

**Thermal Networks for Heating and Cooling Downtown  
Bridgeport  
IDEA Campus Energy Conference**



**NuPower Thermal**



**February 12, 2015**

## NuPower LLC – Renewable Power Development



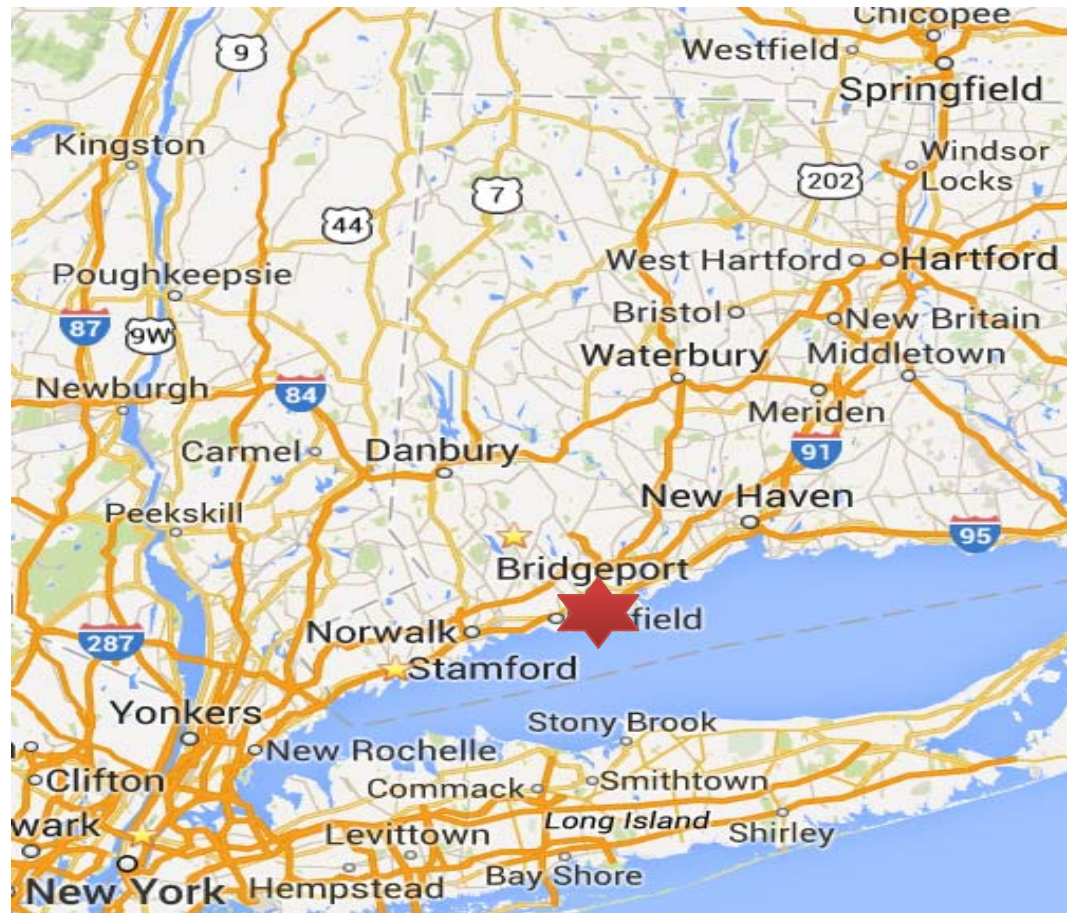
### Plainfield Renewable Energy Project 37.5MW Biomass Power Plant in Plainfield, CT

- Start of Operation - 12/13
- 15 year PPA with UI/Northeast Utilities
- Beneficial reuse of the first US Superfund Site (Gallup Quarry)

