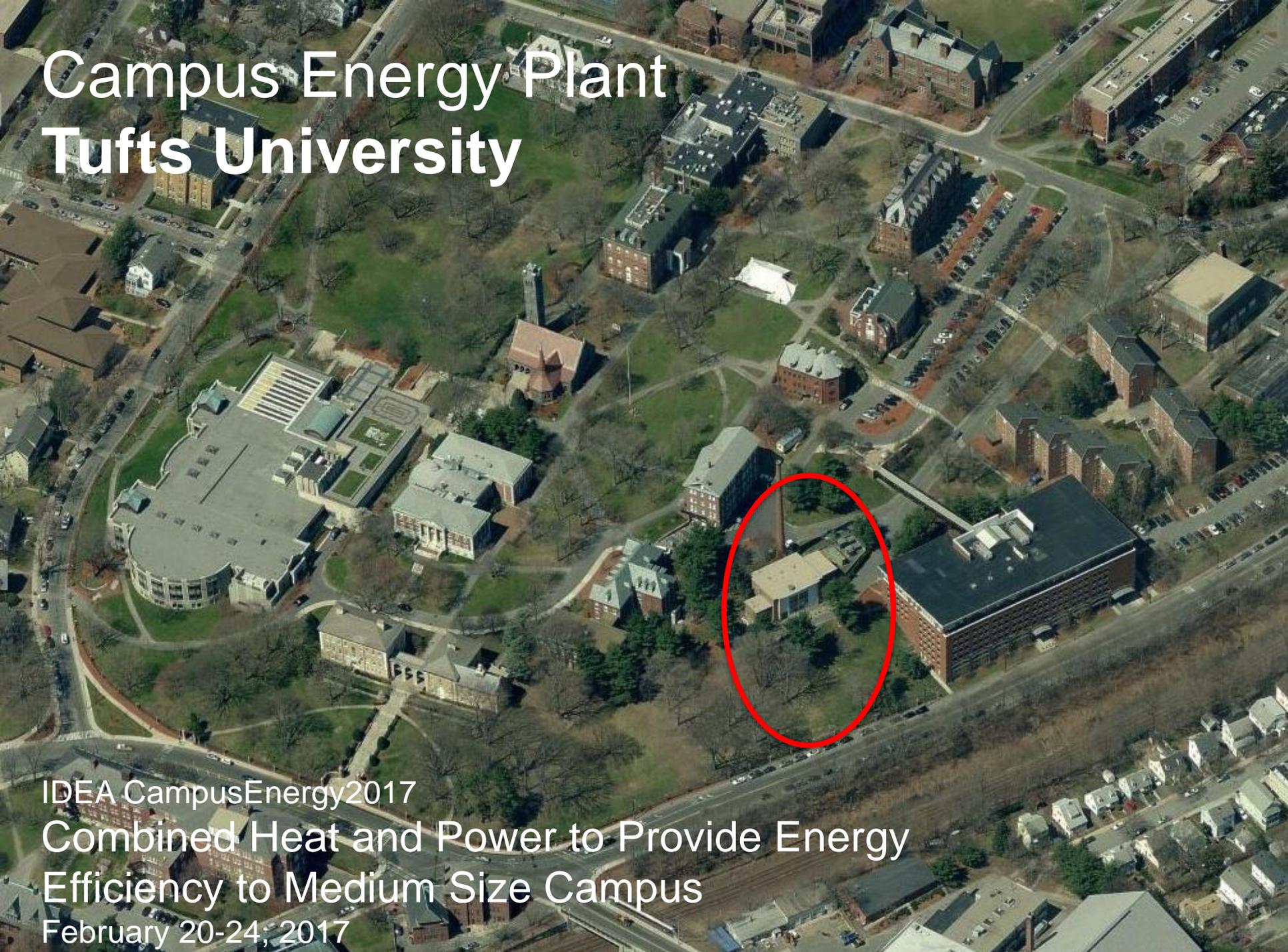


# Campus Energy Plant Tufts University



IDEA CampusEnergy2017  
Combined Heat and Power to Provide Energy  
Efficiency to Medium Size Campus  
February 20-24, 2017

### *Presentation Overview:*

- Campus Introduction
- Project Overview
- Planning, Architecture, and Design
- Construction
- Lessons Learned
- Summary

