



Doosan Fuel Cell America, Inc.
195 Governor's Highway
South Windsor, CT 06074
T - 860 727 2200

November 30, 2016

Responses to PE 1270-(11/16/16 Notice) Interrogatories

RE: PETITION NO. 1270 - Doosan Fuel Cell America, Inc. petition for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required to replace an existing customer-side 200-kilowatt fuel cell facility with a 460-kilowatt customer-side combined heat and power fuel cell facility to be located at the Fairfield Wastewater Treatment Facility, 183 Richard White Way, Fairfield, Connecticut.

Please see the attached responses to the interrogatories with exhibits to the questions posed by the Connecticut Siting Council on 11/16/16 for PE 1270.

Address additional questions to:

Tania Russell

195 Governor's Highway

South Windsor, CT 06074

(860) 727-2073

Tania.Russell@doosan.com

Sincerely,

Doosan Fuel Cell America, Inc.

A handwritten signature in dark ink, appearing to read "Dawn Mahoney". The signature is fluid and cursive, with a large loop at the end of the last name.

Dawn Mahoney, Esq.

General Counsel

Doosan Fuel Cell America, Inc

VIA ELECTRONIC MAIL

November 16, 2016

Dawn Mahoney, Esq.
General Counsel
Doosan Fuel Cell America Inc.
195 Governor's Highway
South Windsor, CT 06074

RE: **PETITION NO. 1270** - Doosan Fuel Cell America, Inc. petition for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required to replace an existing customer-side 200-kilowatt fuel cell facility with a 460-kilowatt customer-side combined heat and power fuel cell facility to be located at the Fairfield Wastewater Treatment Facility, 183 Richard White Way, Fairfield, Connecticut.

Dear Attorney Mahoney:

The Connecticut Siting Council (Council) requests your responses to the enclosed questions no later than November 30, 2016. To help expedite the Council's review, please file individual responses as soon as they are available.

Please forward an original and 15 copies to this office, as well as send a copy via electronic mail. In accordance with the State Solid Waste Management Plan and in accordance with Section 16-50j-12 of the Regulations of Connecticut State Agencies the Council is requesting that all filings be submitted on recyclable paper, primarily regular weight white office paper. Please avoid using heavy stock paper, colored paper, and metal or plastic binders and separators. Fewer copies of bulk material may be provided as appropriate.

Yours very truly,

Melanie Bachman
Acting Executive Director

MB/MP

c: Council Members

Petition No. 1270
Doosan Fuel Cell America, Inc.
183 Richard White Way
Fairfield, CT
Interrogatories

1. Confirm that notice was provided via certified mail to recipients including the host property owner, abutters, and state and local officials. Provide certified mail receipts.
- R1. Notice was provided to all property owners, abutters and state and local officials as required by RCSA §16-50j-40. Per Doosan's filing of Petition 1262 Attachment E, Fairfield Abutters-B, Doosan certified the requisite notice to abutters was sent via U.S. First Class Mail to all abutters listed in Attachment E. Doosan sent notice to the applicable State and Municipal officials as listed on Attachment F and on Doosan's Response to Incomplete Letter via certified mail. Attached please find the certified mail receipts for State and Municipal Official in Fairfield-1 Mail Receipts.
2. Why is the existing 200-kilowatt (kW) fuel cell proposed to be replaced, e.g. age, more electric power capacity, upgrade to more efficient model, etc.?
- R2. The existing 200-kilowatt fuel cell will be replaced due to its age as it has exceeded the design life and is no longer in operation.
3. Would the proposed replacement fuel cell be considered an "upgrade?" If yes, explain why, e.g. because of the higher power output, higher efficiency, etc.
- R3. The replacement is considered an upgrade as the model 400 unit has a higher power output and efficiency than the 200kW fuel cell. The 200 model has also exceeded its design life.
4. Is the existing fuel cell currently in use? Would it be removed prior to the replacement fuel cell installation so that the new fuel cell could be located in the same location?
- R4. The existing 200kW fuel cell is not in operation. The unit will be removed prior to install of the 440kW model in the same location.
5. Can the existing utility lines from the fuel cell to the building be reused? Or would any of the lines have to be replaced/upgraded? Identify such existing versus proposed utility lines on the site plan in response to question 9.
- R5. The existing utility lines will be required to be replaced. The trenching will be carried out in the same area that the original trench work was carried out for the 200kW unit install.
6. What is the age of the existing fuel cell, relative to its service life? What is the projected service life of the proposed replacement fuel cell?
- R6. The original unit was installed in August 2005 and had a service life of 5 years. The 400kW replacement fuel cell has a 20 year product life with a projected 10-year overhaul.
7. What would Doosan Fuel Cell America, Inc. (Doosan) do with the existing fuel cell to be removed? For example, would it be refurbished at the factory for resale or recycled as (mostly) scrap metal? Is there significant monetary recovery for some/all of its contents?

