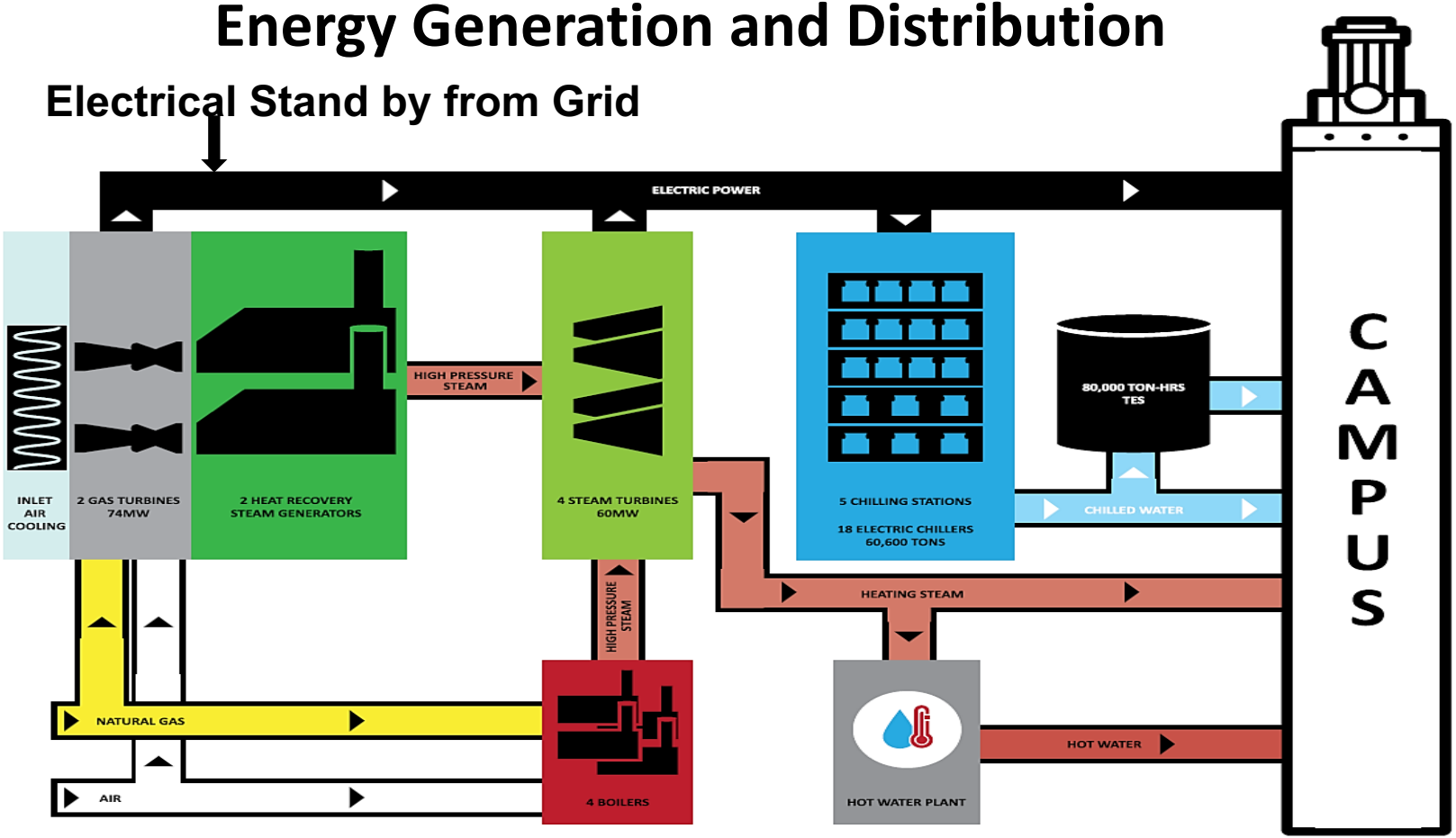
THE UT AUSTIN UTILITY PLANTS

JUAN ONTIVEROS, P.E.
ASSOCIATE VICE PRESIDENT
UTILITIES, ENERGY AND FACILITIES MANAGEMENT
The University of Texas at Austin

