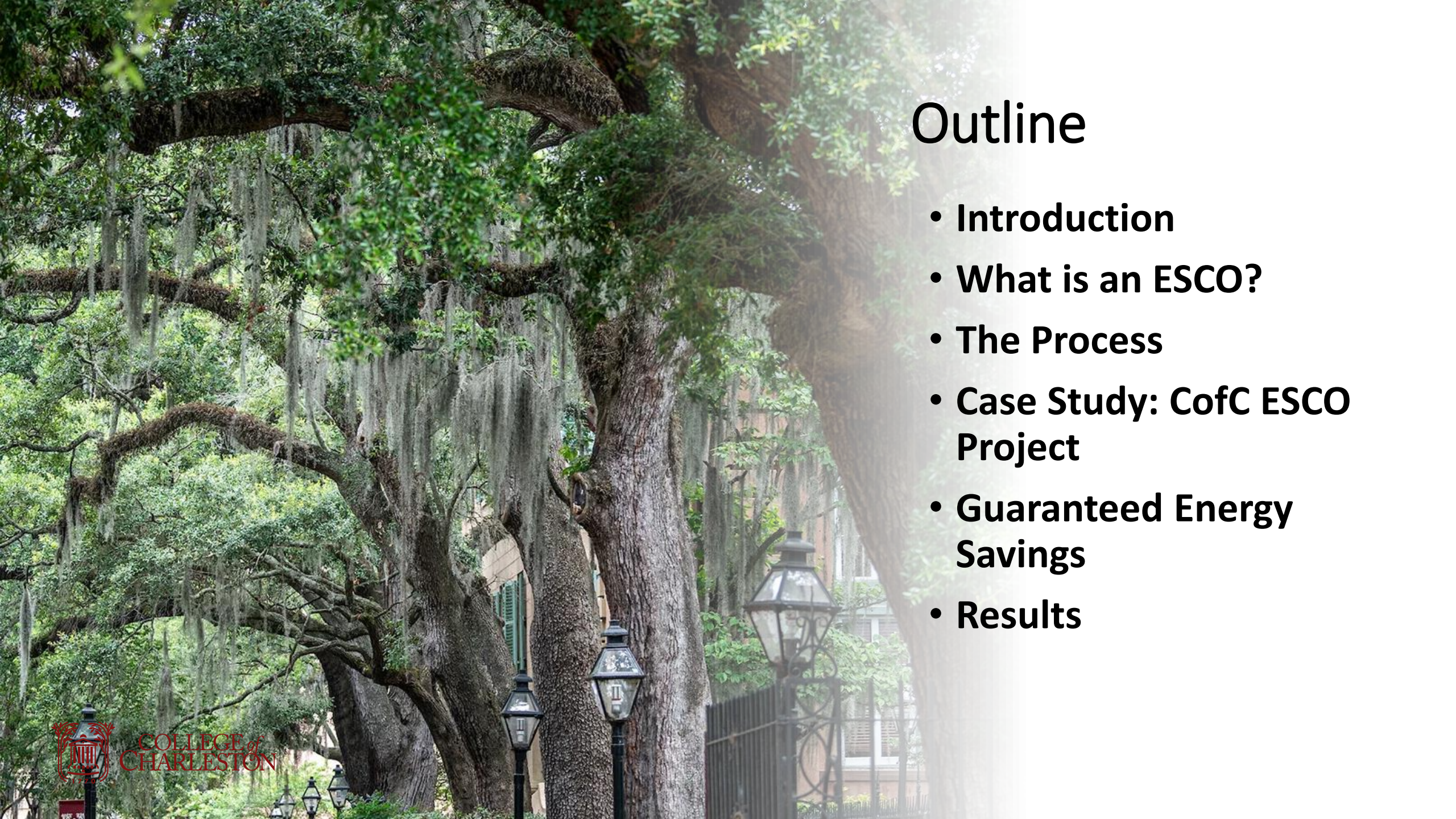
COLLEGE of CHARLESTON

1770

ESCO: The Ultimate Energy Makeover

"The College of Charleston Story"



Outline

- **Introduction**
- **What is an ESCO?**
- **The Process**
- **Case Study: CofC ESCO Project**
- **Guaranteed Energy Savings**
- **Results**

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1. Introduction

- John Gilley
  - *Director of Utility Services*
  - *Power Generation Engineer*
  - *Former: South Carolina Electric & Gas*

- John Holladay
  - *Energy Engineer*
  - *Electrical Engineer, Clemson University*
  - *MBA, University of South Carolina*
  - *Former: Santee Cooper*

About the College of Charleston

- The College of Charleston was established before the United States (1770)
- Over 11,000 students (10,000 undergrad; 1,000 grad)
  - Class of 2027 largest ever!
  - 46 states; 20 countries
  - 68% female; 32% male
  - 44% out-of-state; 56% in-state
  - 14:1 – Student/faculty ratio
- 150 buildings; 3,632,000 sq ft

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2. What is an ESCO?

