March 17, 2015

Co-Chairperson Loni Reed
Co-Chairperson Paul Doyle
Energy & Technology Committee
Connecticut General Assembly
State Capitol
Hartford, CT 06106

Re: HB 6022, An Act Concerning Thermal Energy Transportation Companies in the City of Bridgeport

Chairmen Doyle & Reed and Members of the Energy Committee:

My name is Daniel Donovan and along with my partner Scott Guilmartin, we represent NuPower Thermal as the developer of the Bridgeport Thermal Energy District Project. We supports HB 6022, An Act Concerning Thermal Energy Transportation Companies in the City of Bridgeport in its original form as submitted by Bridgeport' Legislative Delegation.

The Project is based on a very simple concept that is commonly used throughout most of the world. It is the capturing of low grade waste heat that would otherwise be released into the atmosphere for use in space heating and domestic hot water.

The United States has a few examples of this technology such as the low temperature loop that provides the Legislative of Building with it heating. But our Project goes further by using the waste heat from Class I, II and III renewable energy sources making them more efficient and environmentally superior.

The Project is based on exchanging the heat from various thermal sources in the City of Bridgeport using very simple plate frame heat exchangers with no moving parts. Water is circulated in a closed loop through the heat exchanger and then distributed in pipes that

eventually lead to smaller but similar heat exchangers at our customers' locations. The hot water is only at 220 degrees Fahrenheit and its circulation removes the need for our customers' natural gas or oil fired boilers. Our customers' heating system within the building will not see any difference once their boilers are replaced. Our system's water is recirculated with very little loss from evaporation. In contrast, the traditional US district heating systems using steam heat require large pipes, high temperatures, short effective distances before heat loss and typically the dumping of the condensed steam as waste water.

We are working with Ramboll Engineering as our project manager. Headquartered in Copenhagen, Denmark, they are one of the world's leading engineering design firms for district thermal energy. Together with the other members of our design team we have completed the project design and are actively marketing to Bridgeport customers.

It is our intent that the Project grows from the downtown and University of Bridgeport areas to include both commercial and residential customers. This has been the typical model in Europe and cities like Copenhagen have literally miles of low temperature district thermal loops using a variety of heating sources.

Although our Project will have access to low cost heat sources, we are faced with installing a piping network that will last for over 30 years. The piping network will be state of the art – buried at shallow depth, thin walled steel and plastic, flexible and fully instrumented. It will represent approximately 70% of our capital cost.

Despite our overwhelming environmental benefits, our pricing must be attractive to our potential customers, all of whom have invested capital in existing boilers. Our ability to use Class I RECs will permit us to offer equivalent heating prices that at least match what our customers currently pay for fossil fuel heating.

This issue was similarly addressed in the energy efficiency programs that Connecticut and other states have successfully launched. These

programs have changed consumer behavior towards more environmentally and economically superior alternatives.

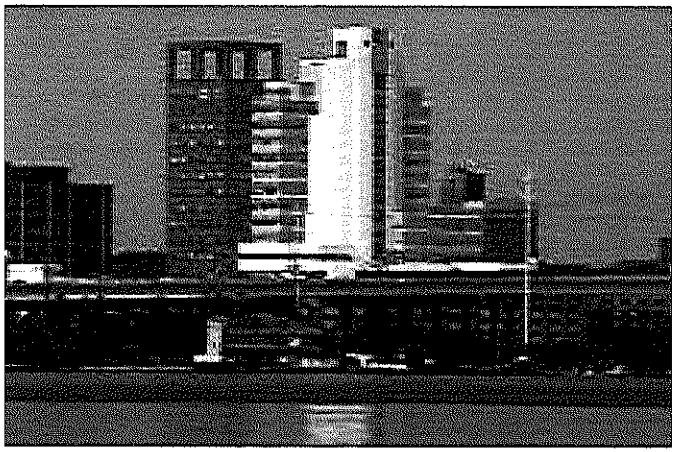
The number of Class I RECS that would be generated by our Project would be less than 1% of the annual Class I RPS for 2017 at the Project's expected start of operation. The Project would represent a CT Class I project located in Connecticut that would be operational on a year round basis and will reduce our customers' existing carbon footprint by over 70%

Many of our customers and our thermal heat sources are providing testimony today in support of HB 6022 as originally submitted by the Bridgeport Delegation. They see the benefits from the smart use of our resources and a future that satisfies both our State's environmental and economic goals. Together we urge you to support HB 6022 as originally proposed.