NuPower Thermal



# City of Bridgeport, CT



## NuPower Thermal



### City of Bridgeport

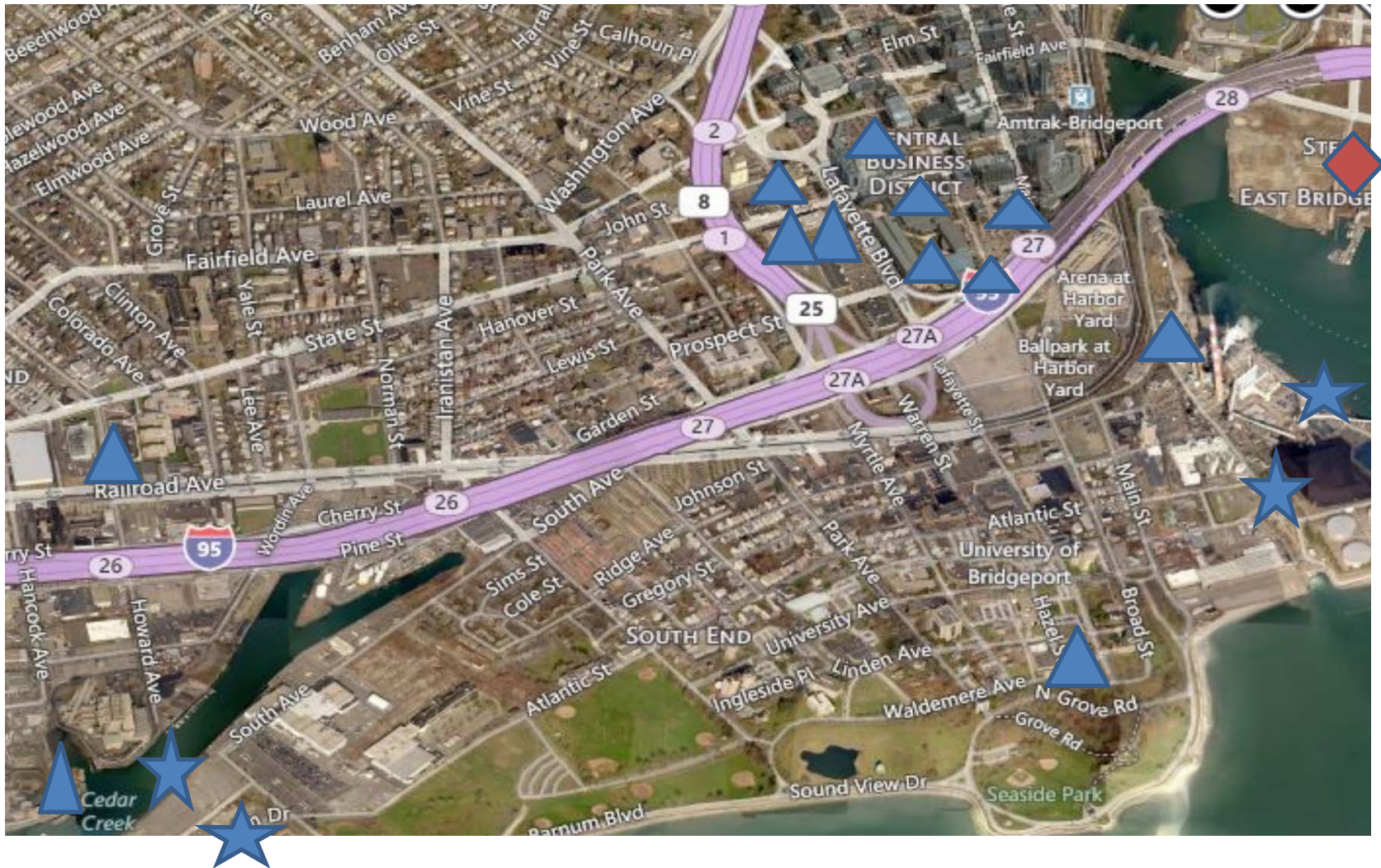
- **Area - 19.4 sqm**
- **Pop. - 147,216 (2013)**
- **Density - 7,588/sqm**



NuPower Thermal



# The Bridgeport Thermal Project





## **Thermal Customer Profile**

**Totaling approximately 3.5 million square feet**

- **Academic**
  - **University of Bridgeport**
  - **Housatonic Community College**
- **Commercial**
  - **Webster Arena**
  - **Peoples Bank**
- **Government**
  - **City Buildings**
  - **State Buildings**

## Potential Heat/Electrical Sources



Wheelabrator WtE Facility  
67 MW



United Illuminating Fuel Cell Facility  
3 MW



Emera Combined Cycle Facility  
520 MW



# Project Services

Distribute Energy Products as Licensed Thermal Energy Carrier

- Low Temperature Thermal Energy
  - Heat Recovery
  - Heat Delivery
- Utilizing Low Cost Electric Power to Generate Chilled Water





## **Bridgeport Thermal Project Progress**

- Feasibility Report completed 2013 on Bridgeport opportunity – funded by Wheelabrator/Fuel Cell Energy/CT Green Bank and NuPower Thermal
- CT Legislature awarded NuPower Thermal in 2014 the exclusive thermal energy carrier franchise for City of Bridgeport and participation in the C-Pace Program
- NuPower Thermal retained Ramboll/Smith Engineering/Malone & McBroom in July 2014
- Closed CT Green Bank Funding January 2015 for development funding



## Project Team

### **Ramboll Group**

- District Thermal Engineering Design Firm
- Focus – District Thermal/Building Design/Environmental Engineering

### **Smith Engineering**

- Engineering Consulting Firm
- Focus – Central Energy Plant Optimization, Chiller Equipment Design and Customer Data Analysis

