DePauw University

Campus Energy Master Plan (CEMP)

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DEPAUW
UNIVERSITY
Est. 1837

HISTORICAL CONTEXT

2016 - Issues and Opportunities

- A need to progress DePauw carbon neutrality commitment
- Increased University financial challenges – need for energy savings
- Growing deferred maintenance burden for physical assets

Final CEMP Objectives

1. **Achieve long-term energy cost reduction for the University**
2. **Advance the University's carbon neutrality commitment**
3. **Reduce the University's existing deferred maintenance burden**

CEMP – First Steps

Dec 2016

RFP for external partner issued

Mar 2017

Partner chosen (EcoSystems) and campus study began w/ significant influence from DePauw

Jun 2017

CEMP scope, cost, and benefits formally defined & presented for BOT approval

CEMP

Scope

I. District Energy
   I. Campus heat energy conversion from steam to hot water
      I. More efficient process and equipment
      II. Enables future renewable opportunities
      III. Impacts NG, electricity, and water use
      IV. Large impact to deferred maintenance (boilers & underground piping)
   II. Campus cooling energy efficiency upgrade
      I. More efficient equipment
      II. Deferred maintenance impact (chillers & underground piping)
II. Campus lighting LED conversion
III. HVAC controls optimization
   I. Scheduling, VFDs, CO2 monitoring, etc.
IV. Low flow water fixture deployment
V. ITTC solar project

Cost

$15,185,000

Benefits

Annual energy savings = $780,000

Annual maintenance savings = $70,000

Deferred maintenance savings = $5,000,000

Annual GHG reduction = 7,400 MT

CEMP – District Energy Project

May 2018 – Sep 2019
Campus district energy underground distribution piping install

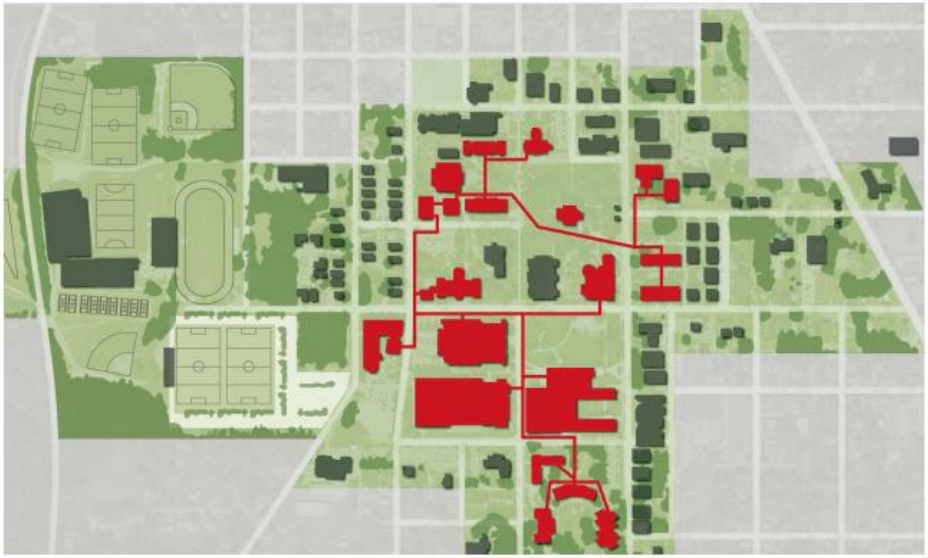
Nov 2019 – Apr 2020
Campus Chiller Plant construction

May 2020 – Sep 2020
Campus Heat Plant construction

Nov 2019 – Sep 2020
Building Tie-Ins

Apr 2020 – Mar 2021
Central plant controls install and optimization

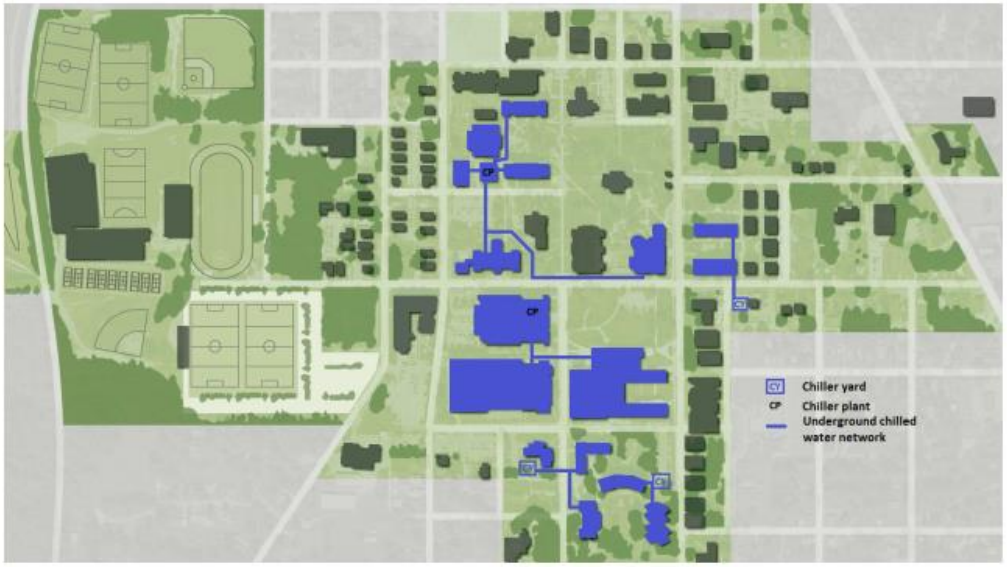
CEMP – District Energy Project



The steam network and buildings fed by the central heating plant

- New Central Heat Plant serves 21 campus buildings
- New underground poly based piping
- New boilers, pumps, and building tie-in systems

