Air Quality Report
Fuel Cell Installations

CONNECTICUT STUDIOS

245 CHAPEL ROAD

SOUTH WINDSOR, CONNECTICUT

HARTFORD COUNTY

Prepared by

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1.1 Air Quality

The only emissions source at the proposed project will be two FuelCell Energy DFC3000 direct fuel cells, each producing 2.49 MW. FuelCell Energy's Direct FuelCell® (DFC®) power plants are based on molten carbonate fuel cell (MCFC) technology, which uses potassium and lithium carbonate electrolytes to produce electricity from hydrogen that is directly generated from a fuel source, such as natural gas, in a process referred to as internal reforming. The hydrogen gas is consumed electrochemically in a reaction with the carbonate electrolyte ions that produces electrons and water. Because there is no combusting of fuel, virtually no harmful emissions are generated by the fuel cells. This results in power production that is almost entirely absent of nitrogen oxide (NOx), sulfur dioxide (SOx), particulate matter (PM) carbon monoxide, (CO) and volatile organic compounds (VOC), which are emitted in significantly higher amounts by conventional fossil fuel-fired power plants on an equivalent electricity output basis. DFC fuel cells also have a low carbon footprint. Fuel cells operating on natural gas generally release less CO_2 than combustion-based power generation due to the high efficiency of the fuel cell power generation process.

Table 1 below compares emissions from the DFC power plant to other conventional fossil-fuel combustion power plants on a pounds-per-MW-hour basis:

Table 1: Comparative Emissions of Fuel Cells vs. Conventional Small Power Plants

Emissions (Lbs. Per MWh)					
Fuel Source	**NOX**	**SO_2**	**PM_{10}**	**CO_2**	**CO_2 with CHP**
Average U.S. Fossil Fuel Plant	5.06	11.6	0.27	2,031	NA
Micro turbine (60 kW)	0.44	0.008	0.09	1,596	520–680
Small Gas Turbine	1.15	0.008	0.08	1,494	520–680
DFC® Power Plant	0.01	0.0001	0.00002	940	520–680

Source: FuelCell Energy (http://www.fuelcellenergy.com/why-fuelcell-energy/benefits/ultra-clean/)

Estimated potential emissions from the proposed project, based on 8,760 annual hours of base load operation at 4,980 kW total plant rating are summarized in Table 2:

Table 2: Project Potential Emissions Summary

		Full CT Studio 5 MW Deployment		
Pollutant	**lb/MWh[1]**	**lb/hr**	**lb/yr**	**TPY**
NOX	0.01	0.050	436.2	0.22
SO2	0.0001	0.0005	4.4	0.002
PM10/PM2.5	0.005	0.025	218.1	0.1091
CO	0.1	0.498	4362.5	2.18
NMHC	0.02	0.100	872.5	0.44
CO2	980	4,880	4.3E+07	21,376
CO2 (w/ waste heat recovery)	680	3,386	3.0E+07	14,832

1. Source: FuelCell Energy, Inc.

Compliance with Air Quality Regulations and Standards

The Project must comply with applicable requirements under EPA and CTDEEP regulations for permitting and control of air pollutant emissions from stationary sources. This section summarizes the air pollution control regulatory requirements potentially applicable to the fuel cell project and the respective compliance demonstrations.

New Source Review Requirements

The New Source Review (NSR) provisions of the Clean Air Act (CAA) apply to new Major Stationary Sources and Major Modification under two separate programs. For Major Stationary Sources located in areas designated as attainment with respect to a specific regulated criteria pollutant, the requirements of the PSD program (40 CFR Part 52.21) apply. For Major Stationary Sources located in non-attainment areas, the requirements of the Non-attainment New Source Review (NNSR) Program (40 CFR Parts 51 and 52) apply. Administration of the PSD and NNSR programs is provided by CTDEEP's State Implementation Plan (SIP) promulgated under RCSA § 22a-174-3a(k) and (l), respectively.

