Better Buildings
U.S. DEPARTMENT OF ENERGY

Building Performance Results from New York State's Real-Time Energy Management Program

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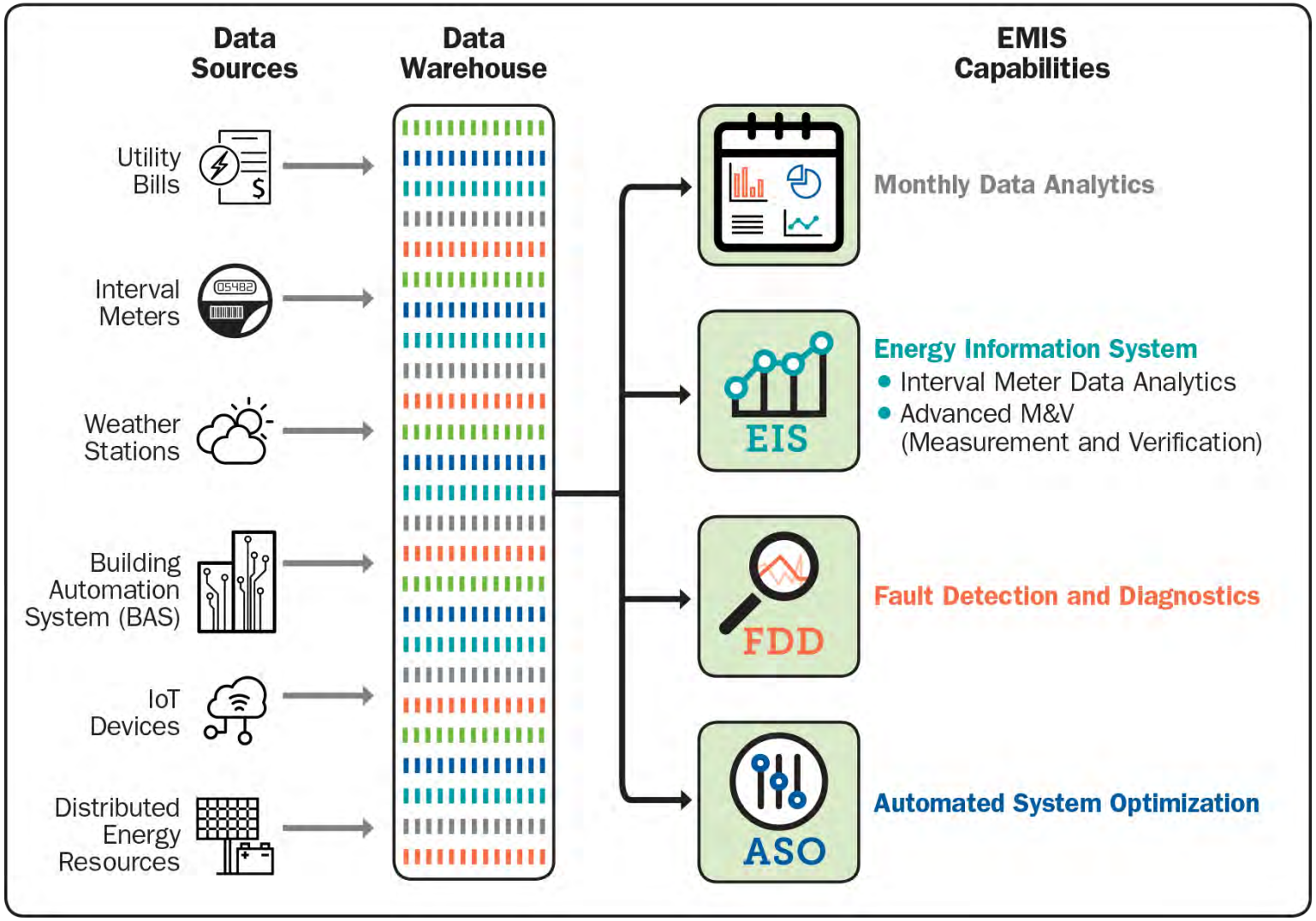
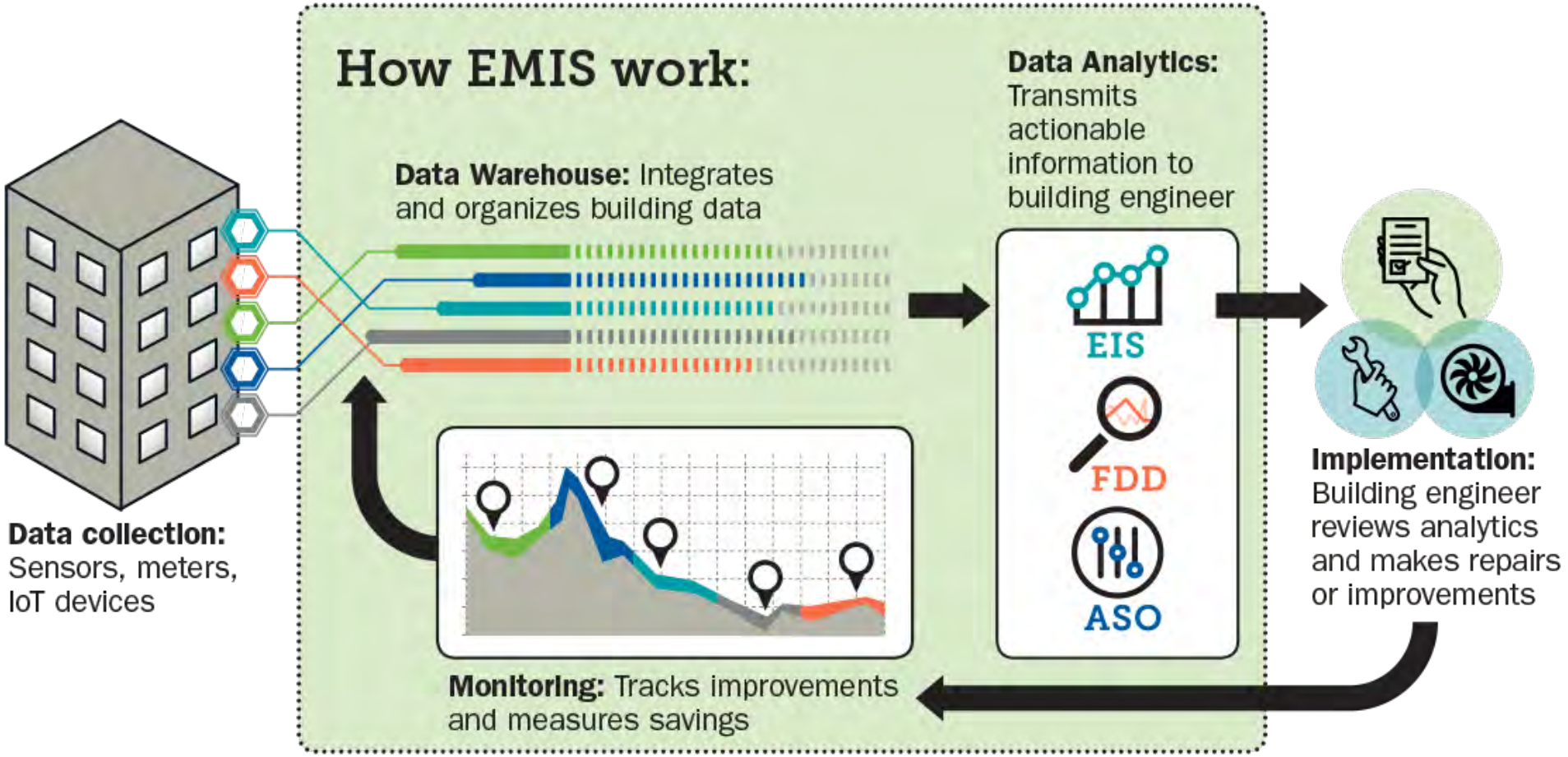
October 8, 2020