# Campus Energy Plant

Traditional Campus Close to City



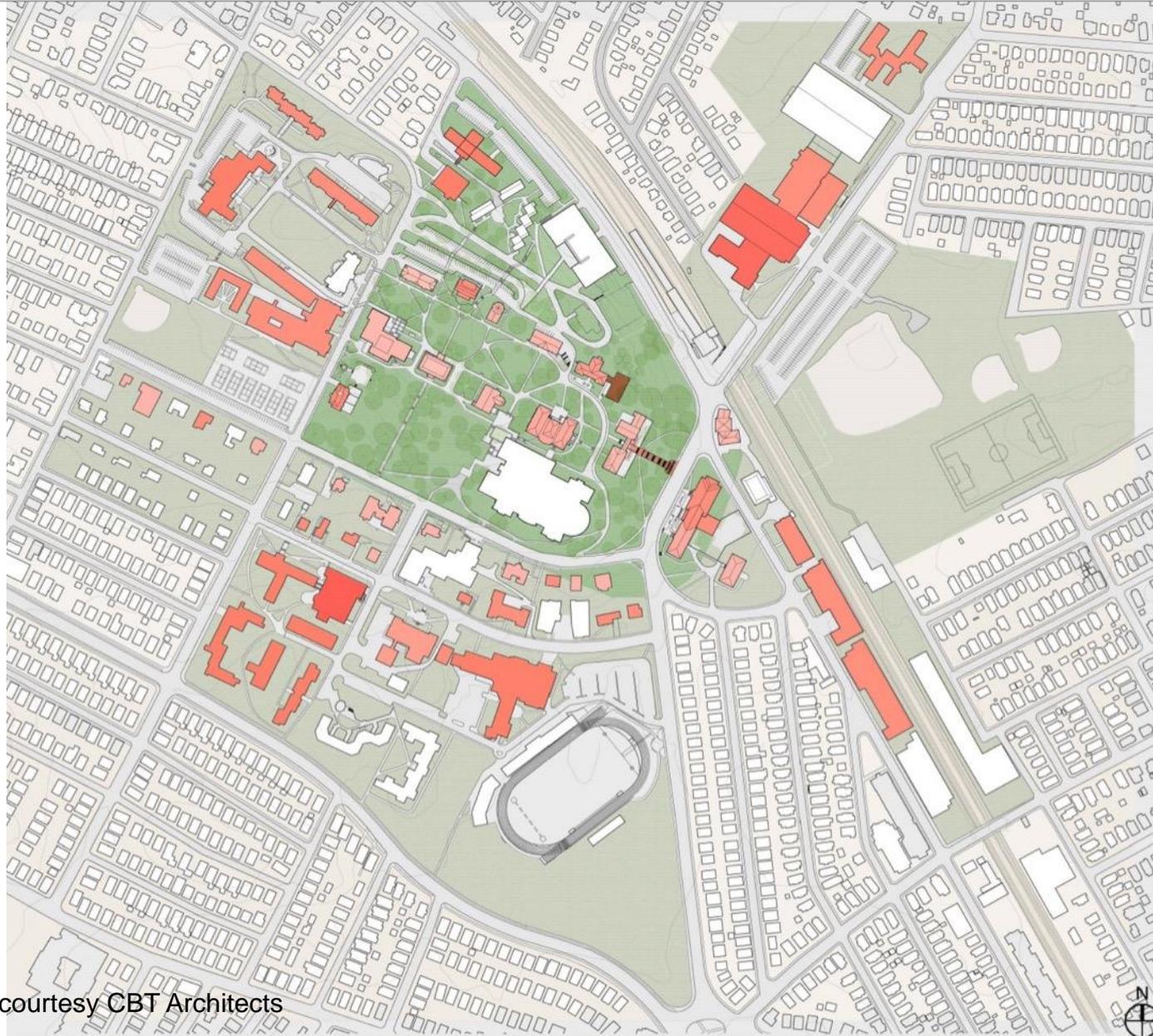
# Campus Energy Plant

Evolution of Campus | 1912: Development on the Hill



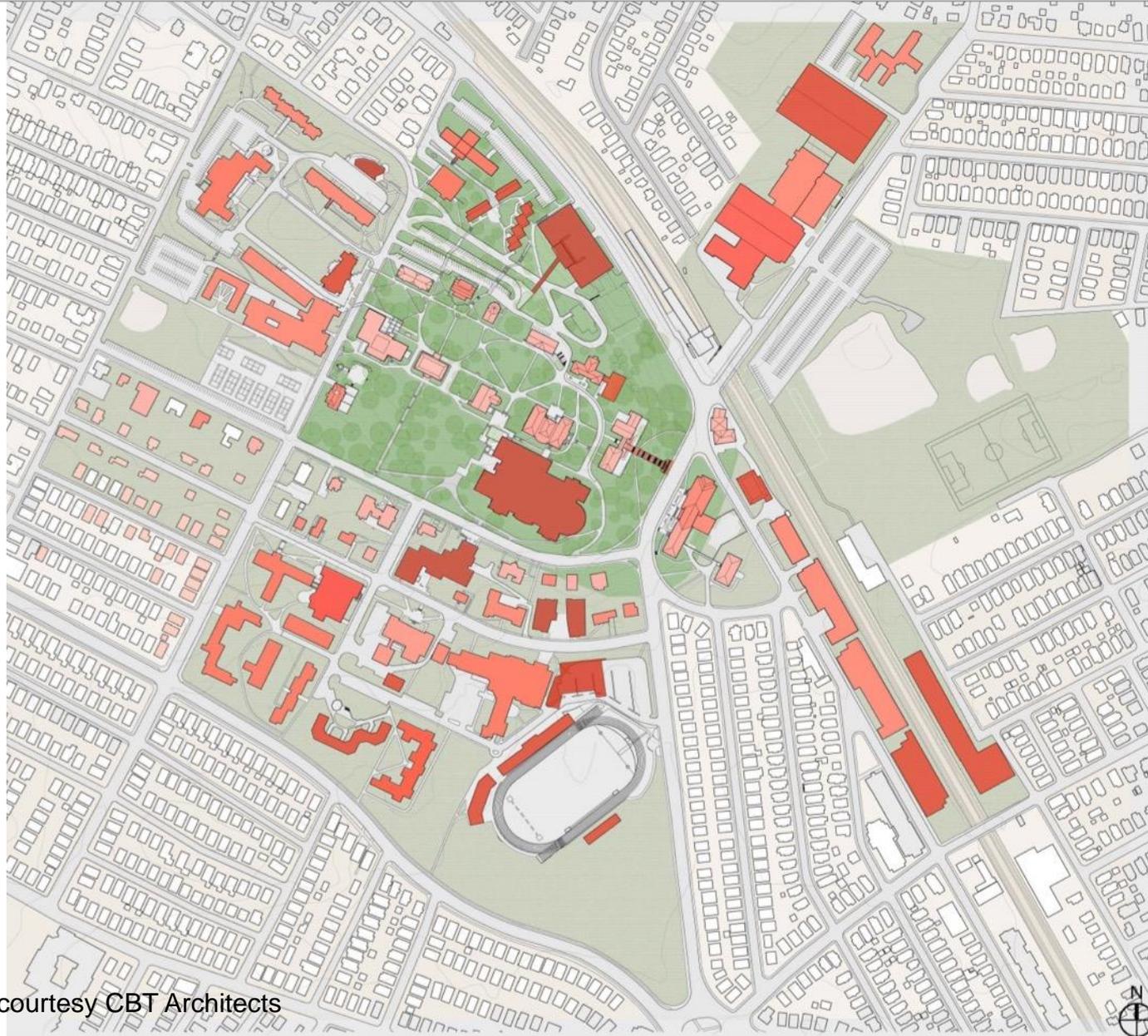
# Campus Energy Plant

Evolution of Campus | 1972: Development around the Hill



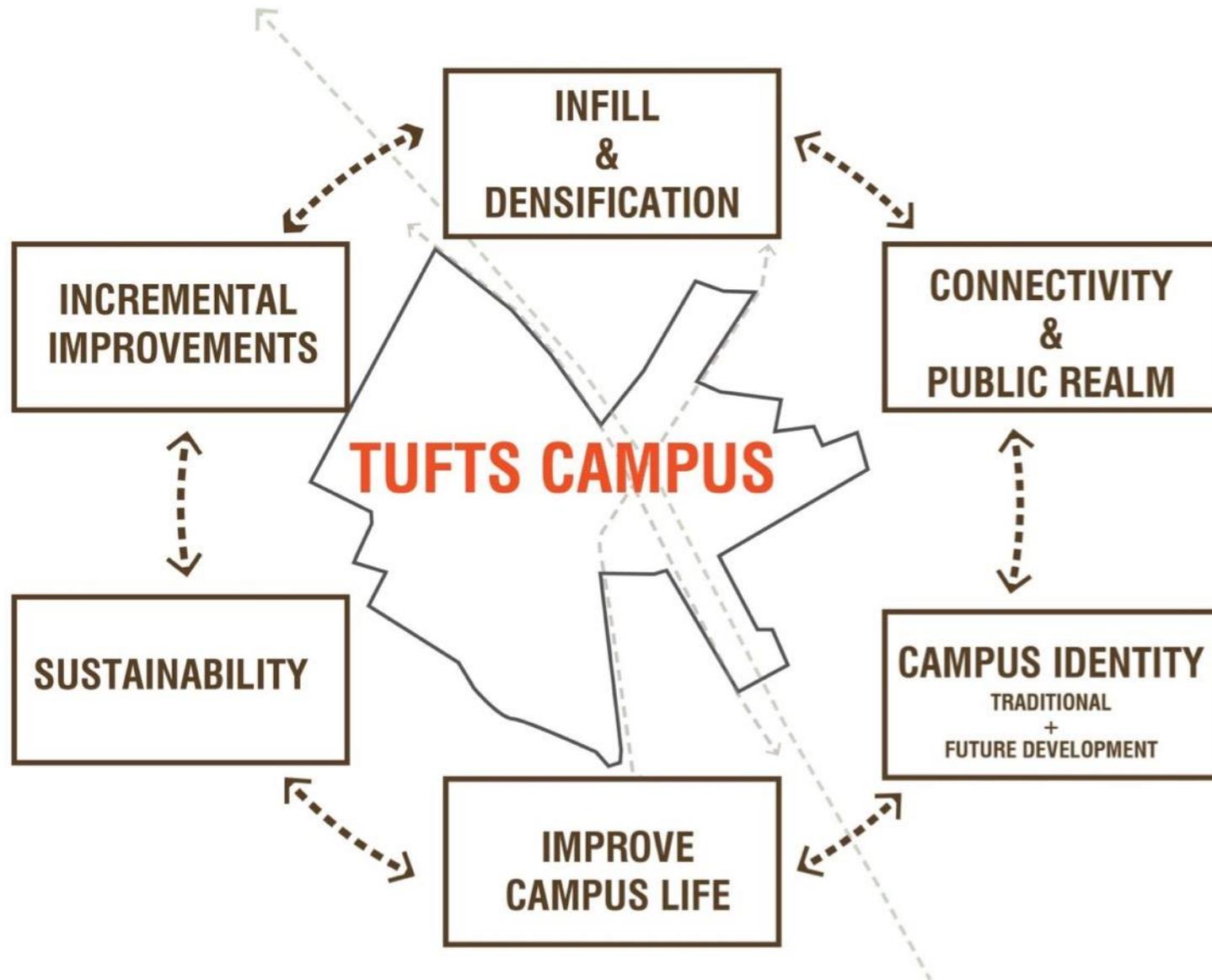
# Campus Energy Plant

Evolution of Campus | 2012: Development on the Hill



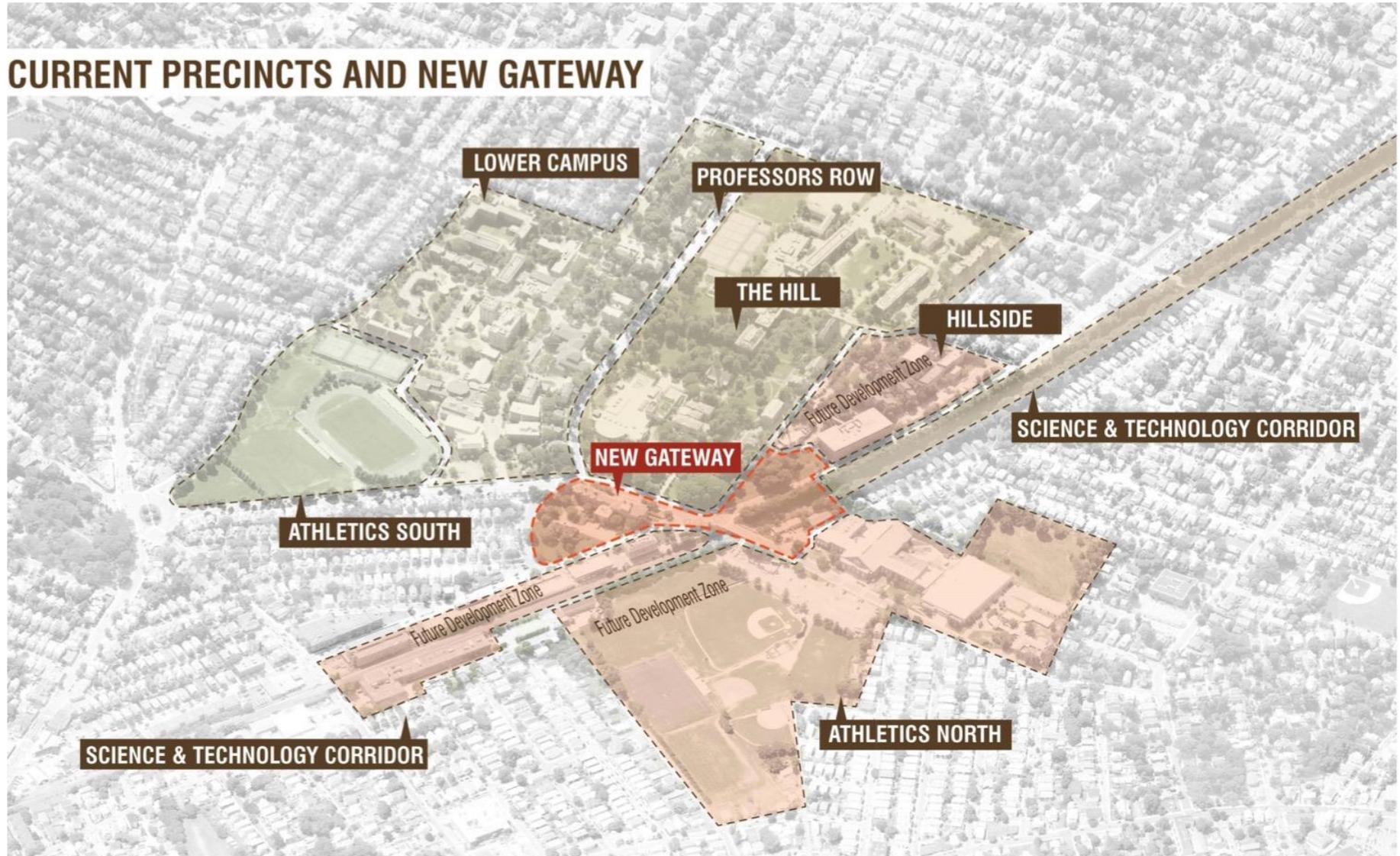
# Campus Energy Plant

A Vision for Future



# Campus Energy Plant

## Current Precincts and New Gateway



# Campus Energy Plant

## Currently Planned Projects

### CURRENTLY PLANNED PROJECTS



SCIENCE & ENGINEERING COMPLEX 2017



CENTRAL ENERGY PLANT 2016



AIR RIGHTS BUILDING 2019/2020

574 BOSTON AVENUE 2015



