



FP&M

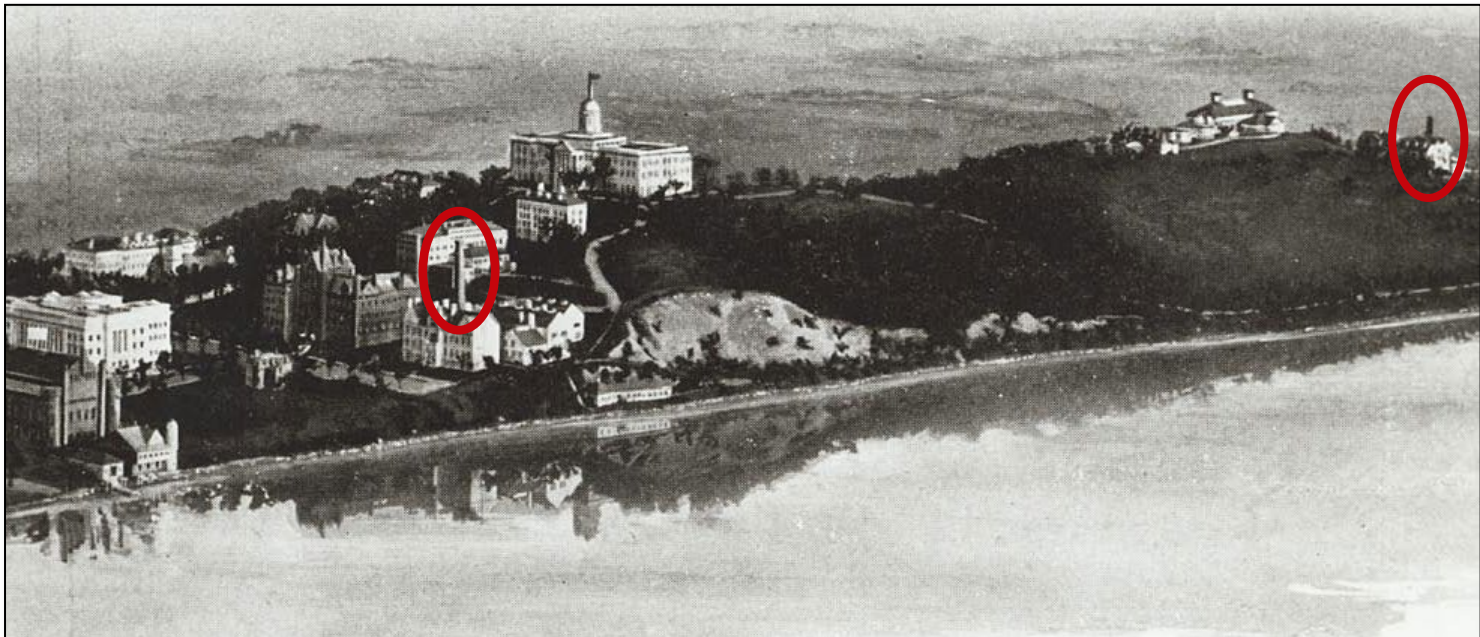
Utilities & Energy Management (UEM)
2023-29 Six-Year Capital Plan Request

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Director of Utilities and Energy Management
Campus Planning Committee Meeting - 9/23/21

Utilities & Energy Management Overview

- To support the UW-Madison FP&M mission by providing excellence in facilities and services for our university community in a **safe, reliable** and **efficient** manner.
- UEM operates and maintains a “District Energy” system that provides steam (heating), chilled water (cooling), compressed air (temperature control) and power to Campus, State and Federal facilities.
 - Definition: “When more than one building is connected to a common thermal energy generating source”.
 - District Energy has been around for over 130 years at UW-Madison.



