Construction Considerations for a CHP Facility Conversion in a Clustered Urban Setting

Charter Street Heating Plant
University of Wisconsin – Madison, WI
Street Plant is one of two power plants run by the university

- Plants serve 43,000 students and 330 buildings
- A true tri-generation plant
- Plant can never afford to go offline for extended periods due to service needs
- Charter Street Plant is on a 3.3 acre brownfield site, surrounded by a bustling urban area:
  - Student housing, urban development, sporting venues, bike path, roads, and a rail line

**Our Mission:** Convert plant from coal to gas without disrupting service to the university.
Scope of Work

$140M Joint Venture with AMEC converting plant from coal to gas.

Demolition scope included:
- Four underground fuel oil tank’s
- Four coal boilers
- Coal handling equipment (yard and internal transfer)
- Two baghouses, stack and ash handling equipment

Installation of the following major components:
- Four ultra low NOx natural gas/fuel oil package boilers
- 71,000 SF for new boiler, control room and water treatment
- Plant of Plant including a 920,000 gal fuel oil storage tank
- Digital controls for both campus heating/cooling plants
- Electrical system upgrades and additions (13.8-KV switchyard)
- Fire protection for the existing plant and expansion

All work completed while the plant remained on line. A prolonged outage was out of the question.
“Before” Aerial Image
Work – Pre-Construction Phase

- Construction of New Facilities
- Maintenance Building
- Demo Facilities Operation Building
Work – Pre-Construction Phase

Removal of 4 Underground Fuel Oil Tanks
Work – Pre-Construction Phase

- Removal of Plant’s Rail Spur
- Removal of Plant’s Rail Siding
- Railroad Mainline
Work – Pre-Construction Phase

Erection of Tower Crane & Mills Street Overpass
Work – Phase 1

Construction of Gas Boiler Building and Fuel Oil Tank

New Fuel Oil Tank
Work – Phase 1 Gas Boiler Building and Fuel Oil Tank
Work – Phase 2

Demo of Coal Handling Equipment, Ash Silo, Baghouse and Chimney
Work – Phase 2 – Coal Yard & Baghouse Demo
Work – Phase 3

Build out of Gas Boiler Building and Installation of Final Two Boilers
Work – Phase 3
Work – Phase 4

Demo of Four Coal Boilers, Installation of New BOP Equipment
Work – Phase 5

Added Water Treatment Building & Roof Top Cooling Tower
Work – Phase 5 - Cooling Tower/Water Treatment Building Installed
Work – Phase 6

Removal of Overpass, Completed Landscaping & Parking Lots
Typical Construction Considerations and Mitigation

- Safety
- Soils
- Groundwater
- Surface water management
- Dust
- Noise
- Weather-Related Planning
- Limited lay-down space required "just-in-time" deliveries to keep the project on schedule
Unique Construction Considerations and Mitigation

- Utilities (gas, electric, cable lines, sewer, water)
- Fuel oil back-up
- Tall Structures Demo
- Traffic
- Campus event planning
- Crane size optimized for scope of work and logistics
- Extensive planning for crane picks
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- **Fuel oil back-up**
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Efficiency in Execution

- Elimination of waste through innovative Lean processes
- Repurposed many materials to add value to the project
- New gas boilers boosted plant's capacity by 80 percent (900,000#/hr steam vs 500,000#/hr steam)
- Efficiency in communication required between project players
- Smooth transition to operations
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Project is seeking LEED Gold certification
Lessons Learned

- Use ILPD processes to keep everyone “in the know” of each other’s work, and accountable as a team player.
- Work with plant personnel to make sure buy-in is early on and continue to verify often.
- In clustered urban settings, plan logistics every day.
- Keep a cross function/cross party management team for rapid decision-making.
- Establish contingency budgets early, and who manages.
- Build consensus plan with all interested parties before committing to price.
- Deploy “just in time deliveries” where at all possible.
Questions