Beacon Falls Energy Park, LLC

Presented to:

Town of Beacon Falls

Open Space and Land Use Committee

July 7, 2015

Project & Development Team

CT Energy & Technology, LLC
A Connecticut development company *(an O&G subsidiary)*

O&G Industries, Inc.
A Diversified Construction Services Company

Wm. Corvo Consultants, Inc.
Project permitting, development and public relations consulting

Fuel Cell Energy, Inc.
Ultra Clean, Efficient, Reliable Power

Project & Development Team

PULLMAN &COMLEY LLC
ATTORNEYS

Pullman & Comley, LLC

A major CT law firm. Comprehensive legal advice on all facets of development, permitting and administrative procedures.

Doyle, D'Amore & Balducci

A full-service government relations, business development and communications consulting firm. Specialists in advertising and marketing.

Financial Management Group, LLC
Energy and Environmental Finance

Financial Management Group, LLC

An energy and environmental finance firm specializing in project finance with experience in a wide array of technologies for the modern electric generation and transmission grid.

Project & Development Team

CT E&T

AND

FuelCell Energy
Ultra-Clean, Efficient, Reliable Power

Wm. Corvo Consultants, Inc.
Middletown, CT

PULLMAN &COMLEY LLC
ATTORNEYS

Financial Management Group, LLC
Energy and Environmental Finance

Doyle, D'Amore & Balducci
100 Lindbergh Drive, Hartford, CT 860.548.1421

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PCI | SKANSKA

Why Beacon Falls?

The reasons we selected Beacon Falls as the best location for this project:

- O&G Industries, parent company of the project, owns the property
- O&G Industries has an excellent relationship with the Town of Beacon Falls
- The property is an under utilized former sand and gravel mine located in an area zoned for this type of development
- The property is in close proximity to both electrical and natural gas fuel interconnections
- There are substantial economic benefits for locating the property in Beacon Falls – both for the Town and the project
- The location and topography of the property provides important benefits including low project visibility and lower noise impacts

Why Beacon Falls?

The reasons we selected Beacon Falls as the best location for this project:

- We had already reviewed the use of the property for development of a solar renewable energy project but concluded the property was too small for that technology. Our proposed Fuel Cell project will develop 63.3 Megawatts on approximately 8 acres of the 25 acres of land - a comparably sized solar project would have required more than 300 acres of land to achieve this electricity output;
- We had also taken a look at development of a wind project but rejected that technology due to lack of available wind at the site plus the extremely high visibility of large scale wind units which are usually more than 300 feet tall.
- Beacon Falls is located in fairly close proximity to the Fuel Cell Energy manufacturing plant which provides substantial benefits for ease of delivery of the major equipment to the site;
- We compared this property with several other locations in Connecticut and the totality of the benefits led us to conclude that Beacon Falls was the better place to locate the project

Development Premise

CT Energy & Technology, LLC is a Connecticut based development company whose purpose is to develop energy projects which meet Connecticut's goals for renewable energy, combined heat and power and distributed generation.

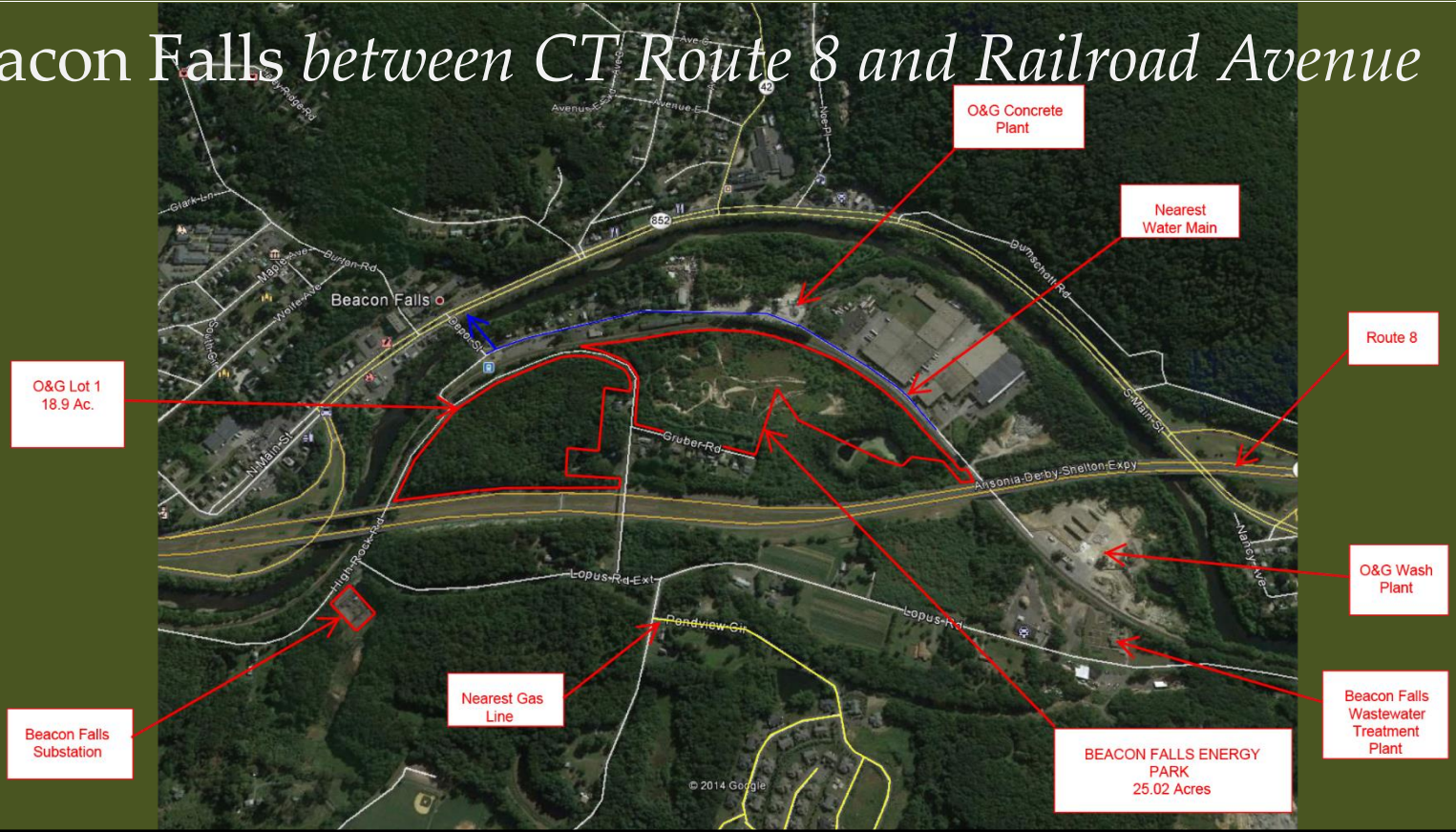
The Beacon Falls Energy Park is a project which meets our criteria and provides us with the opportunity to develop the ***largest renewable energy fuel cell project in the world*** using the most modern technology available.

