CampusEnergy2019

HILTON NEW ORLEANS RIVERSIDE

February 26 - March 1, 2019 | New Orleans, LA

ARCHITECT OF THE CAPITOL

BURNS McDONNELL

Cogeneration at the US Capitol

Architect of the Capitol

Area Served

AOC Mission: Serve, Preserve, Inspire

AOC employees work every day to ***serve*** Congress and the Supreme Court, ***preserve*** America's Capitol, and ***inspire*** memorable experiences for all who visit the buildings and grounds.

Who We Are

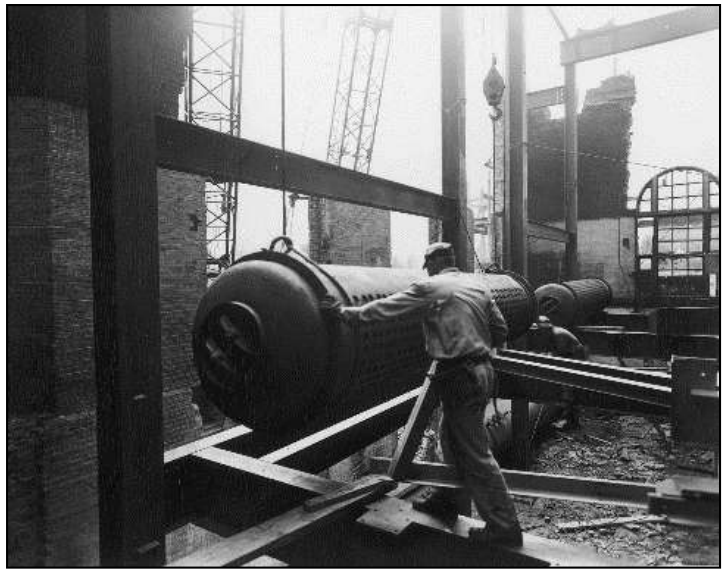
The AOC traces its beginnings to the laying of the Capitol cornerstone in 1793. Our work is rooted in a tradition of unique craftsmanship and ingenuity. 2,100+ employees work behind the scenes to oversee the infrastructure and facilities of the Capitol campus and support congressional operations.

What We Do

We care for 18.4 million+ square feet of facilities, 570+ acres of grounds and thousands of works of art. We oversee an annual budget of approximately $700 million per year and host 5 million visitors annually while serving 30,000 daily occupants around the clock to maintain the Capitol campus.

Project History

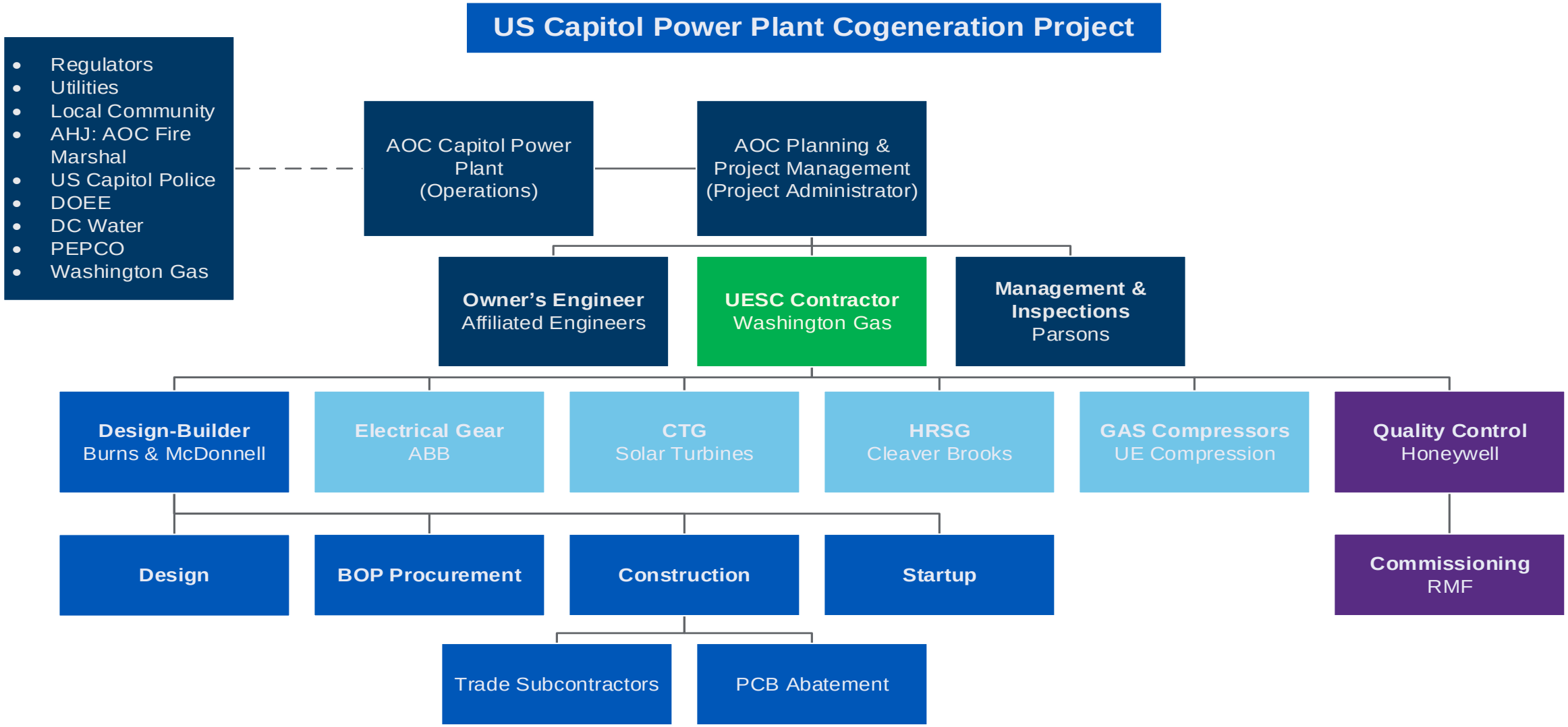
- Capitol Power Plant (CPP) in operation since 1910
  - Additional customers external to Congress
- Old boilers costly to maintain
- Cogeneration selected to address numerous concerns
- Contract vehicle selection
- Initial attempt
- Original design issues