Most respectfully,

Daniel Donovan
Manager
NuPower Thermal Bridgeport LLC

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

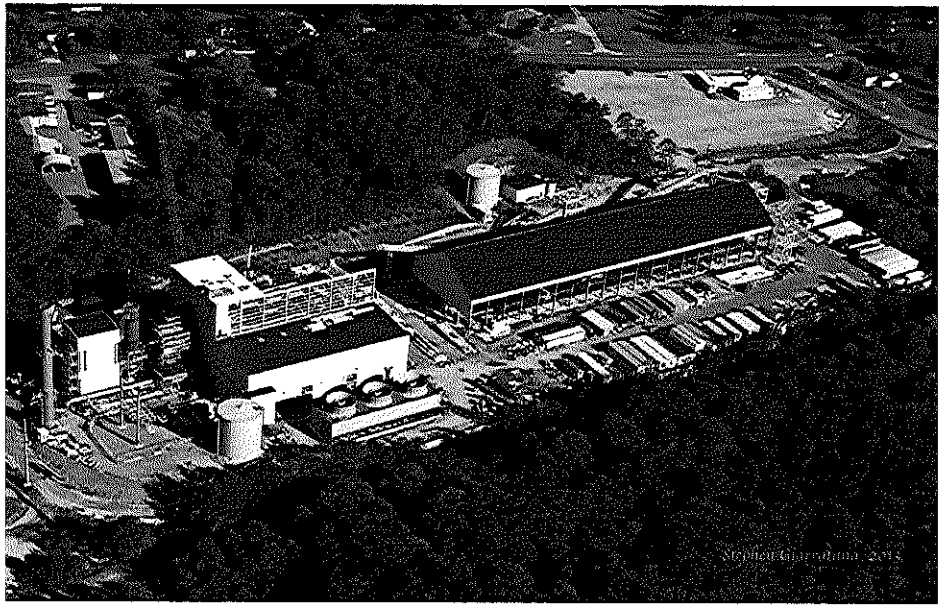


NuPower Thermal

February 12, 2015

NuPower Thermal

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)**

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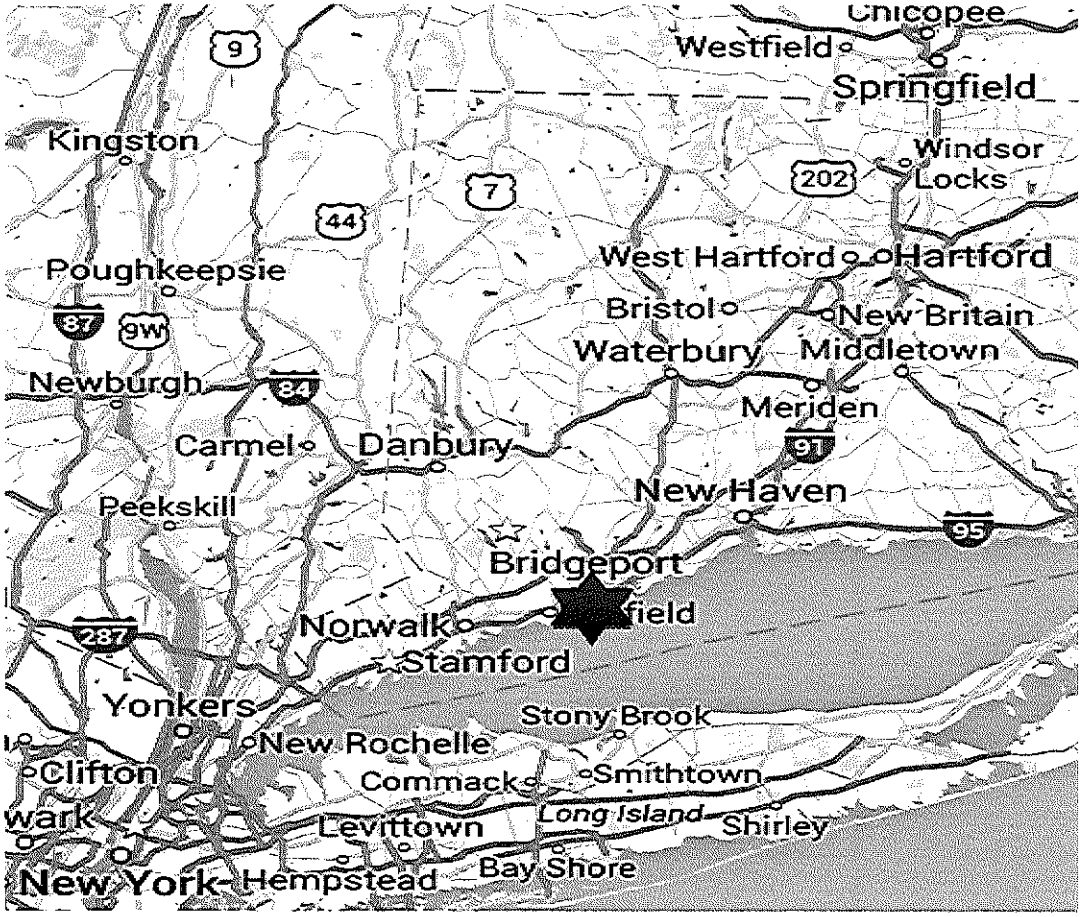
City of Bridgeport, CT



