Continuous Oversight Enhances Energy Upgrades at the University of Medicine and Dentistry of NJ (Rutgers Biomedical Health Sciences)

IDEA Conference

February 2014

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Presentation Overview

- Owner's goals
- Opportunity for Improvement
- Approach
- Results of the capital project
- Continuous Oversight
- Final results

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Owner's Goals

- Reduce energy costs
- Improve reliability of system
- Improve space conditions
- Measure energy use
- Train operating engineers on best practices
- Fast track the project's implementation in order to qualify for grant assistance from local utility

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Opportunity for Improvement

- Central plant is approaching 40 years old
  - (3) 3800 ton and 1 x 1900 ton steam turbine driven chillers
  - (1) 6000 ton electric
  - Variable primary system originally used eddy current drives
- Site had approximately doubled in size since the central plant was constructed
- Multiple buildings were added to the chilled water system with secondary pumps
- System performance diminished and energy consumption increased

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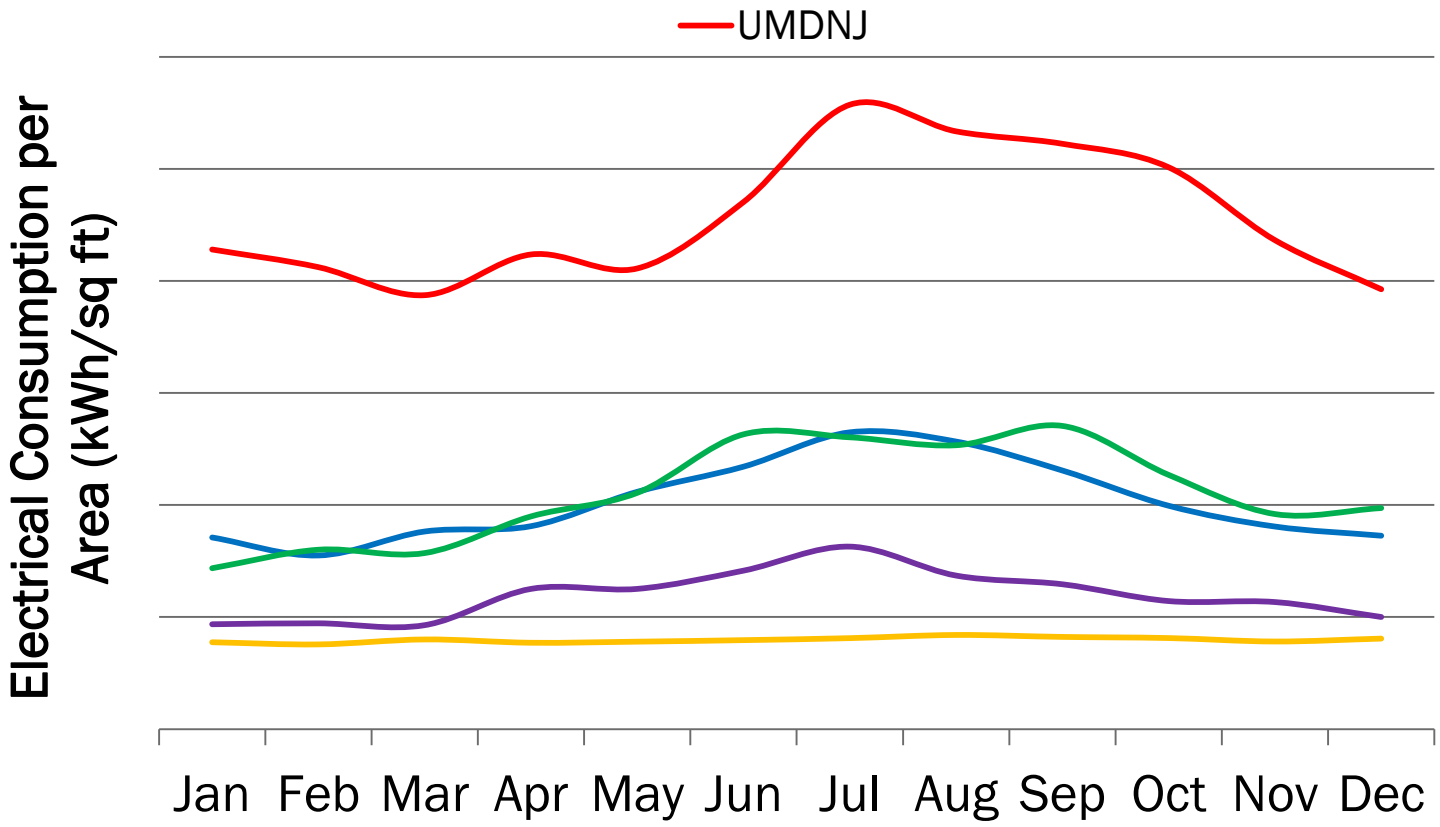
Opportunity for Improvement