### **Milone & MacBroom**

- Regional Civil Engineering Firm
- Focus – Pipe Route Analysis and Permitting

### **Pullman & Comley**

- Contract and Legislative Support



## Project Status

- Completed Concept Design Phase
  - Customer site survey and energy usage analysis
  - Concept design of heating and chilling loop
  - Heat source design for Wheelabrator WTE and UI fuel cell facilities
  - Anchor customer presentations in process
    - Housatonic Community College
    - University of Bridgeport
    - CT Judicial System
    - Webster Arena
    - City of Bridgeport
    - Peoples Bank
  - Final Design Report for Heating and Chilling Systems

## Potential Bridgeport Customers

**Phase 1 - CBD (23)**

ID	Building
3	South End Elem. School ("Swing Space")
4	Roosevelt School
6	City Hall Annex
8	McLevy Hall
10	Fire House
11	Bridgeport City Hall
12	CT Superior Court Main Street
13	CT Judicial Branch Golden Hill
14	Juvenile Detention Center
17	HCC Lafayette Hall
18	HCC Beacon Hall
19	Webster Bank Arena
22	People's Bank Building
23	RBS Building
24	CT Post Building (Offices)
27	Park City Plaza
28	Holiday Inn
33	State Police Barracks
34	Barnum Museum
35	Aquarion Water
36	Casey Family Services
37	Bob's Discount
38	Ralph and Rich's

**Phase 1 - UB (18)**

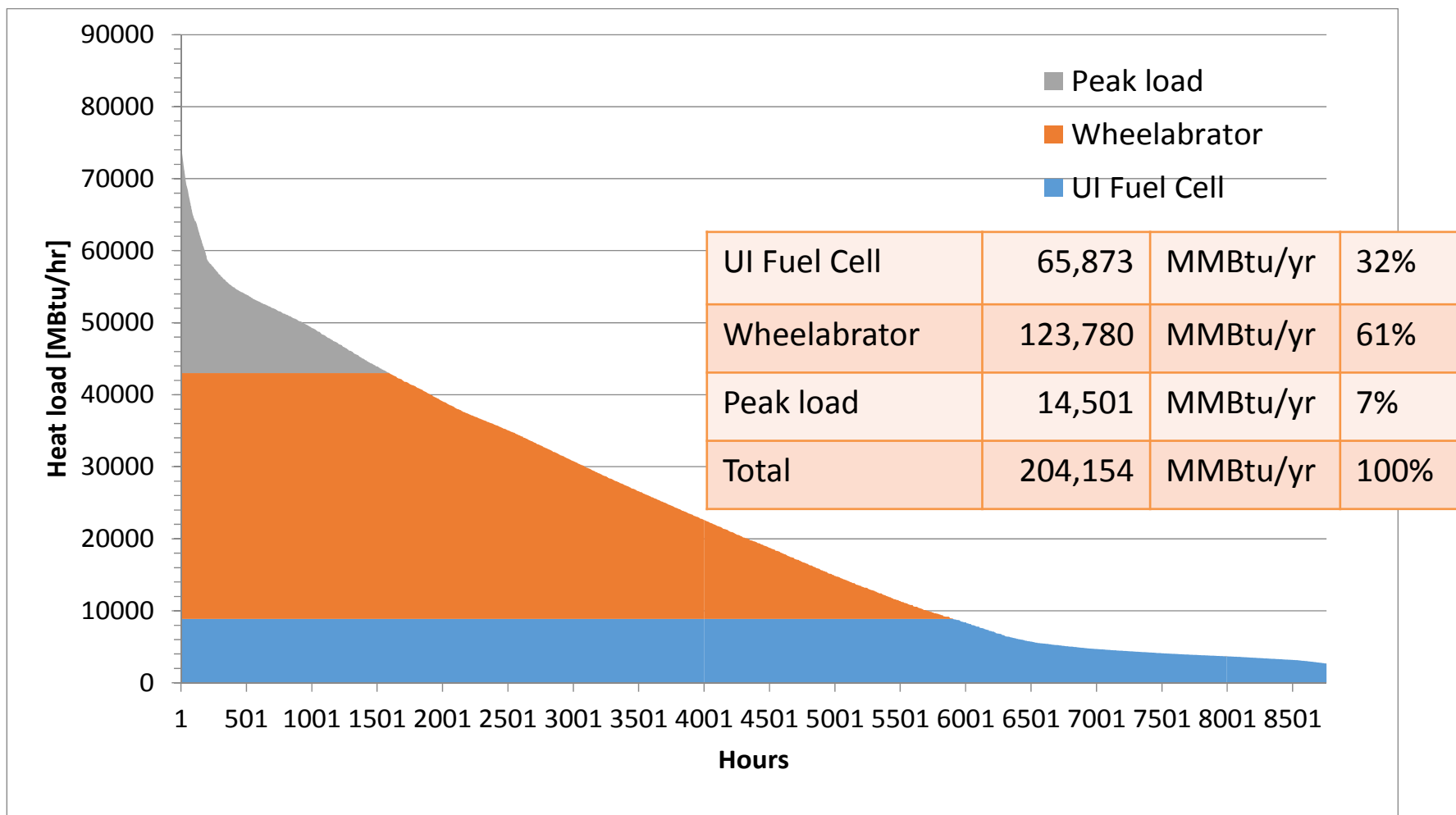
ID	Building
UB-01	Arnold Bernhard Center (ABC)
UB-02	Barnum Hall and Seeley Hall
UB-03	Bodine Hall
UB-04	Carlson Hall
UB-05	Charles A. Dana Hall
UB-06	Chiropractic College
UB-07	Cox Student Center
UB-08	Cooper Hall and Chaffee Hall
UB-09	Eleanor N. Dana Hall (END Hall)
UB-10	Engineering - Technology Building
UB-11	Hubbell Gymnasium
UB-12	Mandeville Hall
UB-13	Marina Dining Hall
UB-14	North Hall and South Hall
UB-15	University Place Apartments
UB-16	Wahlstrom Library
UB-17	Warner Hall
UB-18	Wheeler Recreation Center