Utility Plants

Historic Plants

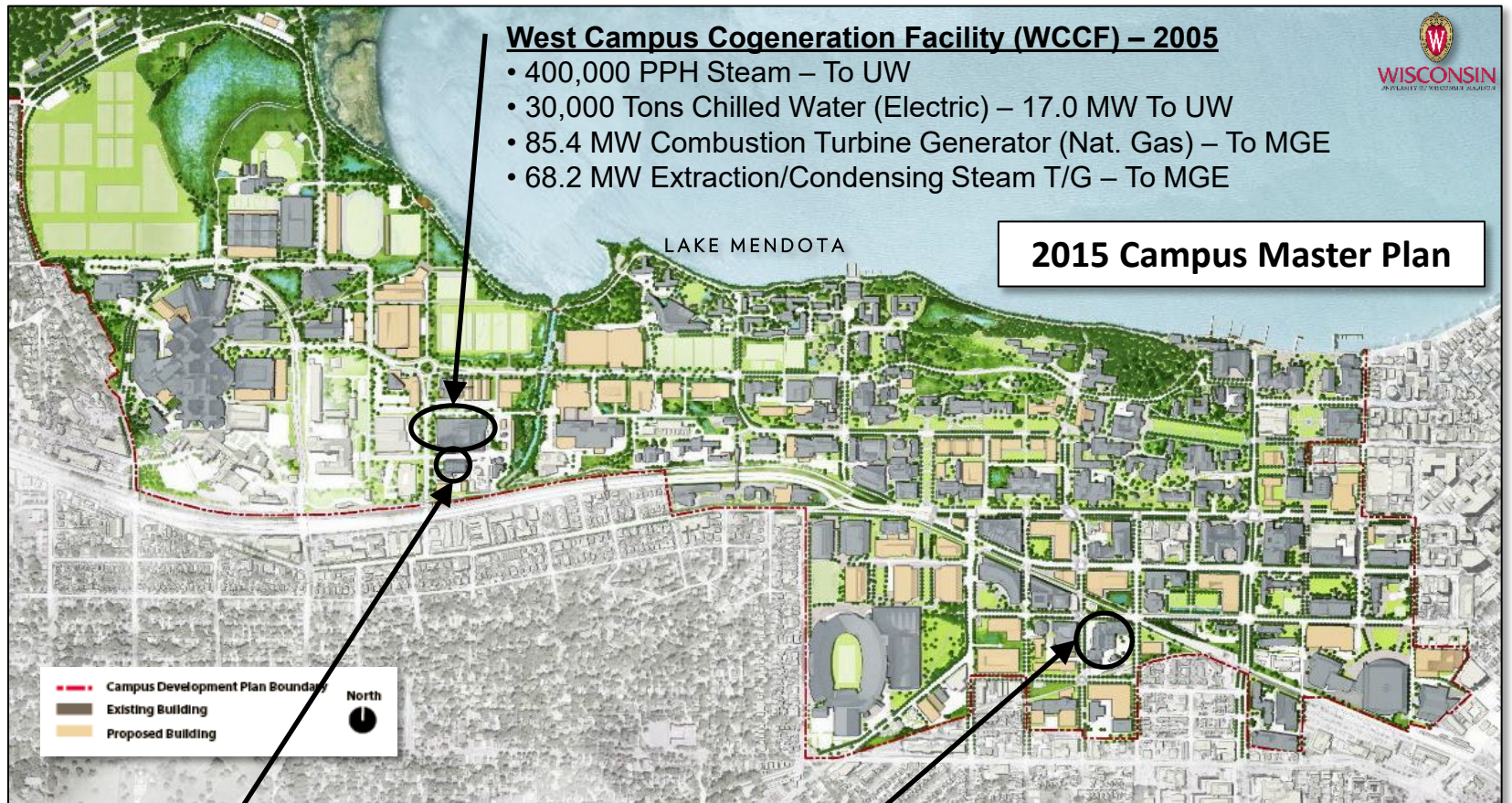
- Radio Hall 1885 – 1908
- Ag Bulletin 1899 – 1937
- Heating Plant (*Service Building Annex*) 1908 – 1958

Current Plants

- Charter Street H&C Plant 1958 – Present
- Walnut Street H&C Plant 1975 – Present
- West Campus Cogeneration Facility 2005 – Present



