**STATE OF CONNECTICUT**
**CONNECTICUT SITING COUNCIL**

PETITION OF VFS, LLC. PETITION NO.
FOR A DECLARATORY
RULING FOR THE LOCATION AND
CONSTRUCTION OF A 920 KILOWATT
FUEL CELL CUSTOMER-SIDE DISTRIBUTED
ENERGY RESOURCE AT PUTNAM REFECTORY
2358 ALUMNI DRIVE, STORRS, CT. 06269

PETITION OF VFS, LLC AS AN AGENT
FOR A DECLARATORY RULING

Pursuant to Conn. Gen. Stat. §§ 4-176 and 16-50k(a) and Conn. Agencies Regs. § 16-50j-38 et seq., VFS, LLC. ("VFS"), as an agent for and on behalf of its Customer The University of Connecticut ("UConn"), requests that the Connecticut Siting Council ("Council") approve by declaratory ruling the location and construction of a Customer-side distributed resources project comprised of Two (2) new natural-gas fueled PureCell® Model 400 phosphoric acid fuel cells ("Fuel Cell"), infrastructure for a Battery Energy Storage System to be installed in the near future and associated building and equipment (the "Facility"), providing 920-Kilowatts ("KW") (net) of power to the Putnam Refectory (commissary kitchen facility) located at 2358 Alumni Drive, Storrs, CT 06269 *(See Attachment* #1). The Facility will be installed, owned, operated and maintained by VFS, LLC.

Conn. Gen. Stat. § 16-50k(a) provides that:

Notwithstanding the provisions of this chapter or title 16a, the council shall, in the

exercise of its jurisdiction over the siting of generating facilities, approve by declaratory ruling . . . (B) the construction or location of any fuel cell, unless the council finds a substantial adverse environmental effect or of any customer-side distributed resources project or facility . . . with a capacity of not more than sixty-five megawatts, as long as such project meets air and water quality standards of the Department of Energy and Environmental Projection."

## I. INTRODUCTION AND COMMUNICATION

The proposed Facility will be a Customer side distributed resource under 65 MW that complies with the air and water quality standards of the Department of Energy and Environmental Protection ("DEEP"). VFS submits that no Certificate of Environmental Compatibility and Public Need is required because the proposed installation will not have a substantial adverse environmental effect. Contacts for the project are listed below.


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## II. DESCRIPTION AND PURPOSE OF THE PROJECT

The Facility will be a customer-side installed distributed generation resource with interconnection at the Putnam Refectory Facility providing electricity and thermal energy to the and Hilltop dormitory facility. The proposed installation consists of two (2) concrete pad mounted 460KW Model 400+ Fuel Cells manufactured by HyAxiom, Inc. in South Windsor,

Connecticut (*See* Attachment #2 for Model 400 Data Sheets). The overall dimension of the individual Fuel Cells is eight feet four inches wide by twenty-seven feet four inches long by nine feet eleven inches tall. The Fuel Cells are totally enclosed and factory-assembled and tested prior to shipment. The associated cooling modules and electrical equipment will be ground mounted directly adjacent to the fuel cells. The overall dimensions for the facility area containing the fuel cells is 80' x 49'.

As a combined heat and power installation the proposed Facility will deliver 920 KW of clean power and a maximum of 2.5 MMBTU per hour of thermal energy to the host buildings. The Facility will be designed and built to accept the near future installation of a Battery Energy Storage System (BESS) and associated electrical equipment and once installed will provide uninterruptable power and thermal energy to the host buildings. The completed fuel cell facility will be capable of a maximum total efficiency of approximately 94% and will significantly advance UConn's 2030 green energy goals and objectives to reduce reliance on fossil fuels, reduce greenhouse gas emissions and improve grid resiliency.