- Electric use was benchmarked against peers



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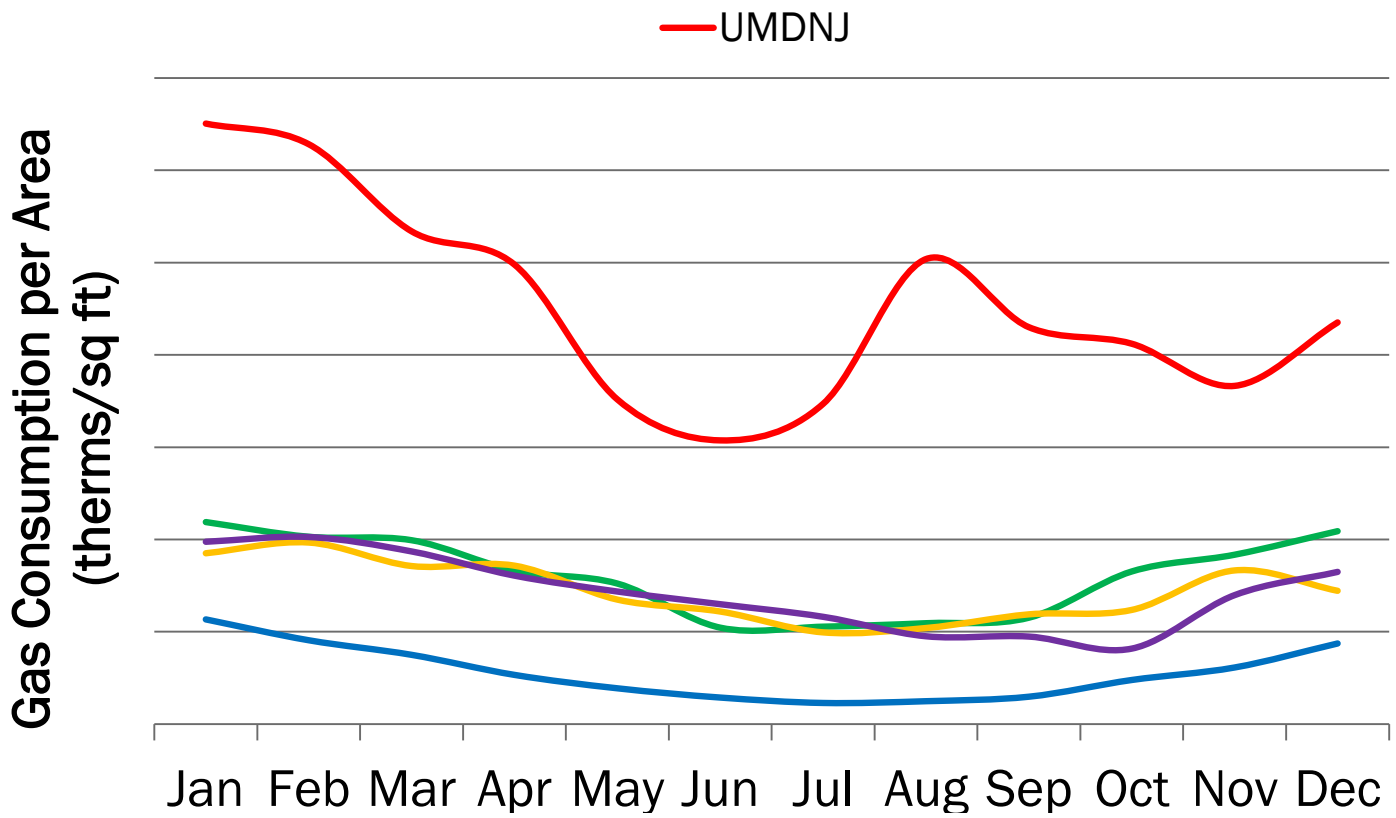
Opportunity for Improvement

