



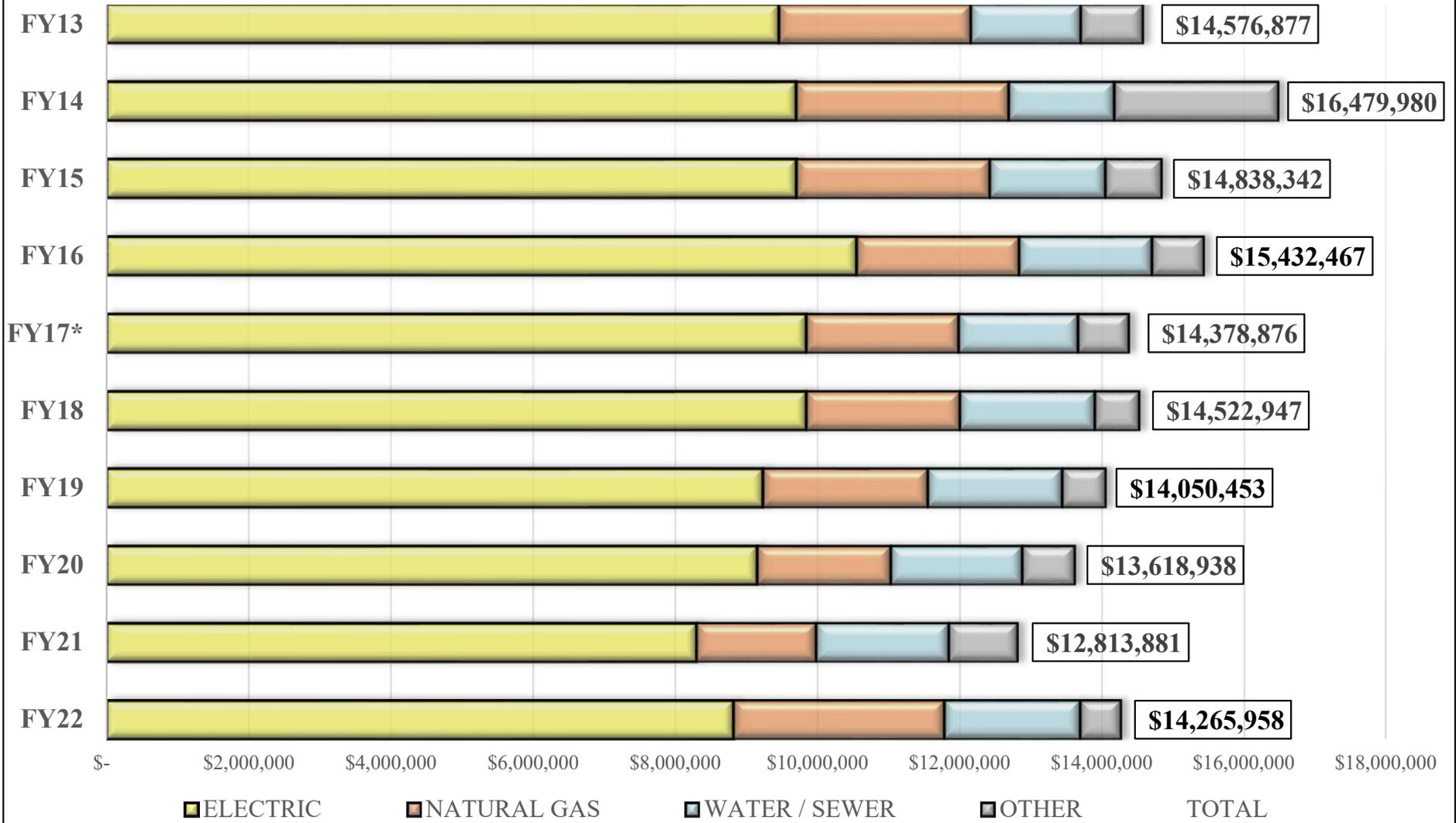
Power Plant and Utilities Overview

August 24, 2022





UTILITIES BY FISCAL YEAR



* Eleven Months of Data

Campus Utilities (FY22)