The participants in the Beacon Falls Energy Park project are all Connecticut based companies. The technology we are proposing to use will be provided by Fuel Cell Energy, a Connecticut company employing 573 people at its Corporate, Engineering and Research & Development offices in Danbury and its manufacturing facility in Torrington, Connecticut.

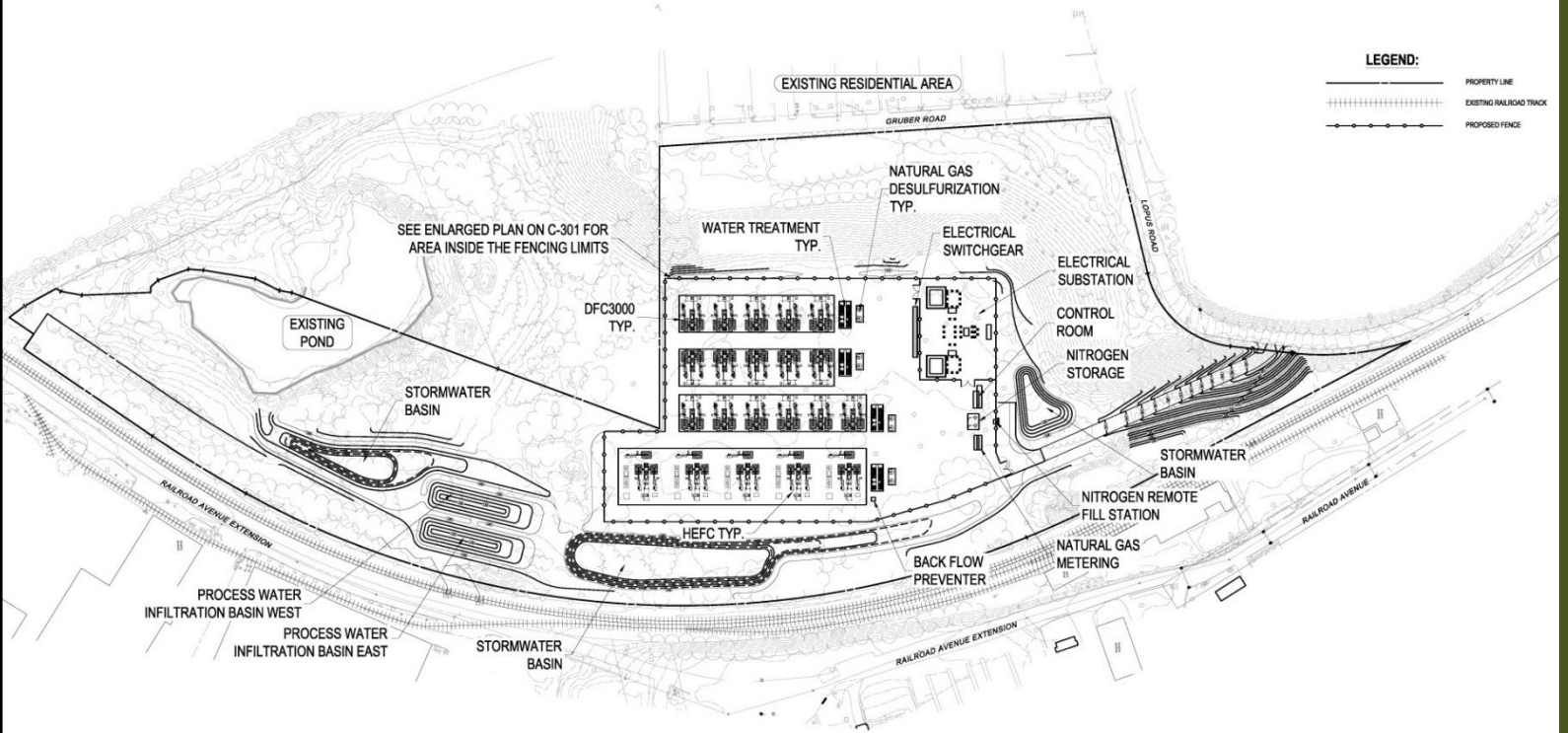
The value to the community of Beacon Falls includes substantial tax revenue, development of a former sand and gravel mining site and enhanced utility availability. The jobs and taxes when coupled with the cleanest renewable energy project of its type, makes our development proposal a home run for Beacon Falls.

Project Location

Beacon Falls *between CT Route 8 and Railroad Avenue*



Project Design & Layout



OVERALL SITE PLAN - GENERAL ARRANGEMENT
SCALE: 1" = 100'-0"

Project is designed to have a low profile and be landscaped for minimum visibility.
Fuel cells produce electricity without combustion.

