis, FCE encourages the Commission to engage in a lifecycle analysis based on the federal model and, in coordination with the federal government and other states, to develop an emissions intensity based standard for determining whether resources will contribute to meeting the State’s Zero-Emission by 2040 Target by reducing greenhouse gas (“GHG”) and co-pollutant emissions.

⁶ Order, at 2.

⁷ *Id.* at 15-17.

⁸ FuelCell Energy, Inc.’s Comments re Zero Emissions Target (Aug. 16, 2023) (“FCE Comments”).

⁹ *See generally* Notice.

¹⁰ *See* Notice Scheduling Technical Conference (Oct. 20, 2023).

A. The State’s Emission Reduction Goals Encompass Both Greenhouse Gas And Co-Pollutants

The Commission has requested comment on whether “the CLCPA, the PSL, and other relevant sources of authority argue for reading ‘emissions’ in the term ‘zero emissions’ as encompassing all air pollutants, greenhouse gas emissions only, or some other subset of air pollutants.”¹¹ The CLCPA calls for the reduction of “greenhouse gas”¹² and of co-pollutant emissions.¹³ In addition, it requires that all state agencies “prioritize reductions of greenhouse gas emissions *and* co-pollutants in disadvantaged communities”¹⁴ Thus, when evaluating the ability of technologies to assist the State in meeting its climate goals, FCE encourages the Commission to consider not just the ability of a particular technology to reduce GHG but also to reduce other pollutants.

Fuel cells offer these benefits. As demonstrated in the FCE Comments, fuel cells avoid greater levels of CO₂ as compared to a solar installation because of the higher capacity factor of a fuel cell, and when one accounts for the FCE fuel cells’ unique ability to capture carbon or operate on biogas, CO₂ avoidance is multiple times that of solar.¹⁵ Fuel cells not only reduce or eliminate carbon emissions, they also avoid the generation of other harmful and significant air

¹¹ Notice, Attachment, Item 1.

¹² Greenhouse gas is defined as: “carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and any other substance emitted into the air that may be reasonably anticipated to cause or contribute to anthropogenic climate change.” Env. Conserv. Law § 75-0101(7).

¹³ See CLCPA, § 1(4) (“It shall therefore be a goal of the state of New York to reduce greenhouse gas emissions from all anthropogenic sources 100% over 1990 levels by the year 2050, with an incremental target of at least a 40 percent reduction in climate pollution by the year 2030”).

¹⁴ See CLCPA, § 7(3) (emphasis added); see also Scoping Plan, at 228 (“The PSC, DEC, NYSERDA, and the New York State Energy Planning Board should work in coordination to determine the potential for GHG emission *and* co-pollutant reductions from fossil fuel generation by 2030 and set a corresponding timeline for interim emissions reduction targets in alignment with the 70x30 and 100x40 requirements.”) (emphasis added).

¹⁵ FCE Comments, at 4-5.

pollutants such NO_x, SO_x and PM.¹⁶ In addition, FCE fuel cells can operate on a variety of fuels and/or blends (natural gas, renewable natural gas, biogas and hydrogen), which can help reduce other harmful emissions.¹⁷ For instance, methane recovery for use as biofuel in fuel cells can provide combustion free electric generation and reduce both CO₂ and methane emissions.¹⁸

Further, FCE's solid oxide fuel cell is capable of running as an electrolyzer for hydrogen production or as a fuel cell for electricity production allowing for both the production of zero-carbon power from hydrogen and the creation or supply of hydrogen power with a low or no carbon intensity score (depending on the feedstock). The benefits of this electrolysis include "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."¹⁹ Because of the flexibility of FCE fuel cells, including their scalability, fuel flexibility, long-duration storage capability, and carbon capture potential, FCE's fuel cell technology is and will continue to be a valuable resource in reducing both GHG and co-pollutant emissions.