**Phase 2 - CBD (4)**

ID	Building
7	Bridgeport Public Library
25	CT Post Building (Production)
31	Kuchma - 1057 Broad Street
32	Kuchma - 1087 Broad Street

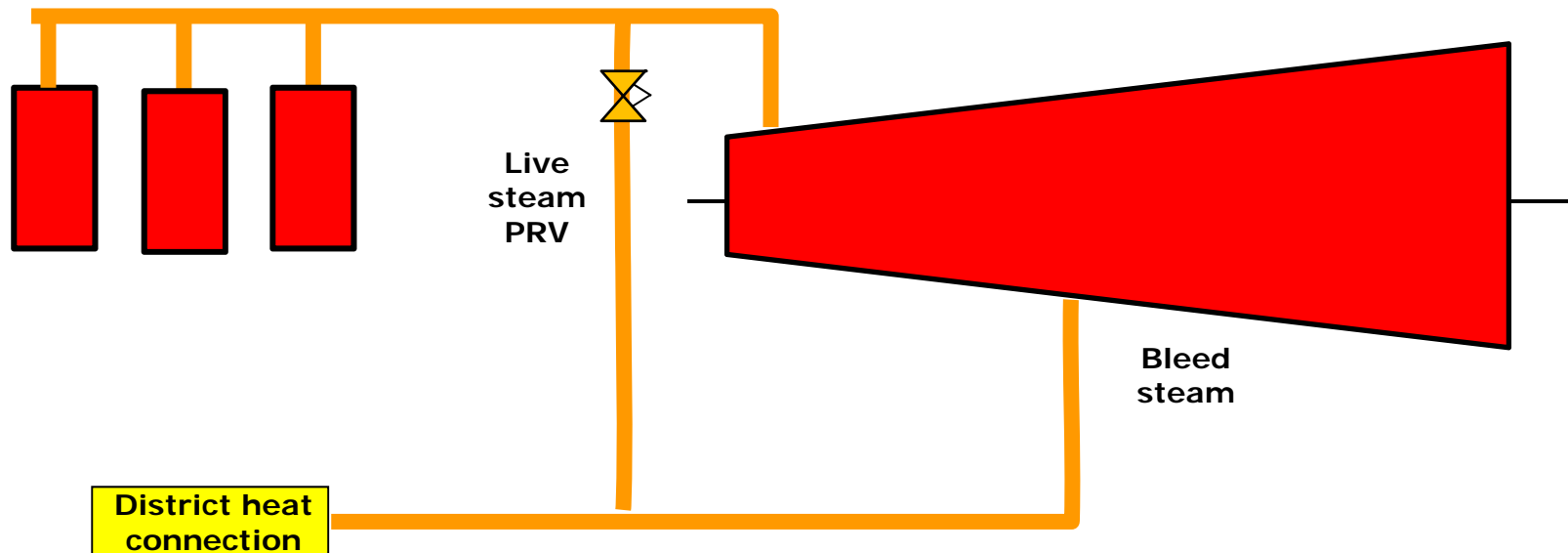


## Bridgeport Heat Duration Curve



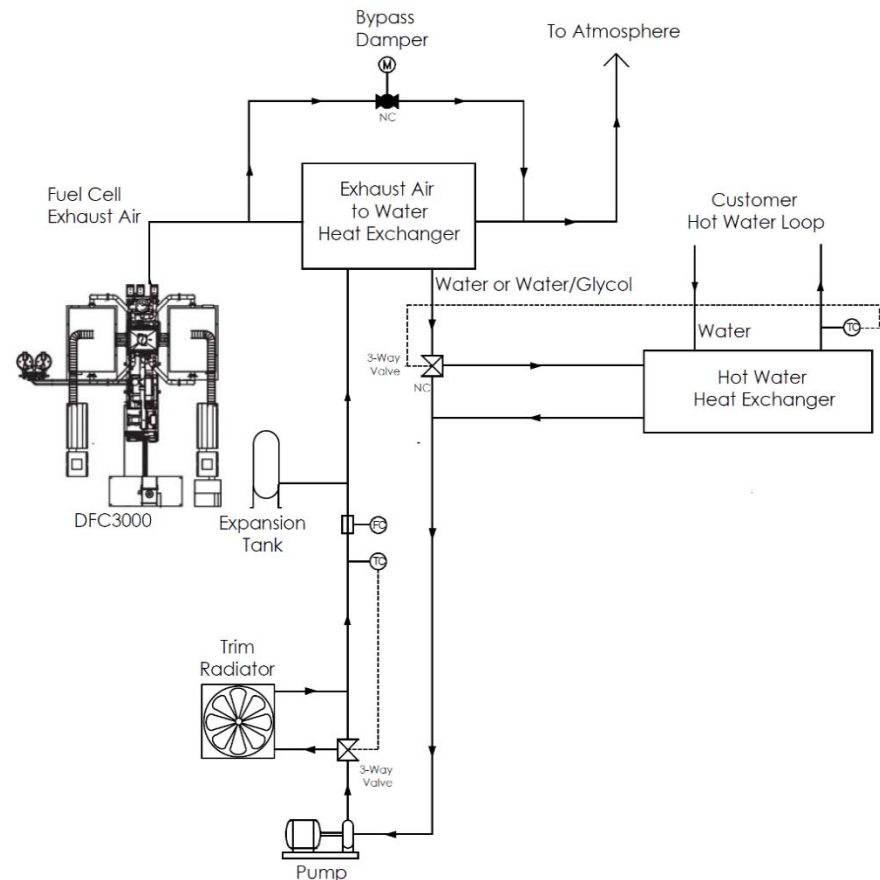
## Wheelabrator – Heat Source

- Bleed steam from turbine up to 34 MMBtu/hr (1:5 Power to Heat Ratio)
- High redundancy with 3 individual boilers and 94% historical availability
- Additional 68 MMBtu/hr available depending on other steam consumers



