

Texas Tech University
Energy Management

Introduction

Brandon McCoy, MBA, CEM

Campus Energy Manager

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- Joined Office of Energy Management in 2013 as a Student Assistant then transitioned to Energy Analyst. Current Campus Energy Manager overseeing Facilities Systems office. Became Certified Energy Manager in 2019. Oversees campus energy consumption, eSight integration, utility metering, and building automation and controls.

Karen Marin, PSM

Sustainability Coordinator

karen.marin@ttu.edu

- Former Recycling/Composting Intern at City of Santa Monica. Has been with Texas Tech University for 3.5 years as an Energy Analyst first and now as Sustainability Coordinator. Use statistics and billing information to monitor building energy efficiency. Working on growing Office of Sustainability to expand sustainability efforts and complement Energy Management program.

Texas Tech University

- Total occupied square footage – 9,696,894
  - Research square footage – 656,173
    - New facilities – ESB II, 115,575 sq. ft.
  - AUX square footage – 2,079,497
- Number of buildings on the main campus – 162
- Number of students – 40,666
- Utility budget – Approximately $17 million (E&G)

Central Heating and Cooling Plant

- Cooling Capacity – 20,000 tons
- Boiler Capacity – 500,000 lbs/hr

- *LP&L cogen plant* provides 40,000 lbs/hr of steam for free.



TTU Structure

Facilities Systems

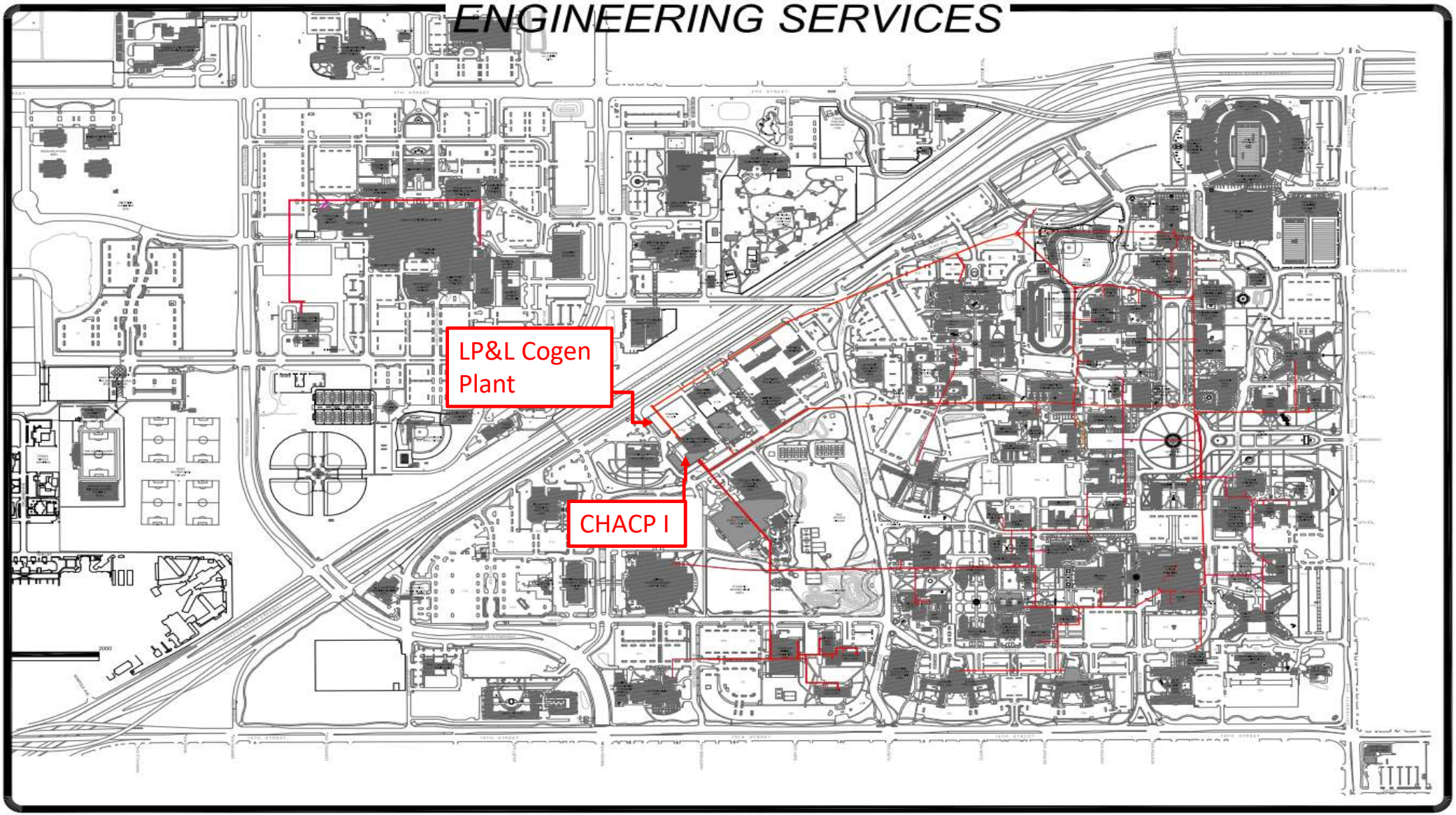
- Oversees Energy Management program
- Building Automation Systems and controls
- Utility submetering
- Controls Center
- Sustainability