Locations



Walnut Street Heating Plant (WSHP) – 1975

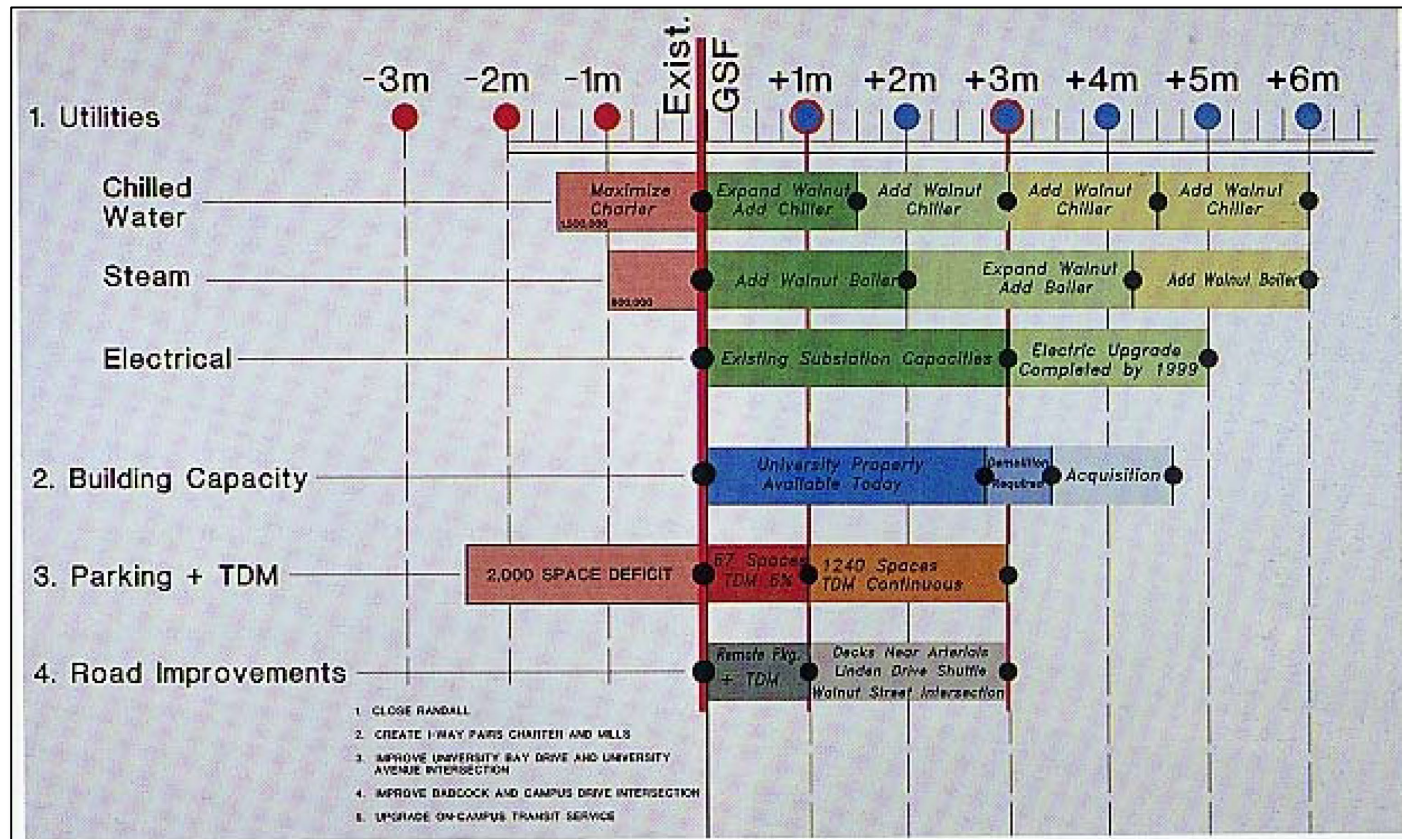
- 600,000 PPH Steam (Nat. Gas)
- 11,200 Tons Chilled Water (Electric)
- 9,000 Tons Chilled Water (Steam)

Charter Street Heating Plant (CSHP) – 1958

- 1,200,000 PPH Steam (Nat. Gas)
- 25,000 Tons Chilled Water (Steam)
- 9.7 MW Back Pressure Steam Turbine Generator