## III. **SAFETY**

The Fuel Cell is certified by CSA international to meet strict ANSI/CSA FC-1 2014 safety standards to protect against risks from electrical, mechanical, chemical, and combustion safety hazards. The Fuel Cell will be installed in accordance with NFPA 853. In accordance with Public Act 11-101, the fuel line pipe cleaning procedure uses inert nitrogen gas or atmospheric air. The following items are a few of the safety measures incorporated into the design. VFS, LLC. through HyAxiom routinely offers on-site training to First Responders on all

projects. Once final design is complete a formal site-specific Emergency Response Plan will be created and implemented. Please also refer to the sample Emergency Response Plan in *Attachment* #3.

A. Fire Protection

The Fuel Cell design incorporates a combustible gas sensor and thermal fuses located throughout the Fuel Cell cabinet. The detection of a potential combustible gas mixture, a fire, or the failure of this detection circuit will result in a Fuel Cell shutdown, closing of the natural gas supply valves, and a subsequent inert gas (nitrogen) purge of the Fuel Cell stack and fuel processing system. This event will also result in an alarm callout notification to HyAxiom service personnel. The Fuel Cell is designed with an integral stop button on the outside of the enclosure to enable immediate shutdown in the event of an emergency. There is also a site-installed manual gas shut-off valve and electrical disconnect switch easily accessible to emergency personnel.

B. Gas Leak

The Fuel Cell is designed with a physical barrier that separates the equipment handling combustible gases (fuel compartment) from electrical or potential spark-creating equipment (motor compartment). The fuel compartment is maintained at a negative pressure relative to both ambient and the motor compartment in order to ensure that any gas leaks do not reach the electrical equipment in the motor compartment. The cabinet ventilation system ("CVS") is designed to dilute a potential gas leak in the fuel compartment to non-combustible levels.

C. Cell Stacks and Hydrogen

The Fuel Cell operates by converting hydrogen to DC electricity. Hydrogen is lighter than air and thus does not pool like other fuels and will readily dissipate with proper ventilation, making it less likely to ignite. Also, the Fuel Cell does not store hydrogen; instead, it produces hydrogen-rich gas at a rate equal to what it requires to produce power. The Fuel Cell stack is wrapped in a fire-retardant blanket. There are no materials inside the unit that would sustain a flame. There is no large volume of gas or any ignition that occurs within the cell stack.

C. Phosphoric Acid

Phosphoric acid is an integral part of the fuel cell system, acting as the electrolyte within the fuel cell stack. Phosphoric acid is a surprisingly common substance that is contained in common cola drinks. A leak of phosphoric acid is not possible because there is no reservoir of liquid: phosphoric acid is constrained within the porous structure of the fuel cell stack material by capillary action.

D. Fluid Leak

The only fluid source is water. All piping systems and pressurized water vessels are designed and fabricated to the appropriate ASME codes. Water produced through the electrochemical process is “pure” water and is reclaimed and reused by the process. Water mixed with propylene glycol and a rust inhibitor (to prevent rust and freezing in colder climates) is also used in the external cooling module.

## IV. **HAZARDOUS MATERIALS**

The Fuel Cells are capable of delivering 460 kW of electric power each. As with other fuel cell technologies, hydrogen and oxygen combine in the presence of a catalyst, which causes an electrochemical reaction to produce an electric current. A phosphoric acid fuel cell uses an inorganic, concentrated phosphoric acid as the electrolyte, allowing the electrochemical reaction to take place. The Fuel Cell also employs on-board natural gas reforming as part of the balance of plant to provide hydrogen to the fuel cell. Within this Fuel Cell, there are only two components that contain hazardous material: the Cell Stack Assembly ("CSA") and the Integrated Low-Temperature Shift Converter ("ILS"). Neither of these components present risk when servicing the Fuel Cell. The material in both the CSA and the ILS is classified as hazardous material for the purposes of shipping. The CSA is classified as a "bulk bin," made from the repeating elements of the Fuel Cell stack. Some of these repeating elements are porous carbon graphite plates. The phosphoric acid used as the electrolyte is contained by capillary action within the pores of these plates. The ILS is a tank containing a self-heating solid catalyst composed of copper, zinc oxide, and alumina. Safety Data Sheets ("SDS") are available in the Sample Emergency Response Plan (*See Attachment* #3).

