Union College

Campus Resiliency, Efficiency and a Reduced Carbon Footprint

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CampusEnergy2020
THE POWER TO CHANGE
FEBRUARY 10-14 ▲ SHERATON DENVER DOWNTOWN ▲ DENVER, CO

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Union College Energy Master Plan

- **NYS Policies & Programs**
  - Reforming the Energy Vision (REV) Initiative
  - NYSERDA Energy Programs
  - REV Campus Challenge
  - Roadmaps Technical Assistance Program
    - Provided funding for Union College to develop an Energy Master Plan

nyserda
Energy. Innovation. Solutions.

Reforming the Energy Vision REV

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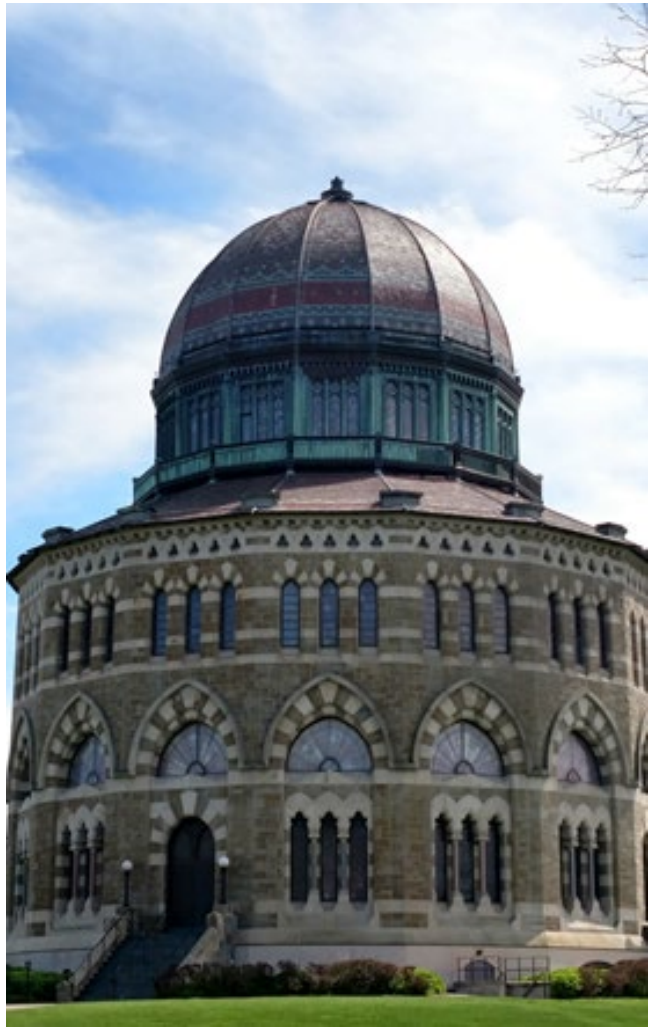

- **Campus Overview**
  - Founded 1795
  - First Planned Educational Campus in US
  - More than 120 Buildings on Main Campus
  - 2.2 Million Gross Square Feet
  - $2.0-2.5MM/year Utility Expenditure
  - 1.8 MW CCHP Plant (2016)
  - New Integrated Science & Engineering Complex
  - 14 Major Capital Projects in 10 Years
  - Future Campus Expansions
  - Dynamic Energy System on Campus

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- **Energy Master Planning Overview**
  - Identify the Need – Why Develop an EMP?
    - Carbon Reduction Goal
    - Future Growth Targets
    - Consolidation of Focused Projects
    - Campus Architectural Master Plan Alignment
  - Identify Key Stakeholders
    - Facilities
    - Finance
    - Residence Life
  - Set Path for Execution
    - Expect Path to Change Course

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- **Our Planned Course**
  - **Phase 1 - Data Collection/Baseline Assessment**
    - High-Level Benchmarking
    - Review Central Plant Operation
    - Rank Buildings by Energy Use, Energy Cost & Level of Opportunity
    - Host Charrette with Stakeholders to Review Findings and Focus Phase 2 Efforts
  - Phase 2 – Goal Setting & ECM Analysis
  - Phase 3 – Rank Initiatives & Recommendations for Implementation