- R7. The 200kW fuel cell will be recovered as per Doosan's recycling process. The unit is stripped and the parts are separated and either recycled, reclaimed or transported to landfill. There is no significant monetary recovery for the contents of the 200kW unit.
8. Would the proposed replacement fuel cell be enclosed with a fence or would Doosan rely on the existing security fence for the subject property? Would bollards be used to protect the fuel cell facility from being accidentally struck by vehicles?
- R8. Doosan will be relying on the existing security fence at the property. The entire site is fenced and the facility is considered secure, therefore, no additional fencing is required. Bollards will be used to protect the facility from vehicles as shown in attached Fairfield-2 Site Plan.
9. Provide a detailed site plan that includes but is not limited to location and dimensions of the replacement fuel cell, cooling module, concrete pads, fence design and bollards (if applicable), and utility connections.
- R9. Please find attached Fairfield-2 Site Plan showing a high level visual of the unit install.
10. Page two of the Petition states that the facility would be "...generating heat that will be used for space heating and cooling." Would the fuel cell's waste heat be used only to supplement the heating, or would it also be used for cooling, e.g. absorption cooling?
- R10. The waste heat will be used for heating only.
11. Is the project located outside of the 100-year and 500-year flood zones? If no, would the proposed replacement fuel cell and cooling module be elevated as a flood mitigation measure, e.g. one foot above the 100-year flood elevation? Provide a Federal Emergency Management Agency flood zone map.
- R11. Please see attached Fairfield-3 Flood Zone Map. The fuel cell facility is located in zone AE of the flood area meaning that it falls under the 100-year flood zone and has a 1% annual chance of flood. Fairfield Wastewater is carrying out measures to mitigate the flood zoning issue. The install of the fuel cell will be located at the same level as the previous install. We will work alongside Fairfield Wastewater Plant to mitigate the measures.
12. What is the zoning designation of the subject property? What are the surrounding land uses for areas abutting the site?
- R12. The zoning designation is in an industrial zone. The surrounding land has residential homes, a donation station and other industrial works.
13. Provide a decommission plan, including the fuel cell facility infrastructure removal plans and site restoration plans.
- R13. The decommissioning plan is as follows:
- 1 – 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.
 - 2 – Disconnect all electrical conductors and conduit at the unit to include electrical power, ACM power, nitrogen pressure switch, RMS power and RMS ethernet. Shore power to be maintained to the unit to maintain temperature as needed.

3 – Contractor will work in concert with Doosan Service Dept. personnel during decommissioning and shutdown.

4 – Contractor to supply rigging labor and equipment including crane service sufficient to safely lift unit and place on Doosan supplied flatbed truck. Contractor to supply labor to install travel tarp (Doosan supplied) on unit prior to being transported.

5 – Return facility to original condition with the exception of the concrete pads.

14. What is the distance and direction from the proposed fuel cell facility to the nearest wetland?

R14. The closest wetland is approximately 400 yards from the proposed site.

15. What is the distance and direction from the proposed fuel cell facility to the nearest residence?

R15. The nearest residence is South East from the proposed site and is located approximately 420 yards from the site.

16. Is the fuel cell facility located within an Aquifer Protection Area as designated by the Connecticut Department of Energy and Environmental Protection (DEEP)?

R16. Fairfield is a town without an Aquifer Protection Areas and a map is not available for this town.

17. Is the fuel cell facility located within any environmentally sensitive areas such as DEEP Natural Diversity Database (NDDB) Area, flood zones, wetlands, Connecticut Critical Habitat Area, etc.?

R17. No, the location of the fuel cell is not in any environmentally sensitive areas.

18. How many trees six inches diameter or greater would be removed to construct the proposed fuel cell facility, if any?

R18. No trees are required to be removed for the install of the facility.

19. Is the proposed site located within a Coastal Boundary per Connecticut General Statutes Section 22a-94? If yes, provide a map and indicate how the project would affect the Coastal Boundary.

R19. The attachment Fairfield-5 Coastal Boundary highlights that the project site location is within the town of Fairfield's coastal boundary. The project will have no effect on the coastal boundary; as this is a replacement project of an existing fuel cell unit it can be shown that the previous unit did not affect the boundary.

20. Would the facility only consume water during the initial commissioning start-up or every time the unit cycles on? How much water is used for a start-up? Would the fuel cell run on mostly a 24/7 basis as a baseload facility and thus have infrequent start-ups?

R20. The unit operates in water balance below 86°F. The initial fill required 350 gallons of water. The amount of make-up water above 86°F increases linearly from 0gpm to 1gpm at 110°F.

21. Would the fuel cell facility provide backup power in the event of a power outage? If yes, would the fuel cell first shut down and then automatically "black start" to restore power, or would it continue running seamlessly despite the loss of grid power (i.e. provide uninterruptible power)? Please explain.

- R21. No, the facility will not provide backup power in the event of a power outage.
22. Would any surplus power be sold to the grid? What percentage of the building's energy usage would be provided by the proposed facility under normal conditions?
- R22. The plant will be net metered and any excess power will be sold to the grid. Under normal conditions, 58% of the building's energy usage will be provided by the facility.
23. Please provide an Emergency Response Plan for the proposed facility in accordance with Public Act 11-101, An Act Adopting Certain Safety Recommendations of the Thomas Commission.
- R23. Please see attached Fairfield-6 Emergency Response Plan.
24. Please identify media to be used for pipe cleaning procedures at the proposed facility in accordance with Public Act 11-101, An Act Adopting Certain Safety Recommendations of the Thomas Commission.
- R24. Use atmospheric air under pressure – no solvents or cleaners will be used.
25. Please submit a noise analysis report to demonstrate compliance with DEEP noise control standards.
- R25. The noise sound level on page 8 of the petition states that per each fuel cell the sound level will be less than 65dBA at 33 feet. This is in compliance with DEEP noise control standards.
26. In the Petition, Doosan predicts a noise level of not more than 62 dBA at 100+ feet away for the fuel cell. Is the cooling module included in this noise prediction? If no, please update this noise prediction accordingly in response to question 25.
- R26. The noise level predicted includes both the fuel cell plant and the cooling module.
27. Which National Fire Protection Association (NFPA) or other codes and standards apply to fuel cell construction, installation and/or modification?
- R27. ANSI FC-1 2014: American National Standard for Stationary Fuel Cell Power Systems. This certification calls out all codes and standards for stationary fuel cell applications.
28. Provide a table showing state criteria thresholds and projected emissions from the proposed facility for all greenhouse gasses listed in the Regulations of Connecticut State Agencies Section 22a-174-1(49) with and without the use of waste heat.

