



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

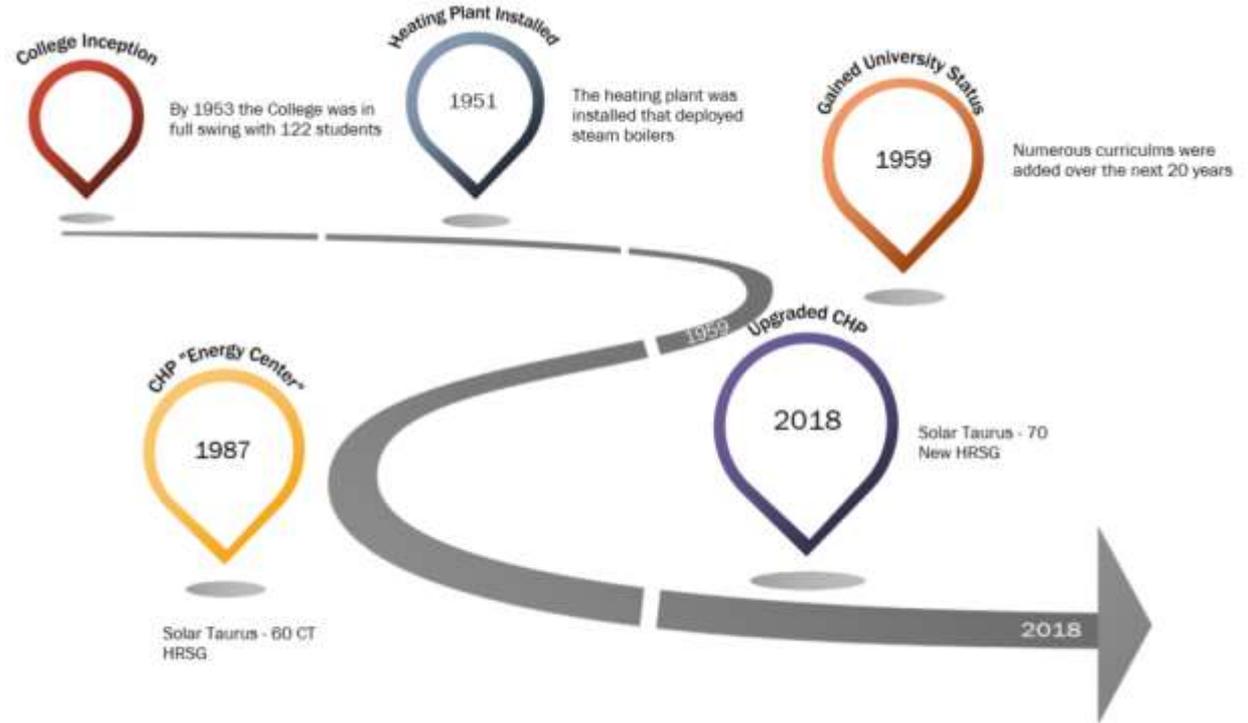
- Dollar Savings
- Continued operation during construction
- Islanded operation
- Black Start capability
- Budget and Contract Firm



“Equity, Exemplar, Excellence”