An 8 acre project on a 25.02 acre parcel

Project Design & Layout

Beacon Falls Substation Project Interconnection

Cold Spring Road

Project Design & Engineering

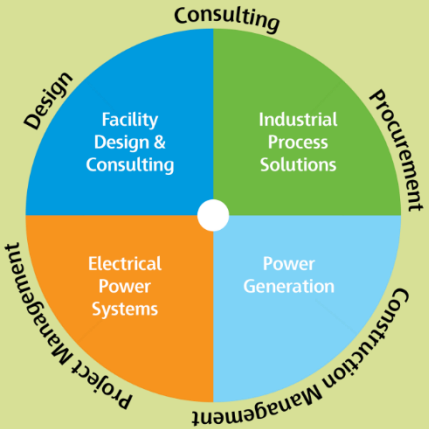
PCI | SKANSKA

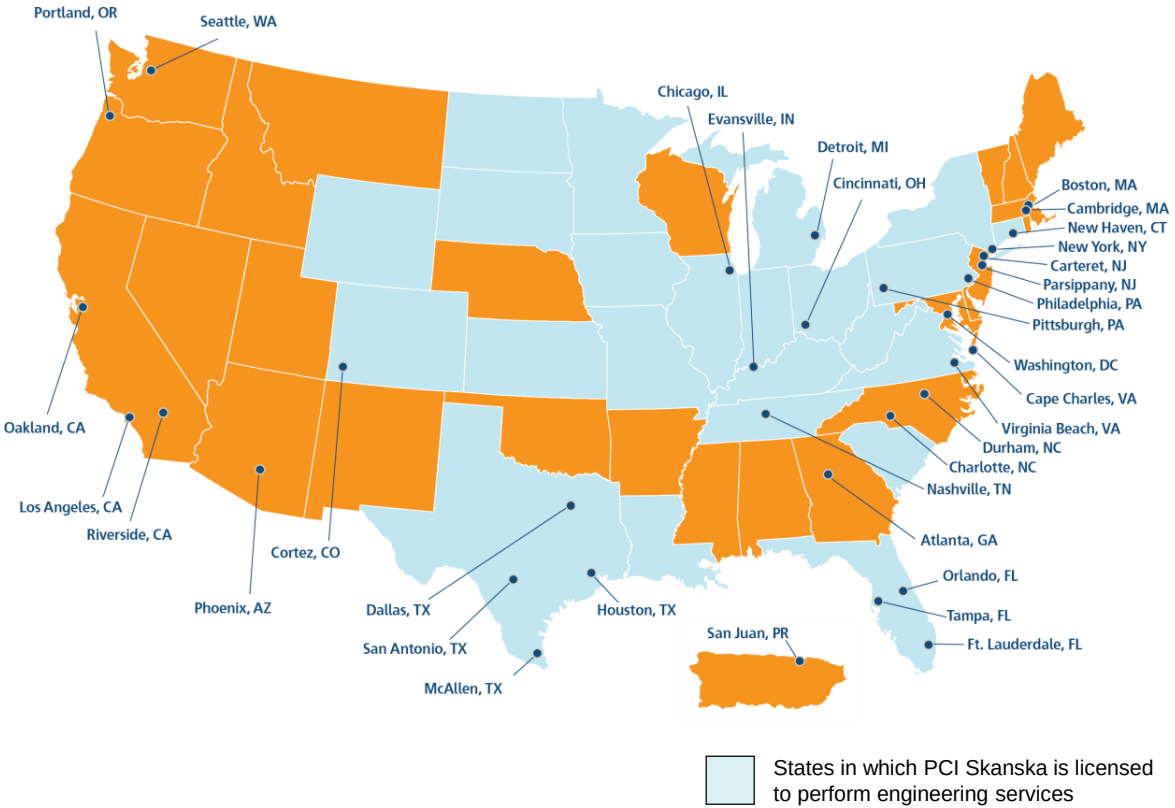
Project Design & Engineering

About PCI Skanska

- Founded in 1972
- Based in Evansville, IN
- Ranked **327** in Engineering News Record's 2014 Top 500 Design Firms
- Approximately 150 Employees
- Became part of Skanska USA in 2011

PCI Skanska Services





Project Design & Engineering

PCI Skanska
Fuel Cell Energy Experience

Project partnerships include:

- 2003: Terre Haute, IN project
  - Site installation contractor
  - Engineering support services
- 2014: Bridgeport, CT project
  - Engineering Firm of Record for the multi-mega watt facility design
  - Multi-discipline design services
  - Procurement services
  - Construction administrative services
  - Electrical Output, 14.9MW

"In Bridgeport, we're investing in clean energy production, which is resulting in job creation and our children breathing cleaner air," said Mayor Bill Finch. "The Dominion fuel cell park is the cornerstone of this effort. It produces enough clean energy to power up to 15,000 homes. It's helping put Bridgeport on the map nationwide as a leader in fuel cell energy production. And, most importantly, it's making our city a better place to live, work, and raise a family."

Project Design: Equipment

FuelCell Energy
Ultra-Clean, Efficient, Reliable Power

"*Connecticut is the world-leader in fuel cell manufacturing, responsible for manufacturing of more than 60% of the worldwide installed capacity of fuel cells for stationary, mobile and portable applications. The Beacon Falls Energy Park is a project which meets our criteria and provides us with the opportunity to assist in developing the largest renewable energy fuel cell project in the world using the most modern technology available.*"

Integrated Fuel Cell Company

Research & Development

Design megawatt–class distributed power generation solutions

- Global fuel cell platform
- Robust intellectual property portfolio
- Developing hybrid applications of existing technology for new markets

Sales, Manufacture & Project Execution

Project development
- Direct sales

Global manufacturing profile
- North America
- Asia via partner
- Europe

Engineering, Procurement and Construction
- Project Financing

Services

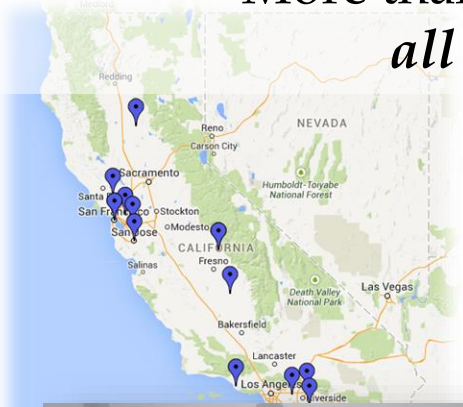
Operate & Maintain power plants

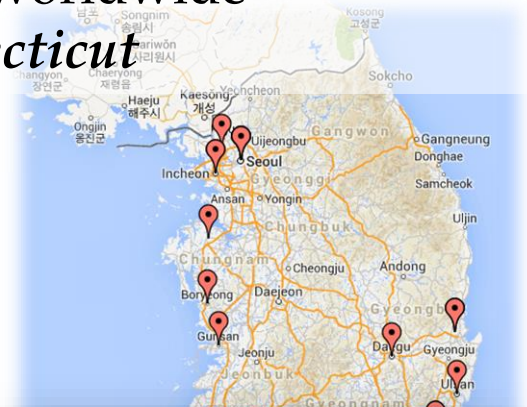
- Over 100 DFC® plants operating at more than 50 sites in 9 countries
- >3 billion kWh ultra-clean power produced
- > 300 MW installed/backlog

Providing turn-key distributed power generation solutions *NASDAQ: FCEL*

Integrated Fuel Cell Company

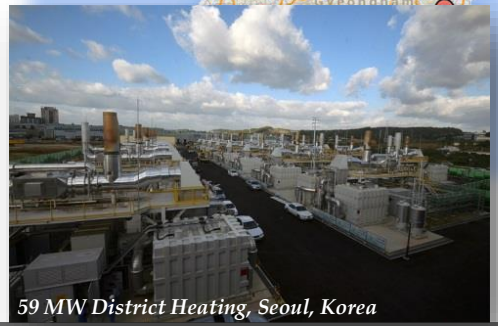
More than 110 fuel cell power plants at 52 sites worldwide ~
all of it manufactured right here in Connecticut





2.8 MW University CHP Fuel Cell in California

15 MW Fuel Cell Park, Bridgeport CT



59 MW District Heating, Seoul, Korea

Proven Capability to Deliver Clean, Cost-Competitive, Local Power

Integrated Fuel Cell Company

FuelCell Energy Connecticut Operations

Danbury, CT
Corporate, Engineering, R&D

- Research Labs & Design Center
- 269 employees, multiple disciplines
- Operations and service support

Torrington, CT
Technology Manufacturing

- Stack production & module assembly
- 304 employees, 3 shifts
- 65,000sf facility – Opened in 2001