- Benchmark gas consumption against peers



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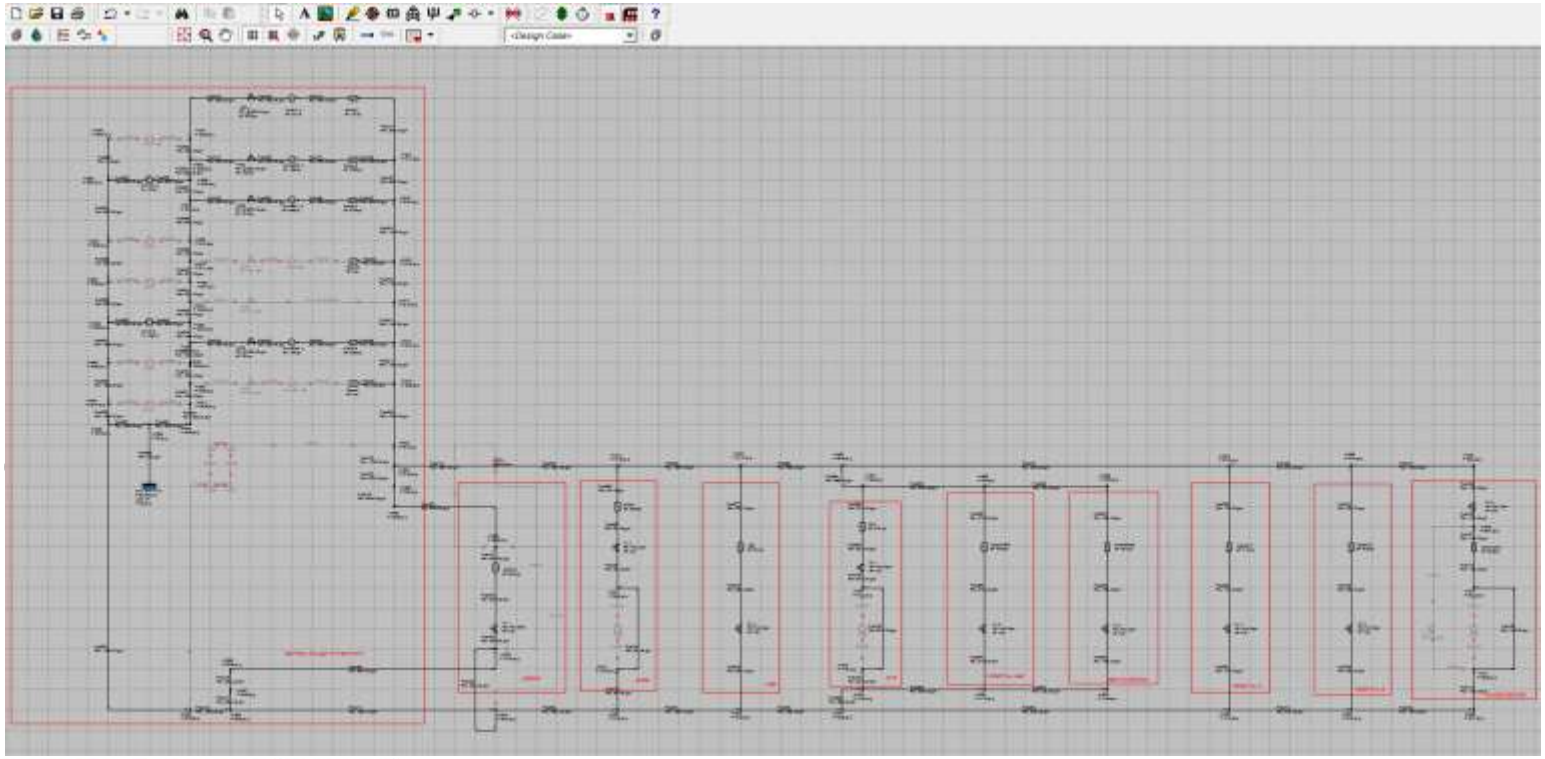
Approach