Project Approach

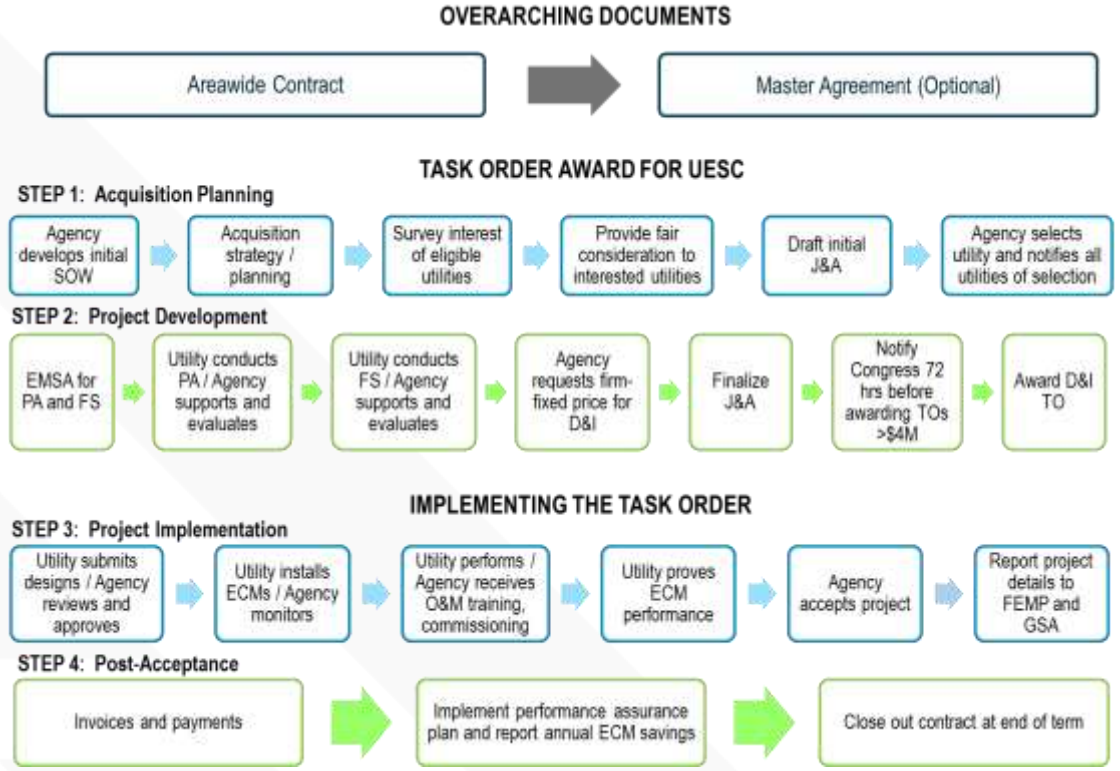
- CPP still in need of means to execute solution
- AOC chose new path
  - Savings vs. performance?
- New vendor
- UESC: Washington Gas
  - EPC Contractor: Burns & McDonnell