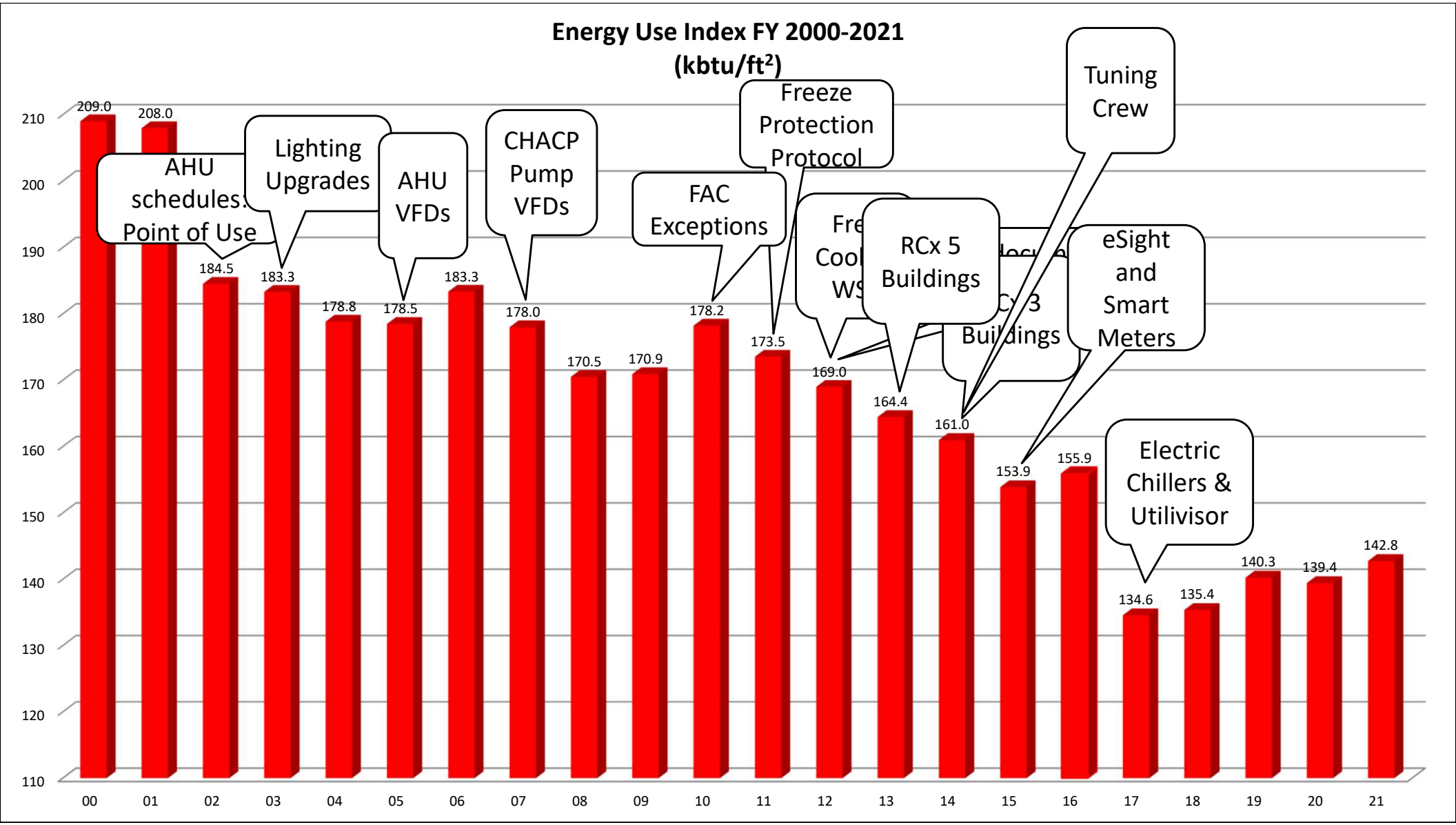
Central Heating and Cooling Plant

- Oversees Plant operations, efficiency
- Tunnel maintenance, repairs

Facilities Maintenance

- Environmental Systems Maintenance (ESM)
  - Building maintenance for hvac systems, controls


ENGINEERING SERVICES
LP&L Cogen Plant
CHACP I


Energy Use Index FY 2000-2021
(kbtu/ft²)
AHU schedules: Point of Use
Lighting Upgrades
AHU VFDs
CHACP Pump VFDs
FAC Exceptions
Freeze Protection Protocol
RCx 5 Buildings
Tuning Crew
eSight and Smart Meters
Electric Chillers & Utilivisor
209.0
208.0
184.5
183.3
178.8
178.5
183.3
178.0
170.5
170.9
178.2
173.5
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210
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21


Savings as per Annual State Reports
compared to 2006 baseline when Energy Management Program was created)
Cumulative Savings: = $25,853,072
$3,000,000
$2,500,000
$2,000,000
$1,500,000
$1,000,000
$500,000
$0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021

Strategies



Point of Use

FAC Exceptions

Freeze protection

Steam ON/OFF



Seasonal setpoints



Energy committee



Statistical analysis (monthly data)