### A. Shipping of Hazardous Material

The Fuel Cell is classified as "hazardous in transportation" under the U.S. Department of Transportation ("DOT") 49CFR regulations, and likewise as dangerous goods under the

International Maritime Dangerous Goods ("IMDG") regulations. The description of hazardous materials contained within each Fuel Cell are listed in subsections B and C below.

B. Integrated Low Shift Converter

The tank, a non-DOT specification container as described below, is a SELF HEATING SOLID INORGANIC N.O.S. (contains metallic copper on zinc oxide and alumina), CLASS 4.2, UN3190, PGII, 900 lb. net wt. of hazardous material.

C. Cell Stack Assembly

The bulk bin, a non-DOT specification container as described below, is a SOLIDS CONTAINING CORROSIVE LIQUID N.O.S. (contains phosphoric acid), Class 8, UN3244, PGII, 1200 lb. net of hazardous material. The amount of phosphoric acid in the Fuel Cell complies with all applicable state and federal regulations. The exact amount of phosphoric acid is proprietary technical information and is less than the 5,000 lb. reportable quantity under 40 CFR 117.3.

D. Integration into Fuel Cell Power Plant

The above items are individual components assembled side by side, with other non-hazardous components, to form one complete Fuel Cell. The containers holding the hazardous material are non-DOT specification containers. DOT regulations allow for the transportation of the hazardous material noted above in non-DOT specification portable tanks and closed bulk bins, as used for the shipment of the Fuel Cell. IMDG regulations require United Nations ("UN") specified containers or an exemption for international ocean transport.

E. Servicing of Product with Hazardous Material Present

The hazardous material contained within the CSA and the ILS presents no danger to installation and service personnel because direct exposure to the material is not possible. Under normal operating conditions, each container, as defined above, will contain its hazardous material for the life of the component. When end of life requires replacement of either component, no special precautions need to be employed with respect to handling because hazardous material will not come in contact with service personnel. The Fuel Cells are designed to have a minimum 20-year product life. This requires overhaul or replacement of major components after 10 years of operation. Components requiring overhaul include the cell stack assemblies and components in the fuel processing system.

F. Hazardous Waste

The Fuel Cells do not produce any hazardous waste.

## V. **THE SITE**

The Facility is located on the UConn campus at Storrs, CT at 2358 Alumni Drive. The site is zoned (I) Institutional. The surrounding parcels to the West are zoned R40/20 All other adjacent properties are zoned (I) Institutional. (*See Attachment* #4). Attachment #5 shows an aerial map of the location of Facility on the Site. The nearest residential properties are West of the property and over 80 feet from the Facility. There is a forested area separating the Facility from the residential areas and no trees are required to be removed for the installation of the Facility. The nearest airport, is over 5.5 miles from the Facility site. The proposed Facility will be a maximum of 10 feet above ground level and does not fall under the FAA notification requirement of 14 CFR Part 77.9 (Attachment #6).

## VI. PROJECT BENEFITS

Fuel cell technology represents an important step in advancing Connecticut's goal of diversifying its energy supply through the use of renewable energy, as expressed in Connecticut General Statutes Section 16-244 et seq. The Facility will serve as a cost-effective clean energy source while also reducing the demand for grid electricity from this location. Further, this Fuel Cell installation will support the efforts of the State of Connecticut to be a leader in the utilization of fuel cell technology.

Because a fuel cell does not burn fuel, the system will significantly reduce air emissions associated with acid rain and smog. Emissions standards of Connecticut will further be discussed in the next section. The Facility is designed to operate in total water balance – no make-up water is normally required after start-up and no water discharges to the environment will occur under normal operating circumstances.