US Capitol Power Plant Cogeneration Project



Project Economics

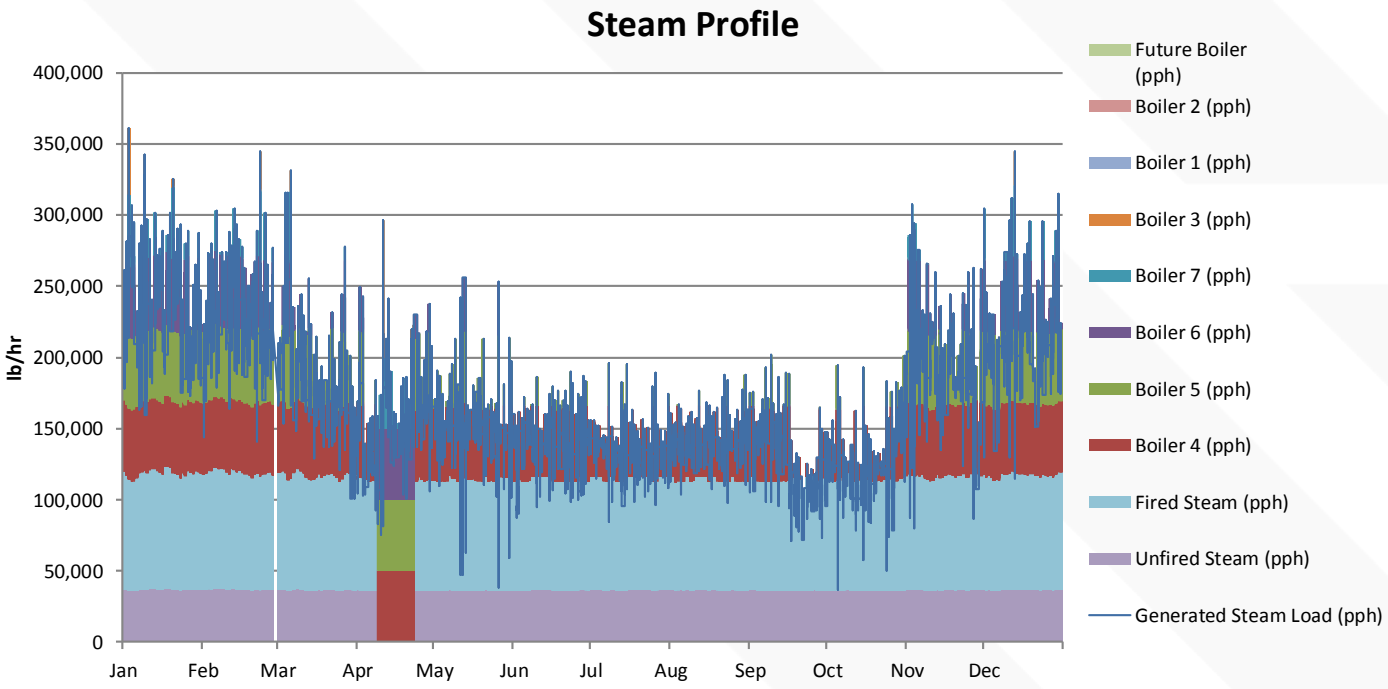
- UESC – “A Utility Energy Service Contract is a limited-source contract between a federal agency and serving utility for energy management services including energy and water efficiency improvements and demand-reduction services.” –US DOE
  - Project capital cost includes UESC fee, paid for through energy savings
- Total Project Value: $57M