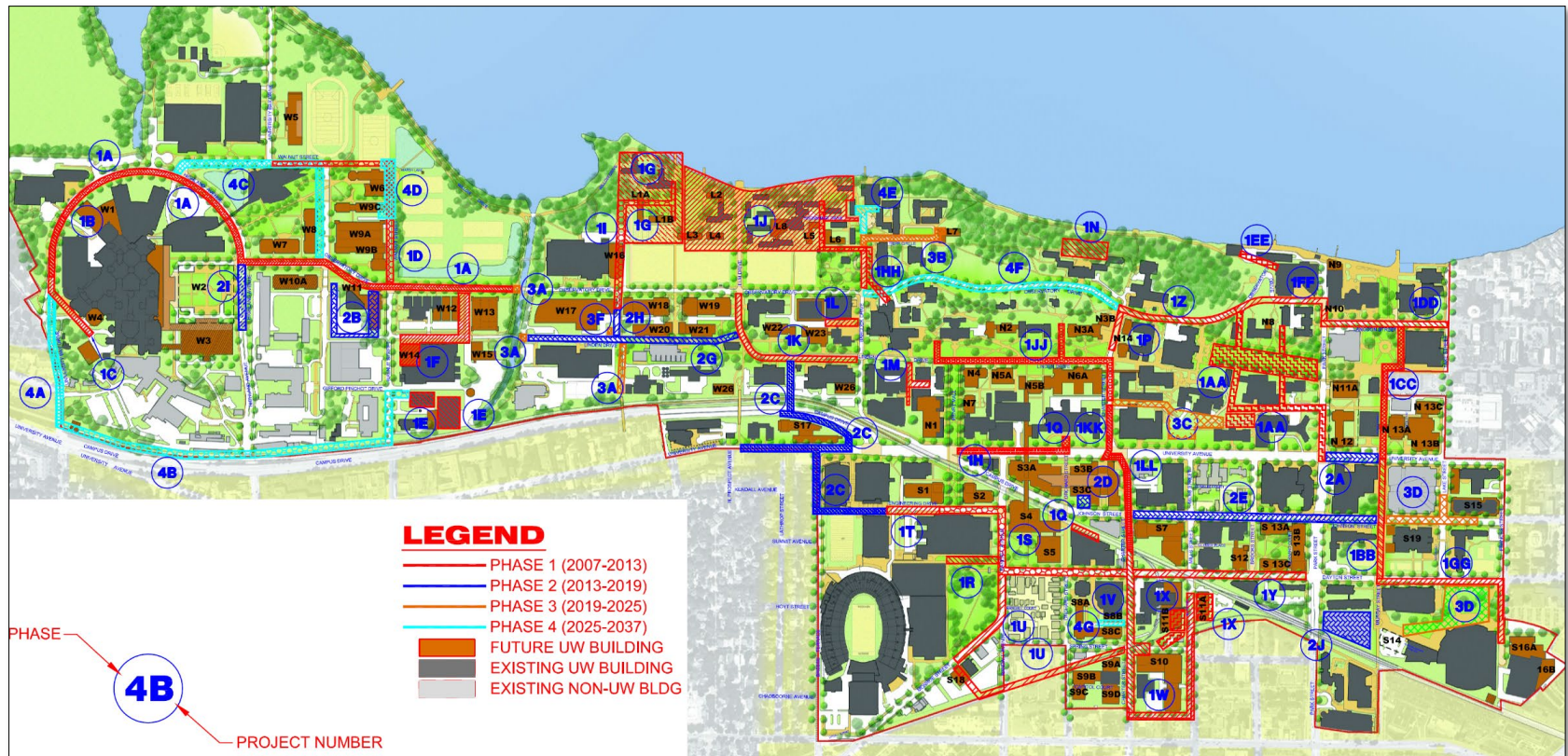
1996 Master Plan – Resulting Utility Investment

