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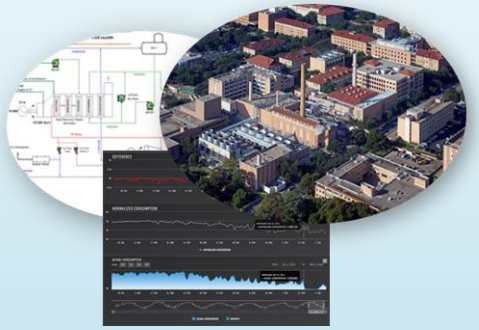
AVP
Utilities, Energy and Facilities Management

The University of Texas Holistic Approach to Energy and Water

districtCOOLING2016
A CLIMATE SOLUTION
NOVEMBER 13-15 | JUMEIRAH BEACH HOTEL | DUBAI, UAE

A Holistic Approach to Energy and Water



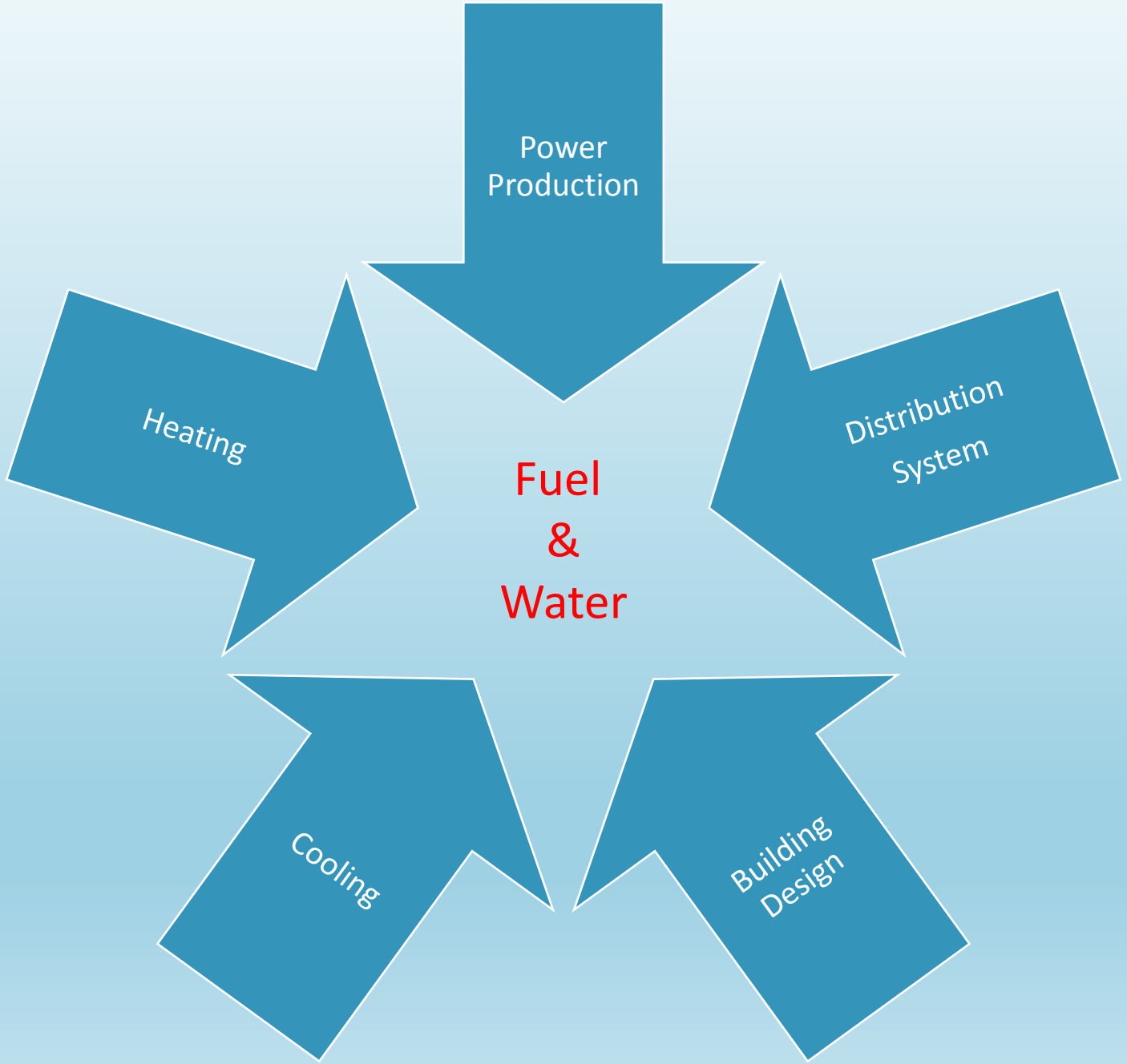
Goals and Objectives

- Introduce the Campus Energy System
- Pathway to Cooling Optimization
- Water and Energy Benefits from Optimization
- Demand Side's Role
- Technology Approach to Manage RO Reject

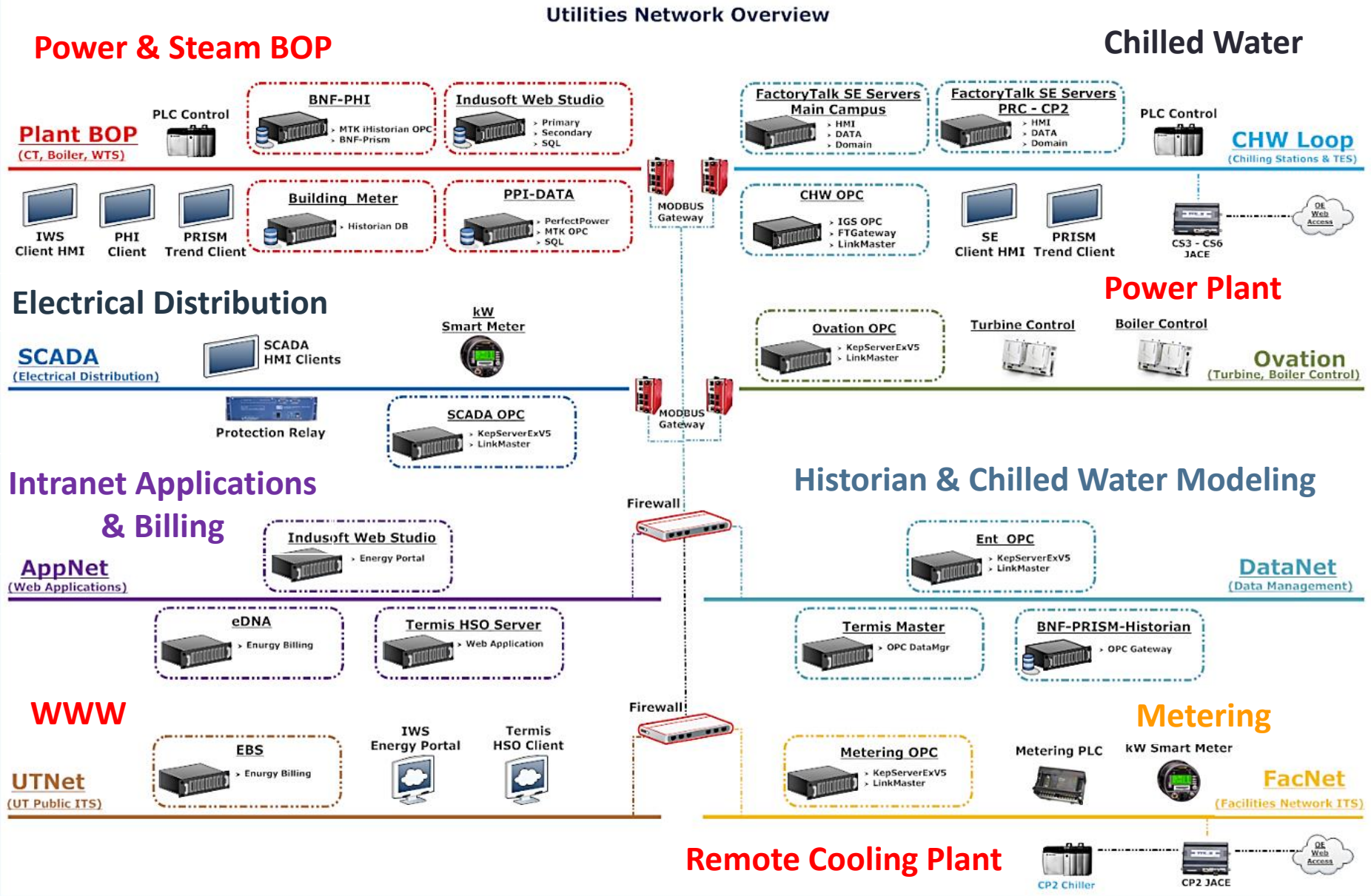
Boiler Plant Commissioned	1910
Power Plant Commissioned	1928
Heating Capacity	1,200,000 lbs/hr (230K Peak)
Cooling Capacity	44,000 Tons
(in construction)	15,000 Tons (33,000 Peak)
Chilled Water Storage	4 Million Gallons
(in construction)	5.5 Million Gallons
Generation Capacity	134 MW (59 MW Peak)

Electrical Duct Banks	32 Miles
Tunnels	9 Miles
Total Square Feet Served	18 million
Campus Acres	485
Student Population	53,000
Campus-Wide blackouts	4 in 54 years

Largest University Utility in US
Most Efficient University Utility in the US

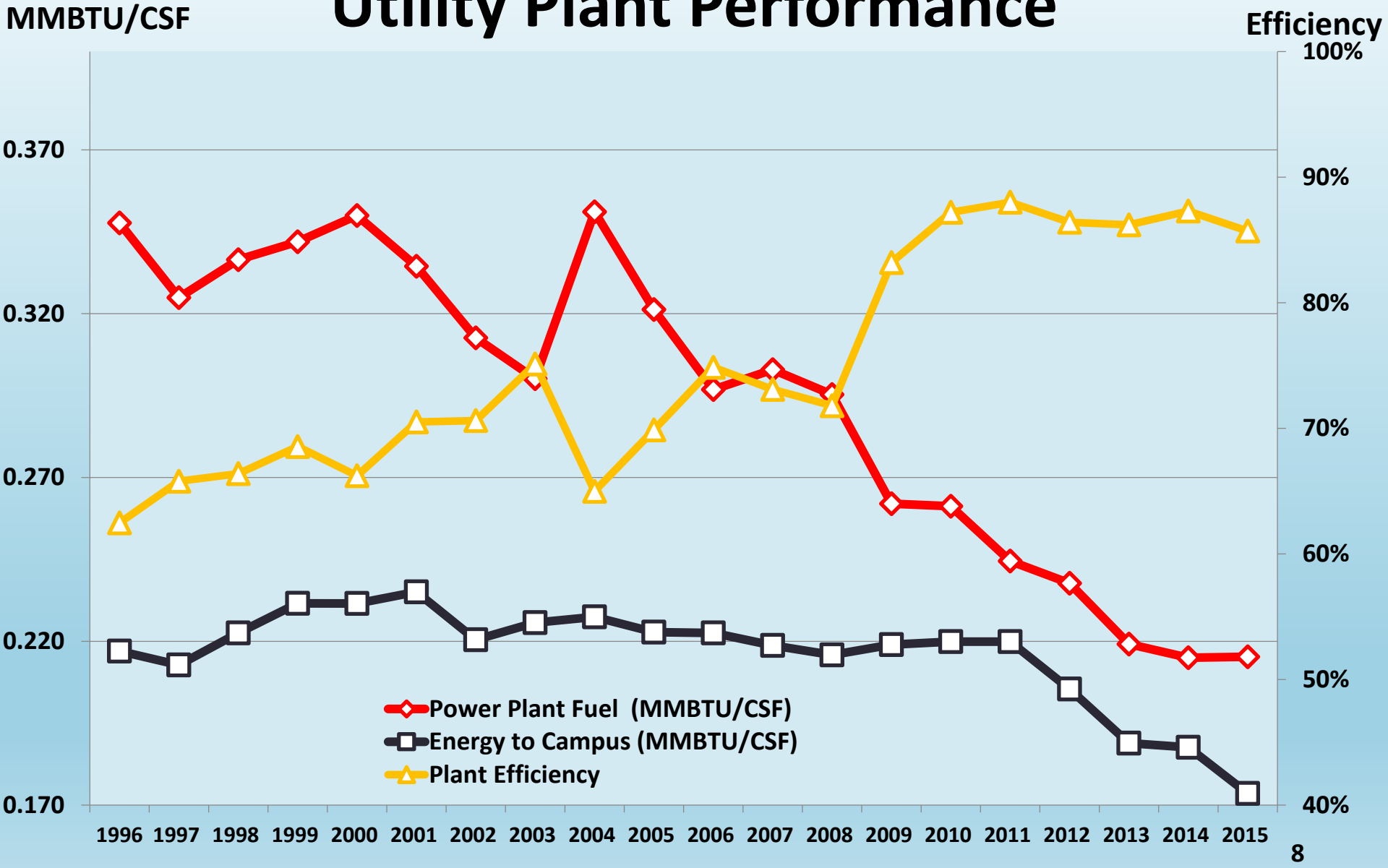

Power Production
Heating
Distribution System
Fuel & Water
Cooling
Building Design