- Targeted the chilled water system to reduce electric consumption
  - Developed Chilled Water Hydraulic Model



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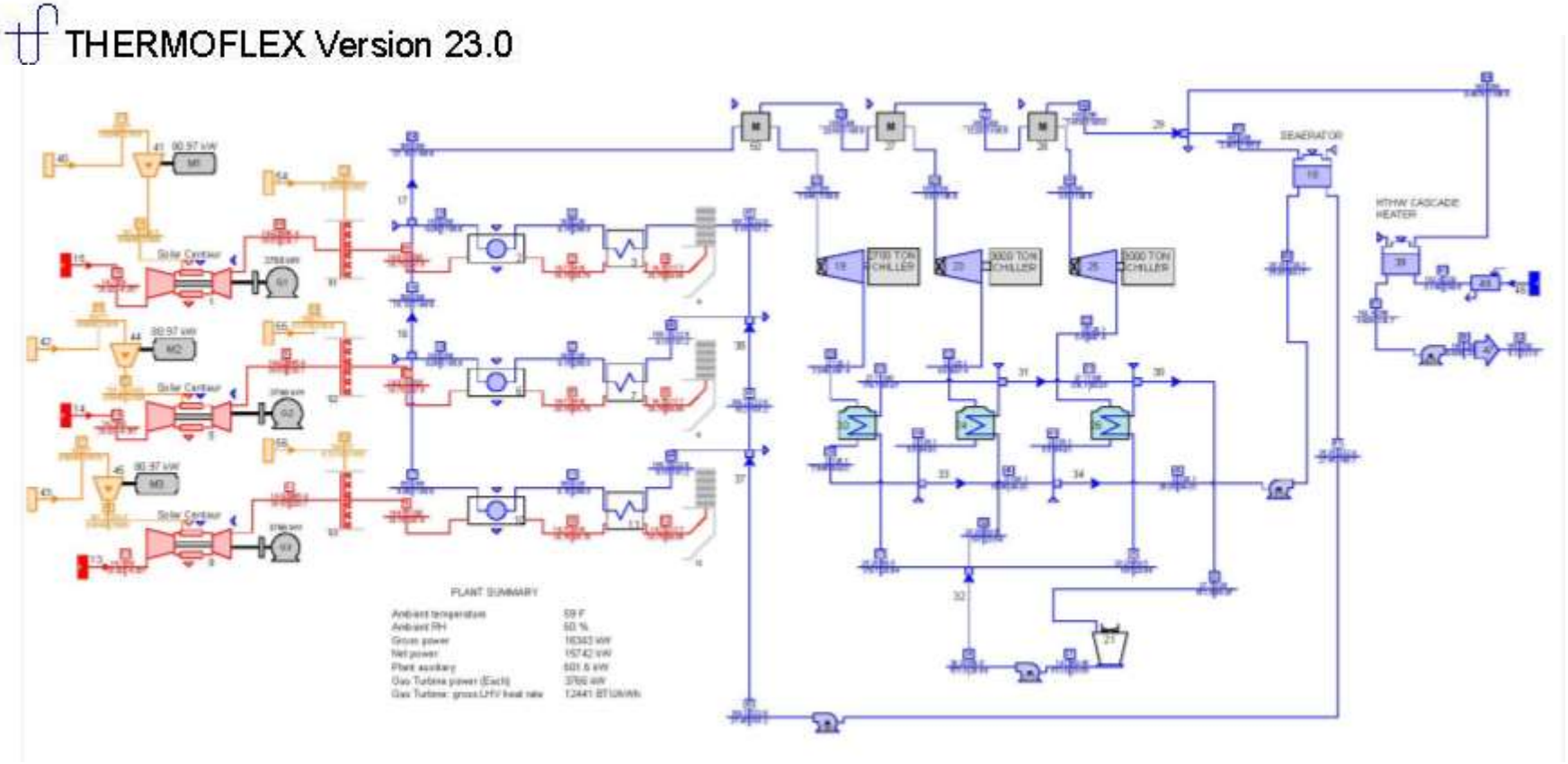
Approach