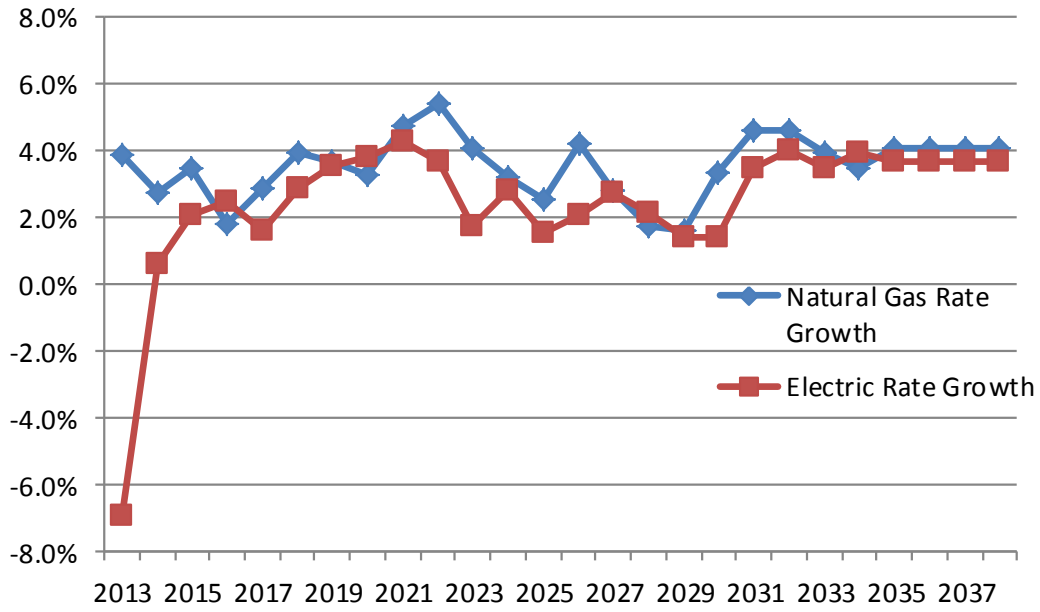


*Utility Energy Service Contract Guide: US DOE FEMP

Project Economics

- Initial Economic Evaluation
  - Energy & Dispatch Modeling Paired with Utility Rate Forecasts per NIST Handbook 135



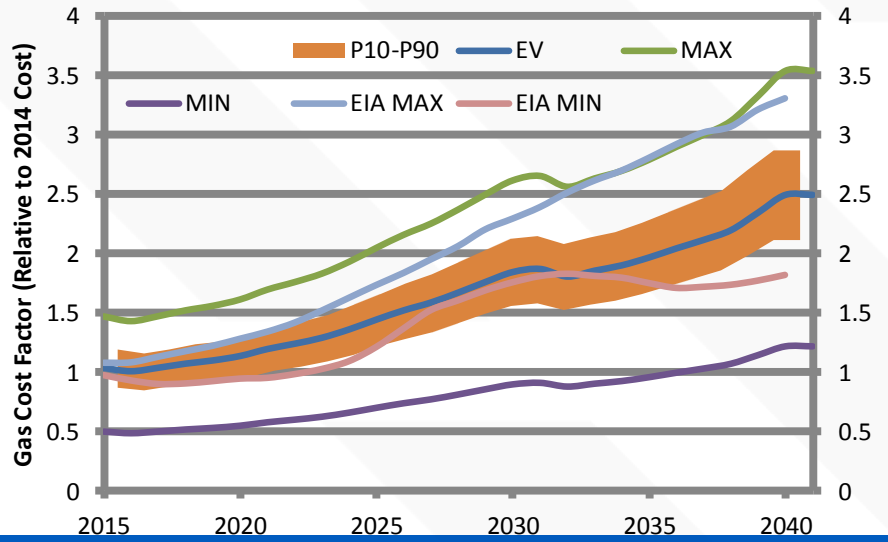


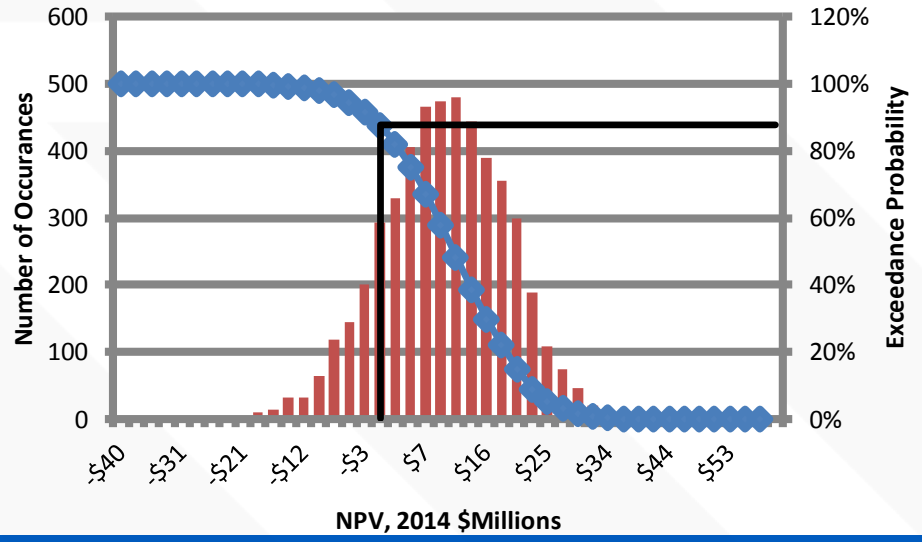
Project Economics

- Present Value of Business-As-Usual Compared to UESC CHP
- Monte Carlo Analysis to Prove Project "Robustness"