CS5
CS4
CS6
CS7
CS3
Construction: Eng. Ed. Research Ctr
Construction: Dell Medical School District
Memorial Stadium
Waller Creek
E Dean Keeton St
Martin Luther King Jr Blvd
Speedway
San Jacinto Blvd
Red River St
Interregional Hwy

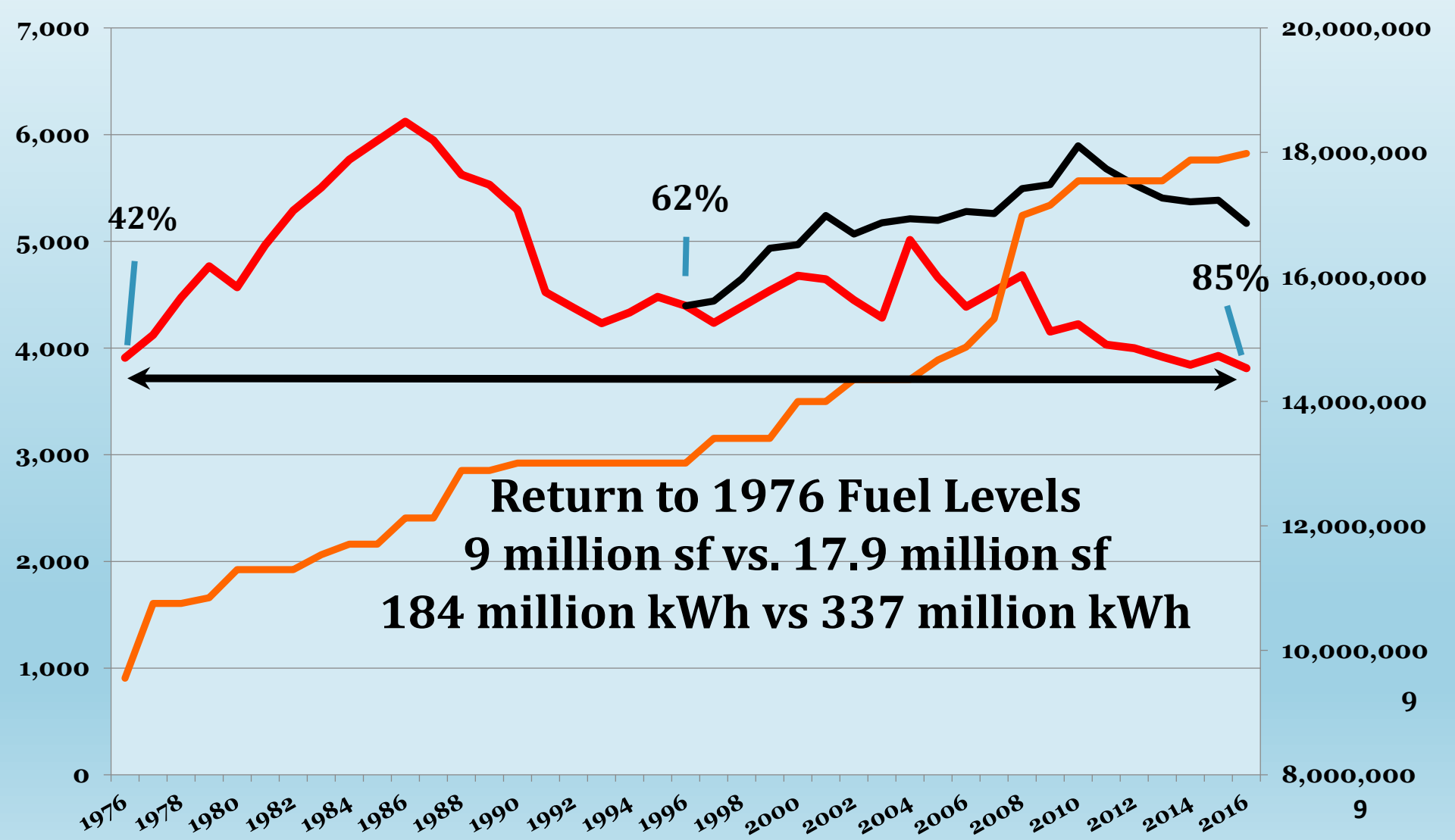

Utilities Network Overview
Power & Steam BOP
Chilled Water
Plant BOP
(CT, Boiler, WTS)
PLC Control
BNF-PHI
MTK iHistorian OPC
BNF-Prism
Indusoft Web Studio
Primary
Secondary
SQL
FactoryTalk SE Servers
Main Campus
HMI
DATA
Domain
FactoryTalk SE Servers
PRC - CP2
HMI
DATA
Domain
PLC Control
CHW Loop
(Chilling Stations & TES)
IWS
Client HMI
PHI
Client
PRISM
Trend Client
Building Meter
Historian DB
PPI-DATA
PerfectPower
MTK OPC
SQL
MODBUS
Gateway
CHW OPC
IGS OPC
FTGateway
LinkMaster
SE
Client HMI
PRISM
Trend Client
CS3 - CS6
JACE
OE
Web
Access
Electrical Distribution
Power Plant
SCADA
(Electrical Distribution)
SCADA
HMI Clients
kW
Smart Meter
Ovation OPC
KepServerExV5
LinkMaster
Turbine Control
Boiler Control
Ovation
(Turbine, Boiler Control)
Protection Relay
SCADA OPC
KepServerExV5
LinkMaster
MODBUS
Gateway
Intranet Applications
& Billing
Historian & Chilled Water Modeling
Firewall
Indusoft Web Studio
Energy Portal
AppNet
(Web Applications)
Ent OPC
KepServerExV5
LinkMaster
DataNet
(Data Management)
eDNA
Enurgy Billing
Termis HSO Server
Web Application
Termis Master
OPC DataMgr
BNF-PRISM-Historian
OPC Gateway
WWW
Firewall
Metering
EBS
Enurgy Billing
IWS
Energy Portal
Termis
HSO Client
Metering OPC
KepServerExV5
LinkMaster
Metering PLC
kW Smart Meter
UTNet
(UT Public ITS)
FacNet
(Facilities Network ITS)
Remote Cooling Plant
CP2 Chiller
CP2 JACE
OE
Web
Access