CAMPUS PLANNING PRESENTATION



### *Project Development*

- Energy saving opportunities study identified Cogen possibility
- Feasibility study – no fatal flaws
- Established the business case
- Concept design – modify existing plant or new plant?
- Design and Construction Drawing Development
- Construction

### *Project Operational Highlights:*

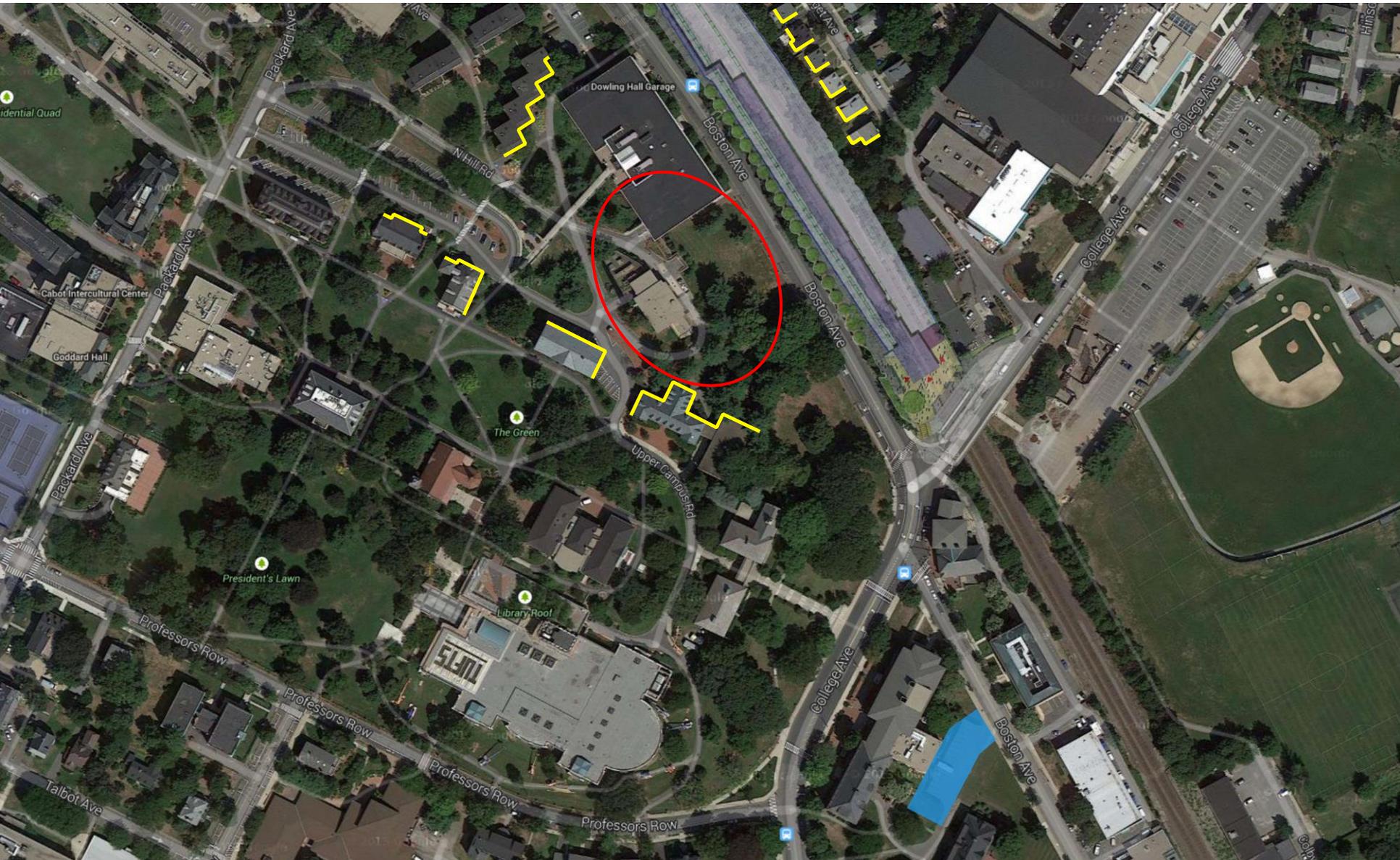
- New Plant includes:
  - On site electrical generation (4MW gas fire reciprocating engine)
  - Supplemental boilers (75 Kpph)
  - Central chilled water system (1,400 tons)
- Enhanced Sustainability
  - Greenhouse gas emissions reduced 14%
  - Significantly more efficient than the existing plant
- Enhanced Resiliency
  - Power continuity even during a long utility outage
- Utility reliability improved