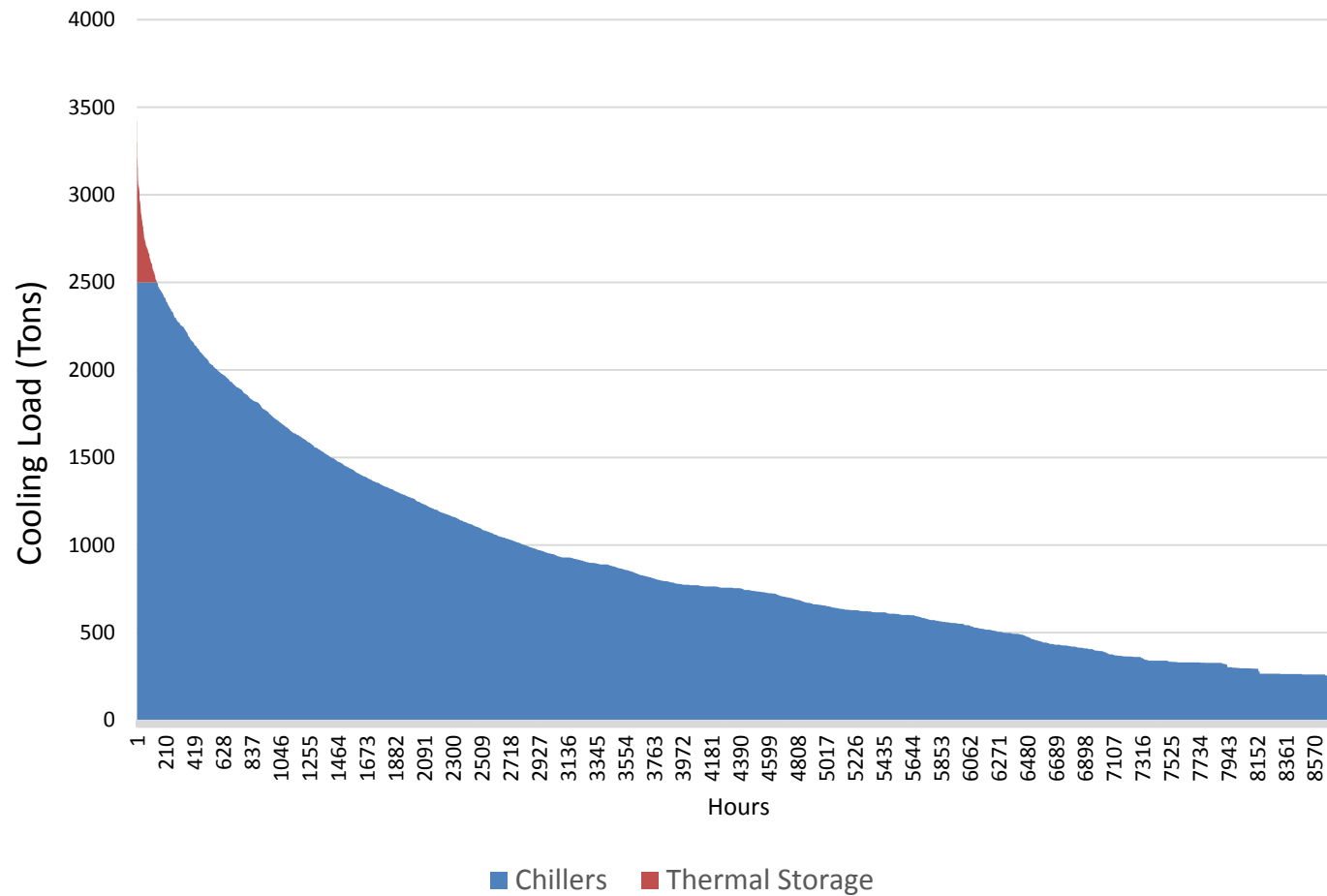
## UI Fuel Cell – Heat Source

- Temperature Exhaust Gas
  - 600 °F
- Heat Recovery Potential
  - 5 MMBTU/hr
- Impact
  - Improves System Efficiency