Energy Generation and Distribution

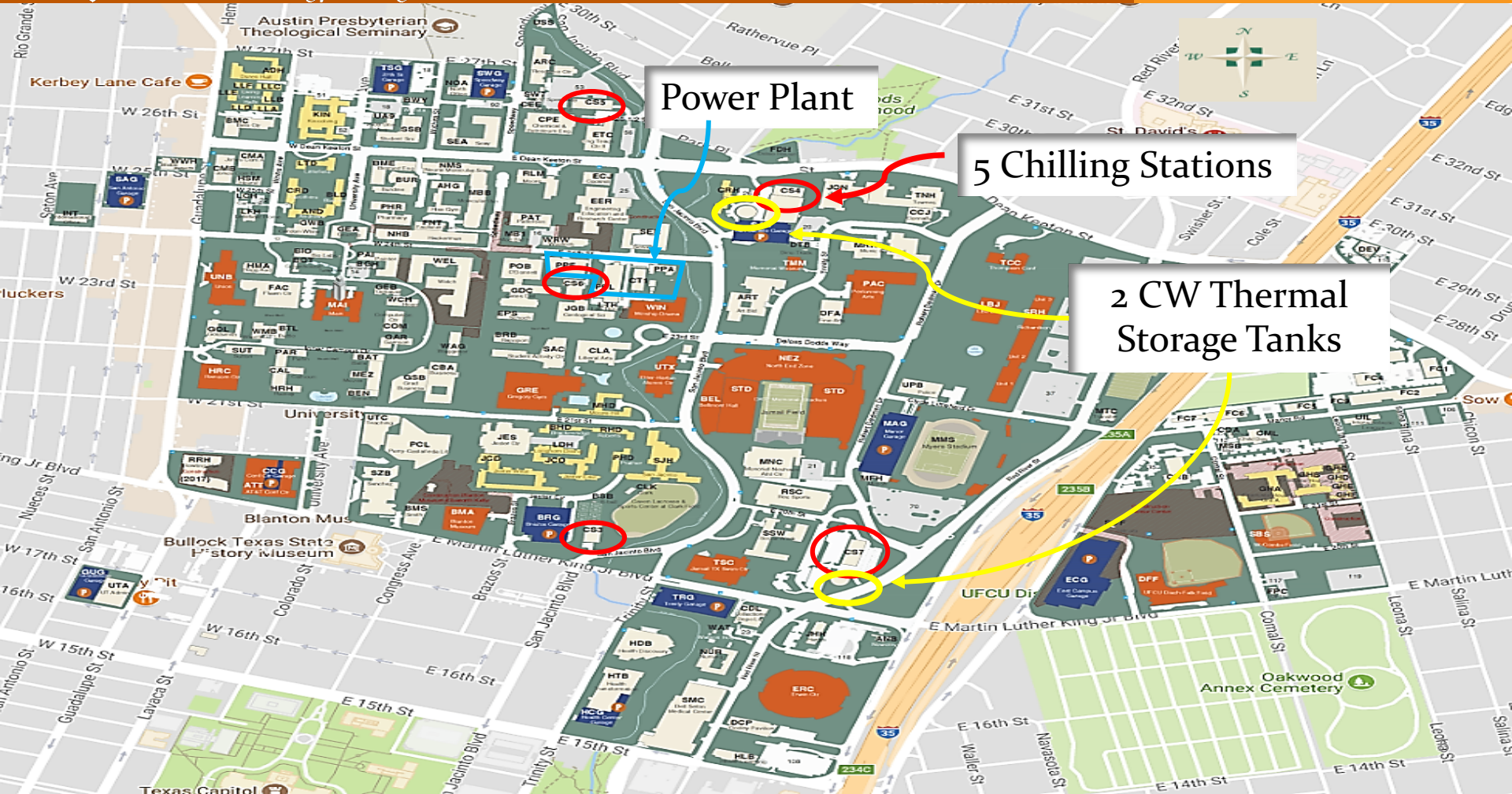


Performance Features

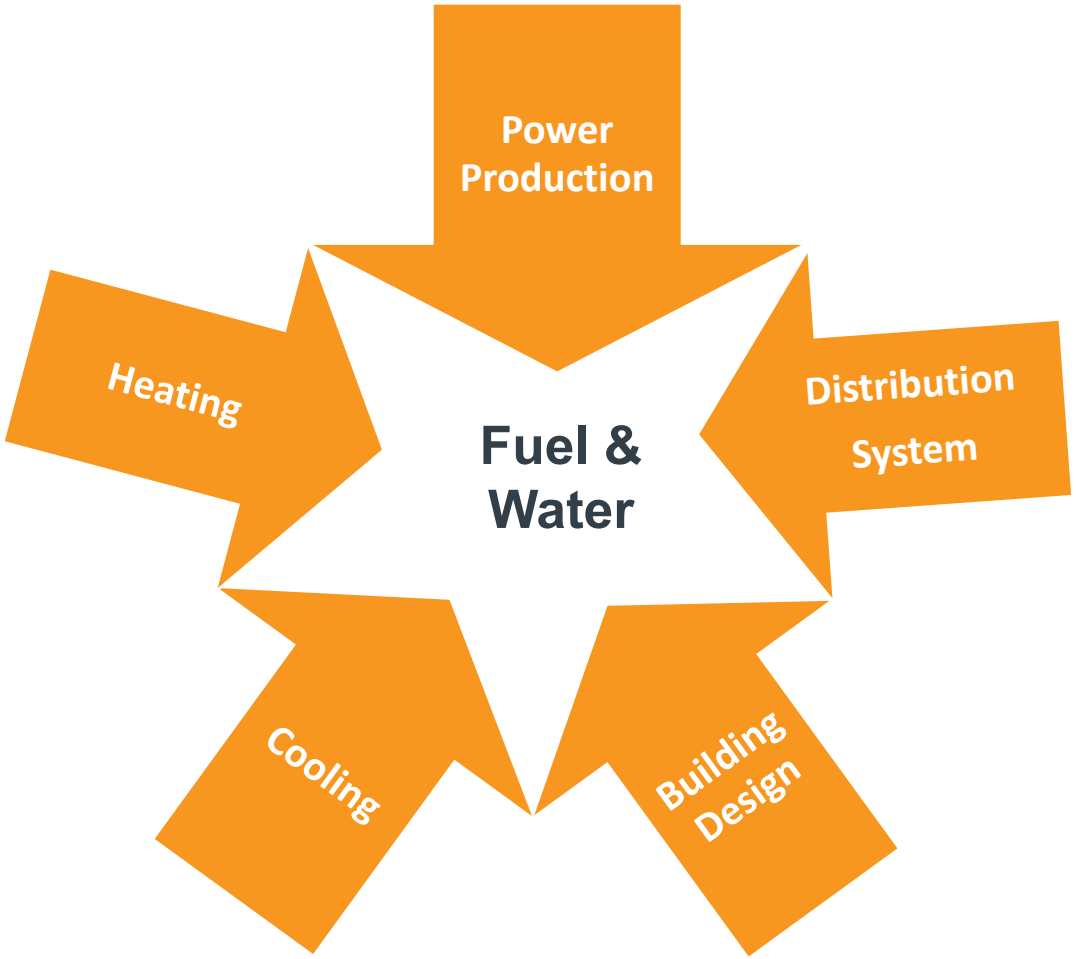
- Ability to 100% Island all Power at will
- Net Zero Power to ERCOT Grid plus simultaneous Heating/Cooling
- Redundancy for Power (134 MW – 60 MW Peak)
  - Multiple Generators – Inlet Air Cooling on Gas Turbines
  - Substation and 25 MW Grid Stand-By
- Redundancy for Chilled Water (60,600 tons – 30,000 tons Peak)
  - 10 MG Chilled Water Thermal Storage (80,000 ton-hours)
    - Backup and Load Shifting
- 2 Independent High-Pressure Gas Mains to Plants
- Instantaneous Load-Shed built in for excess Steam & Electricity

Performance Features

- Optimization
  - Chilled Water System (.62 kW/Ton Annual Average)
  - Heat Rate (8,791 Btu/kW Annual Average)
- Meter 95% of all Campus Facilities (20 million GSF)
  - 1,000 meters
    - electricity, steam, chilled water and domestic water
- Four Campus-Wide Outages in 40 years