### *Resiliency Features:*

- Cogen can operate in “Island Mode” independent of the local electrical grid
  - Shelter and feed the students and sustain most business operations
- Black start capability
- Major equipment placed out of the “flood plain”
- Boilers are dual fuel

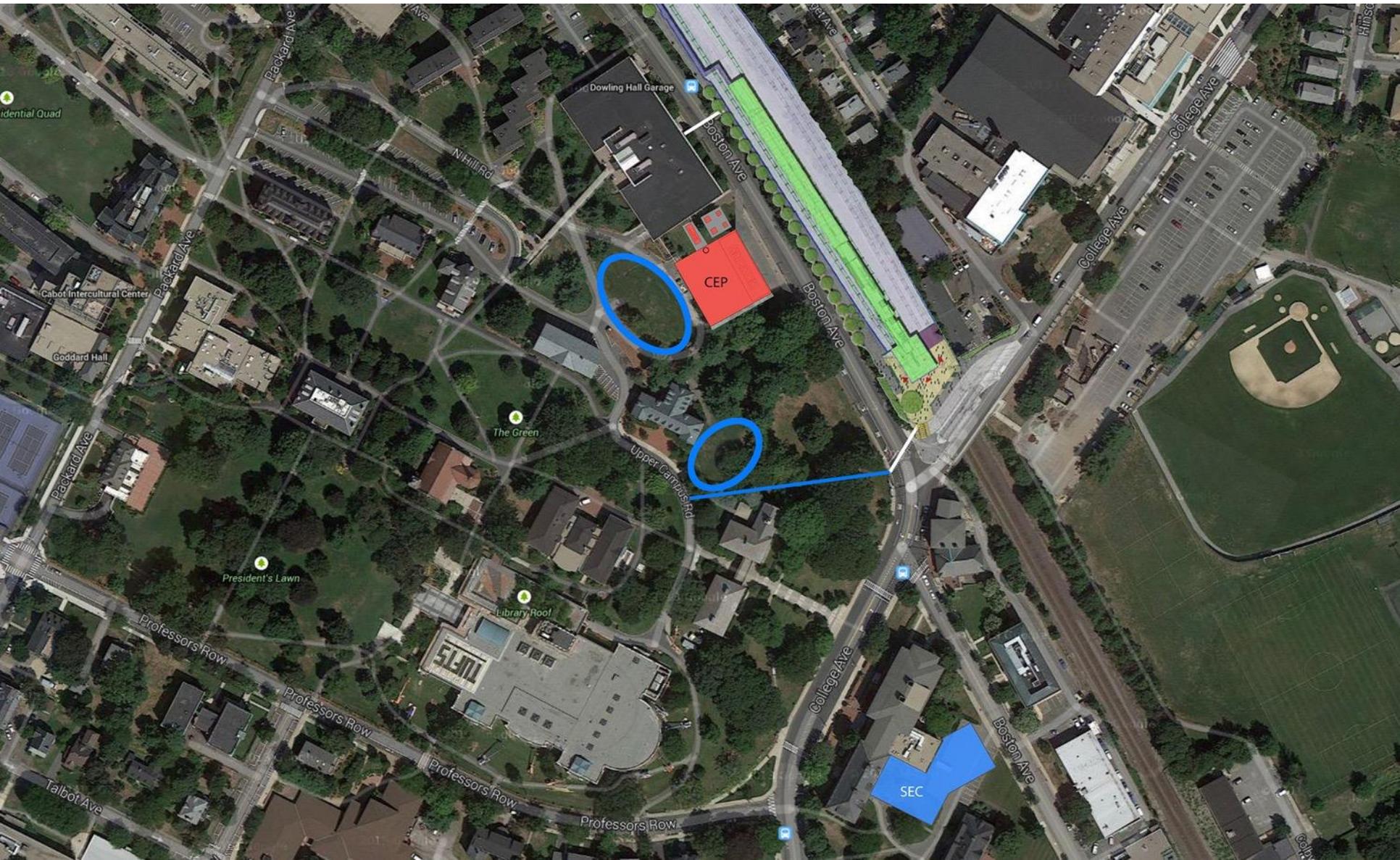
# Campus Energy Plant

- Campus Considerations – Acoustical area of influence includes campus and buildings across Boston Ave.
- Stack height influenced by locations of buildings with operable windows