Networking

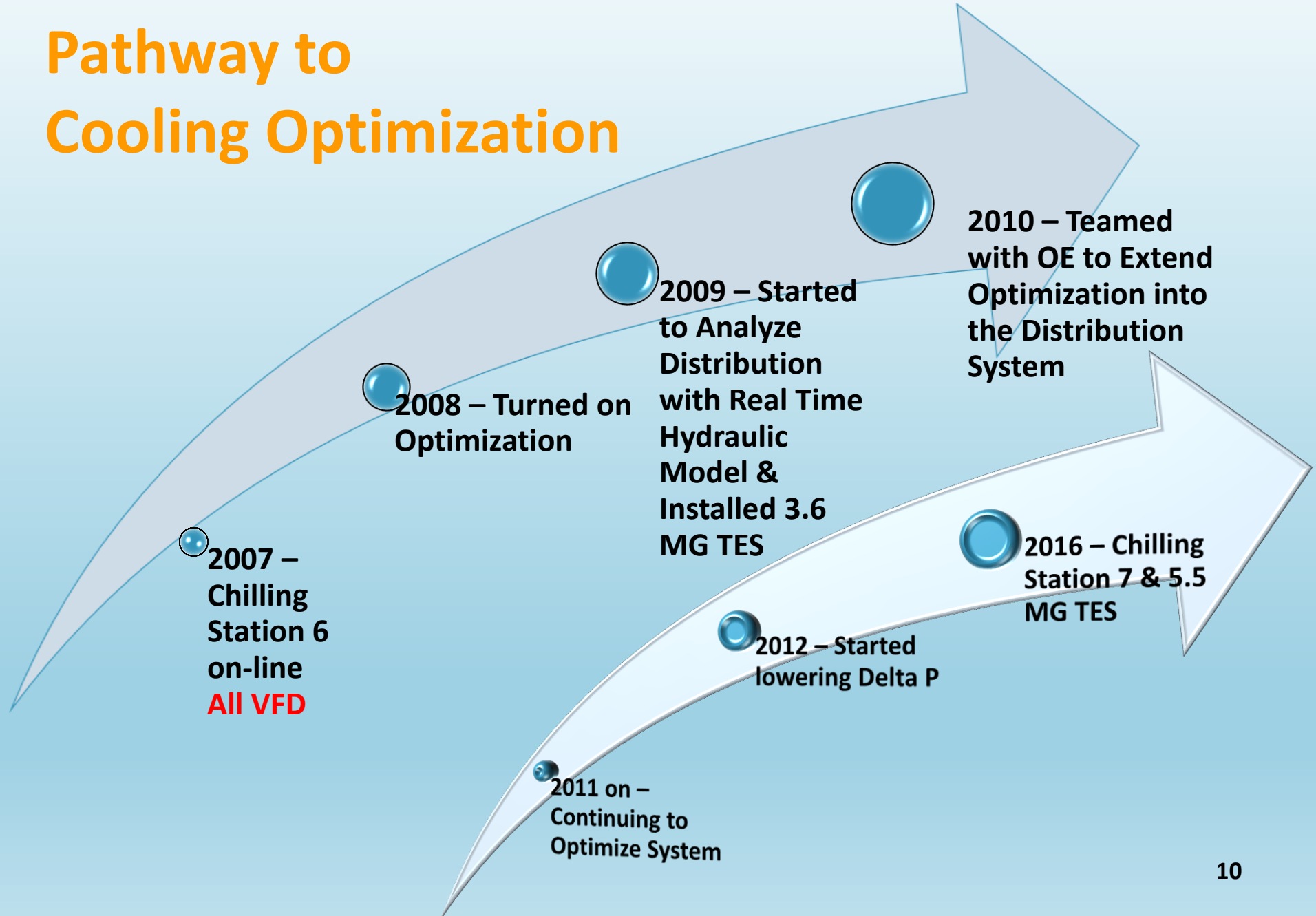
Utility Plant Performance



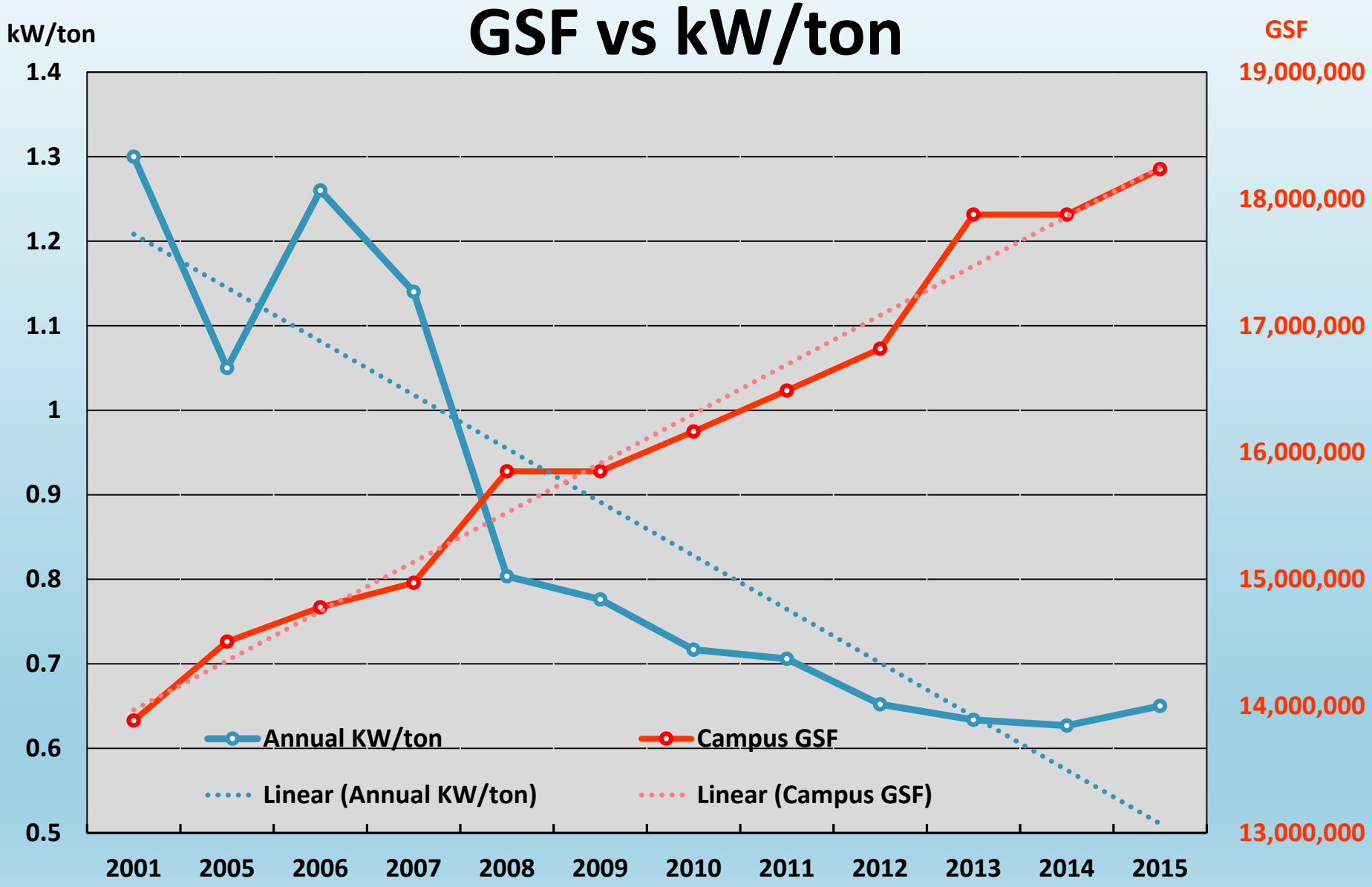
Effects of Utility Improvements on Total Annual Fuel Use



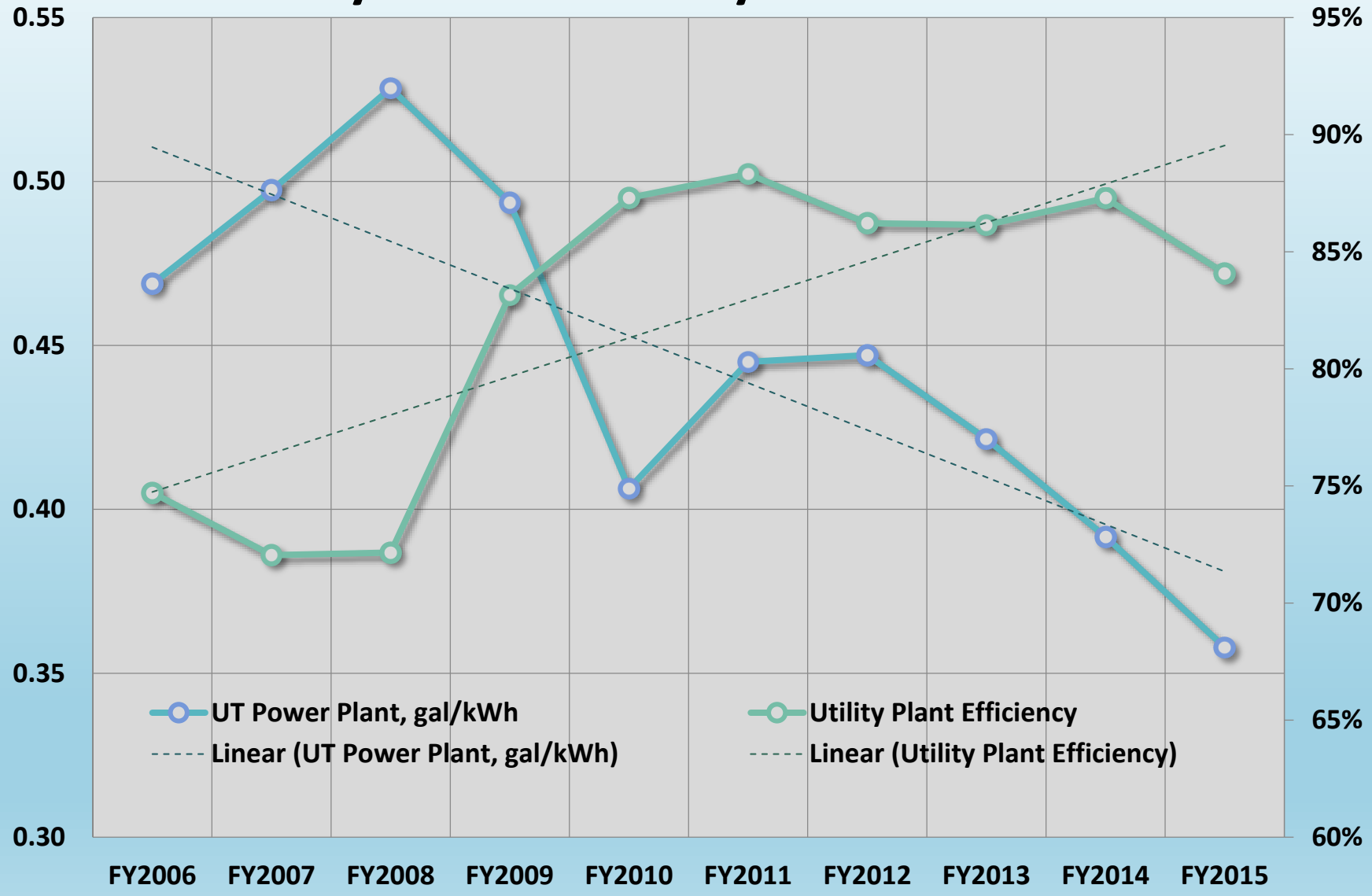
Pathway to Cooling Optimization



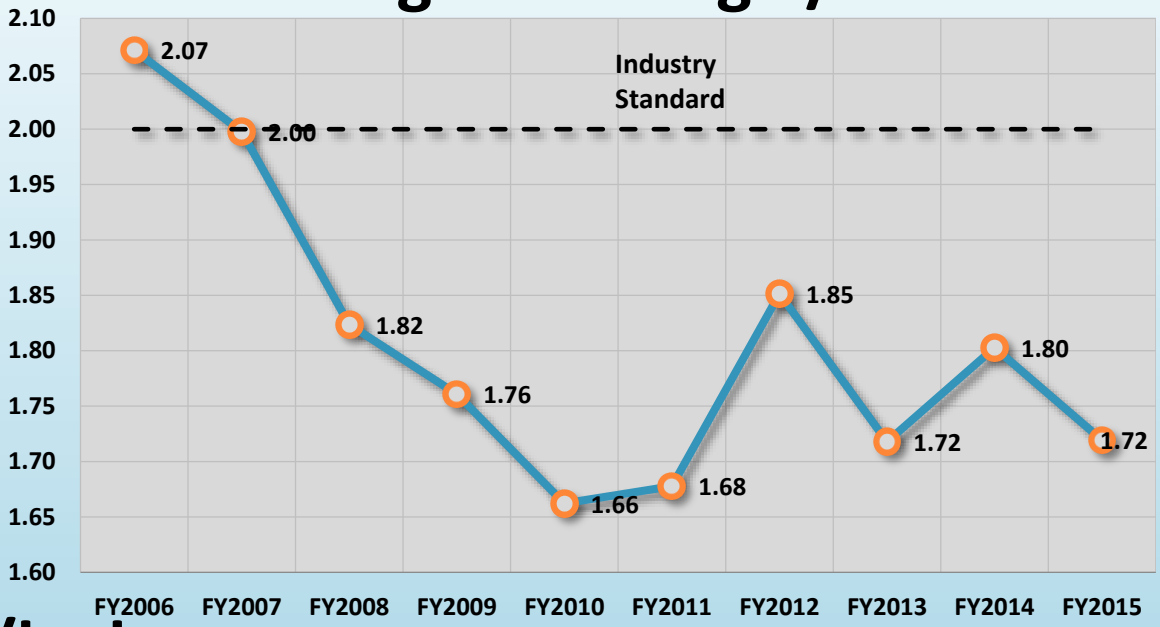
GSF vs kW/ton


kW/ton
GSF
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
19,000,000
18,000,000
17,000,000
16,000,000
15,000,000
14,000,000
13,000,000
2001
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Annual KW/ton
Campus GSF
Linear (Annual KW/ton)
Linear (Campus GSF)

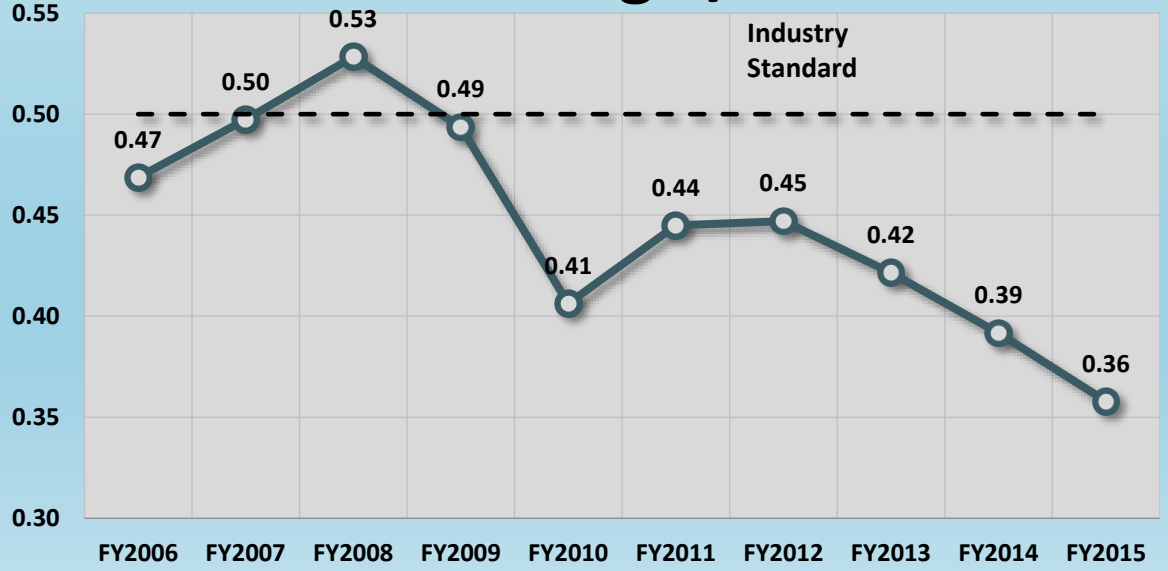
Utility Plant Efficiency vs Water Consumed



