



Greenbuild

# Leading the Charge

**USC's Net Zero Pathway with Sustainable Innovation**



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# Leading the Charge

## USC's Net Zero Pathway with Sustainable Innovation

- **Mick Dalrymple** | *University of Southern California*
- **Jon Soffa** | *University of Southern California*
- **Zelinda Welch** | *University of Southern California*
- **Brian Stern** | *Glumac*

Universities are more than just **centers of learning**; they are **vibrant community hubs** and are often **leading the charge** toward a greener future!

As USC gears up to host the **World Cup FanFest** and **Olympics** while continuing to support its educational mission and medical research, the campus is proactively working towards achieving **net zero greenhouse gas emissions**.

# Learning Objectives

**Learning Objective 1:** Learn how LEED Master Sites can provide a framework for campus development efforts, and how LEED Certified buildings can drive sustainable design standards and scale jump larger campus decarbonization efforts.

**Learning Objective 2:** Learn how close collaboration between sustainability leaders, campus architects, and energy directors drives impactful changes and fosters a culture of sustainability.

**Learning Objective 3:** Walk away with an actionable framework and best practices for developing and scaling sustainability programs on university campuses: building standards, existing buildings optimization retrofits, renewable energy, electrification.

**Learning Objective 4:** Learn how to engage the campus community—students, faculty, and staff—in sustainability efforts, creating a culture of environmental stewardship and collective responsibility for achieving sustainability goals.

**Learning Level - Advanced**

Rating System LEED v4 BD+C, LEED v4.1 BD+C

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# Agenda

**1. Overview of Assignment: Earth**

*Mick Dalrymple, USC CSO*

**2. How FPM and the built environment support USC's sustainability goals**

*Jon Soffa, USC University Architect*

**3. Summary of Overall / Ongoing Sustainability Programs**

*Zelinda Welch, USC Director of Energy and Sustainability*

**4. The Decarbonization Study**

*Brian Stern, GLUMAC Director of Energy, VP*



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# Community Poll: **Who Is Here?**



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# Community Poll: **Your Organization**

**How much of your work is in the Higher Education sector?**

- 0%
- 1-25%
- 26-50%
- 51-75%
- 76-100%

**Do you work primarily with individual buildings or with campus and campus systems?**

- Buildings
- Campuses
- Both
- Neither



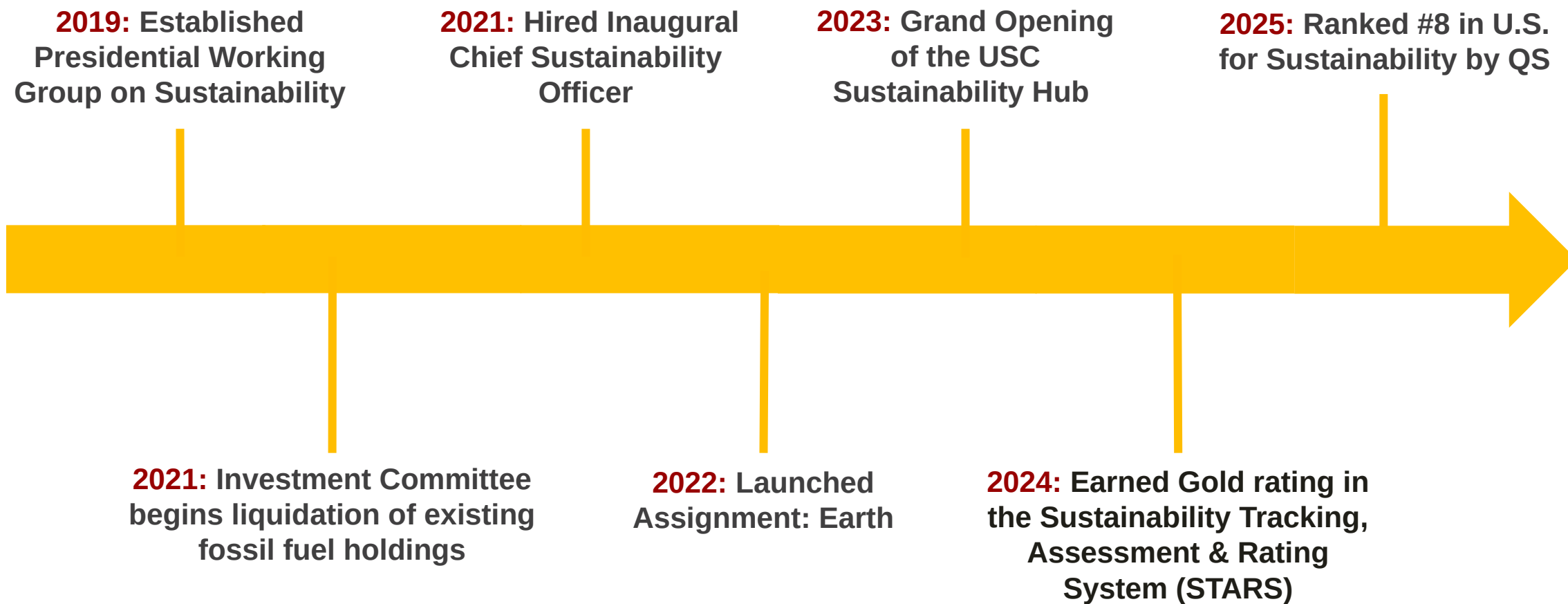
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# Overview of Assignment: Earth