R28. Please see the table below:

Table 1: PureCell® Model 400 Emissions Data

	lb/MWh	PPMvd @ 15.4% O ₂
NO _x	0.01	0.32
CO	0.02	0.67
VOC	0.02	1.36
CO ₂	1050	-

29. How would the amount of phosphoric acid in the proposed replacement fuel cell compare with that of the existing fuel cell?

- R29. Phosphoric acid is bound within a matrix within the fuel cell stacks and the quantity is proprietary. The amount does comply with the State and Federal regulations.
30. Which emission rate in pounds of CO₂ per megawatt-hour (MWh) did Doosan use for the eGRID non-baseload generation for the ISO New England, Inc. electric system? Doosan estimates that annual carbon emissions would be reduced by about 260 metric tons per year. Is this only for displacement of non-baseload electric generation, or would the total carbon reduction be potentially higher if Doosan utilizes the waste heat and reduces the runtime of the building's existing heating system?
- R30. We use the 2012 eGrid "Fossil fuel output emission rate (CO₂ lb/MWh)" of 980.27 with a grid loss of 9.17% for a total of 1070 lb/MWh for the NEWE Region. We account for the CO₂ offset to natural gas heating fuel using avoided heat efficiency of 80% in our carbon emissions.
31. Natural gas has sulfur dioxide injected as an odorant. Is desulfurization required, e.g. to protect the fuel cell stack from sulfur? Explain. If yes, please submit a desulfurization plan narrative for the proposed fuel cell facility containing the following information:
- a) Chemical reaction overview concerning what substances are produced from the desulfurization process, as well as plans for their containment and transport;
 - b) How much solid sulfur oxide would result from the desulfurization process, and methods and locations for containment, transport, and disposal;
 - c) Whether any of these desulfurization substances are considered hazardous, and if so, plans for the containment, transport, and disposal of hazardous substances;
 - d) Anticipated method of disposal for any other desulfurization substances; and
 - e) Whether any gaseous substances resulting from desulfurization can be expected to vent from the fuel cells, as well as the applicable DEEP limits regarding discharge of these gasses.
- R31a. The Model 400desulfurizer system removes sulfur used as an odorant in natural gas. Sulfur is converted to zinc-sulfide, a non-hazardous waste, within the desulfurizer and remains there until an overhaul is required, nominally after 10 years. At no time is sulfur or zinc-sulfide accessible or removed during the operation or service of the fuel cell. When the desulfurized system is overhauled, it is sealed and transported back to the manufacturing facility for recycling.
- R31b. There is no solid sulfur oxide result from the desulfurization process; all natural gas odorant, as noted above, converts to zinc-sulfide and remains sealed within the fuel cell.
- R31c. The by-product, zinc-sulfide, is sealed within the fuel cell system, and as noted above, when the desulfurized system is overhauled, it is sealed and transported back to the manufacturing facility for recycling.
- R31d. As noted above, the only by-product is zinc-sulfide, which is transported back to the manufacturing facility for recycling.
- R31e. No gaseous substances resulting from desulfurization are expected to vent from the fuel cell – as noted above, the desulfurization process is sealed within the fuel cell system.
32. If the project is approved by the Council, approximately when would construction commence and when would it be completed? What are the estimated work hours and days of the week, e.g. Monday through Friday 7:00 a.m. to 5:00 p.m.?
- R32. We plan to start construction work by January 2017. The work is to be completed and commissioned by the end of July 2017. Regular work hours are Monday through Friday 7:00am to 5:00pm.

Attachments

Fairfield-1
Mail Receipts

Check type of mail or service:

Certified
 COD
 Registered
 Registered Delivery (International)
 Handise

Handis

Affix Stamp Here
(if issued as a
certificate of mailing
or for additional
copies of this bill)
**Postmark and
Date of Receipt**

Date of Receipt _____

Postlego

03

Handling Charge

Actual Volume
if Registered

**Insured
Value**

**Duo Sender
if COD**

DC
FebSC
F08SH
FCH

Feu

Article Number

1

**SENATOR
RICHARD BLUMENTHAL
90 STATE HOUSE SQUARE
HARTFORD, CT 06103**

**SUSAN MERROW – CHAIR
STATE COUNCIL OF ENVIRONMENTAL
QUALITY, 79 ELM STREET
HARTFORD, CT 06106**

**GEORGE JEPSEN -ATTORNEY GENERAL
OFFICE OF THE ATTORNEY GENERAL
55 ELM STREET
HARTFORD, CT 06106**

**DORA B. SCHIRO—COMMISSIONER
DEPT OF EMERGENCY SERVICES AND
PUBLIC PROTECTION
1111 COUNTRY CLUB ROAD
MIDDLETOWN, CT 06457**

**SCOTT D JACKSON - COMMISSIONER
DEPARTMENT OF LABOR
200 FOLLY BROOK BOULEVARD
WETHERSFIELD, CT 06109**

Laura Devlin
Rep District 134
85 Brett Ln
Fairfield CT 06824 - 1717

Total Number of Pieces Listed by Sender

Total Number of Pieces Received at Post Office

PS Form 3877, February 2002 (Page 7 of 2)

Ball Point Pen

See Privacy Act Statement on Reverse

SOUTH WINDSOR CT 0607

NOV 29 2016

U.S. POSTAGE
SOUTHWINDSOR, CT
NOV 28 1988
AMOUNT
\$2.16
R2304N118088-12



Restricted Delivery

Indicate full address of sender

Check type of mail or service:

☐ Certified
☐ COD

☐ Registered

☐ Recorded Delivery (International)
☐ Registered
Return Receipt for Merchandise

Article Number

1.