# PROJECT DESCRIPTION

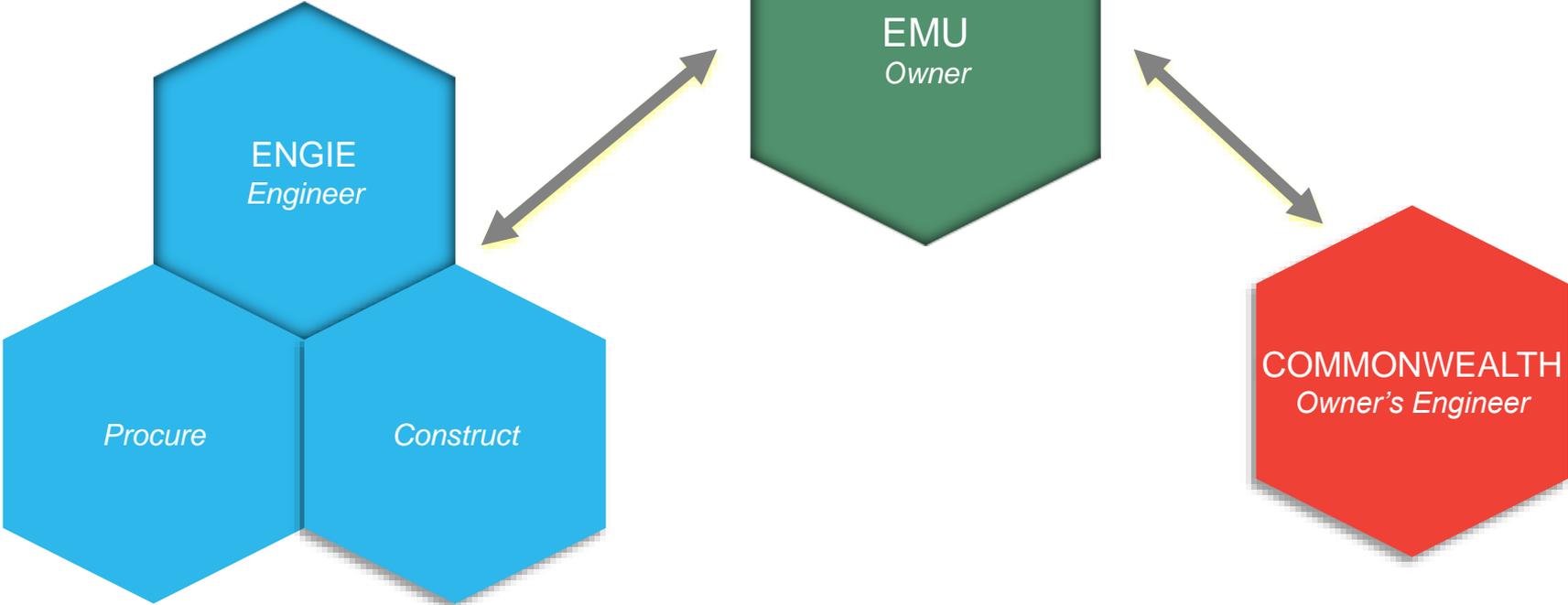
## HISTORY



- 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

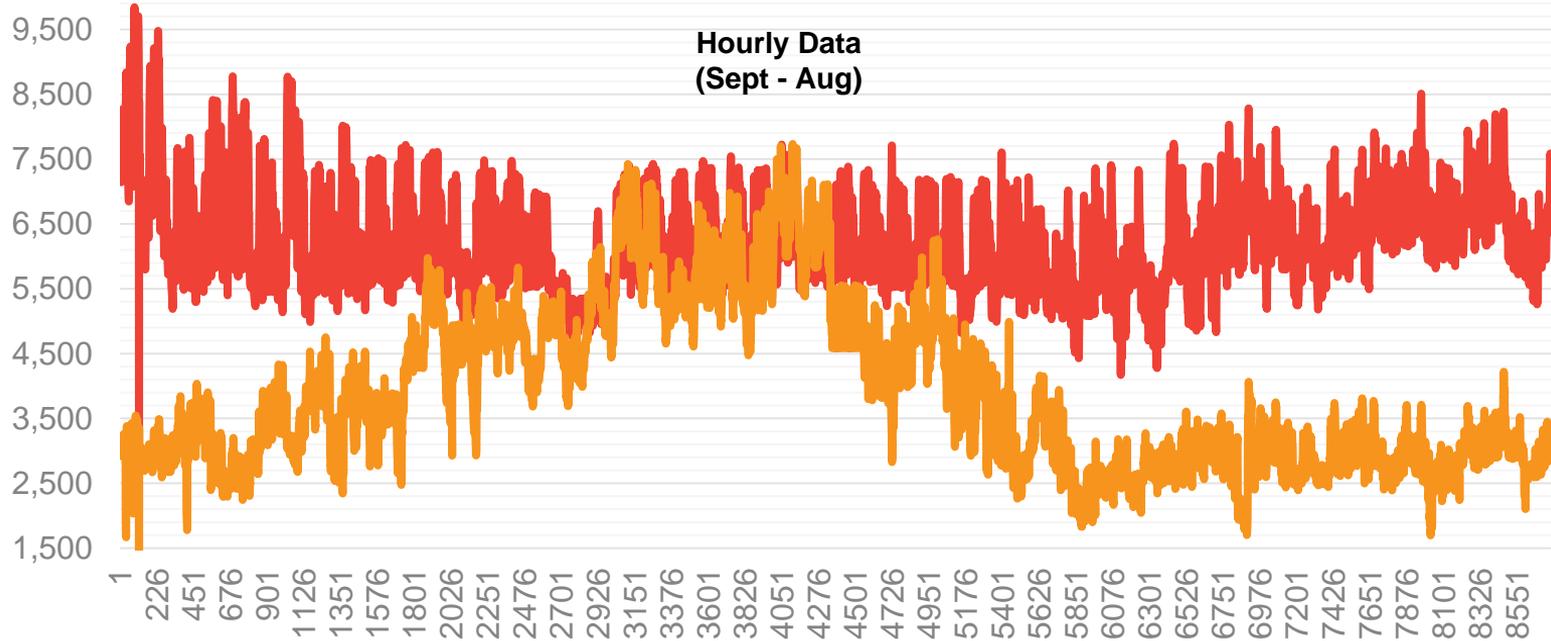


# PROJECT DESCRIPTION

## ELECTRIC AND THERMAL CAMPUS DEMAND

(kW) & (MMBTH x 100)

— ELECTRIC DEMAND — THERMAL DEMAND