Production	\$100,000,000
Distribution	<u>\$25,000,000</u>
Total	\$125,000,000



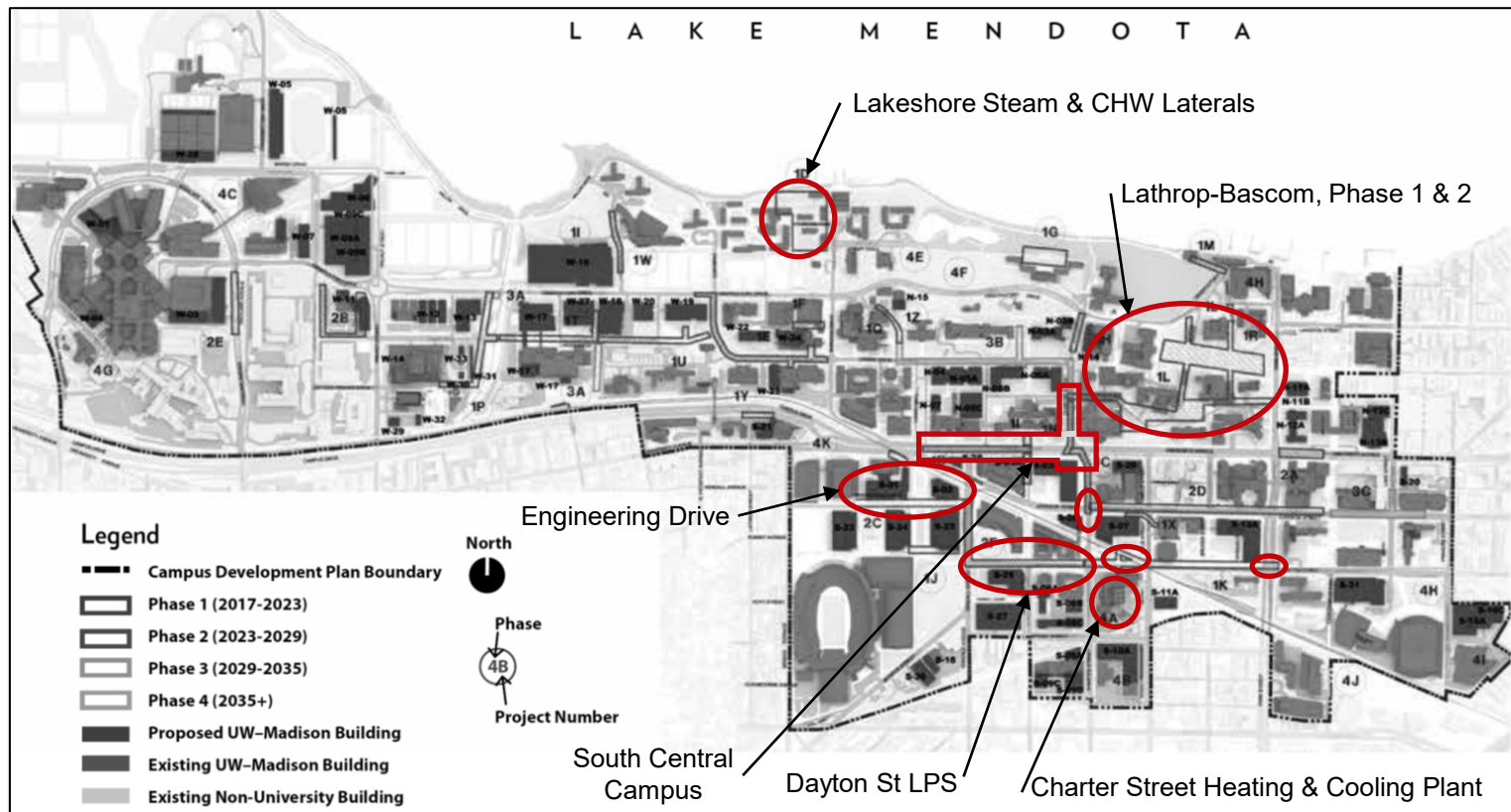
2005 Master Plan – Resulting Utility Investment