Danbury, CT


Torrington, CT

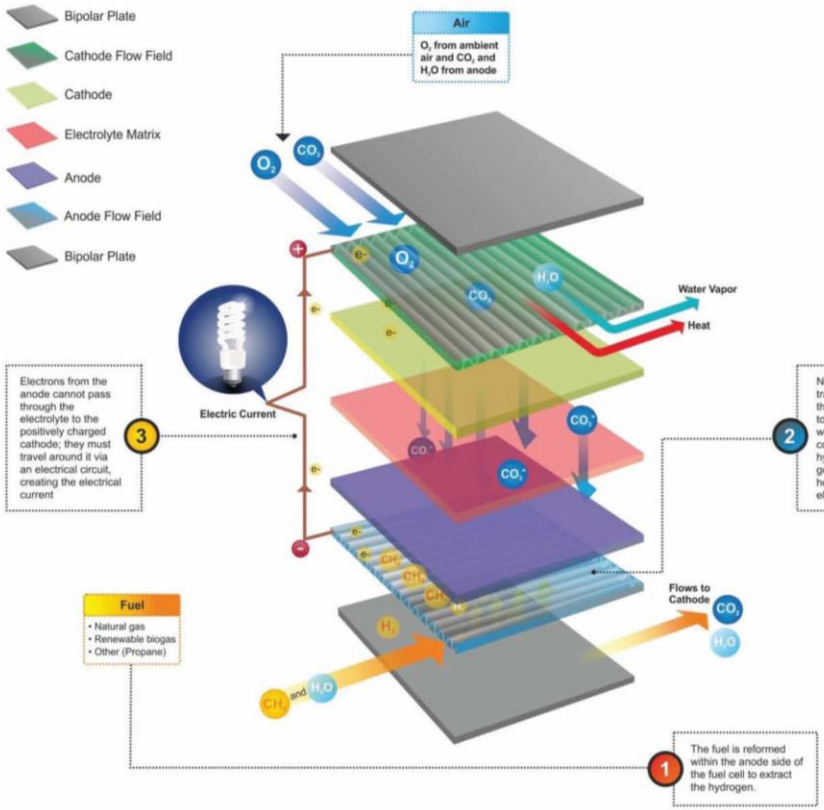
International Operations

Ottobrun, Germany
Capacity for European market

Pohang, South Korea
Capacity being built for Asian market

CO, USA/Calgary, Canada
SOFC Research

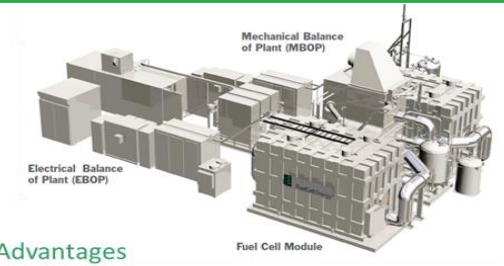
Project Design - Equipment



- **High Temperature DFC**
- **Electrochemical Conversion of Fuel Heating Value to Electricity**
  - Inherently more efficient than engines and turbines
  - Cleaner:
    - No combustion
    - Negligible Nox, Sox, PM
  - Scalable: High efficiency and low emissions achieved at scales from sub-MW to multi-MW
  - Easy to site
    - Low emissions, quiet
  - Hydrogen produced within the stack from hydrocarbon fuel source
  - More efficient
  - No need for H_2 infrastructure

Project Design - Equipment

DFC 3000 Fuel Cell Power Plant



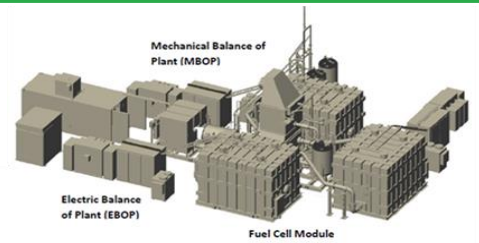
Advantages

FuelCell Energy's DFC3000™ system is the largest of the Direct FuelCell® (DFC®) power plant fleet, capable of providing high-quality baseload power with 47% electric power generation efficiency around-the-clock. Scalable for Multi-Megawatt Fuel Cell Parks, the system is especially suitable for applications with larger load requirements such as universities, manufacturing facilities, wastewater treatment plants, and utility/grid support.

Performance

Power Output	
Power @ Plant Rating	2,800 kW
Standard Output AC Voltage	13,800 V
Standard Frequency	60 Hz
Optional Output AC Voltages	12,700, 4,160 V
Optional Output Frequency	50 Hz
Efficiency	
LHV	47 +/- 2 %
Pollutant Emmissions	
NOx	< 0.01 lb/MWh
SOx	< 0.0001 lb/MWh
PM10	< 0.00002 lb/MWh
Greenhouse Gas Emissions	
CO_2	980 lb/MWh
CO_2 (with waste heat recovery)	520-680 lb/MWh

HEFC High Efficiency Fuel Cell



Advantages

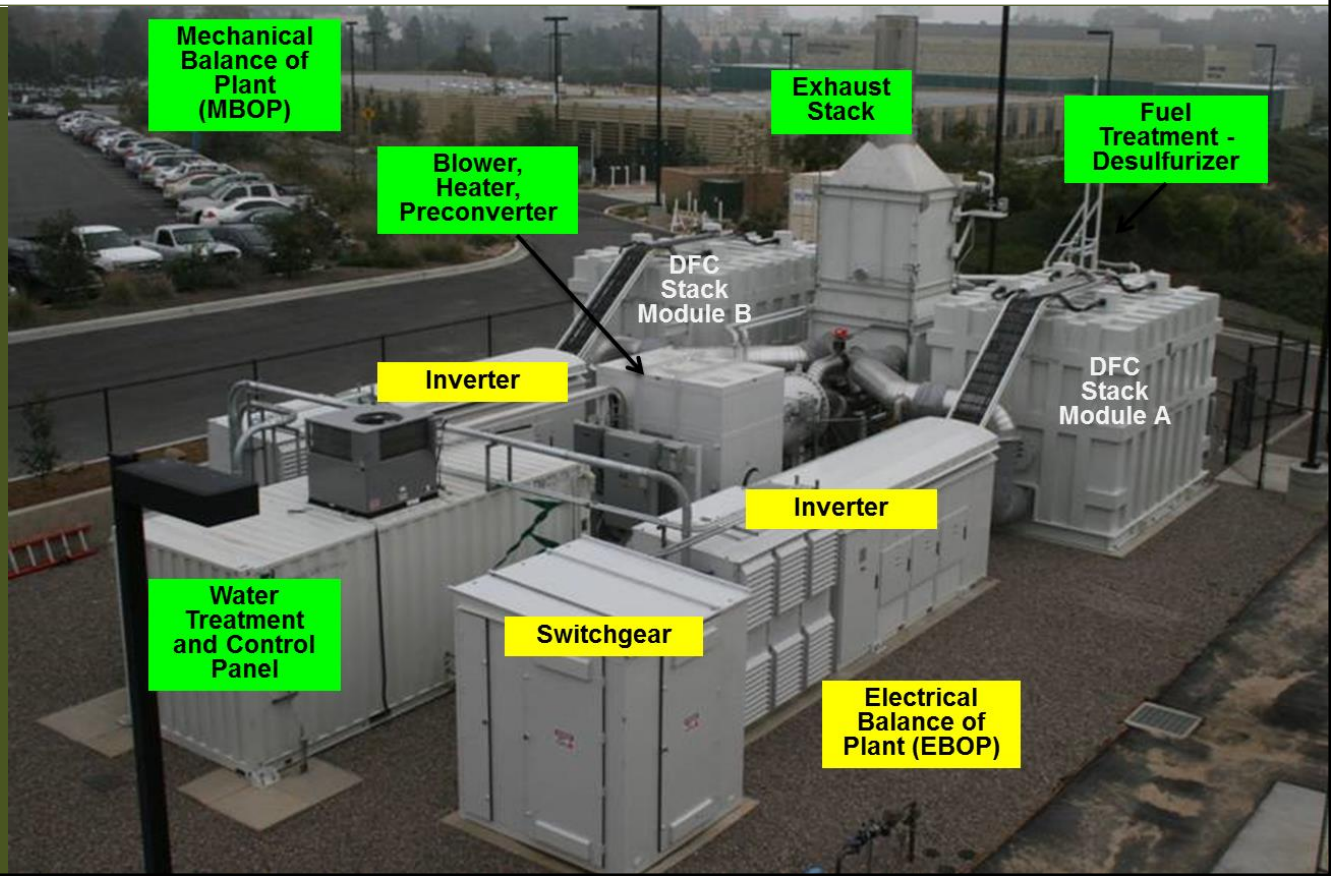
FuelCell Energy's HEFC™ system is capable of providing high-quality baseload power with 59% electric power generation efficiency. Scalable to more than 50 MW, the system is especially suitable to applications with larger load requirements and limited waste heat utilization such as data centers and utility/grid support.