## VII. ENVIRONMENTAL EFFECTS

### 1. Water, Heat and Air Emissions

The proposed installation will have no substantial adverse environmental effect. The installation and operation of the Fuel Cell will meet all air and water quality standards of DEEP.

Section 22a-174-42 of the Regulations of Connecticut State Agencies ("RCSA") governing air emissions from new distributed generators exempts fuel cells from air permitting requirements. Notwithstanding this exemption, the Fuel Cell meets the Connecticut emissions standards for a new distributed generator as shown in Table 1 below, and no permits, registrations or applications are required under rules based on the actual emissions of the Fuel Cell. Furthermore, the Fuel Cell is certified by the California Air Resources Board to meet the Distributed Generation Certification Regulation 2007 Fossil Fuel Emissions Standards (*See Attachment* #7).

**Table 1: CT Emissions Standards for a New Distributed Generator**

| Air Pollutant | CT Emissions Standard (lbs/MWh) | PureCell Model 400 Fuel Cell System at Rated Power (lbs/MWh) |
|---|---|---|
| Oxides of Nitrogen | 0.15 | .01 |
| Carbon Monoxide | 1 | .02 |
| Carbon Dioxide | 1650 | 1,049 |

With respect to water discharges, the Fuel Cell is designed to operate without water discharge under normal operating conditions. To the extent that minimal water overflow may occasionally occur, such discharges will consist of de-ionized water and will be directed to a small dry well located on the site. This discharge will be incorporated into the overall site design. The Fuel Cell operates in water balance below 86°F. The initial fill requires 350 gallons of water for each. The amount of make-up water above 86°F increases linearly from 0gpm to 1gpm at 110°F.

The Facility will also meet state criteria thresholds and projected emissions for all greenhouse gases defined in as Section 22a-174-1(49) as shown in Table 2. Section 22a-174-1(49) states the following: "Greenhouse gases" or "GHGs" means the aggregate of the following

six components gases: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), sulfur hexa fluoride (SF6), any hydrofluorocarbon (HFC) or any perfluorocarbon (PFC)." There is no defined criteria threshold for these compounds, however Section 22a-174-1(21) provides a method for computing carbon dioxide equivalent emissions "CO2e." The proposed Facility will have no emissions of SF6, HFC, and PFC. Emissions of CH4 and N2O will be very low and will not contribute significantly to the GWP of the proposed facility.

**Table 2: PureCell® Model Emissions Data**

| Emission Type | Projected Emissions | GWP in 40 CFR 98, Table A-1 | Projected CO2e |
|---|---|---|---|
| CO2 | 2025 ton/yr | 1 | 2025 ton/yr |
| CH4 | <0.02 ton/yr | 25 | <0.5 ton/yr |
| N2O | <0.01 ton/yr | 298 | <3 ton/yr |
| SF6 | N/A | 22,800 | N/A |
| HFC | N/A | 12 to 14,900* | N/A |
| PFC | N/A | 7,390 to 17,340 | N/A |

Current control technologies are not commercially available to reduce the greenhouse gas emissions from the Facility.

**3. <u>Wildlife and Habitat</u>**

According to the relevant portion of the CT DEEP Easy Lyme Natural Diverse Database Areas Map (*See attachments* #8), the proposed Site is not located within the Natural Diversity Data Base Areas.

**4. <u>Noise Analysis</u>**

Based on the engineering study results conducted by a professional acoustical engineer of the proposed Site dated February 2, 2024 the noise level of the Facility will not exceed local and state noise level ordinance levels. Once in full operation further testing will be conducted to prove compliance with the ordinances. Please review the attached Acoustic Survey Report and recommendations in *Attachment* #9.

**5. Visual Impact**

The Facility will not cause any significant visual effects. The proposed site is on a very large campus situated beside a roadway. The Facility would be visible only from the Alumni Drive.

