



Commonwealth

EASTERN MICHIGAN UNIVERSITY
2018 CHP UPGRADE

CampusEnergy2019
New Orleans, LA
Feb. 28, 2019



AGENDA

- Introduction
- Eastern Michigan University
- Project Description
- Project Goals
- Great Outcome
- Questions



INTRODUCTIONS



Anthony Duty
Project Manager
Eastern Michigan University
Owner



Jack D. McCormick, PE
Project Manager
Commonwealth Associates, Inc.



Rob Fairchild
Project Manager
ENGIE
EPC Contractor

- Engineering and Document Review during design phase
- Performed construction oversight
- Advised EMU during testing, commissioning, and start-up phases
- Aided EMU in punch list and final closeout and review of turnover package

Eastern Michigan University

- 1849 heritage as the first Normal School in Michigan with 122 students
- Current student population: 20,000+
- Colleges
 - Arts & Science
 - Business
 - Education
 - Health & Human Services
 - Technology
 - Graduate
- 120 buildings on over 800 acres
- Campus Energy Center which deploys CHP and over a mile of distribution tunnel



PROJECT GOALS AND OBJECTIVES

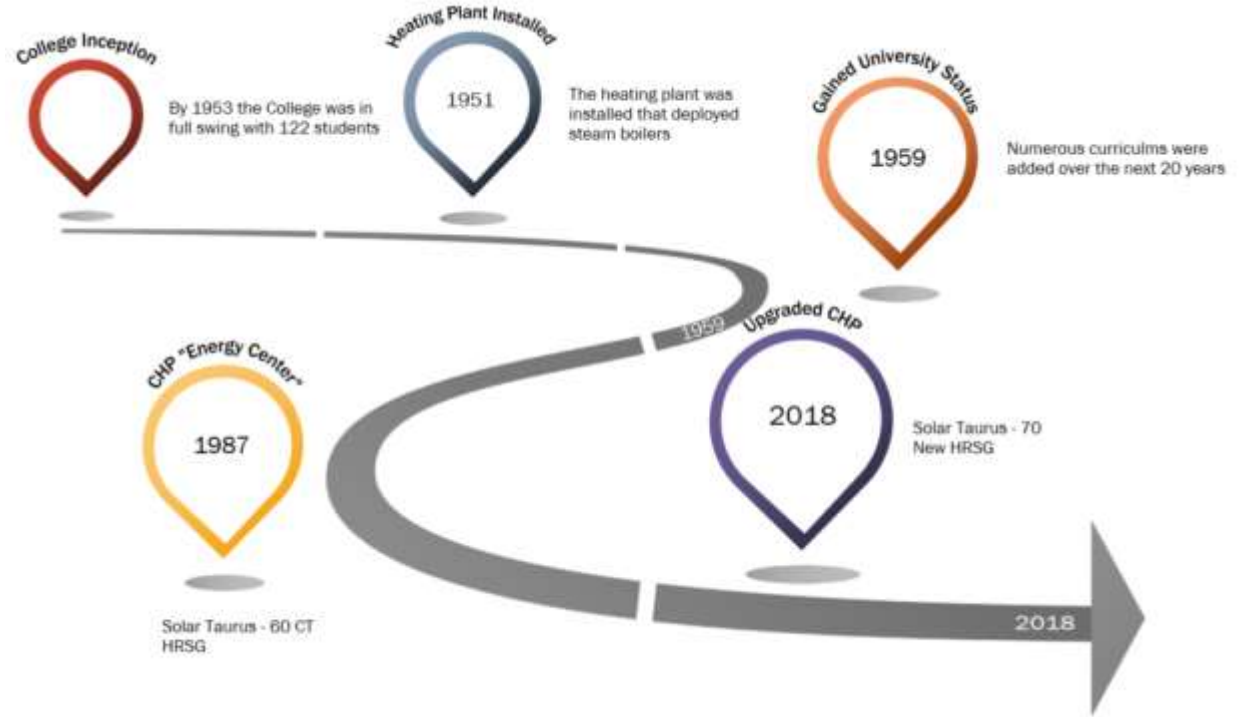
- Dollar Savings
- Continued operation during construction
- Islanded operation
- Black Start capability
- Budget and Contract Firm