Power Plant
5 Chilling Stations
2 CW Thermal Storage Tanks
Austin Presbyterian Theological Seminary
Kerbey Lane Cafe
W 26th St
W 27th St
E 27th St
W 23rd St
W 21st St
E 30th St
Rathervue Pl
E 31st St
E 32nd St
E 30th St
E 29th St
E 28th St
Dean Keeton St
Red River
Swisher St
Cole St
Robert Dedman Dr
Trinity St
Delbas Dodds Way
Red River St
University
Blanton Mus
Bullock Texas State History Museum
W 17th St
W 16th St
E 16th St
W 15th St
E 15th St
E 14th St
Nueces St
San Antonio St
Colorado St
Congress Ave
Brazos St
San Jacinto Blvd
Guadalupe St
Lavaca St
Waller St
Navasota St
Comal St
Leona St
Salina St
Leona St
E Martin Luther King Jr Blvd
UFCU Di
Oakwood Annex Cemetery
Texas Capitol
Rio Grande
Serton Ave
Guadalupe
Hemphill Pl
Rio Grande St
Sow
Chicon St
Salina St
Leona St
Salina St
CSS
CS4
CS6
CS3
CST
CRH
JON
TNH
CCJ
DTB
TMN
PAC
DFA
TCC
LBJ
SRH
ART
WIN
PPA
CT1
POB
PRC
JGB
LTH
EER
ECJ
FLN
PAT
NMS
AHG
MBB
BUR
BME
NHB
WEL
WCH
CON
GAR
GEB
MAI
FAC
HUA
UNB
GOL
WMB
BTL
SUT
PAR
BAT
MEZ
BEN
HRC
CAL
HRH
CBA
GSB
GRE
WAG
SAC
CLA
UTK
NEZ
STD
BEL
MAG
MMS
UPB
MNC
RSC
SSW
MFH
ECG
DFF
SBS
GHA
GHB
GHC
GHD
GHE
FCF
FCE
FCI
FC1
FC2
FPC
CPA
GML
WSB
LCB
MTC
ARB
ERC
DCP
HLB
SMC
HDB
HTB
HCG
NUR
TRG
CCL
WAT
CPE
ETC
SEA
SSE
KIN
UTX
BMA
BRG
BMS
SZB
PCL
JES
LDH
RHD
SJH
CLK
BBB
CCO
PHD
RRH
CCG
ATT
ATHETICS
UTA
OUG
SAG
INT
WWH
CMA
HSM
CRD
ELD
AND
GWB
LTH
CEA
PHR
PNT
BIO
PAI
BIN
HUA
FAC
MAI
GEB
WCH
CON
GAR
WEL
POB
GDC
JGB
LTH
EPS
ERB
SAC
CLA
WAG
GRE
UTX

Holistic Approach to Total Energy



Campus Staging | OAT 70.2 °F | OAH 66 % | WET BULB 62.6 °F | CHLRMODE ON | LOOPMODE ON | UT Austin

UTAustin Distributed Chiller System

Campus Demand

UT CHW Demand Flow	33,303.0 gal/min
UT CHW Demand Tons	16606.8 Tons
UT CHW Chlr Tons	16606.8 Tons
UT CHW TES Tons	0.0 Tons

Chiller Station 4

Total Plant kW	3.0 kW
Total Plant Efficiency	0.000 kW/Ton
CS4 CH1 EvapTons	0.0 Tons
CS4 CH1 EvapFlow	0.0 gal/min
CS4 CH2 EvapTons	0.0 Tons
CS4 CH2 EvapFlow	0.0 gal/min
CS4 CH3 EvapTons	0.0 Tons
CS4 CH3 EvapFlow	1.0 gal/min

Thermal Energy Storage Tank 1

TESMODE	0
Total Plant Energy Use	0.0 kW
TES1 Pump Efficiency	0.0
Charge Flow	0.0 gal/min
Discharge Flow	0.0 gal/min
Thermocline	60.0 ft

Thermal Energy Storage Tank 2

TESMODE	0
Total Plant Energy Use	0.0 kW
TES2 Pump Efficiency	0.0
Charge Flow	0.0 gal/min
Discharge Flow	0.0 gal/min
Thermocline	75.0 ft