¹⁶ See New York State Climate Action Council. 2022. "New York State Climate Action Council Scoping Plan." ("Scoping Plan"), at 96 (noting that "ozone, sulfur dioxide (SO₂), nitrogen oxides (NO_x), and particulate matter . . . are known to exacerbate asthma and to cause eye and respiratory tract irritation, cough, shortness of breath, and reduced lung function") (citations omitted).

¹⁷ Cf. Scoping Plan, at 330-31 (identifying the strategic and beneficial use of biogas as a means of reducing emissions from the waste sector).

¹⁸ See U.S. Environmental Protection Agency, Landfill Methane Outreach Program (LMOP), <https://www.epa.gov/lmop/renewable-natural-gas> (last visited Feb. 19, 2024) (explaining how the use of biofuels, including for the generation of electricity "can result in a net reduction in CO₂ emissions."); Environmental and Energy Study Institute, Fact Sheet | Biogas: Converting Waste to Energy (Oct. 3, 2017), <https://www.eesi.org/papers/view/fact-sheet-biogasconverting-waste-to-energy> (last visited Feb. 19, 2024) ("The reduction of methane emissions derived from tapping all the potential biogas in the United States would be equal to the annual emissions of 800,000 to 11 million passenger vehicles. Based on a waste-to-wheels assessment, compressed natural gas derived from biogas reduces greenhouse gas emissions by up to 91 percent relative to petroleum gasoline.").

¹⁹ 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 (Aug. 2021), <https://www.energypolicy.columbia.edu/publications/green-hydrogen-circular-carbon-economy-opportunities-and-limits> (last visited Feb. 19, 2024).

B. Net Zero Emissions Resources Contribute To The State’s Zero-Emission by 2040 Target

The Notice requests comment on whether the terms “zero emissions” and “net zero emissions” are distinct terms in the CLCPA.²⁰ Notably, neither term appears in the declared purposes of the CLCPA.²¹ In fact, the declared goals of the CLCPA include a “100%” reduction in emissions from all sources by 2050²² and a “100%” reduction in emissions from the electricity sector by 2040.²³ Given the use of the same standard (i.e., 100% reduction) in establishing the goals of the CLCPA, the Commission should consider all technologies that result in either zero emissions or net zero emissions in determining what resources will help the State meet its emission reduction goals.

There are limited electric generating technologies available today that have absolute zero emissions that are also capable of ensuring system reliability.²⁴ However, there are existing technologies that can be employed today that are capable of “net zero emissions” and provide the added benefit of ensuring reliability. Fuel cells are baseload power generation systems that provide these benefits 24 hours a day while also ensuring reliability during system outages or scarcity events.

FCE fuel cell technologies are also able to repurpose the emissions they or other facilities produce to contribute to the State’s Zero-Emission by 2040 Target.²⁵ For example, FCE fuel cells

²⁰ Notice, Attachment, Item 2.

²¹ *See generally*, CLCPA § 1.

²² CLCPA, § 1(4) (“It shall therefore be a goal of the state of New York to reduce greenhouse gas emissions from all anthropogenic sources 100% over 1990 levels by the year 2050 . . .”).

²³ CLCPA, § 1(12) (requiring the adoption of a state energy plan that includes “the additional expressed goal of reducing 100% of the electricity sector’s greenhouse gas emissions by 2040.”).

²⁴ Scoping Plan, at 252 (“[T]he 100x40 requirement presents significant challenges that cannot currently be met by the deployment of . . . existing technologies. Current studies identify that, even after full deployment of available clean energy technologies, there is a remaining need for 15 GW to 45 GW of zero-emission, dispatchable electricity generation capacity in 2040 to meet demand and maintain reliability . . .”).

