The Utility Plant and Demand Side Nexus

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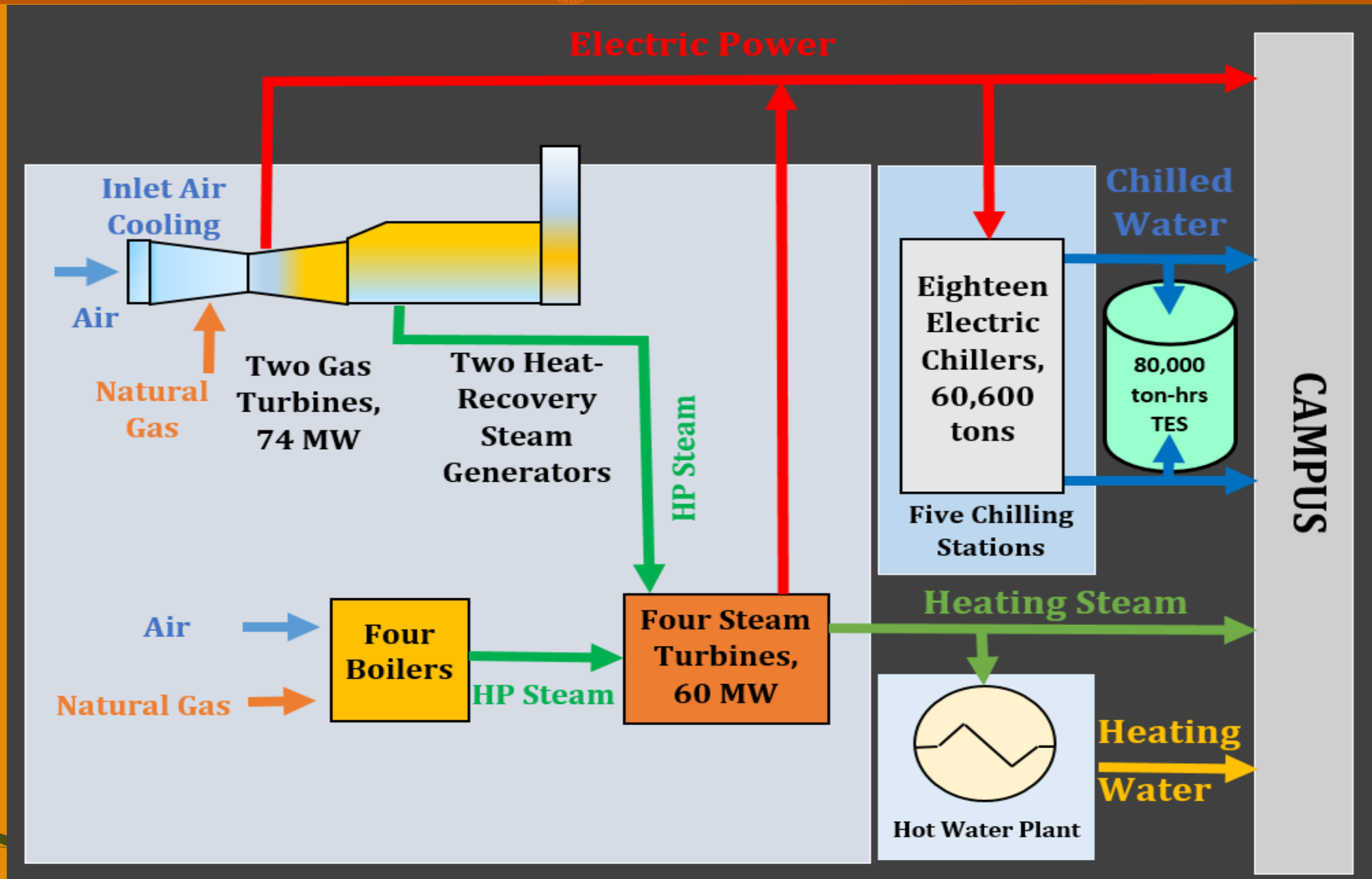
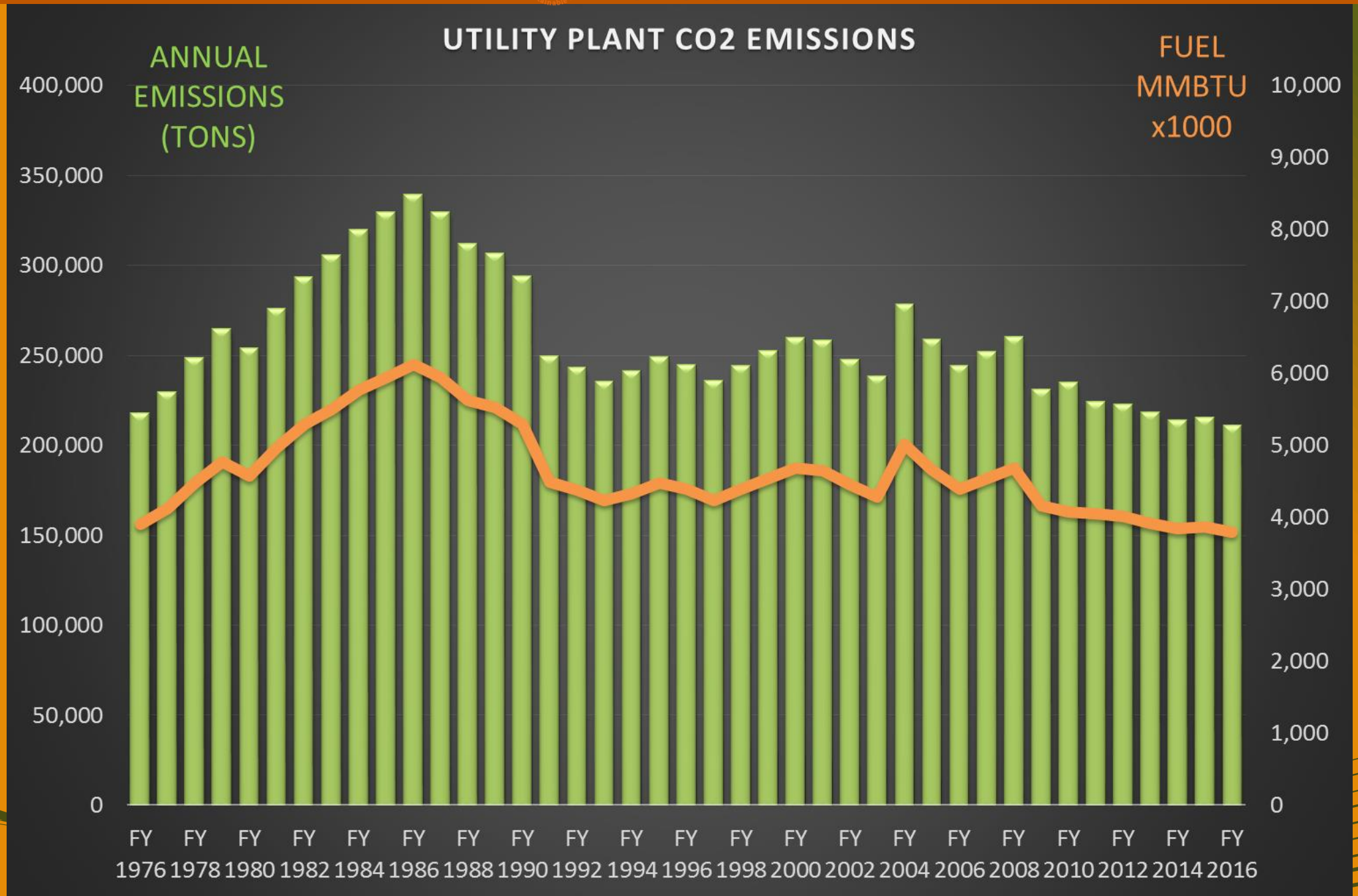
Utilities & Energy Management

Overview

- Space growth at UT Austin and impact on utility plant.
- Efficiency and investment goals on the demand side to offset space growth.
- Utility and Demand Side Nexus to support campus operations without adverse impact to plant reliability and energy cost.