AOC CHP ANALYSIS - LIFE CYCLE COST SUMMARY

OPTION NO.	DESCRIPTION	FUNDING	INITIAL COST ($1,000)	ANNUAL OPERATING COSTS				ANNUAL SAVINGS					NET PRESENT VALUE ($1,000)
				NATURAL GAS ($1,000/YR)	ELECTRIC ($1,000/YR)	O&M ($1,000/YR)	TOTAL ($1,000/YR)	NATURAL GAS ($1,000/YR)	ELECTRIC ($1,000/YR)	O&M ($1,000/YR)	TOTAL ($1,000/YR)	PRESENT VALUE OF SAVINGS ($1,000)	
BASE	EXISTING BOILERS	---	---	10,693	8,660	143	19,496	---	---	---	---	---	---
2A	ONE 8.0MW CHP SYSTEM	UESC	56,998	12,695	3,030	459	16,184	(2,002)	5,630	(316)	3,312	67,862	7,278





Project Goals

- Power Production
  - 7.5 MW Nominal
- Steam Production
  - 100,000 PPH
  - 180 psi, saturated steam
- Natural Gas/No 2 Oil Backup

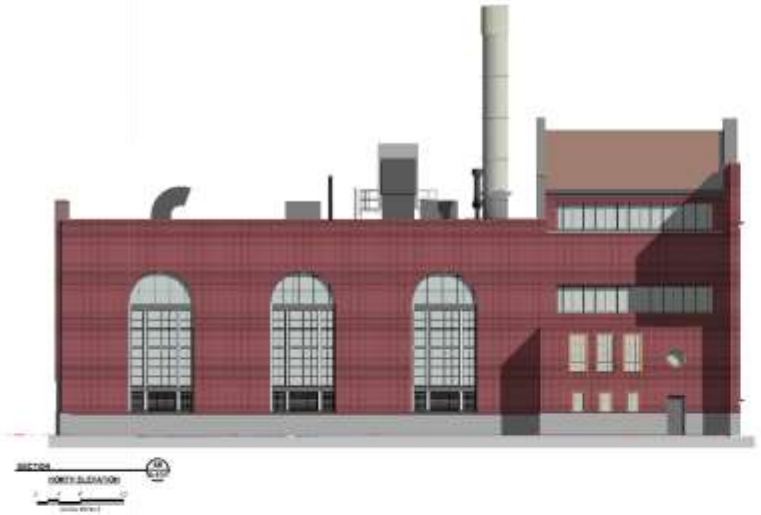
- Employed Existing Support Functions into the new program.
- Plant 100% Active during Construction

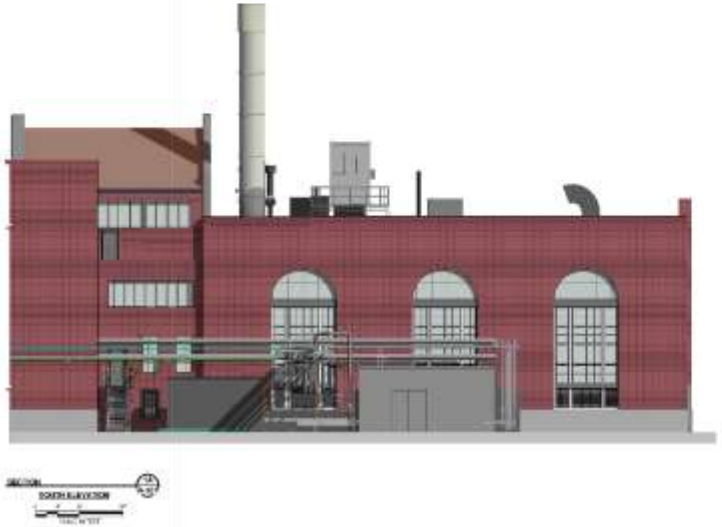
The System

- 7.5 MW Combustion Turbine
- 100 KPPH Watertube HRSG
- 2 Packaged Natural Gas Compressors