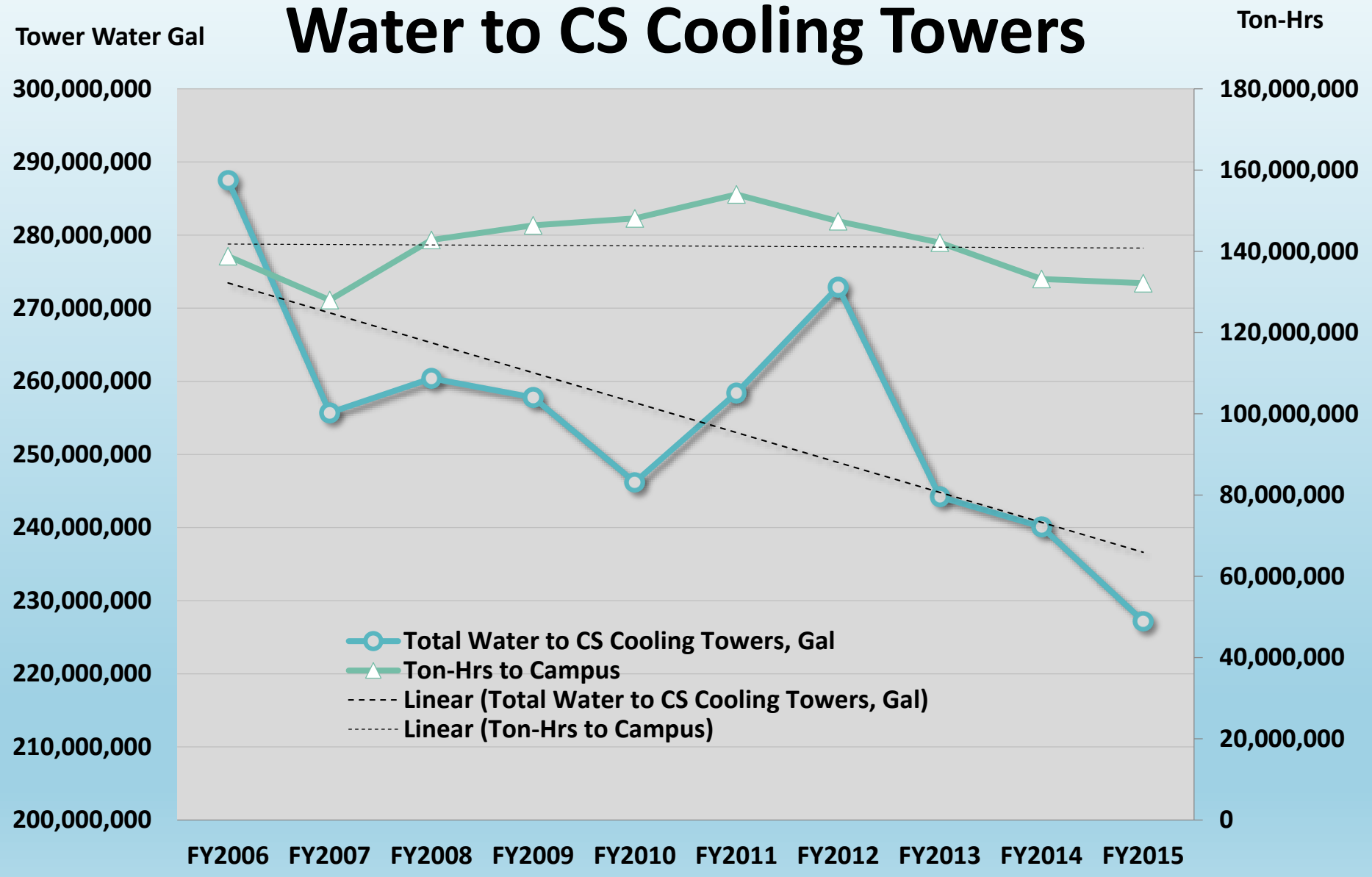
Chilling Stations gal/ton-hr



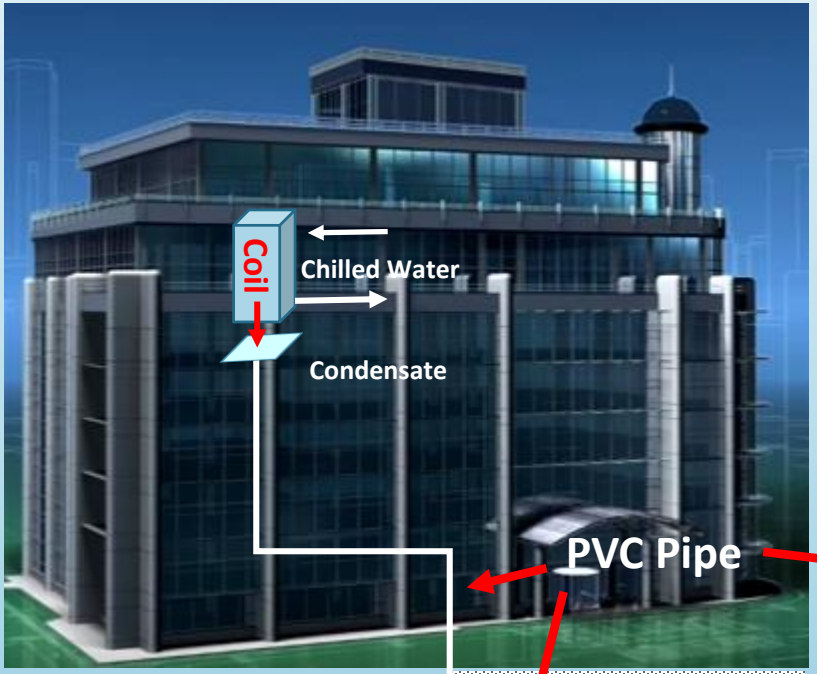
Power Plant gal/kwh



Water to CS Cooling Towers

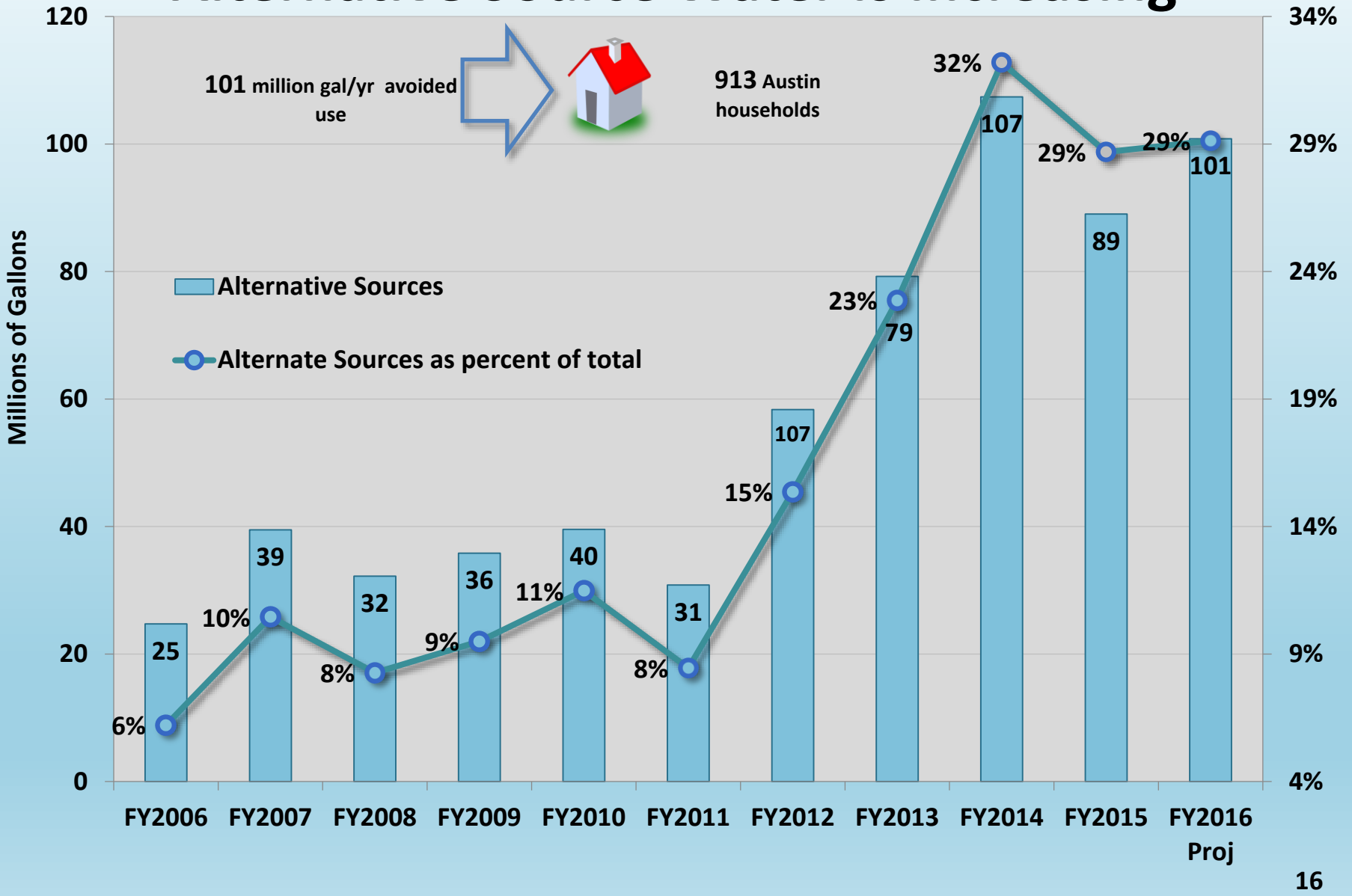


Recovered Water System – AC Condensate