“Equity, Exemplar, Excellence”

PROJECT DESCRIPTION

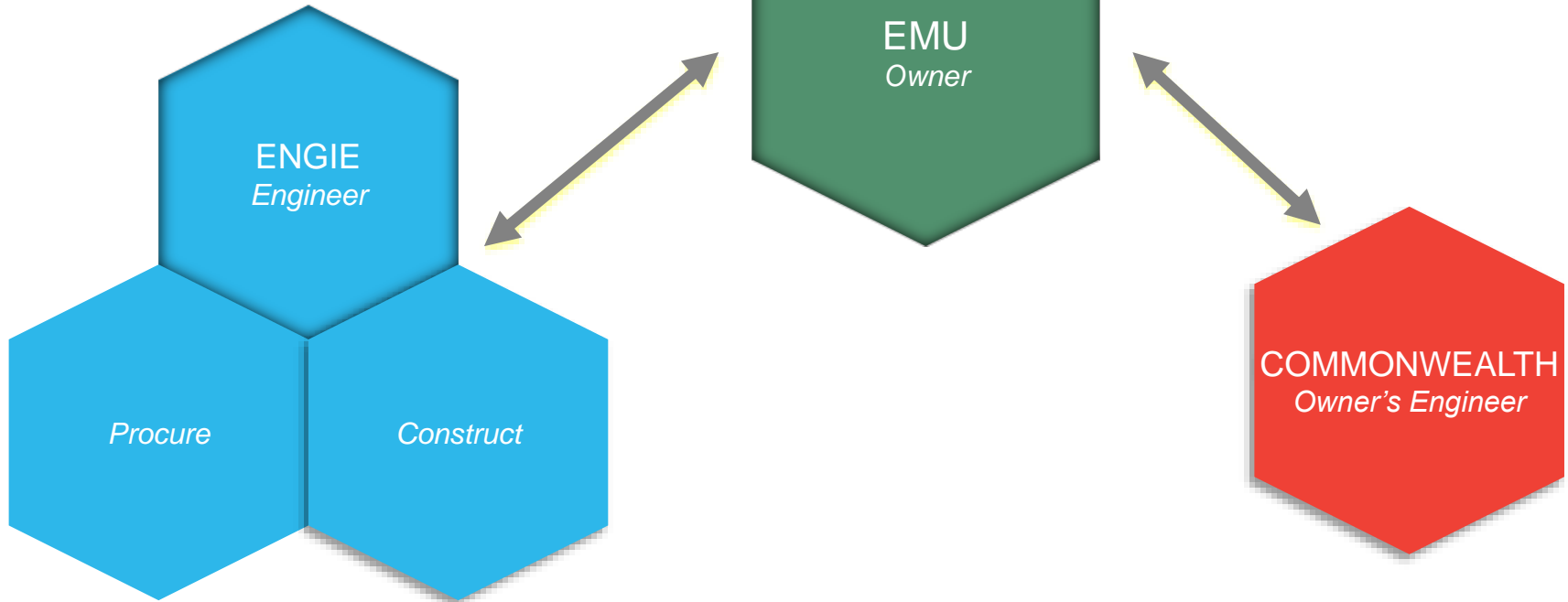
HISTORY



- 1951 – Boilers
- 1987 – First CHP
- 2018 – Upgraded CHP

PROJECT DESCRIPTION

PROJECT TEAM



PROJECT DESCRIPTION

EQUIPMENT

Equipment Sizing & Selection

- Peak steam usage
- Peak electric
- Flexibility
- Redundancy
- Considering ambient conditions and CT operational capabilities
- Considering Owner import requirements

Project Requirements

- Guaranteed savings of \$40,000 to \$50,000 per week
 - Comes from purchasing less electricity from the utility
- Minimal impact to campus operations