- Electricity: \$8,816,004/yr
 - 109,919,788 kWh
- Natural Gas: \$2,967,056/yr
 - 508,729 MCF
- Water / Sewer: \$1,911,471/yr
 - 507,851 CCF

\$13,694,531/yr on Utilities in FY22

\$37,519/day = \$1,563/hr = 43¢/Second

Does not include Trash/Recycling or Power Plant Supplies



Campus Utilities

- KSU spent \$13,694,531 for utilities / year
- Approximately 16,000 Students per semester in FY22

\$855/student

Enrollment Statistics per KSU Reporting & Analytics Data – Undergraduate, Graduate and Vet Med per Semester (Main Campus Only)

Does not include Trash/Recycling or Power Plant Supplies

Electric

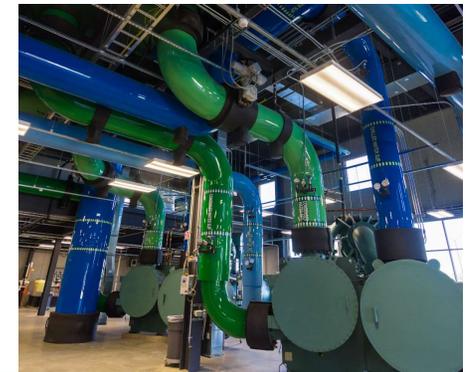


- **2 Main Substations**
 - Southwest near Alumni Center
 - North near NBAF
- **62% of Utility Bill**
 - (\$8,816,004 in FY22)
- **50% of demand comes from wind energy**
 - 20-year partnership with Evergy
 - Receive RECs (Renewable Energy Credits) when retired
 - Saved \$331,321 in FY22 from lower RECA cost



Largest Consumers

- Cooling (Chillers, Window AC, AHU's)
- Labs (Fume Hoods, Lab Equipment)
- Plug Loads (Computers, office equipment)
- Lighting