- Heat & Mass Balance of the Central Plant



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Approach

- Evaluated Energy Conservation Measures that were not selected (based on payback)
  - Steam turbine generator in combined cycle
  - Free cooling heat exchanger
  - Interconnection of cooling towers
  - High efficiency transformers
  - Reconditioning of AHUs
  - Installation of window film
  - DA replacement

Approach

- Implemented Energy Conservation Measures
  - 2,700 T Steam Turbine Driven Chiller
  - 2,500 T Electric Chiller
  - Modifications to improve CHW temperature differential
    - Pressure independent control valves
    - VFDs on CHW pumps
  - VFDs HTHW Pumps
  - VFDs and direct drive motors for field-erected CT fans
  - Replacement of AHU motors with premium efficiency
  - UtiliVisor Continuous Oversight for CCHP
  - Replacement of HRSG Economizers
- Commissioned / retro-commissioned the installed measures to verify and document functional performance of systems

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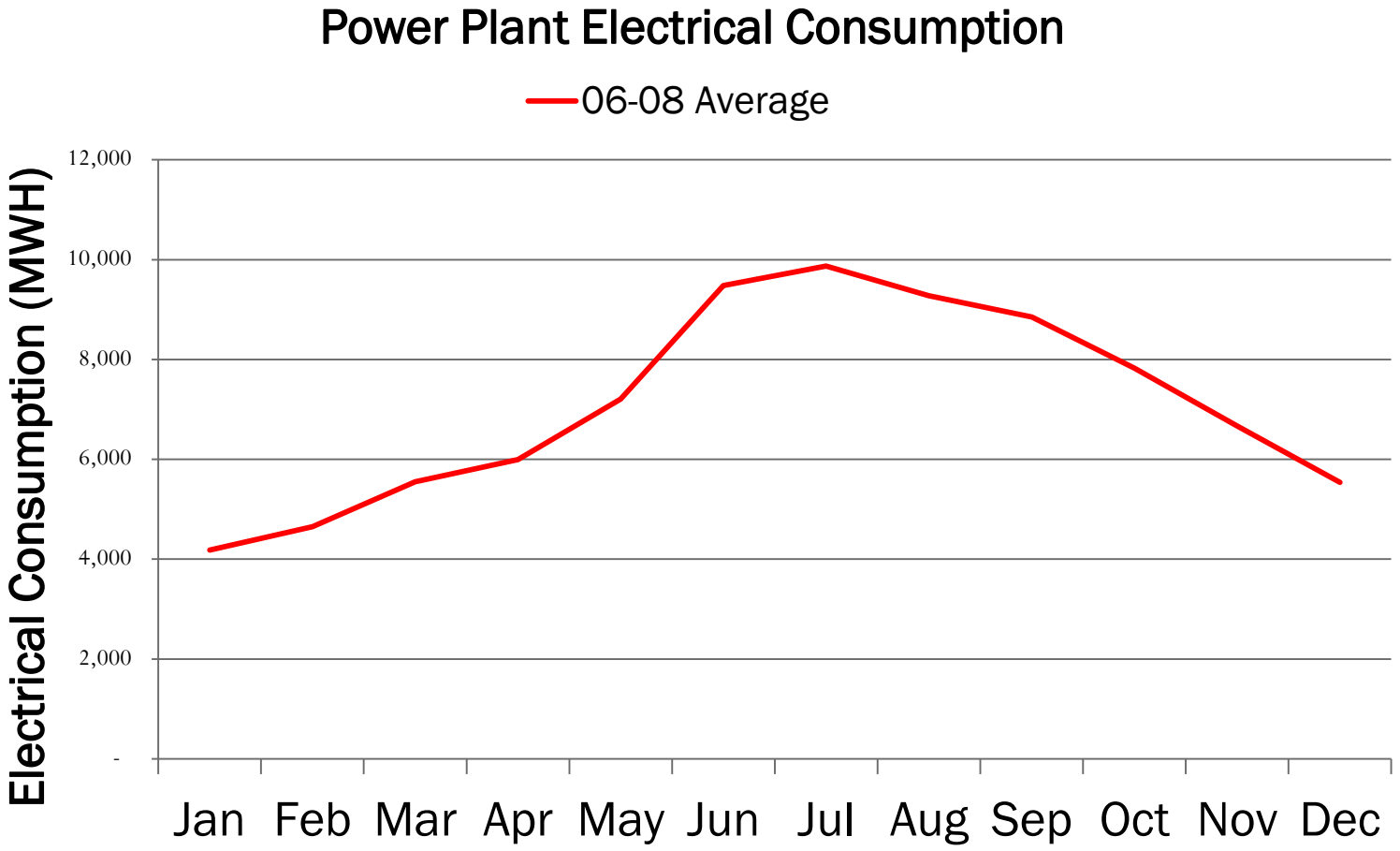
Results