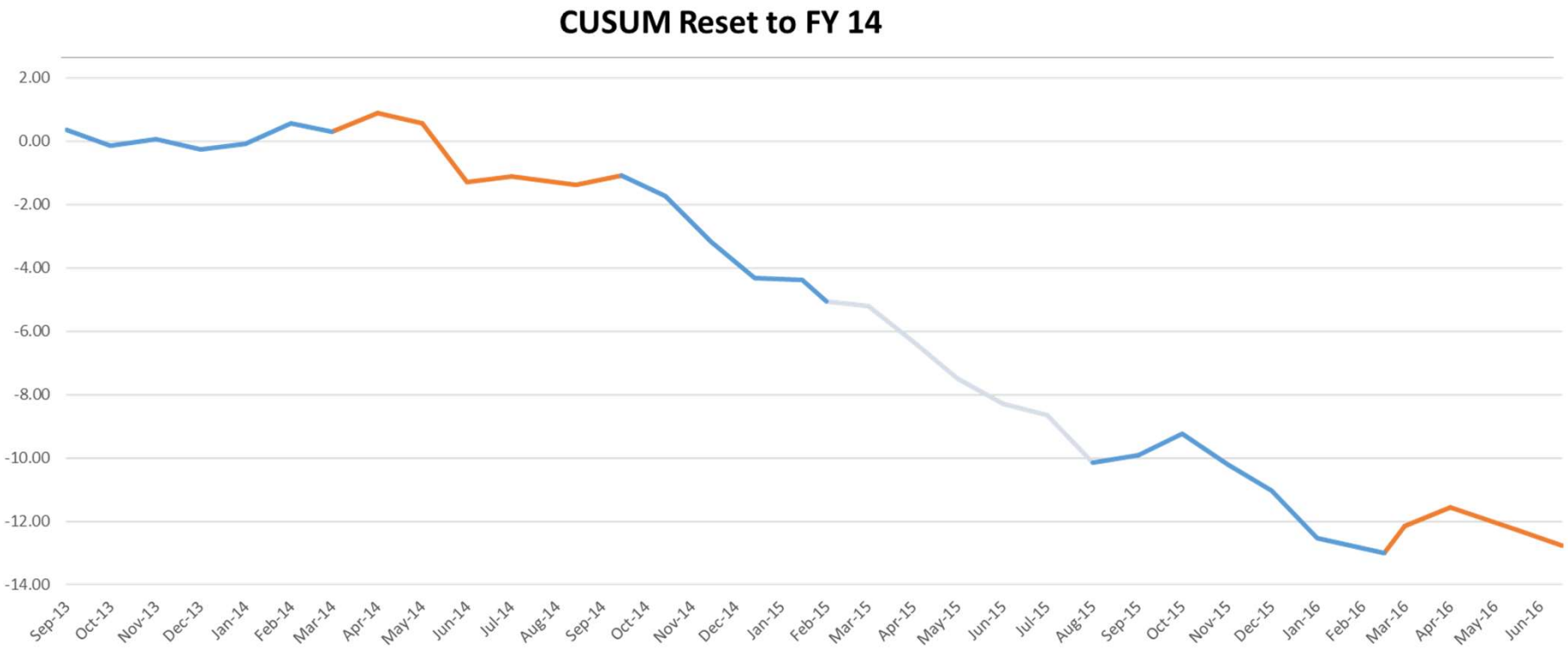
Regression & CUSUM analysis

Standard deviation

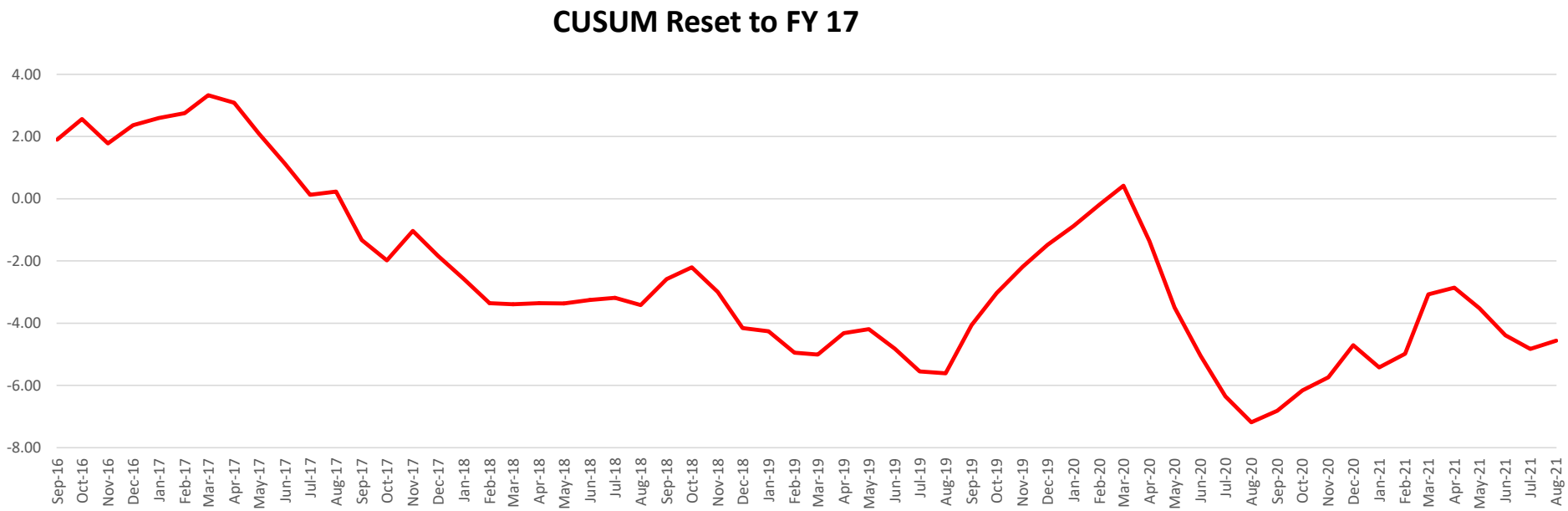


Building audits

CUSUM – Summer Steam



Actual – Predicted plotted cumulatively


CUSUM Reset to FY 17
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
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Mar-21
Apr-21
May-21
Jun-21
Jul-21
Aug-21

CUSUM

2015

TTU decided to make the transition from Reactive maintenance to persistent commissioning.

How do we get there?

- Installing new meters
- Using the data we have to make financial energy decisions
- Installing Energy Management software
- Have monthly AUX energy analysis meetings
- Create hvac setpoint standard

2015

Problem in front of us

- Inadequate meter coverage for electricity, steam and chilled water
  - Manual meter reads
  - Meters that did not report back to BAS: Monthly granularity
  - No insight of bldg. consumption
- Estimates/prediction
- BAS Systems: multiple, proprietary, antiquated, not really automated
- Reactive Maintenance

Solution

- Integrating existing and new meters into eSight.
- Integrating the CHACP data points into Utilivisor.
- Using meter data to make financial energy decisions.
- Using energy management software to assist in the transition from Reactive Maintenance to Persistent Cx

Utilivisor



Holistic Approach

Complete audit and analyzation of CHACP 1+ CHACP 2 and campus distribution.



Unique Site Conditions

The unique conditions of each site are addressed including equipment constraints / challenges, people, and capital requirements.



Patented Technology & Customized Analytics

utiliVisor's patented technology is supported with engineering expertise from our Operations Center.



Continuous Energy Oversight from our Operations Center

Consistent monitoring of systems and data ensure performance goals are met and new savings opportunities are realized even in an ever-changing environment.

utiliVisor ENERGY PLANT SERVICES

utiliVisor

Our Continuous Six-Step Process



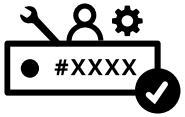
REVIEW



ANALYZE



RECOMMEND



ACTION



REPORT



REPEAT

Continuous Client Oversight



Control Room and Boardroom

Utilivisor

What expertise does utiliVisor offer?

Personal team of efficiency experts utilizing real-time collected data to analyze and make recommendations to decrease operational costs and solve complex technical issues.

Easily monitor progress, check reports, and make sure everything is running as efficiently as possible through our web-based software and information hub.

- In-depth and hands-on experience in utility and energy plant industry
- Develop unique processes
  - Continuous energy oversight
  - Real-time data measurements and monitoring with cloud storage
  - Access to engineering support, provide actionable items for realized cost savings
  - Expert analysis through customized data analytics for plant operations and reporting

Utilivisor

Why TTU chose utiliVisor?

- To increase plant effectiveness concerning Energy Management
- Collected data but needed system to package and present data to understand plant operations
- utiliVisor provides ability to analyze data and identify energy savings
- Information to revise inefficient operating processes
- Generate operational baselines and establish alarm setpoints, notifying operators of issues on campus

Utilivisor

CHACP Best Practices

- Proactive operations program, scheduling equipment line-ups based on forecasted conditions
- Improve results by using past experiences and align lessons learned for optimum performance
- Energy usage monitoring to assess current plant operating conditions against previous, comparable conditions
- Modified and defined clear procedures for equipment operating parameters
- Update plant matrices so plant operators can modify plant conditions to serve customers
- Set monthly, quarterly, and annual goals for continued improvement
- Isolate areas where efficiencies have been maximized to establish firm plant operating procedures

Annual Plant Savings (based on utiliVisor):

- 2020 - $280,003
- 2021 - $370,492

Strategies

Training of operations technicians and operators. TTU has taken a ground up and long-term approach to enhancing our operations team; which has been one of the main keys to our success.