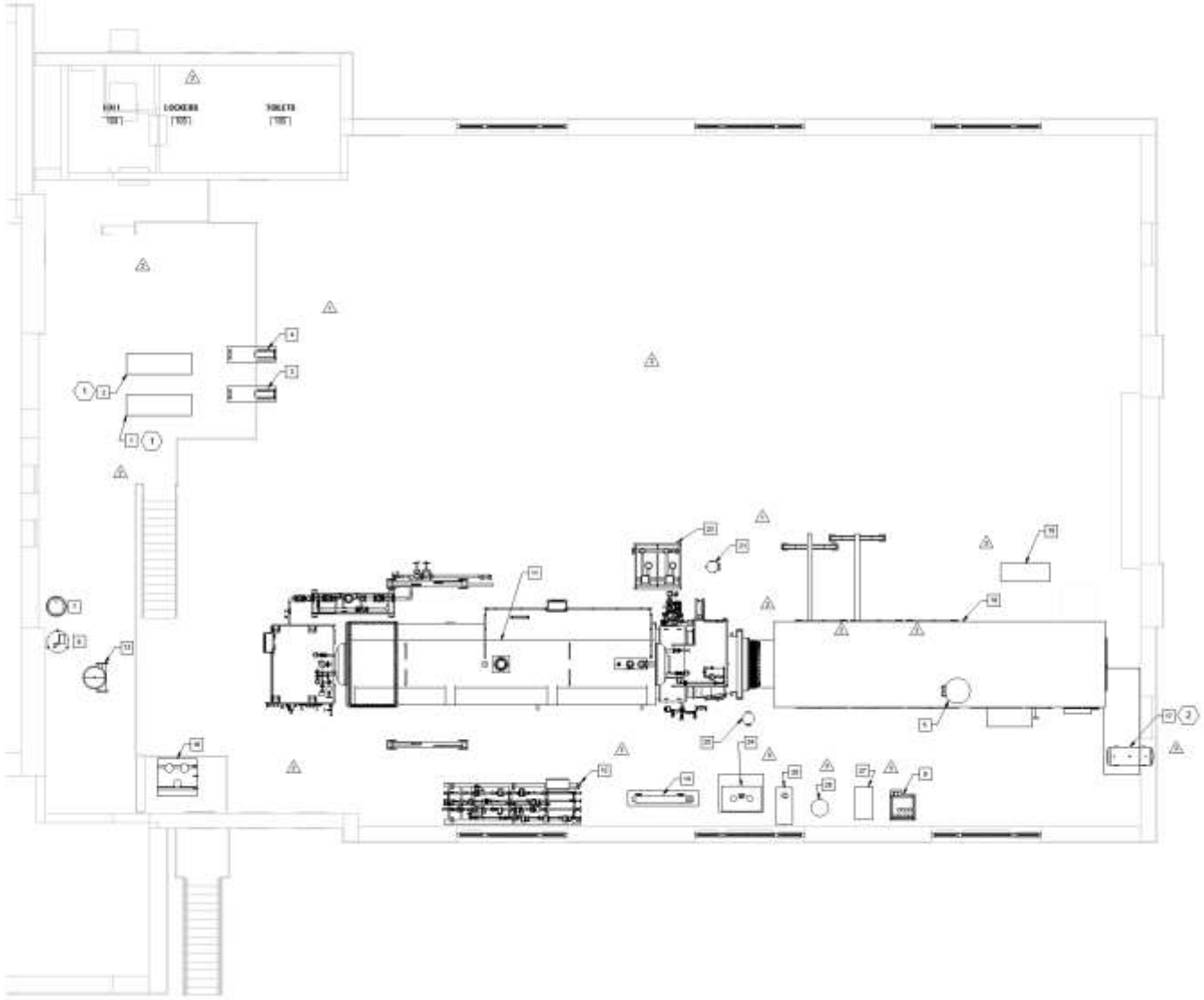
Architectural Considerations

- Historic Building
  - New Stack
  - Enlarge Door
  - Exterior Equipment Piping
- Neighborhood
  - Densely Populated
  - Residential Area
  - Noise Restrictions