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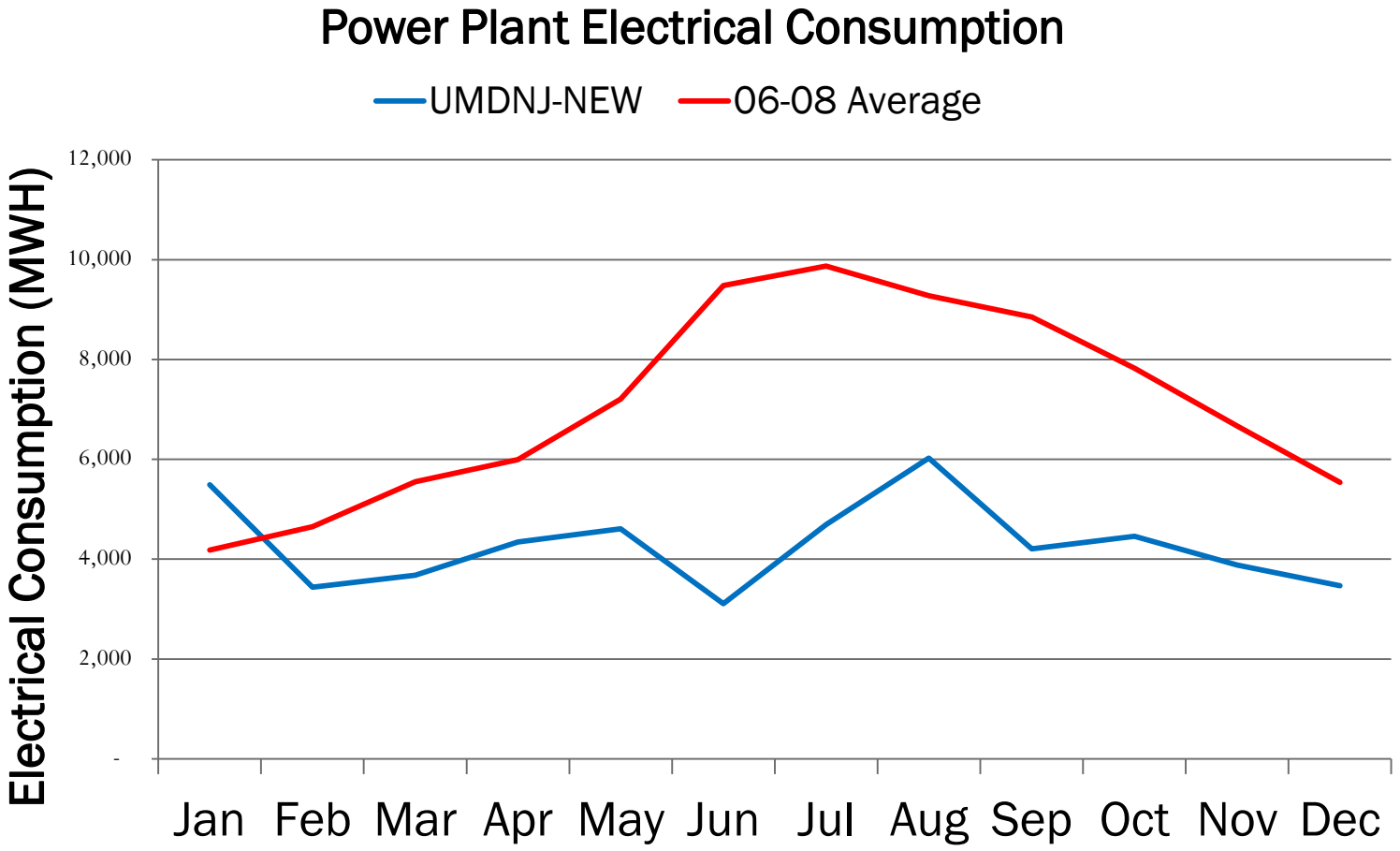
Results