PSD Requirements

CTDEEP's SIP provides the authority to issue air permits that are at least as stringent as the federal PSD regulations (40 CFR Part 52.21). The PSD regulations are designed to ensure that the air quality in current attainment areas does not significantly deteriorate beyond baseline concentration levels. PSD regulations specifically apply to the construction of CTDEEP-defined Major Stationary Sources in areas designated as attainment or unclassified attainment for at least one of the following criteria pollutants: SO_2, NO_2, PM_{10}, CO, O_3, and Pb. For CTDEEP PSD applicability purposes, a Major Stationary Source is defined as a source with the potential to emit 100 tons per year (TPY) or more of any criteria pollutant, with the exception of NO_x and VOC in

a serious ozone non-attainment area such as South Windsor, for which the Major Stationary Source threshold is 50 TPY[1]. Pollutants specifically subject to PSD review requirements at new Major Stationary Sources are those that have the potential to be emitted above Significant Emission Rate Thresholds listed in Table 3a(k)-1 of RCSA § 22a-174-3a.

Based on the attainment status of the South Windsor area (serious nonattainment for ozone, attainment or unclassified for all other criteria pollutants) and the estimated potential emission levels summarized in Table 2, the proposed Project will be not be classified as a Major Stationary Source with respect to the PSD regulations and will not be subject to PSD review.

Non-attainment New Source Review Requirements

The Clean Air Act Amendments of 1990 established more stringent provisions for New Source Review of Major Stationary Sources proposed to be located in non-attainment areas. CTDEEP regulations implementing those provisions are codified in RCSA § 22a-174-3a(l). However, based on potential emissions, the proposed Project will not be a Major Stationary Source of NO_X or VOC and is, therefore, not subject to NNSR requirements.

New Source Performance Standards Requirements

The New Source Performance Standards (NSPS), codified in 40 CFR Part 60, were reviewed for applicability to the Project. None of the listed source categories were determined to apply to a fuel cell power plant.

National Emissions Standards for Hazardous Air Pollutants Requirements

The NESHAPs, codified in 40 CFR Part 61, regulate HAP emissions. Part 61 was promulgated prior to the 1990 Clean Air Act Amendments (CAAA) and regulates only eight types of hazardous substances (asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic,

[1] Certain pollutants, such as lead, are potentially regulated under both PSD and federal HAP regulations. Major Source thresholds for HAPs are 10 TPY for each individual HAP and 25 TPY for all HAPs emitted by a source in aggregate.

mercury, radionuclides, and vinyl chloride). Fuel cell power plants do not emit any of the pollutants or fall under any of the source categories regulated by Part 61; therefore, the requirements of Part 61 are not applicable to the proposed Project.

National Emissions Standards for Hazardous Air Pollutants for Source Categories Requirements

The proposed fuel cell power plants will not emit hazardous air pollutants (HAPs) regulated by Section 112 of the Clean Air Act. Therefore, the proposed Project will not be classified as a new or existing Major Stationary Sources of HAPs or otherwise be subject to any of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories (40 CFR Part 63), commonly referred to as Maximum Achievable Control Technology (MACT) standards.

Title V Operating Permit Requirements

Under CTDEEP's Title V Operating Permit regulations (RCSA § 22a-174-33), a Title V permit is required for Major Stationary Sources. For Title V applicability purposes, a Major Stationary Source is defined differently than a Major Stationary Source under PSD review, with potential emissions thresholds established at 10 TPY for any individual HAP, 25 TPY for any combination of HAPs, 50 TPY for NO_X or VOC in a serious ozone nonattainment area and 100 TPY for any other regulated air pollutant. Based on the estimated potential emissions, the Project will not be a Major Stationary Source subject to Title V permitting.

Acid Rain Program Requirements

The Acid Rain Program is codified in 40 CFR Parts 72 through 78. This program aims to reduce acid rain by reduction of SO_2 and NO_X from utility units that have a nameplate electricity generation capacity greater than 25 MW. A "unit" is defined as a "fossil fuel-fired combustion

device" and "fossil fuel-fired" is defined as "the combustion of fossil fuel, alone or in combination with any other fuel, independent of the percentage of fossil fuel consumed in any calendar year". Although fossil fuel (natural gas) will be used in the Project fuel cells, it is not combusted; it is reformed to hydrogen, which is then reacted electrochemically to produce electricity. Furthermore, the fuel cell units will have a nameplate capacity well under 25 MW.