Mick Dalrymple

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# USC's Sustainability Journey

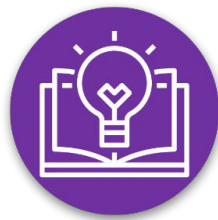


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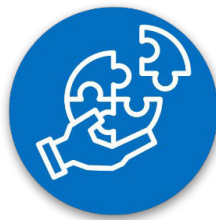
# Assignment: Earth — USC's Sustainability Framework



Working together  
for a sustainable future



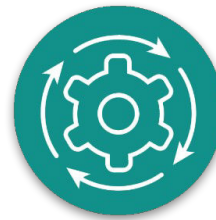
**Education**



**Research**



**Inclusion**



**Operations**

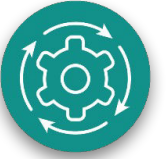


**Engagement**

[sustainability.usc.edu](https://sustainability.usc.edu)



# Major Accomplishments: Operations



**Greenhouse gas  
reduction\***



**Water reduction\***



**Waste diversion\*\***



**Plastic bottles  
avoided†**

\*As of FY24. \*\*As of FY25. †Since July 2022 elimination policy.

# Major Accomplishments: Engagement



**USC Sustainability  
Hub**



**Arts & Climate  
Collective**



**Online Sustainability  
Training**



**President's Sustainability  
Internship Program**



**Zero-Waste Games**

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# Major Accomplishments: Research & Education



**>8,100 students enrolled  
in sustainability-  
focused classes**



**President's  
Sustainability  
Initiative Awards**



**Sustainability Across  
the Curriculum**



**Research for Social  
Impact**



**University-wide  
Collaboration Tools**



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# Sustainability Research for Impact



**Tackling “Forever Chemicals”  
Through Collaboration**



**Using AI to Predict Wildfire  
Spread**



**Extreme Heat Speeds Aging in  
Older Adults**

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# Sustainability Research for Impact



**Ocean-Based Carbon Capture  
for Greener Shipping**



**Turning Canals into Solar  
Power and Water Savers**



**Advancing the Future of Shade  
in Los Angeles**



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# Looking to the Future



**Empowering Changemakers**



**Next-Gen Energy Solutions**



**Healthy Ocean & Blue Economy**



**Elevating Climate Narratives**



**Climate and Health**



**Transforming Transportation**



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# Decarbonization: A Campus Macro Approach

1. **Minimize loads** (retrofits, RCx, controls, load shedding, efficient new)
2. **Move heat rather than generating it**
3. **Incorporate thermal storage**
4. **Convert from steam to hot water**
5. **Convert from fossil-fuel to electricity**
6. **Source grid and on-site clean electricity with storage**



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# How FPM and the built environment support USC's sustainability goals

Jon Soffa

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# Community Poll: Domain Challenges

**Which operational sustainability domain does your organization find most challenging?**

- Energy/GHG
- Waste
- Water
- Health
- Employee Engagement
- Purchasing
- Other



# Sustainable Facilities Planning & Management

MISSION & ACTION INTEGRATION



University Park  
Campus



USC University of  
Southern California

Health Sciences  
Campus



**University Vision, Mission & Values**  
**Guiding Principles**



**Planning and Design Guidelines & Priorities**  
**Character, Culture, Performance and Standards**



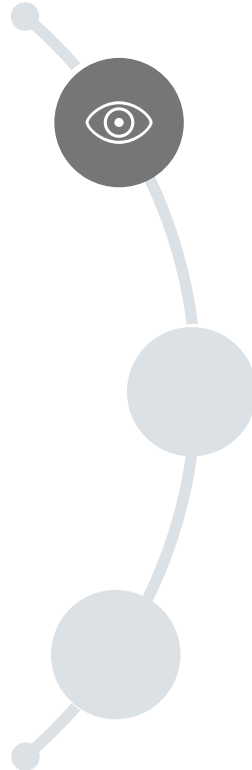
**Project Development & Operations**  
**Implementation, Monitoring & Reporting**



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# Sustainable Facilities Planning & Management

## GUIDING PRINCIPLES



### University Vision, Mission & Values

Mission Statement

Bylaws

Policies

Integrity & Accountability Code

Strategic Plan

Sustainability Framework USC Assignment: Earth

# Sustainable Facilities Planning & Management

CHARACTER, PERFORMANCE & OPERATION STANDARDS



## Planning and Design Guidelines & Priorities

Campus Planning and Design Guidelines

Master Plans: Buildings, Utilities & Open Spaces

Sustainability Design & Construction Guidelines

Targets & Action Plans

- Greenhouse Gas Emissions Reduction
- Carbon Reduction
- Energy Efficiency & Solar Renewables
- Water Reduction
- Waste Reduction