Welcome! We'll be starting shortly…

The Energy Managment and Information Systems (EMIS) Tech Team collaborates with researchers and industry experts to promote awareness and energy reduction through new technologies. Contact the Better Buildings Alliance at bba@ee.doe.gov to learn how you can get involved.


Data Sources
Data Warehouse
EMIS Capabilities
Utility Bills
Interval Meters
Weather Stations
Building Automation System (BAS)
IoT Devices
Distributed Energy Resources
Monthly Data Analytics
EIS
Energy Information System
• Interval Meter Data Analytics
• Advanced M&V (Measurement and Verification)
FDD
Fault Detection and Diagnostics
ASO
Automated System Optimization



EMIS TOOLS: Energy information systems (EIS) help find energy waste using smart meter data. Fault detection and diagnostic tools (FDD) detect and prioritize HVAC system faults. Automated system optimization (ASO) includes control algorithms to minimize energy use across systems.

- Building Owners, Managers and Operators
  - Join the Better Buildings EMIS Tech Team for webinars, technology updates, and peer presentations
  - Better Buildings Solutions Center – Smart Energy Analytics Campaign Toolkit
  - Ask questions to LBNL EMIS Tech Team staff

- Utilities
  - Present cost-benefit findings from Campaign study
  - Technical support for EMIS and MBCx program design
  - Review draft program materials

Alicia Noriega
Project Manager
New York State Energy Research and Development Authority (NYSERDA)

REAL TIME ENERGY MANAGMENT

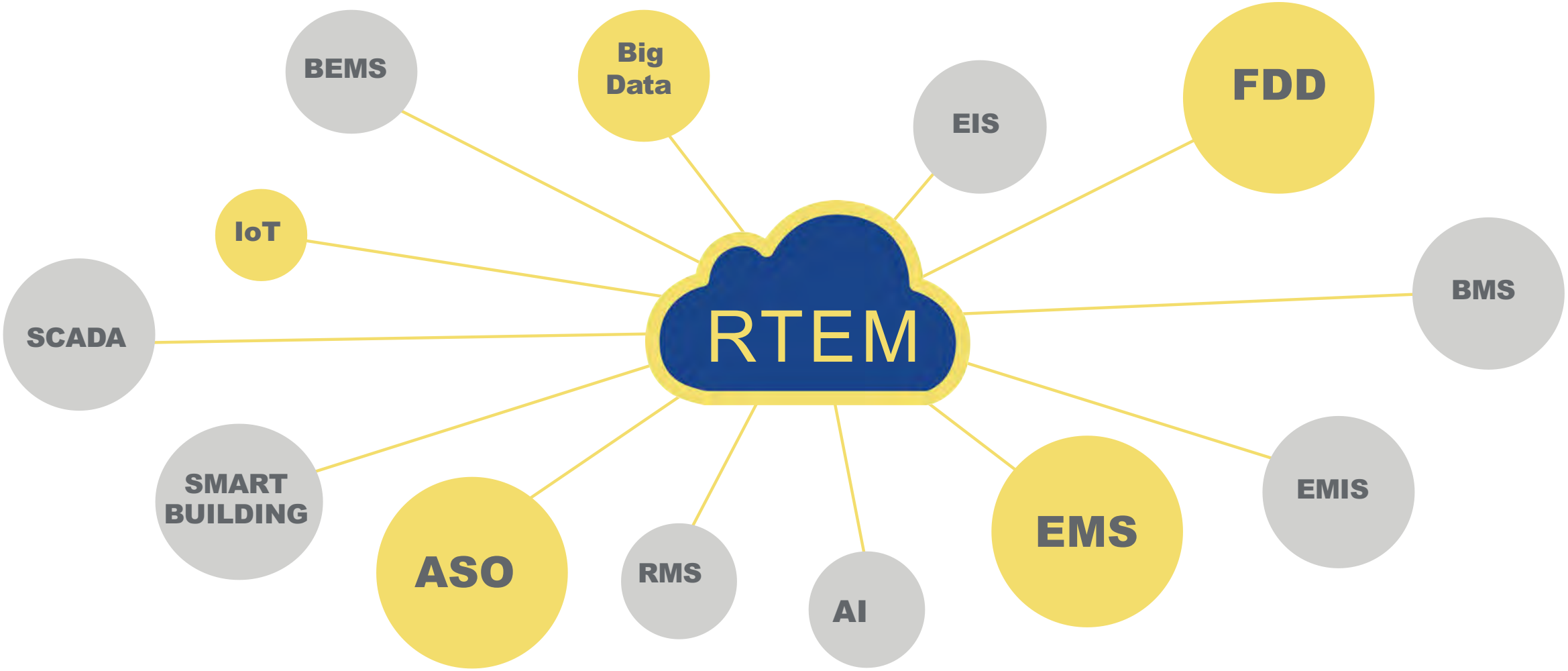
Smart Building Solutions for New York State

Real Time Energy Management systems monitor the live operation of energy-consuming equipment and plants installed within buildings.

RTEM can optimize HVAC setpoints and scheduling, and often uses FDD software to prevent faults and performance degradation.

RTEM encourages the inclusion of lighting, plug load, and air quality monitoring data for richer analytics & a more robust energy management platform.