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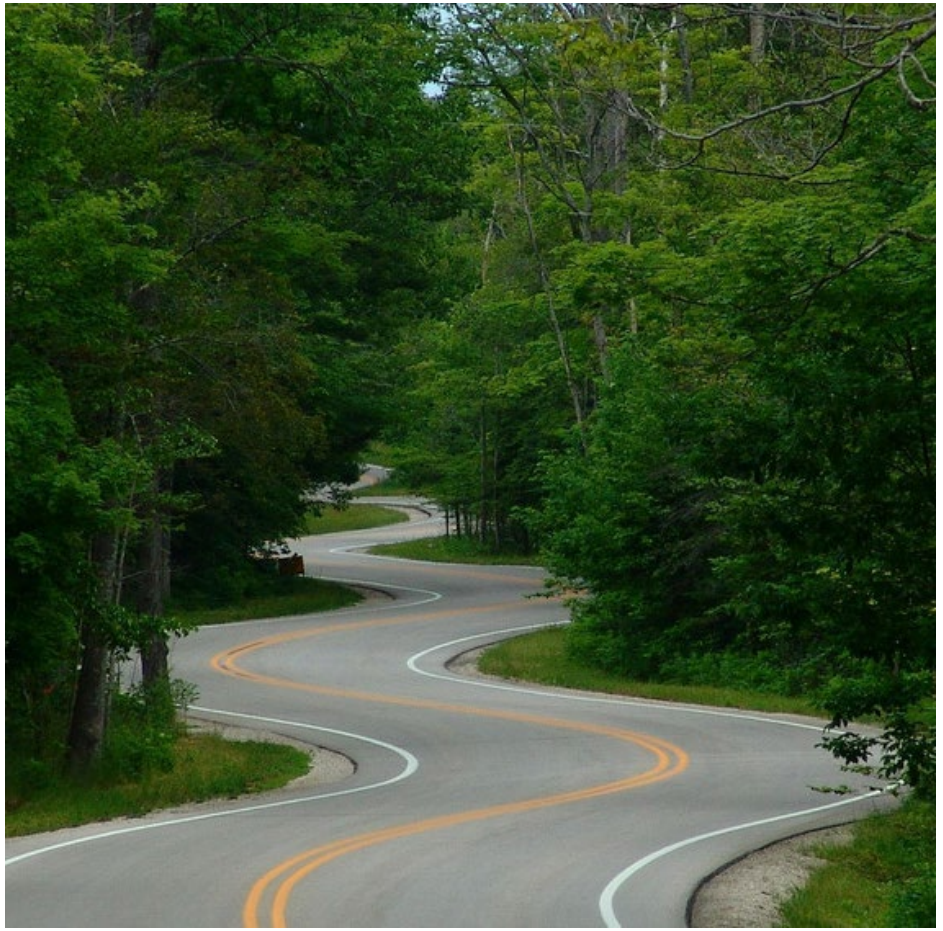
- **Phase 1 – Initial Benchmarking**
  - Set Project Boundaries – On-Campus Buildings
  - Perform Campus Utility Analysis & Benchmarking
  - Target High-Energy Users
  - Review Previous Energy Audits & Projects
  - Site Walkthroughs – Develop Initial ECM Opportunity List



