

**STATE OF CONNECTICUT  
CONNECTICUT SITING COUNCIL**

PETITION OF DOOSAN FUEL CELL, : PETITION NO. 1369  
AMERICA, INC. FOR A DECLARATORY :  
RULING FOR THE LOCATION AND :  
CONSTRUCTION OF A 0.44 MEGAWATT :  
FUEL CELL CUSTOMER-SIDE DISTRIBUTED : April 26, 2019  
ENERGY RESOURCE AT 75 BATTISTO ROAD,  
BRISTOL, CONNECTICUT

PETITION OF DOOSAN FUEL CELL AMERICA, INC. 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., Doosan Fuel Cell America, Inc. (“Doosan”), as an agent for and behalf of its affiliate Doosan Energy Solutions America, Inc. (“DESA”), requests that the Connecticut Siting Council (“Council”) approve by declaratory ruling the location and construction of a customer-side distributed resources project comprised of one (1) new natural-gas fueled PureCell® Model 400 phosphoric acid fuel cell (“Fuel Cell”) and associated equipment (the “Facility”), providing 0.44-megawatts (“MW”) (net) of power to the City of Bristol, Water Pollution Control Facility located at 75 Battisto Road, Bristol, Connecticut (the “Site”) (*See Attachment 1*). The Facility will be installed, owned, maintained, and operated by Doosan.

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**

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”). Doosan submits that no Certificate of Environmental Compatibility and Public Need is required because the proposed installation will not have a substantial adverse environmental effect.

## **II. DESCRIPTION AND PURPOSE OF THE PROJECT**

The Facility will be a customer-side installed distributed generation resource with grid interconnection to be located at the Site. The Facility will be placed East of the Generator Building and within the plant area (*See Attachments 1 and 2*). The proposed installation consists of one (1) Fuel Cell manufactured by Doosan in South Windsor, Connecticut (*See Attachment #3 for Model 400 Data Sheets*). The overall dimension of the Fuel Cell is eight feet four inches wide by twenty-seven feet four inches long by nine feet eleven inches tall. The unit is totally enclosed and factory-assembled and tested prior to shipment.

The purpose of the proposed Facility is for power and distributed generation. The Fuel Cell for Bristol’s WWTF will be capable of producing a total of 440 kW of continuous, reliable electric power. The Facility will be net metered and will operate in parallel with the utility grid, any electricity generated in surplus of the site’s demand will be traded to the grid in accordance with Eversource’s Interconnection Technical requirements. The Facility will provide 84% of the electrical requirements of the building under normal circumstances, additional base load power

will be imported from the electrical grid. The installation of the Facility will have an overall annual electrical efficiency of 41%.

When a utility grid outage occurs, the Fuel Cell will automatically disconnect from the host facility electrical system using an internal breaker while continuing to operate providing all the internal loads needed to operate the Fuel Cell. The Fuel Cell will not provide back-up power to the host facility. Upon return of the utility supply, the fuel cell will monitor the grid for stability for five minutes and then will automatically reconnect and ramp up output.

The Fuel Cell is 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.

### **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. Please also refer to the Bristol WPC 75 Battisto Rd. Emergency Response Plan in *Attachment #4*.

#### **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 Doosan 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.

#### D. 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.

#### E. 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 Cell is capable of delivering 440 kW of electric power. 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 Bristol WWTF 75 Battisto Rd. Emergency Response Plan (*See Attachment #4*).

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.

#### F. Hazardous Waste

The Fuel Cell does not produce any hazardous waste.

## V. **THE SITE**

The Facility is proposed to be located entirely on the Site. The proposed location is zoned Industrial under the zoning regulations of the City of Bristol (the “City”). The surrounding parcels bordering the north and west of the host property are zoned for industrial use (*See Attachment #5 and 5a*). Attachment #6 shows an aerial map of the location of Facility on the Site. The nearest residential properties are West of the property and over 1000 feet from the Facility. The proposed Fuel Cell facility will not be fenced as the entire plant area is secured and access to the site is restricted. No trees are required to be removed for the installation of the Facility, and no parking spaces need to be removed for the installation of the Facility. Robertson Airport, the nearest airport, is 3.5 miles from the proposed facility. The proposed Facility will be a maximum of 25 feet above ground level and does not fall under the FAA notification requirement of 14 CFR Part 77.9 (Attachment 7).