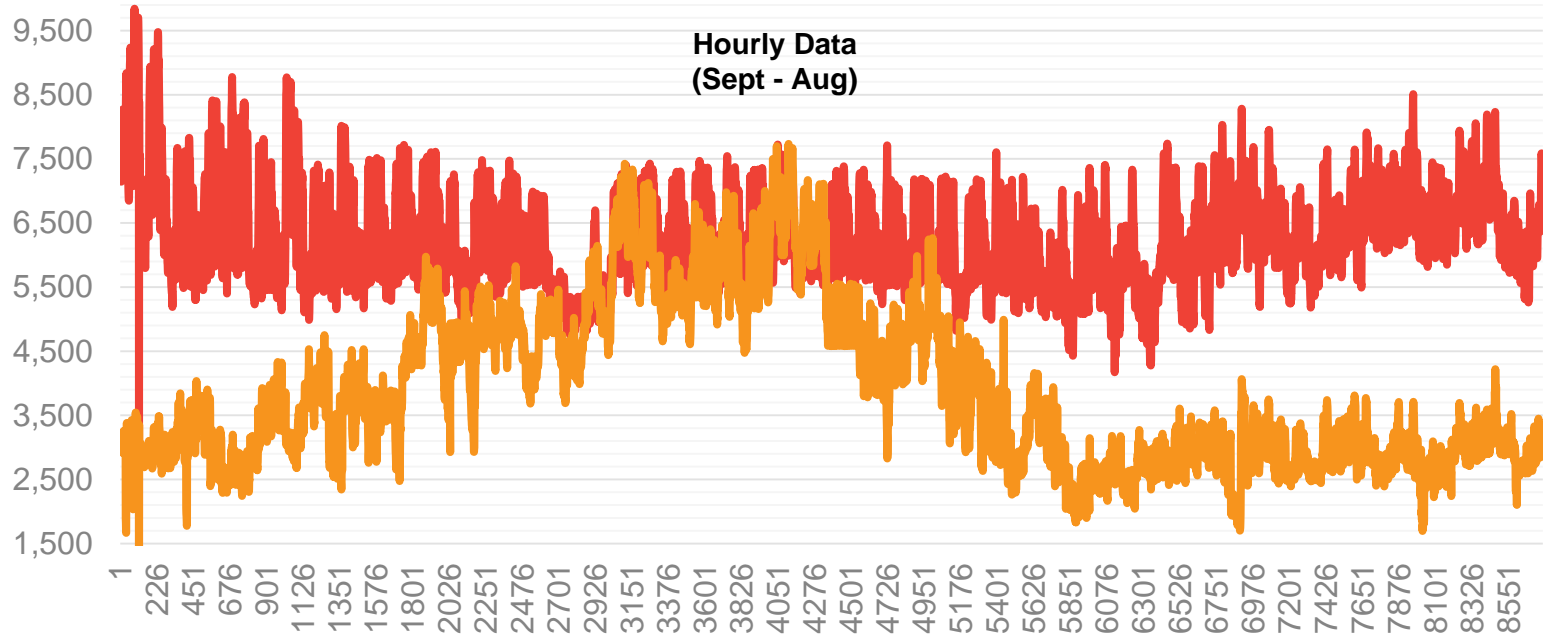


PROJECT DESCRIPTION

ELECTRIC AND THERMAL CAMPUS DEMAND

(kW) & (MMBTH x 100)