An Energy Services Company helps customers:

- Upgrade facilities
  - Energy efficiency upgrades
  - General facility upgrades (to fix problems and deferred maintenance items)

- Pay for some or all the cost of these upgrades with guaranteed energy savings (**ESPC – Energy Savings *Performance Contract***)

Energy Savings Performance Contract (ESPC)

- **The ESCO assumes the performance risk for the services delivered**
- **The ESCO's compensation is tied to the measured performance**
- **The customer and ESCO choose an approach to performance measurement that works for both**

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3. The Process

a. Engage leadership

b. Prepare Request for Advertisement/ RFQ

c. Establish selection committee/ Review RFQ/ Select ESCOs to provide RFPs

d. Energy audit - Identify energy-saving opportunities

e. Selection committee review/rate/select ESCO

f. Develop engineering designs and specifications

g. Arrange financing (we used master lease program)

h. Manage construction

i.Guarantee performance and savings (M&V)

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a. Engage Leadership

- **Prepare a high-level proposal to leadership to gain support.**

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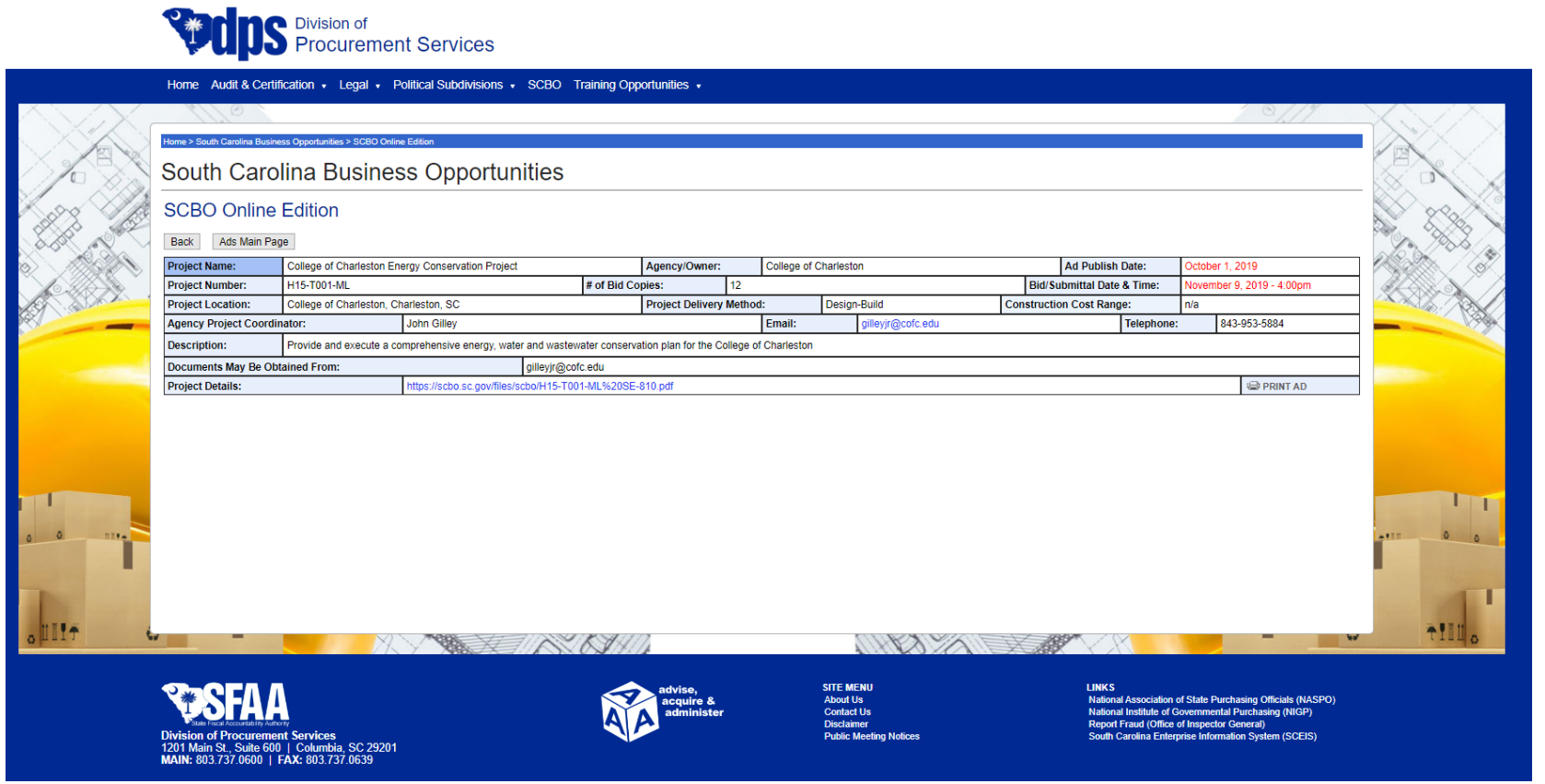
b. Prepare Request for Advertisement/ RFQ

- **The top 3 respondents will be short-listed to interview.**



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c. Select ESCO

- Establish selection committee
- Review RFQs
- Select ESCOs to provide RFPs
- Note that price is not a part of the selection process, as the project scope is not fully developed.
- After selection, you and your ESCO will now need to agree-upon the project scope, which buildings, total square footage, and overall price.

d: Audit - Identify Energy-Saving Opportunities

- **Develop list of energy conservation measures and prioritize**
- **Set schedule to implement**

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e. Selection committee selects ESCO

- Selection committee will review, rate, and select ESCO

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f. Develop engineering designs/specifications

- **Once the ESCO is selected, the ESCO will work with their contractors to develop the scope of work and engineering design specifications**

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g. Arrange financing

We financed through the Master Lease Program of the SC Business Office.