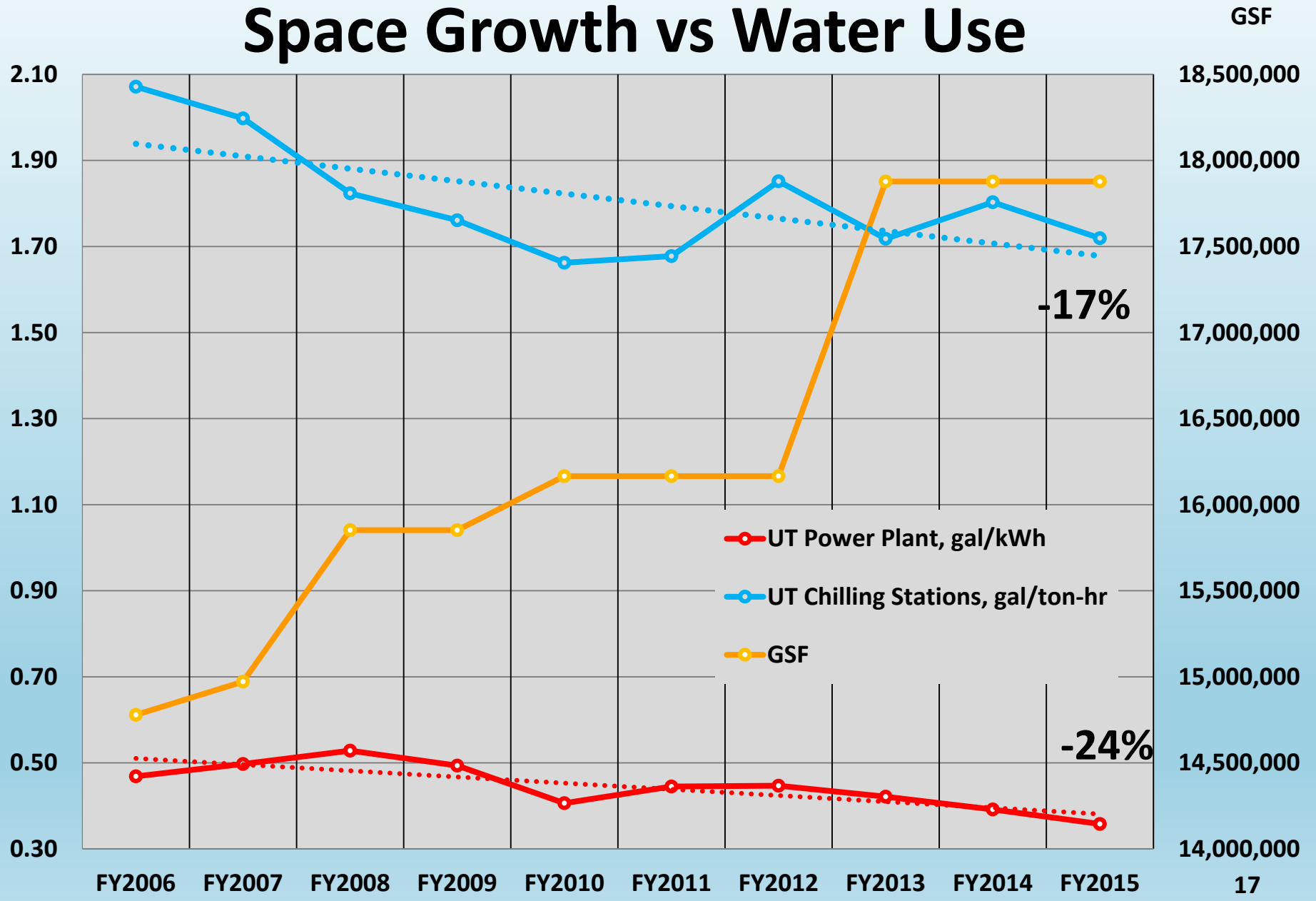


Condensate Blends with Basin Water Chemically Treated

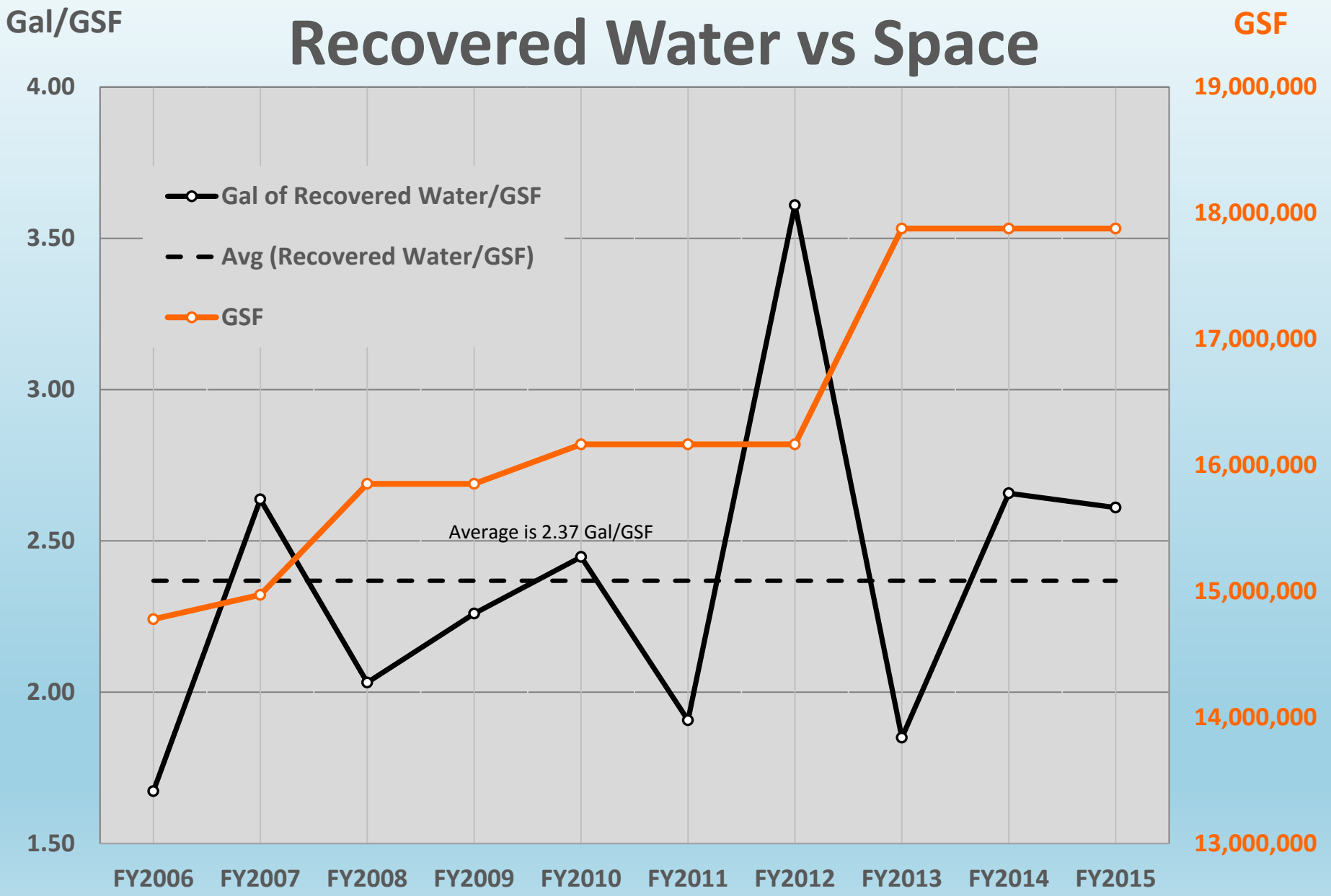
Alternative Source Water Is Increasing



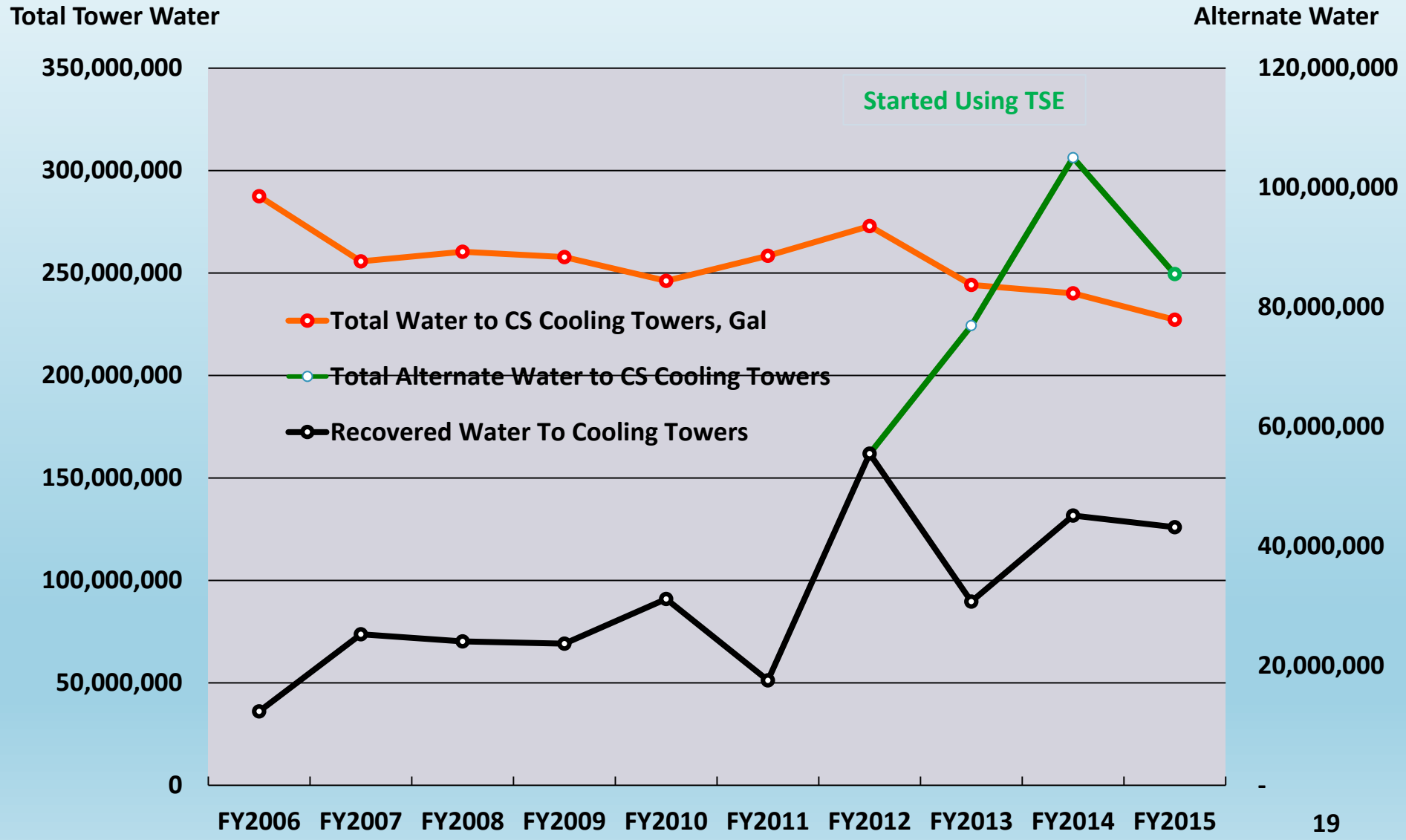