Extensive training for instrumentation personnel to allow in-house tuning and programming changes.

HVAC Standards
- Setpoints
- Operations
- Sequence of Operations

Maintenance Strategies:
- Prioritize for energy payback. For performance indicators, measure against the upper bound of desired performance.

Project selection
- Analysis
- Facility air handler schedule
- Consumption
- Payback/ROI
- Baseline comp
- Statistics

eSight

Texas Tech implemented the eSight® energy management software (EMS) as a means of effecting a transition from reactive maintenance to persistent commissioning.

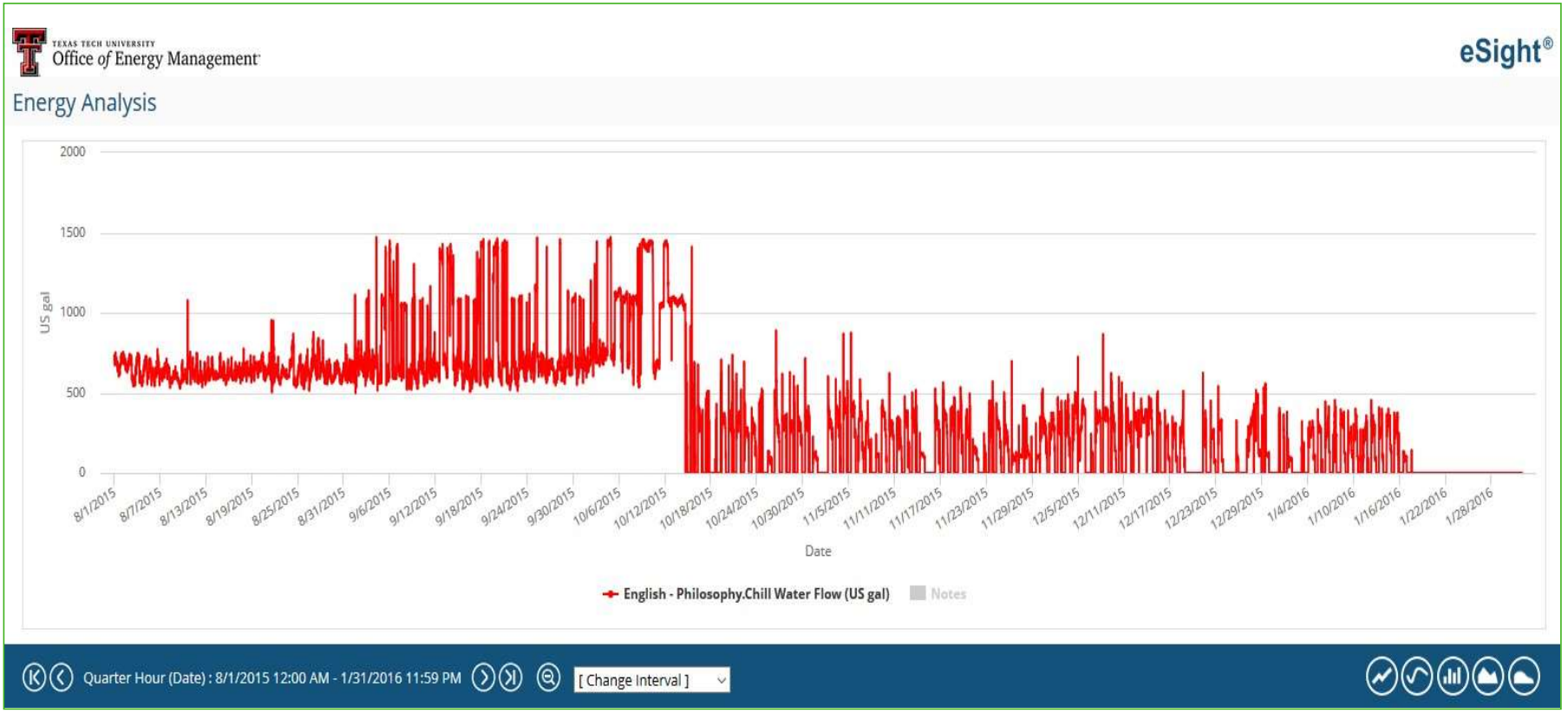
Modularity of their offerings

- The eSight system allowed for growth.
- Allowed us to start by integrating existing capable meter before investing in new meters.