THE BUZZ AROUND RTEM



MARKET CHALLENGES & NYSERDA SOLUTIONS

1. High upfront costs

30% up-front cost-share incentive for systems and services

2. Overwhelmed by data streams

Required service component

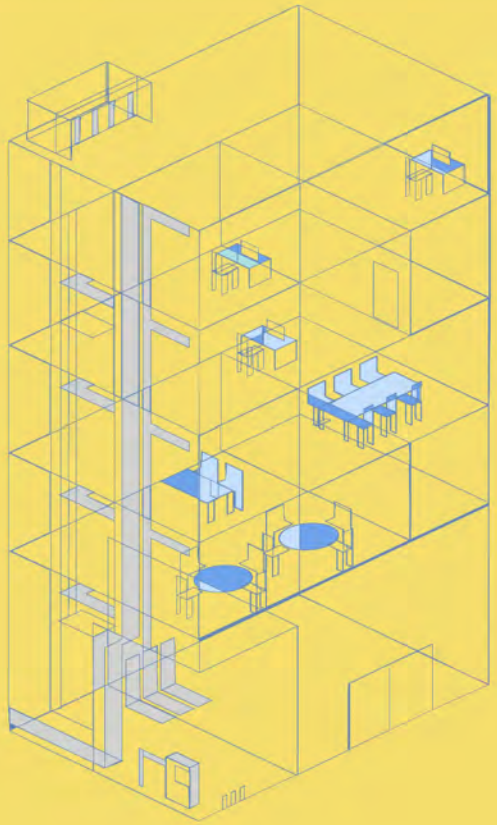
Objective quality review

3. Market confusion

Qualified vendor list

Threshold criteria for RTEM systems

THE RTEM SUITE



HARDWARE **SOFTWARE** **SERVICES**

VENDOR BASED PROGRAM

53	Active Vendors
8	Service-Only
6	System-Only
39	System and Service

SERVICE REPORT SAMPLE

Overview of RTEM findings for the semi-annual report of Dec 2017 – May 2018:

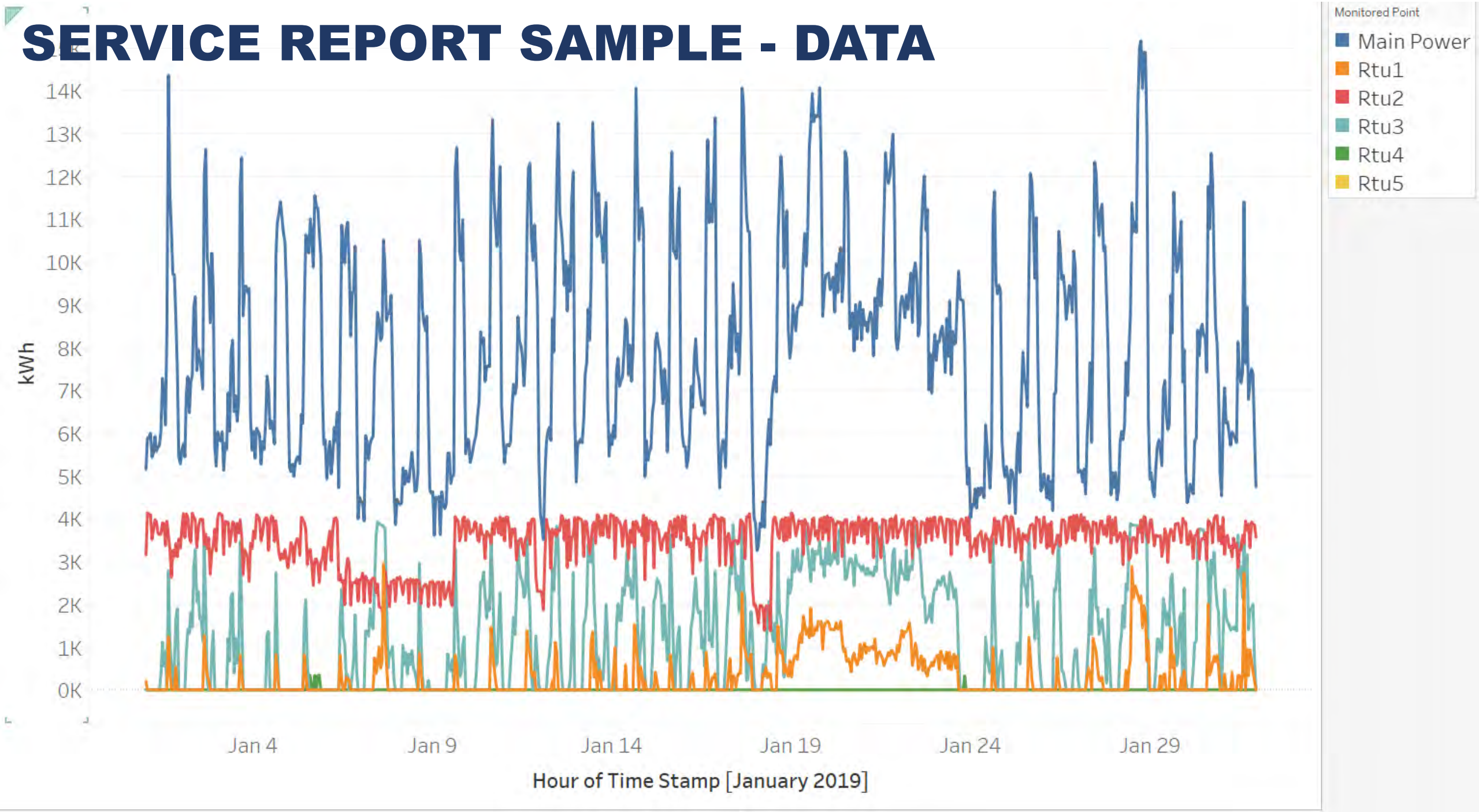
1- Same start up time for multiple equipment.
2- Chiller peak demand upon start up.
3- AHU-5 operates on extreme temperatures.

- **Table of Recommendations**

No.	Recommendations	Status	Consumption Savings (KWh)	Avg. Demand Reduction (KW)	Cost Savings* ($)	Implementation Date
1	Offsetting loads and pre-cooling.	Accepted and implemented	NA	100 KW/month	12,500	3/12/2018
2	Use chiller demand limiting capabilities and manage start-up.	Under Review	9,000 KWh	NA	1,800	5/30/2018
3	Fine tune control sequence and/or calibrate supply air sensor.	Under Review	4,800 KWh	NA	960	5/30/2018

*Cost Savings are based on Consumption (KWh) and Demand (KW) reductions.