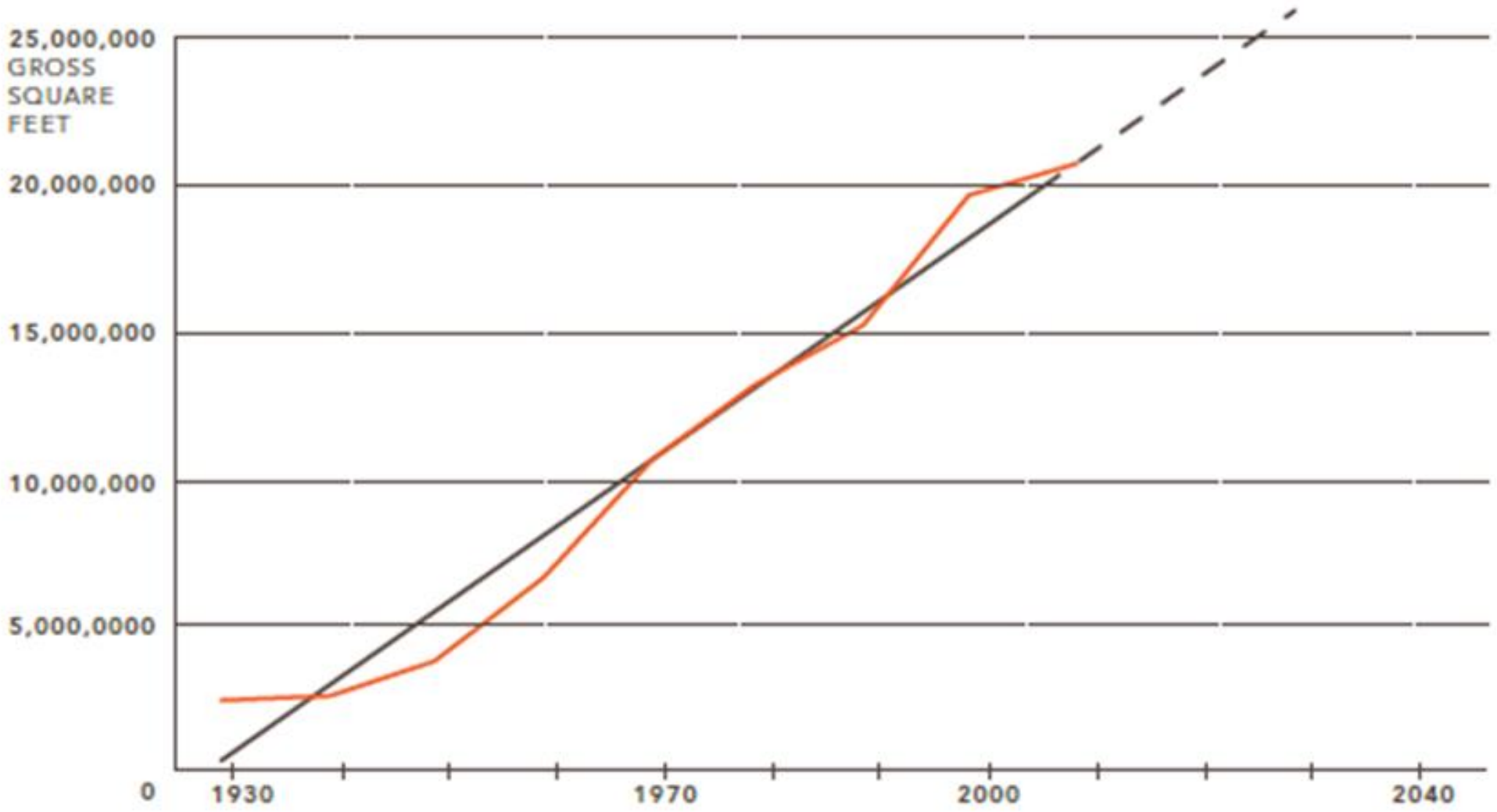


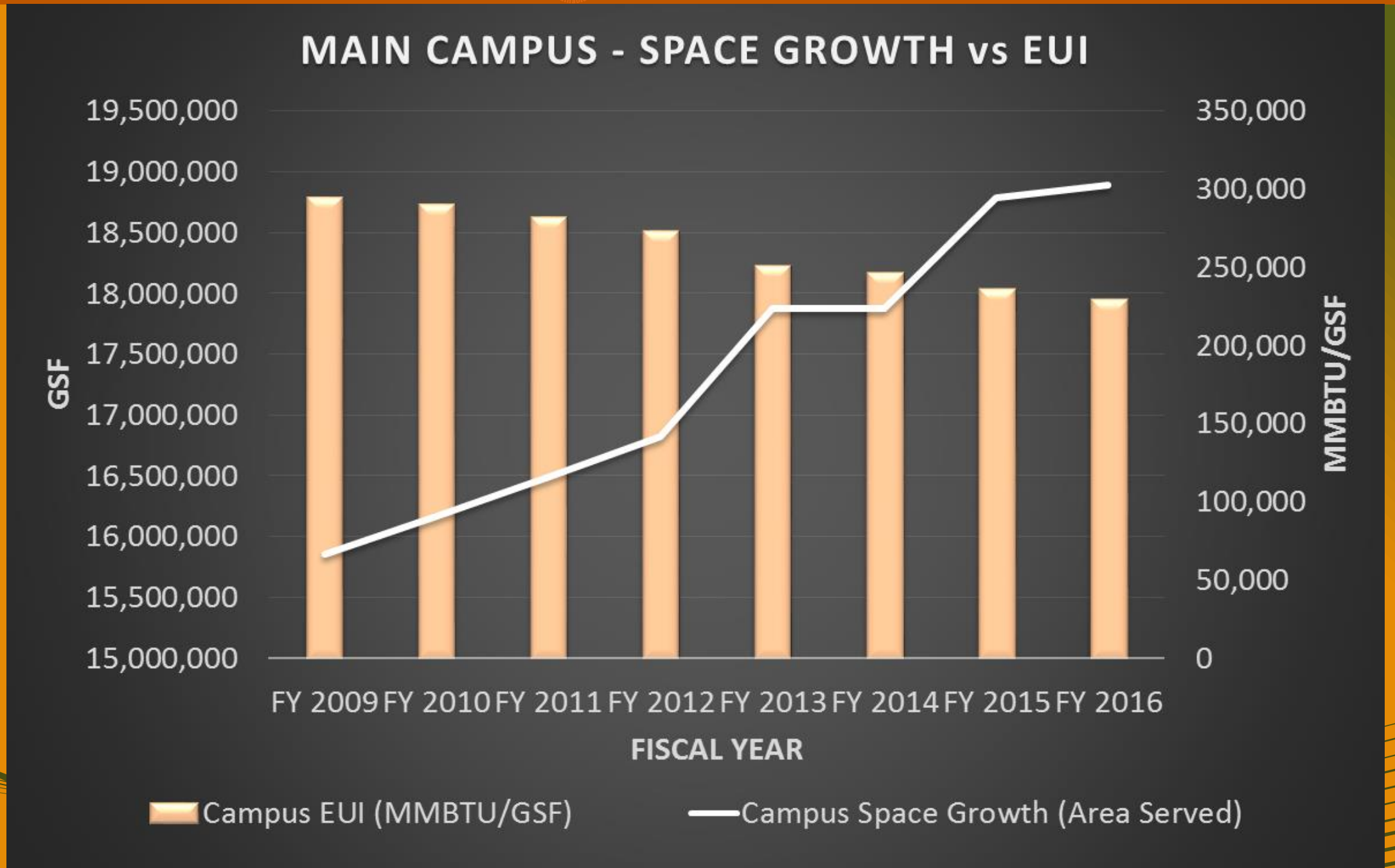
UT AUSTIN UTILITY PLANT OVERVIEW

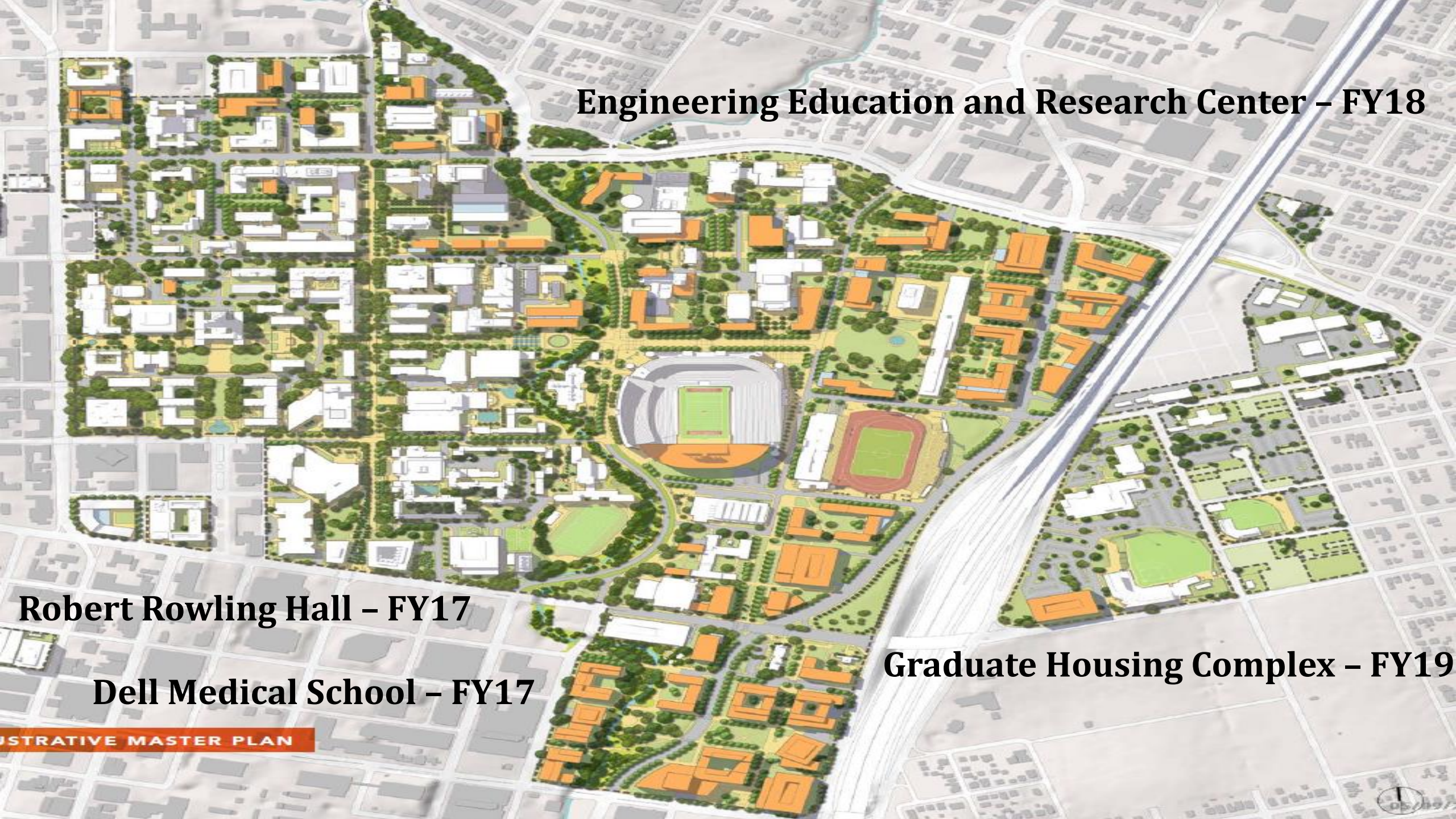

UTILITY PLANT CO2 EMISSIONS
ANNUAL EMISSIONS (TONS)
FUEL MMBTU x1000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
FY 1976
FY 1978
FY 1980
FY 1982
FY 1984
FY 1986
FY 1988
FY 1990
FY 1992
FY 1994
FY 1996
FY 1998
FY 2000
FY 2002
FY 2004
FY 2006
FY 2008
FY 2010
FY 2012
FY 2014
FY 2016