Loan (bond) was funded through TD Bank America

15-years @ 1.67% interest rate

Guaranteed performance savings pays the principal and interest of the bond

Note:

Do not lower your utility budget, as the savings pays the bond

Include utility rebates into your cash flow

Some equipment may require advance purchasing

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h. Manage Construction

PROJECT WAS LED BY ESCO PROJECT MANAGER

THE ESCO TEAM AND COLLEGE OF CHARLESTON UTILITY SERVICES WORK TOGETHER TO MANAGE CONSTRUCTION

OUR ESCO PROVIDED AN ON-SITE SUPERINTENDENT THAT REALLY HELPED COORDINATE THE WORK.

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i. Guarantee performance and savings

Project savings are guaranteed for 15 years (if we don't realize the savings, the ESCO makes up the difference)

A large part of our savings was due to controls upgrades

Established settings and schedules need to be monitored throughout the period to ensure performance

Day/Night; Occupied/Unoccupied

We selected a performance monitoring program that tracks performance and identifies needed changes

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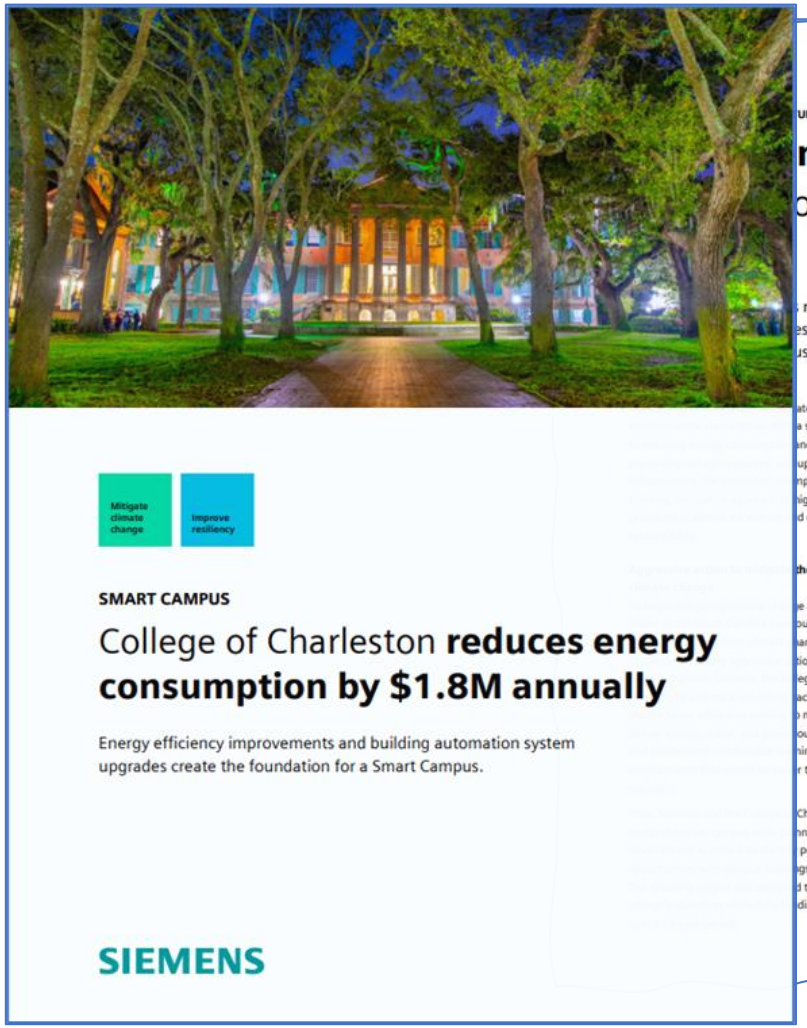
4. Case Study – College of Charleston



Mitigate climate change

Improve resiliency

SMART CAMPUS

College of Charleston **reduces energy consumption by $1.8M annually**

Energy efficiency improvements and building automation system upgrades create the foundation for a Smart Campus.

SIEMENS

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...d to deliver on the
...ding the finance project

Ultimately, the college's actions would encompass campus-wide measures to reduce energy consumption, water use, and carbon emissions and to improve the campus's resilience to climate risks.

Energy conservation measures

Since establishing their partnership in July 2021, the College of Charleston and Siemens have been identifying and implementing campus-wide energy conservation measures that also have positive impacts on the college's utility costs, carbon emissions, and living and learning experiences. Implemented through a 15-year energy savings performance contract, the college's energy conservation measures have included:

- Building automation system – Upgraded to the latest Desigo CC platform to create the Smart Campus foundation and enable energy savings improvements including HVAC equipment scheduling, space temperature setbacks, Variable Air Volume (VAV) static pressure resets, reduced reheat, pump differential pressure reset, hot water loop temperature reset, single-zone VAV control, and exhaust system setback based on demand. Siemens also upgraded building controls systems at 68 buildings across campus.
- Water conservation – Installed water-saving devices in 89 campus buildings; solution included retrofitting faucets and sinks with tamper-resistant flow restrictors, urinals and toilets with devices to reduce gallons per flush, showers with low-flow showerheads, and ice machines with heat exchangers to further reduce energy consumption by delivering pre-cooled water for ice.
- Lighting retrofits – Implemented energy-efficient LED lighting at 111 campus buildings, along with occupancy sensors, energy-saving Vending Misers for vending machines, and streetlamp retrofits that also create a brighter and safer campus at night.
- Building weatherization – Improved weatherization in 37 buildings by applying spray foam insulation, window film, and door sweep replacements; adding insulation for attics and roofs; and sealing exterior gaps.

