High-Performance Buildings

EEP 09

UTA

Initiative

Retrofit and design high-performance buildings across campus

LEAD: Office of Facilities Management
with support from the Office of Sustainability

Definition

High-performance buildings are an essential building block to a low-carbon future for UTA. Building operations are the driver for nearly all scope 1 and 2 emissions at UTA, and improving their efficiencies will have some of the most immediate impact on overall carbon emissions reductions efforts. Additionally, high-performance buildings complement on-site renewable power generation, and taking steps to reduce consumption will allow for more effective use of on-site renewables. It Is also important to integrate the sustainability principles into construction and design documents for consultants and contractors.

Resilience Co-benefits

- Shrinks Carbon Footprint
- Supports Community Health
- Increases Energy Efficiency
- Decreases Utility Costs
- Establishes UTA as a Regional Leader

HIGH-PERFORMANCE BUILDINGS

Current Building Performance Metrics

UTA's Campus Energy Use Intensity (EUI), a metric that tracks building performance on a per square foot basis, has been a key reference point for the Office of Sustainability Dashboard for several years. This number has fluctuated throughout the last five years, but following the notable dip in energy utilization brought on by the COVID-19 Pandemic, the university has been steadily increasing its campus EUI. Since 2023, UTA's campus EUI has outpaced pre-pandemic numbers, both a sign of a growing campus, and a noteworthy reduction in building performance. UTA's current and future building stock will require intervention in order to maximize the potential for sustainable development and operation.

Campus EUI in kBTU/SF

UTA 2019 - 2024

2019	2020	2021	2022	2023	2024
112.9	109.7	106.1	110.5	113.1	114.4

State of Energy Conservation

In 2005, UTA contracted the Siemens Building Technologies team to evaluate energy conservation measures on-site, and identified 18 Energy Cost Reduction Measures, including the development of a chiller plant on the west side of campus, lighting retrofits, occupancy sensors, as well as HVAC system upgrades in order to drive down utility consumption at UTA.[22] These recommendations are the groundwork for this plan's future recommendations, and serve as an early step to adopting energy conservation as a core ethos at UTA.

The implementation of these Energy Cost Reduction Measures has had a significant impact on overall consumption at UTA, seeing a 22% reduction in energy use consumption per square foot between the beginning of their implementation and today.

In order to meet the goals outlined as part of this plan, additional measures need to be taken to continue to drive down campus utility consumption.