Mandatory Greenhouse Gas Reporting Requirements

Although the proposed project will emit CO_2, a greenhouse gas, the fuel cells are not in any of the applicable source categories listed in Tables A-3 or A-4 to Subpart A of Part 98, are not fuel combustion units and will not have the potential to emit 25,000 metric tons or more per year of greenhouse gases. Therefore, the proposed Project will not be subject to mandatory greenhouse reporting requirements.

CTDEEP Minor Source Permitting Requirements

The procedure for evaluating minor source air permit applicability for a new or modified source of air pollution involves comparison of potential emissions to minor source permit applicability thresholds. CTDEEP minor source permit applicability thresholds are 15 tons per year (TPY) potential emissions of any regulated air pollutant. Based on potential emissions summarized herein Table 2, a CTDEEP minor source Permit to Construct and Operate will not be required for the proposed Project.

CTDEEP Emission Standards and Regulatory Requirements

Regardless of the non-applicability of CTDEEP Permit to Construct and Operate requirements and EPA standards and regulations, state emission standards and other requirements were evaluated for potential applicability to the proposed emission sources. Applicable CTDEEP

emission standards and other requirements are summarized below in **Table** along with the compliance demonstrations.

Table 3: Applicable CTDEEP Emission Standards and Other Requirements

Potentially Applicable Pollutant/Parameter or Requirement	Regulatory Limit / Compliance Demonstration	Citation
Permit to Construct and Operate Stationary Sources	Not applicable. Project does not trigger any of the applicability criteria.	RCSA § 22a-174-3a
Source monitoring, record keeping and reporting.	Not applicable. Project does not trigger any of the applicability criteria.	RCSA § 22a-174-4
Air pollution emergency episode procedures	Not applicable. Project does not trigger any of the applicability criteria.	RCSA § 22a-174-6
Particulate emissions control	Any source of air pollution is subject to the visible emission standards in § 22a-174-18(b): 20% opacity within any 6-minute block average and 40% in any 1-minute block average (as determined by visual opacity observation – EPA Reference Method 9). Based on insignificant potential emissions from the fuel cells and the nature of the process, visible emissions are not anticipated.	RCSA § 22a-174-18(e)(1)
Control of Sulfur Compound Emissions	Not applicable. Fuel cells do not involve fuel combustion and does is not in any of the other regulated source categories.	RCSA § 22a-174-19(a)(2)(i)
Control of Organic Compound Emissions	Not applicable. The fuel cells are not covered by any of the regulated source categories.	RCSA § 22a-174-20
Control of Nitrogen Oxides Emissions	Not applicable. Fuel cells are not fuel-burning equipment or covered by any of the regulated source categories.	RCSA § 22a-174-22
The Clean Air Interstate Rule (CAIR) Nitrogen Oxides (NOx) Ozone Season Trading Program	Not applicable. Fuel cells are not classified as "CAIR NOx Ozone Season units" or fossil fuel-fired emission units.	RCSA § 22a-174-22c
Control of Odors	This regulation is generally applicable to any potential source of nuisance odors. The proposed Project is not expected to be a source of emission of any odorous compounds.	RCSA § 22a-174-23
Hazardous air pollutants	Not applicable. The fuel cells are not subject to CTDEEP permitting and are not expected to be a source of any of the specific compounds listed in Table 29-1.	RCSA § 22a-174-29
Control of Carbon Dioxide Emissions	Not applicable. The proposed fuel cell units will not serve an electricity generator with a nameplate capacity equal to or greater than 25 MW.	RCSA § 22a-174-31
Reasonably Available Control Technology for organic compounds	Not applicable. The proposed Project will not be a major stationary source of VOC emissions.	RCSA § 22a-174-32
Title V Sources	Not applicable. The proposed Project will not be a major stationary source of any pollutant.	RCSA § 22a-174-33
Distributed Generators	Not applicable. Fuel cells are specifically exempted from this regulation in § 22a-174-42(b)(3)(C)	RCSA § 22a-174-42