
IDEA2021
Powering the Future: District Energy/CHP/Microgrids
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STANLEYCONSULTANTS

The University of Texas at San Antonio North Plant Rebuild

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DANGER
VOLTAGE


DANGER
HIGH VOLTAGE


DANGER
HIGH VOLTA


Yale
DANGER
HIGH VOLTAGE


HURST
HURST


HURST


HURST
HURST

How we got here:

- Weather difficulties
  - ✓ Surprise cold front in fall of 2014
  - ✓ 50s/40s temps caused UTSA to start backup Boiler No. 2
- Cold buildings/lower domestic hot water temps
  - ✓ Boiler No. 1 operated but did not have the steam production capacity needed
- Parts Obsolescence
  - ✓Igniter
  - ✓Gaskets
  - ✓Feedwater pumps bearings
- Lack of Redundancy
  - ✓ Boiler
  - ✓ Feedwater Pumps

“We need to do something.”

- Catalyst = Inclement weather and lack of reliability/redundancy
- 40-plus-year-old equipment
- Unable to not meet current and future needs
- Utilities Master Plan
- Rebuild the NTEP
- Simplify plant operation

Challenges

- Vet the Utilities Master Plan
- Perform evaluation of existing and prospective:
  - ✓ Steam System
  - ✓ Chilled Water System
  - ✓ Electrical System
- Design and construct program building blocks
- Keep the plant running during reconstruction

USTA Program Building Blocks

First boiler addition project, demolish generator, new piping, deaerator system and related work

October 2017

Motor control Centers Replacement

May 2017

Boiler replacements

No. 1 – **April 2018**

No. 2 – **Oct 2018**

Incoming 15-kV switchgear

June 2020

Chiller 3 replacement

April 2021

Shutdown Design

- August 2016 - Critical steam system shutdown
- Vestigial piping demolition
- New piping installation with isolation valves
- Contractor completed work within a 4-day shutdown window
  - ✓Chillers remained in operation for campus cooling
  - ✓Old piping and insulation removed
  - ✓Welders installed new piping

Boiler Addition

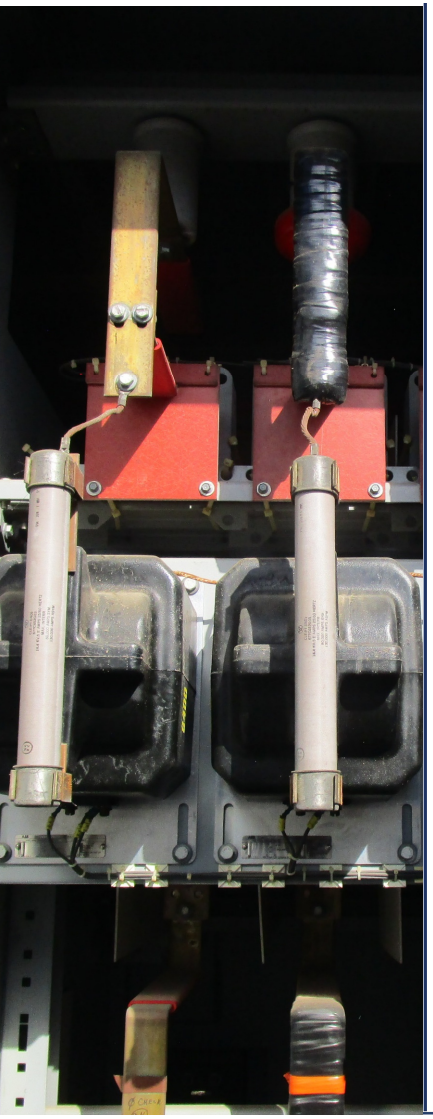
- Engine-Generator Demolition
- Boiler No. 3 Installation
  - ✓ Packaged 800 BHP Fire-tube
- New deaerator system installation
  - ✓ Packaged 100 klbh system with N+1 FWPs
- Work allowed for future steam tie-ins without steam system operation disruption