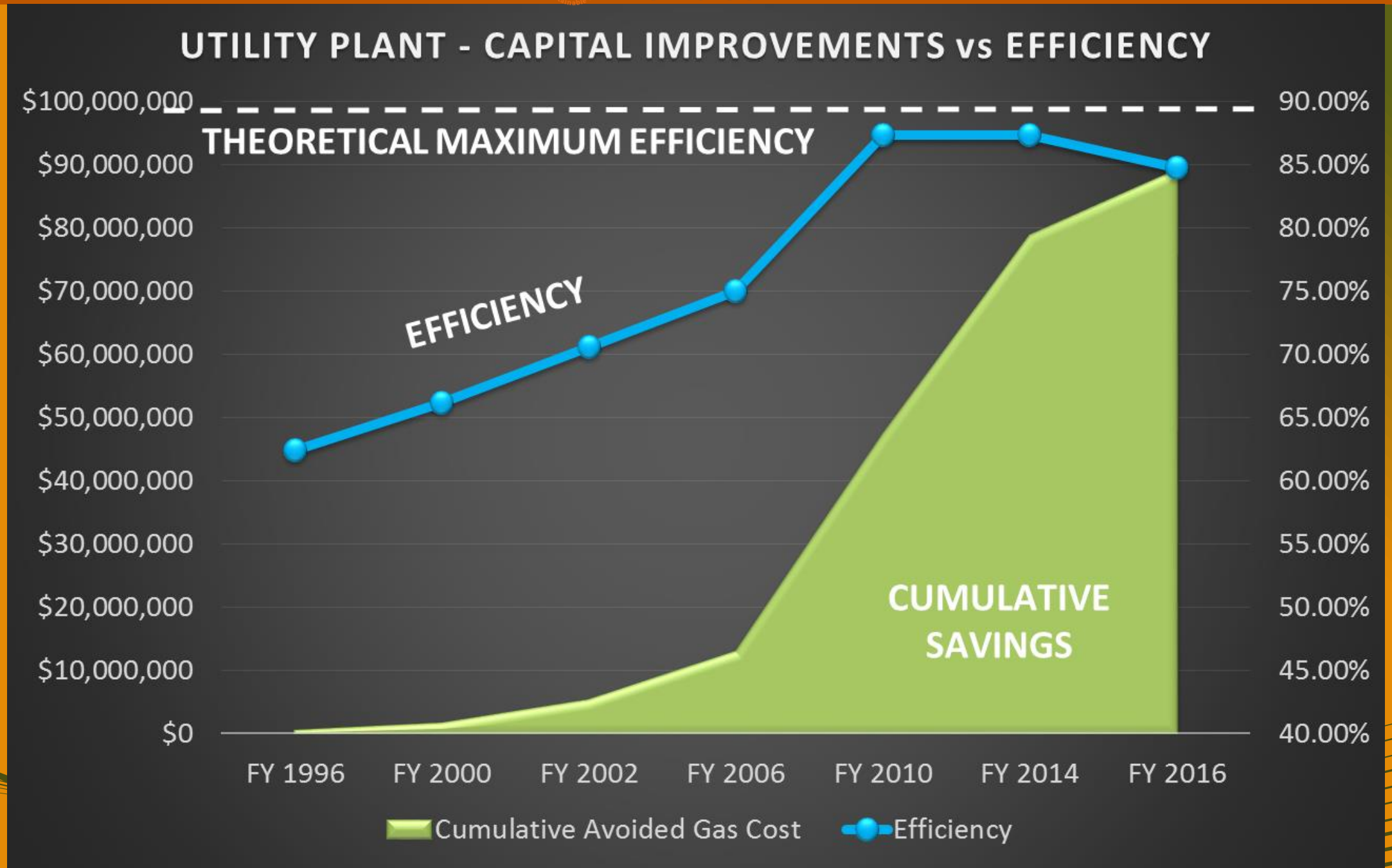
MAIN CAMPUS CONSTRUCTION TRENDS

2.4 million GSF/decade




MAIN CAMPUS - SPACE GROWTH vs EUI
GSF
19,500,000
19,000,000
18,500,000
18,000,000
17,500,000
17,000,000
16,500,000
16,000,000
15,500,000
15,000,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
MMBTU/GSF
FY 2009
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FISCAL YEAR
Campus EUI (MMBTU/GSF)
Campus Space Growth (Area Served)

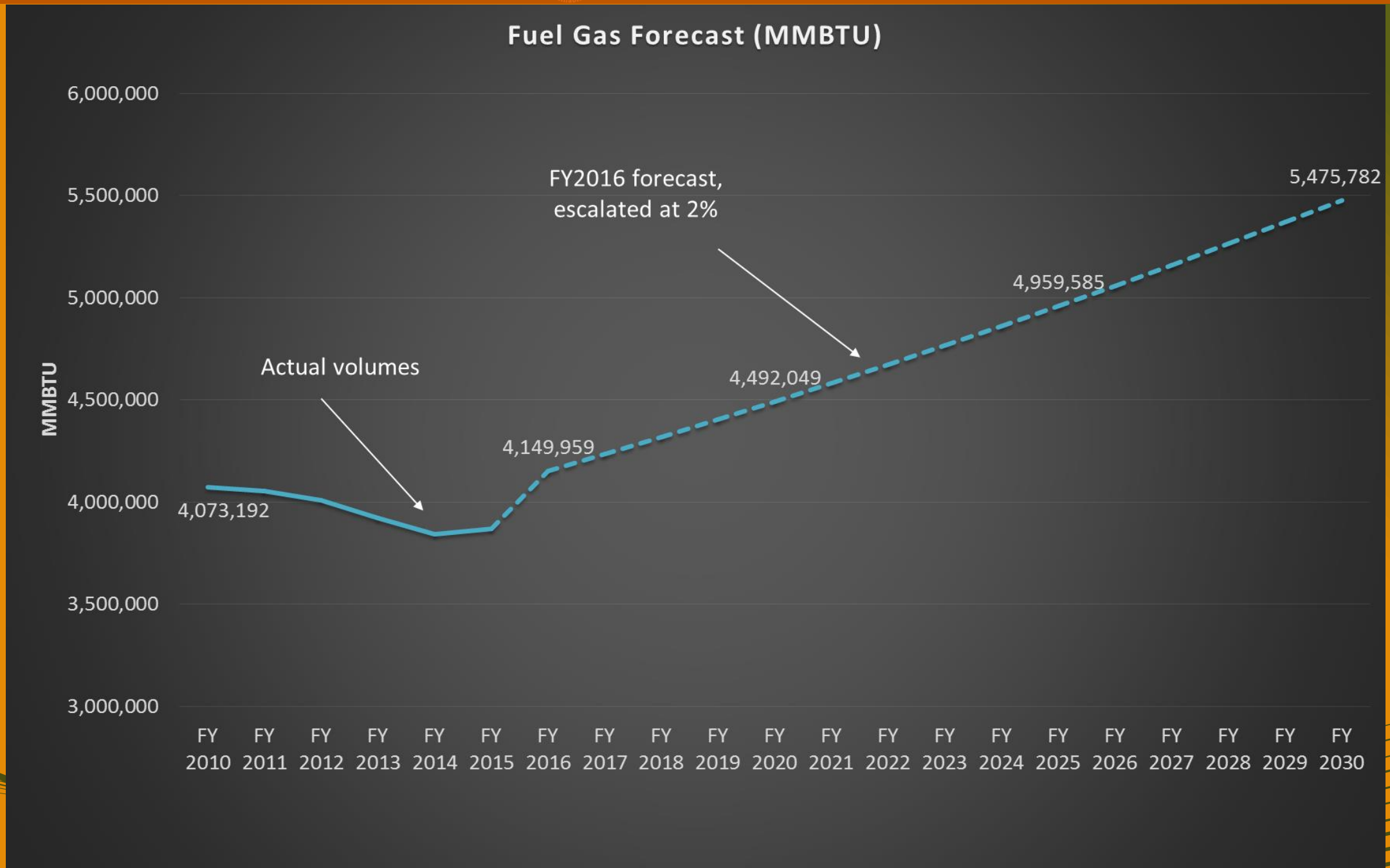

Engineering Education and Research Center – FY18
Robert Rowling Hall – FY17
Dell Medical School – FY17
Graduate Housing Complex – FY19
USTRATIVE MASTER PLAN