CATHERINE SMITH - COMMISSIONER
CT DEPT OF ECONOMIC & COMM.DEV
505 HUDSON STREET
HARTFORD, CT 06106 -7106

Postage

Fee

Handling
Charge

Actual Value
if Registered

Insured
Value

Due Sender
if COD

DC
Fee

SC
Fee

SH
Fee

RT
Fee

2.

Tony Hwang
House District 28
80 Martingale Ln
Fairfield CT 06824-2465



U.S. POSTAGE
SOUTH WINDSOR, CT
NOV 29 2016
\$2.16
R2304N110088-12

DC
Fee

SC
Fee

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Fee

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RT
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4.

ARTHUR HOUSE - CHAIRMAN
PUBLIC UTILITIES REGULARITY AUTH
10 FRANDLIN SQUARE
NEW BRITAIN, CT 06051

5.

JANATHAN HARRIS - COMMISSIONER
DEPT OF CONSUMER PROTECTION
165 CAPITAL AVENUE
HARTFORD, CT 06106 -6300

6.

7.

Breanda Kupchick
Rep District 132
213 Farist Rd
Fairfield CT 06825 - 3206

8.

Total Number of Pieces
Listed by Sender

Total Number of Pieces
Received at Post Office

PS Form 3877, February 2002 (Page 1 of 2)

Complete by 11:59pm, Nov 29, 2016

See Privacy Act Statement on Reverse

Name and Address of Sender

Check type of mail or service:

(International)
Landline

Affix Stamp Here
(If issued as a
certificate of mailing,
or for additional
copies of this bill)
Postmark and
Date of Receipt

Article Number

1.

Tom Conley
Chief Building Official
Sullivan Independence Hall, 2nd Flr
Fairfield CT 06824

2.

Cristin McCarty Vahey
Rep District 133
1625 Melville Ave
Fairfield CT 06825-2044

3.

Sen Christopher S. Murphy
One Constitution Plaza, 7th Floor
Hartford, CT 06103

4.

Brian Bidolli- Executive Chair
CT Metro Council of Governments
1000 Lafayette Blvd
Norwich CT 06360-4592

5.

DR. JEWEL MULLEN - COMMISSIONER
STATE DEPT OF PUBLIC HEALTH
410 CAPITOL AVENUE
HARTFORD, CT 06106

7.

BENJAMIN BARNES - SECRETARY
OFFICE OF POLICY & MANAGEMENT
450 CAPITAL AVENUE
HARTFORD, CT 06106

8.

Total Number of Pieces
Listed by Sender

Total Number of Pieces
Received at Post Office

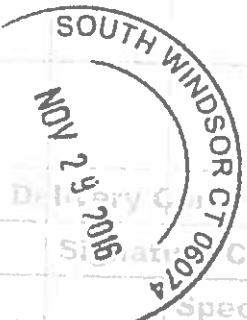
PS Form 3877, February 2002 (Page 1 of 2)

Complete by Typewriter, Ink, or Ballpoint Pen

See Privacy Act Statement on Reverse



U.S. POSTAGE
SOUTH WINDSOR, CT
NOV 29 2016
\$2.16
R2304N118088-12



Restricted Delivery

Fairfield-2

Site Plan

Site Layout

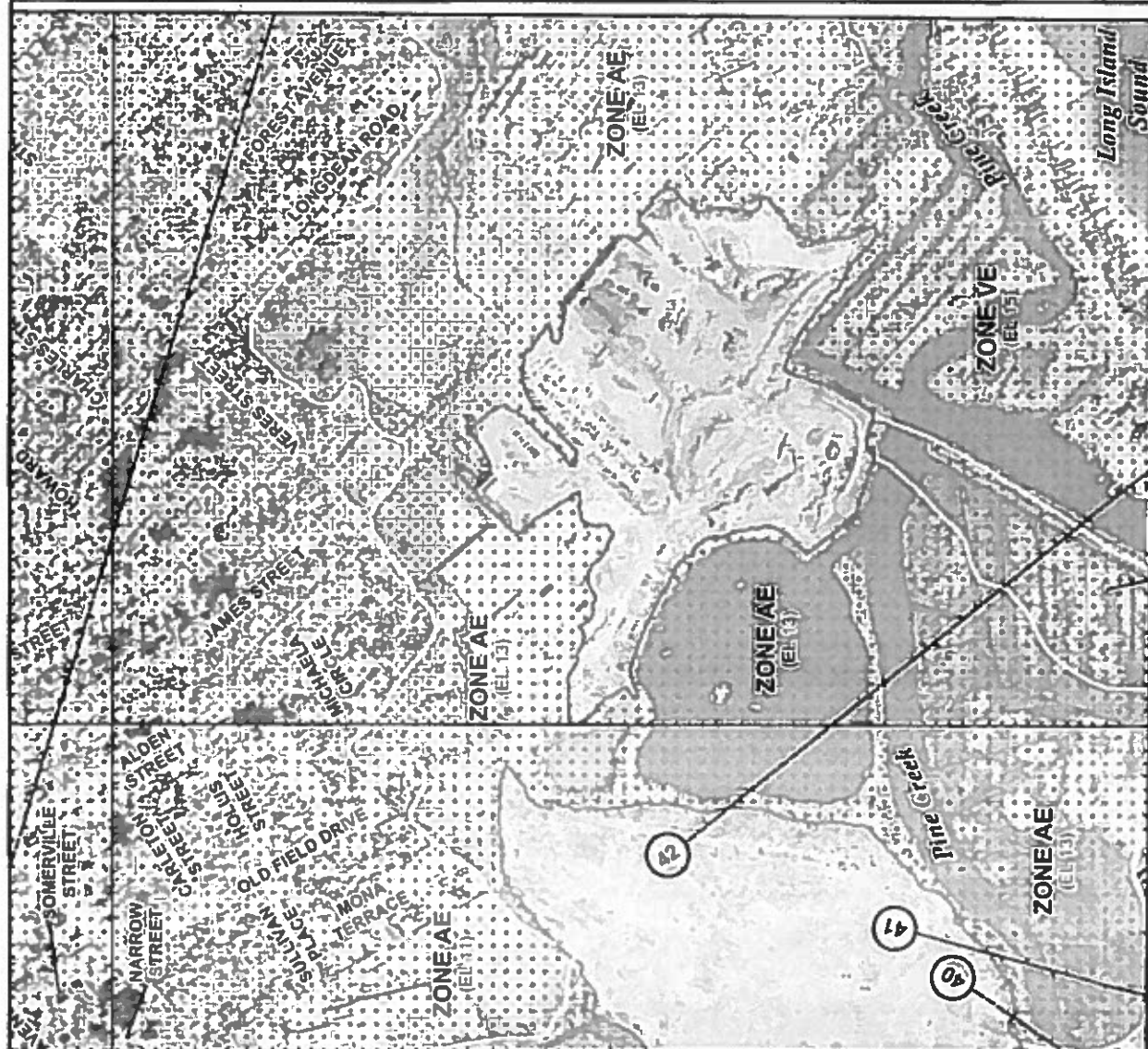
- Visualization showing proposed location of units
- New 400 kW unit to replace existing unit in same location