# Sustainable Facilities Planning & Management

IMPLEMENTATION, MONITORING & REPORTING



## Project Development & Operations

Sustainability Design and Construction  
Protocols

Emergency Preparedness & Recovery

Regulatory Compliance

Asset Management, Maintenance & Renewal

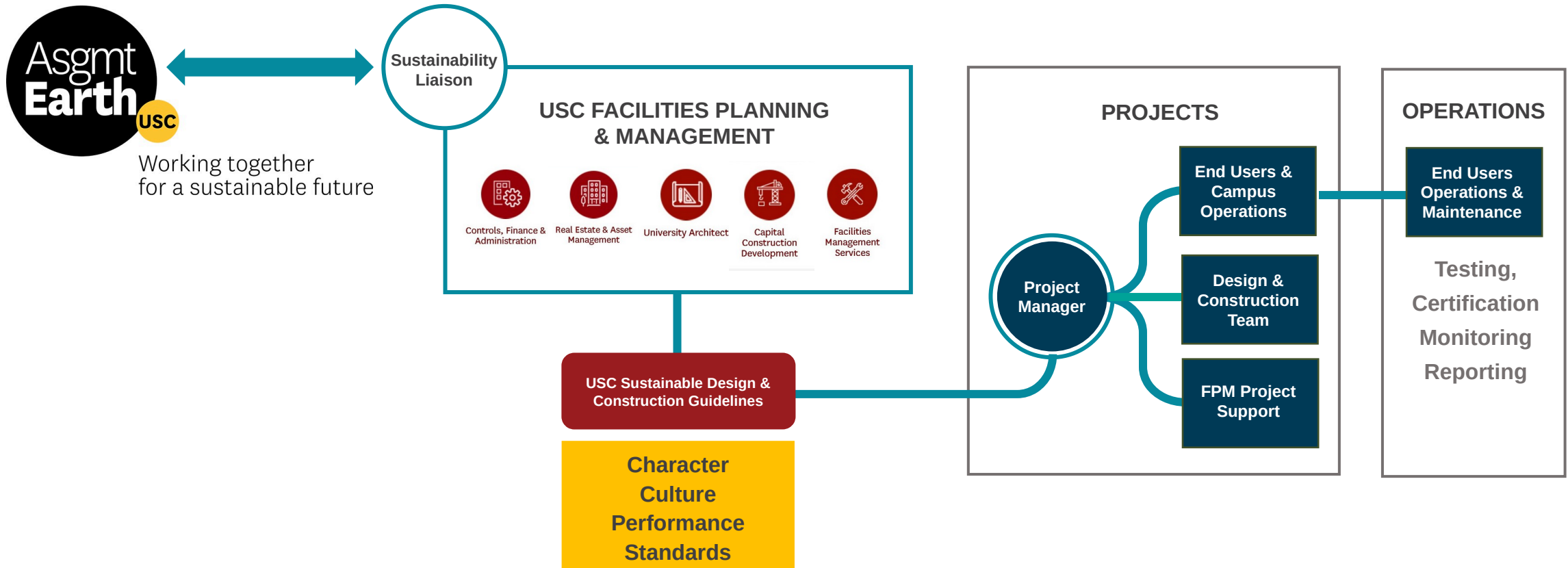
Green O&M Practices

Data Collection, Analysis and Reporting

Connected Facilities Planning & Management

# Sustainable Facilities Planning & Management

PROJECT MANAGEMENT & INTEGRATION







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# Summary of Overall/Ongoing Sustainability Programs

Zelinda Welch



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# Community Poll: Organizational Challenges

**What are the biggest challenges your organization or your clients face in creating change needed to achieve decarbonization goals?**

- Technical constraints
- Culture change
- Financial or human resources
- Decision-making processes
- Lack of clear goals or strategy
- Misalignment of incentives
- Insufficient data
- Identifying executive sponsor(s)

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# Ongoing Sustainability Programs

CONTINUOUS & COMPREHENSIVE RANGE OF EFFORTS



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MANAGING CHANGE



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EASE OF ACTION



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CAMPUS AS LIVING LAB



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FOUNDATIONAL PROJECTS

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# Managing Change

MOVING FROM VISION TO REALIZATION

- ✓ Guides, Plans, & Roadmaps
- ✓ Building Relationships
- ✓ Task Forces
- ✓ Trainings
- ✓ Engagement
- ✓ Dorm Competitions
- ✓ Building Leadership at All Levels



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# Ease of **Action**

FACILITATE THROUGH ASSISTANCE

- ✓ Requirements Coupled with Support
- ✓ LEED Master Site
- ✓ Infrastructure
- ✓ Champions
- ✓ Dashboards
- ✓ Targeted Programs