# PROJECT DESCRIPTION

## CONTROLS AND OPERATIONS

### Controls Integration

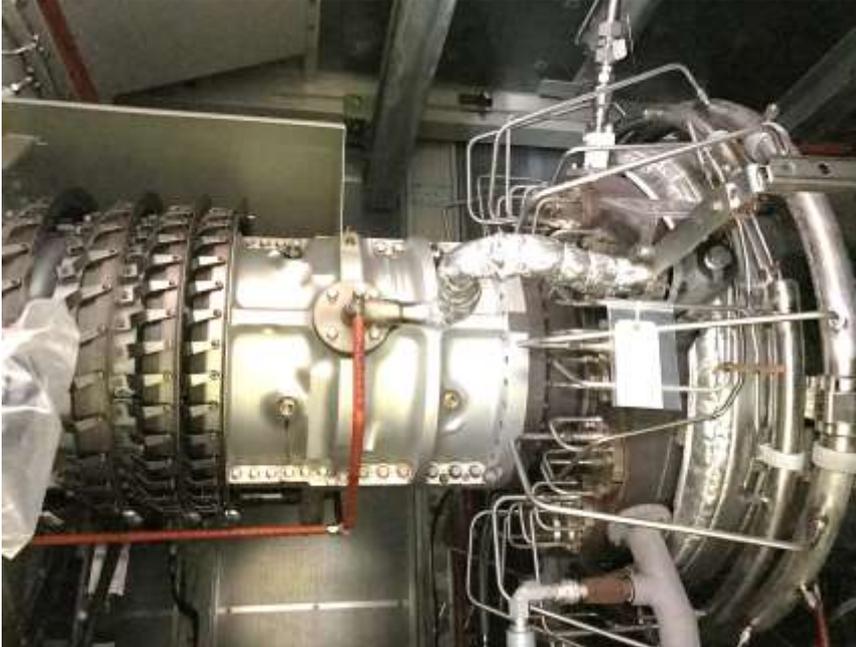
- How and Who will operate the EC
- What major electrical and steam demands and fluctuations occur
- Can the EC island, or is it dependent on the local utility
- What equipment needs to be operational during the course of the project through startup