Production	\$265,000,000
Distribution	<u>\$ 90,000,000</u>
Total	\$355,000,000

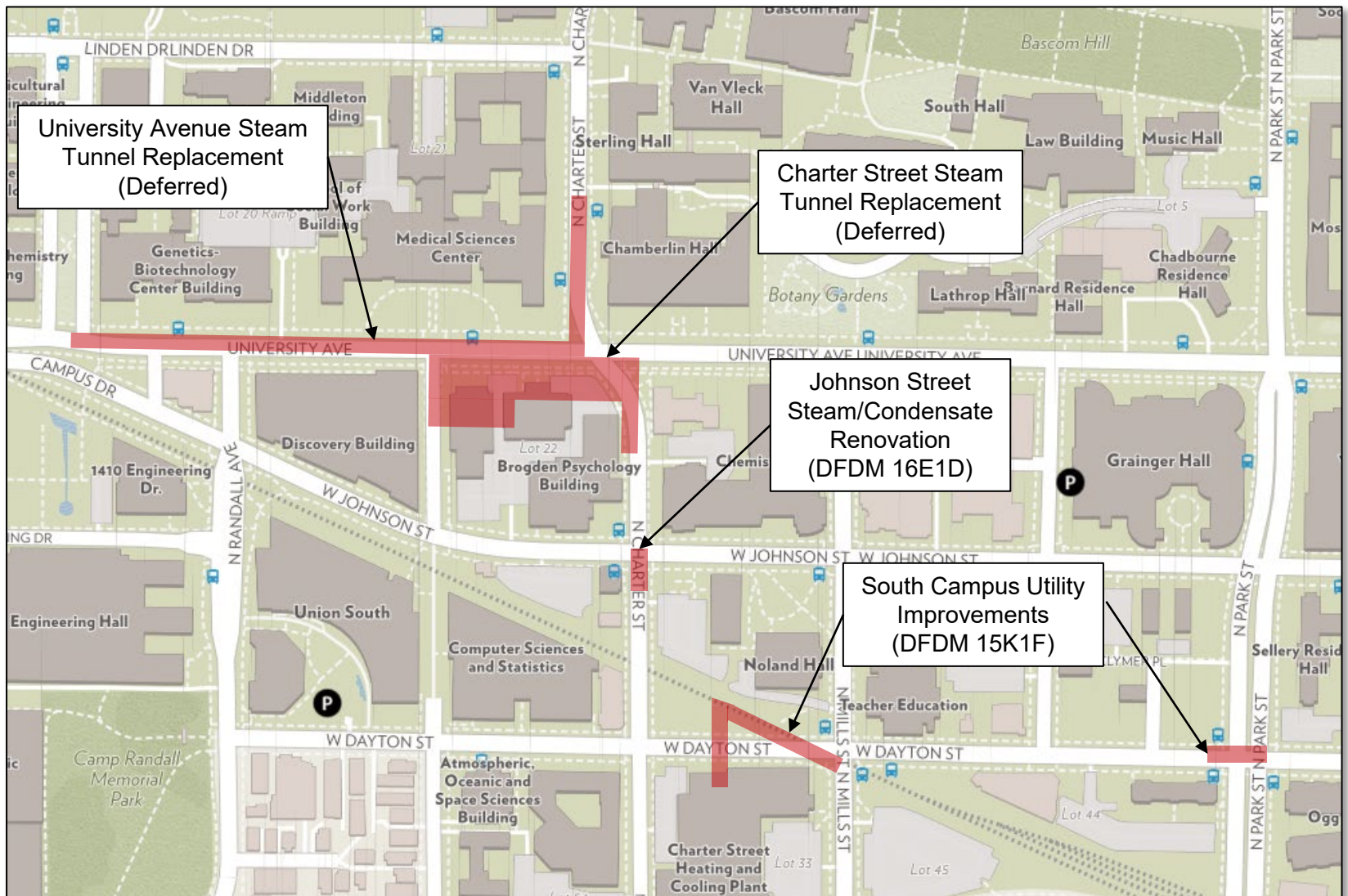


2015 Master Plan – Resulting Utility Investment

	<u>2015-2023</u>	<u>2023-2029</u> (Proposed)
Production	\$ 0	\$135,791,000
Distribution	<u>\$106,560,000</u>	<u>\$ 88,589,000</u>
Total	\$106,560,000	\$224,380,000



1. South Central Campus Steam Utility Replacement



1. South Central Campus Steam Utility Replacement

Proposed Biennium 2023-25: ~\$54.6M (\$37,666,000 GSFB and \$16,923,000 PRSB)