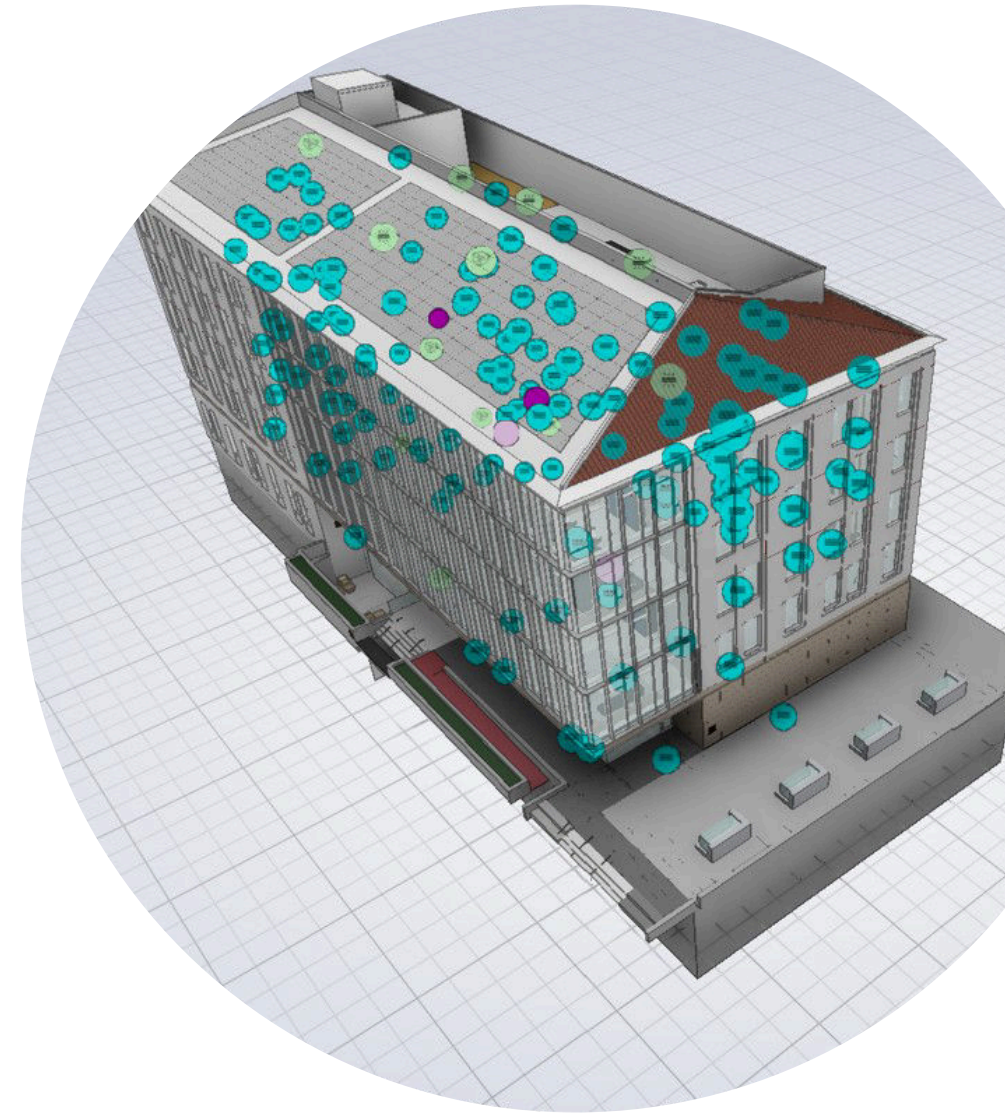


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# Campus as a Living Lab

LEVERAGING A LEARNING INSTITUTION

- ✓ Digital Twin Project
- ✓ Student Internships
- ✓ Brown Bag Talks
- ✓ Data Hub –GIS Mapping
- ✓ Hands On Learning Projects





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# Foundational Projects

BEHIND-THE-SCENES WORK

- ✓ Metering System
- ✓ LED Retrofit Program
- ✓ PV Solar Installations
- ✓ Waste Infrastructure
- ✓ Landscape Plot Transitions
- ✓ Fault Detection Pilot Program
- ✓ Retro-commissioning & Energy Audits





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# The Decarbonization Study

Brian Stern

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# Community Poll: **Organizational Challenges**

**What are some of the most important factors for an actionable decarbonization plan on universities campuses?**

- Accurate Documentation
- Campus Master Plan
- Heating Technology
- Implementation Plan
- Flexible Pathways
- Capital Planning



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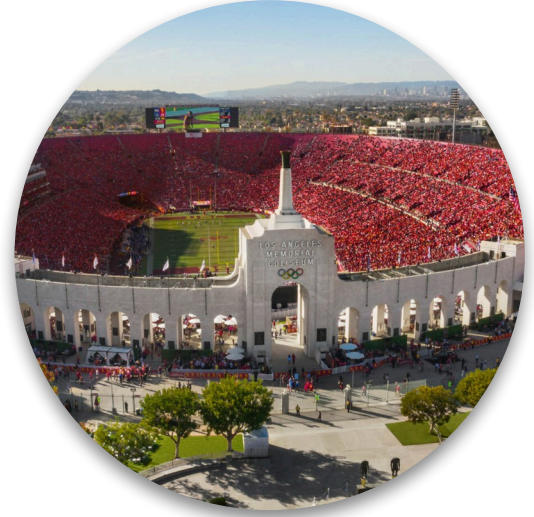
# USC Buildings Portfolio