Performance

Power Output	
Power @ Plant Rating	3,700 kW
Standard Output AC Voltage	13,800 V
Standard Frequency	60 Hz
Optional Output AC Voltages	12,700, 4,160 V
Optional Output Frequency	50 Hz
Efficiency	
LHV	59% +/- 2%[1]
Pollutant Emmissions	
NOx	< 0.01 lb/MWh
SOx	< 0.0001 lb/MWh
PM10	< 0.00002 lb/MWh
Greenhouse Gas Emissions	
CO_2	740 lb/MWh
CO_2 (with waste heat recovery)	520-680 lb/MWh

Project Design - Equipment

Powerplant Subsystems



Project Design - Maintenance

- DFC3000® Fuel Cell Systems require periodic inspections, basic preventative maintenance, and replacement of consumables. This work is accomplished by FCE's trained East Coast Service Team, based in Danbury CT
- At multi-system installations such as this, generation outages of individual units are staggered to maximize instantaneous overall facility capacity
- A power generation outage is required every 18 months for maintenance of critical electrical and safety components. All other preventive maintenance can be done while a system is on-line, even annual replacement of fuel contaminant removal media. Fuel cell modules have a service life of five to seven years before requiring factory refurbishment
- System operation is monitored 24/7/365 by FCE's Global Technical Assistance Center, also based in Danbury CT

Project Design - Safety

- FuelCell Energy uses the HAZOP Process to study hazards associated with the operation of our plants (documentation available)
- DFC® systems are **subject to third-party reviews of the system design and control logic as part of the power plant certification process**.
- DFC® power plants are certified to the **CSA FC-1 fuel cell safety standard**, which requires third party design reviews, and inspections of manufacturing facilities and **ISO 9001 certified**.

Project Design - Safety

DFC® Fuel Cell Systems are designed to comply with these codes and standards:

- UL 1741 - Standard for Power Conversion Systems
- IEEE 1547 - Standard for Interconnecting Distributed Resources With the Electric Power System
- NFPA 70 - National Electric Code
- NFPA 853 - Standard for the Installation of Stationary Fuel Cell Power Systems
- ASME Process Piping and Pressure Vessel codes, as applicable per process conditions
- OSHA General Industry Standards – 29 CFR Part 1910

Project Air Quality Assessment & Impacts

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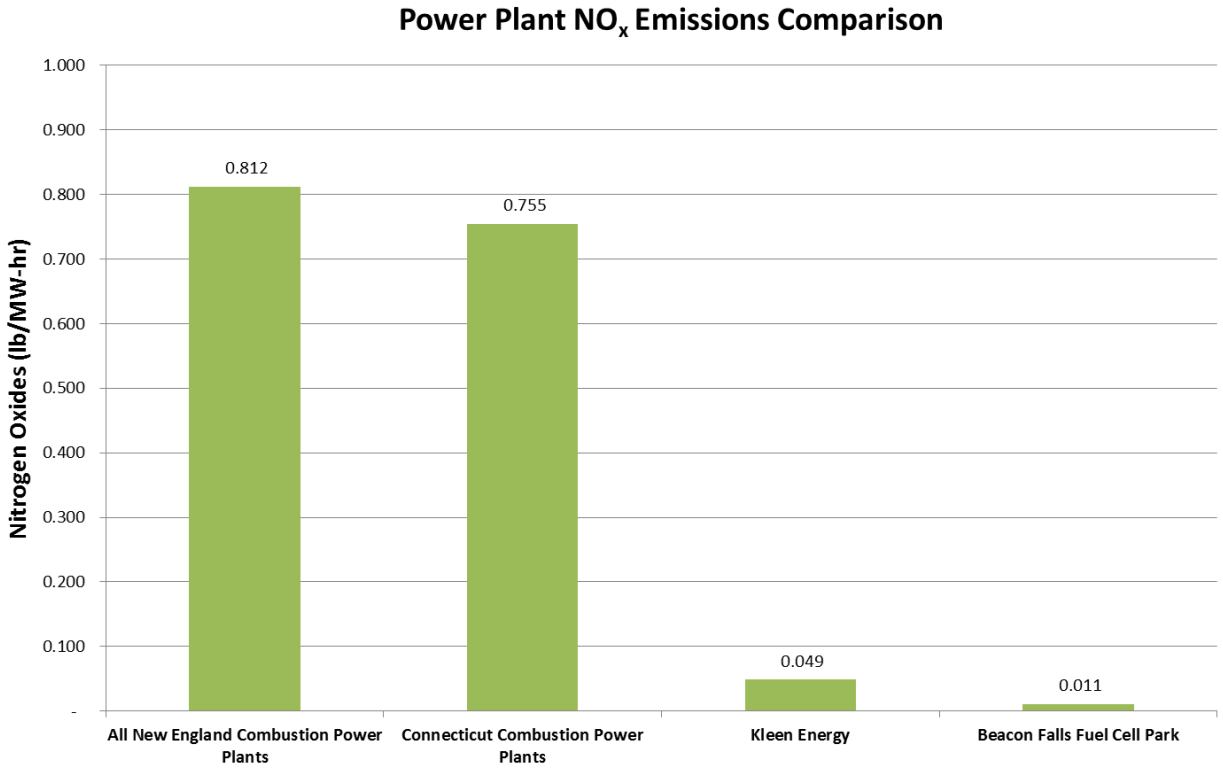
Air Quality Assessment & Impacts