Fairfield-3
Flood Zone Map



MAP SCALE 1" = 500'



NFP

FIRM

FLOOD INSURANCE RATE MAP
FAIRFIELD COUNTY,
CONNECTICUT
(ALL JURISDICTIONS)

PANEL 419 OF 628

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CORRECTIONS

COMMUNITY

FAIRFIELD TOWN CT

MAP USER

PANEL SAFETY

0419



MAP NUMBER
09001C0419G
MAP REVISED
JULY 8, 2013

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MAT Co-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.fema.gov

Fairfield-4
Aquifer Protection Area

Natural Diversity Data Base Areas

FAIRFIELD, CT

June 2016

-  State and Federal Listed Species & Significant Natural Communities
-  Town Boundary

NOTE: This map shows general locations of State and Federal Listed Species and Significant Natural Communities. Information on listed species is collected and compiled by the Natural Diversity Data Base (NDDDB) from a number of data sources. Exact locations of species have been buffered to produce the general locations. Exact locations of species and communities occur somewhere in the shaded areas, not necessarily in the center. A new mapping format is being employed that more accurately models important riparian and aquatic areas and eliminates the need for the upstream/downstream searches required in previous versions.

This map is intended for use as a preliminary screening tool for conducting a Natural Diversity Data Base Review Request. To use the map, locate the project boundaries and any additional affected areas. If the project is within a shaded area there may be a potential conflict with a listed species. For more information, complete a Request for Natural Diversity Data Base State Listed Species Review form (DEP-APP-007) and submit it to the NDDDB along with the required maps and information. More detailed instructions are provided with the request form on our website.