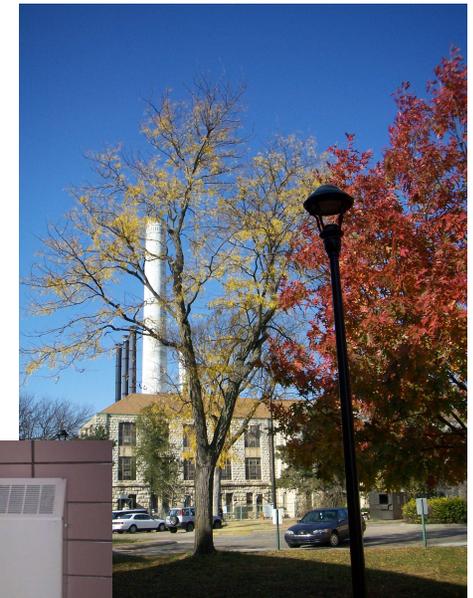
Natural Gas



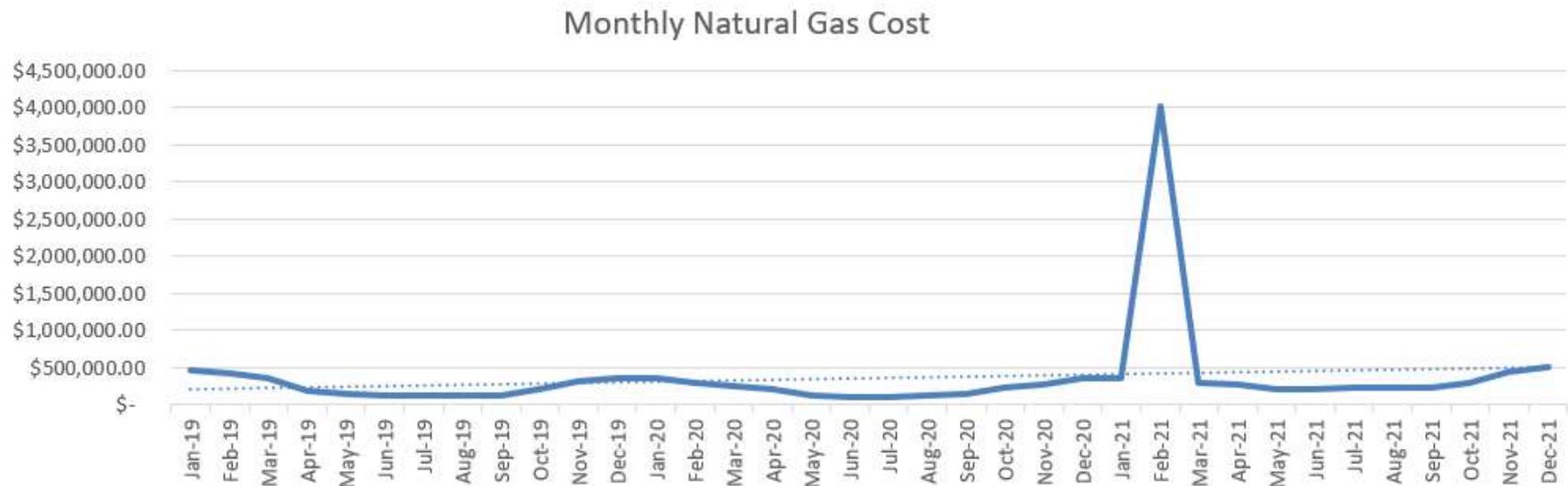
- **Natural Gas is an unregulated commodity**
 - Blue Mark Energy - Transport
 - Kansas Gas Electric - Local Distribution
- **Rates**
 - Adjust Monthly
 - First of Month price on Henry Hub currently \$9.188 / mcf
 - Hedge
 - 35% of load locked in at \$2.63 / mcf
- **21% of Utility Bill**
 - (\$2,967,056 in FY22)

Largest Consumers

- Heating (Boilers/Steam, AHUs)



Feb 2021 Winter Storm Uri



- Natural Gas Bill for February 2021 was \$4,012,031 (Main Campus)
- Average February Bill is approximately \$350,000
- Currently in mediation

Water / Sewer



- **Provided by the City of Manhattan**
- **Expecting Rate Increase for next 4 years**
 - Anticipating 4% per year beginning in January
 - Annual evaluation of Sewer / Stormwater Credit
- **13% of Utility Bill**
 - (\$1,911,471 in FY22)