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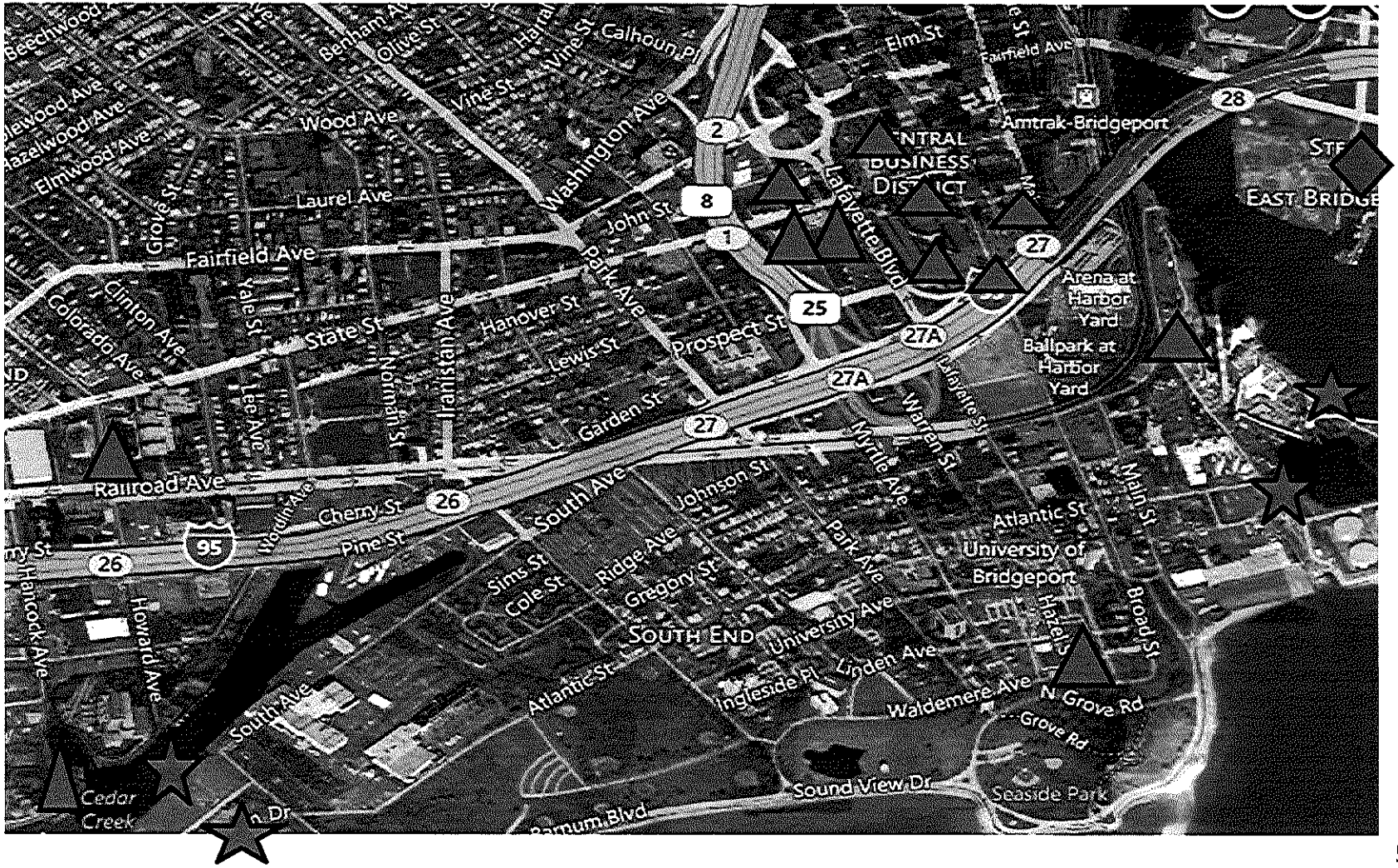
City of Bridgeport

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

NuPower Thermal

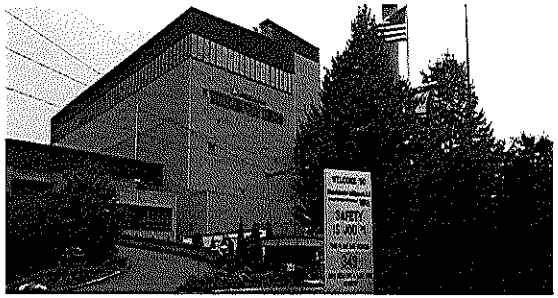
The Bridgeport Thermal Project



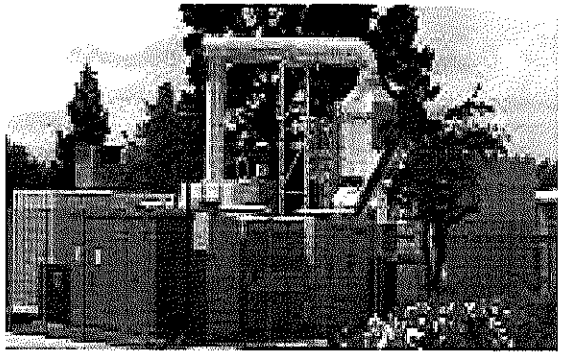
Thermal Customer Profile
Totaling approximately 3.5 million square feet

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

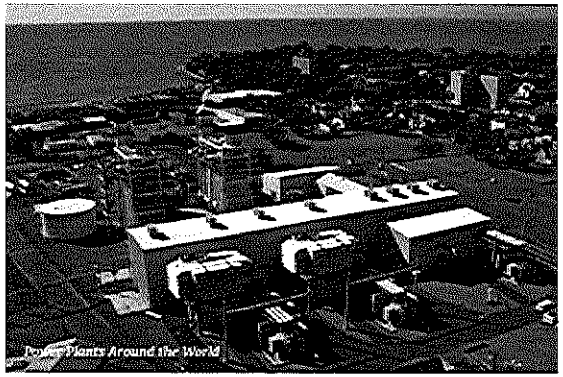
Potential Heat/Electrical Sources



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

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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