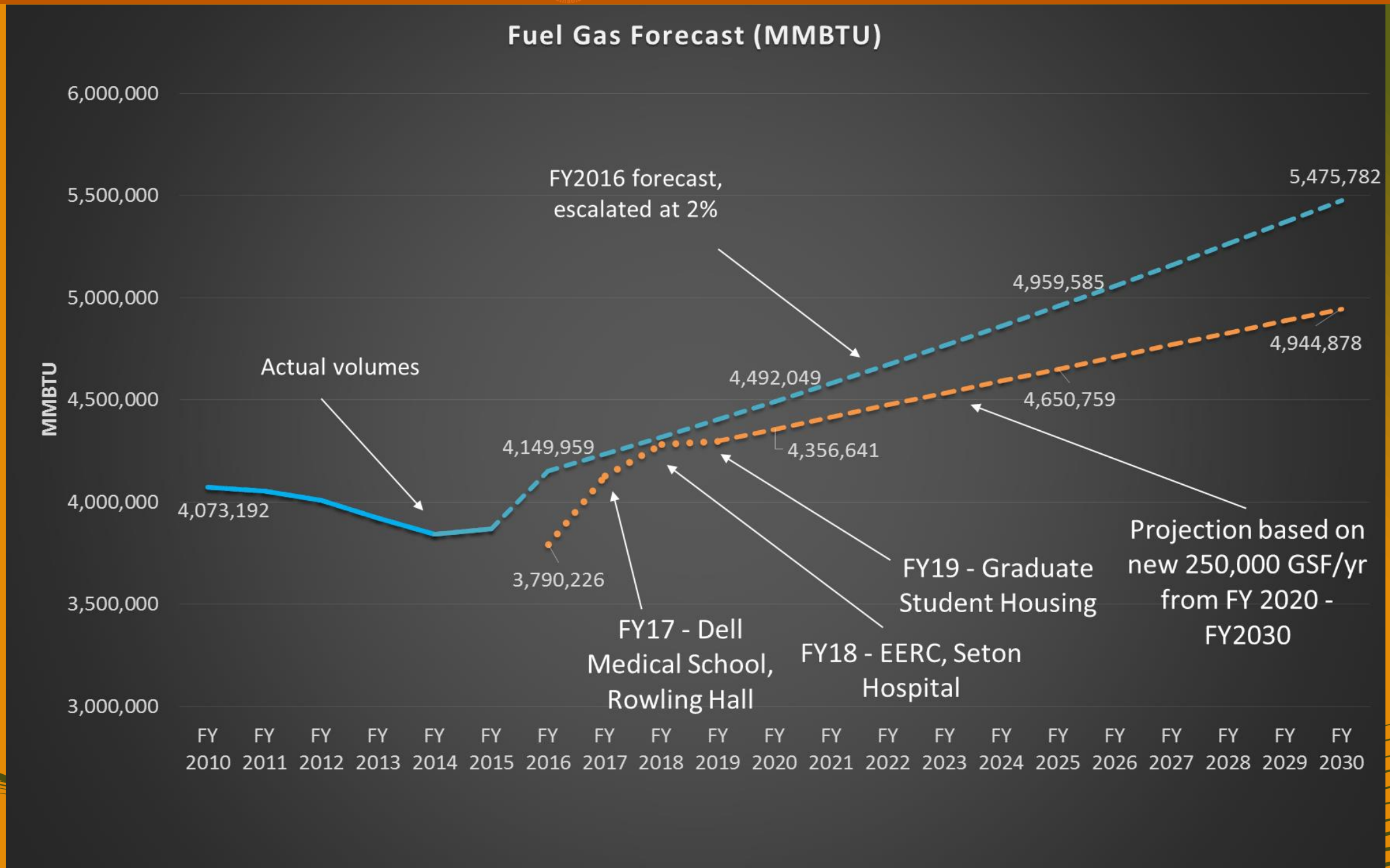

UTILITY PLANT - CAPITAL IMPROVEMENTS vs EFFICIENCY
$100,000,000
$90,000,000
$80,000,000
$70,000,000
$60,000,000
$50,000,000
$40,000,000
$30,000,000
$20,000,000
$10,000,000
$0
90.00%
85.00%
80.00%
75.00%
70.00%
65.00%
60.00%
55.00%
50.00%
45.00%
40.00%
THEORETICAL MAXIMUM EFFICIENCY
EFFICIENCY
CUMULATIVE SAVINGS
FY 1996
FY 2000
FY 2002
FY 2006
FY 2010
FY 2014
FY 2016
Cumulative Avoided Gas Cost
Efficiency