Largest Consumers

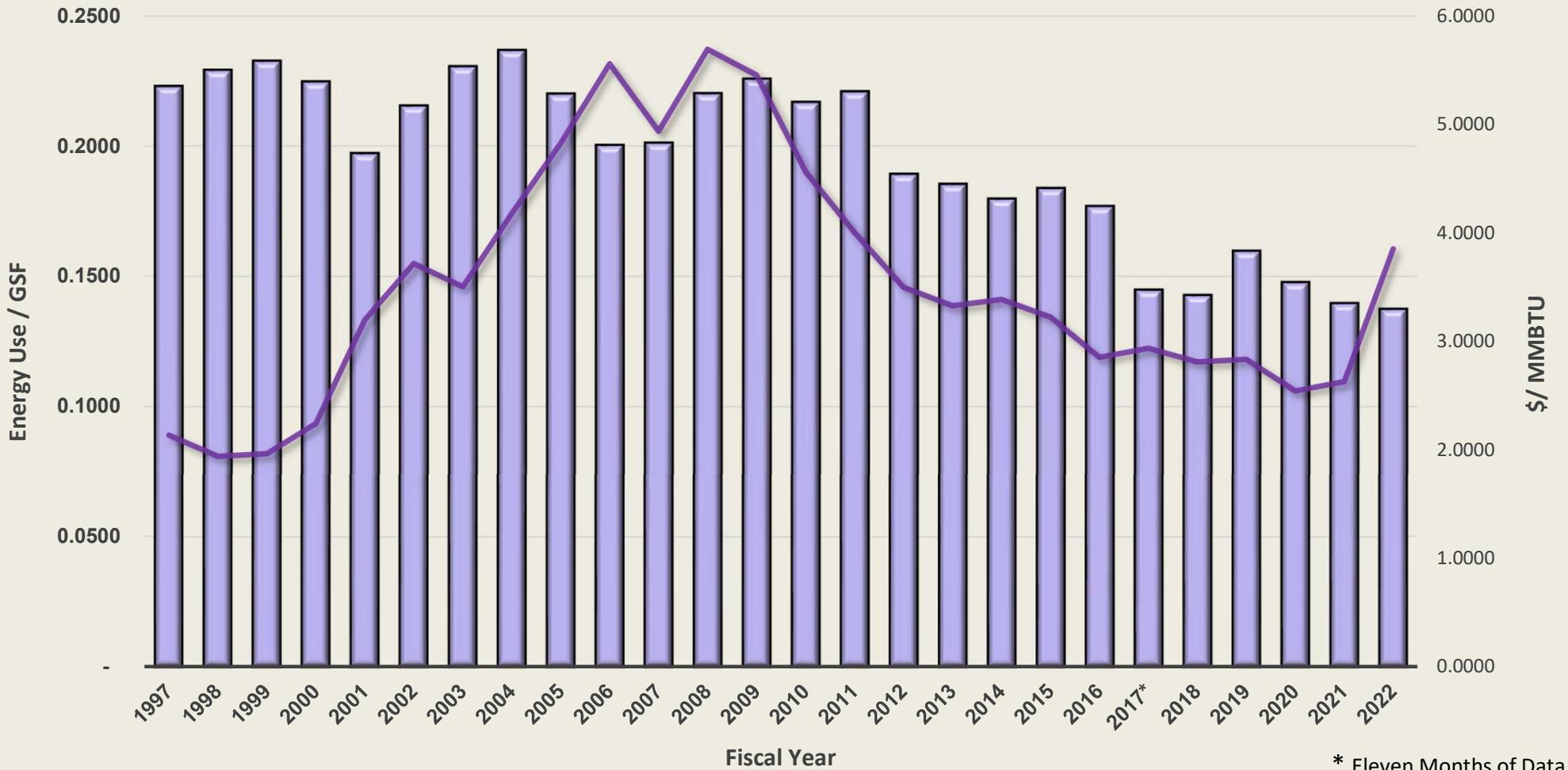
- **Process (Cooling Towers, Boiler Makeup)**
- **Domestic (Toilets, urinals, sinks, etc.)**
- **Irrigation**