SERVICE REPORT SAMPLE - DATA



REAL TIME ENERGY MANAGMENT

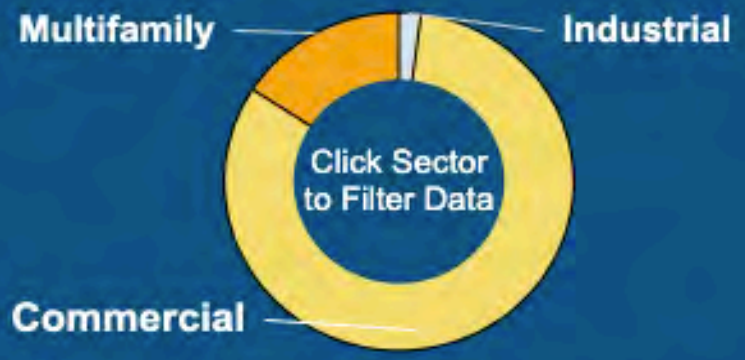
Program Impact

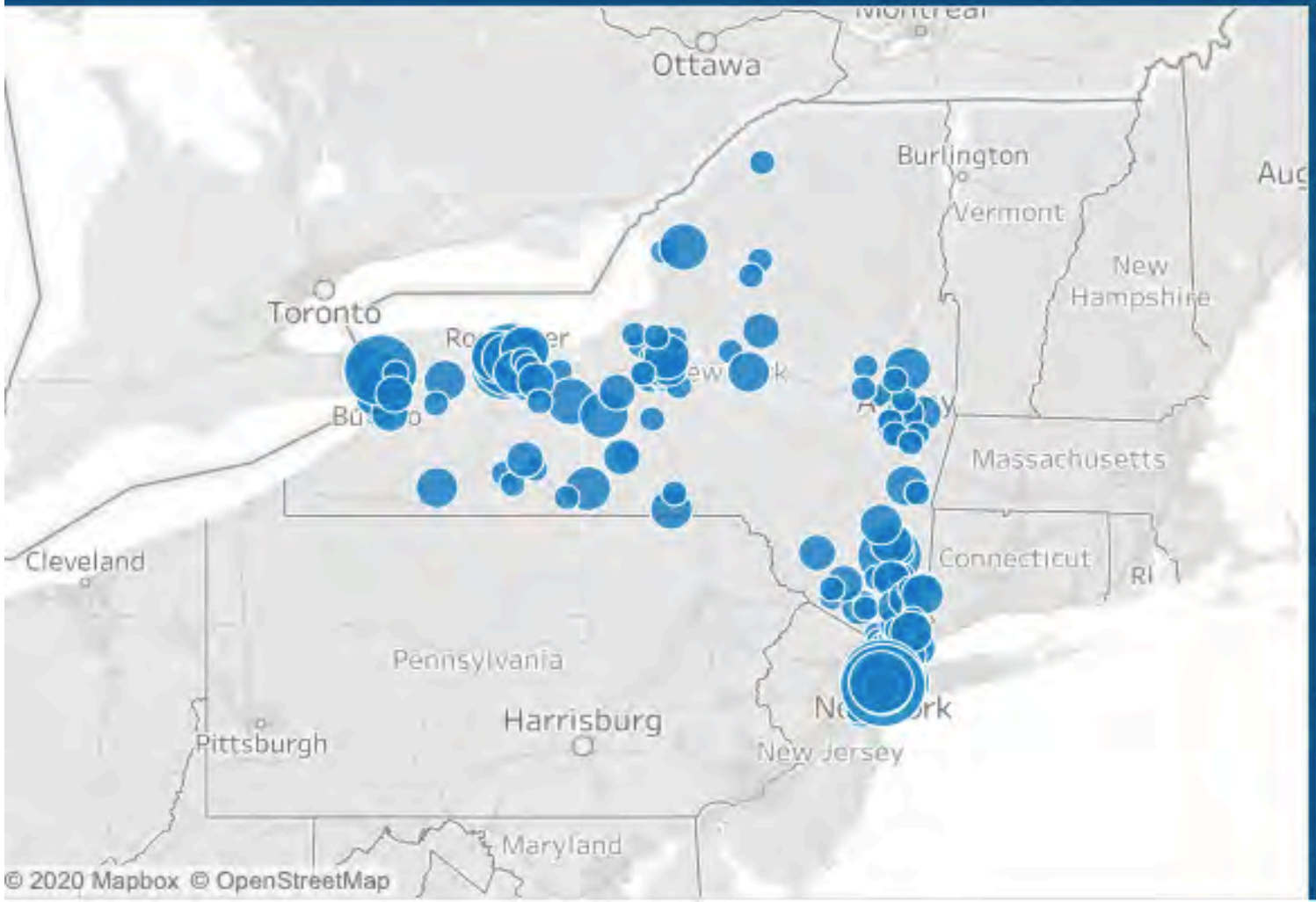
853
RTEM Sites to Date

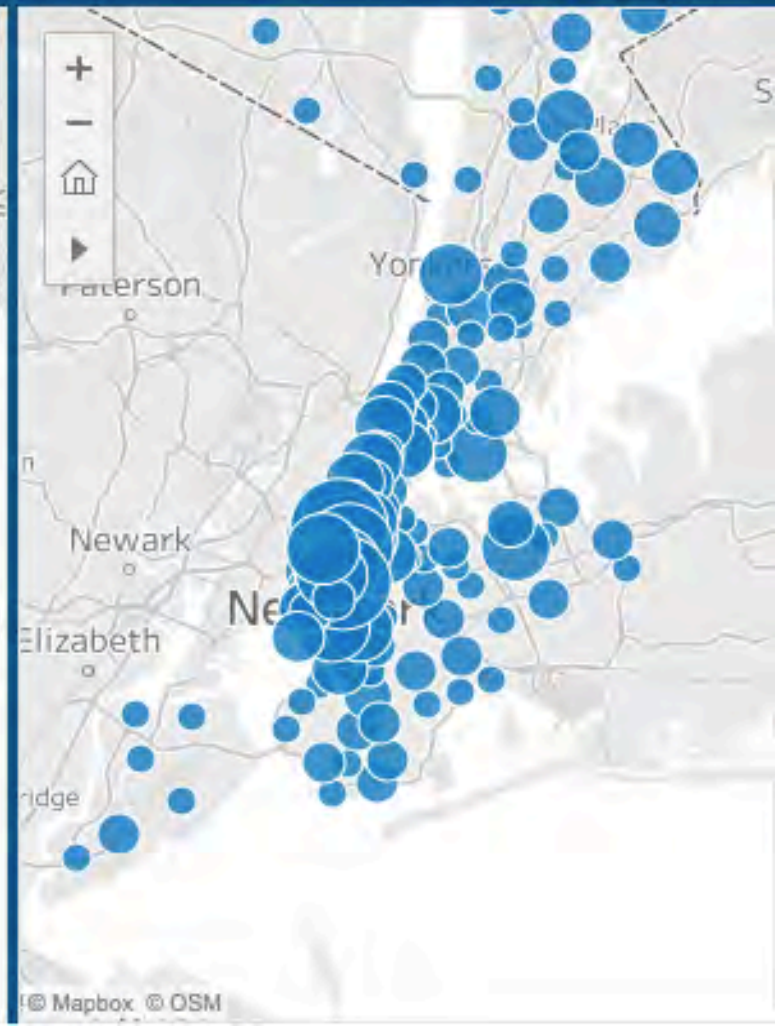
200.9M RTEM Impacted Square Footage

$48.3M NYSERDA Incentives

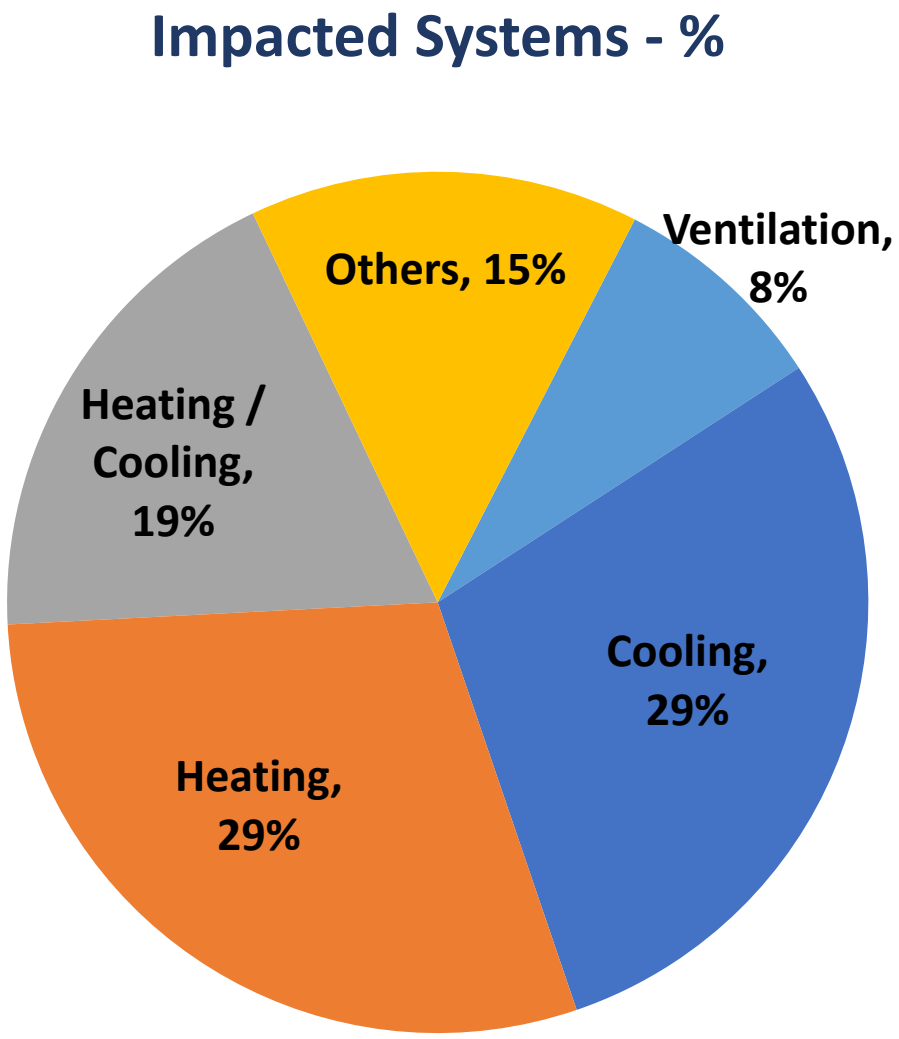
$143.7M Direct Private Investment







RTEM CLOSER LOOK – IMPACTED SYSTEMS