22 Sustainability - Energy: UT Arlington

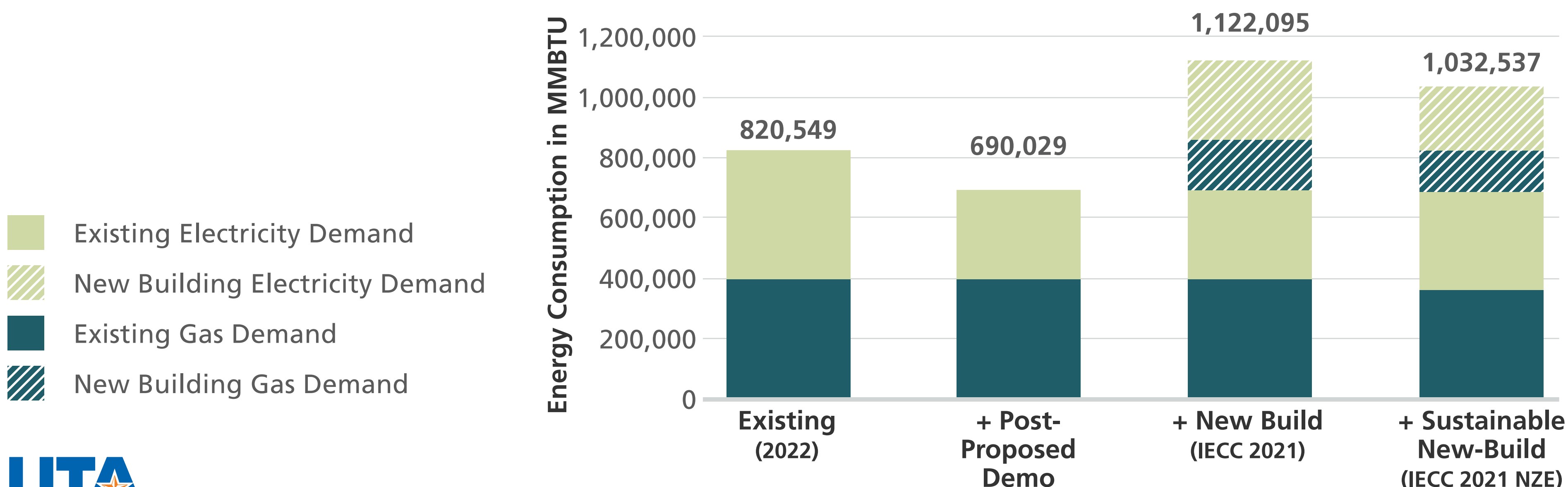
New Building Targets

As of 2023, the City of Arlington and UTA have adopted the 2021 version of the International Energy Conservation Code (IECC) as the building energy code standard. A portion of IECC 2021, titled "Zero Energy Commercial Buildings Provisions" (NZE Buildings Provisions) illustrates potential paths to Net Zero Energy buildings by climate zone. UTA, within the IECC's Climate Zone 2A, has target EUI of buildings tabulated below. To supplement UTA's advanced research development, this plan recommends an additional target for lab and research spaces. Although not included in the IECC 2021 NZE Buildings Provisions, these targets are based on current research space operations, as well as high-performance benchmarking from the International Institute for Sustainable Laboratories (I2SL).

A key component of infrastructure modernization is development of high performance targets for each building type on campus.

USE TYPE	TARGET EUI
Admin	30
Athletics	54
Classroom	42
Mixed-Use	73
Lab/Science/Research	165
Office	30
Residential	73

Future Utility Demand Scenarios



Daylighting
Maximizing natural light with windows and skylights reduces artificial lighting needs and improves occupant well-being.

Direct Digital Control (DDC) Upgrades
DDC advanced monitoring and diagnostics capabilities improve efficiency, reduce maintenance costs, and improve reliability.

Demand Controlled Ventilation (DCV)
Adjusting ventilation based on occupancy and air quality with real-time sensors optimizes energy use while maintaining comfort.

LED Lighting Transition
LEDs use up to 90% less energy than traditional lighting while offering longer lifespans and smart control compatibility.

High-Efficiency Mechanical Equipment
Converting traditional high-temperature equipment to modern solutions like heat pumps significantly improves performance.

Building Thermal Envelope Improvement
Upgrading insulation, windows, and air sealing reduces heat transfer and energy consumption and increases comfort levels.

Mechanical Energy Recovery
Finding opportunities for heat recovery technologies reduces overall demand with the aim of reducing scope 1 emissions.

Plug Load Controls
Advanced plug load controls can optimize energy consumption by adjusting power settings based on occupancy and usage patterns.

Heating Water Circulation Temperature
Decomissioning steam systems in favor of hot water boilers steps down high temperature hot water more gracefully.

Building Level ECMs

Building on what was developed by Siemens in previous iterations of energy efficiency efforts on campus, this plan lays out comprehensive building-level energy conservation measures (ECMs) that will enable existing buildings to operate even more efficiently, while continuing to serve the needs of students, faculty, and staff at UTA. These recommendations are designed as continual efforts to reduce utility consumption year over year, in order to align with a future, low-carbon UTA.