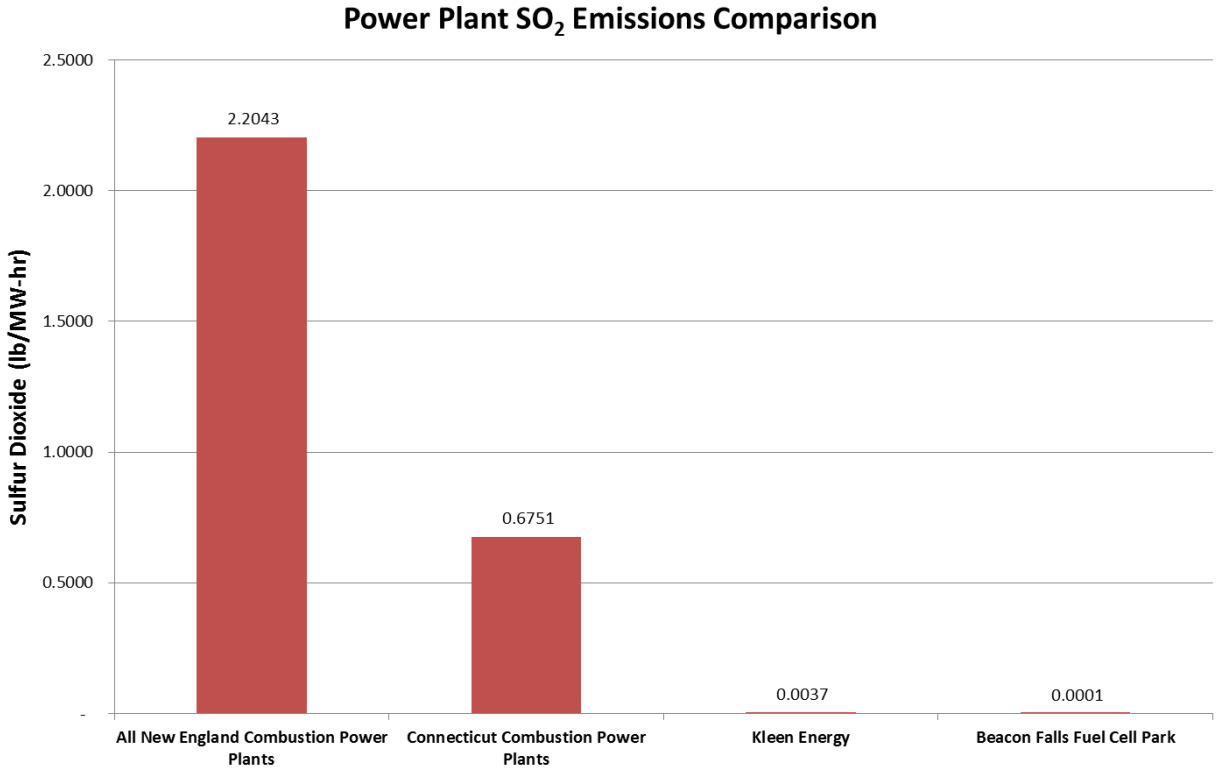
- Air Emissions Calculations
  - Fuel Cells: 5 @ 3.7 MW, 16 @ 2.8 MW = 63.3 MW
  - Emissions: NO_x, SO_x, CO, VOC, PM_{10}/$PM_{2.5}$, CO_2
- Air Quality Regulatory Requirements
  - The Potential Emissions of Each Individual Fuel Cell, and of All the Fuel Cells Combined, Are too Small to Require Air Permits to Construct and Operate
  - No Other Applicable Air Quality Regulations Were Identified
- Power Generation Emission Comparisons
  - Data Source for Beacon Falls Fuel Cell Park: FuelCell Energy

Air Quality Assessment & Impacts



Data Source for Existing Plants: U.S. Environmental Protection Agency (EPA) Emissions and Generation Resource Integrated Database (eGRID) http://www.epa.gov/cleanenergy/energy-resources/egrid/, for calendar year 2010 (most recent available), accessed 05/18/15.

Air Quality Assessment & Impacts



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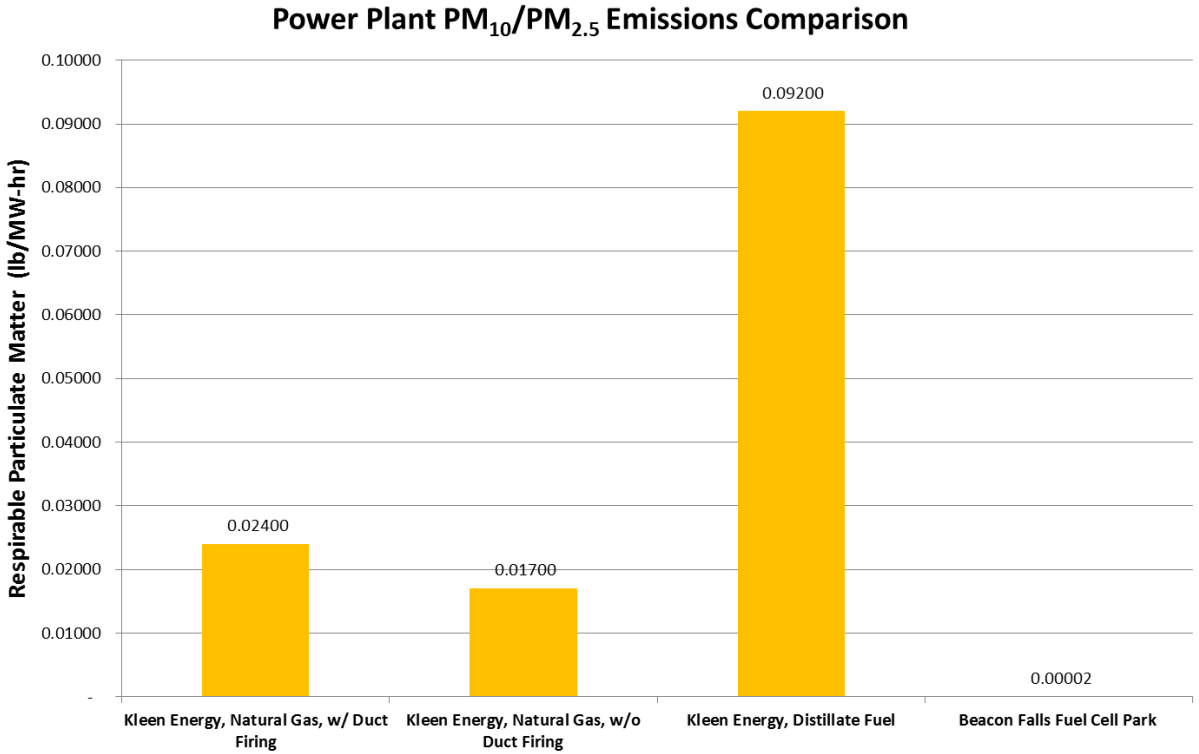
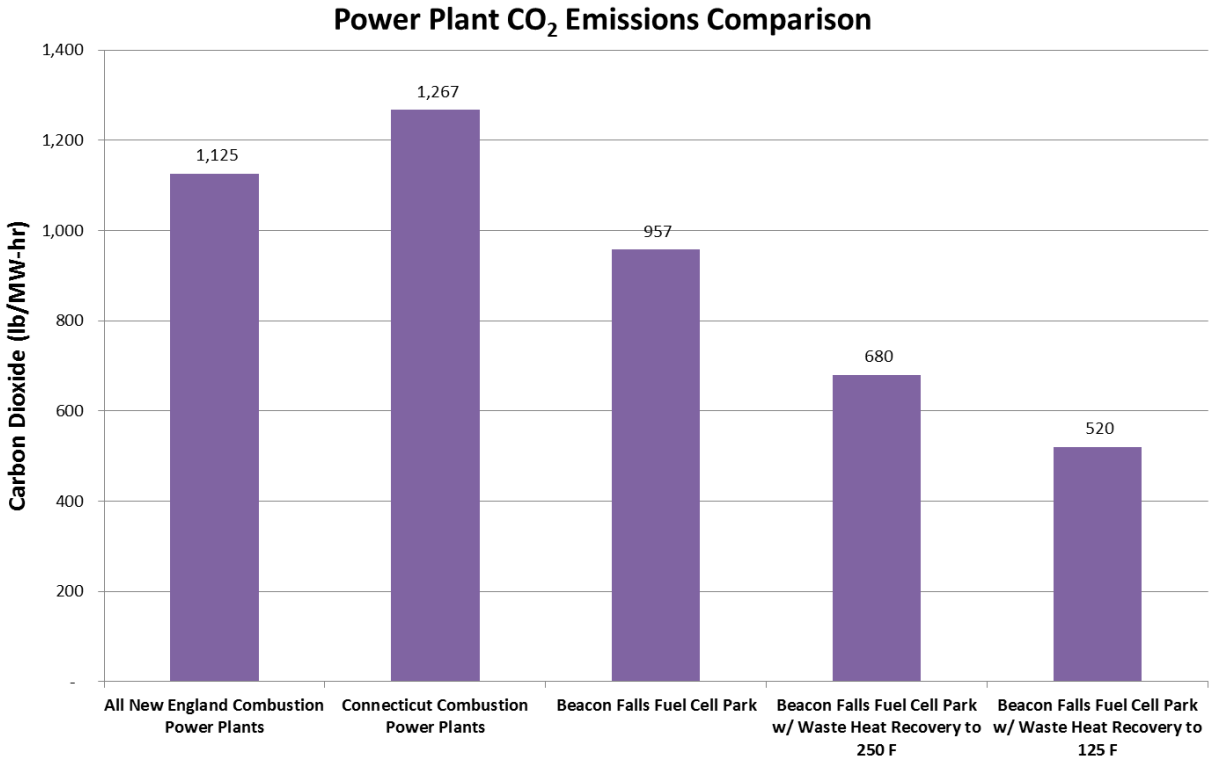
Air Quality Assessment & Impacts