— ELECTRIC DEMAND — THERMAL DEMAND



PROJECT DESCRIPTION

CONTROLS AND OPERATIONS

Controls Integration

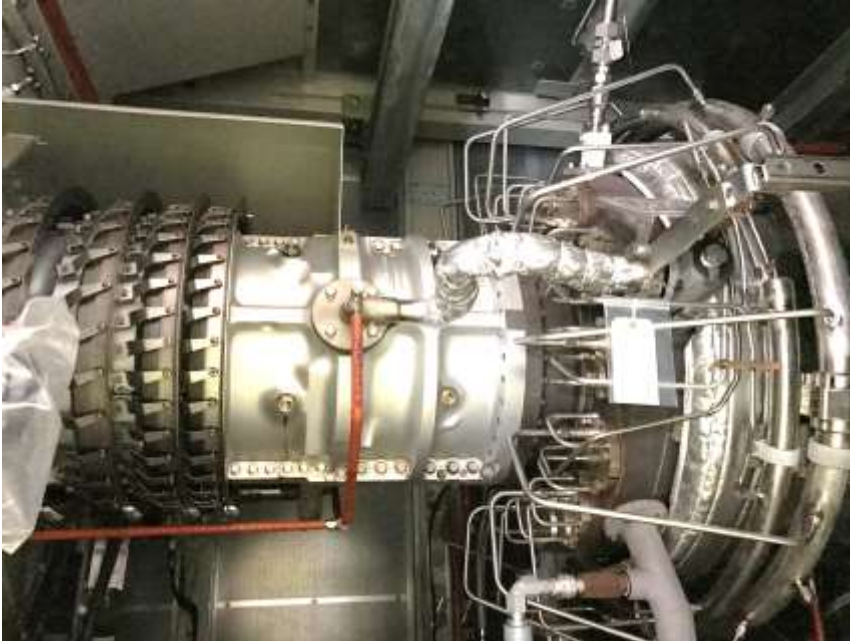
- How and Who will operate the EC
- What major electrical and steam demands and fluctuations occur
- Can the EC island, or is it dependent on the local utility
- What equipment needs to be operational during the course of the project through startup



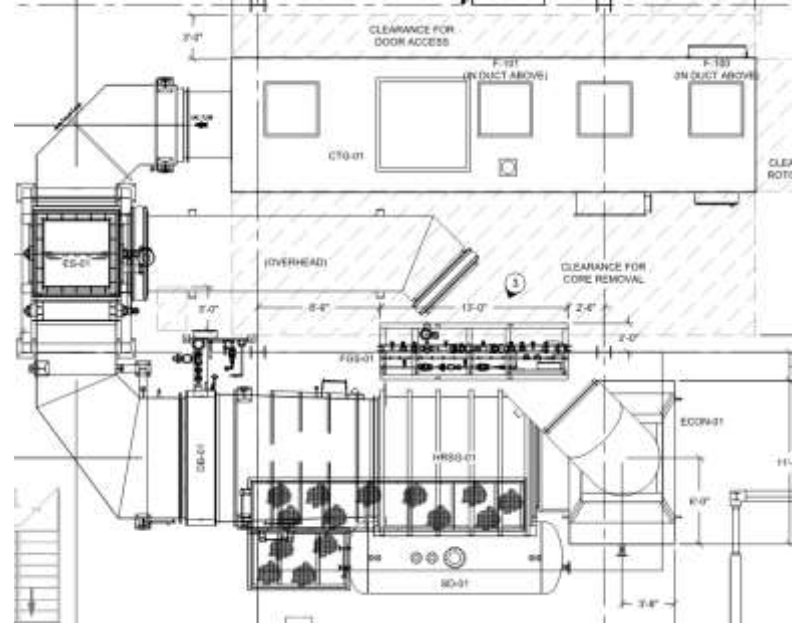
PROJECT DESCRIPTION

MAJOR EQUIPMENT

Combustion turbine (CT)



Heat recovery steam generator (HRSG)