Motor Control Centers Replacement

- Timeframe 2016-2017
- Need for electronic overload protective relays, soft starters and variable-speed drives became critical
- Replaced 3 MCCs and updated 4th MCC to improve operability and maintenance
- Replacement of feeder circuit breakers, surge protective devices, full-voltage starters, two speed starters, soft starters and high-speed VFD for CT No. 1 Fan
- Phasing plan provided to transfer loads

Boiler Replacements

- Timeframe 2017-2018
- CDs for Boilers Nos. 1 and 2
  - ✓Packaged 800 BHP Fire-tube
  - ✓Boiler No. 2 as alternate
- Demolition of old deaerator and feedwater system
- Project Funding



15 kV Switchgear Replacement

- Timeframe 2019-2020
- Replaced obsolete MV incoming switchgear
- New switchgear – 2 incoming breakers, a tie breaker and four outgoing breakers
- Phasing plan for demolition and installation
- Temporary 15 kV feeder designed for selected boilers, chillers, cooling towers and associated pumps

Chiller No. 3 Replacement

- Timeframe 2020 – 2021
- Upstream Feasibility Study
- Removed existing 3,000-ton chiller and auxiliaries
- Installed new 2,500-ton electric chiller in existing footprint
- Replaced 5,000kVA Transformer
- Side-stream Filtration for Chilled Water System
- Brought total cooling capacity of plant to 9,500 tons

Lessons Learned

- Meticulous design and planning
- Energy plant operators and designers must have a good plan and clear goals for what they want to achieve
- Knowing what must be done and what it will cost will improve a project's chances of obtaining funding
- The new steam system equipment proved fully functional with redundancy as per design during the February 2021 Winter storm

System snapshot: The University of Texas at San Antonio Main Campus

	Steam system	Hot water system	Chilled-water system
Startup year	1973 – North Thermal Energy Plant began steam service	2008 – South Thermal Energy Plant opened, providing hot water service	1973 – North Thermal Energy Plant began chilled-water service 2008 – South Thermal Energy Plant opened, providing chilled-water service
Number of buildings served	19	3	24
Total square footage served	2.19 million sq ft	527,229 sq ft	2.94 million sq ft
Plant capacity	North Thermal Energy Plant: 82,800 lb/hr	South Thermal Energy Plant: 41,400 MMBtu/hr	North Thermal Energy Plant: 9,500 tons South Thermal Energy Plant: 4,800 tons
Number of boilers/chillers	North Thermal Energy Plant: 3 boilers (packaged firetube)	South Thermal Energy Plant: 2 boilers	North Thermal Energy Plant: 5 chillers (centrifugal) South Thermal Energy Plant: 3 chillers (centrifugal)
Fuel types	Natural gas with fuel oil backup	Natural gas	Electricity
Distribution network length	1 mile steam/1 mile condensate return	0.25 miles	1.33 miles
Piping type	Insulated carbon steel in utility tunnels, service drives and building utility crawl spaces	Insulated carbon steel in service drives, tunnels and direct-buried	Insulated carbon steel in utility tunnels, service drives and building utility crawl spaces/limited direct-buried
Piping diameter range	4 to 12 inches	6 to 24 inches	6 to 24 inches
System pressure	120 psig	60 psig	80 psig
System temperatures	353 F supply/160 F condensate return	180 F supply/160 F return	40 F supply/54 F return
System water volume	N/A	30,000 gal	400,000 gal