Space Growth vs Water Use



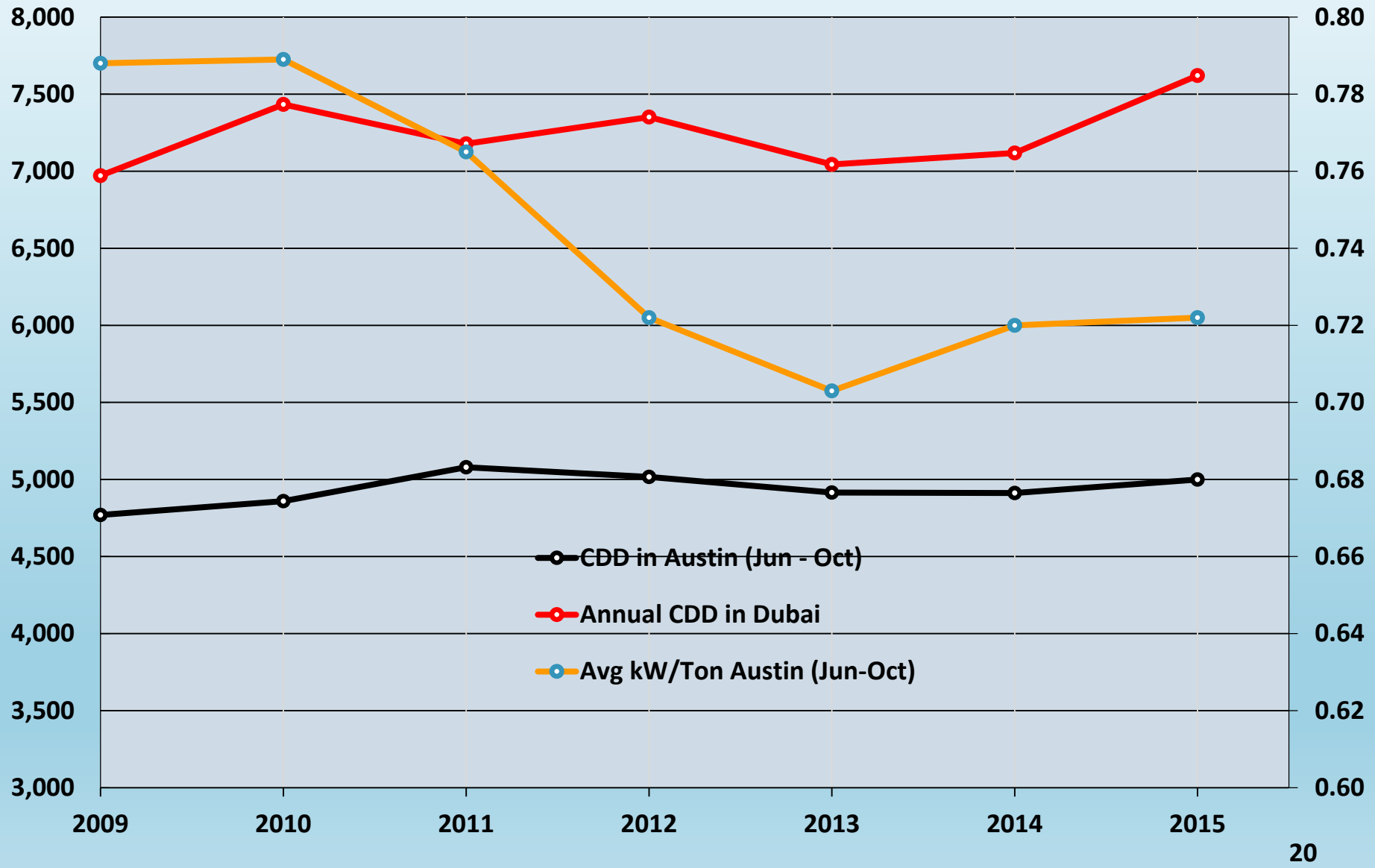
Recovered Water vs Space

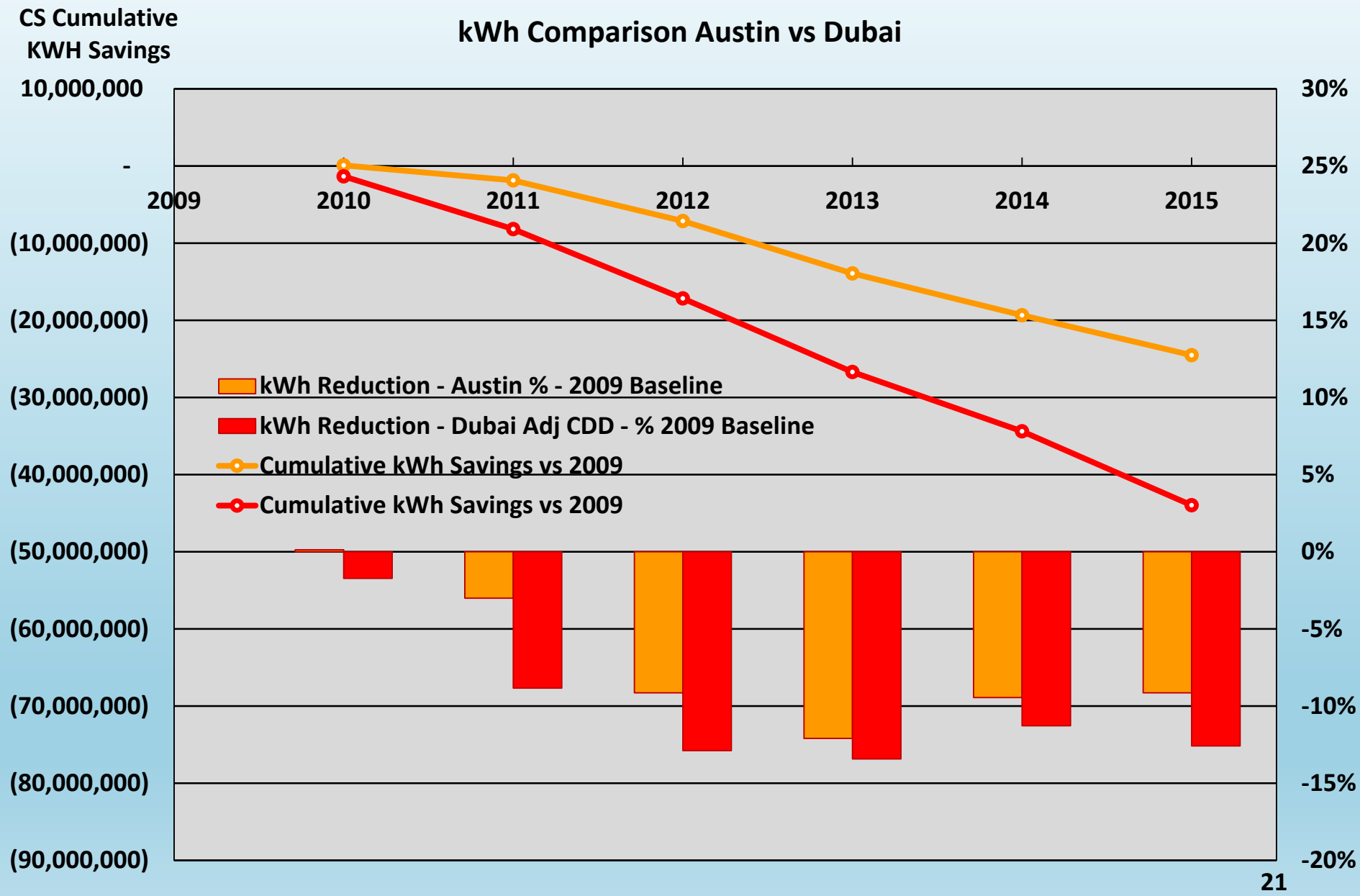


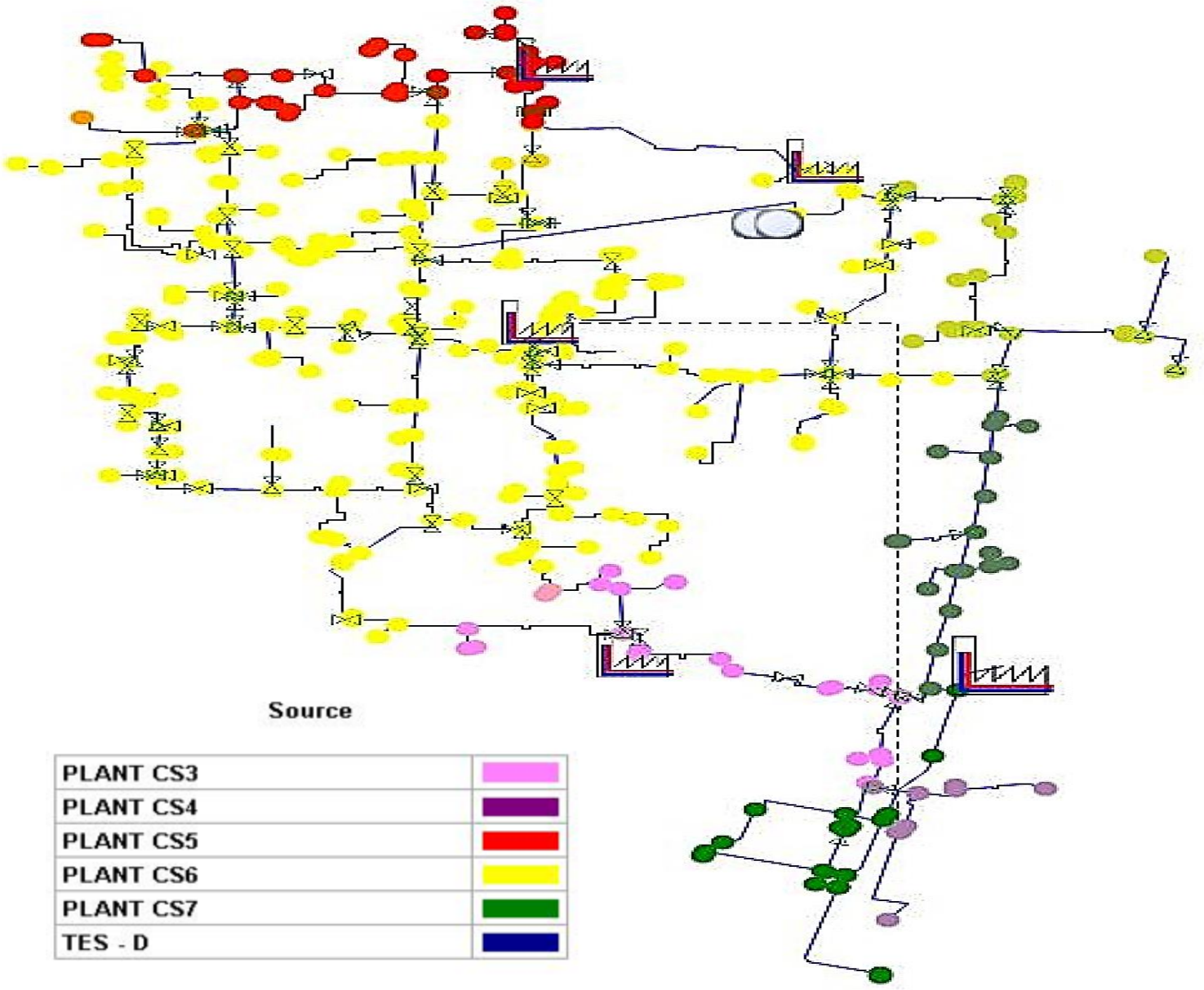
Total Water Vs Reclaimed/Recovered Water