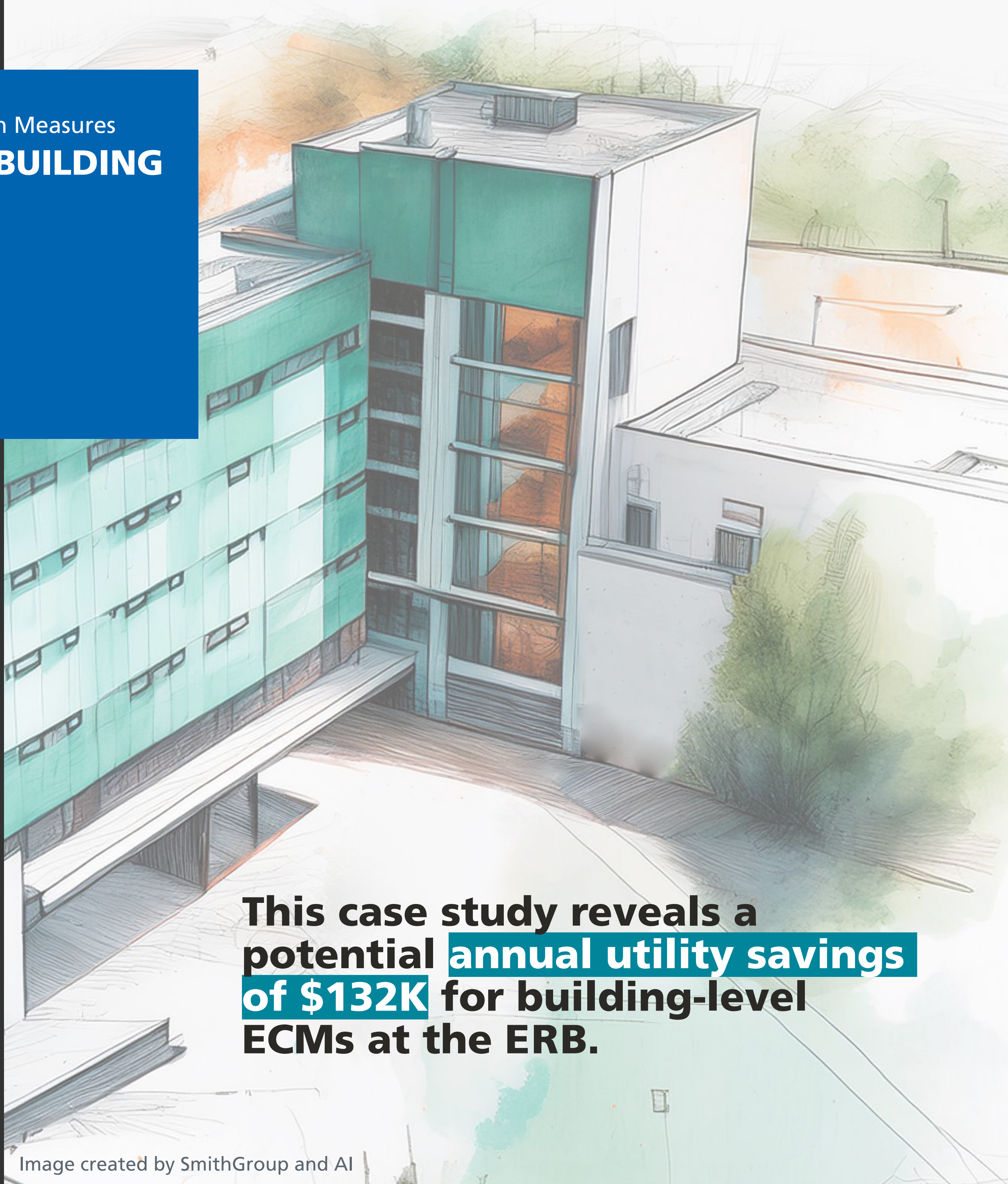
Case Study: Impact of Energy Conservation Measures

ENGINEERING RESEARCH BUILDING

Use Type: Lab
Gross Square Footage: 236,528
Certification: LEED Gold Certified
Completion Date: 2011
EUI: 329 kBTU/sf/yr
Estimated Annual Utility Cost: $481,018

This case study serves as an opportunity for application across campus for existing buildings, and will be key to understanding the potential impacts of future campus-wide energy conservation measures, based on existing campus operations.

These comprehensive energy conservation measures account for building architectural, mechanical, and electrical system upgrades to drive efficiency as much as possible, in order to support future electrification.