ECMs were categorized based on the mechanical system impacted by the project.

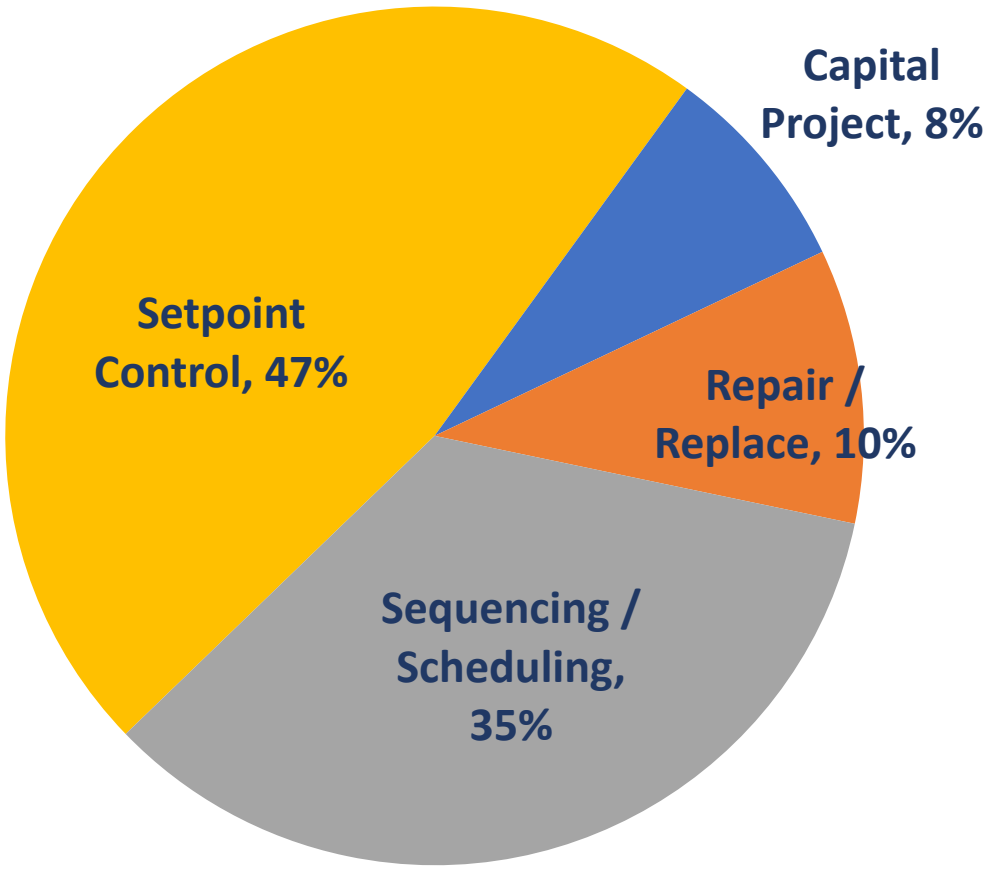
The main systems that were impacted were

- **Cooling** – Chillers, Chilled Water Pumps, Circulating Water Pumps
- **Heating** – Boilers, Heat Exchangers
- **Heating / Cooling** - RTUs capable of providing both heating and cooling
- **Ventilation** – Fans, AHUs
- **Others** – Demand Control, Lighting