Data source for Existing Plant: Kleen Energy air permit (eGRID does not contain $PM_{10}/PM_{2.5}$ emissions data). Note: Kleen Energy is the newest, cleanest combined-cycle power plant in Connecticut.

Air Quality Assessment & Impacts



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Project Noise Level Assessment & Impacts

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Noise Level Assessment & Impacts

Applicable Noise Standards

- State of Connecticut Noise Standards
  - Section 22a-69 of the Connecticut Department of Energy & Environmental Protection (DEEP):

    Noise limits vary based on land use
    - Class A – generally residential, hotels, hospitals and other sensitive areas
    - Class B – commercial areas
    - Class C – industrial uses
    - *Most restrictive is for residential uses*
- Town of Beacon Falls Ordinance Regarding Noise
  - Same numerical noise level limits as the State of Connecticut

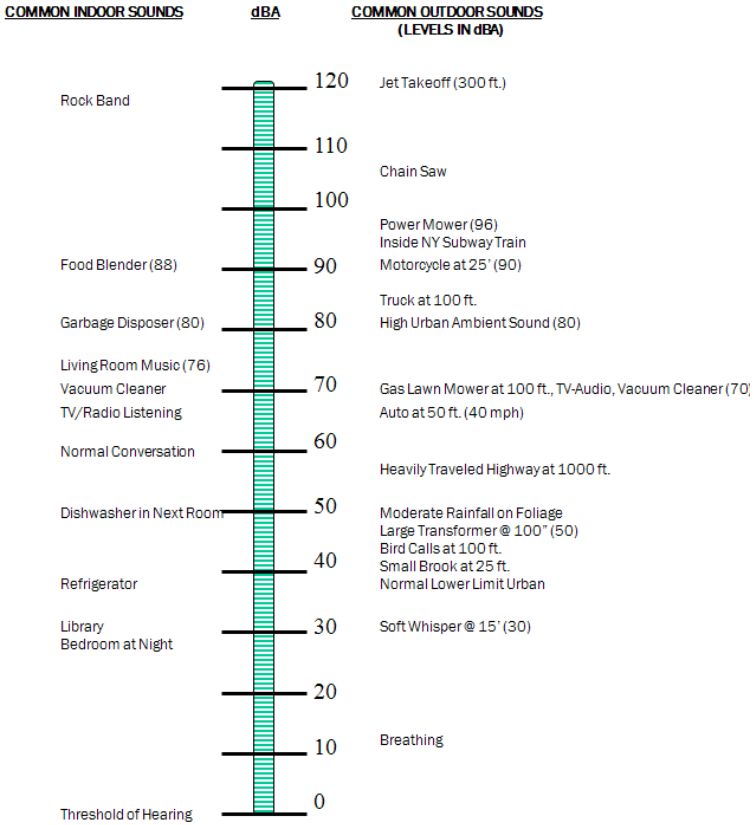
Noise Level Assessment & Impacts

Applicable Noise Standards

Applicable Limit for Beacon Falls Energy Park
(Class C Source Emitting to Class A Receiver)

Daytime	Nighttime
61 dBA	51 dBA

Noise Level Assessment & Impacts



Sources: Piranch and Beland, 1970; Stocnick, et al, 1981; and EPA, 1974.