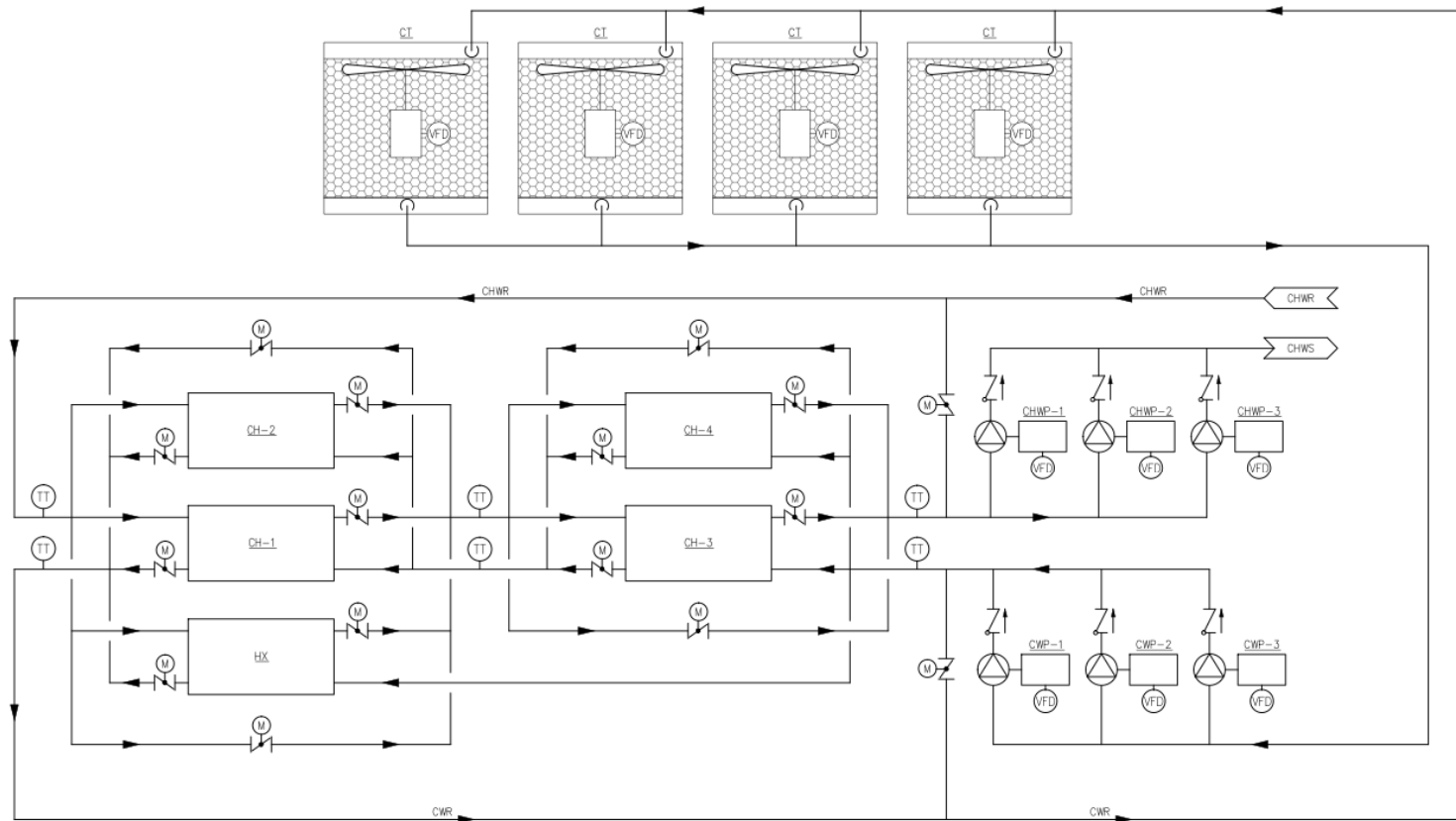
## Bridgeport Cooling Duration Curve

### System Cooling Load Duration Curve





## Central Chilled Water Plant at Emera