- Recommended in both the 2005 and 2015 Utility Master Plans
- Concrete and rebar degradation along Charter Street and University Avenue
- Significant steam distribution corridor connecting east and west campus
- Utilities are 60-110 years old and at the end of their useful life
- Completes steam utility restoration at three other locations deferred due to funding limitations



Impacts if not implemented:

- Safety of tunnels for university staff
- Reliability and resiliency of steam distribution from the Charter Street Plant
- Multiple future projects will be required to address deficiencies

2. Charter Street Black Start and Generation Implementation

Proposed Biennium: 2025-27 ~\$65.6M (GSFB/PRSB Split TBD)

- “Black Start” – Ability to restart a utility plant after either a power failure or natural gas outage
- Deficiency identified during UWPD’s May 2018, Operation Dark Sky exercise
- Major components:
 - 5 kV emergency diesel generators
 - Propane backup ignition for boilers
 - Cooling tower addition for steam condensing
 - 20-25 MW of additional power production
- Increased efficiency and energy savings by cogenerating more than 30% of campus electrical needs

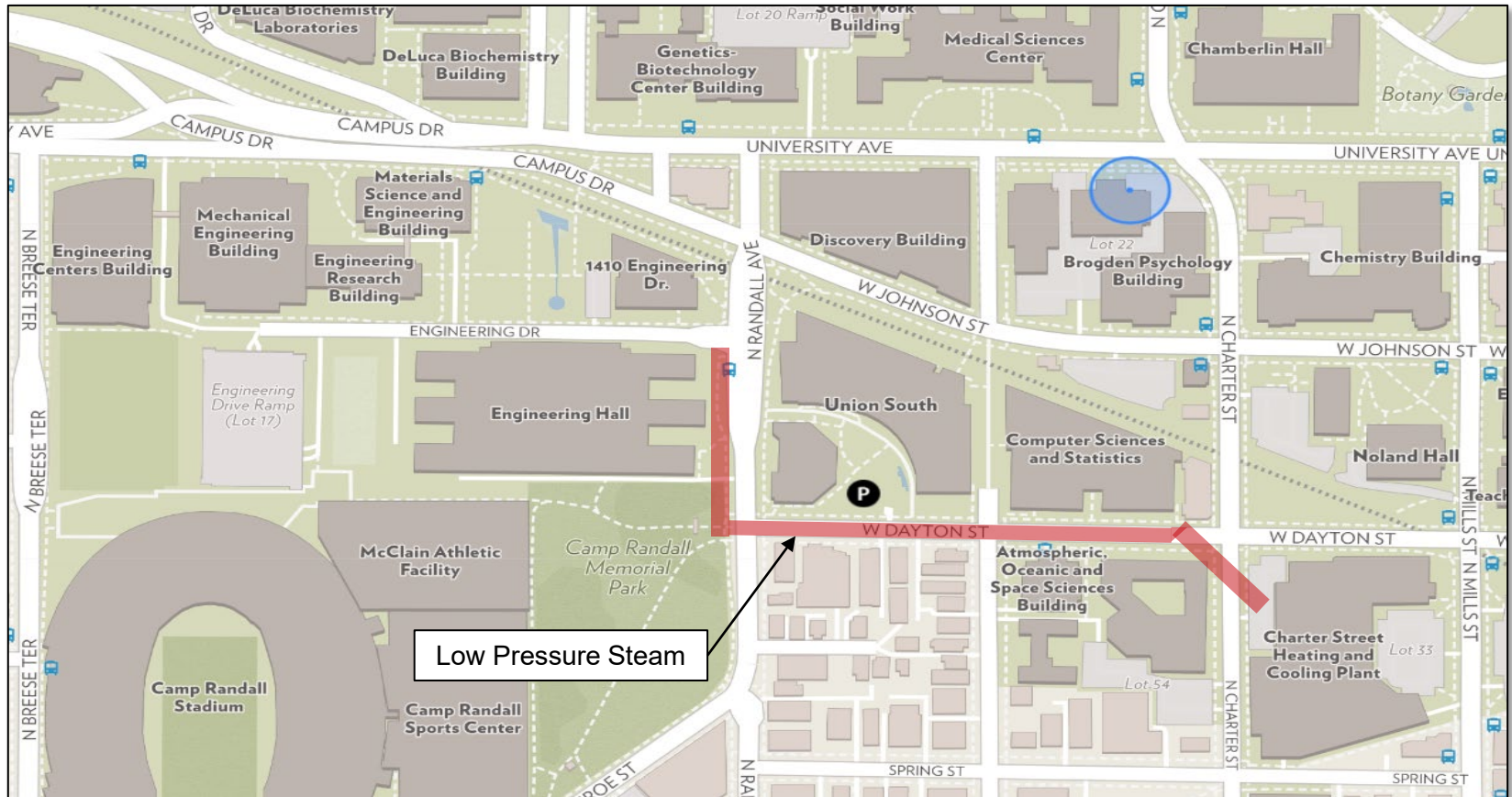


Impacts if not implemented:

- Resiliency of utility operations
- Life safety and property damage in a severe emergency
- Lost opportunity to reduce greenhouse gas emissions and energy costs

3. Dayton St Low Pressure Steam (LPS) Upgrade

Proposed Biennium: 2025-27 ~ \$10M (\$6,900,000 GSFB and \$3,100,000 PRSB)



- Supplies LPS to campus and maximizes plant electrical power output

4. Charter Street Chiller & Thermal Energy Storage (TES) Addition

Proposed Biennium: 2027-29 ~\$70.2 (GSFB/PRSB Split TBD)

- Ability to “fuel switch” by operating electric chillers off-peak when energy rates are lower
- Increased efficiency and energy savings by lowering peak electrical demand
- Major components:
 - (2) 5,500 Ton Variable Speed Electric Chillers
 - Primary and Condenser Pumps & Controls