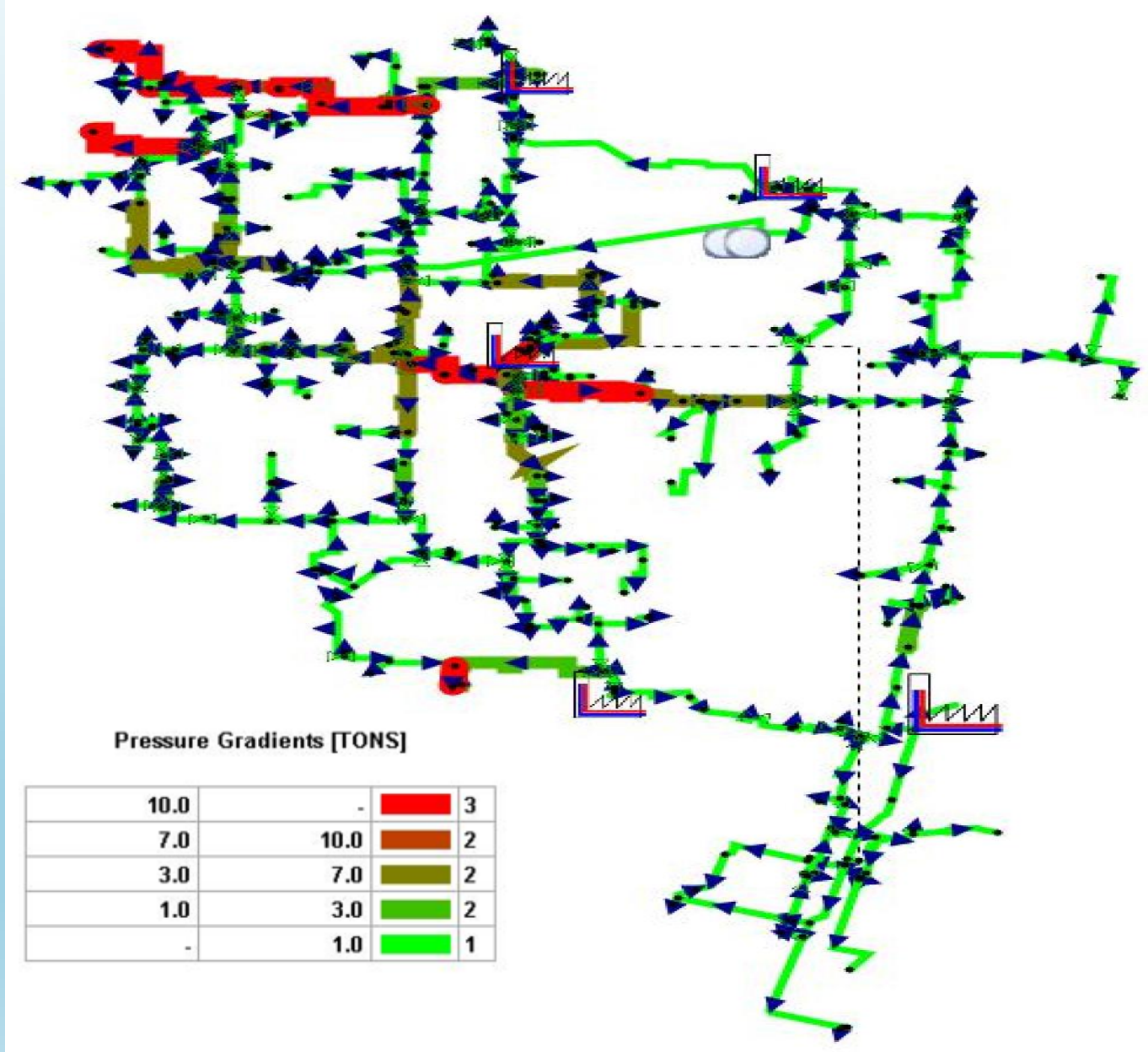


CDD -Austin vs Dubai

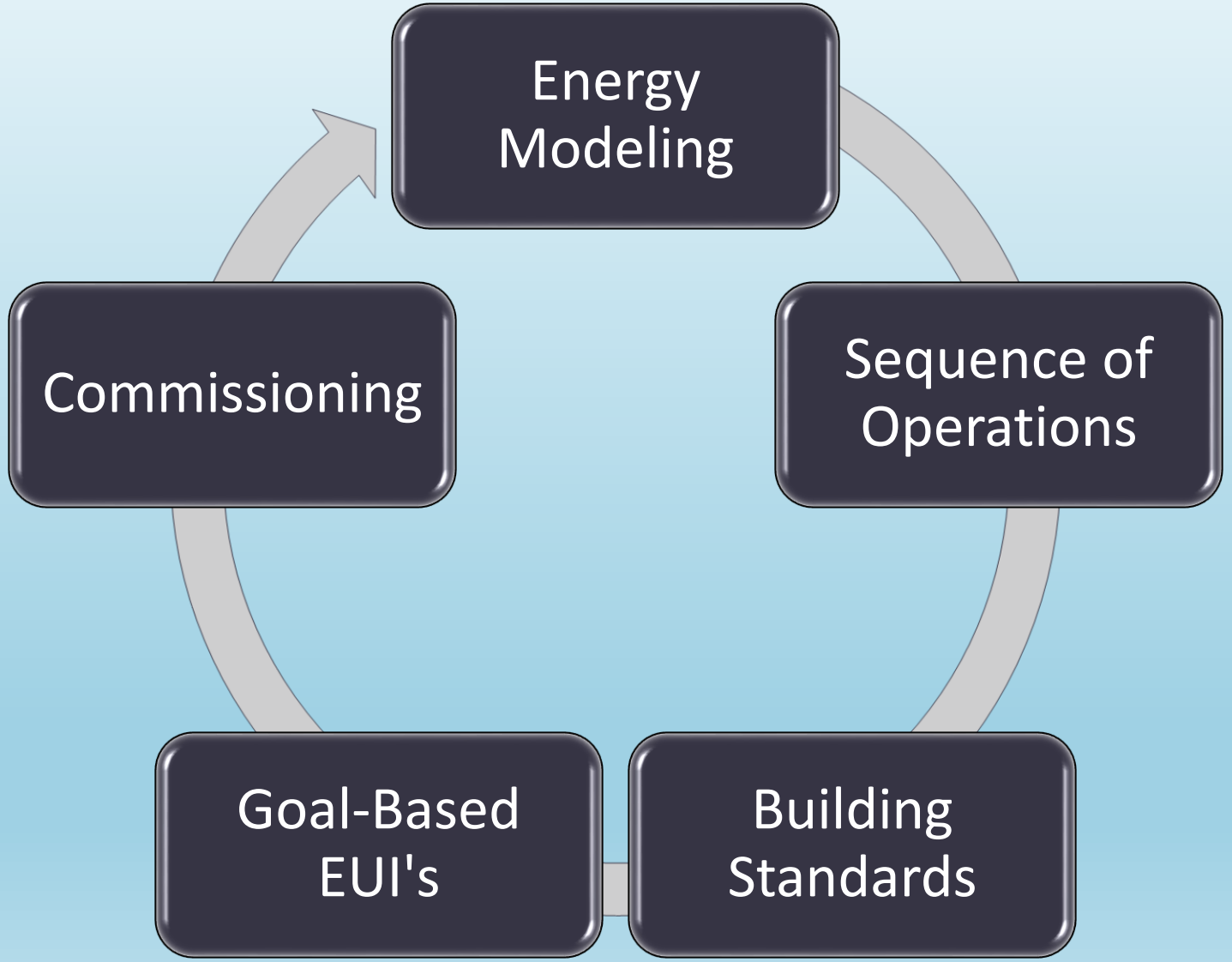



kWh Comparison Austin vs Dubai
CS Cumulative KWH Savings
10,000,000
-
(10,000,000)
(20,000,000)
(30,000,000)
(40,000,000)
(50,000,000)
(60,000,000)
(70,000,000)
(80,000,000)
(90,000,000)
30%
25%
20%
15%
10%
5%
0%
-5%
-10%
-15%
-20%
2009
2010
2011
2012
2013
2014
2015
kWh Reduction - Austin % - 2009 Baseline
kWh Reduction - Dubai Adj CDD - % 2009 Baseline
Cumulative kWh Savings vs 2009
Cumulative kWh Savings vs 2009


Source
PLANT CS3
PLANT CS4
PLANT CS5
PLANT CS6
PLANT CS7
TES - D


Pressure Gradients [TONS]
10.0 - 3
7.0 10.0 2
3.0 7.0 2
1.0 3.0 2
- 1.0 1

New Building Construction



Building Design Approach

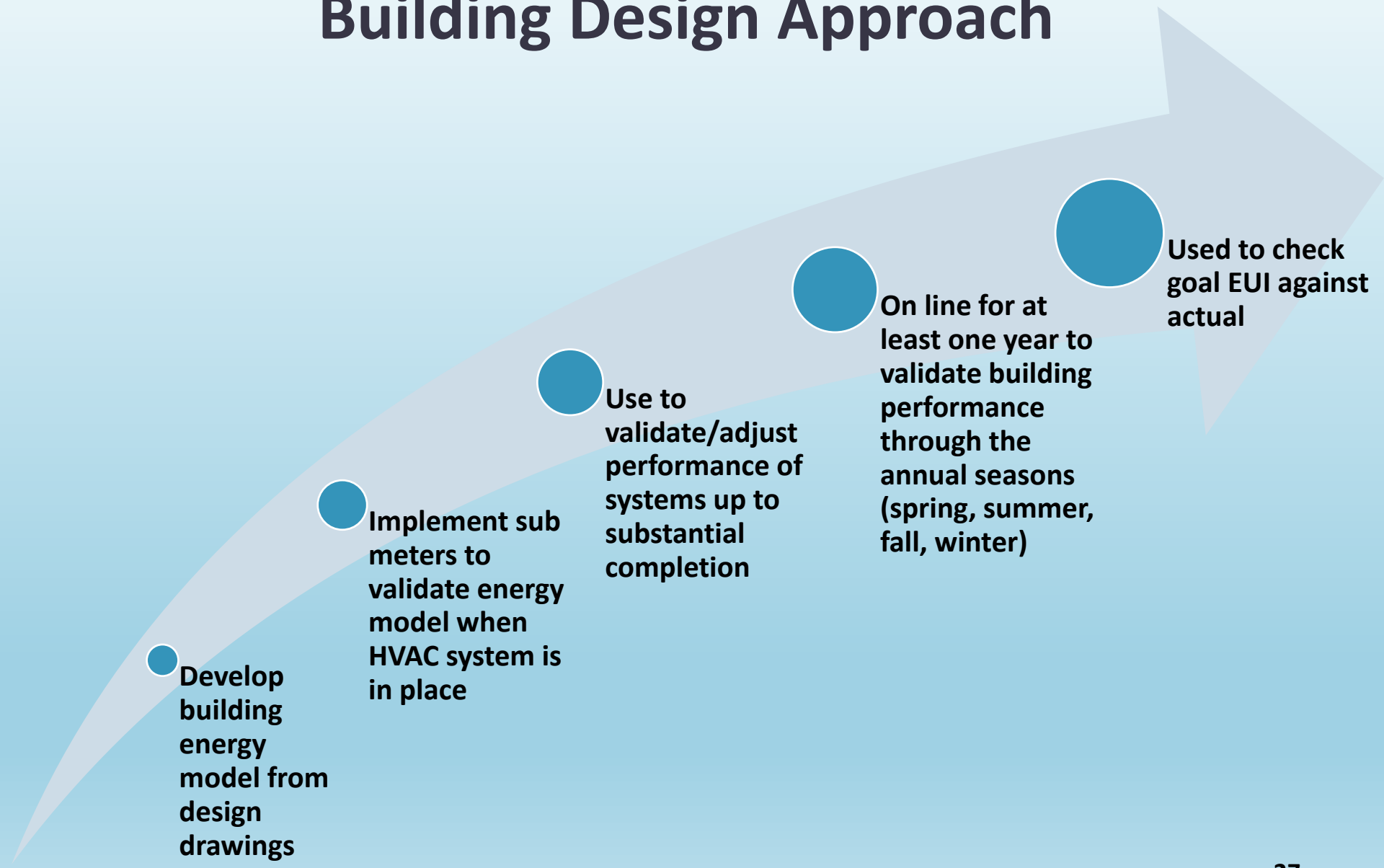
- Controls Integrator contracted up front to work with the designer but works for the contractor
- Conceptual Sequence of Operations for the building provided up-front
- Goal EUI for the project

EUI Targets

- New facilities designed to achieve the Energy Use Index (EUI, in kBTU/gsf/yr)
- Confirm target will be met through energy model.
- Confirm no later than 10 months after substantial completion as part of the post-occupancy commissioning process.

UT Austin Building Category	UT Austin New Construction EUI Target
Classroom & Academic	113
Research Laboratory	275
Housing	99
Office & Administration	82
Public Assembly & Multipurpose	112

Building Design Approach



Building Model Presentation (Bractlet)

Building Design Approach

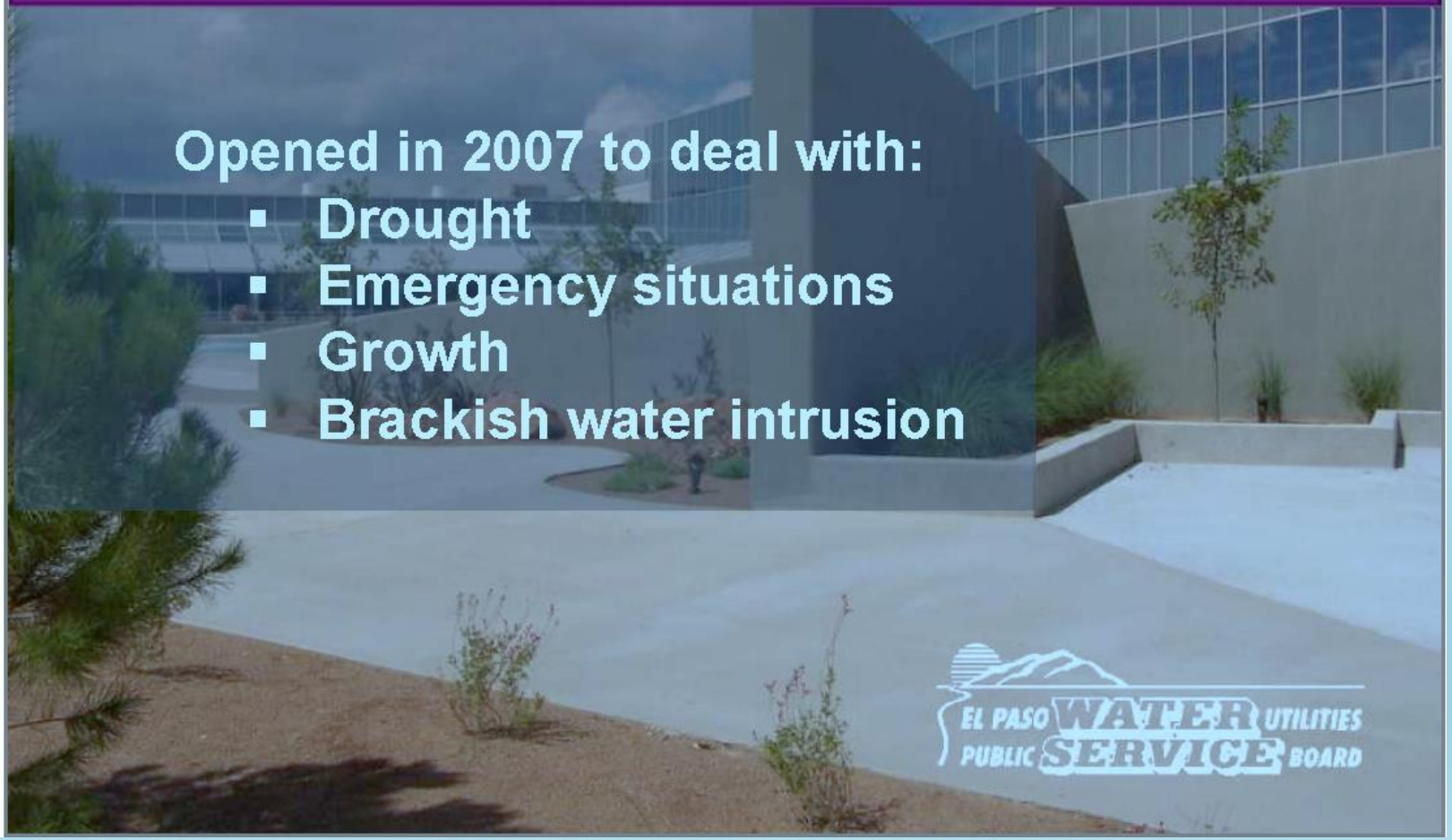
Sustain Performance

- OptimumAIR™ (Optimum Energy)
  - Contracted up-front for consultation & to make sure system is ready to accept optimization
  - System hardware paid out of “Project”
  - Turned-on after the one-year baseline is established to sustain performance and achieve optimization