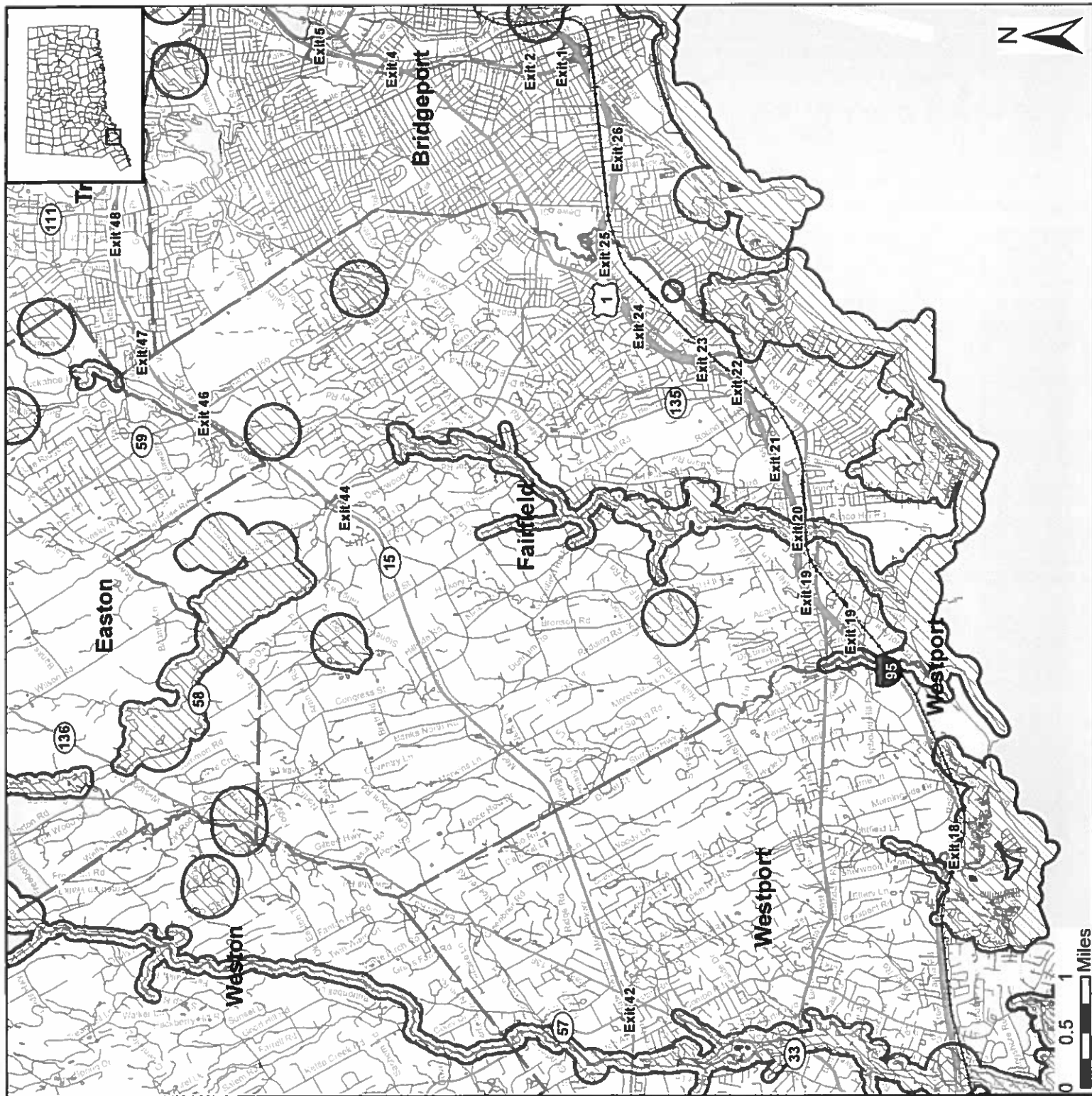
www.ct.gov/deep/hndbrequest

Use the CTECO Interactive Map Viewers at www.cteco.uconn.edu to more precisely search for and locate a site and to view aerial imagery with NDDDB Areas.

QUESTIONS: Department of Energy and Environmental Protection (DEEP)
79 Elm St., Hartford CT 06106
Phone (860) 424-3011



Connecticut Department of
Energy & Environmental Protection
Bureau of Natural Resources
Wildlife Division



Fairfield-5
Coastal Boundary

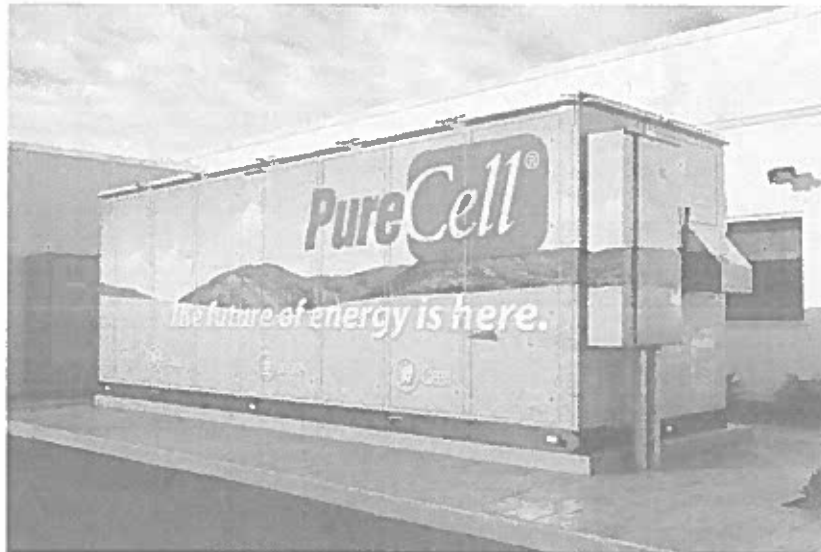


Fairfield-6
Emergency Response Plan



Doosan Fuel Cell America, Inc. Fuel Cell Emergency Response Guide

Fairfield Wastewater Treatment Plant
183 Richard White Way,
Fairfield, CT 06824



DISCLAIMER

Doosan Fuel Cell America reserves the right to change or modify, without notice, the design or equipment specifications of the PureCell® system Model 400 without obligation with respect to equipment either previously sold or to be sold. This guide is provided by Doosan Fuel Cell America, and no liability will accrue to Doosan Fuel Cell America based on the information or specifications included herein. No warranties or representations are made by this guide and no warranties or representations shall apply to the equipment except as stated in Doosan Fuel Cell America's standard terms and conditions of sale applicable at the time of purchase, a copy of which will be provided upon request. The Model 400 is designed to provide safe and reliable service when operated within design specifications, according to all applicable instructions, and with the appropriate operating materials. When operating this equipment, use good judgment and follow safety precautions to avoid damage to equipment and property or injury to personnel. Be sure to understand and follow the procedures and safety precautions contained in all applicable instructions, operating materials, and those listed in this guide. All information in this document is as of May 30, 2015.

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Policy

The following plan has been developed to minimize the severity of damage to human health, the environment, and property in the event of an unexpected failure.

Scope

This Emergency Response Guide shall be integrated into the site Emergency Response Plan. Information contained in this document shall be customized to meet local requirements and shall be shared with local responders as necessary. This guide is only a template and in no way assumes or transfers liability or ownership. Doosan Fuel Cell America should be contacted if clarification is needed.