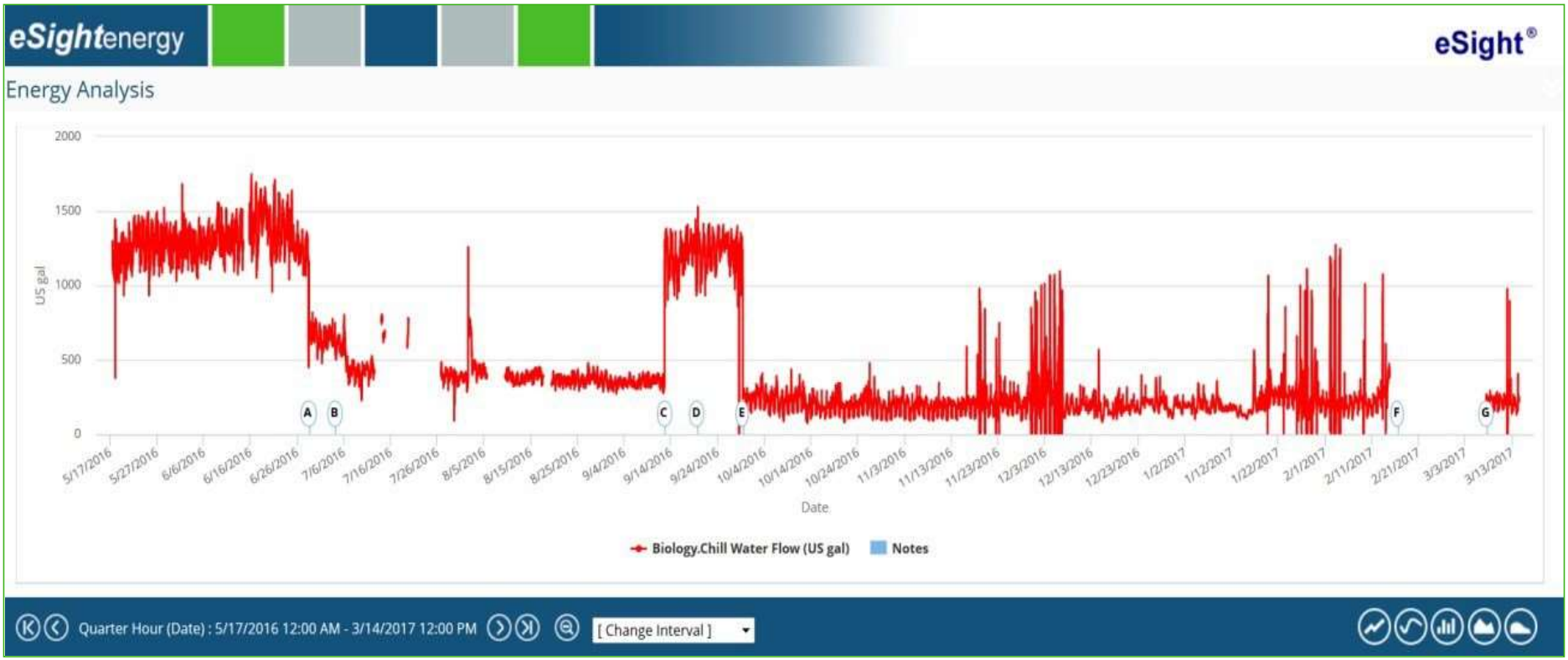
Incremental investments

- Minimization of financial risks
- The initial investment was $14,805. This included a few of their models and integrating 16 meters (62 data points) into eSight.

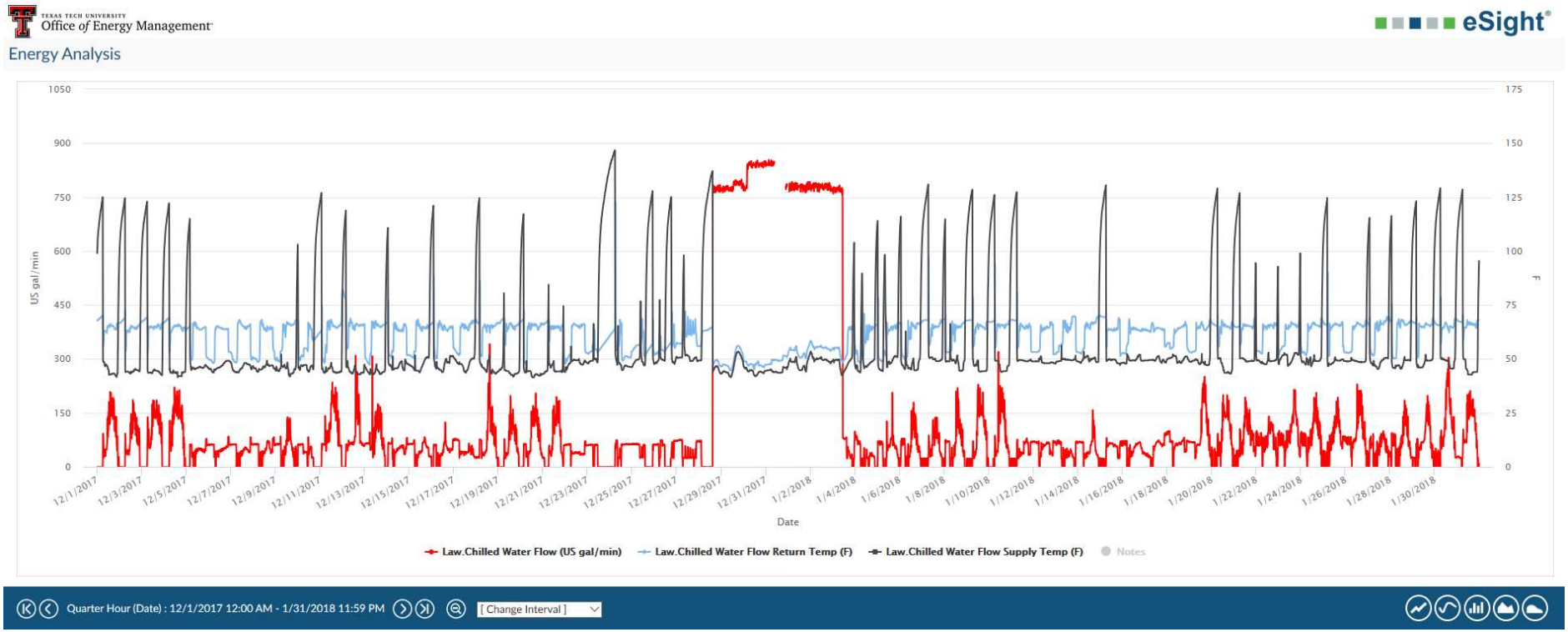
English Philosophy FY16 – Chilled water valve stuck open **($222,678 cost avoidance)**



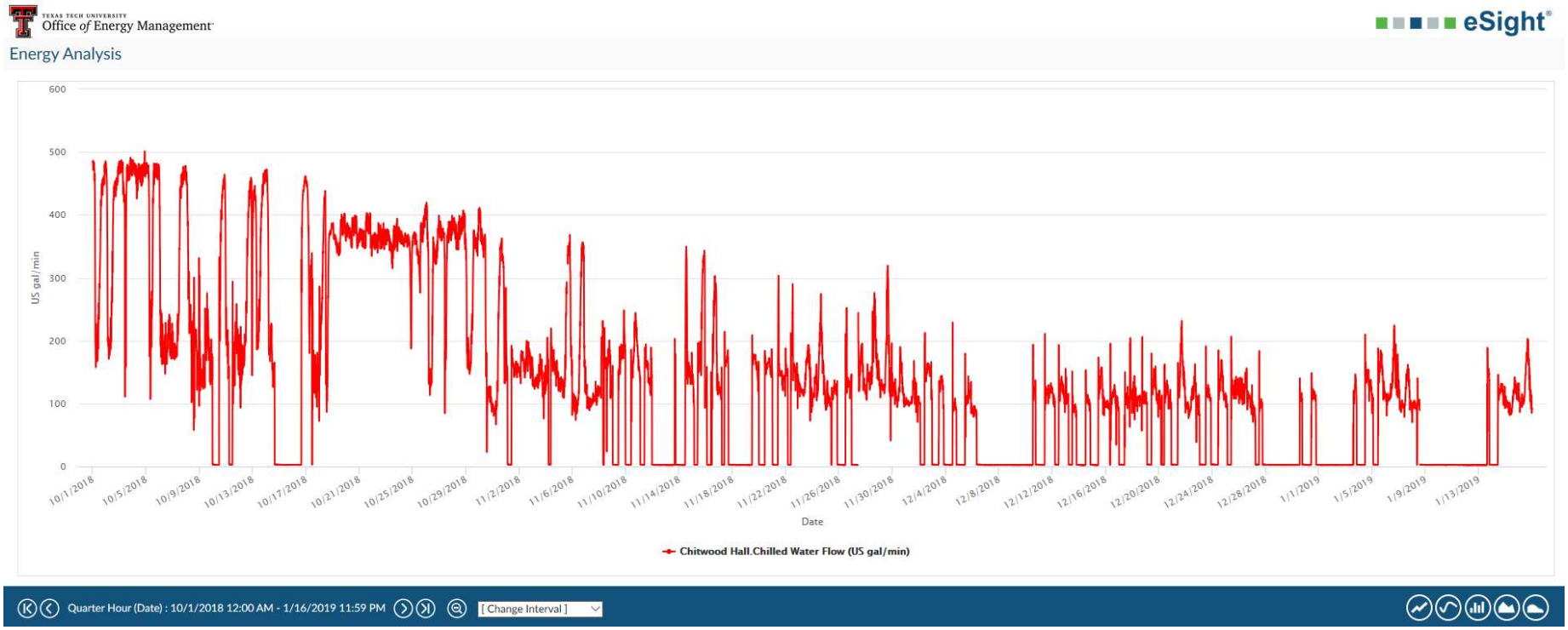
Biology FY17 – Pneumatic line disconnected from chilled water valve **($313,628 cost avoidance)**