**Academic Campus**



**Health Science Campus**



**Off Campus Buildings**

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# Academic Campus



## Existing Conditions

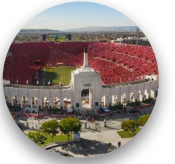
- Steam Distribution
- 6 Heating Plants
- Well Maintained Systems
- 82 Buildings (5.5M SF)
- Former Public Streets
- 4.2M Therms Natural Gas





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# Local Heating Systems

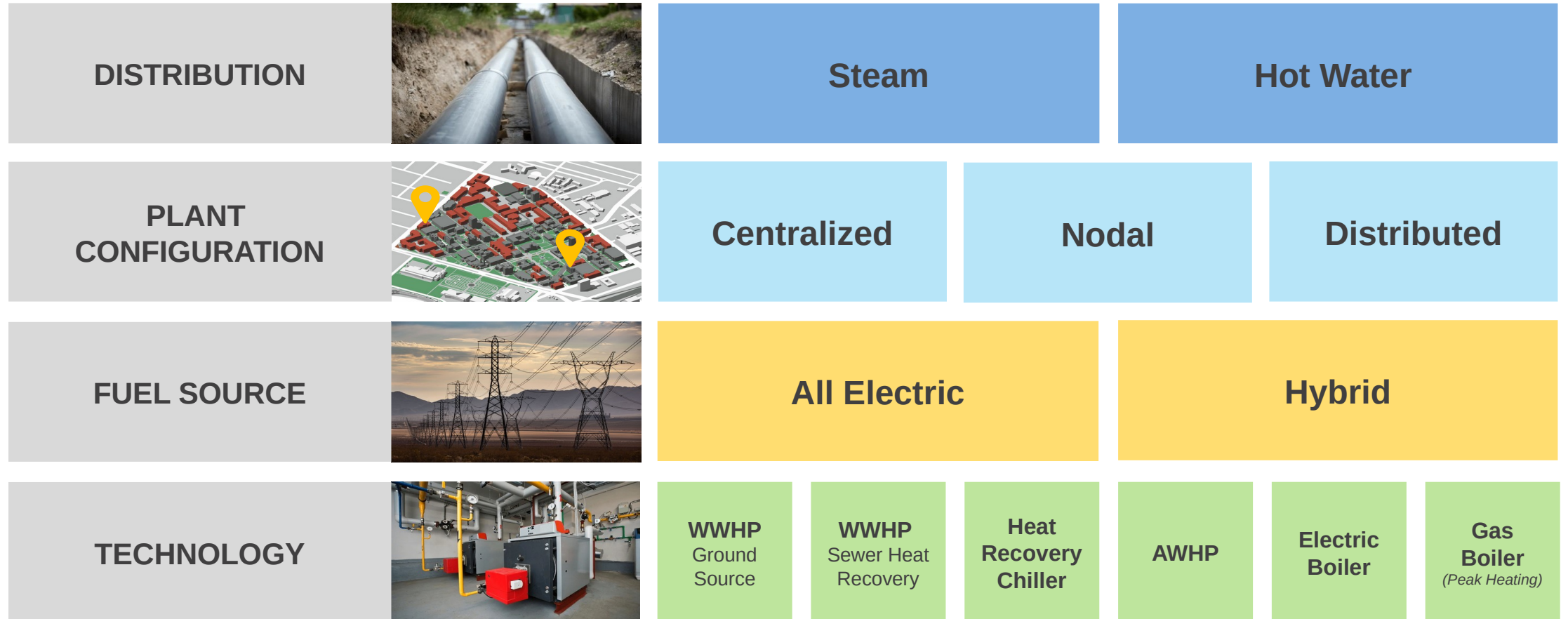


## Existing Conditions

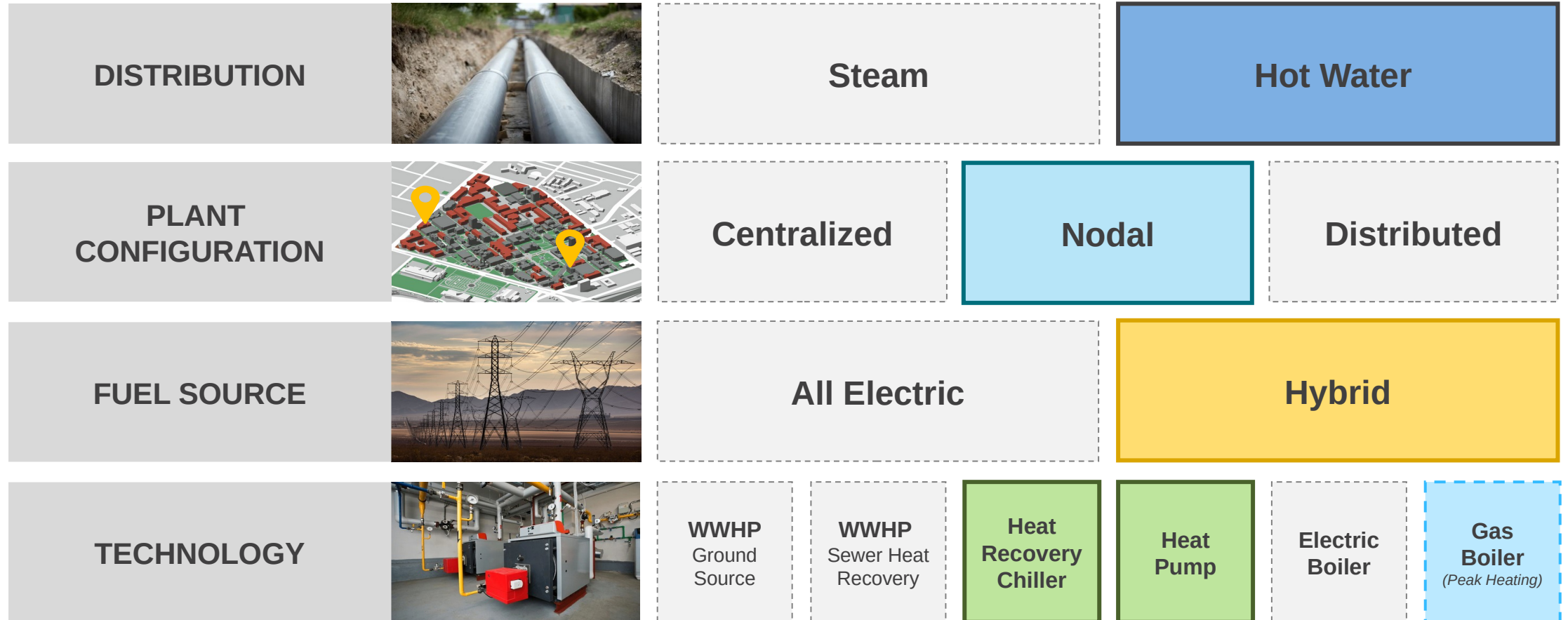
- On and Off Campus Buildings
- 26 Heating Plants
- 50+ Hot Water Boilers
- Well Maintained Systems
- 1M+ Therms Natural Gas



# Decarbonization Strategies

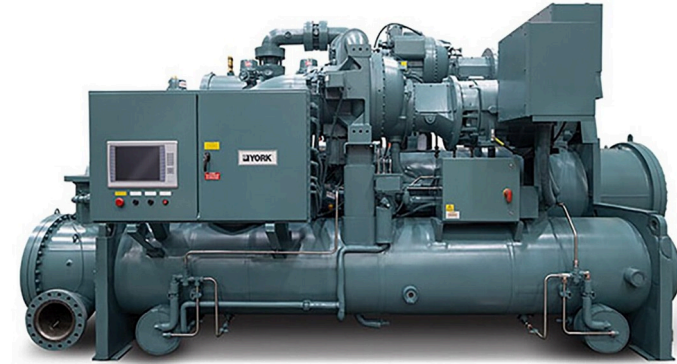
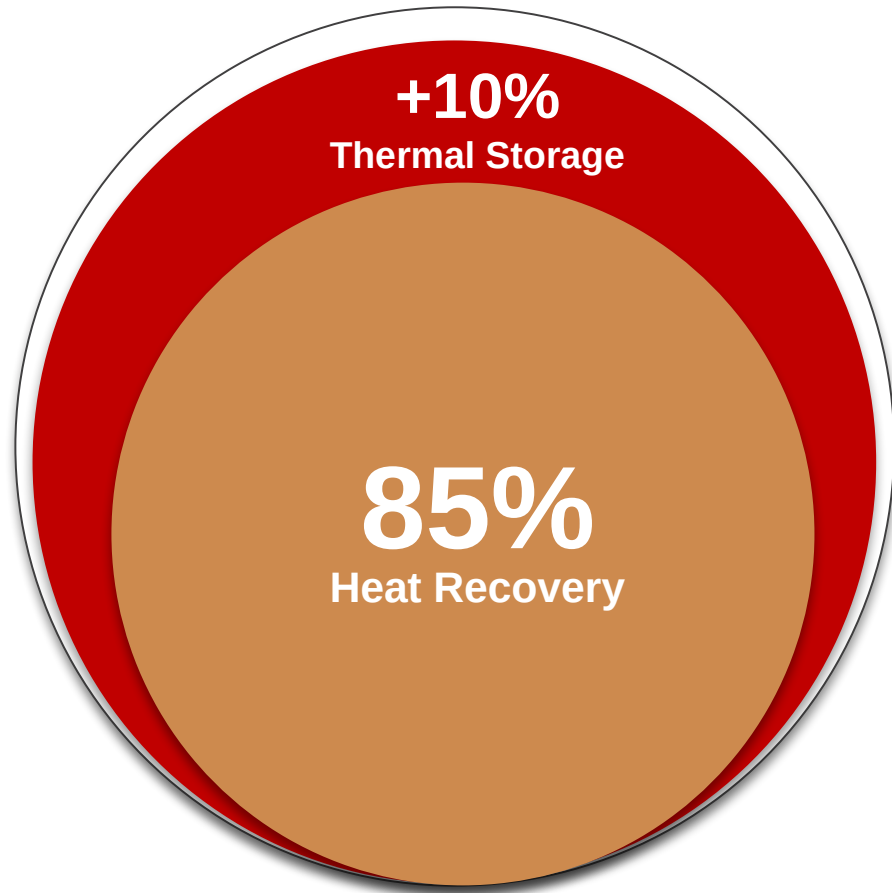