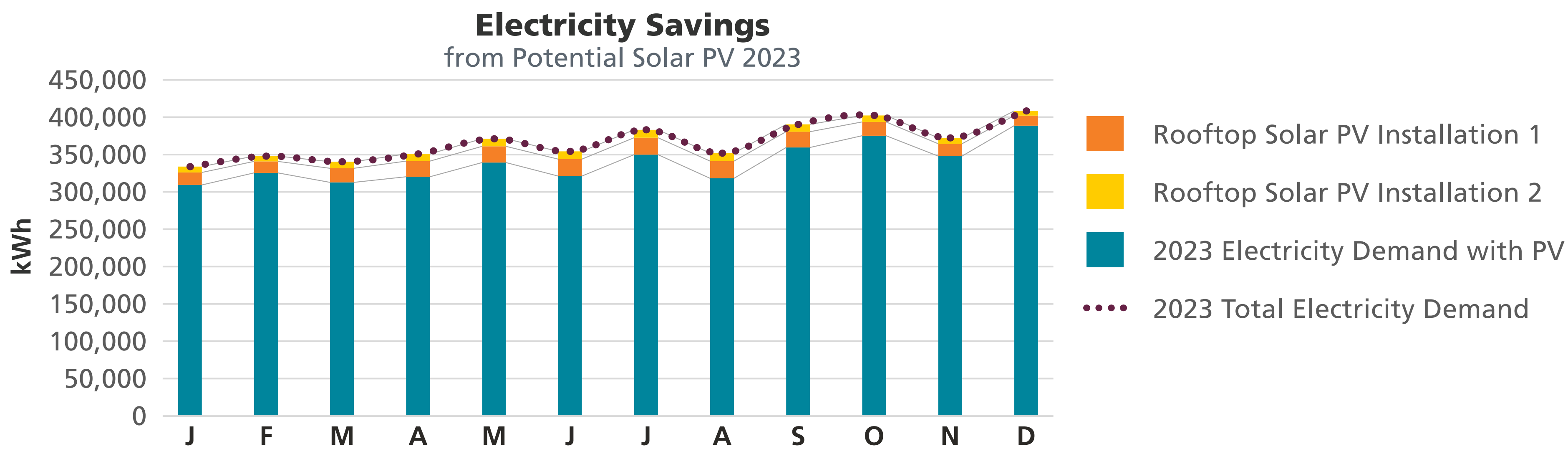


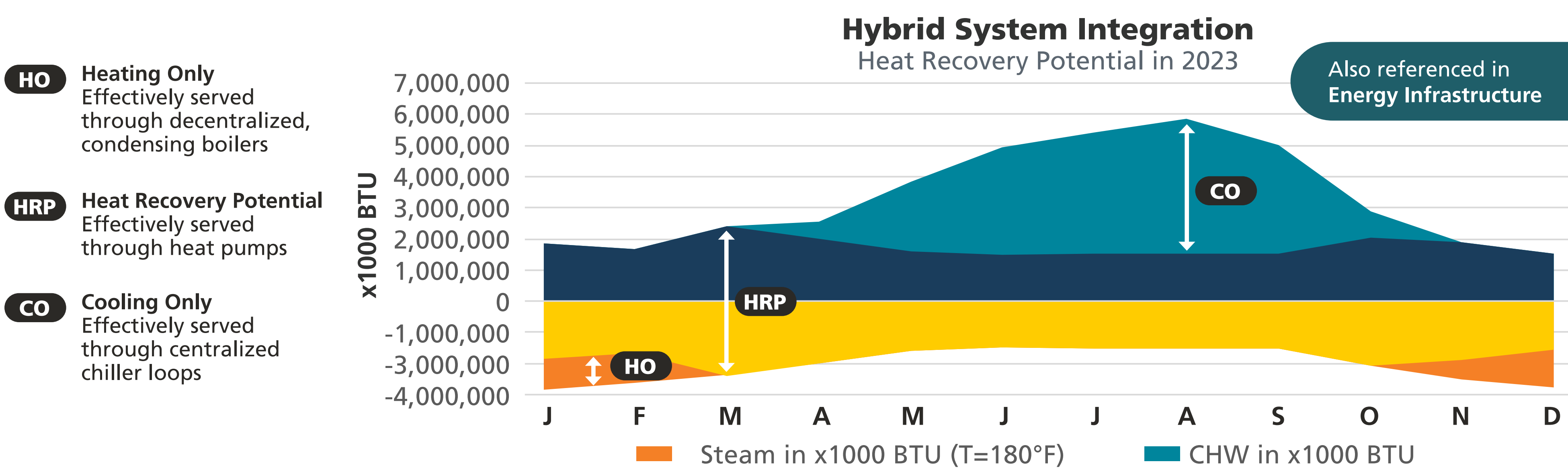
This case study reveals a potential annual utility savings of $132K for building-level ECMs at the ERB.