...al to creating the Smart
...ge of Charleston. The
...ystems for a centralized
...to transform campus
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...ng relied on a centralized,
...metimes referred to as a
...tems are commonly used
...her campuses to create
...en transported through
...provide space heating and

hot water. Although these systems are generally recognized for their energy efficiency and environmental benefits, they can face challenges like water damage, deterioration, and corrosion in low-lying, flood-prone coastal areas like Charleston.

Looking ahead, the college recognized that its underground steam system could be even more vulnerable due to climate change (rising sea levels, more frequent and severe weather events, temperature fluctuations, and so on).

Through this project, Siemens was able to eliminate approximately 80% of the college's underground steam piping and replace the system with new, more efficient condensing boilers in a decentralized system. Not only did this portion of the project improve energy efficiency and reliability, but the system also now requires less maintenance. Moreover, the college was able to avoid a $10 million capital outlay because they did not have to upgrade the old steam distribution piping.

Additional utility system modernization projects included:

- HVAC upgrades – Siemens installed a new, high-efficiency mechanical air handler for building 30.
- Chiller replacements – In the central plant, Siemens replaced an existing 1,500-ton chiller with a new, high-efficiency model. An existing 110-ton chiller in the School of Education building was also replaced.
- Boiler replacements – In two buildings, high-efficiency condensing boilers were installed to replace aging equipment.
- Central energy plant upgrades – Siemens installed three new 410-ton air-cooled chillers, three new high-efficiency condensing boilers, and associated pumps to enable greater efficiency and reliability in the central energy plant.

The College of Charleston will realize at least $28.1 million in energy and operational savings over its 15-year agreement with Siemens.

...se campus-wide improvements, the college's ongoing partnership with Siemens involves
...encompasses:

...ment
...on study, funded by Siemens
...tnership with Siemens Digital Industry Software (DISW), including software donations and
...
...on the planned integration of Siemens Cooperates with Education (SCE) PLC training program
...ns Certification Program
...ablished College of Charleston engineering degrees

...amount to more than $28.1M over 15 years

...ergy conservation measures, Smart Campus and building automation system improvements,
..., the College of Charleston will realize at least $28.1 million in energy and operational
...ent with Siemens.

...ave been implemented through an energy savings performance contract, the college's energy
...ject to annual measurement and verification by energy engineers.

...ergy

...demand	Natural gas	Fuel oil	Water	Sewer
...047 ...yr	48,136 therms/yr	21,403 gallons/yr	13,419 kgal/yr	13,052 kgal/yr

...avings reduce the college's annual greenhouse gas (GHG) emissions by 30%,
...60 metric tons of CO_2e and are equivalent to removing more than
...cars from the road every year.

...mens, the College of Charleston has implemented a wide range of energy conservation
...tomation system upgrades, water and lighting retrofits, building weatherization, and utility
...roduction of the Smart Campus foundation, powered by the Desigo CC platform and bolstered
...nced energy efficiency but also contributed substantial annual savings.

...ected to generate more than $28.1 million in guaranteed energy savings over a 15-year
...s forward-thinking approach to both sustainability and fiscal responsibility.

...siemens.com/SmartCampus

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Building Automation System

- Upgraded to Desigo system – installed BACnet interface
- HVAC equipment scheduling
- Space temperature setbacks
- Variable Air Volume (VAV) static pressure resets
- Reduced reheat
- Pump differential pressure reset
- Hot water loop temperature reset
- Single-zone VAV control
- Exhaust system setback based on demand

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Water Conservation

- **Installed water-saving devices in 89 campus buildings**
  - **Faucets and sinks with tamper-resistant flow restrictors**
  - **Urinals and toilets with devices to reduce gallons per flush**
  - **Showers with low-flow showerheads**
  - **Ice machines with heat exchangers to deliver pre-cooled water for ice**
  - **Pedal valves for commercial kitchen sinks**
  - **Applied for sewer credits for cooling towers since they do not discharge to the sewer**