The University of Texas at San Antonio

Founded by the Texas legislature in 1969

Largest university in the San Antonio metropolitan area

Four campuses across the city: Main, Downtown, Hemisfair, Park West

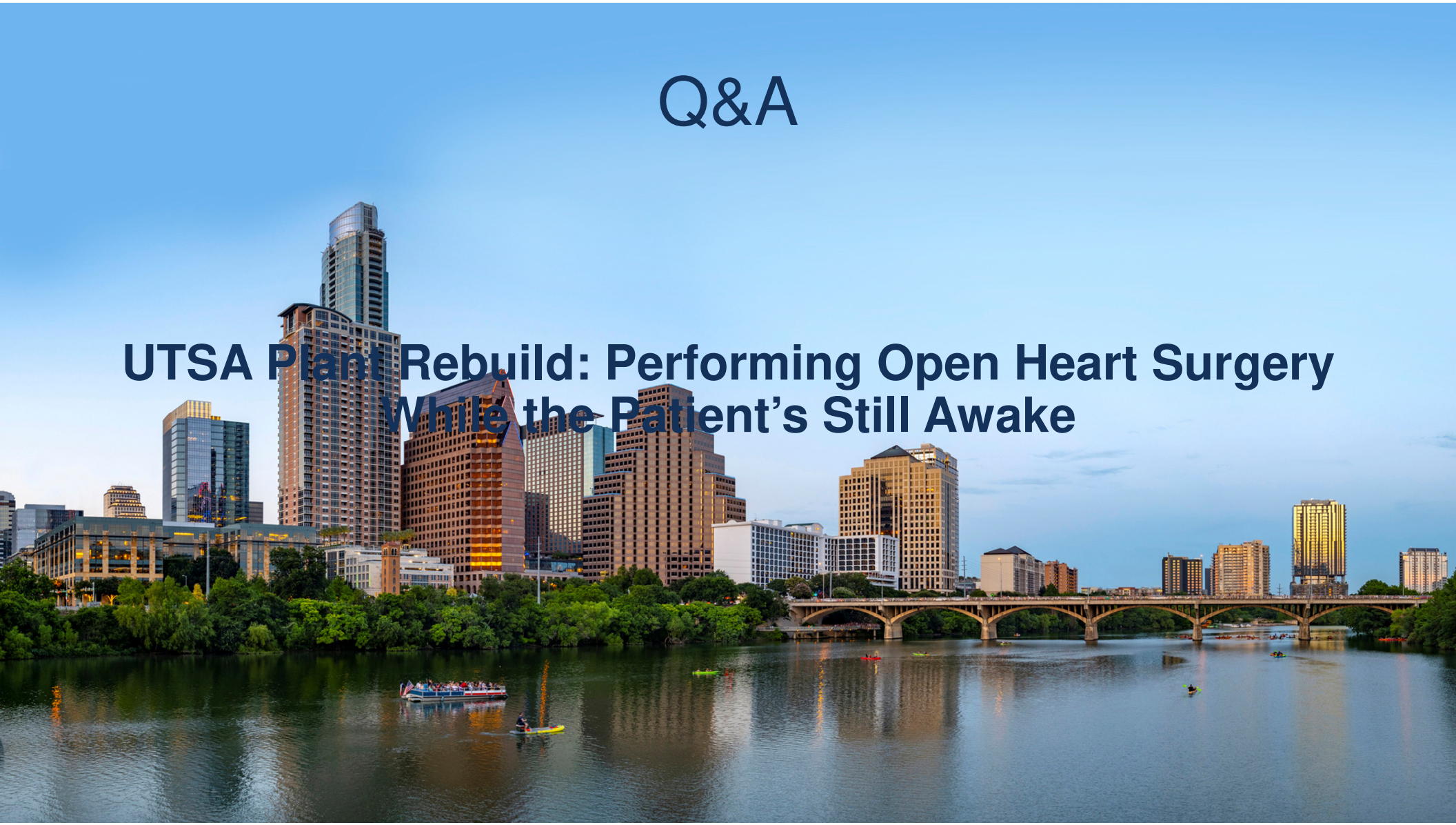
More than 34,000 students at all physical campuses

Home to the top cybersecurity program in the nation

A Hispanic serving institution offering 165 degree programs

Competes in NCAA Division 1, Conference USA (C-USA) in 15 varsity sports

Q&A



UTSA Plant Rebuild: Performing Open Heart Surgery While the Patient's Still Awake

Thank You!

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