Remainder of Utility Bill for Trash / Recycling and Power Plant Supplies



Kansas State University Main Campus MMBTU per GSF vs Commodity Cost



* Eleven Months of Data



Energy Conservation



Energy & Environment Program
Kansas State University

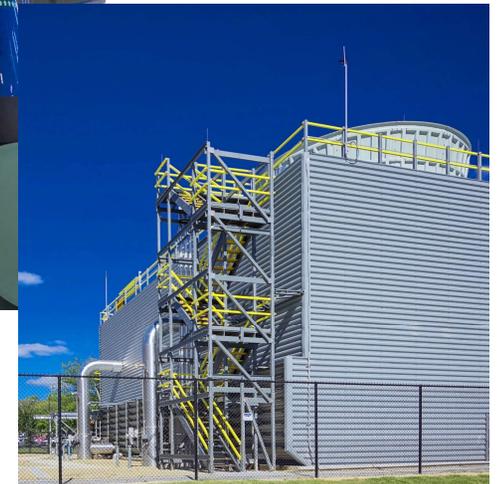
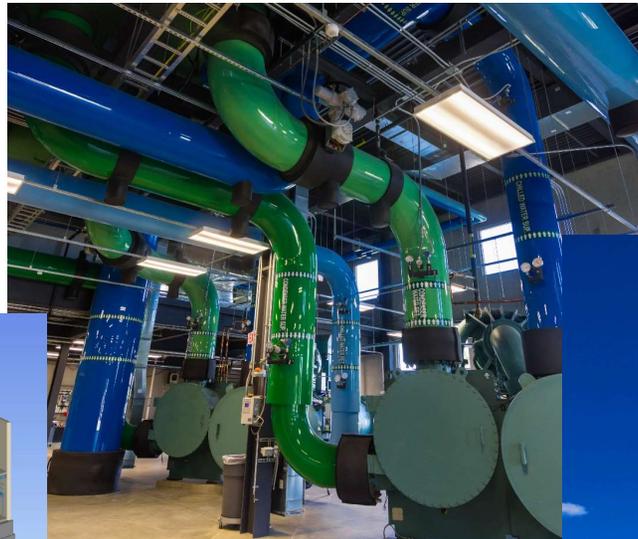
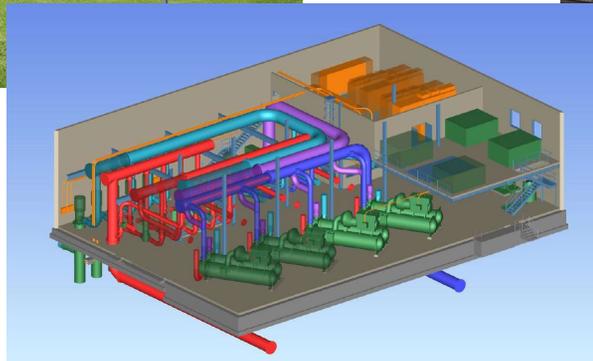
- **Energy & Environment Program**

- Program Started in 2010
- Installed extensive Sub-metering
- More focus on new building design
- LED Lighting Retrofits
- Occupancy Sensors
- VFDs
- Building Controls Upgrades
- CO2 Demand Ventilation



Central Chiller Plant Project

- 2 Chillers (2850 Tons each) – more energy efficient equipment
- Chiller optimization
- Simultaneous building modifications to utilize efficiencies
- Capability of “free cooling” in shoulder months