- New Central Chiller Plants serve 17 campus buildings
- Eight (8) less efficient air cooled chillers removed from service & centralized to new & more efficient water cooled chillers



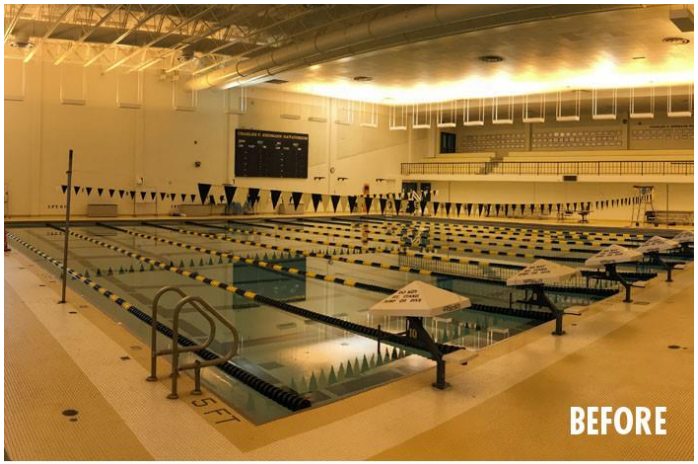
The cooling network

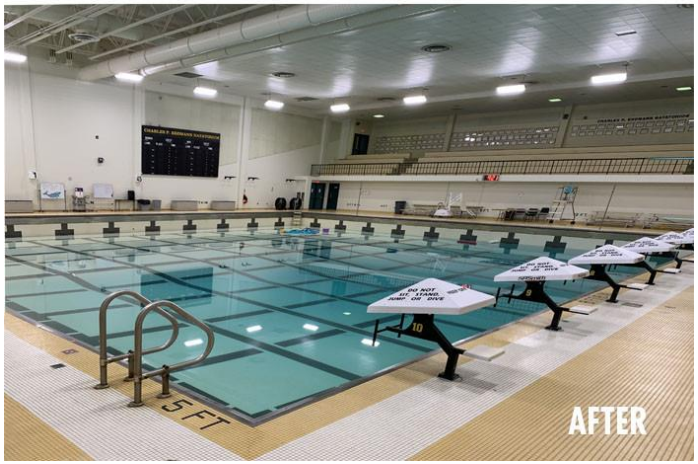
CEMP – LED LIGHTING

- May 2019 – Sep 2019 - Campus LED lighting conversion
  - ITTC and Lilly Natatorium were largest projects
- Only approx 75% campus conversion
- Many bulb replacements instead of fixture replacements
- Need to continue this work (piecemeal)

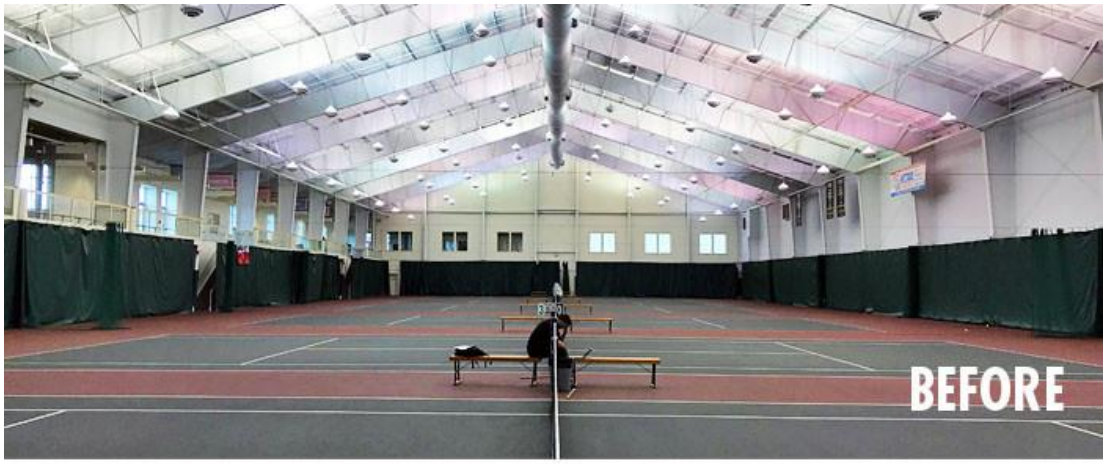
CEMP – LED LIGHTING

LILLY NATATORIUM





ITTC - TENNIS



CEMP – HVAC Controls Optimization

- Jan 2020 – Dec 2020
  - AHU and pump VFD additions
  - HVAC scheduling
  - Use of occupancy and CO2 sensors

CEMP – Low Flow Water Fixtures

- Jun 2019 – Aug 2019
- Low flow toilet, sink, and shower fixtures were deployed
- Feedback reduced campus scope to sink and shower fixtures

CEMP – Indoor Track & Tennis PV Project

- Aug 2019 – Nov 2019 ----- Apr 2020 – May 2020
- Delays:
  - Roof structural reinforcement requirements
  - Material delays
  - Safety concerns
- "Grid-tied" installation
- 240 KW_{DC} array
- 30% annual utility offset (avg $34,000 annual savings)
- Dashboard available to campus

ITTC PV Project

QUESTIONS ????