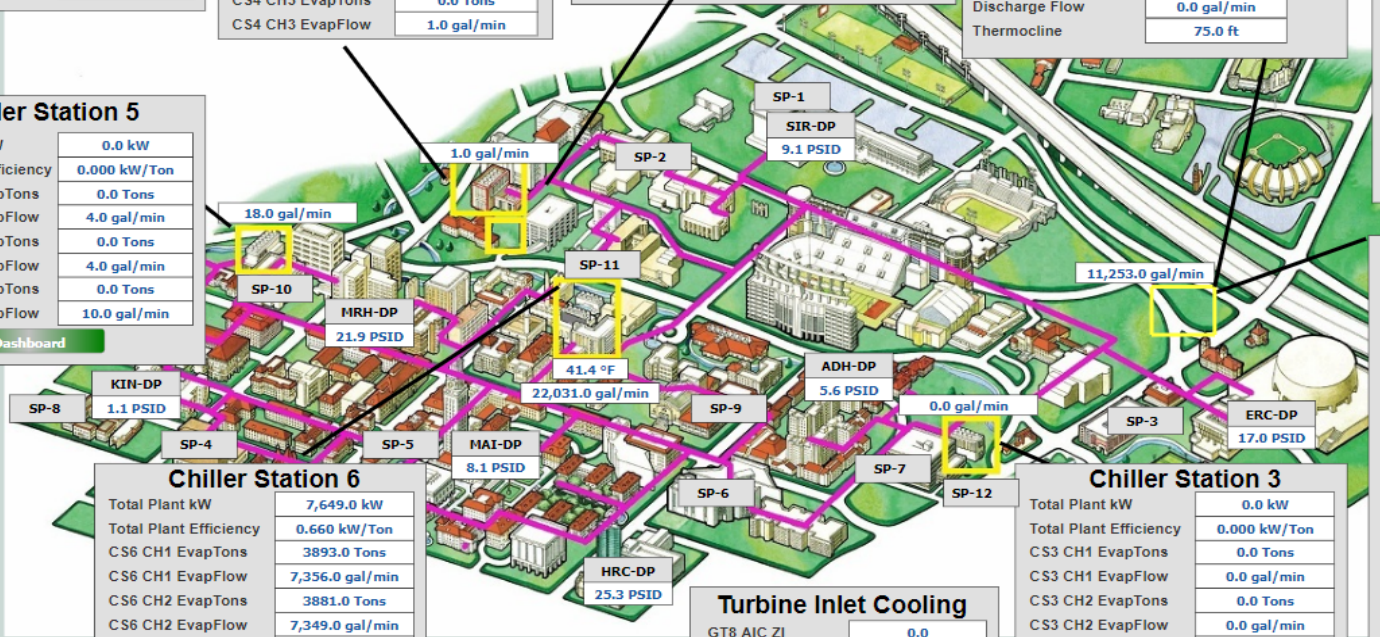
System Totals

UT CHW Total Flow	33,303.0 gal/min
UT CHW Total kW	10,212.1 kW
UT CHW Total Ton	16606.8 Tons
UT CHW Total kW/Ton	0.615 kW/Ton
CS3 Total Ton	0.0 Tons
CS4 Total Ton	0.0 Tons
CS5 Total Ton	0.0 Tons
CS6 Total Ton	11592.0 Tons
CS7 Total Ton	5014.8 Tons
HDPE CHWS Flow	-4,832.0 gal/min
HDPE CHWR Flow	-5,402.0 gal/min

Chiller Station 5

Total Plant kW	0.0 kW
Total Plant Efficiency	0.000 kW/Ton
CS5 CH1 EvapTons	0.0 Tons
CS5 CH1 EvapFlow	4.0 gal/min
CS5 CH2 EvapTons	0.0 Tons
CS5 CH2 EvapFlow	4.0 gal/min
CS5 CH3 EvapTons	0.0 Tons
CS5 CH3 EvapFlow	10.0 gal/min