Room for Growth



Other Constraints

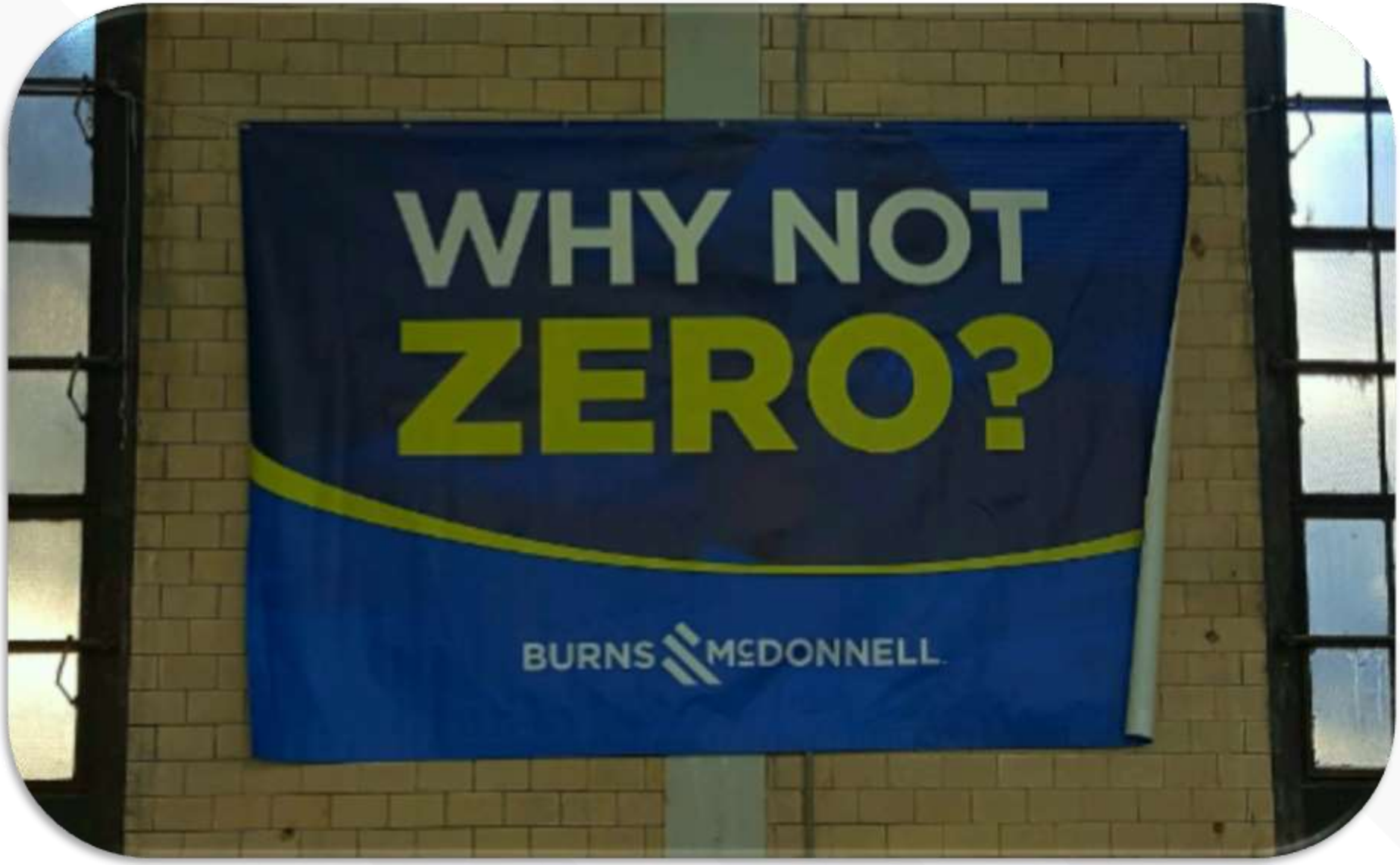
- Intersecting Tunnels below the Turbine and HRSG
  - Micropiles and grade beams span tunnels
  - Vibration Monitors to protect Vintage Brick Sewage Tunnel (still active)

- Switchgear Replacement
  - 5 incoming feeders
  - Plant Active throughout
  - Season Limits for Change

Construction and Delivery Approach

- Integrated Design-Build Contract
  - Washington Gas: Major Equipment
  - Burns & Mac: Design & Construction
- Phased Design, Procurement & Subcontracting
- Union Project

Safety



Safety

Challenges

- Restricted/crowded work areas
- Existing Live Plant Systems
- Critical Lifts
- Hazmat (lead-based paint, ACM, PCB)

Strategies

- Shift work
- Close collaboration with CPP Operations
- Vigilant LOTO Program
- Rigorous Lift Planning & Coordination
- Layout and abatement of anchor points
- Air monitoring
- Behavior Based Safety Program (TSO's)
- Multiple Safety Managers

Safety Results:

- ✓180,000+ Craft Manhours
- ✓Zero Recordables

Construction Challenges / Strategies

Challenges

- Operating Plant – No Service Interruptions
- Switchgear Replacement vs. Cooling Season ’17
- Heavy Demolition vs. Historic Tunnels
- Residential neighborhood
- Depleted local labor market
- Major Equipment vs. Historic Building
- Existing PCB HazMat