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Results Summary

- Improved CHW dT from an average of 9°F to 15°F
- Reduced carbon by 9,100 TPY
- Projected energy savings of $1.6M was verified by utility grant auditor
- “There were significant improvements across all buildings in terms of occupant comfort”
  - Michael Manchello, Executive Director of Physical Plant Operations, RBHS

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CHP/Chiller Plant Advisory Services

at

Rutgers Health Sciences at Newark

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- utiliVisor was tasked with implementing continuous energy oversight following the completion of the plant enhancements.

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Agenda

- Who is utiliVisor?
- Background
- Goal for the Implementation of utiliVisor at UMDNJ/Rutgers
- Description of Facilities
- Examples of Energy Savings Measures within the Plant
- Savings Realized
- Future Projects

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Who is utiliVisor?

- utiliVisor has been in business for over 35 years.
  - Headquarters and Operations Center located in NYC.
  - Development and software engineers are located in Milwaukee.
- utiliVisor platform was created over 14 years ago and investment in development is ongoing.
- 200 million square feet of buildings and facilities monitored
- In excess of 125,000 energy points connected
- Data is stored at Contegix which is a Tier 1 data center. Secure data environment which guarantees a 99.1% uptime.
- Energy Metering and Plant Analysis are our only businesses.

utiliVisor has saved over $100 Million energy dollars in the last 5 years with minimum capital expenditure!

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Background

- University of Medicine and Dentistry of New Jersey (Rutgers New Jersey Medical School)
- The campus that the Energy plant serves is approximately __ million square feet
- The campus provides the following utilities:
  - Electricity
  - High temperature hot water
  - Chilled water

Goal for the Implementation of utiliVisor at UMDNJ/Rutgers

- Monitor operations of the plant holistically; following the upgrade to the plant hardware and controls.
- Assist with the operations team to maximize the investment of the recent plant upgrade and drive additional savings from continuous energy oversight.
- Measurement and Validation for past and future ECM's
- Validation for the 3rd party reviewing team that was hired by the state's auditors.

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Description of Facilities

Power Generation Capacity	Capacity
Cogeneration	Three (3) 3.3 MW Turbines
	Three (3) HRSG 41,000 lbs/hr
Boiler Plant Capacity (HTHW System)	Two (2) Boilers
Chilled Water Plant Capacity	20,700 tons