# Decarbonization Strategies





# Decarbonization Strategies – Main Academic Campus



**<5%**  
Boilers

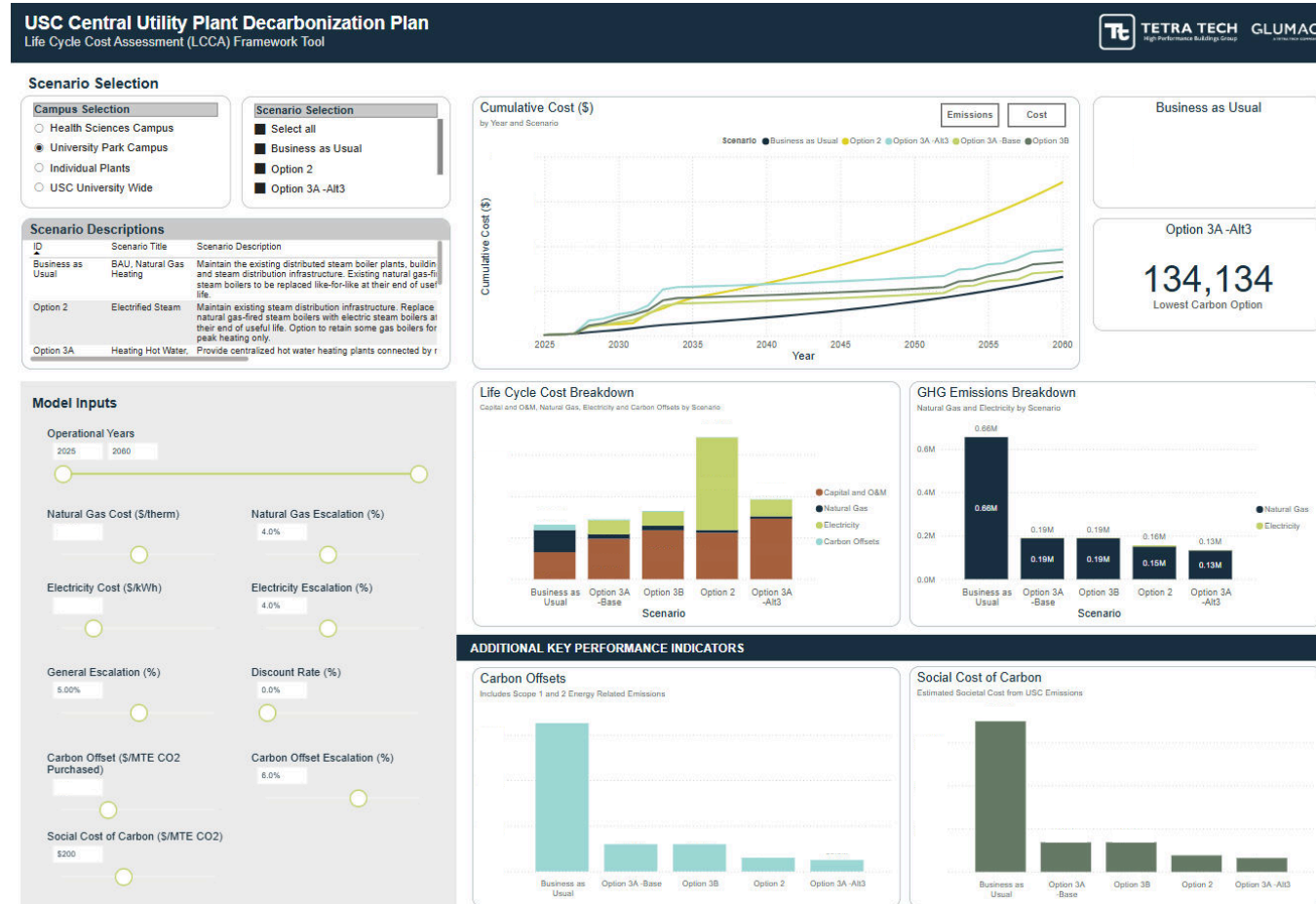
**Backup Boilers +  
Energy Efficiency**



# Planning Approach

## Technical & Financial Planning

- Scenarios Planning
- Sensitivity Analysis
- Life-Cycle Costs
- GHG Emissions
- Carbon Offsets
- Social Cost of Carbon