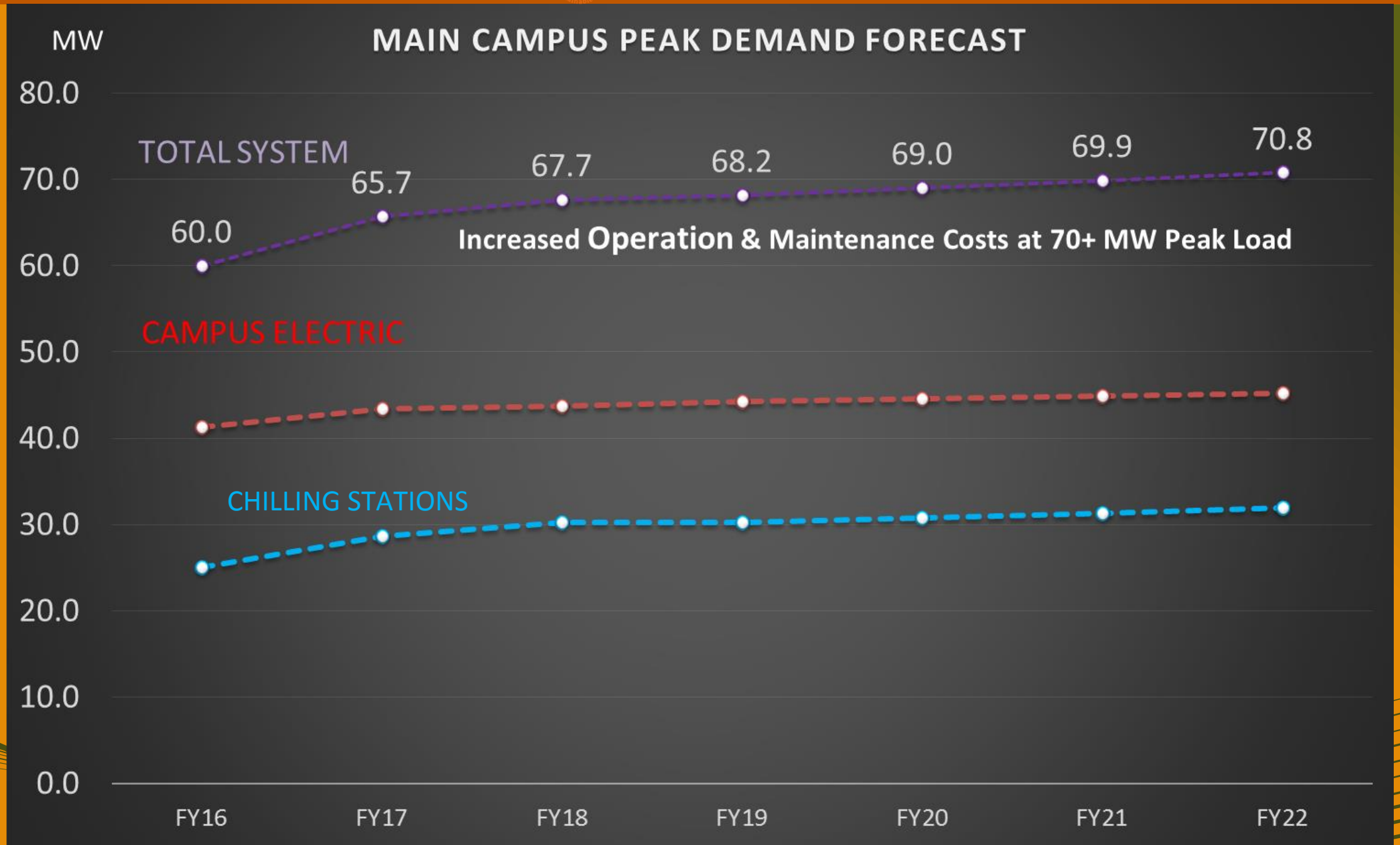
Demand Side Strategic Plan

- Background:
  - Preserve and enhance the university's utility supply assets in the context of potential space growth.

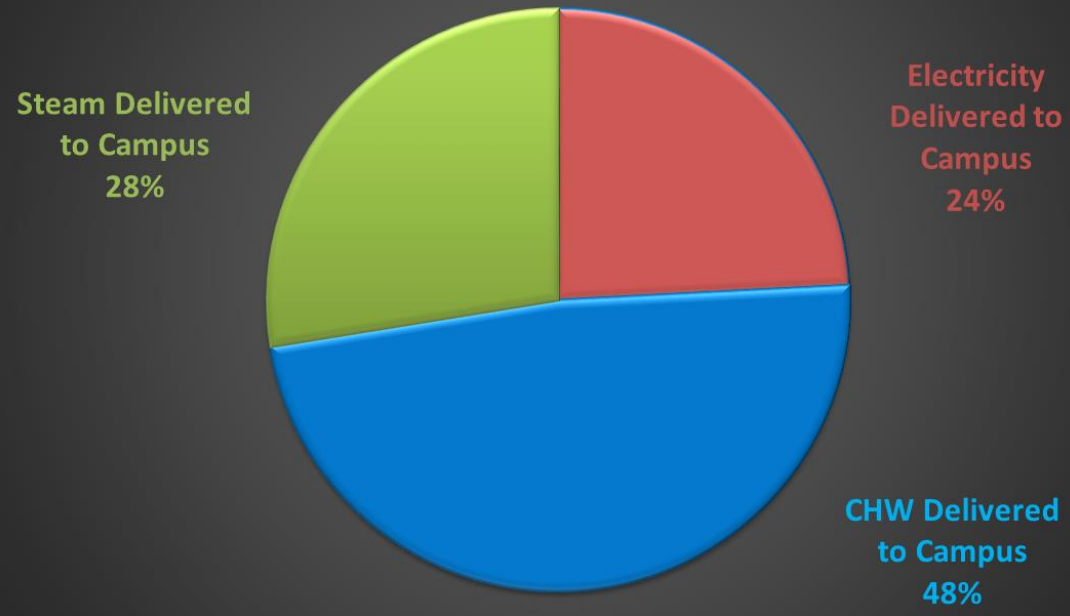
- Guiding Principles:
  - Comprehend unprecedented space growth currently underway.
  - Minimize impact to capacity, high efficiency, long term reliability, resilience and operational costs of utility plants.
  - Major capital improvements to plant and systems are not cost effective.


Fuel Gas Forecast (MMBTU)
MMBTU
6,000,000
5,500,000
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
Actual volumes
FY2016 forecast, escalated at 2%
4,073,192
4,149,959
4,492,049
4,959,585
5,475,782
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
FY 2020
FY 2021
FY 2022
FY 2023
FY 2024
FY 2025
FY 2026
FY 2027
FY 2028
FY 2029
FY 2030

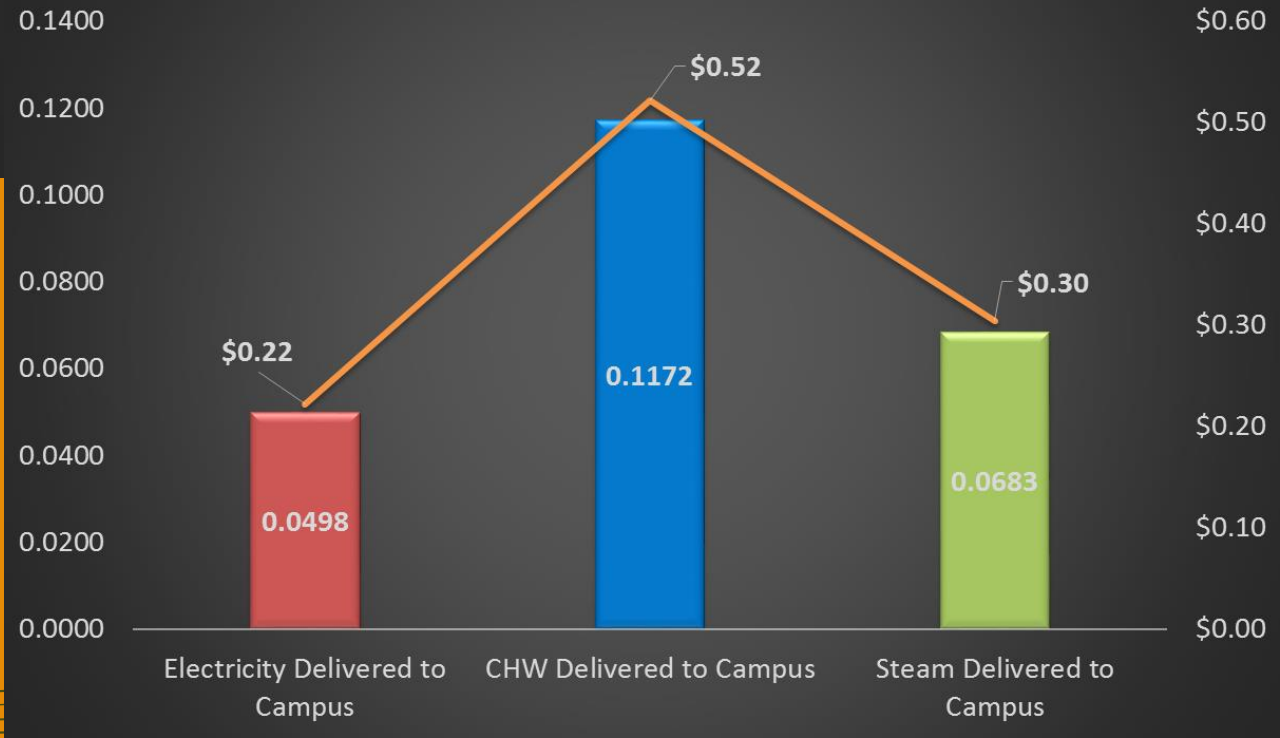

Fuel Gas Forecast (MMBTU)
MMBTU
6,000,000
5,500,000
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
FY2016 forecast, escalated at 2%
Actual volumes
5,475,782
4,959,585
4,944,878
4,492,049
4,650,759
4,149,959
4,356,641
4,073,192
3,790,226
FY17 - Dell Medical School, Rowling Hall
FY18 - EERC, Seton Hospital
FY19 - Graduate Student Housing
Projection based on new 250,000 GSF/yr from FY 2020 - FY2030
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
FY 2020
FY 2021
FY 2022
FY 2023
FY 2024
FY 2025
FY 2026
FY 2027
FY 2028
FY 2029
FY 2030