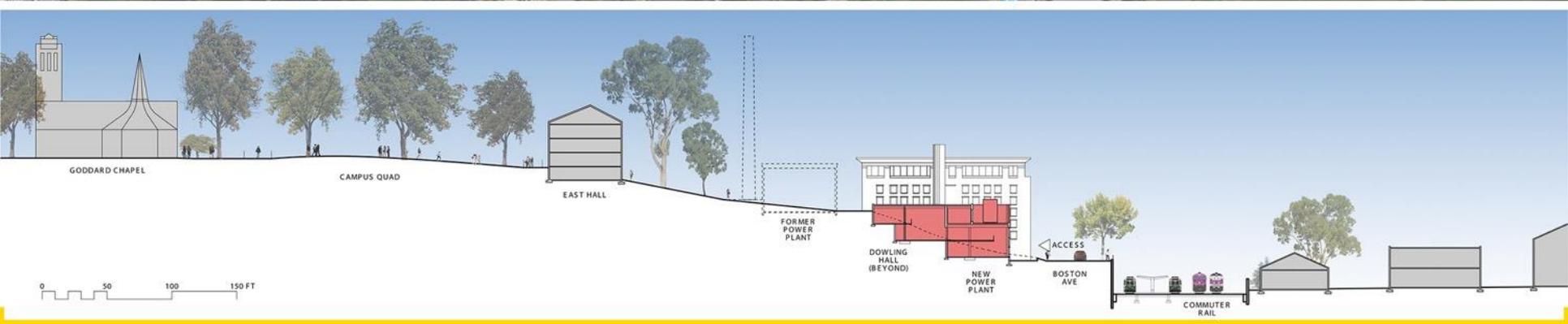
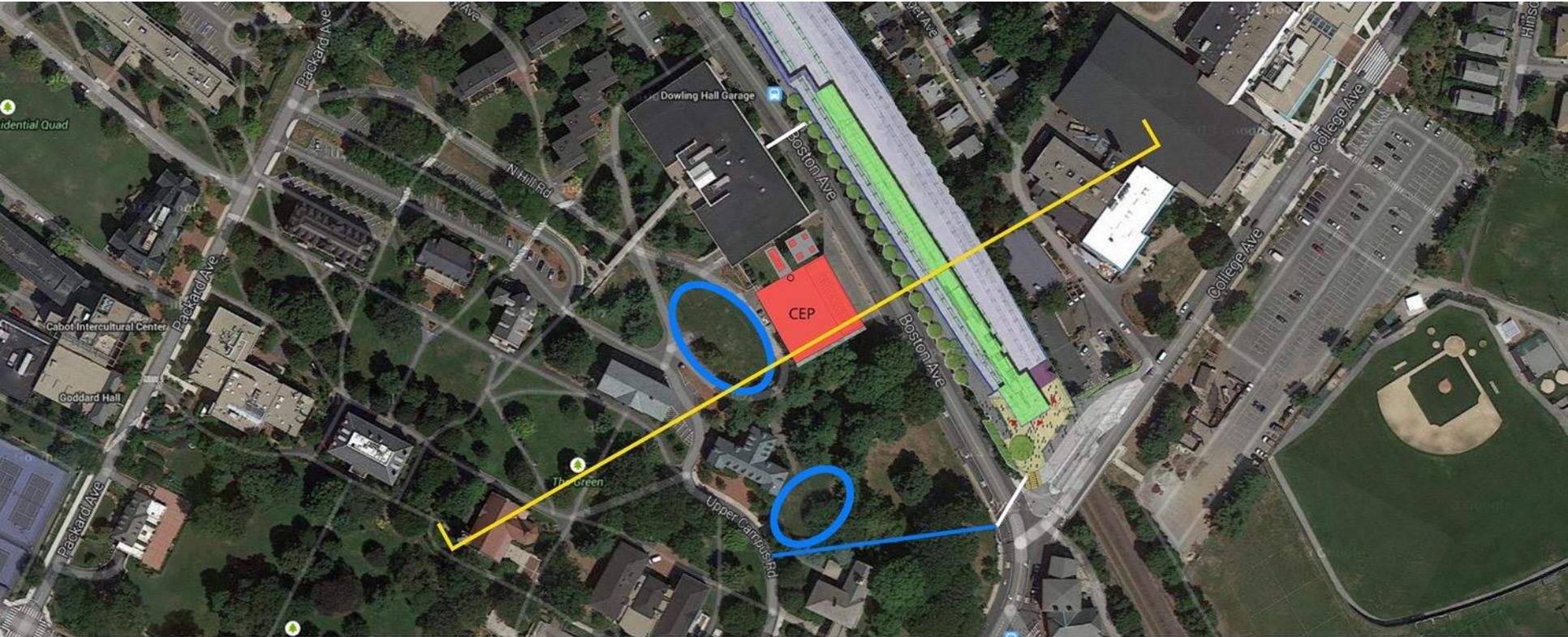
# Campus Energy Plant

Campus Master Plan Development – Creates Increased Real Estate Values with new sites and improved views  
– Future MBTA Greenline Station at College Avenue, new pedestrian access



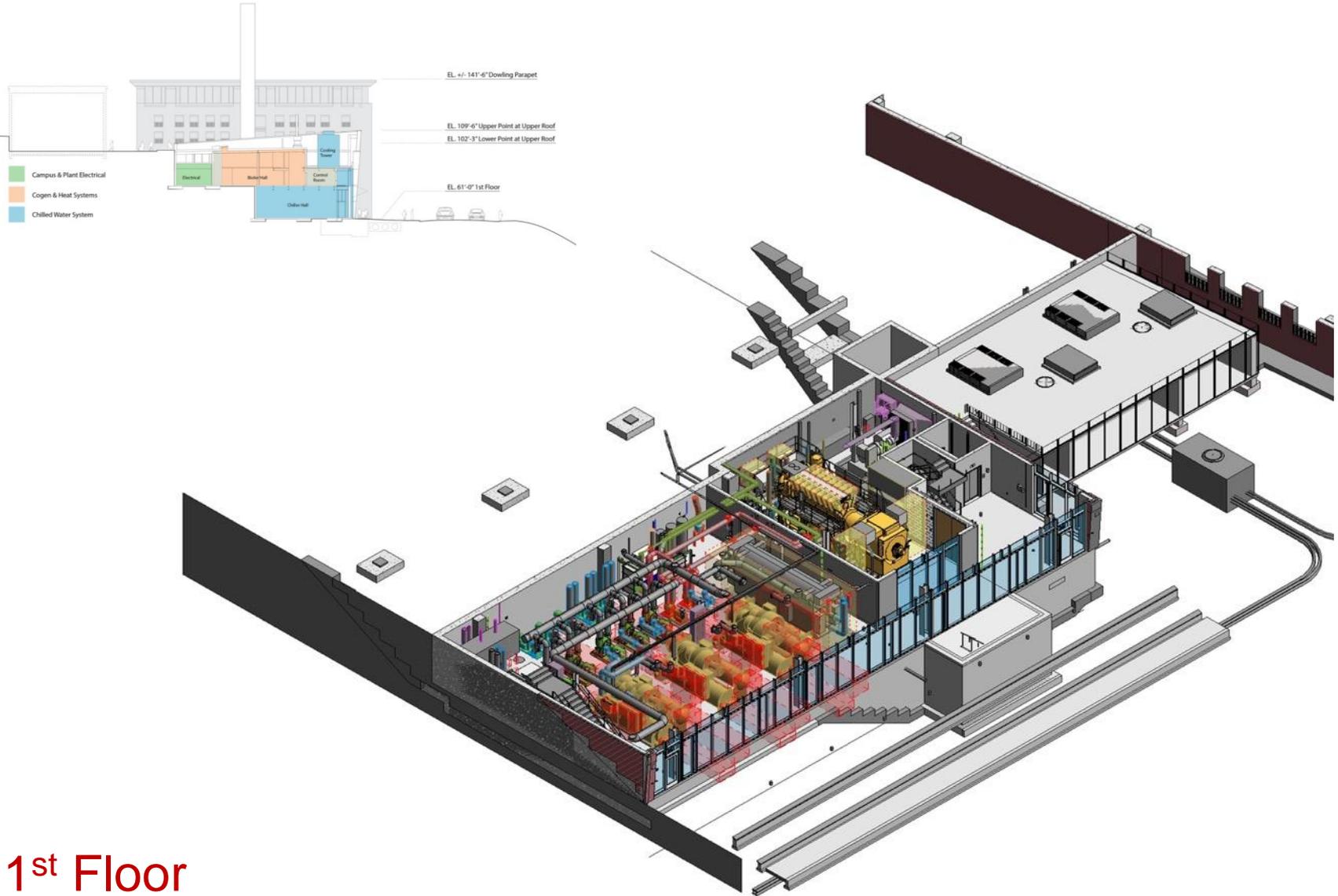
# Campus Energy Plant

Campus Site Section – Improved views from Campus Quad and from Dowling Hall Visitors Center,  
- Reduced truck traffic on North Hill Ave and Loop Road