## 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 #8*).

**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 site dry well. This discharge will be incorporated into the overall site design, and will be covered by the Site’s water discharge permit, if necessary. The Fuel Cell operates in water balance below 86°F. The initial fill requires 350 gallons of water. 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 host site.

**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.

**2. Wildlife and Habitat**

According to the relevant portion of the CT DEEP Bristol Natural Diverse Database Areas Map (*See attachments #9*), the proposed Site is not located within the Bristol Natural Diversity Data Base Areas.

**3. Noise Analysis**

Based on the engineering study results conducted by a professional acoustic engineer of the proposed Site dated April 23, 2019, the noise level of the Facility will not exceed local and state noise level ordinance levels. Please review the attached Acoustic Survey Report and Recommendations in *Attachments #10*.

**4. Visual Impact**

The Facility will not cause any significant visual effects. The Site hosts a Municipal Water Pollution Control Plant with industrial buildings and concrete settling tanks within its proximity. The Facility would be visible only from the passing traffic along Battisto Rd.

**5. Public Notice**

Notice was provided via certified mail to all property owners, abutters and state and local officials pursuant to Conn. Agencies Regs. §16-50j-40(a). Doosan's copy of the notice letter, Abutters list and Abutters' Map are included in *Attachments* 11, 12 and 13. Prior to filing this Petition, Doosan sent notices to all applicable Federal, State and Municipal officials of Bristol as listed in *Attachments* 14, 15 & 16, which shows the certified mail receipts for State and Municipal officials and Abutters. On April 17, 2019 Doosan held a meeting with Bristol Building Department and Zoning enforcement officer and also communicated with Bristol Fire Marshal's Office to discuss the proposed work and address their concerns.

#### **6. 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 Doosan'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, reclaimed or transported to landfill.

#### **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 Bristol (*See Attachment #17*), the proposed Facility is not situated in a 100 or 500 year flood zone. The Site is in already disturbed area with existing construction on the Site plus several industrial properties within its vicinity. The City of Bristol has no Aquifer Protection Areas near the Site and there is no wetland close to the proposed installation site with the nearest watercourse 2000 feet away from the proposed Site. (*See Attachment #18*)

Due to the distance of the proposed Facility from any recognized watercourses, flood protected zones, wetlands or coastal boundaries and the implementation of Doosan construction protection measures; no negative impact to the watercourses and wetlands is anticipated throughout the construction or operation of the Fuel Cell.

## **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 #18*).

## **VIII. CONSTRUCTION AND MAINTENANCE**

Doosan plans to start construction work by July 2019. Construction will take approximately fifteen 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. Doosan and its contractors will fully cooperate with the City Inspector and will follow all City of Bristol and Connecticut State construction policies and codes.

## **IX. LOCAL INPUT AND STATE FUNDING**

Doosan met with the local officials and presented the plans for the installation of the Facility. This project has been awarded a contract to sell Low Emission Renewable Energy Credits (LREC) to Eversource through the CT Low and Zero Emission Renewable Energy Credit Program. Doosan will complete all necessary permitting before installing the Fuel Cell.

**X. CONCLUSION**

As set forth above, Doosan 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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Walter Bonola

Installation Manager

Doosan Fuel Cell America, Inc.

## LIST OF ATTACHMENTS

- Attachment 1: Site Plan
- Attachment 2: Electrical One Line Drawing
- Attachment 3: Doosan PureCell® Model 400 Datasheet
- Attachment 4: 75 Battisto Road Bristol CT Emergency Response Plan
- Attachment 5: City Zoning Map
- Attachment 5a: City Zoning Map zoom map
- Attachment 6: Aerial Map
- Attachment 7: 14CFR Part 77.9
- Attachment 8: California Air Resources Board Emission Certification
- Attachment 9: DEEP Diverse Database Areas Map
- Attachment 10: Acoustic Site Survey Report
- Attachment 11: Abutters Notification Letter
- Attachment 12: Abutters Map
- Attachment 13: Abutters List
- Attachment 14: Complete Officials List



Attachment 15: Copy of Certified Mail receipts for letters to Abutters, State/Town

Officials

Attachment 16: NFIP Map

Attachment 17: Doosan Natural Gas Desulpherization Process Memo

Attachment 18: FEMA Flood Map

Attachment 19: Wetlands Map