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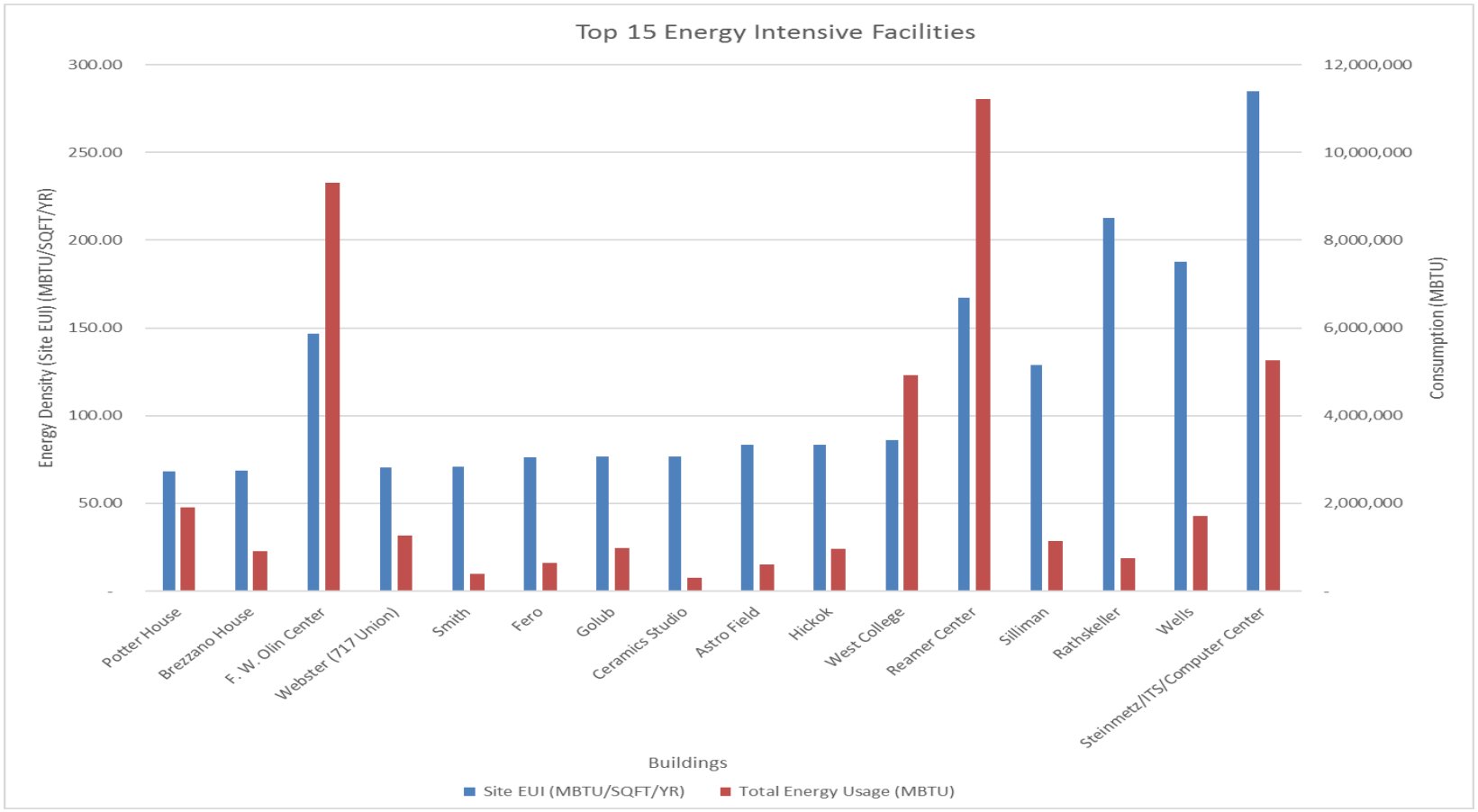
- **Phase 1 – EUI Review**