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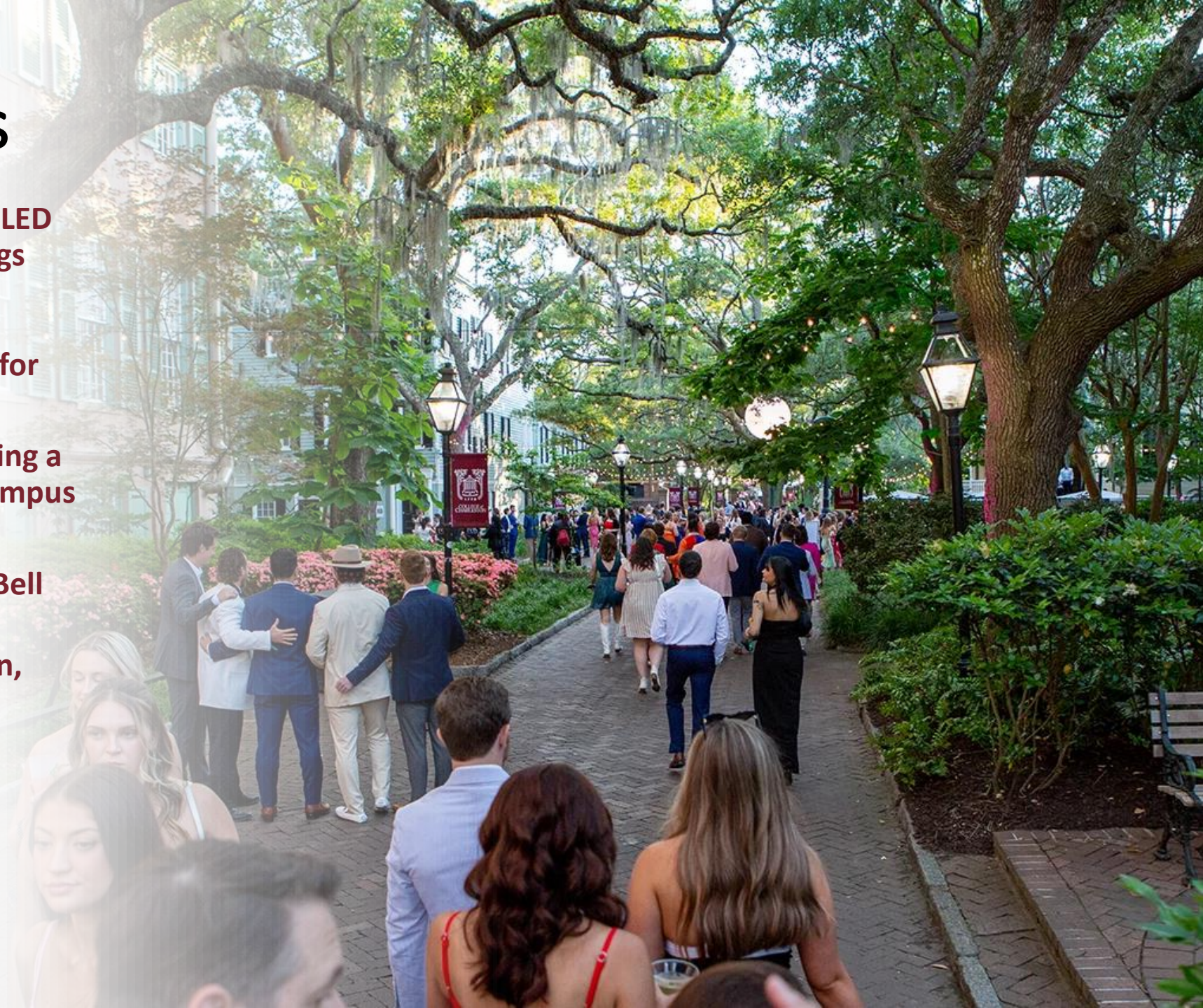
Building Weatherization

- **Improved weatherization in 37 buildings by applying spray foam insulation**
- **Window film**
- **Door sweep replacements**
- **insulation for attics and roofs**
- **Sealed exterior gaps**

Lighting Retrofits

- Implemented energy-efficient LED lighting at 111 campus buildings
- Occupancy sensors
- Energy-saving Vending Misers for vending machines
- 250 streetlamp retrofits, creating a uniform, brighter, and safer campus at night
- Installed Enlighted system on Bell Building
  - Sensors can detect motion, light levels, temperature, energy consumption
  - Heat Mapping
  - Space Utilization