Dashboard



Chiller Station 7

Total Plant kW	2,563.1 kW
Total Plant Efficiency	0.516 kW/Ton
CS7 CH1 EvapTons	1232.4 Tons
CS7 CH1 EvapFlow	2,817.0 gal/min
CS7 CH2 EvapTons	0.0 Tons
CS7 CH2 EvapFlow	2.0 gal/min
CS7 CH3 EvapTons	1258.5 Tons
CS7 CH3 EvapFlow	2,769.0 gal/min
CS7 CH4 EvapTons	1252.4 Tons
CS7 CH4 EvapFlow	2,809.0 gal/min
CS7 CH5 EvapTons	1271.5 Tons
CS7 CH5 EvapFlow	2,852.0 gal/min
CS7 CH6 EvapTons	0.0 Tons
CS7 CH6 EvapFlow	1.0 gal/min

Dashboard

Chiller Station 6

Total Plant kW	7,649.0 kW
Total Plant Efficiency	0.660 kW/Ton
CS6 CH1 EvapTons	3893.0 Tons
CS6 CH1 EvapFlow	7,356.0 gal/min
CS6 CH2 EvapTons	3881.0 Tons
CS6 CH2 EvapFlow	7,349.0 gal/min
CS6 CH3 EvapTons	3818.0 Tons
CS6 CH3 EvapFlow	7,326.0 gal/min

Dashboard

Turbine Inlet Cooling

GT8 AIC ZI	0.0
GT8 AIC Flow	0.0 gal/min
GT10 AIC ZI	3.0
GT10 AIC Flow	0.0 gal/min