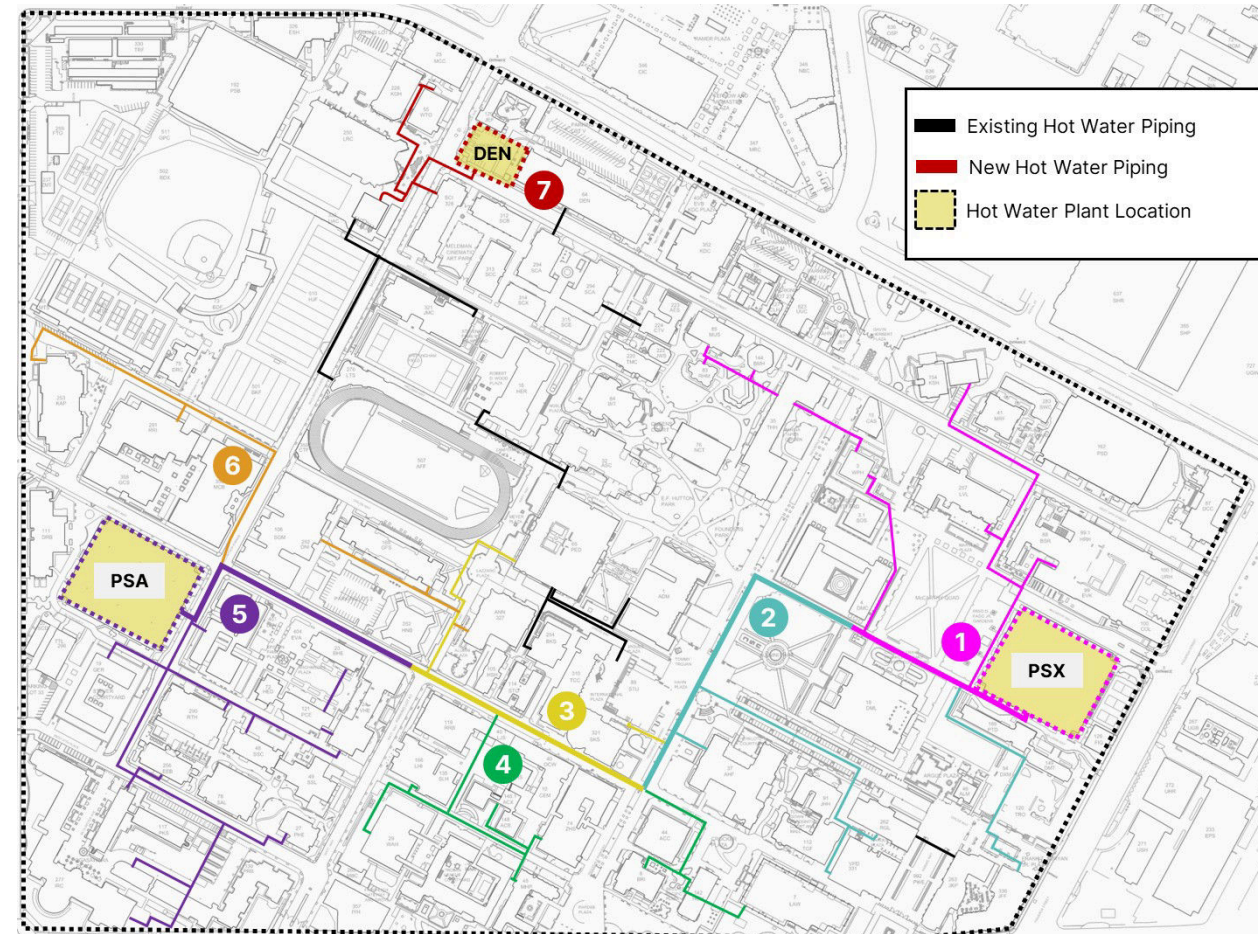
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# Academic Campus



## Decarbonization Findings

- Low Temp Hot Water
- Heat Recovery + Storage (+95%)
- Phased Implementation
- Capital Project Alignment
- Multiple Pathways

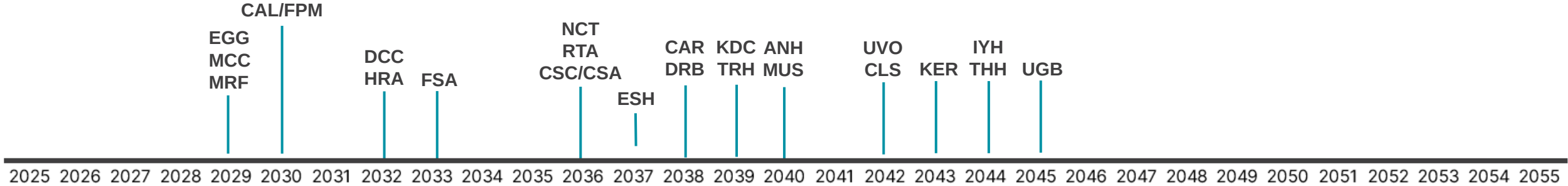




# Local Heating Systems Timeline

## SCAQMD

25-years



## Business as Usual

35-years



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# USC Decarbonization Approach



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**Hot Water  
Transition**



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**Phased  
Implementation**



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**Flexible  
Pathways**



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**Capital  
Planning**



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# Lessons Learned





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# Thank You

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