²⁵ Pub. Svc. Law § 66-p(2)(b).

can utilize the carbon dioxide from the exhaust of a natural gas or coal-fired system to generate electricity.²⁶ By capturing the carbon from carbon emitting technologies, FCE fuel cells are able to offset emissions that would otherwise be released into the atmosphere. In addition, FCE fuel cells can run on natural gas or biogas, which are made up of methane containing one carbon atom and four hydrogen atoms.²⁷ When in operation, FCE fuel cells are able to convert the methane by separating the hydrogen from the carbon then using the hydrogen as a fuel to generate electrical power and heat.²⁸ Through this process, electricity is generated, and the carbon is captured as a byproduct.²⁹ The carbon dioxide that is captured can then be put to use as a valuable end-product in certain industries, like dry ice production, beverage production, and medical uses.³⁰ Through these processes, FCE fuel cells are capable of “net zero emissions” and, thus, can assist the State in meeting its Zero-Emission by 2040 Target.

C. The Life Cycle Analysis Of Resources Should Be Based On Federal Models

The Notice requests comment on the discretion available to the Commission to determine “which elements of the lifecycle of a given emissions source are to be counted, and the threshold level above which emissions from that source are impermissible or disqualifying.”³¹ Pursuant to the Scoping Plan, in evaluating dispatchable technologies that can support the Zero-Emission by 2040 Target, the Commission is required to undertake “a comprehensive analysis of the life cycle of GHG emissions, benefits (health, environmental, and economic), safety considerations,

²⁶ See FuelCell Energy “Carbon Capture With Fuel Cell Power Plants” (July 2022), <https://go.fuelcellenergy.com/hubfs/Carbon%20Capture%20with%20FuelCell%20Energy%20Systems.pdf> (last visited Feb. 19, 2024).

²⁷ See “The Basics of FuelCell Energy’s Carbon Capture Platform” (Sep. 21, 2022), <https://www.fuelcellenergy.com/blog/basics-of-fuelcell-energy-carbon-capture-platform/> (last visited Feb. 19, 2024).

²⁸ *Id.*

²⁹ *Id.*

³⁰ *Id.*

³¹ Notice, Attachment, Item 4.

and costs of these technologies.”³² This analysis should include “feedstock production, conversion, and delivery to the end user.”³³

Consistent with this, a lifecycle analysis should include the full emissions profile of a resource from pre-production (including transportation of raw materials)³⁴ to production and construction (including transportation of products/materials to installation location) as well as operation (including accounting for capacity factors)³⁵ and through end of life.³⁶ When evaluating pre-production emissions, the standard should consider what emissions are produced in mining for raw materials as well as how those emissions vary based on where those activities occur and how far those materials must travel. The standard should also reflect emissions produced during end of life activities, including disposal and/or recycling. A life cycle analysis should also consider indirect emissions. For example, although wind and solar themselves do not emit pollutants, due to the intermittency of those resources, when they are not operating, in most

³² Scoping Plan, at 254.

³³ *Cf.* Scoping Plan, at 310 (“NYSERDA should work with Cornell CALS and SUNY ESF to identify bioenergy pathways with high life cycle energy efficiency and high emissions reductions (from feedstock production, conversion, and delivery to the end user) that complement and support wide-scale electrification.”).

³⁴ *Accord* United States Environmental Protection Agency (“EPA”), “Lifecycle Analysis of Greenhouse Gas Emissions under the Renewable Fuel Standard,” <https://www.epa.gov/renewable-fuel-standard-program/lifecycle-analysis-greenhouse-gas-emissions-under-renewable-fuel> (last visited Feb. 19, 2024).

³⁵ *See, e.g.*, Table 1 *supra*.

³⁶ *See, e.g.*, California Energy Commission, Energy Research and Development Division, “Life-Cycle Assessment of Environmental and Human Health Impacts of Flow Battery Energy Storage Production and Use” (Dec. 2021) (*available at*: <https://www.energy.ca.gov/sites/default/files/2021-12/CEC-500-2021-051.pdf>), at 15 (“Life-cycle impact assessment (LCIA) refers to the evaluation, characterization, and calculation of the potential impacts associated with the constructed life-cycle inventories within the range of the selected system boundary, which may include the raw materials extraction, transportation, production manufacturing, and assembly, use-phase, and end of life”) (last visited Feb. 19, 2024).