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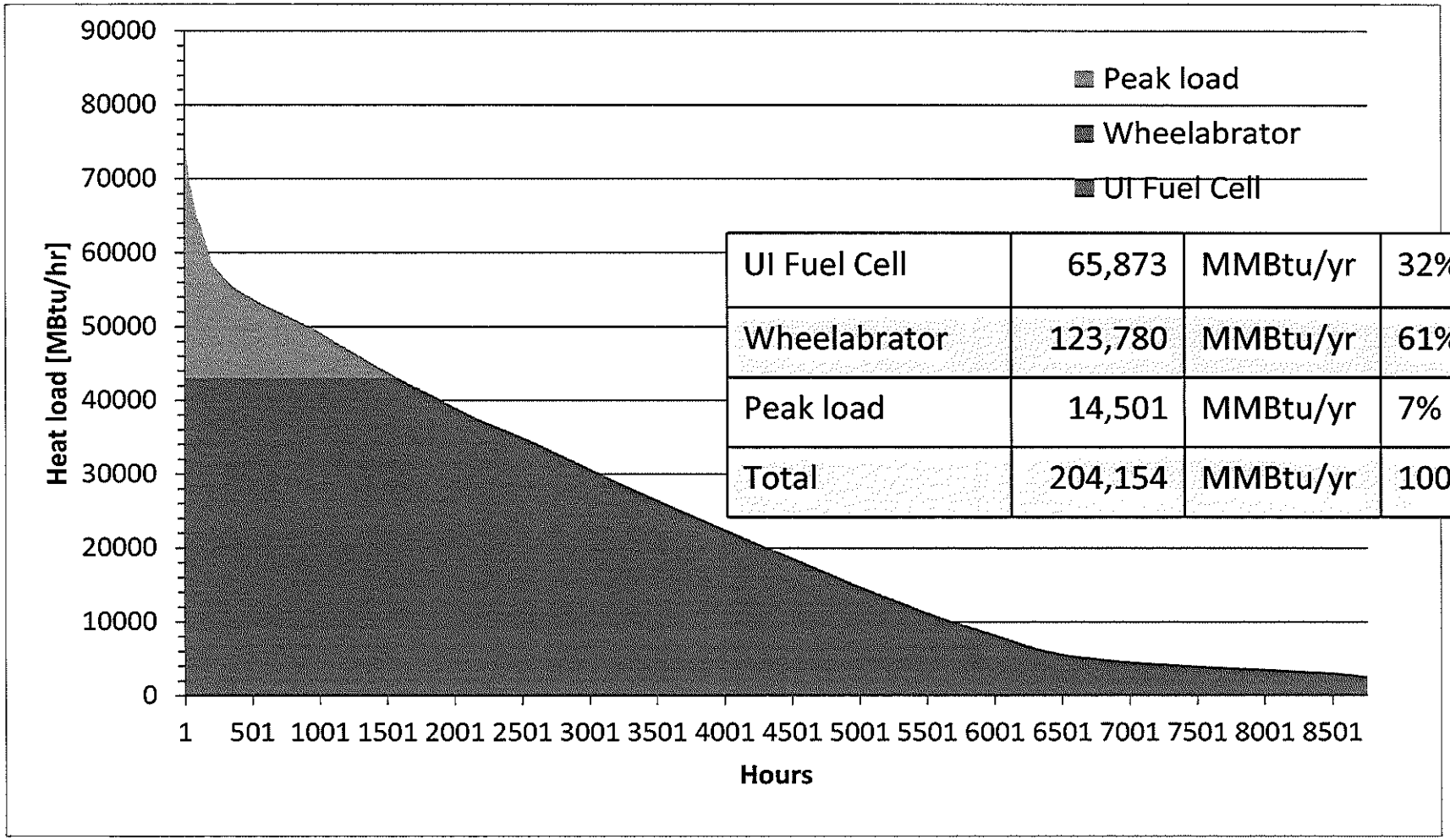
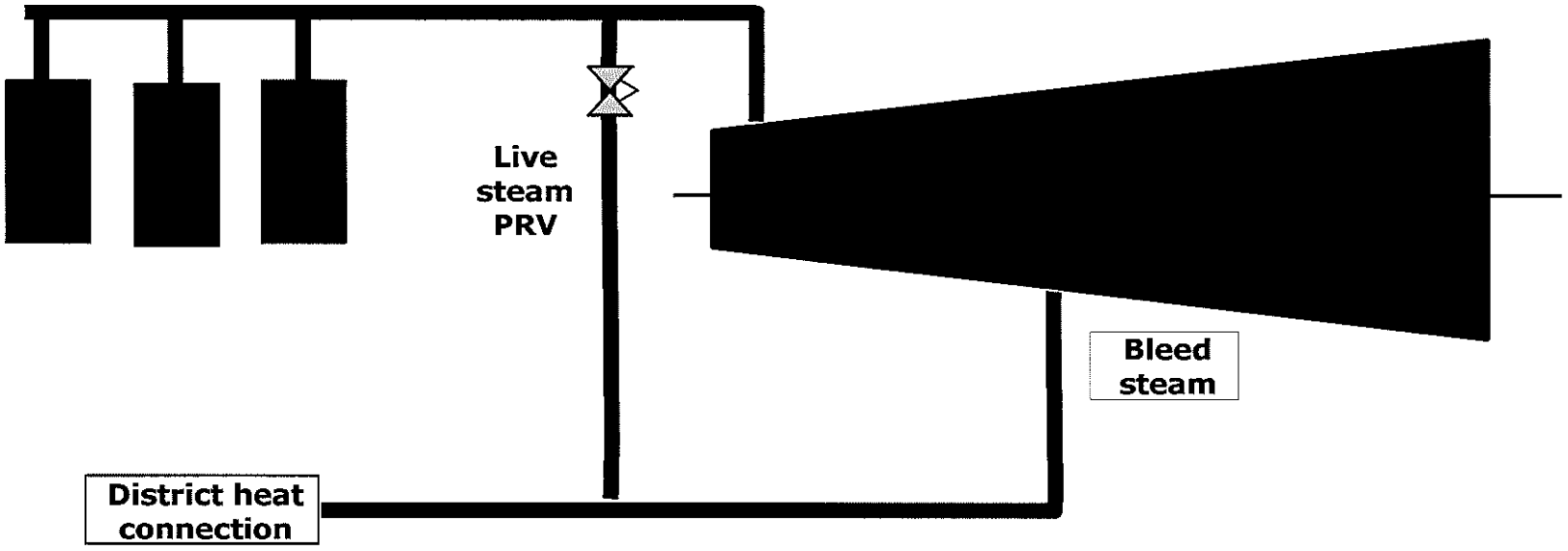
Bridgeport Heat Duration Curve