MW
MAIN CAMPUS PEAK DEMAND FORECAST
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
TOTAL SYSTEM
60.0
65.7
67.7
68.2
69.0
69.9
70.8
Increased Operation & Maintenance Costs at 70+ MW Peak Load
CAMPUS ELECTRIC
CHILLING STATIONS
FY16
FY17
FY18
FY19
FY20
FY21
FY22

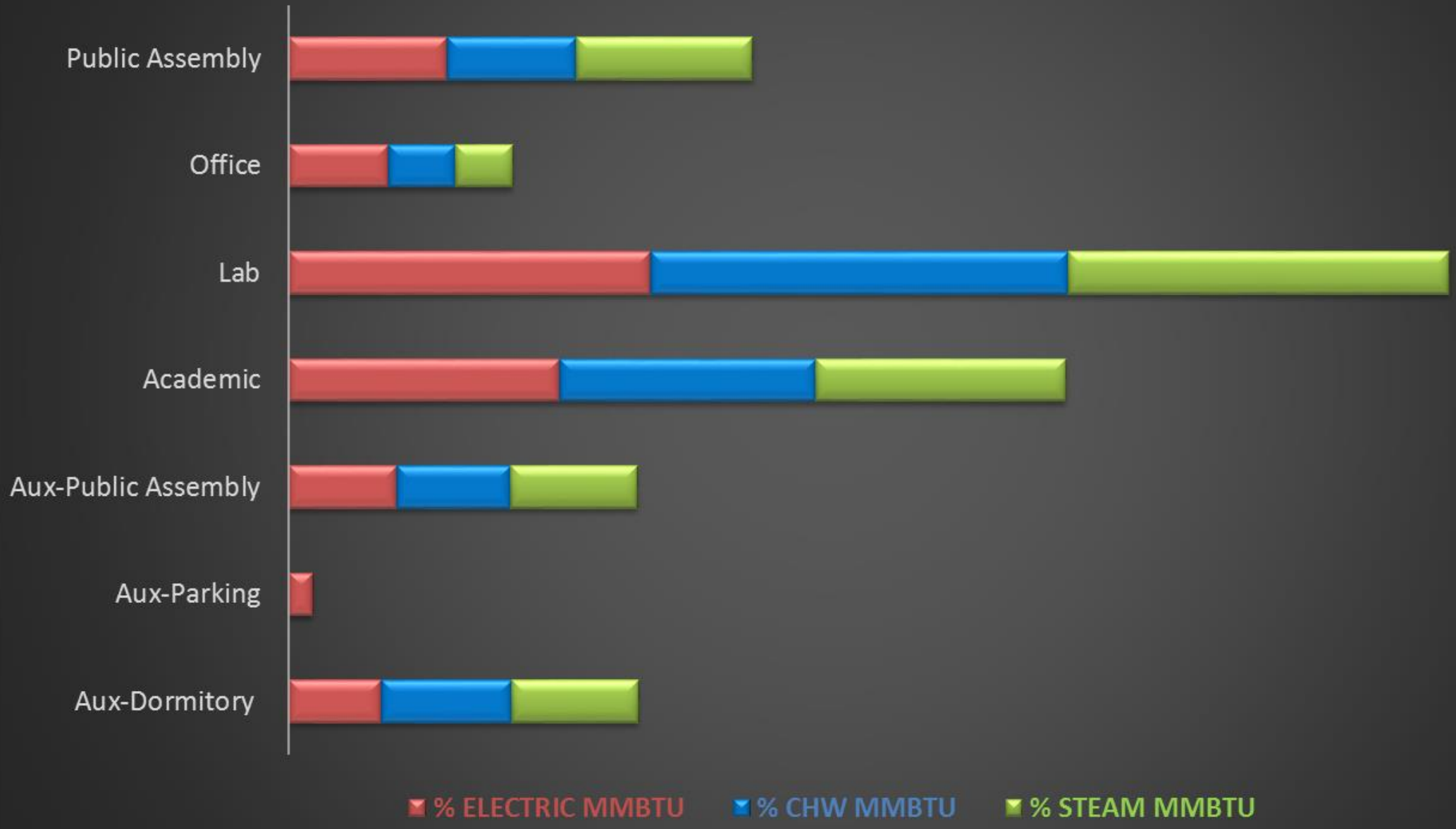
UT AUSTIN DEMAND PROFILE (FY15 DATA)