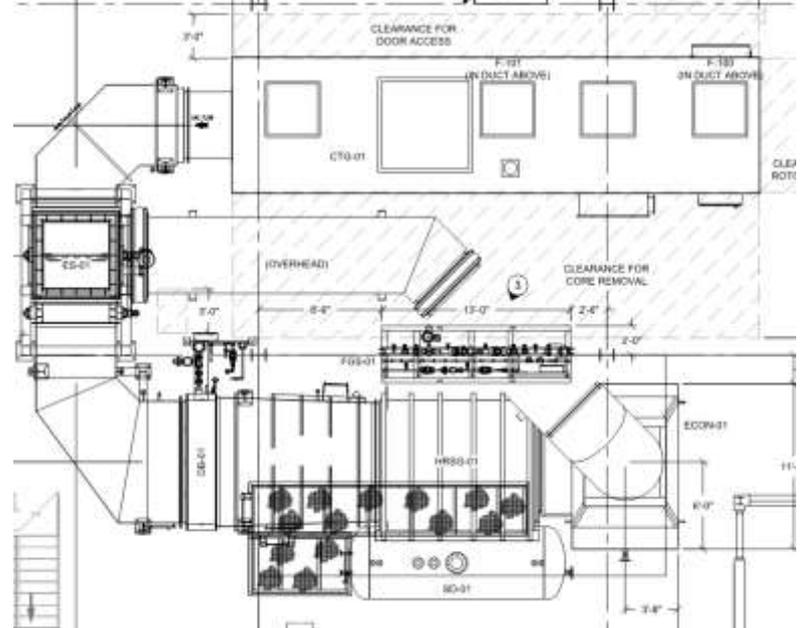
# PROJECT DESCRIPTION

## 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



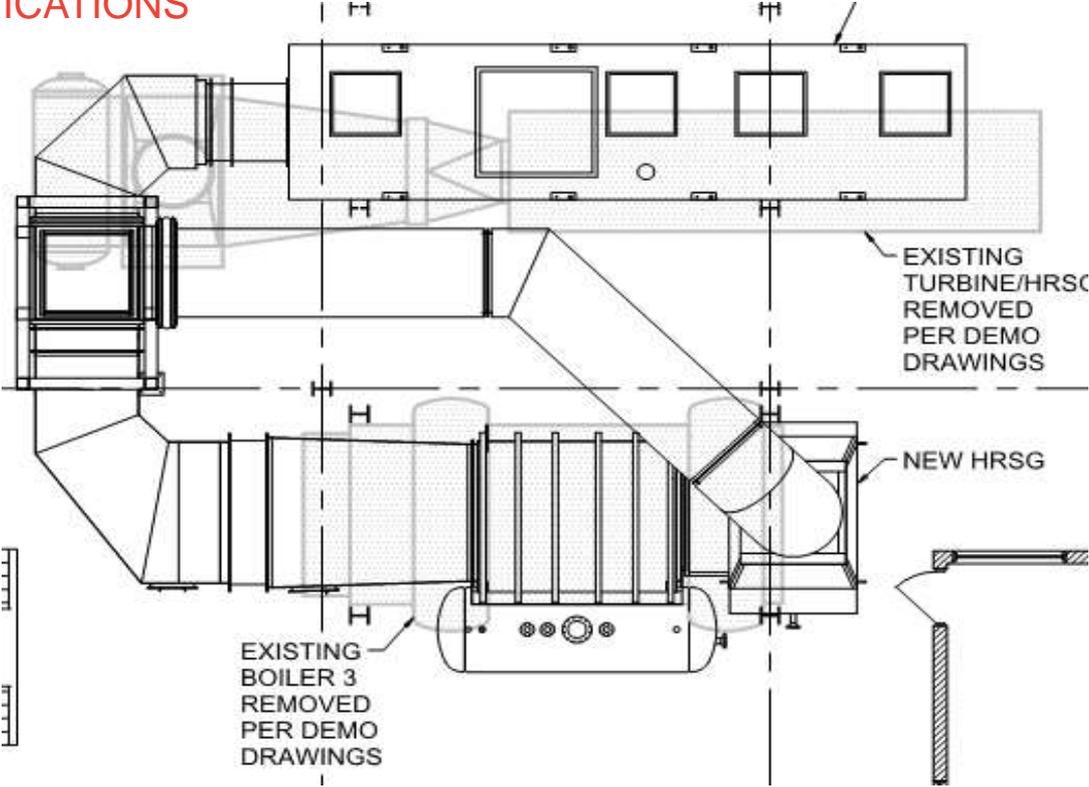
Pre-upgrade



Post-upgrade

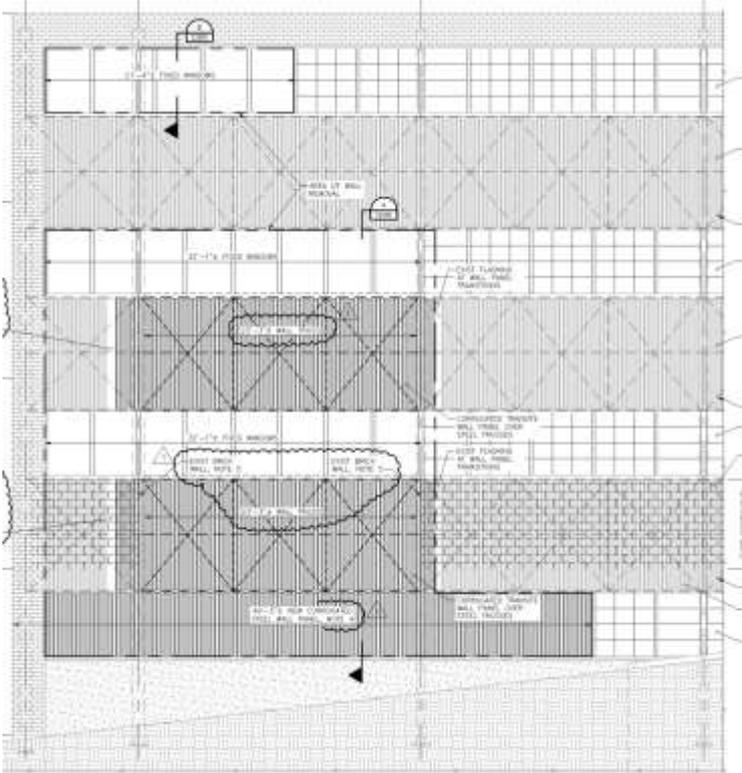
# PROJECT DESCRIPTION

## BUILDING MODIFICATIONS



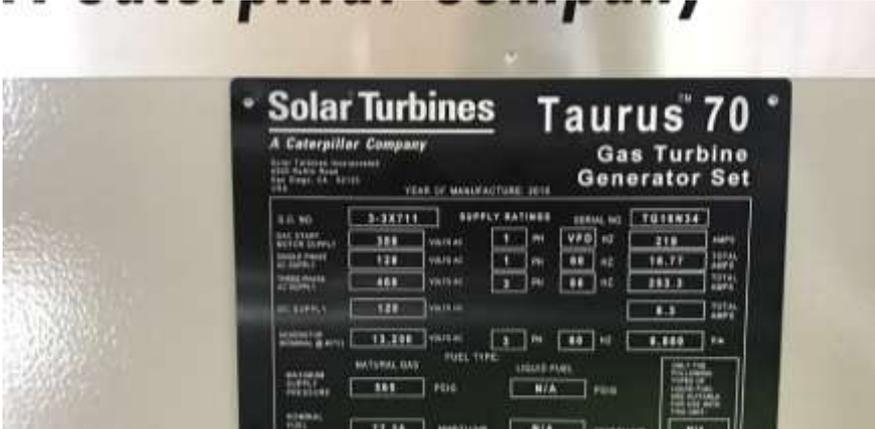
# PROJECT DESCRIPTION

## 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



A large, bold, green serif letter 'E' is centered at the top of the left side of the image.

EASTERN MICHIGAN  
UNIVERSITY

The logo for ENGie features a blue gradient arch above the word 'ENGie' in a blue, rounded, sans-serif font. A thin vertical line is positioned to the left of the logo.

# 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 CO<sub>2</sub>
- Net energy cost savings of **over \$2.8M**



MAKE A POWERFUL DIFFERENCE.



Commonwealth