cases, fossil fuel resources and, in some instances, inefficient resources are forced to operate;³⁷ resulting in increased emissions.³⁸ As a consequence of additional fossil fuel generation, although emissions from electric generation have been reduced significantly from 1990 levels, emissions from in-state electric generation actually increased from 2019 to 2020.³⁹

As noted in the Scoping Plan, “[t]o assist with standardization and methodological consistency, New York should leverage tools being developed by the federal government, such as the U.S. Department of Energy’s Building Technology Office, for life cycle analysis and standard setting for specific products.”⁴⁰ Consistent with this directive, FCE encourages the Commission to adopt to the Department of Energy’s Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies (“GREET”) model. Adopting the GREET model will provide for a more universal standard at the state and federal levels. In this way, the Commission can ensure that actions it takes in New York can be easily compared and coordinated with those of

³⁷ See New York Independent System Operator (“NYISO”), 2021-2040 System & Resource Outlook Report (available at: <https://www.nyiso.com/documents/20142/33384099/2021-2040-Outlook-Report.pdf>) (last visited February 19, 2024), at 7-8 (“The operational needs of dispatchable generation on the system, such as existing fossil generators, will become more demanding as the state progresses towards policy goals. The number of dispatchable generator starts/stops, daily ramping, operational range, and other flexibility attributes will increase to meet a more dynamic net-load. There will be a greater need for resources that can operate more flexibly to meet the increased variability associated with wind and solar generation. This Outlook demonstrates that the flexible units will be dispatched more frequently but will operate for less hours within the year as the transition unfolds. Until new technologies emerge, continued operation of fossil will be required in some manner during the grid transition.”).

³⁸ Accord, e.g., MIT Energy Initiative, “Managing Large-Scale Penetration of Intermittent Renewables” (Apr. 20, 2011) (available at: <https://energy.mit.edu/wp-content/uploads/2012/03/MITEI-RP-2011-001.pdf>) (last visited Feb. 19, 2024), at 19 (“Renewable resources are considered a clean source of electricity because of their low emissions profiles. Inefficient thermal plant ramping and cycling operations, non-coincident peaks between wind generation and demand, and regional differences in generation mixes can potentially reduce the emissions benefits of renewables.”); *Id.* at 8 (“[B]aseload units that have been forced to cycle but are not designed to do so will . . . suffer from increased heat rates, in which case they will be burning significantly greater amounts of fuel to produce the same level of electric output. Such increases in fuel use also result in increased emissions.”).

³⁹ Cf. New York Department of Environmental Conservation, Energy, 2022 Greenhouse Gas Emissions Report, Sectoral Report #1 (available at: https://www.dec.ny.gov/docs/administration_pdf/ghgenergy22.pdf) (last visited Feb. 19, 2024), at 2 (“Emissions from fuel combustion for electricity generation in the state increased 2mmt CO₂e in 2020 and is representative of increased fossil-fueled energy generation as compared to 2019 (4,606.2 GWh).”).

⁴⁰ Scoping Plan, at 216.

other states and regions.⁴¹ A more unified methodology will also help establish better market stability and certainty. Accordingly, consistent with the requirements of the Scoping Plan,⁴² FCE encourages the Commission to rely upon the GREET life cycle analysis model to evaluate whether resources qualify as zero emissions.

D. Determination Of Whether A Resource Qualifies As Zero Emissions Should Be Based On Emission Intensity Profile

The Notice requests comment on the significance of the definition of fuel cells that are considered renewable energy for purposes of section 66-p of the Public Service Law in determining whether fuel cells utilizing “hydrogen, biogas, renewable natural gas, or other non-fossil fuels” qualify as “zero emissions.”⁴³ The “renewable energy” and “zero emissions” goals in the CLCPA are separate and distinct.⁴⁴ Thus, what resources qualify as “renewable energy” should not determine what resources qualify as “zero emissions.” Instead, the Commission should determine which resources qualify as zero emissions based on the emission intensity profile of each resource.

