

**STATE OF CONNECTICUT  
CONNECTICUT SITING COUNCIL**

PETITION OF DOOSAN FUEL CELL, : PETITION NO. 1374  
AMERICA, INC. FOR A DECLARATORY :  
RULING FOR THE LOCATION AND :  
CONSTRUCTION OF A 0.44 MEGAWATT :  
FUEL CELL CUSTOMER-SIDE DISTRIBUTED : June 28, 2019  
ENERGY RESOURCE AT 280 NUTMEG ROAD, :  
SOUTH WINDSOR, CONNECTICUT 06074

**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 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 PureCell® Model 400 phosphoric acid fuel cell (“PAFC”) and associated equipment (the “Facility”), providing 0.44-megawatts (“MW”) (net) of power to the Carla’s Pasta Inc’s new manufacturing facility located at 280 Nutmeg Road, South Windsor, Connecticut (the “Site”) (*See* Attachment 1 for aerial photo). 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 Protection.”

## **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 is a customer-side installation distributed generation resource with grid interconnection to be located at the new manufacturing facility at Carla’s Pasta, 280 Nutmeg Road S. Windsor, CT 06074. The Facility will be placed in the northwest corner of Carla’s Pasta complex next to the parking lot. (*See Attachments 2 and 3*). The installation consists of one (1) natural-gas fueled 440 kW PureCell® Model 400 phosphoric acid fuel cell system (“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. (*See Attachment #4*)

The purpose of the proposed Facility is for combined heat and power distributed generation and to serve as a backup power system for critical plant equipment. The system for Carla’s Pasta 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 50% of the electrical requirements of the building under normal circumstances, additional base load power will be imported from the electrical grid. Waste heat from the fuel cell will be used in Carla's Pasta's production plant. The installation will have an overall annual electrical efficiency of 41% and up to 90% overall efficiency when utilizing full waste heat from the fuel cell.

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. Within 10 seconds the power plant will reconfigure to operate in grid-independent mode. A facility operator will then operate a manual transfer switch inside the facility and start an automated process to power critical loads from the fuel cell grid-independent output. Upon return of the utility supply, the facility operator will reverse the process and the powerplant will reconnect to the grid after a 5-minute time-delay.

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 PureCell® Model 400 fuel cell system 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 Carla's Pasta 280 Nutmeg Road Emergency Response Plan in Attachment #5.

**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 Model 400 is a PAFC power plant, 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 PAFC uses an inorganic, concentrated phosphoric acid as the electrolyte, allowing the electrochemical reaction to take place. The Model 400 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 CSA (Cell Stack Assembly) and the ILS (Integrated Low-Temperature Shift Converter). 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 and therefore requires special attention. 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 Carla's Pasta 50 Talbot Ln. Emergency Response Plan (See Attachment 5).

#### A. Shipping of Hazardous Material

The Model 400 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 the following subsections.

#### B. Integrated Low Shift Converter

Tank (non-spec) 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

Bulk bin (non-spec) 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 that are assembled side by side in a full assembly, with other non-hazardous components, to form one complete Model 400. The containers holding the hazardous material are non DOT specification containers. U.S. DOT regulations allow for the transportation of the hazardous material noted above in non DOT specification portable tanks and closed bulk bins, as shipped in the Model 400. 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 since 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 as 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 Carla's Pasta new manufacturing plan property at 280 Nutmeg Road S. Windsor, CT 06074. The proposed location is zoned Industrial under the zoning regulations of the Town of South Windsor (the "Town"). The surrounding parcels bordering the north, south and west of the host property are zoned Industrial (*See Attachment #6*). Refer to an Aerial map South Windsor Carla's Pasta which clearly shows the location of Fuel Cell Facility on the host property. The nearest residential properties are east of the property and over 760 feet from the Facility. The proposed Fuel Cell will be protected from unauthorized intrusions or vehicle traffic by a fence as per Carla's Pasta Site plan (*See Attachment #3*). No trees over 6 inches in diameter 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. Bancroft Airport, the nearest airport, is 3 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.

## 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 the Connecticut Department of Environmental Protection (“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 system meets the CT 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 system 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 Model 400 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 sanitary drain or 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 unit 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 (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), sulfur hexa fluoride (SF<sub>6</sub>), any hydrofluorocarbon (HFC) or any perfluorocarbon (PFC)." There is no defined criteria threshold for these compounds, however Section 22a-174-1(21) provide a method for computing carbon dioxide equivalent emissions "CO<sub>2</sub>e". The proposed facility will have no emissions of SF<sub>6</sub>, HFC, and PFC. Emissions of CH<sub>4</sub> and N<sub>2</sub>O will be very low and 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 CO <sub>2</sub> e

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. The utilization of the waste heat in the facility into the factory's processes on site will offset the facilities consumption of natural gas and is projected to reduce the CO<sub>2</sub> emissions by 820 ton / yr.