UI Fuel Cell	65,873	MMBtu/yr	32%
Wheelabrator	123,780	MMBtu/yr	61%
Peak load	14,501	MMBtu/yr	7%
Total	204,154	MMBtu/yr	100%

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**



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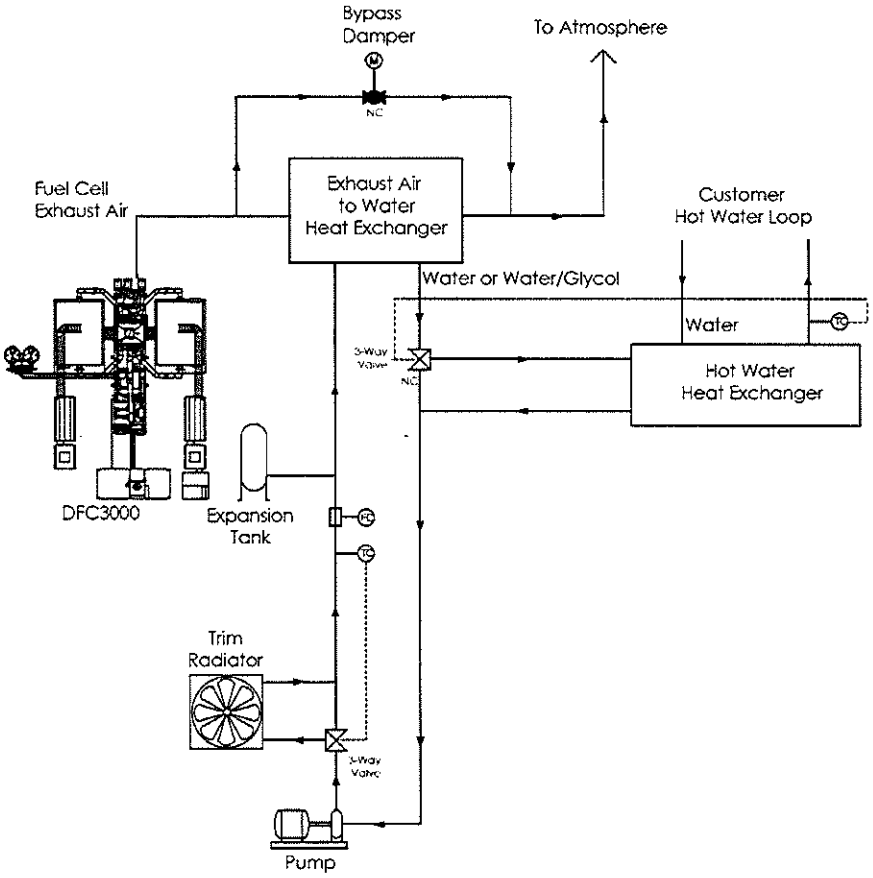
UI Fuel Cell – Heat Source