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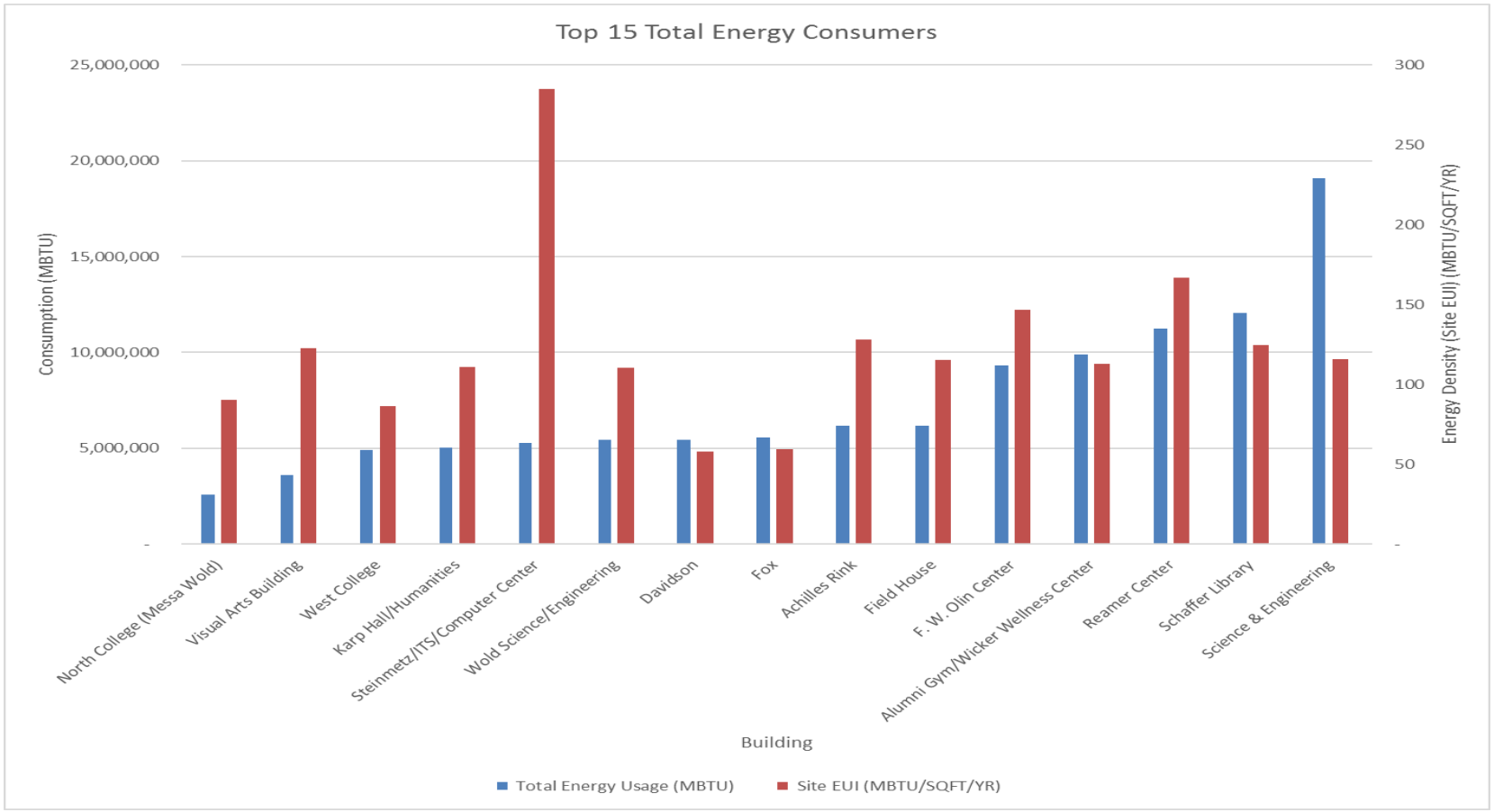
- **Phase 1 –Total Energy Review**



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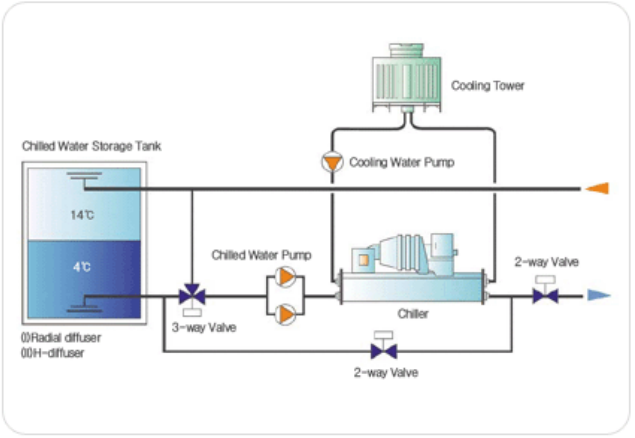

- **Phase 1 – Central Plant Opportunities**
  - CCHP Plant Expansion
  - Organic Rankine Cycle
  - Expand Chilled Water Usage
  - Chilled Water Storage
  - Battery Storage
  - Satellite CCHP for Ice Rink
  - Satellite Dorm Mini-Plant Microgrid

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- **Phase 1 – Sample Building Opportunities**
  - Reamer Campus Center – 3rd Highest Energy User
    - Install LED Lights
    - Install Lighting Controls
    - Install Destratification Fans
    - Install Demand Control Ventilation
    - Install Condensing DHW Heater
    - Replace Pneumatic Controls
    - Install Ultra-Low Flow Water fixtures
    - Insulate HW Piping
    - Install Kitchen Hood Controls
    - Replace Domestic Booster Heater
    - Install Walk-in Freezer Controls
    - Install Daylight Sensors