## **2. Wildlife and Habitat**

According to the relevant portion of the CT DEEP South Windsor Natural Diverse Database areas Map (*See attachments #8*) the proposed site is located within the South Windsor Natural Diversity Data Base Areas. The proposed facility is located in area disturbed as part of ongoing construction of Carla's Pasta's new production facility. Construction of this facility proceeded after migration activities, including translocation of 400 beetle larvae to Veterans Memorial Park, South Windsor CT (*See attachments #20*)

## **3. Noise Analysis**

Based on the recommendation of acoustic site survey conducted by a professional acoustic engineer of the proposed site on April 14, 2019, Doosan plans to install a sound barrier 8 feet high around two sides of the fuel cell cooling module to mitigate the effect of airborne noise on the

nearest neighbors. With the installation of a sound barrier, the anticipated sound level at residential property boundary will be below all state and town noise threshold. Please review the attached Acoustic Survey Report and Recommendations in *Attachment #10*.

**4. Visual Impact**

There will be no significant visual effects to the Facility; the host facility is a manufacturing plant with industrial and office buildings within its proximity. The Facility would be visible only from the passing traffic in and out of the Carla's pasta facility.

**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 Petition, Doosan sent notices to all applicable State and Municipal officials of South Windsor as listed in Attachments 14, 15, 16 showing the certified mail receipts for State and Municipal officials and Abutters.

**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 unit 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 Dept. personnel during decommissioning and shutdown.
- D) Return facility 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. There's no significant monetary recovery for the contents of the de-commissioned Fuel Cell.

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

From an analysis of the Federal Emergency Management Agency's ("FEMA) National Flood Insurance Program ("NFIP") flood mapping data for South Windsor (*See Attachment #17*), the proposed Facility is not situated in a 100 or 500 year flood zone. The host location is currently undergoing a major construction to build a new manufacturing plant. The lot has been cleared and buildings are being erected. The Town of South Windsor has no Aquifer Protection Areas near the host property and there's no close wetland to the proposed with the nearest watercourse approximately 2600 feet away. Site. (*See Attachment #18*)

Due to the distance of the proposed Fuel Cell 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 Facility.

## **8. Cultural Resources.**

The proposed facility will be located in an already developed vicinity, consequently construction and operation of the Fuel Cell Facility 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 Model 400 system. For further details of desulfurization please refer to the attached Desulfurization memo (*See Attachment 19*).

## **VIII. CONSTRUCTION AND MAINTENANCE**

Doosan plans to start construction work by August 15, 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 South Windsor town and Connecticut State construction policies and codes.

The proposed project cost breakdown is detailed below:

Installation Labor	\$50,000
Ancillary Equipment	\$95,000
Design	\$45,000
Construction	\$350,000
Rigging	\$15,000
Utility fees, permits:	<u>\$30,000</u>
Total	\$585,000

## **IX. STATE FUNDING**

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.

## **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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Donald Emanuel

Installation Manager

Doosan Fuel Cell America, Inc.

## **LIST OF ATTACHMENTS**

Attachment 1: Carla's Pasta 280 Nutmeg Road Site Aerial Photo

Attachment 2: 280 Nutmeg Road Site Photos

Attachment 3: General Arrangement Drawing

Attachment 4 Doosan PureCell® Model 400 Datasheet

Attachment 5: 280 Nutmeg Road Emergency Response Plan

Attachment 6: South Windsor Zoning Map

Attachment 7: California Air Resources Board Emission Certification

Attachment 8: South Windsor DEEP Diverse Database Areas Map

Attachment 9: Tiger Beetle Mitigation Report

Attachment 10: Acoustic Site Survey Report

Attachment 11: Abutters Notification Letter

Attachment 12: Abutters Map

Attachment 13: Abutters List

Attachment 14: South Windsor Town and Connecticut State Officials List

Attachment 15: South Windsor Town and Connecticut State Officials Notification Letter

Attachment 16: Copy of Certified Mail receipts for letters to Abutters, State/Town officials

Attachment 17: FEMA Flood Map

Attachment 18: Wetlands Map

Attachment 19: Doosan Natural Gas Desulfurization Process Memorandum