Total ECM in sample: 629

RTEM CLOSER LOOK - ECM

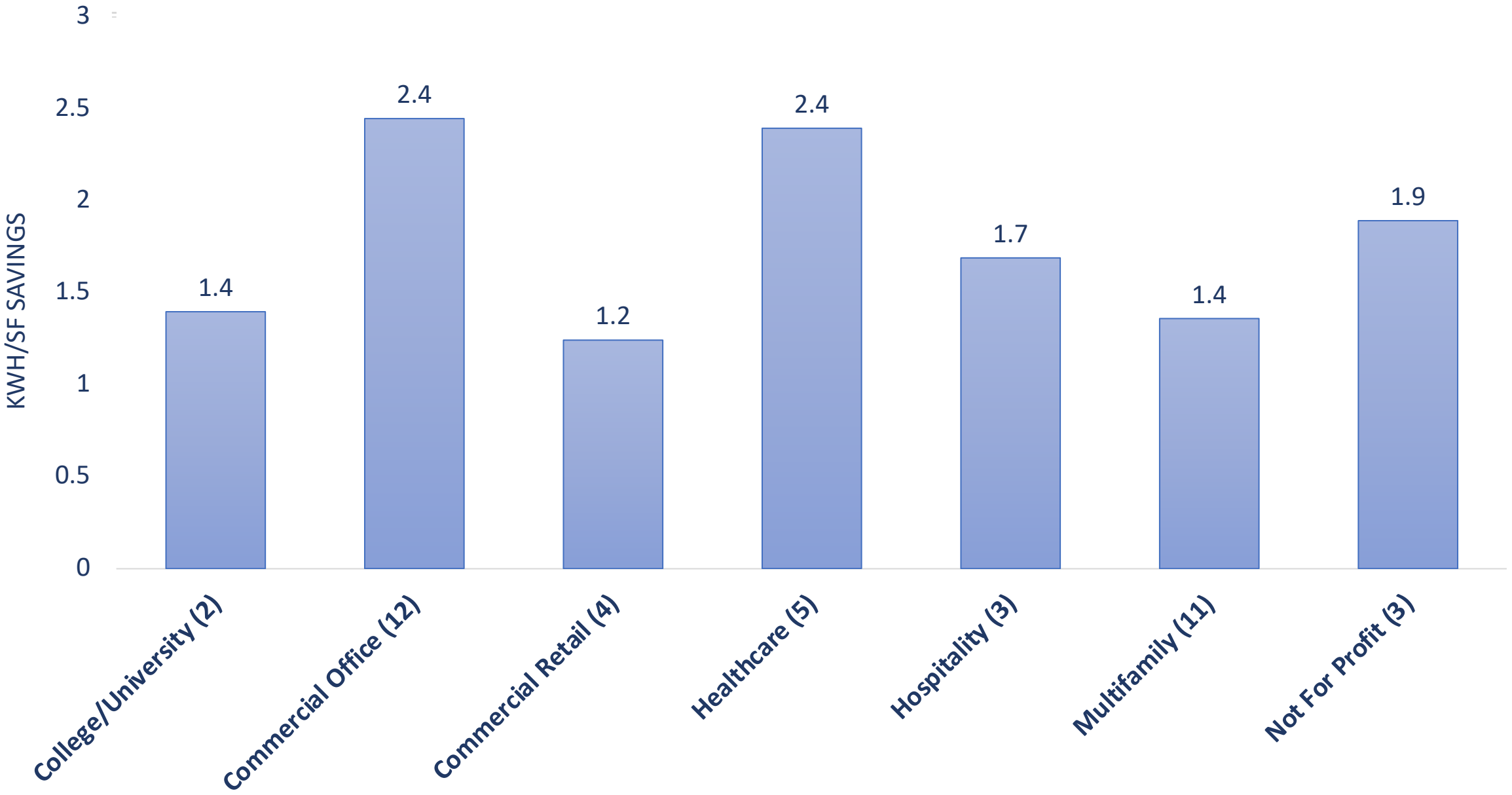
Type of Measures - %

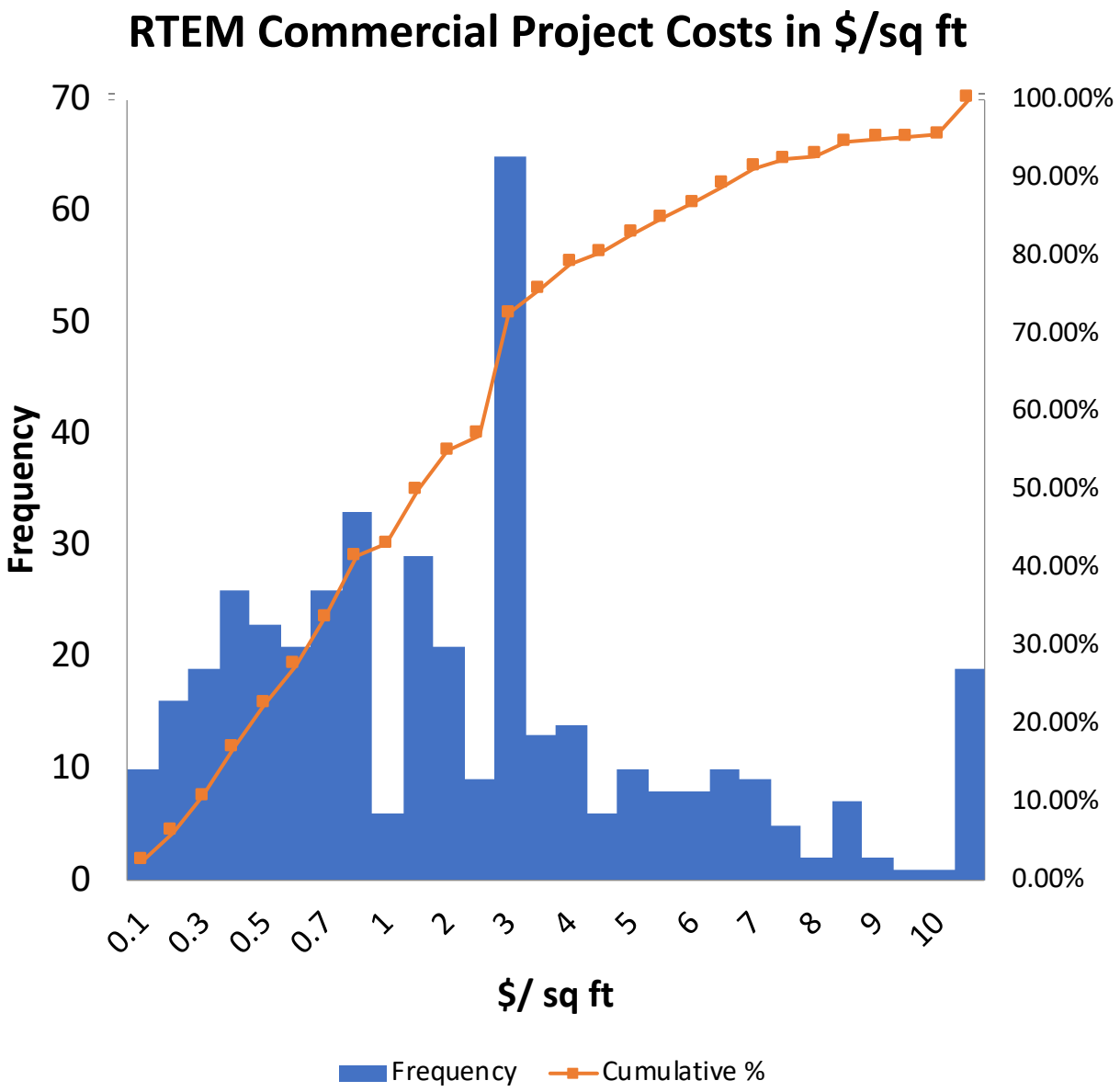


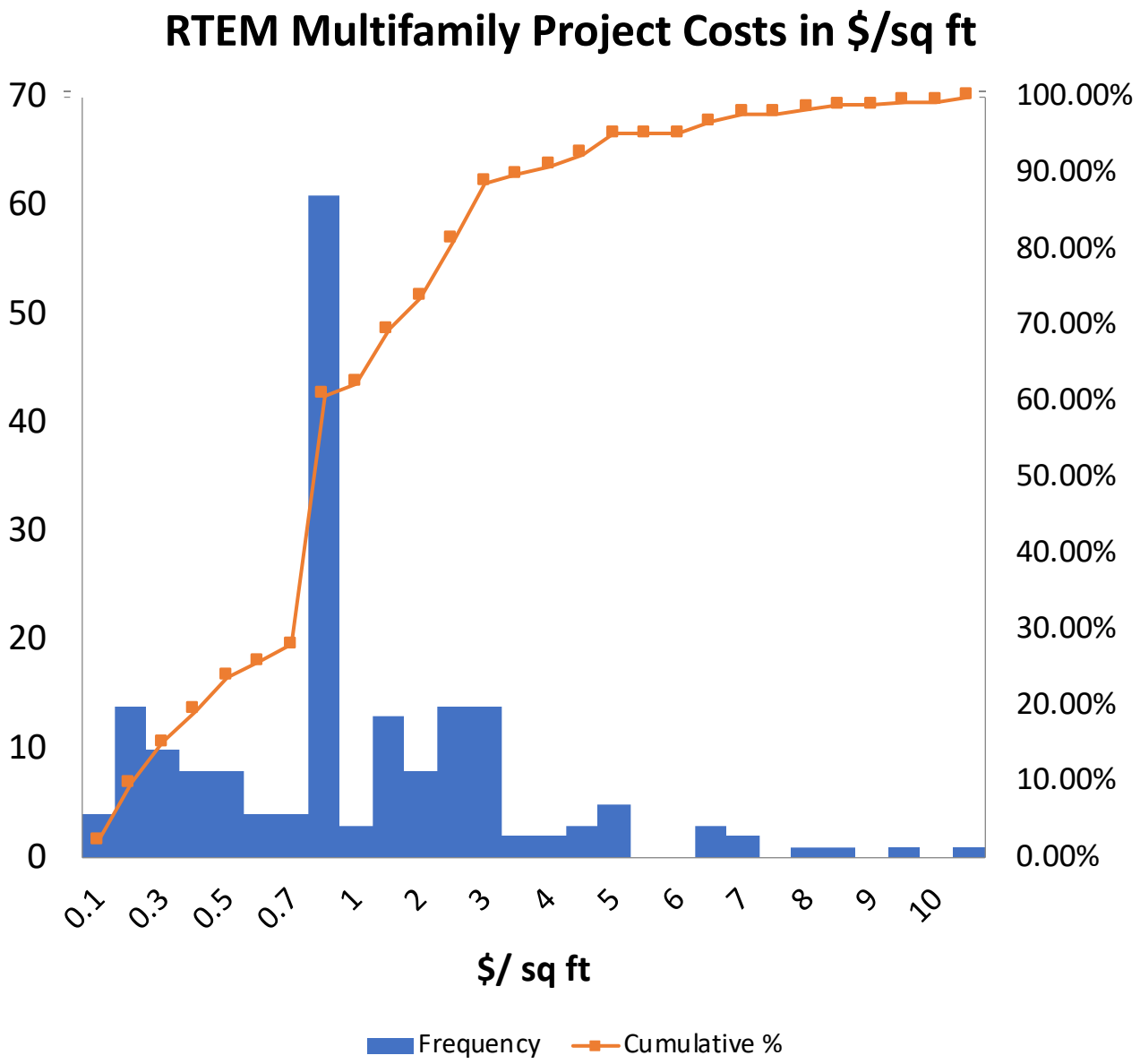
- **Setpoint Control** – ECM would require controlling a setpoint within the system. For example, chilled water temperature setpoint.
- **Sequencing / Scheduling** – ECM would require changing the operational pattern of the system involved. For example, changing start time of AHUs.
- **Repair / Replace** – ECM would require repair or overhaul of the equipment identified. For example, replacing a valve.
- **Capital Project** – ECM would require budget planning and would have a longer timeline for implementation. For example, replacement of chillers. These ECMs have the highest energy savings associated.

Total ECM in sample: 629

WEATHER NORMALIZED kWh/sq ft SAVINGS




RTEM Commercial Project Costs in $/sq ft
Frequency
70
60
50
40
30
20
10
0
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
0.1
0.3
0.5
0.7
1
2
3
4
5
6
7
8
9
10
$/ sq ft
Frequency
Cumulative %


RTEM Multifamily Project Costs in $/sq ft
70
60
50
40
30
20
10
0
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