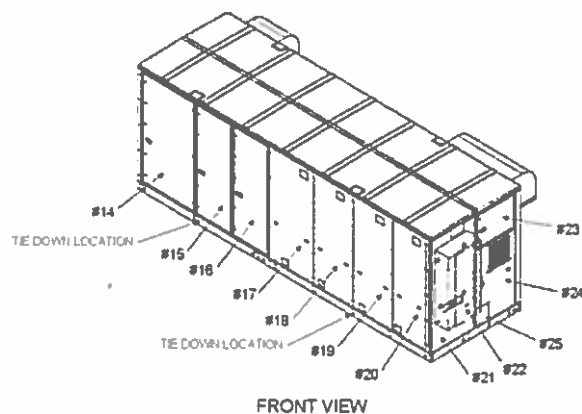
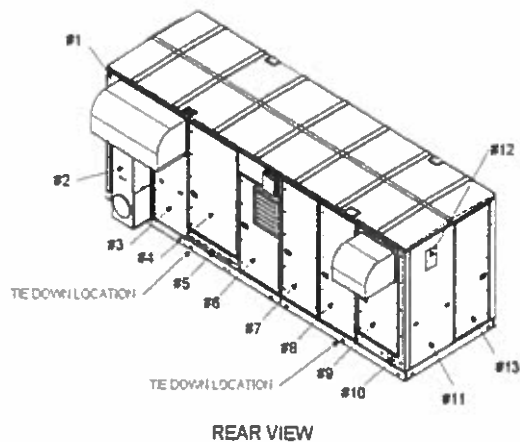
Emergency Contacts and Numbers

Local Emergency Number	911
Doosan Fuel Cell America Control Center	(860) 727-2847
Clean Harbors Emergency Cleanup Response	(800) 645-8265
Fire Department – Non-emergency number	Fairfield Fire Department (203) 254-4700
Hospital – Non-emergency number	St Vincent's Hospital urgent Care Centre 1055 Post Rd, CT 06824 203-259-3440
Electric Utility Name: United Illuminating Company	800-722-5584
Gas Utility Name: Eversource Energy	*Gas Leaks Only: <u>877-944-5325</u>
Local Oil & Chemical Spill Response Division	800-645-8265
EPA - Environmental Protection Agency Region 1	(800) 424-8802 Environmental Emergency
OSHA - Occupational Safety and Health Admin. Emergency Number	(800) 321-6742 National Emergency Number
Poison Control Center	(800) 222-1222 National Emergency Number

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Fuel Cell Hazard Overview



480 V Grid Disconnect



Emergency Stop Button

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Rear View Panel	Primary Hazard	Front View Panel	Primary Hazard
1 (Computer Terminal)	Electrical = 120 VAC	14 (Reformer)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam
2 (Air Conditioner)	Electrical = 480 VAC Chemical = Refrigerant	15 (Reformer)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam
3 (Swing Door)	Electrical = 480 VAC	16 (Reformer)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam
4 (Mechanical Entry)	Electrical = 480 VAC Chemical = Propylene Glycol Thermal = 350°F Steam Pressure = 150 psi Steam	17 (DC Cell Stack)	Electrical = 300 VDC Chemical = Solid phosphoric acid / combustibles
5 (Mechanical Entry)	Chemical = Propylene Glycol Thermal = 350°F Steam Pressure = 150 psi Steam	18 (DC Cell Stack)	Electrical = 300 VDC Chemical = Solid phosphoric acid / combustibles
6 (TMS)	Electrical = 480 VAC Chemical = Propylene Glycol / Deionized Water / Resin Thermal = 350°F Steam Pressure = 150 psi Steam	19 (DC Cell Stack)	Electrical = 300 VDC Chemical = Solid phosphoric acid / combustibles
7 (ILS)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam	20 (DC Cell Stack)	Electrical = 300 VDC Chemical = Solid phosphoric acid / combustibles
8 (Fuel Processing Area)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam	21	Not accessible
9 (Fuel Processing Area)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam	22 (Grid Connect Disconnect)	Electrical = 480 VAC
10 (Gas/Nitrogen Inlet)	Chemical = combustibles	23 (Blower 110)	Electrical = 300 VDC Mechanical = Blower
11 (Reformer)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam	24 (Inverter)	Electrical = 1400 VDC / 480 VAC
12 (Reformer)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam	25 (Grid Independent Circuit)	Electrical = 480 VAC
13 (Reformer)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam	ALL Roof Panels	Multiple Hazards DO NOT WALK ON ROOF!

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Conditional Assessment

Normal Condition	Potential Abnormal Condition	Response
<u>Fuel Cell</u> White steam exiting power plant at exhaust chimney, above panel #6 (It can be a large amount of white steam depending on ambient conditions)	Dark colored smoke exiting chimney or any other part of enclosure	1. Establish safe perimeter 2. Contact Doosan Fuel Cell America Control Center (860) 727-2847
	Observable fire or heavy smoke at any point on fuel cell	1. Press Fuel Cell 'Stop Button' – Only if safely accessible! 2. Dial 911 or Local Emergency Response Number 3. Establish safe perimeter 4. Contact Doosan Fuel Cell America Control Center (860) 727-2847
<u>Fuel Cell</u> Moderate humming, clicking and fan sounds	Grinding or loud intermittent noises	1. Contact Doosan Fuel Cell America Control Center (860) 727-2847
	Observable fire or heavy smoke at any point on fuel cell	1. Press Fuel Cell 'Stop Button' – Only if safely accessible! 2. Dial 911 or Local Emergency Response Number 3. Establish safe perimeter 4. Contact Doosan Fuel Cell America Control Center (860) 727-2847
<u>Cooling Module</u> Fan humming	Smoke or fire coming from module	1. Press Fuel Cell 'Stop Button' – Only if safely accessible! 2. Dial 911 or Local Emergency Response Number 3. Establish safe perimeter 4. Contact Doosan Fuel Cell America Control Center (860) 727-2847
	Grinding or loud noise coming from fans	1. Contact Doosan Fuel Cell America Control Center (860) 727-2847
<u>Cooling Module</u> No leaking from cooling loop piping or coils	Small leak dripping from joint, valve or connection	1. Contact Doosan Fuel Cell America Control Center (860) 727-2847
	Medium to large leak	1. Follow local spill response protocol or contact Clean Harbors Emergency Cleanup Response (800) 645-8265 2. Contact Doosan Fuel Cell America Control Center (860) 727-2847
<u>Mechanical Hi/Lo Grade Piping</u> Small amounts of condensate dripping from piping	Small leak dripping from joint, valve or connection	1. Contact Doosan Fuel Cell America Control Center (860) 727-2847
	Medium to large leak	1. Follow local spill response protocol or contact Clean Harbors Emergency Cleanup Response (800) 645-8265 2. Contact Doosan Fuel Cell America Control Center (860) 727-2847
<u>Disconnects/Other Equipment</u> No leaks or smoke	Smoke or fire coming from equipment	1. Dial 911 or Local Emergency Response Number 2. Establish safe perimeter 3. Contact Doosan Fuel Cell America Control Center (860) 727-2847