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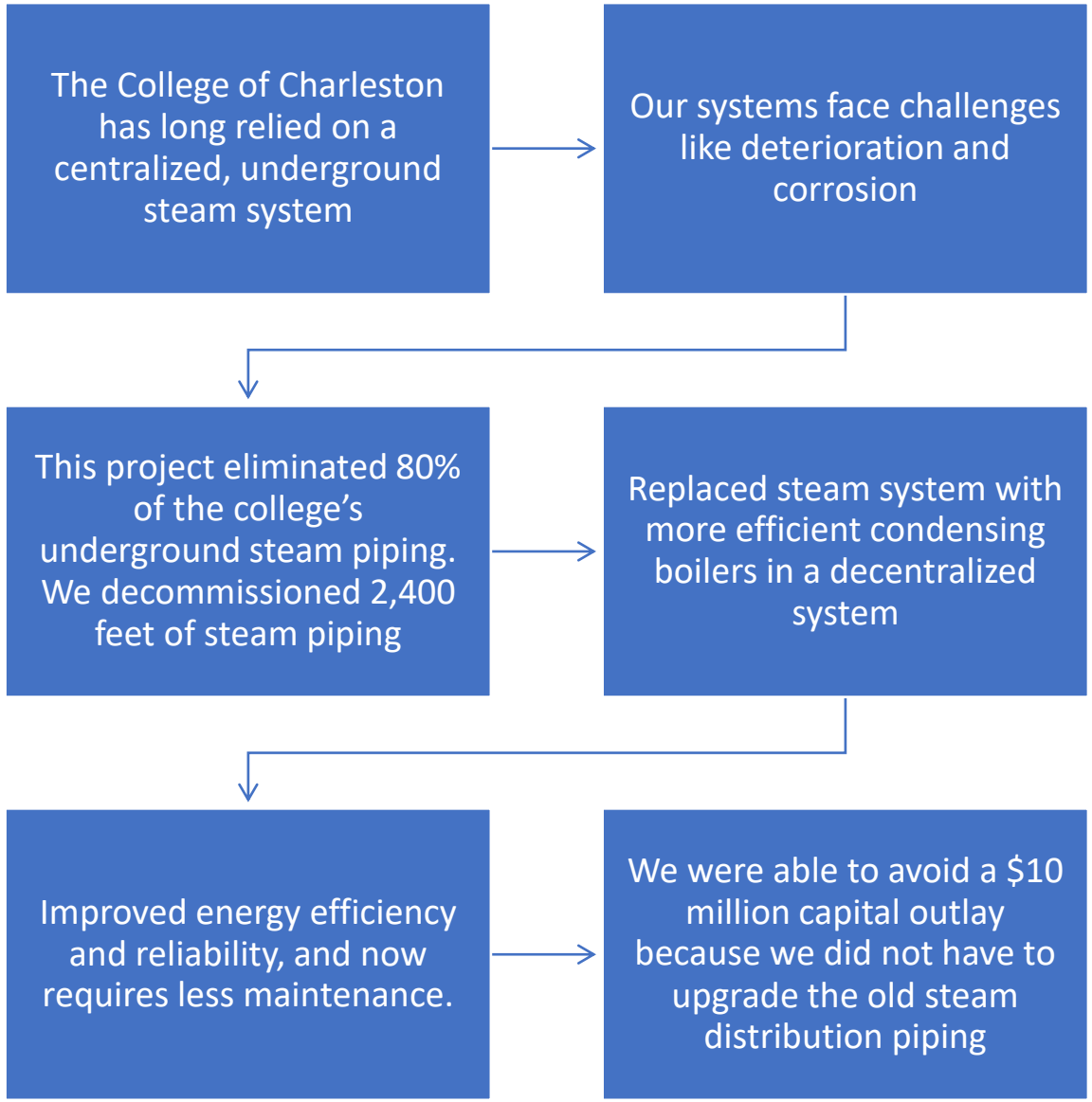
Steam Decentralization



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New Chillers

- New high-efficiency 1,500-ton chiller in the Central Energy Plant
  - 0.60 kW/ton (old) to 0.49 kW/ton for new chiller
- New 110-ton chiller in the School of Education building.

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New Boilers

- **High-efficiency condensing boilers were installed to replace aging equipment.**
- **New gas-condensing boilers were installed to replace steam heating systems as part of the steam decentralization project**

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New (additional) Energy Plant – Boilers, Chillers

New Simons Central Energy Plant:

- New plant provides chilled water and hot water to two buildings
- No longer using centralized chilled water and steam to these buildings
- Three, new 410-ton air-cooled chillers
- Three new high-efficiency condensing boilers
- Associated pumps to enable greater efficiency and reliability

5. Guaranteed Energy Savings

- $28.1 million in energy and operational savings over the 15-year agreement
- Project Cost: $23.5 million

Reduced Energy Cost by $1.8 million/ year!