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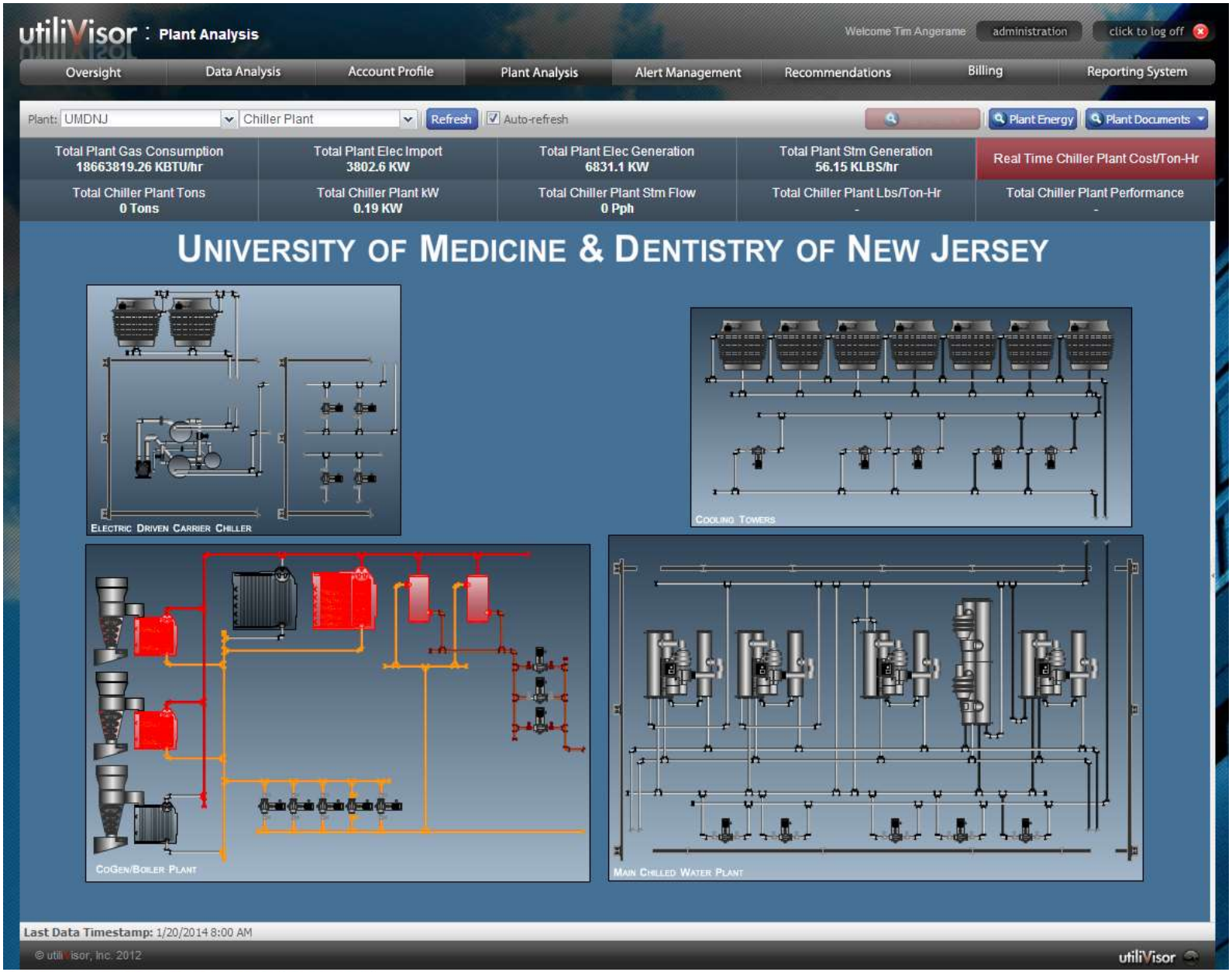

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utiliVisor Operations Center

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Examples of Energy Savings Measures within the Plant

- Developed custom operating sequences and staging of equipment based on efficiency, cost and demand.
- Identified incorrect control strategies embedded within the control system; specifically with the pumping sequences.
- Identified and corrected inaccurate measurement devices which in turn was providing the operations team inaccurate information to properly and efficiently operate the plant.
- Providing the design engineering team at UMDNJ accurate, reliable and repeatable data for additional ECM's.

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Savings Realized

Chiller Plant Savings (YTD):	$ 494,944
Reduction of Total kW from reducing Campus Differential Pressures (10 DPs) = 30% Savings	
Cooling tower sequence	
Isolating Cooling Tower Cells based on # of Chillers operating	
Corrected CTs from short cycling	
Cogen/Boiler Plant Savings (YTD):	$ 210,000
HTHW savings	
Recommended reducing HWS Temperature from +400 Deg.F (Valve Issue) to 335 Deg.F	
HWPs were never properly linked to be controlled from new VFD,	
Identified CoGen 1 was not producing similar Steam Output compared to #2 and 3 (Diverter Valve was not operating properly)	
Total Savings (YTD)	**$ 704,944**

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Future Projects

- Chiller Free Cooling; Chiller Control Panel Upgrade
- Tune the control of the primary chilled water pumping system
- Cooling tower sequence

Thank you

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