Annual Savings from Chiller Plants alone >\$1M per year

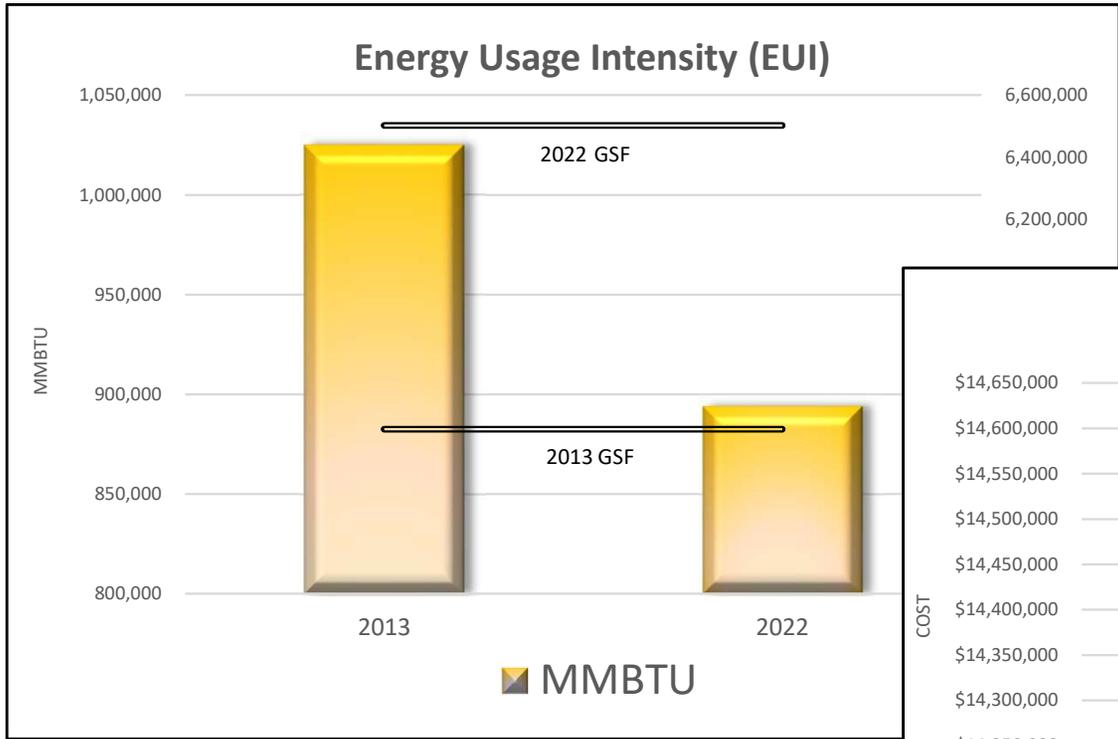
Energy Conservation

Future Potential?

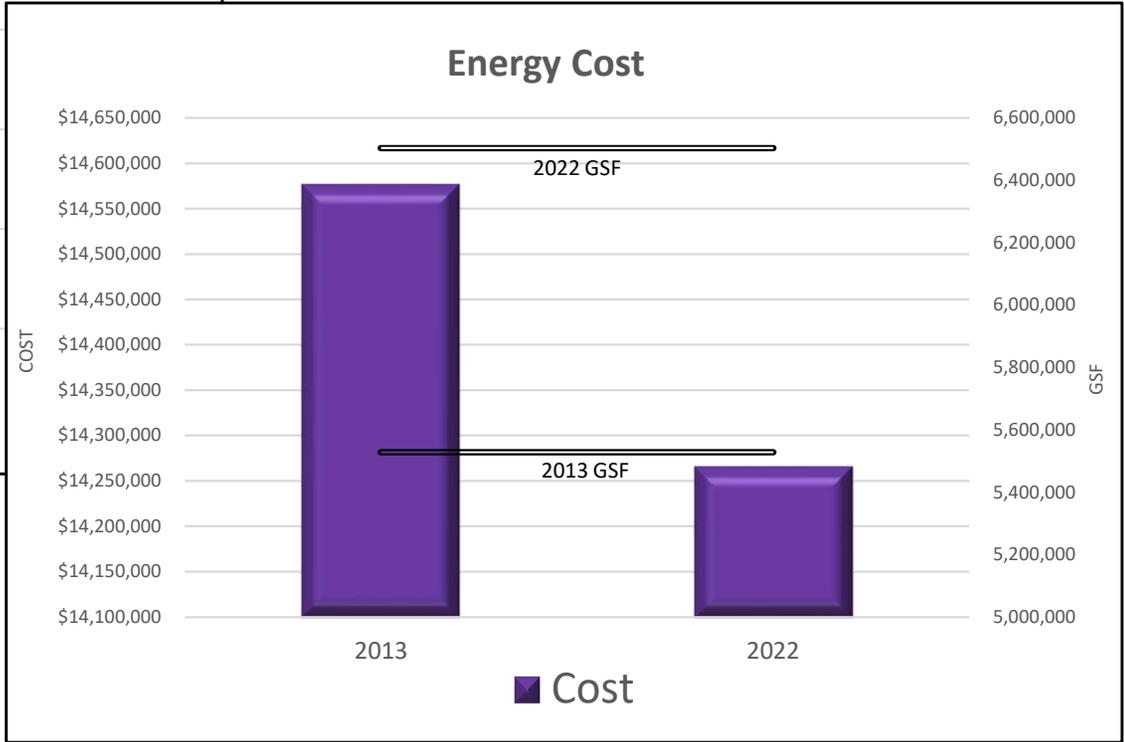
- **Utility System Enhancements**
 - Thermal Energy Storage (TES)
 - Steam & Condensate Pipe Insulation
- **Sustainable Energy Sources**
 - Combined Heat & Power (CHP Micro grid)
 - Wind Turbines
 - Solar Photovoltaic Panels
- **Lighting**
 - Interior Lighting
 - Exterior Lighting
 - Lighting Controls
- **Building Envelope Enhancements**
 - Window Replacement
 - Window Film
- **Building System Enhancements**
 - Building Automation
 - Building Retro Commissioning