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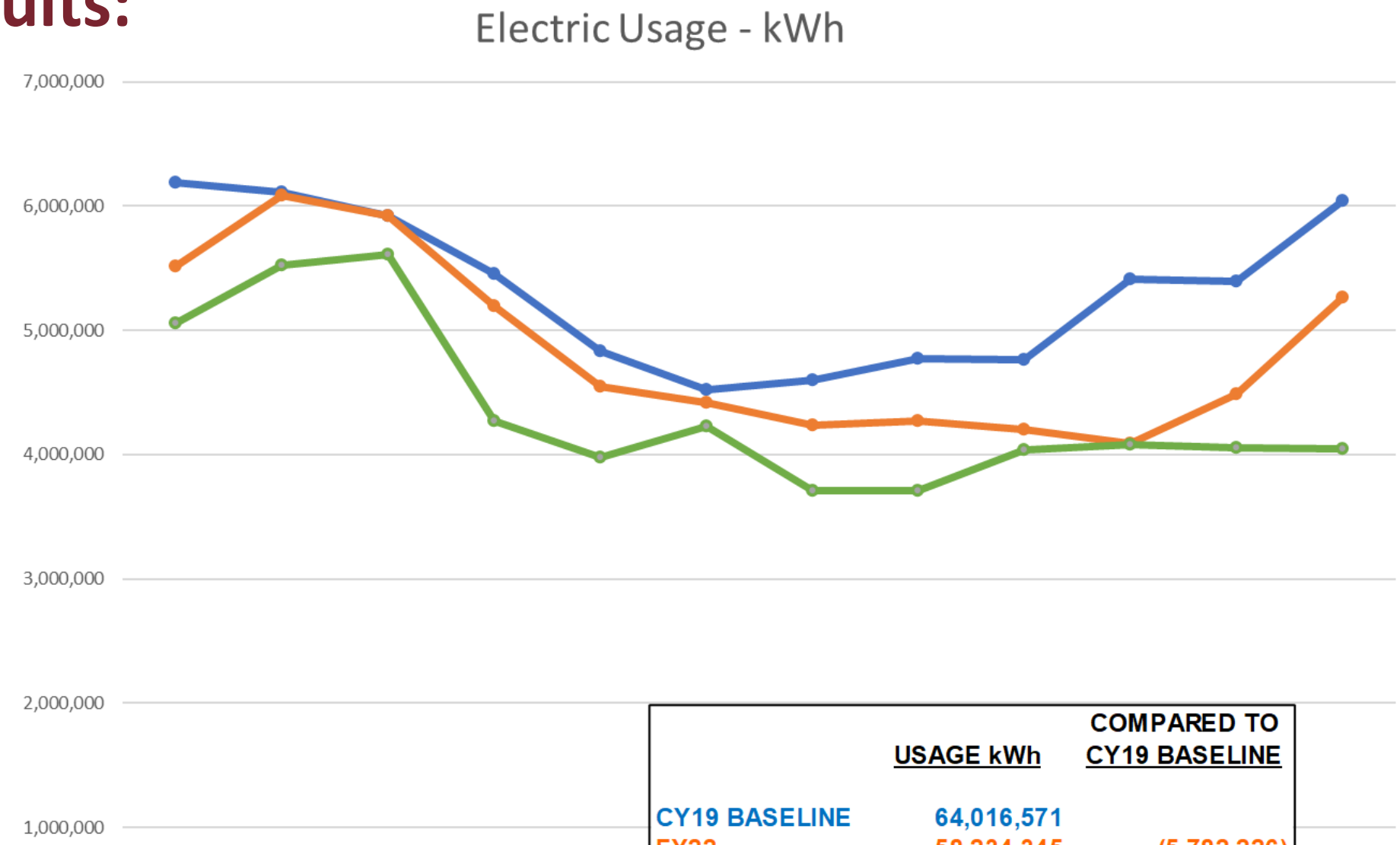
6. Results:



	USAGE kWh	COMPARED TO CY19 BASELINE
CY19 BASELINE	64,016,571	
FY22	58,234,345	(5,782,226)
FY23	53,316,219	(10,700,352)

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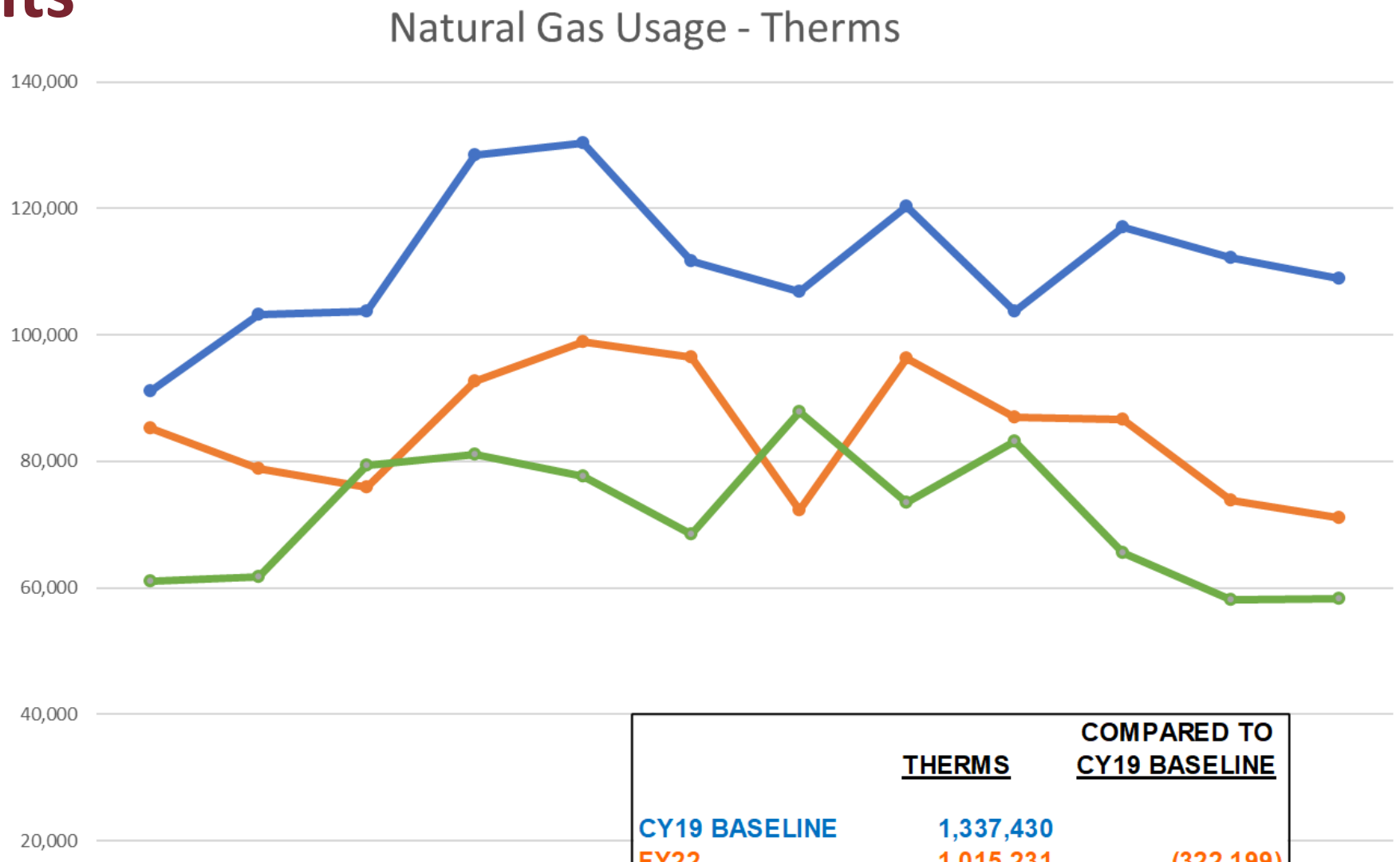
6. Results