# Campus Energy Plant

First Floor Chiller Hall and Reciprocating Engine Room  
Showing Vehicle Apron and NGRID Transformer Terrace Beyond

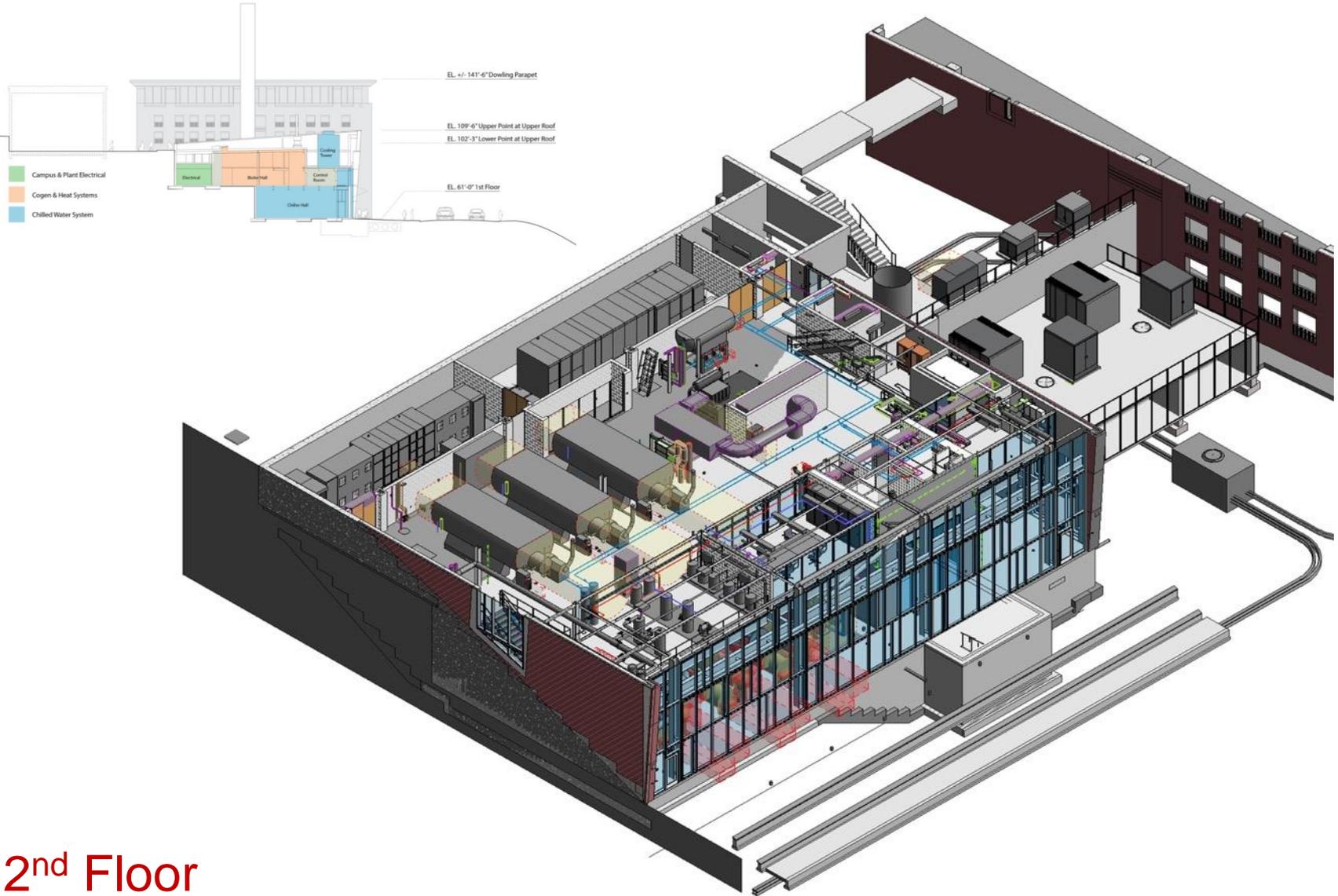


1<sup>st</sup> Floor

# Campus Energy Plant

Second Floor with Boilers, HRSG, Plant and Campus Electric Rooms

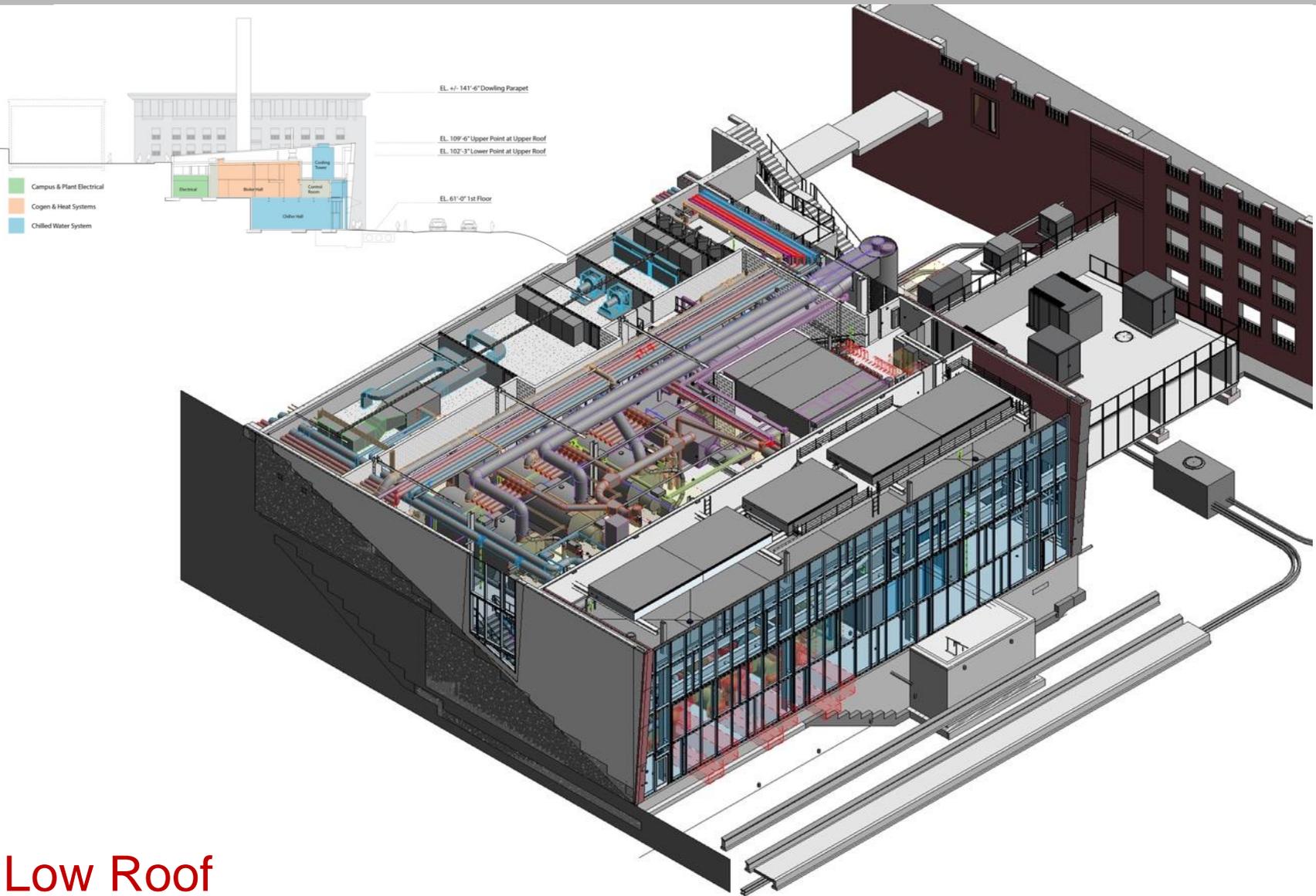
Control Room, Lockers and Restrooms, Meeting Room and NGRID transformers and Meter Cabinets Beyond