Site



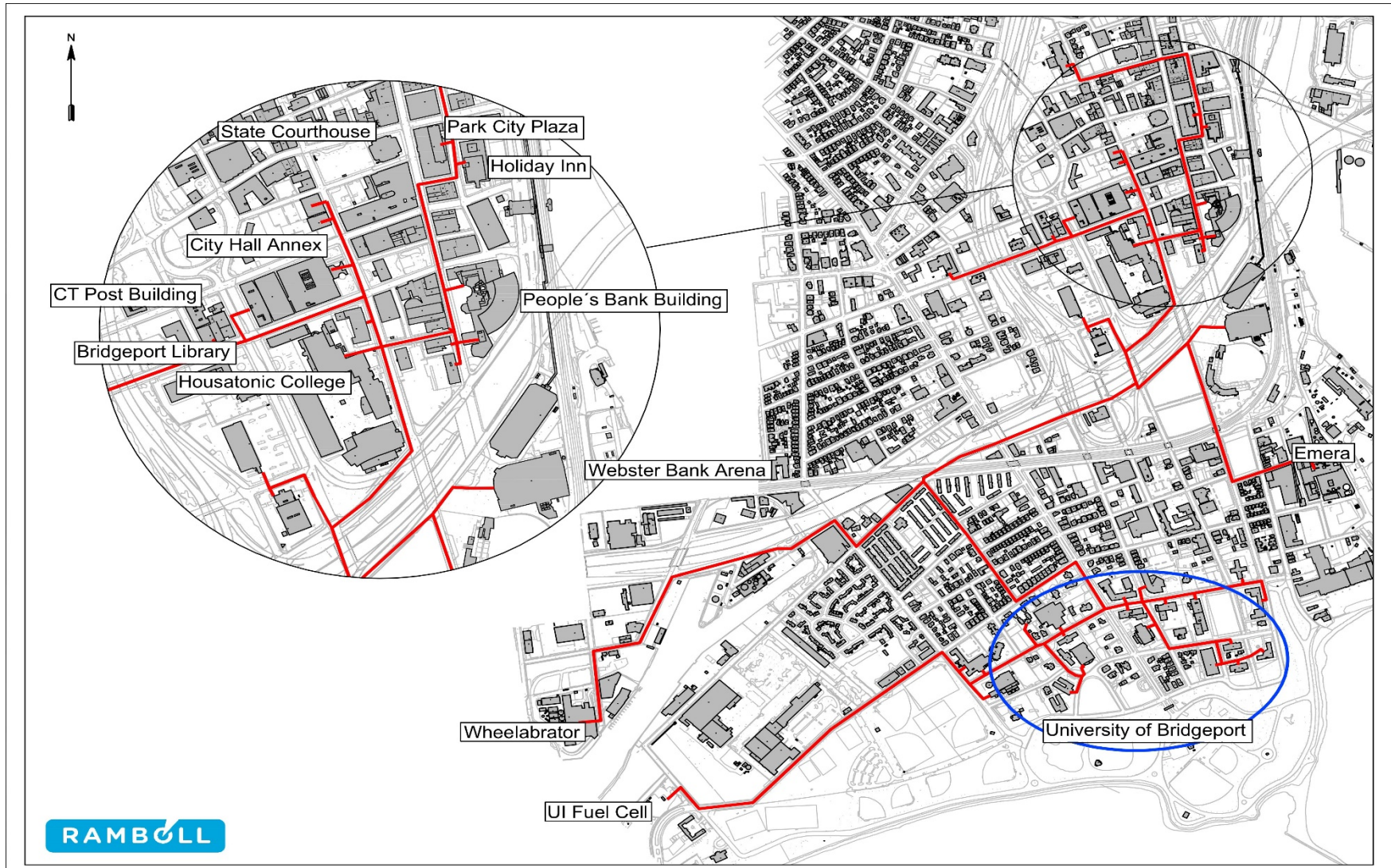
**SMITH ENGINEERING PLLC**  
 347 West 36th St, #204  
 New York, NY 10018  
 PHONE: 212.671.2420  
 WWW.SMITH-ENG.COM