0.1
0.3
0.5
0.7
1
2
3
4
5
6
7
8
9
10
$/ sq ft
Frequency
Cumulative %

REAL TIME ENERGY MANAGMENT

Case Studies

CASE STUDY*

*JLL and ESRT RTEM Case Study

Leveraging RTEM

- Empire State Realty Trust Portfolio
- Over 12mm SF
- Piloting RTEM in over half of the portfolio, including the Empire State Building
- Empire State Building:
- Cortex
- Johnson Controls JEM

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EMPIRE STATE BUILDING*

*JLL and ESRT RTEM Case Study

CASE STUDY - EMPIRE STATE BUILDING & CORTEX

CORTEX

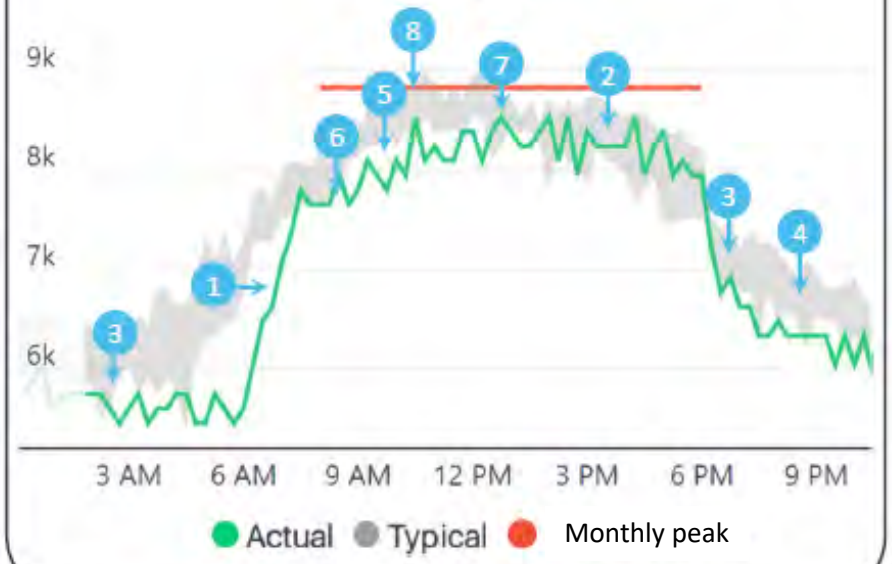
The ESB engineering team uses Cortex to drive a broad number of operational changes, which has the reshaped the load curve

Operational Improvements

1. Pushing back of HVAC start time
2. Afternoon coasting of fans
3. Increasing chilled water setpoints overnight
4. Reducing speed of chiller pumps overnight
5. Correcting over-cooled spaces (e.g., Goldin)
6. Staging chillers 4 and 6 to reduce peak
7. Limiting amperage on chillers using JCI programming to reduce peak
8. Proactively dropped demand when close to setting new monthly peak
9. Identified equipment that was running overnight