2<sup>nd</sup> Floor

# Campus Energy Plant

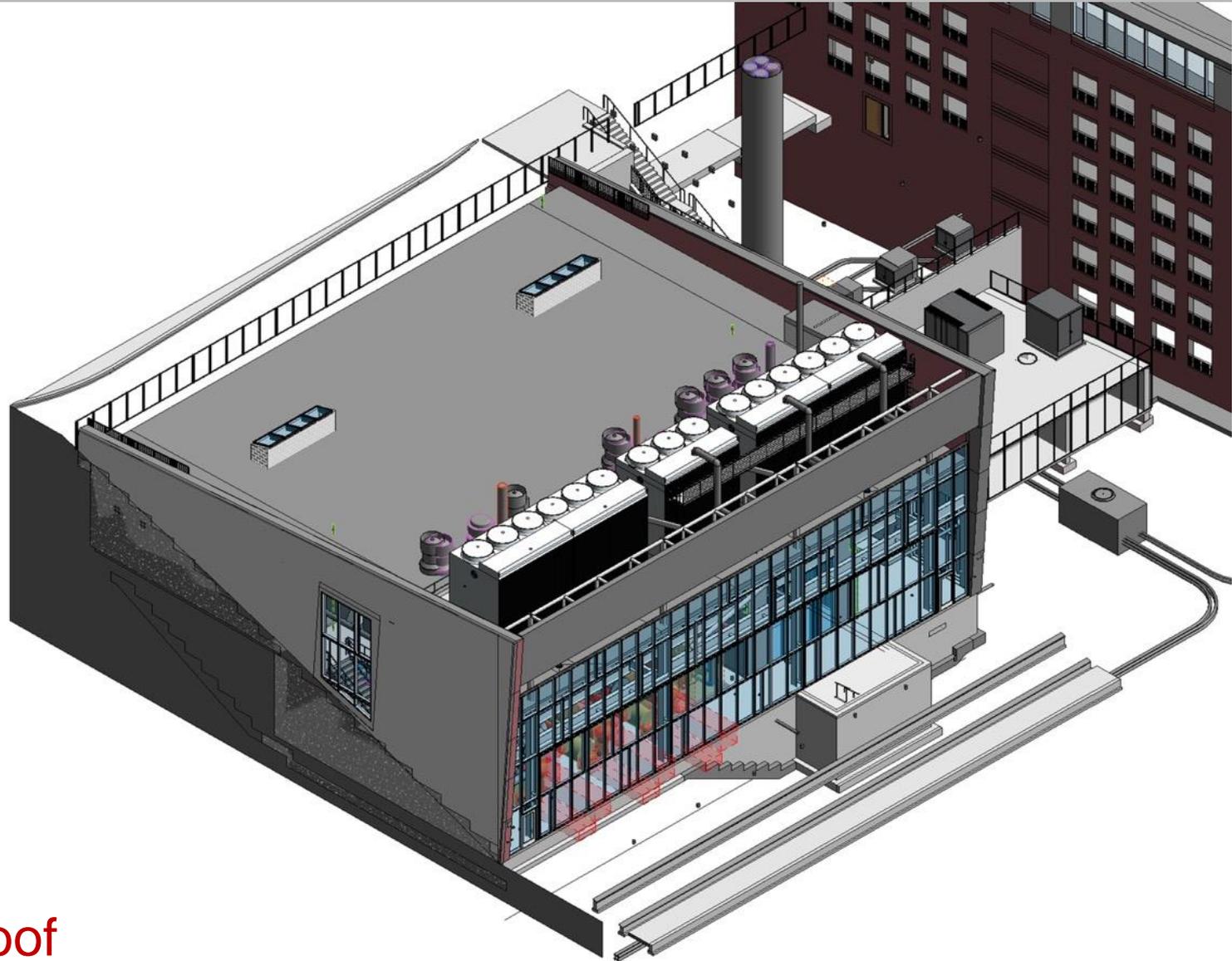
Lower Roof Level with Cooling Tower Basins, Upper Boiler Hall Piping, Air Plenum and Site Utilities Exits



Low Roof

# Campus Energy Plant

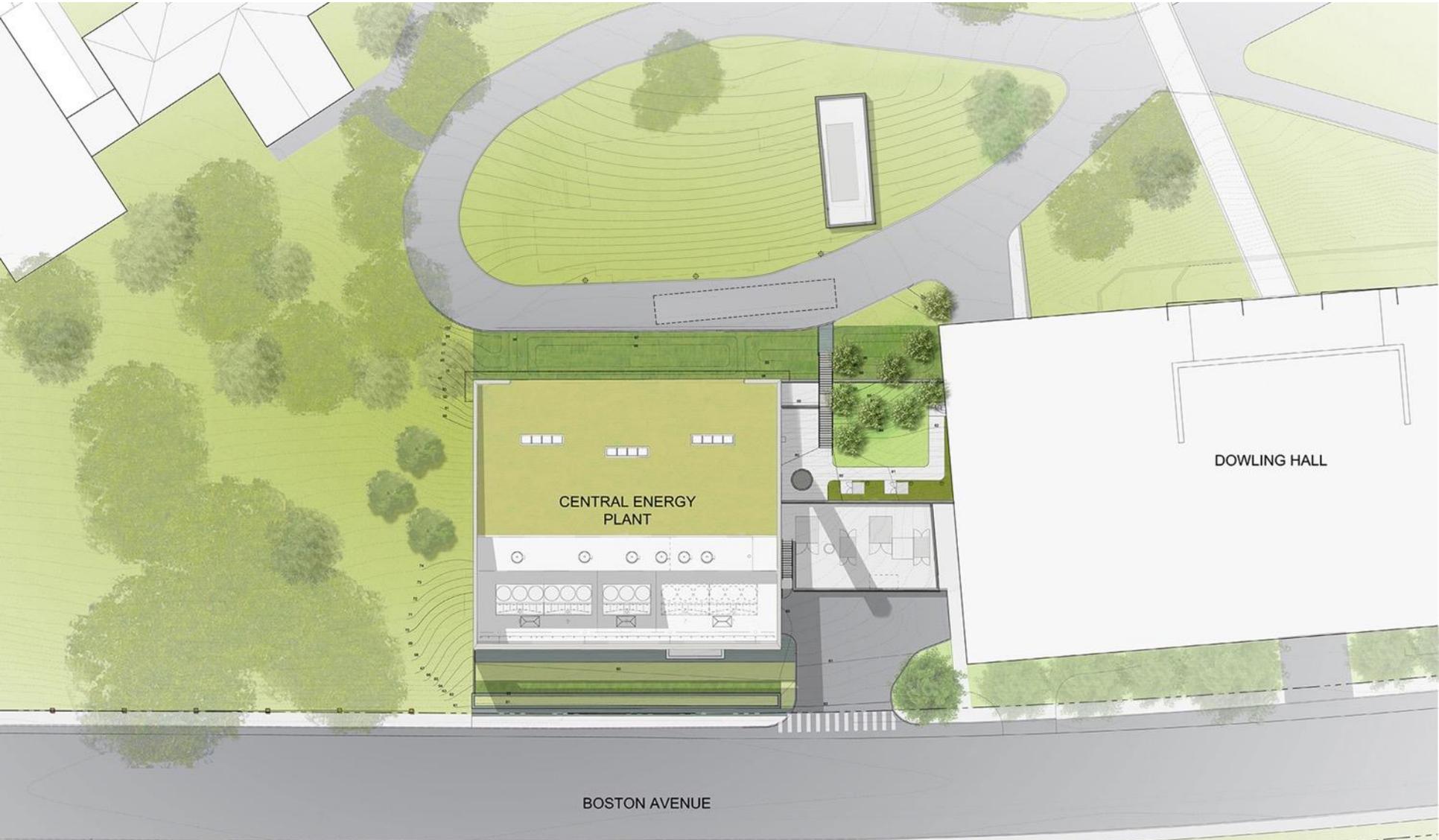
Upper Roof Level with Cooling Tower Full Buildout, Fans and Acoustic Baffle



High Roof

# Campus Energy Plant

## Site Plan with Green Roof Add Alternate



# Campus Energy Plant

View from Boston Ave.