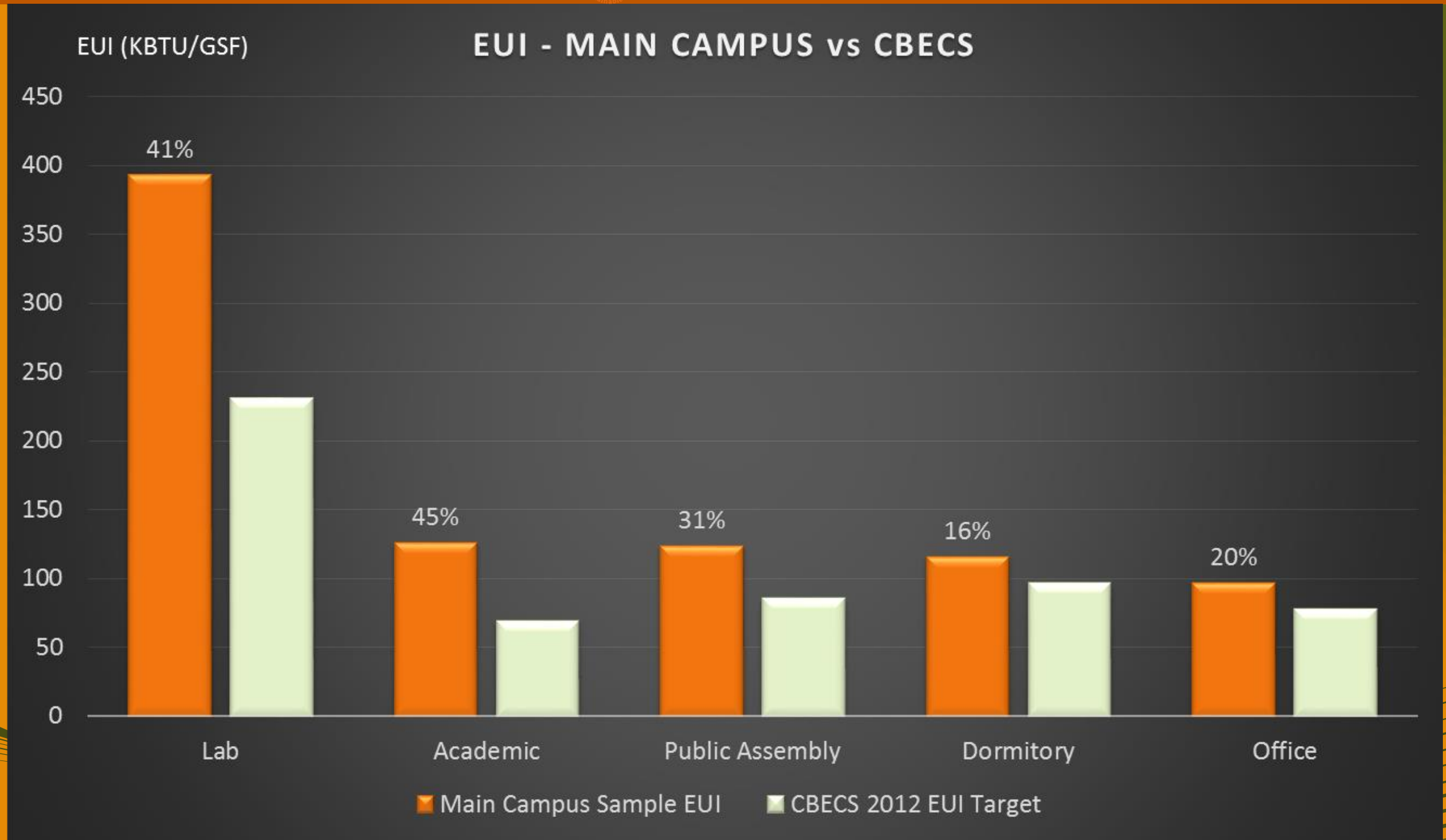


DEMAND PROFILE STANDARDIZED (FY15 DATA)



DEMAND PROFILE- BUILDING TYPE (FY15 DATA)




EUI - MAIN CAMPUS vs CBECS
EUI (KBTU/GSF)
450
400
350
300
250
200
150
100
50
0
41%
45%
31%
16%
20%
Lab
Academic
Public Assembly
Dormitory
Office
Main Campus Sample EUI
CBECS 2012 EUI Target

Demand Side Strategic Plan - Framework

Mission: "Utilize innovative demand side energy management strategies to offset projected campus energy growth"

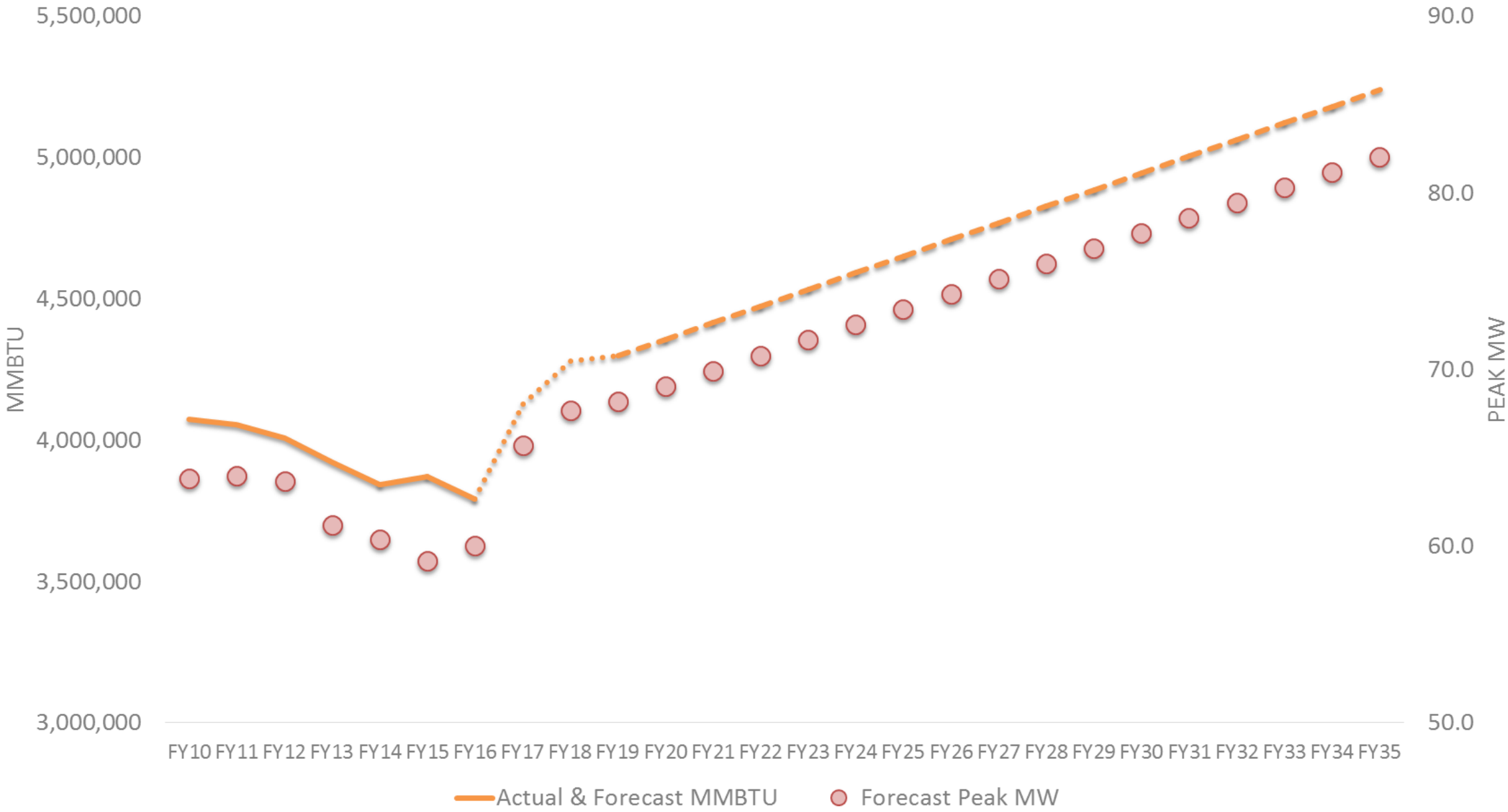
Goal: Reduce the average EUI on main campus by at least 2% annually

- Objectives
- Strategies
- Action Plan

Demand Side Strategic Plan – Goal Topic Areas

- **Building Optimization, Operations & Maintenance (BOOM)**
  - Revolving Fund
  - Operation & Maintenance
  - Building Commissioning
- **Campus Construction & Renovation**
  - EUI Targets
  - Life Cycle Cost Analysis
  - Technical Reviews
- **Energy Conservation Culture**
  - Energy Standards & Policies
  - Behavior Programs
  - Accessible Energy Data

Overall Energy Impact - Offset 2% Space Growth



Overall Energy Impact - Offset 2% Space Growth

$150 Million Power Plant Expansion to Ensure Reliability & Resiliency at 80+ MW Peak Load

Increased Operation & Maintenance Costs at 70+ MW Peak Load

Overall Energy Impact - Offset 2% Space Growth

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Increased Operation & Maintenance Costs at 70+ MW Peak Load

Implementation of Strategic Plan will Offset Future Growth and Avoid $150 Million Power Plant Investment