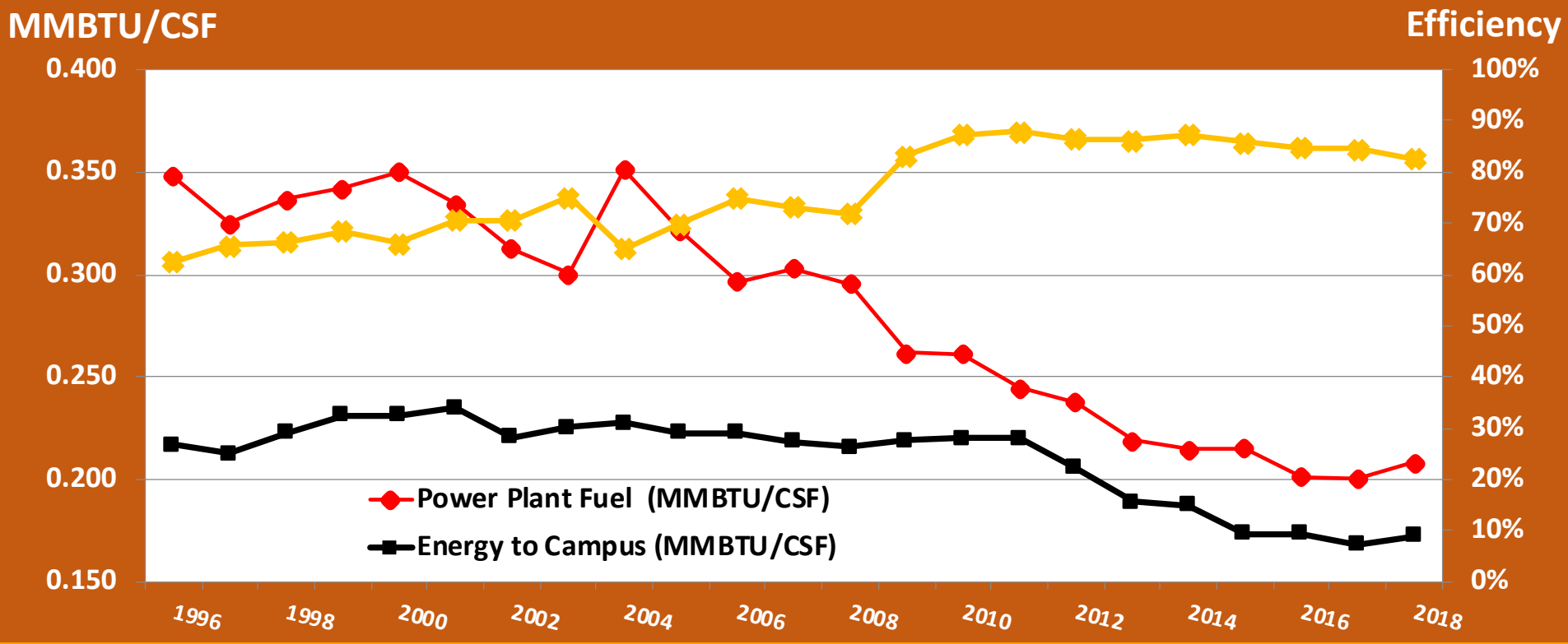
Chiller Station 3

Total Plant kW	0.0 kW
Total Plant Efficiency	0.000 kW/Ton
CS3 CH1 EvapTons	0.0 Tons
CS3 CH1 EvapFlow	0.0 gal/min
CS3 CH2 EvapTons	0.0 Tons
CS3 CH2 EvapFlow	0.0 gal/min
CS3 CH3 EvapTons	0.0 Tons
CS3 CH3 EvapFlow	0.0 gal/min