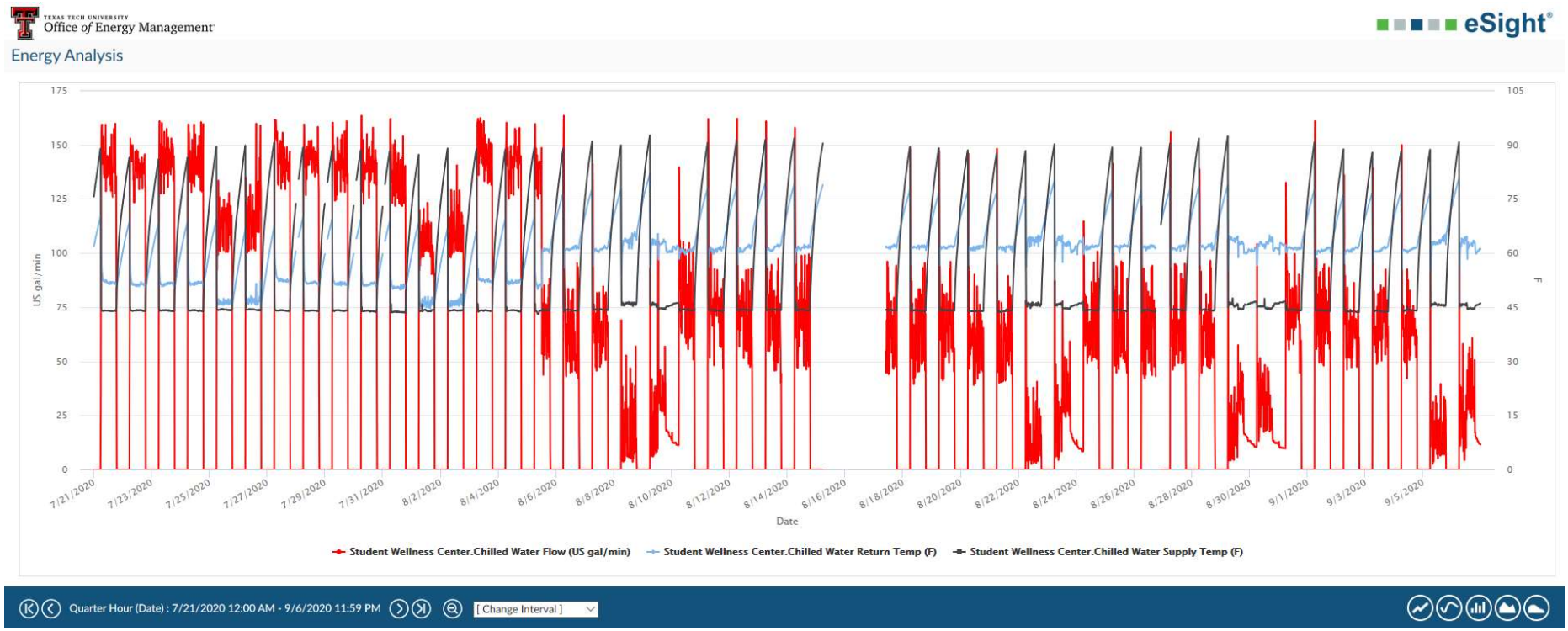
Law FY18 – CHW pump VFD failed (Persistent Commissioning)



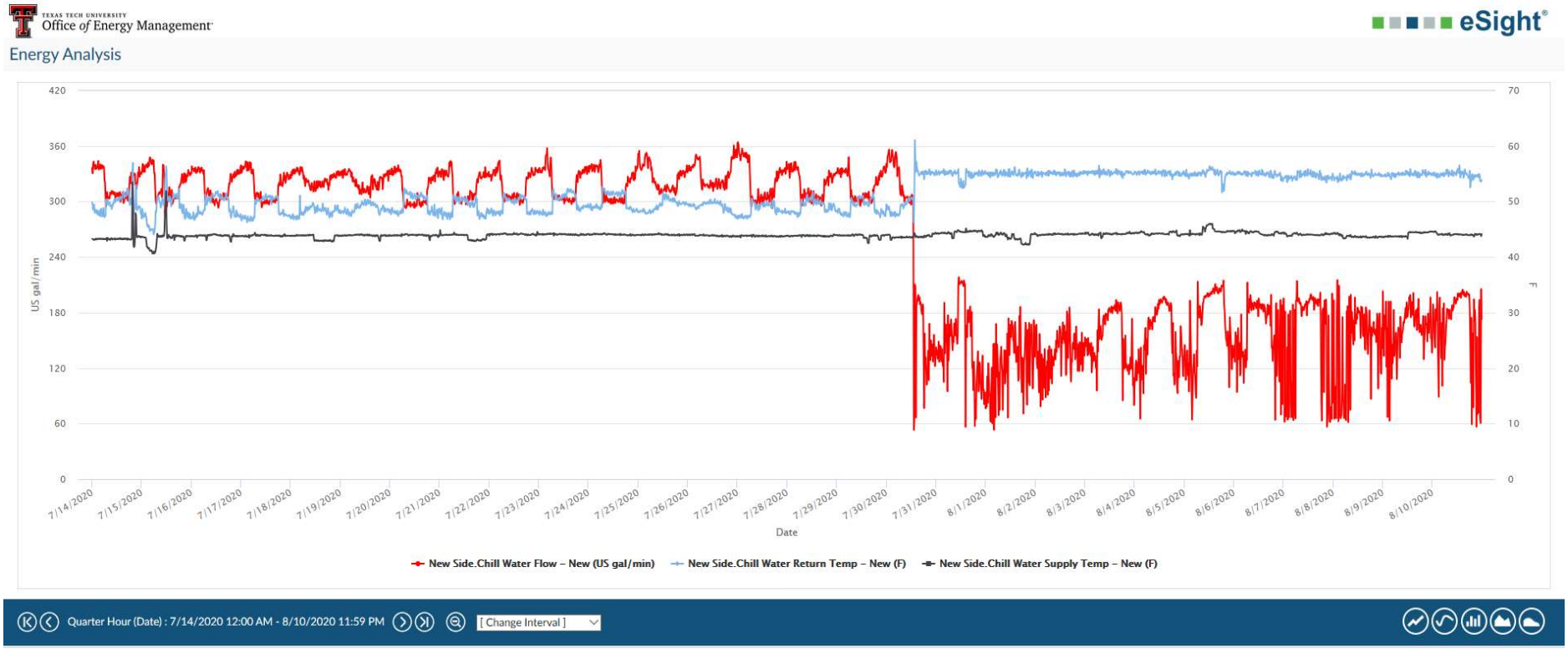
Chitwood FY19 – Fine tuned chilled water system **($18,000 saved)**