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



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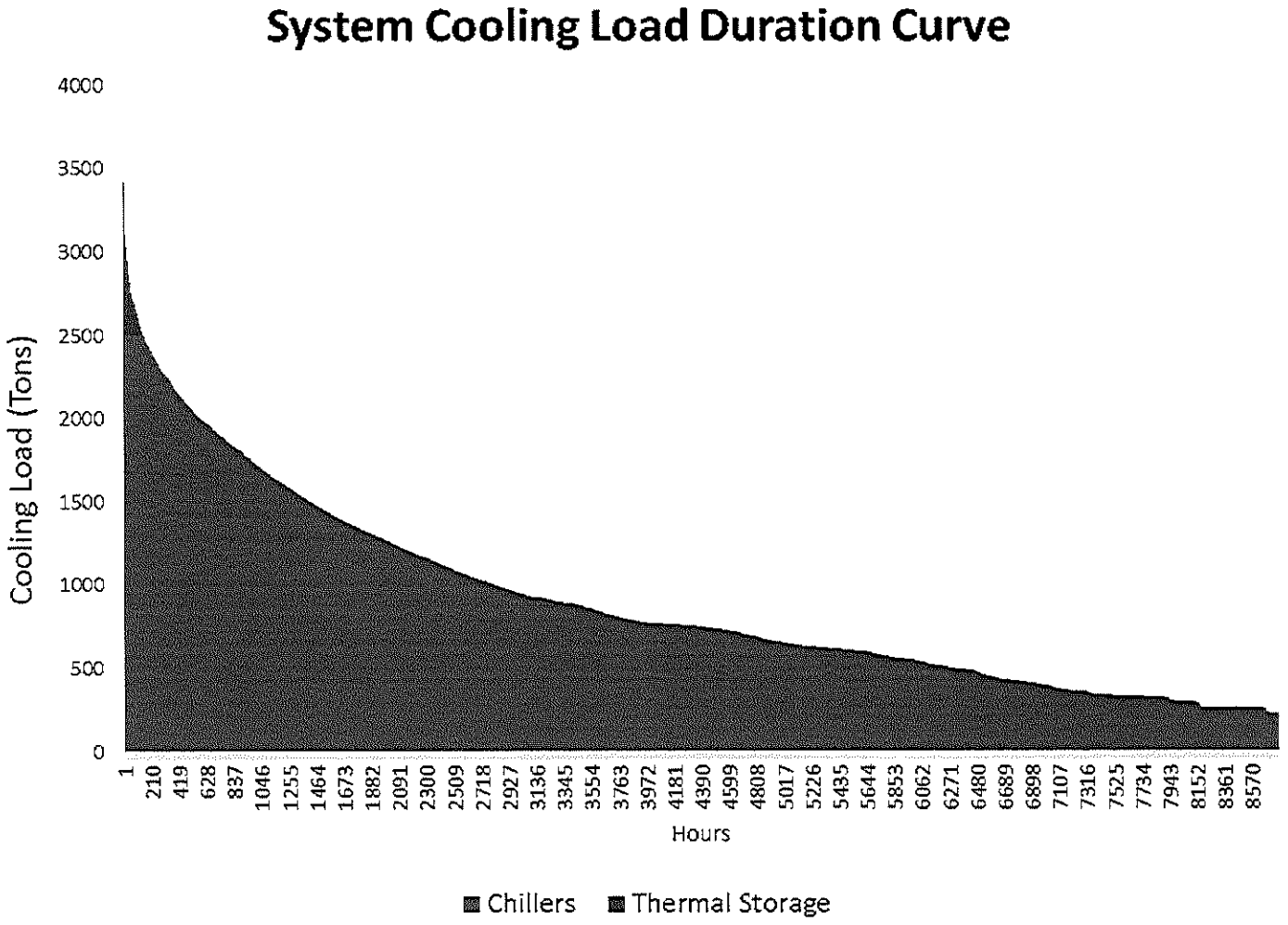
Bridgeport Cooling Duration Curve