10-Year Comparison 2013 - 2022



During this time period,
we experienced an 18%
INCREASE in GSF....



while simultaneously experiencing
13% **DECREASE** in Consumption
and a 2% **DECREASE** in Cost



Power & Chiller Plants

- **Boilers (Five Total)**

- Three Nebraska 80,000 pph water tube boilers
- One IBW 45,000 pph water tube boiler
- One Nebraska 27,000pph water tube boiler
- +310,000 pph Total Capacity

- **Chillers (Seven Total)**

- Two 2,950-ton chillers
- Four 1,250-ton chillers
- One 900-ton chiller
- 12,000-ton Total Capacity (Built for Future Expansion)

- **Other**

- 3.5 miles of accessible tunnel
- 10+ miles of direct buried central chilled water (up to 48” diameter)

Responsibilities

Steam

- Plant operation & maintenance 24/7/365.
- 8 satellite (Off Campus) steam boilers
- Includes maintenance for 108 Condensate pumps and 3800+ steam traps, 60+ heat exchangers
- Includes Chemical make-up/testing

Chilled Water

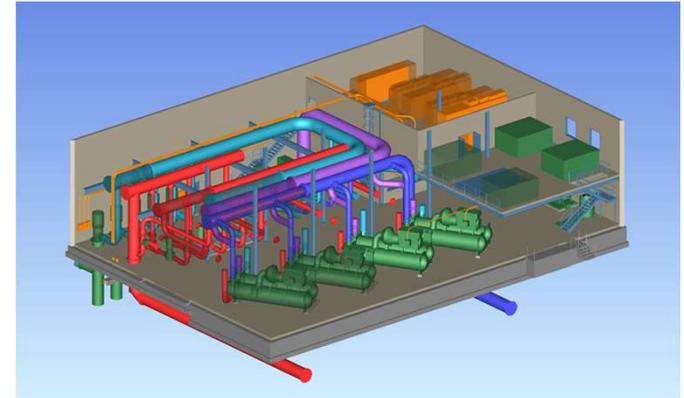
- 2 plants operating in tandem
- 3 satellite (off Campus) chillers
- Includes maintenance for 46 chilled/HW pumps

Distribution Systems

- Maintenance & repair of 3.6 miles of underground steam tunnels & equipment
- Approx. 100 miles of buried water lines, Sewer, Natural Gas, and Electrical Infrastructure

Other

- Snow Removal
- Street and parking lot lights
- Road/Street maintenance
- Utility locating
- Metal fabrication and installation
- Minor construction



Accomplishments

Work Accomplished

- 2016: 344 work orders completed
- 2021: 5,401 work orders completed
- Expanded plant operation in 2016 to include all tunnel maintenance and condensate pumps. 2019 we took over all steam trap maintenance.

Utility Savings

- 40% reduction in steam plant make-up since 2015
- 84% Savings in Chemical Treatment, nearly \$55,000/yr
- Feedwater pumps in plant to save over \$50,000/yr in electric cost
- Negotiated Service Contract with JCI to save ~ \$90,000/yr

Distribution Systems

- 2/3 of steam tunnels upgraded with new pipe hangers, and insulation, remainder will be completed by 2025
- Fixed leaks in tunnel that saved close to 10,000,000 gallon per year of water and hundreds of gallons of chemical

What's next to accomplish?

- Walk lights, Street lights wiring located and on GIS (including circuitry)
- Use meter data to optimize chiller stage ups and substation loads during peak months to save on Electrical Demand Fees
- Continual equipment updates to mitigate ongoing deferred maintenance
- Road/Curb/Gutter maintenance catchup
- GPS locations on every light, valve, and sewer manholes on main campus
- New boiler/chiller controls to update obsolete systems and controllers



Questions?