Phasing Required for Adding CHW Capacity and Replacing Aging Infrastructure for an Urban Campus
AGENDA

► Overview
► Campus Growth
► Effects of Growth
► Solutions
OVERVIEW

Oakland Campus
- Enrollment: 28,000 Students
- 4 Chilled Water Plants
- Installed CHW Tonnage
  - 31,200 TOTAL

<table>
<thead>
<tr>
<th>PLANT</th>
<th>TONS</th>
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<tbody>
<tr>
<td>PITT</td>
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<tr>
<td>POSVAR</td>
<td>12,800</td>
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<tr>
<td>PETERSEN</td>
<td>5,200</td>
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<tr>
<td>UPMC</td>
<td></td>
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<tr>
<td>SCAIFE</td>
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<tr>
<td>BST</td>
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OVERVIEW

► CHW PROGRAM

• NEW CHILLED WATER PLANT
  o 15,000 TONS

• RENOVATIONS TO EXISTING CHILLED WATER PLANT
  o OPERATIONAL AND EFFICIENCY IMPROVEMENTS

• EXTENSIVE DISTRIBUTION PIPING
CAMPUS GROWTH

► Original Campus CHW Plan

• CHW Plant designed to be in the center of the loads (1962)
CAMPUS GROWTH

- Original Campus CHW Plan
  - CHW Plant designed to be in the center of the loads (1962)
CAMPUS GROWTH

- Original Campus CHW Plan
  - CHW Plant designed to be in the center of the loads (1962)

- 1992 Plan
  - CHW density shifted North and East

- Now & Future
  - More Growth toward the North and East
EXISTING DISTRIBUTION
EXISTING

- POSVAR
- PETERSEN

DISTRIBUTION

UPPER LOOP

LOWER LOOP
EXISTING DISTRIBUTION SYSTEM

EFFECTS
EXISTING DISTRIBUTION SYSTEM

14 FPS

ΔT = 5.0

ΔP = 24
ΔT = 3.5

HIGH VELOCITY

PIPE EROSION
LEAKS

EXCESIVE PRESSURE DROPS

INCREASED DISTRIBUTION Pressures

PUMP $$
LOW ΔT

$$ SHUTDOWNS
PHASING DISTRIBUTION PIPING
FUTURE

NEW REC CENTER

• POSVAR

• PETERSEN

• NEW CHILLER PLANT

• UPMC
FUTURE

NEW REC CENTER

- POSVAR
- PETERSEN
- NEW CHILLER PLANT
- UPMC
DISTRIBUTION

FUTURE

• POSVAR

• PETERSEN

• NEW CHILLER PLANT

• UPMC
DISTRIBUTION

- MID CAMPUS

EXISTING

- ACCESS VIA UNIVERSITY DR.
DISTRIBUTION

- MID CAMPUS

- NEW REC CENTER

- CONSTRUCTION/DEMOLITION

- LIMITED ACCESS

- NEW ROAD DESIGN
DISTRIBUTION

• MID CAMPUS

NEW REC CENTER

• CONSTRUCTION/DEMOLITION

• LIMITED ACCESS

• NEW ROAD DESIGN
DISTRIBUTION

- MID CAMPUS

EXISTING SERVED BY

- POSVAR
- PETERSEN
- NEW CHILLER PLANT
- UPMC

FIRE DEPARTMENT ACCESS
DISTRIBUTION

- MID CAMPUS

EXISTING

SERVED BY

- POSVAR
- PETERSEN
- NEW CHILLER PLANT
- UPMC
DISTRIBUTION

• MID CAMPUS

NEW REC CENTER

SERVED BY

• POSVAR

• PETERSEN

• NEW CHILLER PLANT

• UPMC
DISTRIBUTION

- MID CAMPUS

NEW REC CENTER

SERVED BY

- POSVAR

- PETERSEN

- NEW CHILLER PLANT

- UPMC
DISTRIBUTION

• MID CAMPUS

FUTURE SERVED BY

• POSVAR

• PETERSEN

• NEW CHILLER PLANT

• UPMC
FUTURE

- POSVAR
- PETERSEN
- NEW CHILLER PLANT
- UPMC
RESULTS

MODELED

- VELOCITY IMPROVEMENTS
- PRESSURE DROP IMPROVEMENTS
- POSVAR CHILLER PLANT MODIFICATIONS

VELOCITY
14 FPS → 6 FPS

PRESSURE DROP
28 PSI → 11 PSI

POSVAR KW/TON
1.049 → 0.69
ADDED CAPACITIES

► NEW CHILLER PLANT
  • 15,000 Tons Total
  • 2,500 Ton Chillers
  • 5 kV Substation

► PLANT AVG KW/TON
  • 0.557
COORDINATION

➤ Adjacent Properties
➤ Internal Departments
➤ Understand Limitations
COORDINATION

► Adjacent Properties
  • Campus & Health Care
    • UPMC Renovations
    • Capacity Study incorporating both Campuses
  • Share N+1 Equipment
  • Taps for future connection

► Internal Departments

► Understand Limitations
COORDINATION

► Adjacent Properties

► Internal Departments
  • Campus Development
    - New building loads / locations
    - Resurfacing roads
  • Electrical
    - 5kV Distribution for future buildings
    - Redundant feeds for major loads
  • Sustainability
    - Rainwater Collection infrastructure
    - EUI, GHG Goals

► Understand Limitations
COORDINATION

► Adjacent Properties
► Internal Departments
► Understand Limitations
  • Allowable / Scheduled Outages:
    • Labs
    • Hospitals
    • Plan for loops for future shutdowns / redundancy
  • Temporary Chiller Connections
  • Fire Department Access
Key Targets from Pitt’s Sustainability Plan:

- Reduce greenhouse gas (GHG) emissions by 50%
- Produce or procure at least 50% of campus electric energy from renewable sources
- Achieve an energy use intensity that is at least 50% below the national average - 120
- Achieve water use intensity that is 50% below the district average
CREATE AMAZING.