	THERMS	COMPARED TO CY19 BASELINE
CY19 BASELINE	1,337,430	
FY22	1,015,231	(322,199)
FY23	856,057	(481,373)

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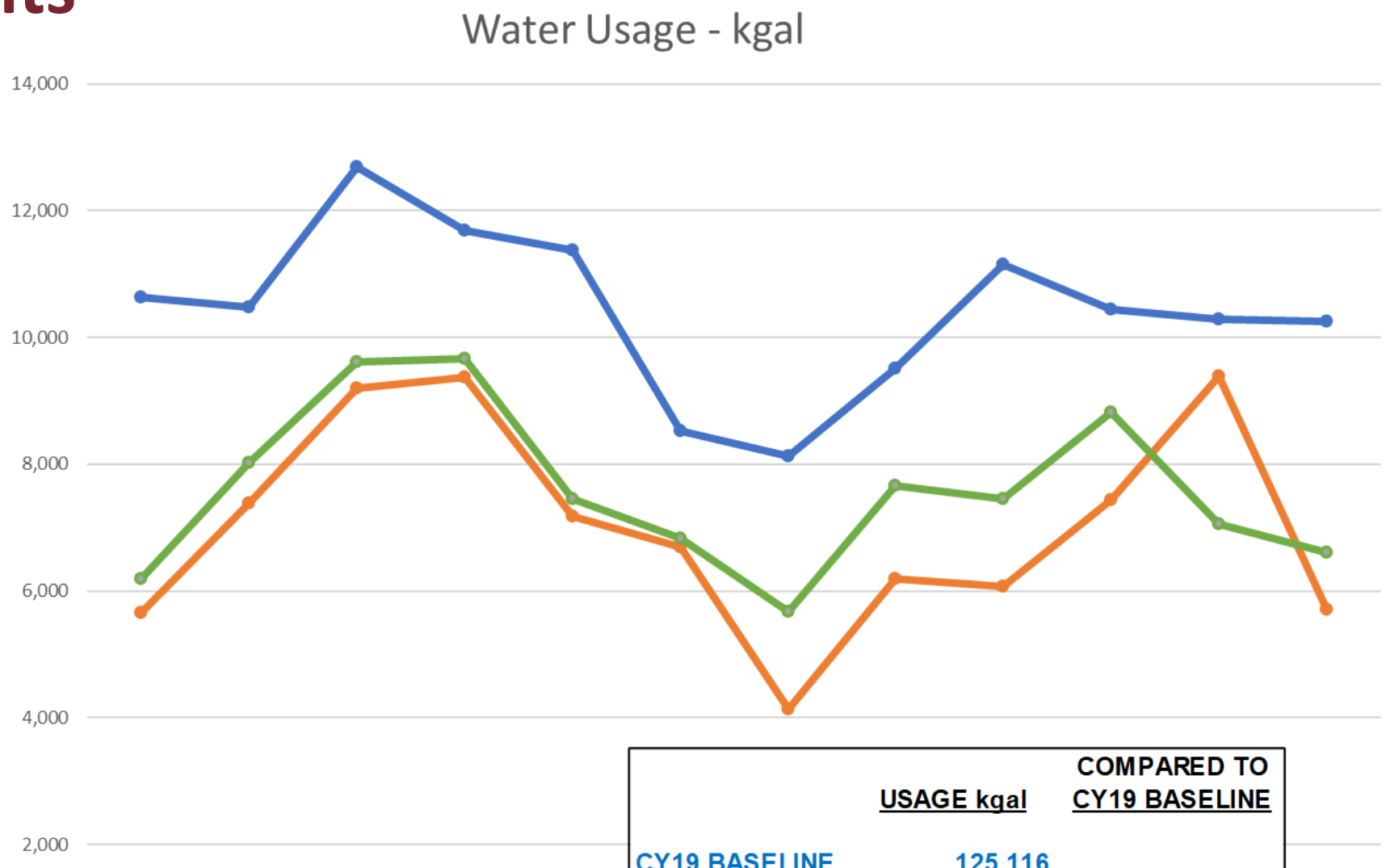
6. Results



	USAGE kgal	COMPARED TO CY19 BASELINE
CY19 BASELINE	125,116	
FY22	84,429	(40,687)
FY23	91,040	(34,076)

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Questions?

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