**6. Public Notice**

Notice was provided via USPS mail to all property owners, abutters and Federal, State and Local officials pursuant to Conn. Agencies Regs.§16-50j-40(a). VFS, LLC's copy of the notice letter, Abutters list and Abutters' Map are included in *Attachments* 10, 11 and 12. Prior to filing this Petition, VFS sent notices to all applicable Federal, State and Municipal officials of Storrs-Mansfield as listed in *Attachment* 13. Proof of mailing for all notices including abutters and officials is shown in Attachment #14.

**Project Decommissioning Plan**

Following the 20-year operational life of the Facility, the decommissioning plan is as follows:

A) Isolate, lock out and disconnect all piping for cooling module at the power module. Remove gas piping to the unit. Disconnect nitrogen purge system at power module.

B) Disconnect all electrical conductors and conduit at the Fuel Cell to include electrical power, cooling module power, and nitrogen pressure switch. Shore power to be maintained to the unit to maintain temperature as needed.

C) Contractor will work in concert with HyAxiom's Service Department personnel during decommissioning and shutdown.

D) Return Site to original condition with the exception of the concrete pads.

E) The decommissioned Fuel Cell will be stripped, the parts are separated and either recycled or reclaimed.

## 7. Aquifer Protection Area, Coastal Boundaries, and Flood Zones

Based on an analysis of the Federal Emergency Management Agency's ("FEMA") National Flood Insurance Program ("NFIP") flood mapping data for Mansfield (*See Attachment* #15), the proposed Facility is not located within a 100 500 year flood zone and being placed at approximate elevation 667'. The fuel cells and associated electrical equipment will be installed at or above elevation 667'. The Site is in an already fully developed area of the University complex with existing building construction on the Site. The Facility will be located over 7000' to the South of the Aquifer Protection Area which is partially located within the UConn Forest area North and East of CT. State Route 195. Having referenced GIS mapping no wetlands are on or near the proposed Facility installation property. No negative impact to watercourses and wetlands is anticipated throughout the construction or operation of the Fuel Cell as the nearest watercourse, East Brook is some 1500' to the West of the facility.

**8. Cultural Resources.**

The proposed Facility will be located in an already developed vicinity, consequently construction and operation of the Fuel Cell will have no unpleasant effect on any cultural (historical and archaeological) resources in the area.

**9. Natural Gas Desulfurization Process**

Sulfur is present in pipeline natural gas. It is primarily used as an odorant so leaks can be easily detected. Unfortunately, sulfur is also a poison to fuel cell systems and must be removed by the Fuel Cell. For further details of desulfurization please refer to the attached Desulfurization Memo (*See Attachment* #16).

## VIII. CONSTRUCTION AND MAINTENANCE

VFS plans to start construction work by September 2024. Construction will take approximately sixteen weeks, followed by approximately four weeks of testing and startup. Regular working hours for the proposed project are Monday through Friday from 8:00 am to 5:00 pm. VFS and its contractors will fully cooperate with the CT. State Building Inspectors and will follow all Town of Mansfield and Connecticut State construction policies and codes.

## IX. LOCAL INPUT AND STATE FUNDING

For years, VFS has worked closely with the UConn Administration in pursuit of energy efficiencies and deploying clean fuel cell technologies on the campus. This project will be constructed by VFS and the energy will be sold to UConn under an Energy Services Agreement (ESA). No State funds will be used to construct this facility. This project is part of a larger campus wide plan to deploy fuel cells in combined heat and power configurations to bolster UConn's grid resiliency and provide clean, low cost, reliable energy to the University.

VFS is proud to welcome student involvement in this pursuit and continues to work with University faculty and students in planning and deploying these valuable renewable energy assets.

## X. CONCLUSION

As set forth above, VFS requests that the Council issue a determination, in the form of a declaratory ruling, that the proposed installation above is not one that would have a substantial adverse effect, and, therefore, that a Certificate is not needed.

Respectfully submitted,

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## LIST OF ATTACHMENTS