 - Cooling tower
 - 8.0 Million Gallon TES Tank w/Pumps & Controls
- TES tank provides redundant cooling in case equipment goes off-line unexpectedly
- TES shifts electrical power consumption from daytime (Peak) to nighttime (Off-Peak)



Impacts if not implemented:

- Resiliency of utility operations
- Reduction of cooling capacity due to refrigerant change
- Lost opportunity to reduce greenhouse gas emissions and energy costs

Connecting Strategic Plan to a Facilities Plan

Strategic Objectives

1. Provide excellence in facilities and services for our university community
2. Safe, reliable and efficient production and distribution of utilities
3. Stewardship
4. Campus Master Plan commitment to conservation, preservation, and sustainability

Major Project Priorities 2023-29

1. **South Central Campus Steam Utility Replacement**
 - Underground utilities
 - \$54,589,000
 - Proposed Biennium (2023-25)
2. **Charter Street Black Start and Generation Implementation**
 - Reliability and Resiliency
 - \$65,641,000
 - Proposed Biennium (2025-27)
3. **Dayton Street LPS Upgrade**
 - Underground Utilities
 - \$10,000,000
 - Proposed Biennium (2025-27)
4. **Charter Street Chiller and Thermal Energy Storage Addition**
 - Plant & Capacity Addition
 - \$70,150,000
 - Proposed Biennium (2027-29)
5. **Lakeshore Steam & CHW Upgrade**
 - Underground Utilities
 - \$24,000,000
 - Proposed Biennium (2027-29)

Physical Plant's Carbon Neutrality Efforts

Current Initiatives

- O'Brien Solar Array (10 Megawatts ~ 5% Campus Consumption)
- Energy Conservation Projects:
 - ✓ LED Lighting Charter St.
 - ✓ Innovas Tube Cleaning
 - ✓ 1 MW Demand Energy Reduction
 - ✓ CHW Optimization & Dispatch Model
 - ✓ CHW ClO2 Chemical Treatment Upgrade
 - ✓ UV Technology for Lake Water
 - ✓ Data Historian Upgrade
 - ✓ Reduce CHW system pressure

Future Initiatives

- Working with Office of Sustainability on Clean Energy Framework
- Update campus utility plan with focus on Scope 1 & 2 Emissions



Questions?