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- **Phase 1 – Sample Building Opportunities**
  - Hickok House – 30th Ranked Energy User
    - Install condensing DHW heater
    - Install VFDs on HHW pumps
    - Install condensing boiler
    - Install LED lights
    - Install lighting controls
    - Insulate HW pipes

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- **Phase 1 – Conflicting Building Opportunities**
  - Fox, Davidson, Webster & West Buildings
    - Each building had significant ECMs identified
    - All buildings part of current plan for Mini-Plant
    - Coordinate Demand-Side ECMs with Mini-Plant
    - Review Options with Stakeholders

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- **Phase 1 – Key Takeaways**
  - Overall Campus Energy Consumption on Increasing Trend (campus expansion)
  - Facility is working to increase use of CCHP to Improve Efficiency
  - Campus NG Usage Increase due to CCHP
  - Electricity Cost has Significantly Reduced due to CCHP
  - Ongoing Demand-Side Energy Efficiency Efforts Continue
  - Most “Low-Cost” and Some Higher Capital Efficiency Projects Completed
  - Facility Continues to Evaluate and Consider Cutting Edge Technologies

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- **Our Planned Course**
  - Phase 1 - Data Collection/Baseline Assessment
  - **Phase 2 – Goal Setting & ECM Analysis**
    - Conduct Charrette with Stakeholder Team
    - Identify Goals & Strategies
    - Evaluate ECMs for Feasibility
    - Identify Scope for More Detailed Study (separate FlexTech Study)
  - Phase 3 – Rank Initiatives & Recommendations for Implementation

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- **Phase 2 – Stakeholder Charrette**
  - In-depth presentation on Phase 1 Efforts
    - Recap of Benchmarking Efforts
    - Overview of ECMs Identified
    - Team Identification of Goals & Strategies
    - Priority Ranking of Goals & Strategies

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- **Phase 2 – Charrette Team**
  - Associate Director of Facilities, Utilities Management & Construction
  - Sustainability Coordinator
  - Manager of Central Plant and Cogeneration
  - Director of Facilities & Planning
  - Vice President for Administration and Finance
  - Board of Trustees Members
  - Central Plant Intern
  - Students

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- **Phase 2 – Defining Goals & Strategies**

Net Zero Carbon Campus by 2060

Where do we want to be in 5, 10, 20 years?

How will we get there?

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- **Phase 2 – Primary Goals Identified**

Votes	Goal Name
6	**Implement an energy education program**
5	**Large-scale (> 1 MW) renewable opportunities (on or off campus; possibly leased; solar, geothermal, etc.)**
4	**Energy Use Intensity (EUI) reduction by __% by year 20__ (TBD)**
3	**Full-campus resiliency (in case of blackout) (steam generation, add 1 MW, optimize current plant and efficiency)**
3	Net zero energy use by year 20__ (TBD)
2	BTU reduction by __% by year 20__ (TBD)
1	Reduce chiller $/kW

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- **Phase 2 – Primary Strategies Identified**

Votes	Goal Name
4	Implement control strategies (e.g., lights, HVAC, kitchen equipment)
4	Integrate sustainable energy into capital project policy (talk about options and alternative funding at decision making stage)
3	Connect more buildings to the Central Plant
2	Incorporate energy projects into multi-disciplinary curriculum
2	Participate in NYSERDA's Onsite Energy Manager program
1	Centralize plants where possible (geothermal, boilers, power, etc.)
1	Geothermal
1	Ice/thermal energy storage, peak demand shaving
1	Improve energy data granularity, transparency, and accessibility
1	Incorporate ROI into energy studies
1	Photovoltaic/solar canopy, College Park Hill parking lot, Fieldhouse's south face

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- **Next Steps**
  - Working to Schedule Phase 2 Charrette
    - Finalize EMP Goal Values
    - Begin Acting on Immediate Action Items
    - Share EMP Strategy Results (ECMs, etc.)
  - Prioritize and Rank Strategies
  - Begin Detailed Study for Select Buildings/Measures
  - Standalone Studies as necessary
  - Engineering Support as necessary

Questions?