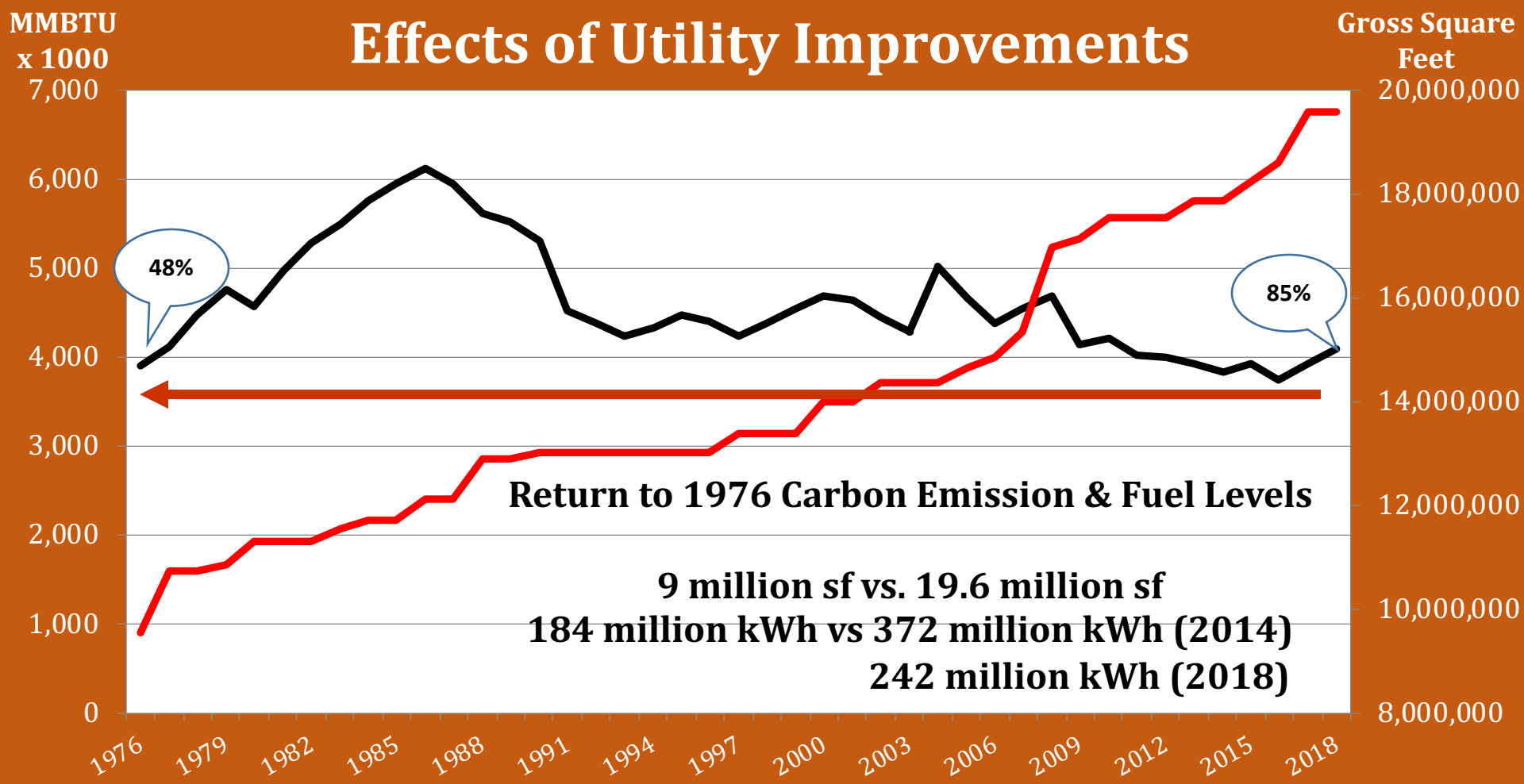
Dashboard

Optimized Dispatch

	Hour	4	5	6	7	8	9	10	11	12
TES	Disch TES	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
	Disch Rate	0.0 gal/min	0.0 gal/min	0.0 gal/min	0.0 gal/min	0.0 gal/min	0.0 gal/min	6,846.3 gal/min	14,048.3 gal/min	17,500.0 gal/min
	Disch History	OFF	OFF	OFF	OFF	OFF				
	Disch Avg GPM	0.0 gal/min	0.0 gal/min	0.0 gal/min	0.0 gal/min	0.0 gal/min				
	Disch Gallons	0 gal	0 gal	0 gal	0 gal	0 gal				
	Charge TES	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
	Charge Rate	8,719.1 gal/min	9,577.5 gal/min	8,741.1 gal/min	1,245.6 gal/min	0.0 gal/min	0.0 gal/min	0.0 gal/min	0.0 gal/min	0.0 gal/min
	Charge History	ON	ON	ON	ON	OFF				
	Charge Avg GPM	14,226.9 gal/min	9,393.7 gal/min	4,508.4 gal/min	1,638.0 gal/min	132.3 gal/min				
	Charge Gallons	853,616 gal	563,622 gal	270,505 gal	98,278 gal	7,937 gal				
					<—— History	Current Hr	Forecast ——>			
WEATHER	Forecast OAT	77.0 °F	74.0 °F	72.0 °F	72.0 °F	70.0 °F	70.0 °F	71.0 °F	73.0 °F	75.0 °F
	Actual OAT	76.6 °F	74.7 °F	72.6 °F	71.2 °F	70.0 °F				
	Forecast RH	64 %	61 %	64 %	65 %	61 %	60 %	56 %	52 %	48 %
	Actual RH	63.8 %	66.8 %	69.3 %	69.3 %	66.6 %				
	Forecast OAWB	67.1 °F	65.3 °F	64.5 °F	63.5 °F	61.8 °F	61.0 °F	60.9 °F	61.5 °F	62.0 °F
	Actual OAWB	67.8 °F	66.8 °F	65.6 °F	64.4 °F	62.6 °F				
POWER CURVE FIT	Forecast MW	35.689	35.78	37.427	39.408	41.088	43.285	45.446	47.416	48.586
	Baseline MW	37.571	36.684	37.93	39.284	38.109				
	Actual MW	42.025	38.683	38.881	39.547	38.109				
	Fcast 24 Hr Avg MW	39.926	40.124	39.942	39.759	39.596	39.483	39.401	39.357	39.304
	Target MW	38.606	38.714	39.932	39.759	43.876	43.783	43.701	43.657	43.604
COOLING CURVE FIT	No CH Running	8	8	8	8	7				
	Rated Online Tons	30000.0 Tons	30000.0 Tons	30000.0 Tons	30000.0 Tons	25000.0 Tons				
	Forecast Tons	17519.6 Tons	16125.2 Tons	15799.0 Tons	15432.1 Tons	14606.6 Tons	14641.3 Tons	15175.7 Tons	16226.9 Tons	17152.8 Tons
	Actual Tons	19634.7 Tons	18347.9 Tons	18642.8 Tons	18384.5 Tons	14203.7 Tons				
	Forecast Plant MW	11.456	9.953	9.163	8.852	7.862	7.667	7.882	8.548	9.223
	Actual Plant MW	17.659	14.102	12.668	11.271	8.669				



Gas Savings 1996 vs 2018
19,853,000 MMBTU
Cumulative

CO_2e Avoided = 1,164,500 tons
Cumulative

Effects of Utility Improvements