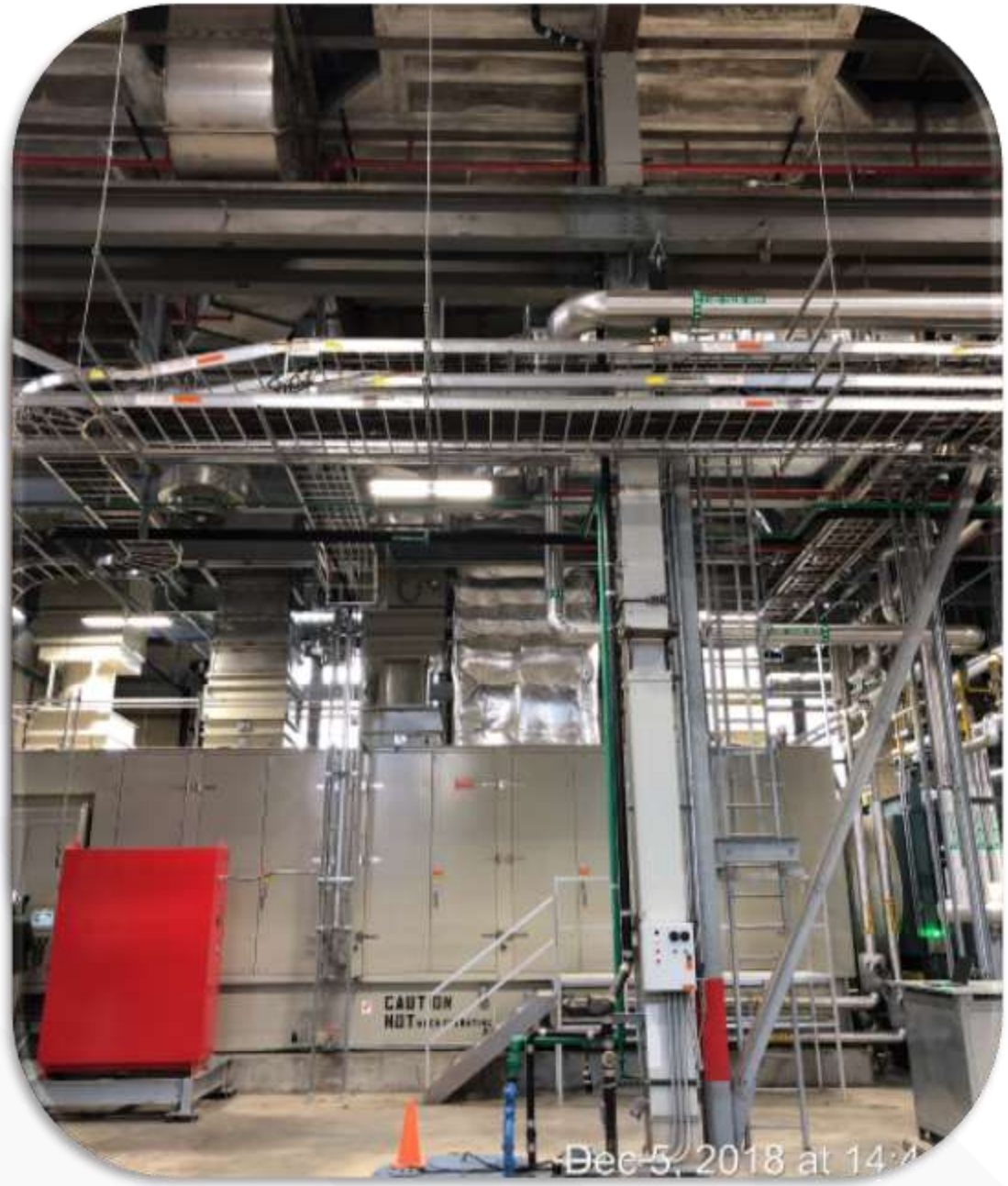
Strategies

- Pre-planning and coordination with scheduled outages
- Expedite equipment, Collaborate with utility, Phase the work
- Seismic Monitoring
- Use smaller equipment
- Robust, proactive communication plan
- Labor form outside DC
- Overtime
- Collaboration between AOC and Integrated Design-Build Team
- Work where we can, when we can

Results

- Everything Fit!
- UESC: Successful Approach for Congress
- Financially Advantageous
- Future Expandability
- No unscheduled interruptions
- First Fire occurred May 17, 2018
- Systems functioning as-expected
- No complaints from the neighbors!
- Zero Recordables

Happy Client!



Capitol Power Plant

Installation of the
Heat Recovery Steam Generator
and Combustion Turbine Generator

July 22nd and 23rd, 2017

ARCHITECT OF THE CAPITOL