Image created by SmithGroup and AI

Energy Conservation Potential

SmithGroup and Ameresco both found that without energy conservation efforts, solar generation covers only 7.7% of annual consumption. Based on June 2024 Plant Reports, current steam boilers are operating at 75.7% efficiency, not including additional distribution losses through campus steam system. Proposed new condensing boiler units at the building level are assumed to operate at 92% efficiency, with rated conditions as high as 99% efficiency. Campus heating systems reveal significant opportunity for heat recovery, particularly transitional seasons where simultaneous heating and cooling demand occurs.





Also referenced in **Energy Infrastructure**

Viable Building ECMs at the ERB

Estimated savings based on previous energy conservation experience

Building-level ECM	Electric Savings	CHW Savings	Heating/Steam Savings	Total Energy Savings kBTU	Gas Emissions Reduction mTCO2e	Electric Emissions Reduction mTCO2e
Daylighting	2.0%	-	-	300,470	-	36.64
DDC Upgrades	3.8%	-	4.0%	1,882,989	71.903	69.62
DCV	2.5%	-	-	375,588	-	45.80
LED Lighting	2.0%	-	-	300,470	-	36.64
High-Efficiency Mechanical Equipment	-	3.8%	4.0%	2,907,503	71.903	194.56
Building Thermal Envelope Improvement	-	3.5%	4.0%	2,781,550	71.903	179.20
Mechanical Energy Recovery	-	5.0%	5.0%	3,739,340	89.879	256.00
Plug Load Controls	1.0%	-	-	150,235	-	18.32

* Based on current energy conservation efforts undertaken by the university, LED transition is likely currently underway for the ERB.

UTA

Viable Building ECMs at the ERB

Total Costs and Savings

ECM	Gross Cost	Gas Utility Savings	Electric Utility Savings
Daylighting		-	
DDC Upgrades			
DCV		-	
LED Lighting		-	
High-Efficiency Mechanical Equipment			
Building Thermal Envelope Improvement			
Mech. Energy Recovery			
Plug Load Controls		-	

$100K – $5M

$1K – $70K

ECM Applications for the ERB

Direct Digital Control (DDC) Upgrades

- Upgrade existing systems to ASHRAE Guidelines 36 DDC Control Schemes

High-Efficiency Mechanical Equipment

- Adapt existing steam heating systems on campus
- Expand heating coils within building systems
- High efficiency thermal distribution systems: passive and active chilled beams, radiant heating, etc.

Mechanical Energy Recovery

- Focus on research and lab facilities which provide excellent opportunities for heat recovery
- Build on existing building performance analysis completed as part of Energy Efficiency Plan

Heating Water Circulation Temperature

- Conduct building stress tests to determine minimum circulating temperature requirements on peak heating day
- Transition from current 180°F to suitable temperatures for heat pump operations
- Develop a phased decommission plan for the campus steam system
- Install high-efficiency condensing boilers at each building

STRATEGIES

PRIORITIZATION KEY
NEAR ■ ■ ■ LONG

UTA sustainable design guidelines	Lower building water intensity	Lower building level Energy Use Intensity	Target LEED/WELL Certification on all new construction
ACTION ITEMS 2	ACTION ITEMS 1	ACTION ITEMS 1	ACTION ITEMS 2
Develop sustainable design guidelines for UTA	Use high-efficiency fixtures where possible	Pursue high-performance energy targets for new buildings	Update the 2011 Green Building Policy
Share sustainable design guidelines to all contractors on UTA projects			Enforce the Green Building Policy for all new construction to require LEED Certified rating

Reduce existing building energy consumption

ACTION ITEMS 2

Reduce building energy consumption on existing buildings through targeted retrofitting

Pursue energy conservation measures at each building

Reduce campus embodied carbon

ACTION ITEMS 1

Consider low carbon materials in order to reduce embodied carbon in new construction

Best utilize roof space for sustainability measures

ACTION ITEMS 3

Prioritize roof space for high-efficiency HVAC equipment

Develop new buildings as rooftop solar ready

Identify future candidates for green roof projects as available

Pursue building electrification for heating and cooling systems where possible

ACTION ITEMS 1

Align systems electrification with expanded electrical capacity as a long-term priority