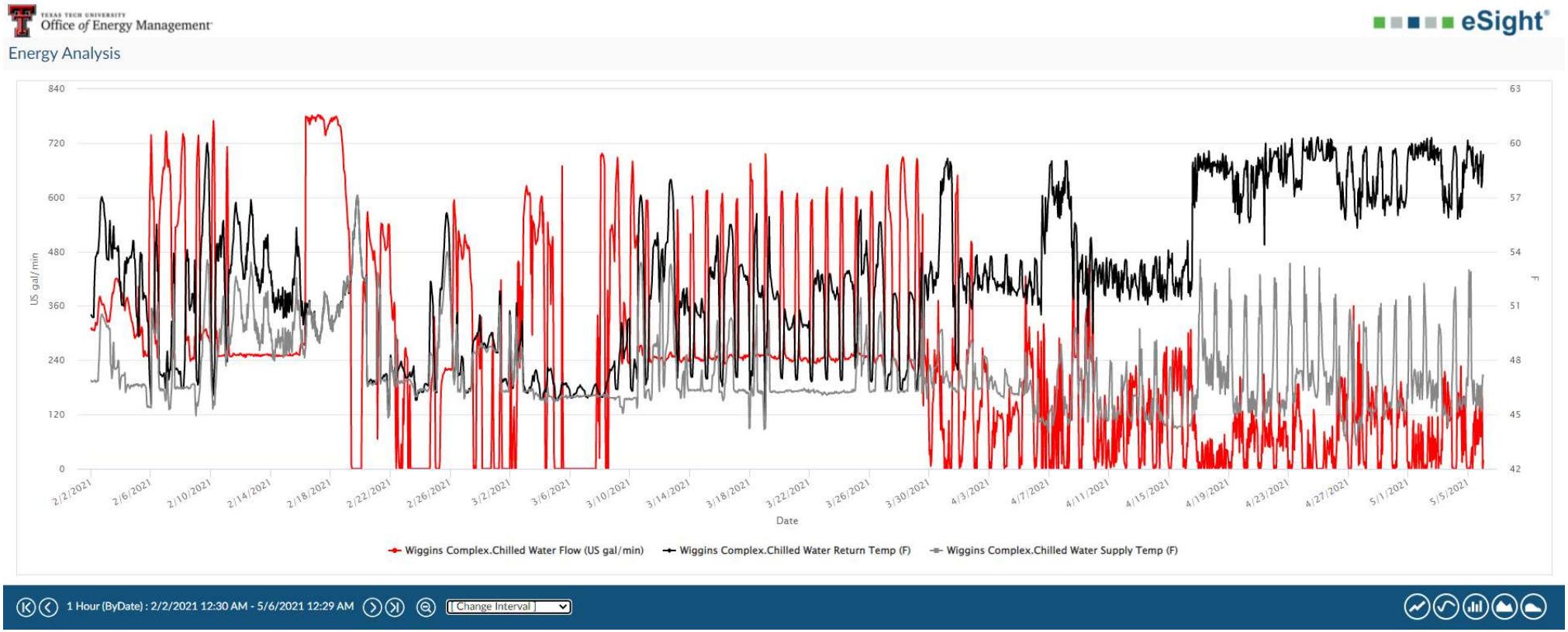
Student Wellness FY20 – Replaced mixing valve actuator **($21,600 cost avoidance)**



IMSE FY20 – Programmed mixing valve controls **($78,000 cost avoidance)**



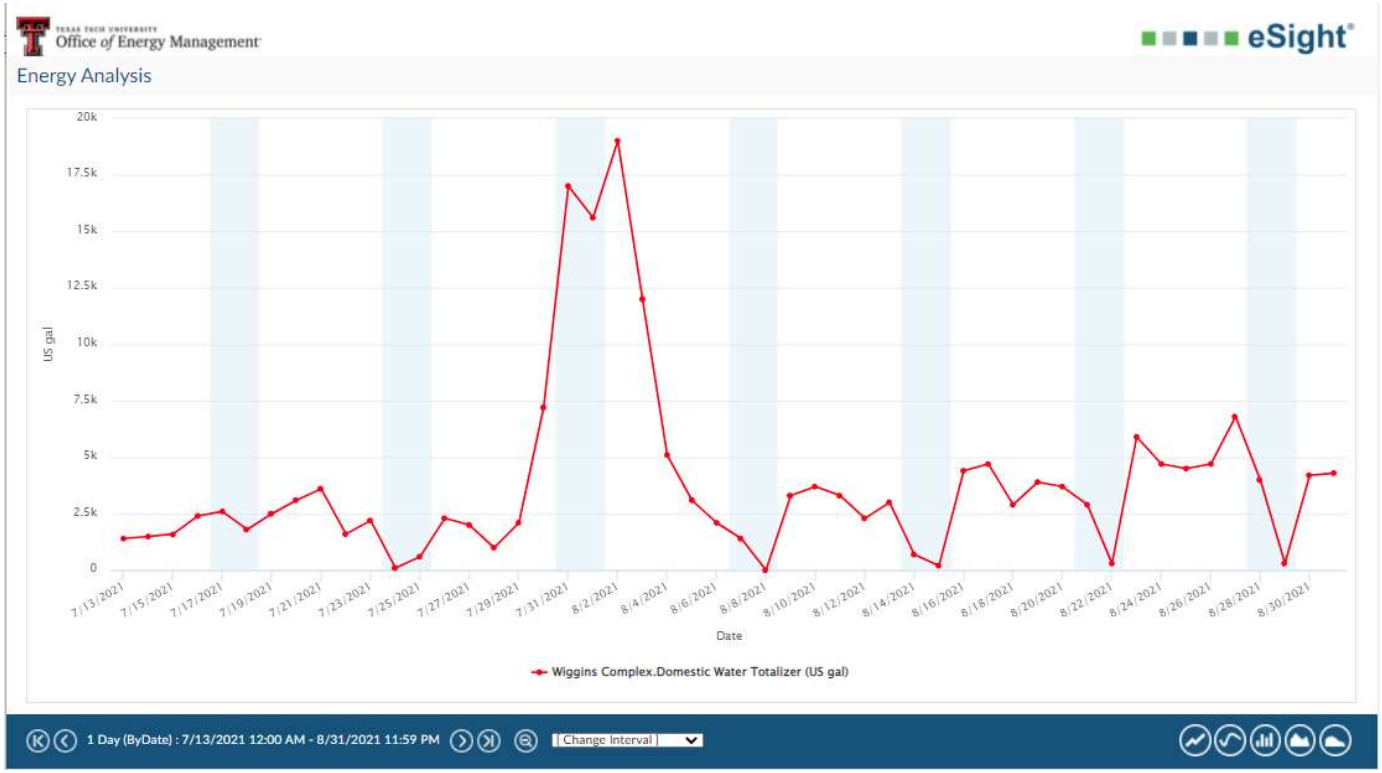
Wiggins FY21 – Upgrade chilled water/steam valves, actuators, electronic controls **($32,203 cost savings)**