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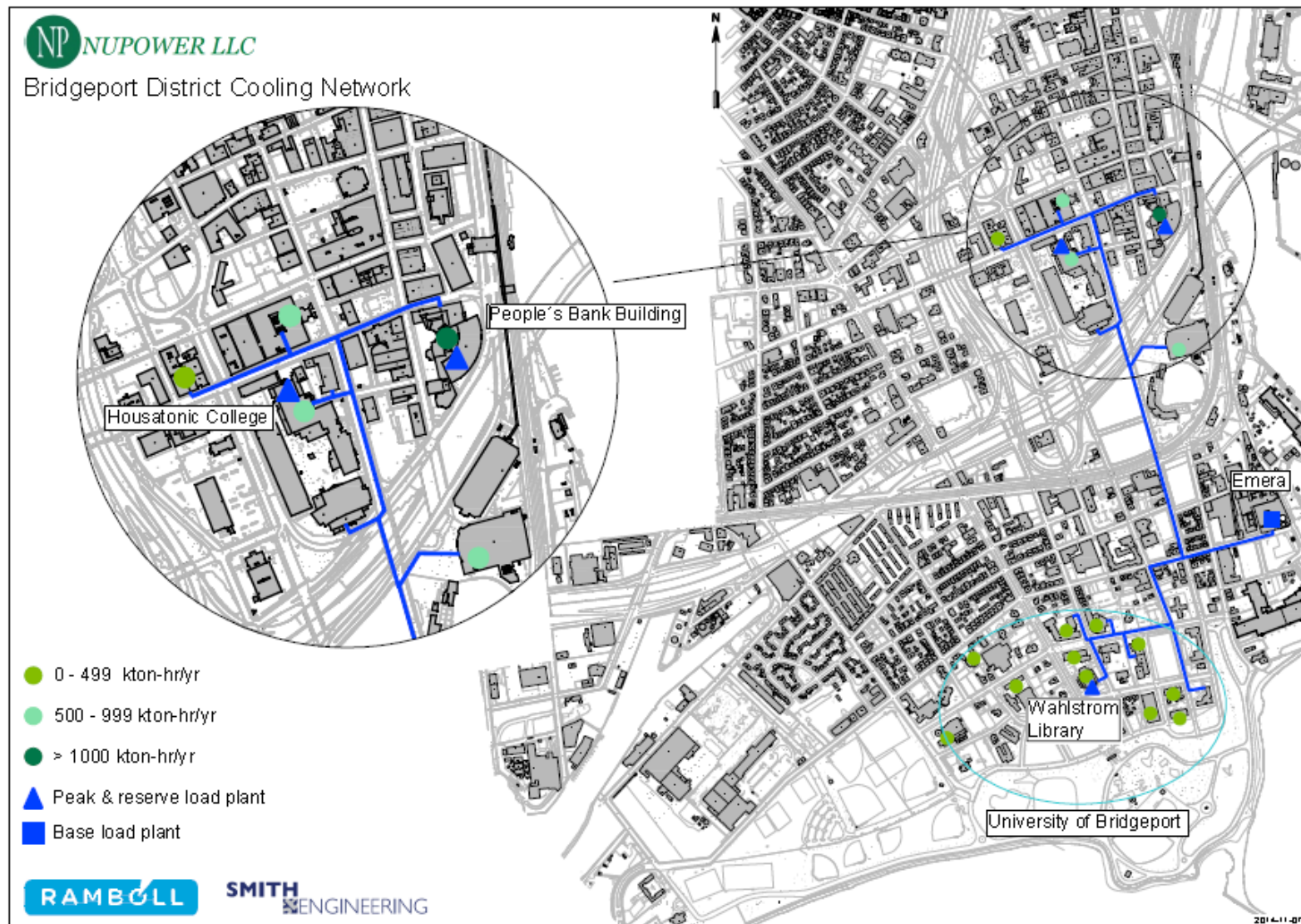
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Drawing Name CHW PLANT - SIMPLIFIED CHW/CW P&ID		
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## Heating Network





## Cooling Network





## Key Project Attributes

- Unregulated utility status as licensed Thermal Energy Carrier
  - access to public ROW
  - exclusive license for City of Bridgeport
- Environmental Permits – no controversial permits. Air permit requirements are minimal
- Legislative Initiatives – currently in process of qualifying project for renewable energy status
- Anchor customers
  - Identified
  - energy usage analysed and site visits completed
  - 50% of anchor tenant presentations completed
  - MOU developed and submitted to customers
- Off-Take and Customer Purchase Contracts in development





# NuPower Thermal LLC

## Contact:

Daniel Donovan  
ddonovan@nupowerllc.net  
203.395.4148