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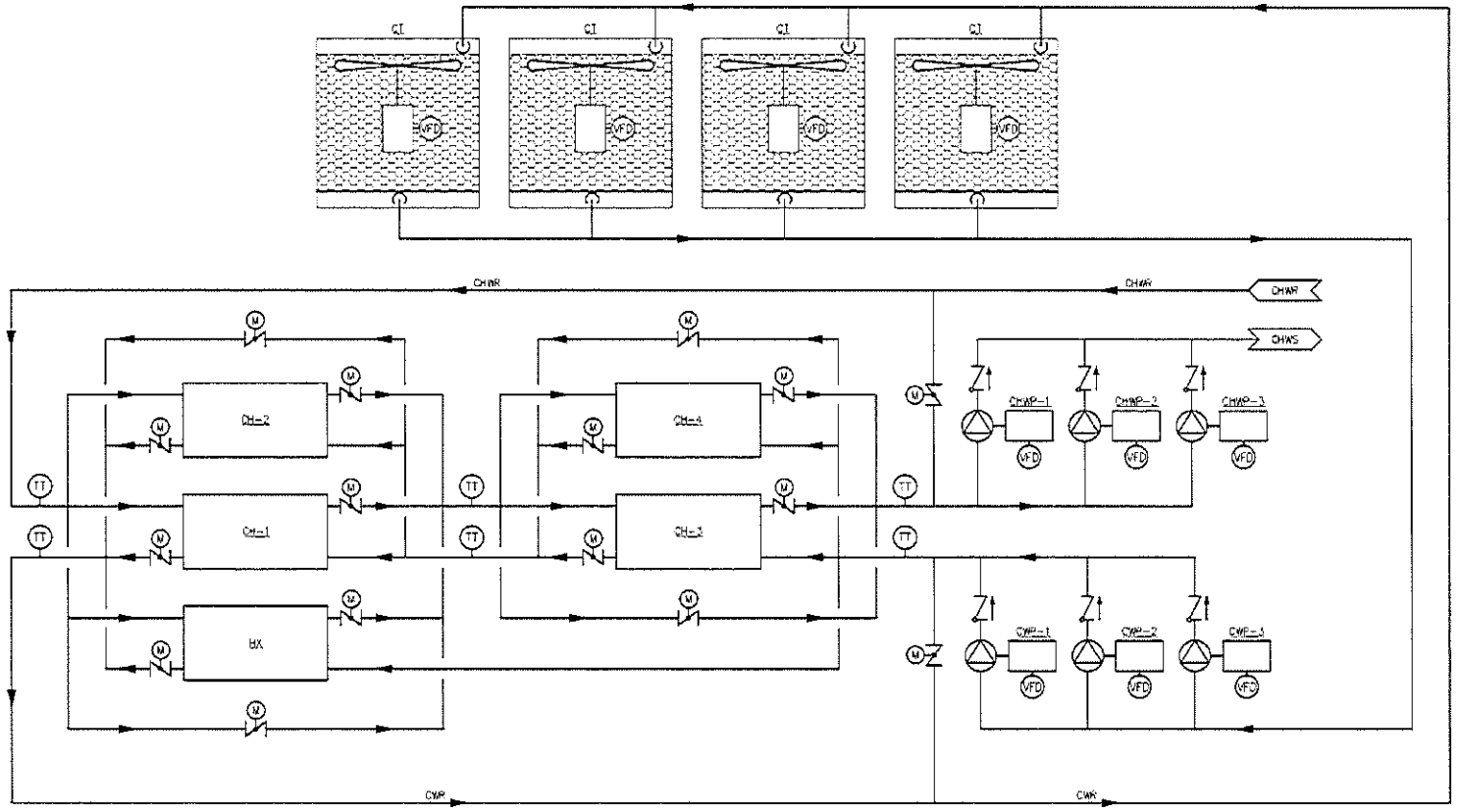
Central Chilled Water Plant at Emera Site



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Project Name: BRIDGEPORT DISTRICT ENERGY		
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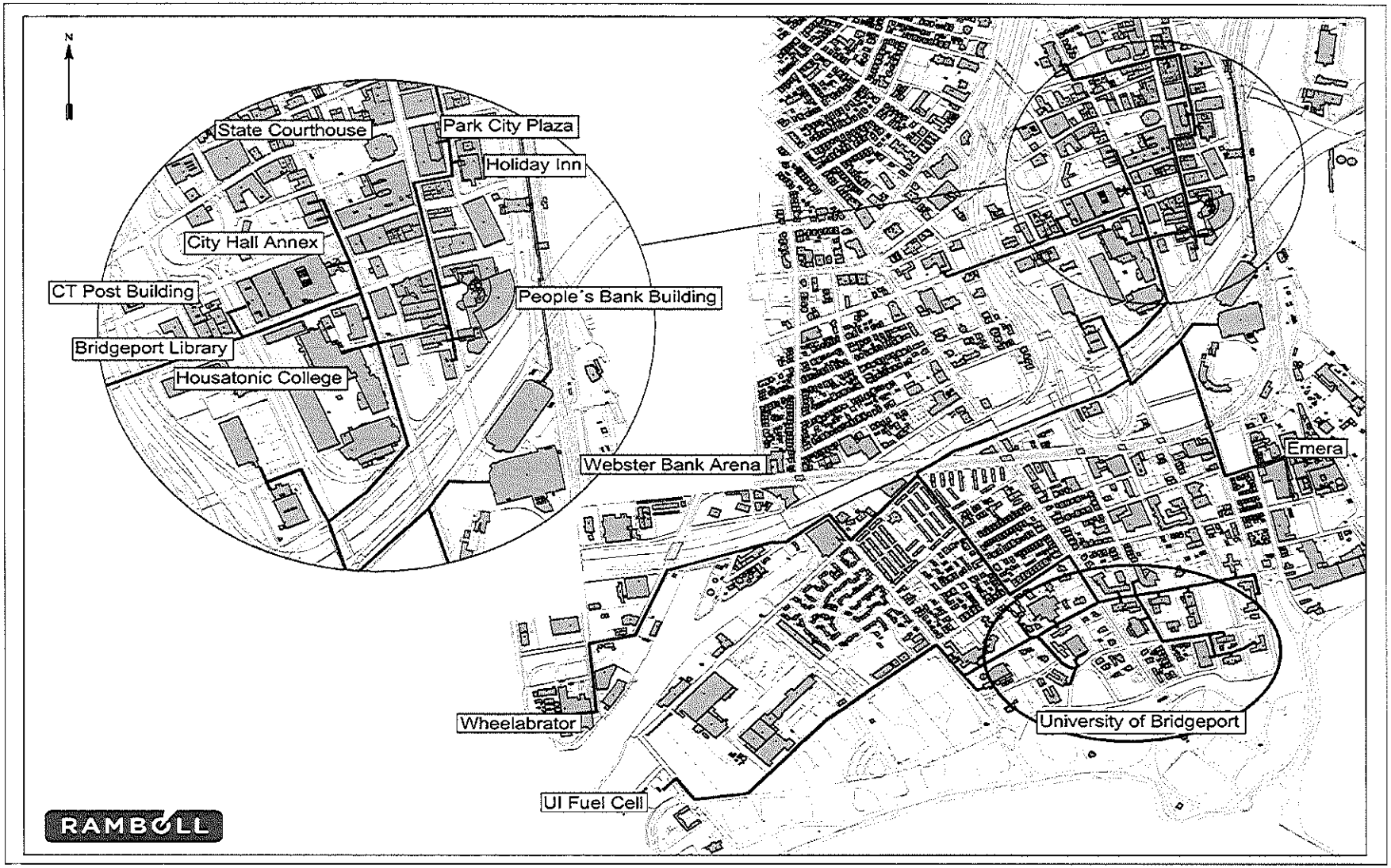
Heating Network