Given the uncertainty of what technologies may be available and how existing technologies may evolve in the future, the Commission should not define zero emissions

⁴¹ Cf. World Resources Institute, “8 Charts to Understand US State Greenhouse Gas Emissions” (Aug. 10, 2017), <https://www.wri.org/insights/8-charts-understand-us-state-greenhouse-gas-emissions> (last visited Feb. 19, 2024) (comparing emissions intensity across various states).

⁴² Scoping Plan, at 216 (“To assist with standardization and methodological consistency, New York should leverage tools being developed by the federal government, such as the U.S. Department of Energy’s Building Technology Office, for life cycle analysis and standard setting for specific products.”).

⁴³ Notice, Attachment, Item 5.

⁴⁴ CLCPA, § 1(12) (directing “the adoption of a state energy plan establishing clean energy goals for the year 2030 aimed at reducing greenhouse gas emission levels by 40% from 1990 levels, **producing 70% of electricity from renewable sources**, increasing energy efficiency from 2012 levels by 23% **and the additional expressed goal** of reducing 100% of the electricity sector’s greenhouse gas emissions by 2040.”) (emphasis added); *see also* Pub. Svc. Law § 66-p(2) (“No later than June thirtieth, two thousand twenty-one, the commission shall establish a program to require that: (a) a minimum of seventy percent of the state wide electric generation secured by jurisdictional load serving entities to meet the electrical energy requirements of all end-use customers in New York state in two thousand thirty shall be generated by renewable energy systems; **and** (b) that by the year two thousand forty (**collectively**, the ‘targets’) the statewide electrical demand system will be zero emissions.”) (emphasis added).

resources by identifying specific technologies. Instead, working in conjunction with the federal government and other states, the Commission should adopt a common standard for determining whether a technology qualifies as zero emissions based on a quantification of the emissions intensity (i.e., the level of GHG emissions per unit of economic activity) of that technology over its entire life cycle.⁴⁵

An emissions intensity based standard is particularly important when the Commission considers hydrogen technologies. As the International Energy Agency (“IEA”) noted:

Various terms are currently used to describe the environmental attributes of hydrogen. These either use colours to refer to different production routes (e.g. “green” for hydrogen from renewable-powered electrolysis and “blue” for production from natural gas with carbon capture, utilisation and storage (CCUS)) or terms such as “sustainable”, “low-carbon” or “clean” hydrogen to distinguish it from unabated fossil-based production. However, there is no international agreement on the use of these terms, and their existing definitions are generally considered insufficient to be used as a reference in regulations or supply contracts. For example, much existing electrolysis currently runs on grid electricity, for which a colour has not been proposed. The terms “grey” and “blue” provide no information about important factors such as upstream and midstream methane emissions and carbon capture rate.⁴⁶

Developing a common emissions intensity based standard would create a common lexicon that “would allow for comparison of the emissions intensities between different production pathways and producers, while still leaving governments the possibility to define acceptable emissions intensity levels, taking into account local circumstances and opportunities.”⁴⁷ By relying on scientific based, commonly accepted standards, the Commission can ensure that actions it takes in New York can be easily compared and coordinated with those of other states and regions.

⁴⁵ Cf. International Energy Agency, 2023, “Towards hydrogen definitions based on their emissions intensity” (available at: <https://iea.blob.core.windows.net/assets/acc7a642-e42b-4972-8893-2f03bf0bfa03/Towardshydrogendefinitionsbasedontheiremissionsintensity.pdf>) (last visited Feb. 19, 2024).


⁴⁶ *Id.* at 34.

⁴⁷ *Id.*

III. CONCLUSION

FCE appreciates the opportunity to offer these further comments and looks forward to continuing to partner with New York as it pursues its clean energy goals.

Respectfully submitted,

By: 

Diana Neeves
Robinson & Cole LLP
1055 Washington Boulevard
Stamford, CT 06901
Phone: (203) 462-7500
Fax: (203) 462-7599
E-mail: dneeves@rc.com

Attorney for FuelCell Energy, Inc.

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