# Campus Energy Plant

View from Boston Ave



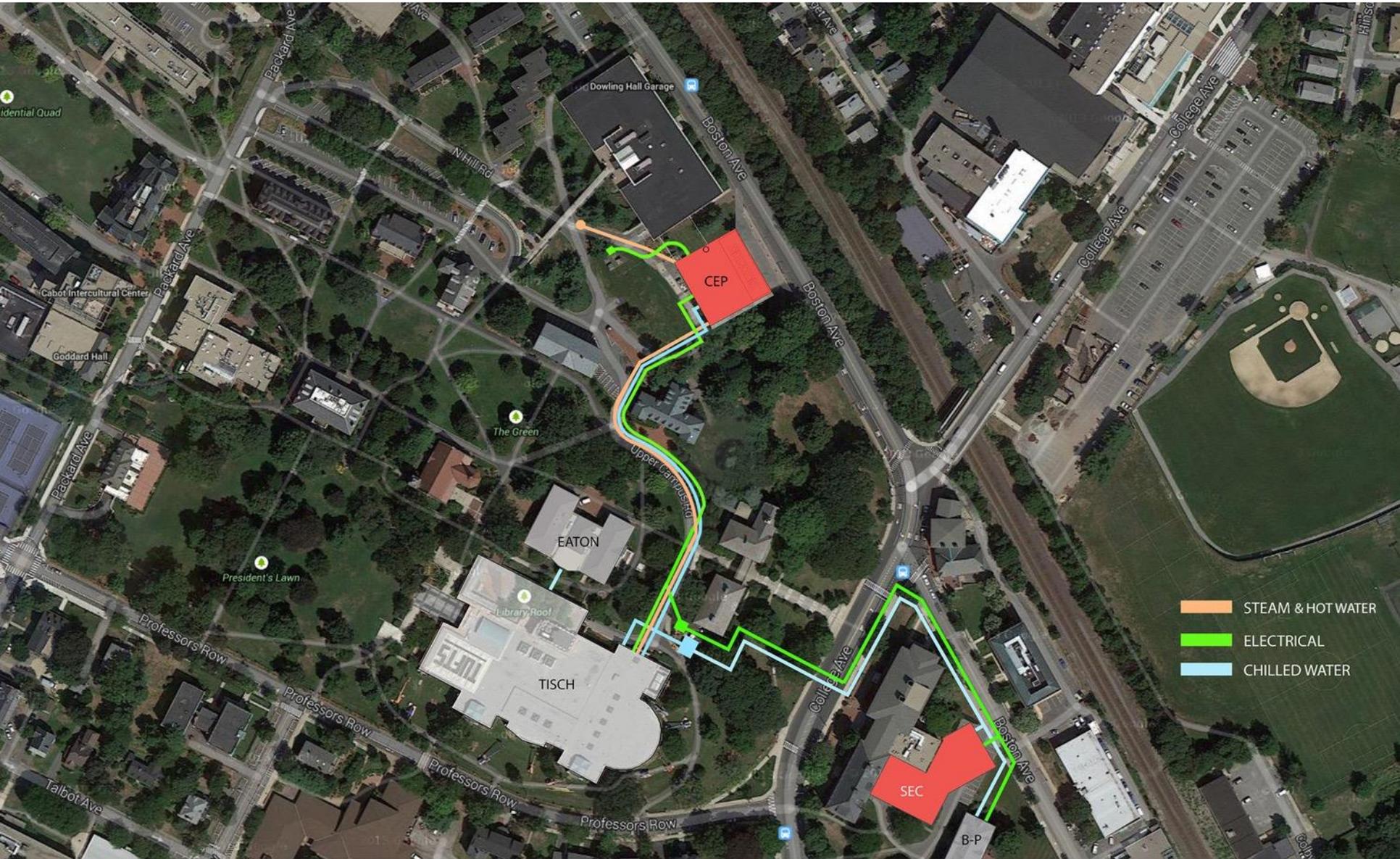
# Campus Energy Plant

Roof Level Pedestrian Bridge View with Acoustic Wall and Green Roof Add Alternates



# Campus Energy Plant

## Site Distribution for Steam, Hot Water, Electrical, and Chilled Water





# Campus Energy Plant

Construction is underway



# Campus Energy Plant

Construction is underway



# Campus Energy Plant

Construction is underway



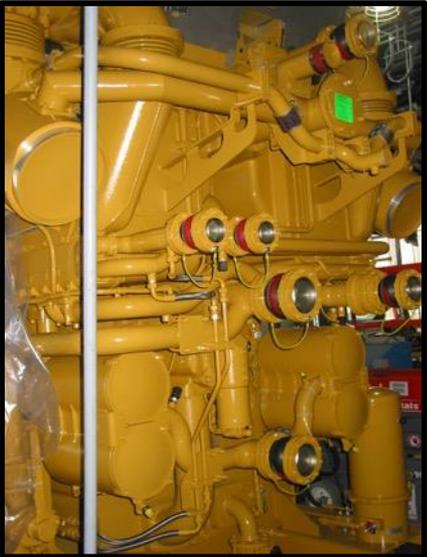
# Campus Energy Plant

Construction is underway



# Campus Energy Plant

Construction is underway



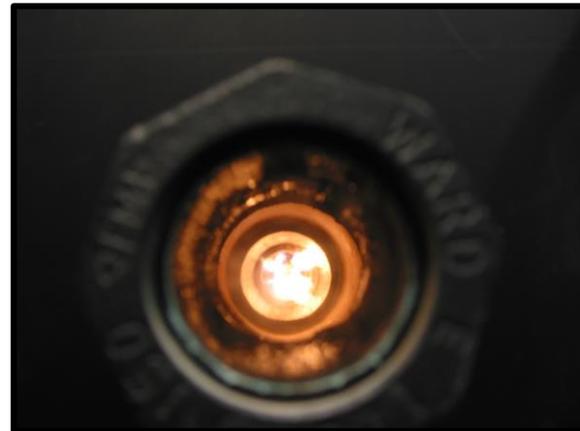
# Campus Energy Plant

Construction is underway



# Campus Energy Plant

Construction is underway



### Project Lessons Learned:

- Selection of Architect, Engineers, Construction Manager, and Owner's Project Manager
- Schedule & commitments to provide services – steam, chilled water, etc.
- Budget and contingency
- Owner purchased equipment
- Value of BIM

### *Project Operational Highlights:*

- New Plant includes:
  - On site electrical generation (4MW gas fire reciprocating engine)
  - Supplemental boilers (75 Kpph)
  - Central chilled water system (1,400 tons)
- Enhanced Sustainability
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