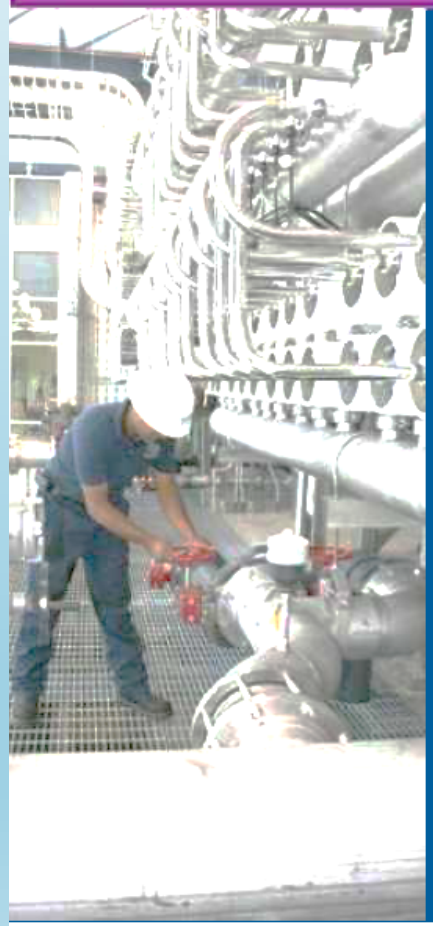
OptimumAIR™ Presentation

Desalinization Water Savings (EWS)

Kay Bailey Hutchison Desalination Plant

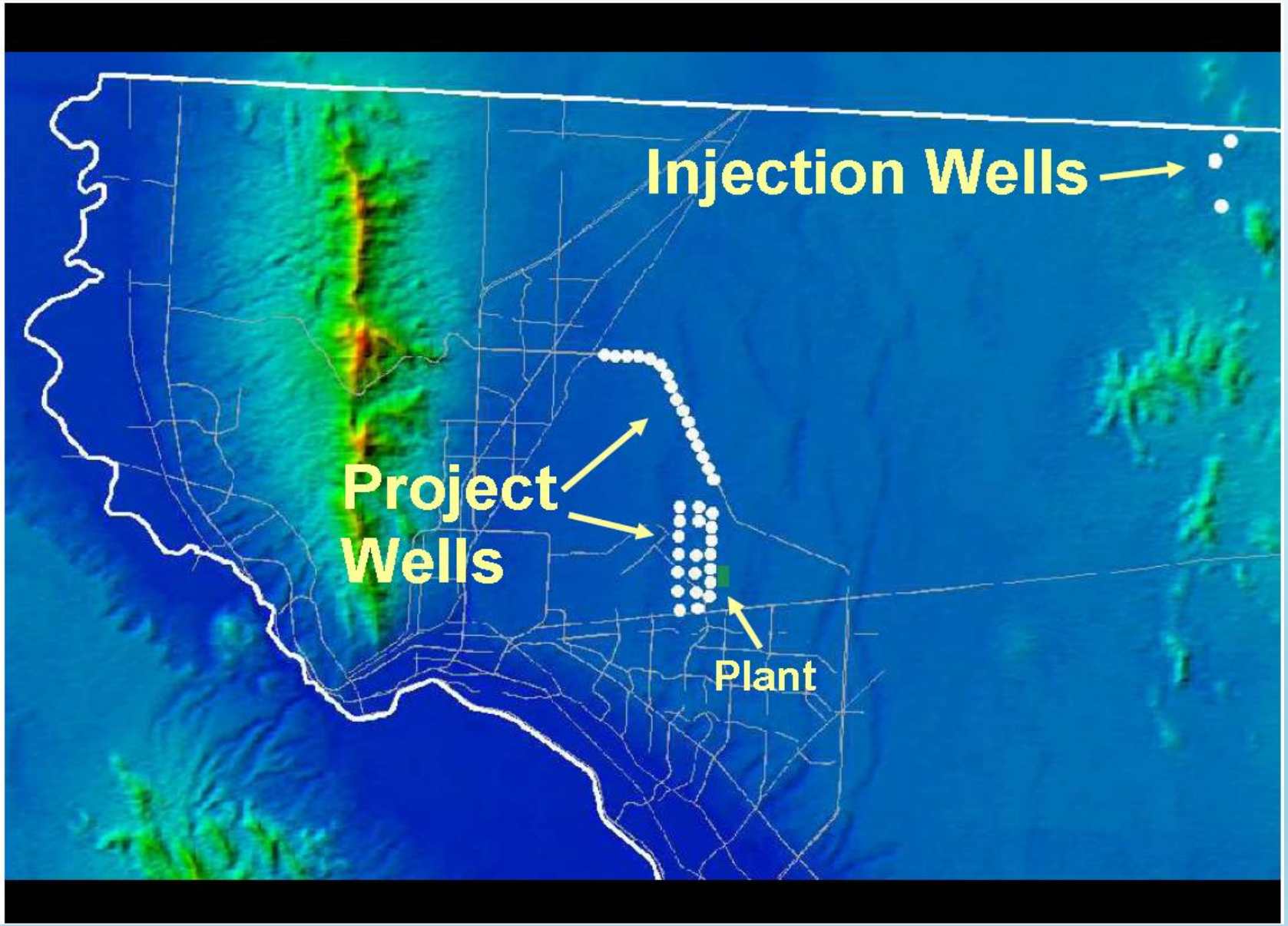


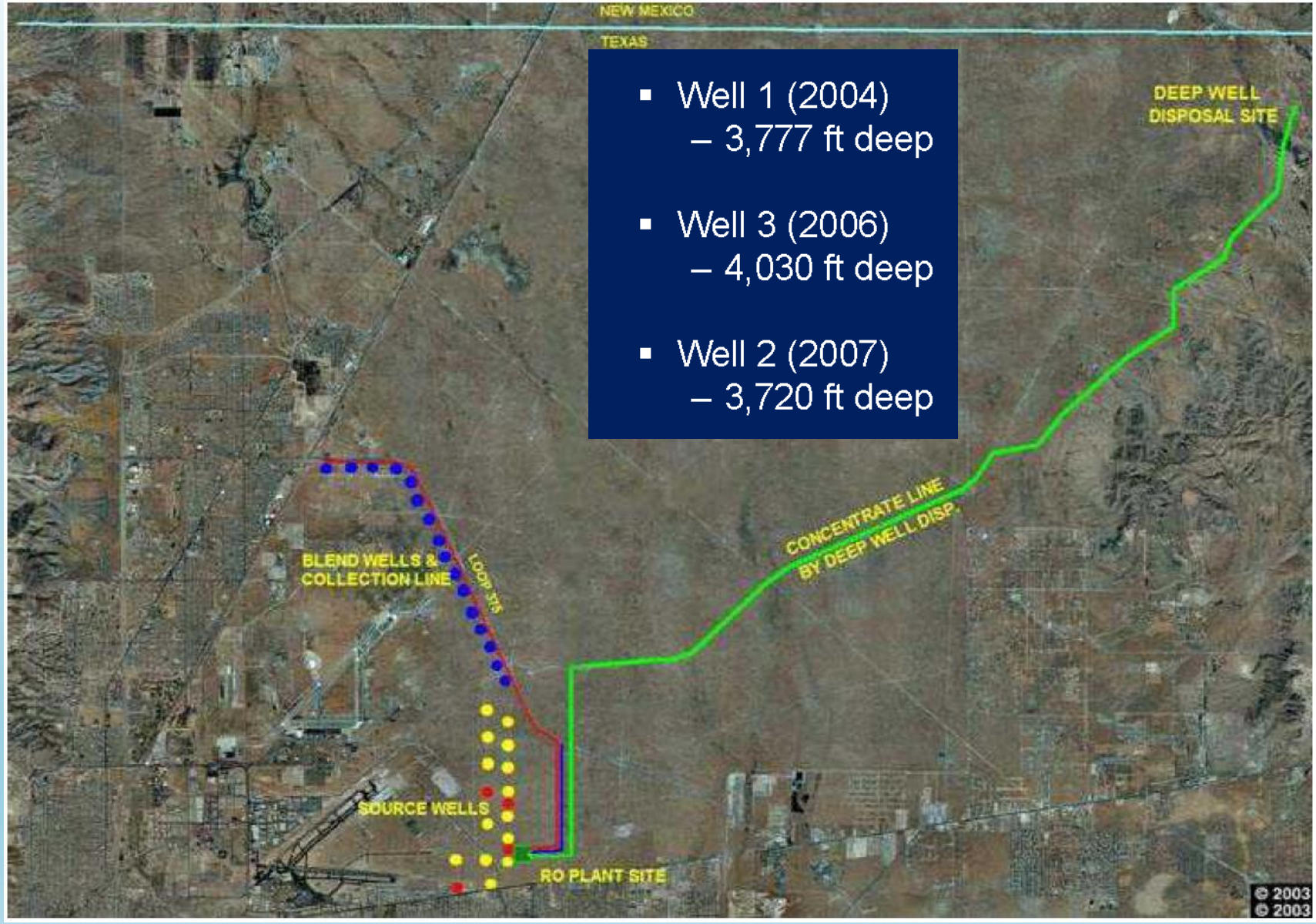
Desalination Plant Details



- Up to 27.5 MGD capacity
- Utilizes 5 reverse osmosis skids
- Year round usually runs at 1-2 skids
- Operated at full capacity for the first time in May 2012

EL PASO WATER UTILITIES PUBLIC SERVICE BOARD


Injection Wells
Project Wells
Plant



- Well 1 (2004) – 3,777 ft deep
- Well 3 (2006) – 4,030 ft deep
- Well 2 (2007) – 3,720 ft deep

Managing RO Water Reject
Cutting Edge Technology

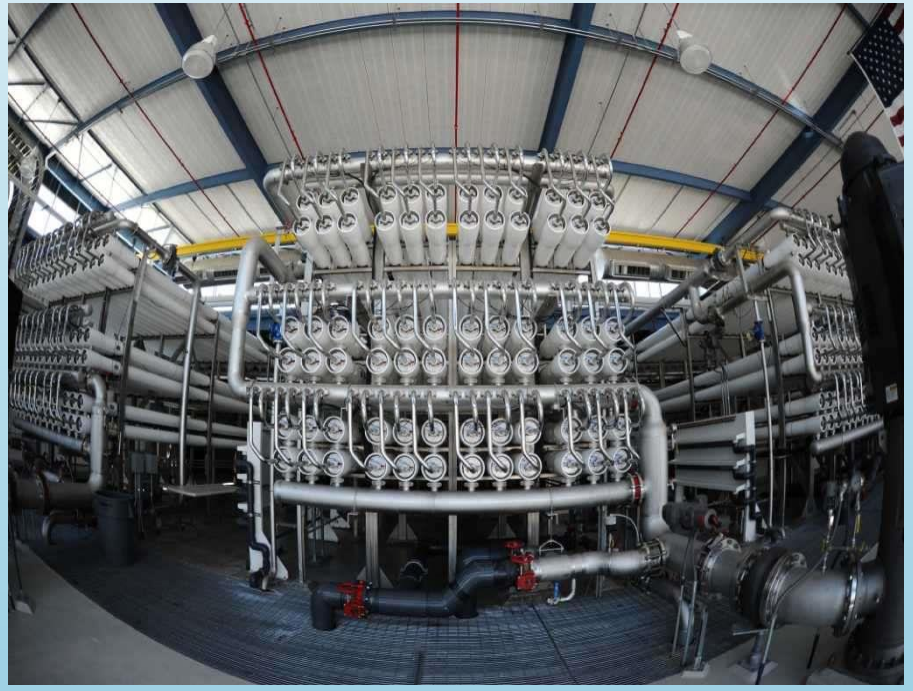
- Recovers potable quality water from waste
  - Municipal desalination
  - Agricultural brackish well water
  - Industrial water (e.g. power plant cooling tower blowdown)
  - Oilfield produced water/flowback water

Managing RO Water Reject Cutting Edge Technology

Solves problem of waste brine / concentrate disposal

- **Extracts marketable minerals from waste brine**
- **No residual waste water (zero liquid discharge)**
- **Pairs revenue from mineral sales and sale of potable water to make business model feasible**
- **Can process concentrate to recover 90% of the water**

Being Commercialized in Plant at the Kay Bailey Hutchison Desalinization Plant in El Paso, Texas



EWM
ENVIRO WATER MINERALS COMPANY

http://envirowaterminerals.com/