Noise Level Assessment & Impacts

Noise Level Assessment & Impacts

Noise Modeling Study

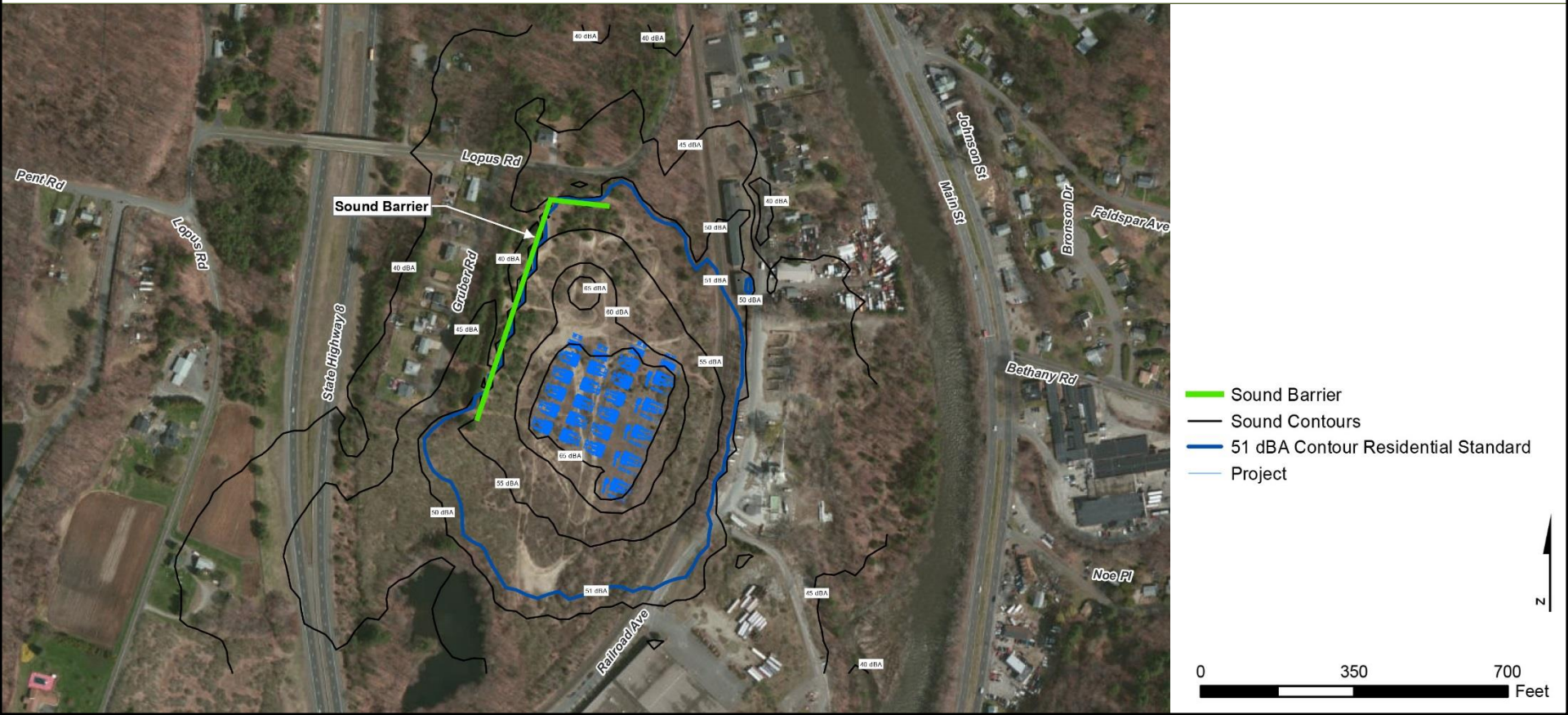
3-D CadnaA Noise Model

- Topographic Features Included
- Low Noise Options Selected for Fuel Cells
- All Fuel Cells Operating Simultaneously
- Sound Barrier Wall for Gruber Road Neighborhood

Noise Modeling Results

- Gruber Road: 43 dBA to 47 dBA
- Lopus Road: 46 dBA
- Railroad Avenue: 43 dBA to 45 dBA

Noise Level Assessment & Impacts



Noise Level Assessment & Impacts

Ambient Noise Monitoring Program

Pre-Construction Noise Monitoring Will Be Conducted to Establish Existing Noise Levels

Planning & Zoning

MILONE & MACBROOM

Planning & Zoning

- Zone: Industrial Park District (IPD)
  - 25 Acres
  - Conforms to lot size and dimensional requirements
  - Conforms to all setbacks
  - Conforms to height requirements
  - Conforms to coverage requirements
  - Screened per Section 52.7.6.1 of Zoning Regulations

Stormwater & Wastewater

- Stormwater Discharge
  - Sand and gravel mine has very high permeability
  - Deep sand and gravel
  - Stormwater will be collected into basins and allowed to infiltrate naturally
  - No net discharge of stormwater from site *(same as existing conditions)*

Stormwater & Wastewater

- Wastewater Discharge
  - Drinking water supply must be purified further prior to use in fuel cells
  - Water filtration wastewater will be collected in one of two basins and allowed to infiltrate naturally *(CTDEEP Permit #GP-002)*
  - No discharge to Naugatuck River or sewer plant

Stormwater & Wastewater

Waste Management

- Fuel cells require purification of the natural gas supply. This requires the removal of Sulphur from the gas (desulphurization).
  - Sulphur is filtered using activated carbon
  - Activated carbon cartridges are packaged and shipped off-site for recycling/regeneration
  - Shipment occurs using a hazardous waste manifest tracking system
  - Hazardous waste is not stored, treated or disposed of at the site

Inland Wetlands

- Wetland delineation performed by Certified Soil Scientist.
- No significant wetland soils found on site.
- Open water pond located in southern portion of site.
  - Pond has no inlet or outlet
  - Pond receives stormater run-off from Route 8
  - Highway drainage results in water level fluctuations
- Project will have no wetland disturbance or impact.

Environmental Assessment

Land Use Impact

- The proposed project is consistent with the *Conservation and Development Policies Plan for Connecticut*.
- The proposed project is consistent with the *Plan of Conservation and Development for Beacon Falls*.
  - Site is located in area classified as Industrial Park District
  - Site is in close proximity to primary growth areas along Route 8.
  - Project is compatible with the existing industrial land uses located along Railroad Avenue Extension.

Environmental Assessment

Natural Resources & Traffic Impacts

- Development of the energy park is not likely to significantly impact the natural resources.
- Largest potential impacts will be short term and related to construction.
  - Only ordinary efforts will be required to limit the overall amount of disturbance of the site during construction.
- Once constructed, traffic impacts will be minimal as facility will be remotely operated and virtually unmanned.

Environmental Assessment

Natural Resources & Traffic Impacts

- Project has been reviewed by State Historic Preservation Office and no concerns were noted.
- Project has been reviewed by CT DEEP for potential Endangered or Special Concern species.
  - No Endangered Species identified
  - Species of Special Concern have not been located during field inspections. Additional field inspections are being performed.

Project Benefits

Project Benefits

Benefits to Beacon Falls

- Economic development benefits – large scale taxable project. Positive impact on tax revenue
- Final project will have low visibility and sound profile
- World class renewable energy project using clean Connecticut base load fuel cell technology
- Positive economic benefit of jobs during development

Project Benefits

Benefits to Beacon Falls

- Development of former sand mine property
- Injection of energy into the Beacon Falls area that is physically delivered to Connecticut electric users
- Project will provide enhanced natural gas availability to Beacon Falls

Project Benefits

Benefits to Connecticut

- Cost effective, base load renewable energy
- Energy physically delivered to Connecticut consumers
- Reduced area emissions
- Jobs for Connecticut manufacturing and construction companies
- Tax revenue from project development

Project Benefits

Benefits to Connecticut

- Improvement of electric grid reliability
- Improvement of natural gas distribution system
- All Connecticut companies in development


Questions???
CT E&T
FuelCell Energy
Ultra-Clean, Efficient, Reliable Power