PROJECT DESCRIPTION

EQUIPMENT

Fuel gas compressors



Ancillary equipment

- Air compressor
- CT inlet air filter
- Lube oil cooler

PROJECT DESCRIPTION

SITE



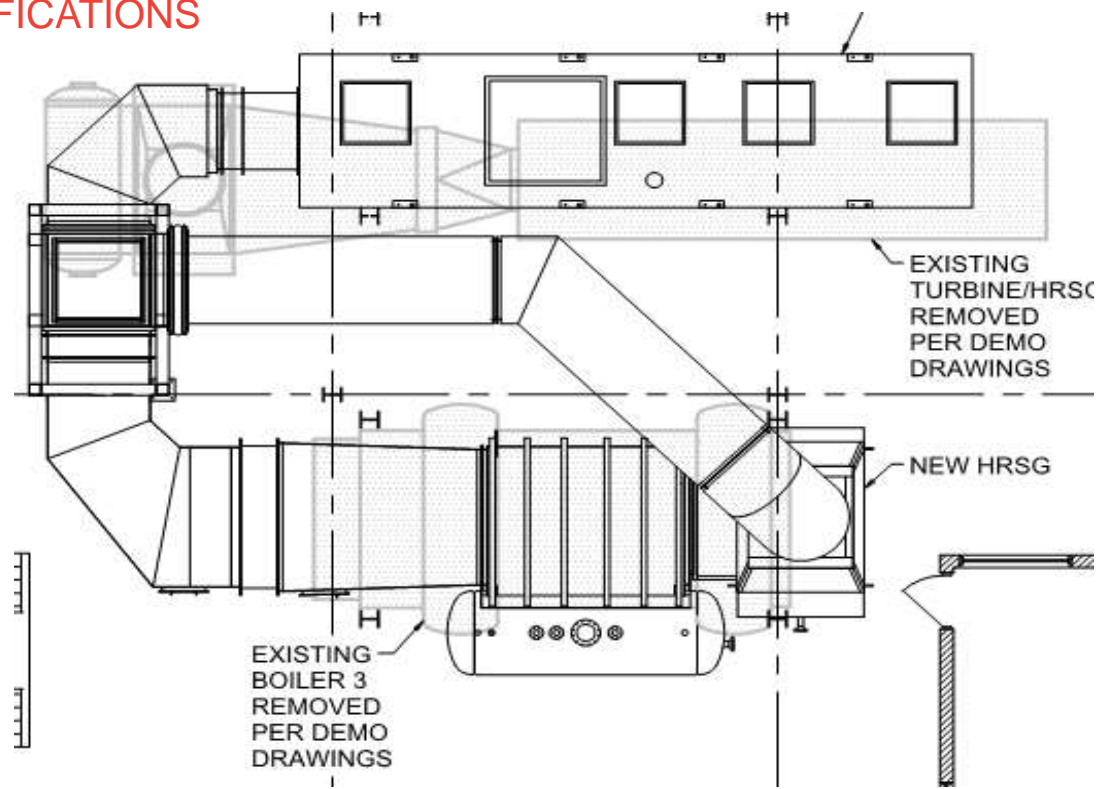
Pre-upgrade



Post-upgrade

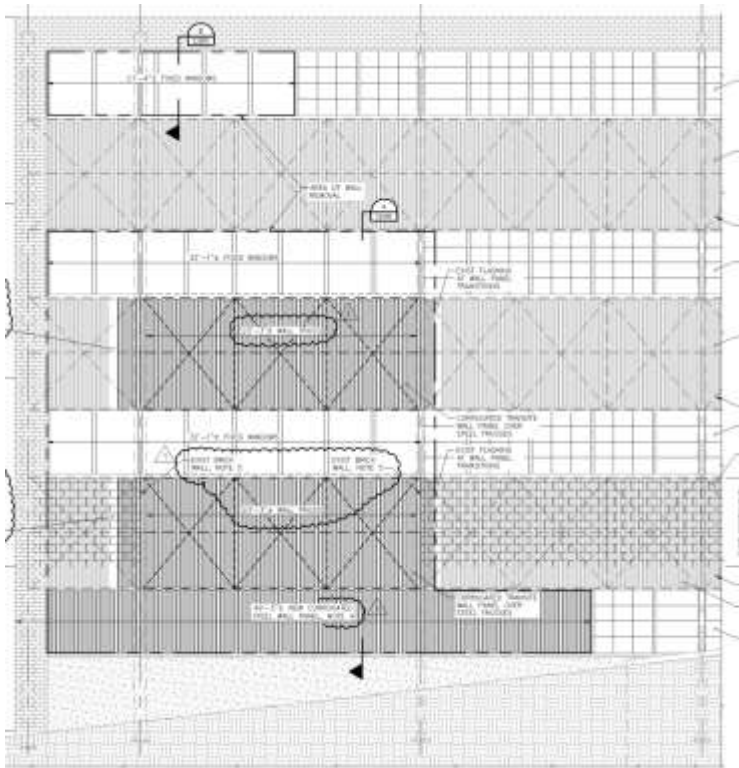
PROJECT DESCRIPTION

BUILDING MODIFICATIONS



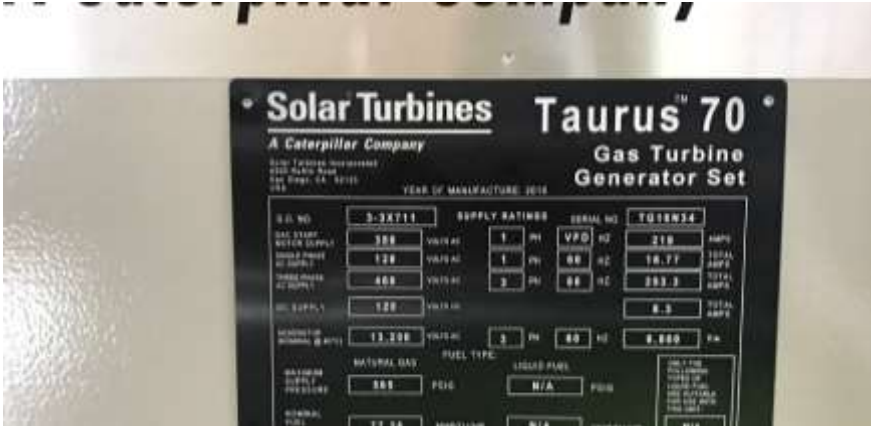
PROJECT DESCRIPTION

BUILDING ENVELOPE



PROJECT DESCRIPTION

EQUIPMENT



PROJECT DESCRIPTION

ELECTRICAL – LOOP 1 INTEGRATION



- Coral Substation
- Loop 1 and Loop 2
- Increased Reliability and Load on the Energy Center
- Coordination and Phasing Required due to:
 - Minimizing outages requirements
 - Different Engineering Firms

PROJECT DESCRIPTION

MECHANICAL PIPING





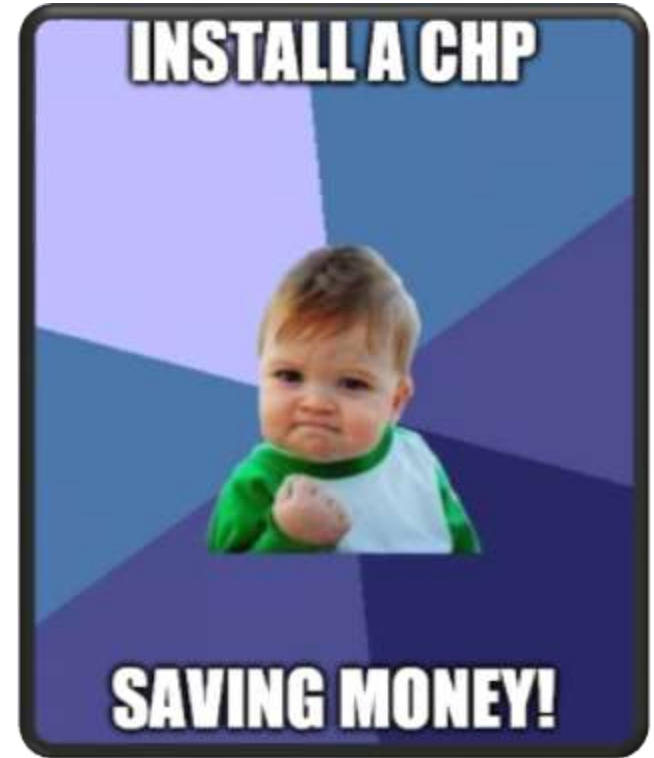
EASTERN MICHIGAN
UNIVERSITY



OUTCOME

Results

- In operation for approximately 13 months
- Savings have been tracked since COD
- The guaranteed savings terms have been as anticipated – approximately \$40-50k/wk



RECAP

Institutional Combined Heat & Power (CHP) or “Cogeneration” Project

- Client: Eastern Michigan University
- Owner’s Engineering role
 - Design phase review and recommendations
 - Construction phase observations and consulting
 - Commissioning and startup oversight
 - Coordinating and assembling final project documentation
- \$19.6M project to replace 29-year-old co-generation unit that ceased operations in 2016
- Creates near self-sufficiency in production of electricity (98%) and heat (93%) for the University (50% of each prior)
- Reduction of 21,305 tons of CO₂
- Net energy cost savings of **over \$2.8M**



MAKE A POWERFUL DIFFERENCE.



Commonwealth