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Compressed Gas Manifold (N₂/H₂) No leaks, May hear intermittent gas flow during purges	Leaks – may be able to hear hissing sound.	<ol style="list-style-type: none"> If Indoors – Evacuate Immediately! Dial 911 or Local Emergency Response Number Establish safe perimeter Contact Doosan Fuel Cell America Control Center (860) 727-2847
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Fuel Cell Related Material Safety Data Sheets (MSDS)

1. Propylene Glycol – DowFrost®
2. Phosphoric Acid – Solid
3. Reformer/ILS Catalysts
4. Anion/Cation Resin
5. Nitrogen / Hydrogen Compressed Gas Mixture (non-flammable)

Inspections

Inspection Type	Equipment Requirements	Frequency Required
General Maintenance	Laptop, Service Vehicle	Monthly
General Housekeeping	N/A	Monthly
Waste and Chemical Storage*	N/A	Weekly
Internal Combustible Gas Monitor	AT-160 Calibration Kit	Annual
Fire Prevention	N/A	Monthly

*When applicable

Fuel Cell operation is monitored and controlled remotely 24 hours a day 7 days a week by the Doosan Fuel Cell America Control Center. Upset or abnormal occurrences outside of normal operating parameters are immediately identified and service technicians are dispatched within 24 hours to respond when required.

Emergency Procedures

Alarms	There are no audible or visual alarms on Fuel Cell. Alarm conditions are relayed immediately to the Doosan Fuel Cell America Control Center. The Doosan Fuel Cell America Control Center will then contact the appropriate site personnel on the site's emergency contact list.
Emergency Shut Down Onsite	Actuate Fuel Cell Stop Button
Emergency Area Egress - Gas Odor	Evacuate 330 Feet in all directions
Emergency Area Egress - Fire	Evacuate 330 Feet in all directions – CV000 automatic natural gas supply shut off
Emergency Egress - General	Fuel cell is unmanned remotely monitored and controlled. No Doosan Fuel Cell America employees attending unit unless service or maintenance is required.

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Signage and Labeling

External service lines will be clearly identified. Labeling will be in accordance with ANSI A13.1. Labeling will be similar to example below:



Perimeter fencing will have signage clearly identifying that "No smoking, no ignition sources" on every side of the fence. Signage will be similar to the sign below:





General

Safety Hazard Analysis

The PureCell® Model 400 fuel cell system has been designed to meet strict ANSI/CSA safety standards to protect against risks from electrical, mechanical, chemical, and combustion safety hazards. The following items are a few of the safety measures incorporated into the design.

Fire Detection and Protection:

The power plant design incorporates a combustible gas sensor as well as thermal fuses located throughout the power module cabinet to detect fire. The detection of a potential flammable gas mixture, a fire, or the failure of this detection circuit will result in a power plant shutdown 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 Fuel Cell America service personnel. The power plant is designed with an integral emergency-stop button on the outside of the enclosure to enable immediate shutdown in the event of an emergency. There is also a gas shut-off valve and electrical disconnect switch easily accessible to emergency personnel. There are no restrictions for type of fire suppression equipment.

Gas Leak:

Augmenting the internal combustible gas sensor, the power plant also monitors the flow rate of natural gas. If the gas flow rate exceeds the equivalent power production of the power plant then a shutdown will result. The largest possible accumulation from a leak prior to shutdown is below combustible limits. Fuel valves inside the power plant are "fail safe" and will return to their normally closed position upon loss of power. The power plant is designed to have 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 kept at a negative pressure to contain and remove any potential gas leaks, whereas the motor compartment is pressurized by a fan source to prevent combustible gases from entering.

Hydrogen:

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. Although hydrogen has low self-ignition characteristics, the fuel in the power plant is not pure hydrogen. Also, the power plant is not producing or storing hydrogen, it consumes hydrogen-rich gas 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.

Phosphoric Acid:

Phosphoric acid is 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 phosphoric acid is not in liquid form once applied in the equipment. There is no reservoir of liquid. Phosphoric acid is contained in the porous structure of the fuel cell stack material by capillary action, similar to how ink is absorbed into a blotter.

Fluid Leak:

The only fluid source is water. All pressurized water vessels are designed to ASME boiler codes and inspected annually. All piping, welds, etc. meet pressurized piping standards. Water produced through the electrochemical process is "pure" water and is reclaimed and reused by the process. The other source of water is water used in the external cooling module, which is mixed with a polypropylene glycol and a rust inhibitor to prevent rust and freezing in colder climates.

Hazardous Waste:

The fuel cell does not produce any hazardous waste. Standard Material Safety Data Sheets (MSDS) are available upon request.