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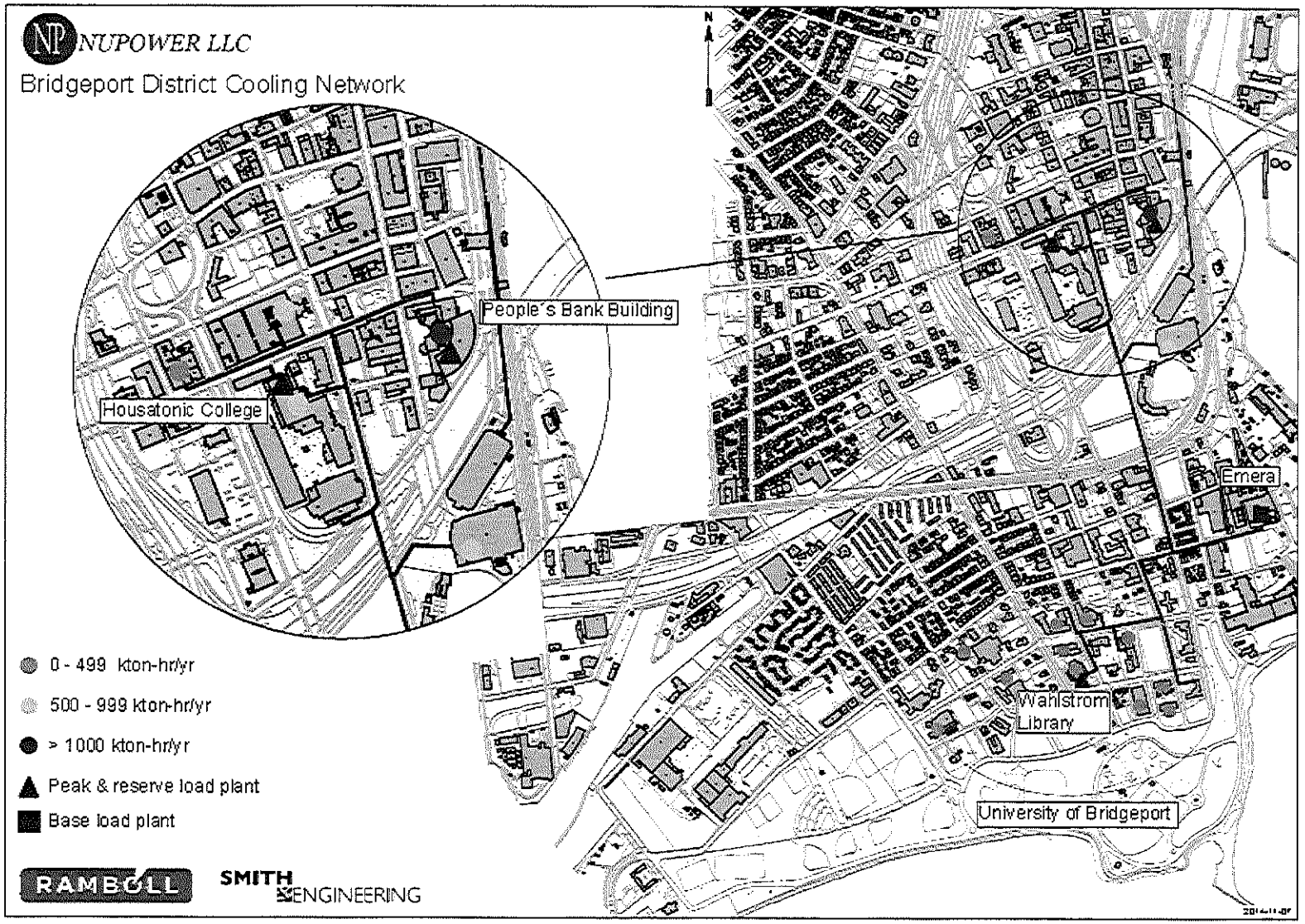
Cooling Network



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

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