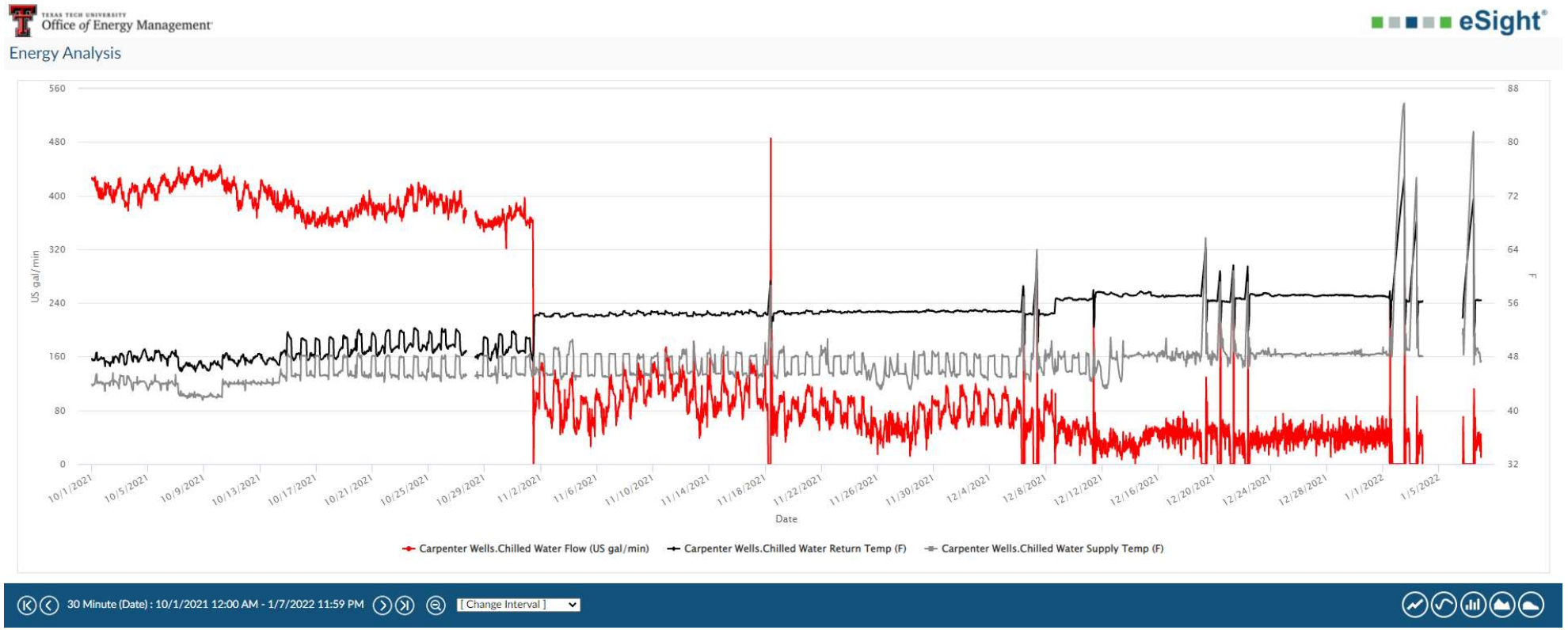
FY21 Mechanical Engineering North – Persistent Commissioning



FY 21 Wiggins Complex - Persistent Commissioning



Carpenter-Wells Residence Hall FY22 – Repaired pneumatic leaks and replaced an EP **($20,832 cost avoidance)**



TTU eSight Success

Texas Tech's pilot eSight program was commissioned July 2015.

By November 2015, TTU was able to identify cost avoidances well over $257,000.

Today's status of eSight

We now use the meter data in eSight to create utility consumption baselines, track project savings, track utility billing for our Auxiliary customers, and strategize next potential projects.

TTU Success

Because of our success with eSight, Utilivisor, and our additional operation/efficiency strategies, University leadership allowed us to reinvest our energy savings into meter projects and energy efficiency measures.

- Financial Structure
  - Associate energy budgets and maintenance budgets in the same FOAP so that energy-related maintenance expenses can be recovered by energy savings but the funds are earmarked for energy efficiency measures.

Ability to accurately cost justify and show real metered paybacks on energy efficiency measures.

Ability to report opportunity costs.

More responsive maintenance staff

Standardized campus setpoints

Leveraging the systems in place to document and track successes has motivated the team for continued growth.

Sec 17.11 Energy Efficiency Savings for State Facilities

Determine whether implementation of continuous commissioning or existing building commissioning practices would result in estimated savings of at least 10 percent in utility costs for the facility.

Facilities larger than 100k GSF.

Leveraging eSight and Utilivisor to determine whether implementation of continuous commissioning or existing building commissioning practices would result in estimated savings of at least 10 percent in utility costs for the facility.

- Remote or on-site commissioning assessment.
- Plan for implementation and monitoring.

TEXAS TECH UNIVERSITY

Operations Division™

Office of Energy Management & Sustainability

For more information, please contact Brandon McCoy at:
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