Impact on Electric Demand: Single Day

KW, August



* Note: Average and Efficient consumption for similar past days

EMPIRE STATE BUILDING*

*JLL and ESRT RTEM Case Study

CASE STUDY - EMPIRE STATE BUILDING & CORTEX

CORTEX

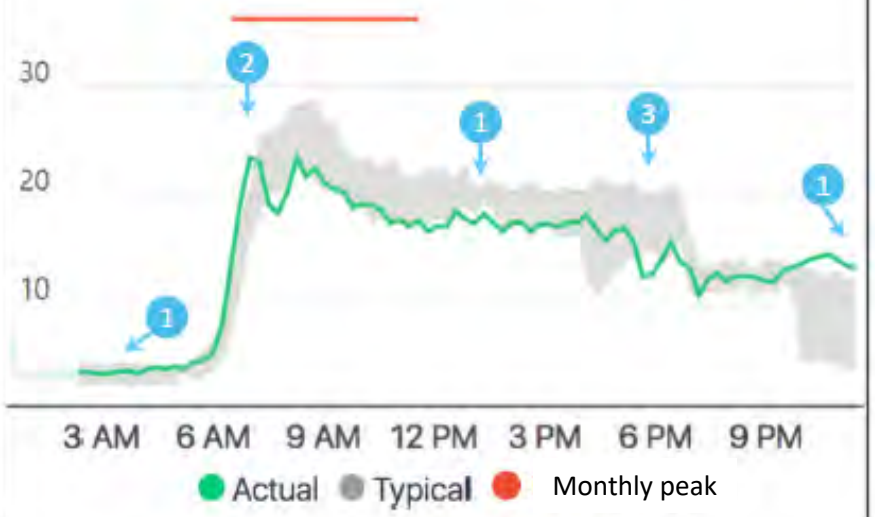
The engineering team has also used Cortex to reshape the steam load curve during the heating season

Operational Improvements

1. Reducing steam pressure setpoints overall, thereby reducing consumption overnight and throughout the day
2. Real-time notification when ESB is within 80% of setting a new demand peak for the month (using red line as visual reminder), which reduces peak charges
3. Coasting steam pressure setpoints at 6p, which reduces consumption while still providing Goldin their heating needs

Impact on Steam Demand: Single Day

Mlbs / hr, December



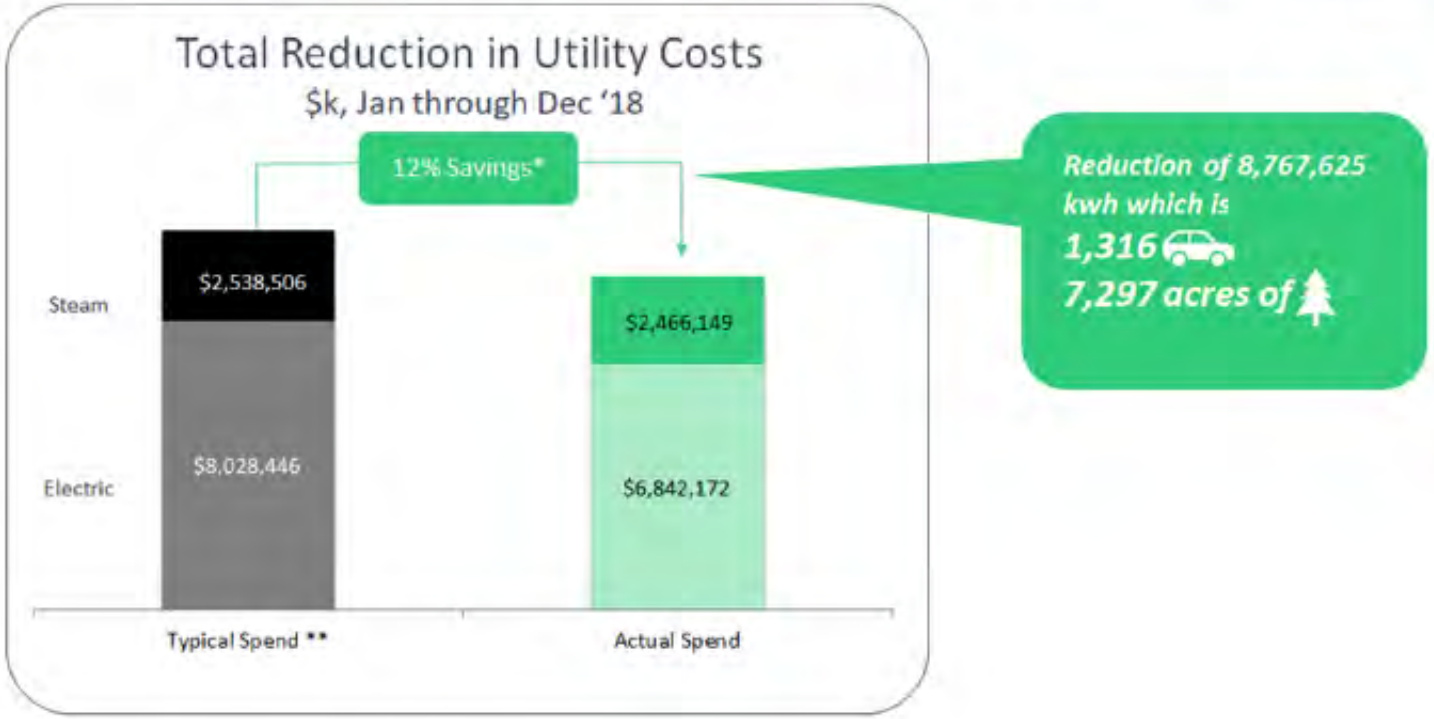
* Note: Average and Efficient consumption for similar past days

EMPIRE STATE BUILDING*

*JLL and ESRT RTEM Case Study

CASE STUDY - EMPIRE STATE BUILDING & CORTEX

When normalized for changes in occupancy, ESB saved $1,258,631 during the 12 months from January - December 2018



* Uses building's utility rates
** Average during similar pre-Cortex days (similarity defined by 4am/pm temperature, day of week, cloud cover, preceding day profile, and holiday profile)

MORE EXAMPLES OF RTEM DEPLOYMENTS

Case Study

Company Name:
Edison Properties

Square Footage:
350,000 Sq. Ft.

Energy Savings Results:
500,000 kWh,
9700 Therms, and
$85,000 in cost savings

Sector:
Commercial

Location:
New York, NY

Case Study

Company Name:
Jack Resnick & Sons

Square Footage:
563,391 Sq. Ft.

Energy Savings Results:
480,000 kWh,
$98,000 annually

Sector:
Commercial

Location:
New York City

Case Study

Name:
NYU Langone
Medical Center

Square Footage:
338,424 Sq. Ft.

Energy Savings Results:
382,455 kWh and $57,369
in cost savings annually

Sector:
Healthcare

Location:
Manhattan, NY

Case Study

Company Name:
Four Seasons
Natural Foods

Square Footage:
9,200 Sq. Ft.

Energy Savings Results:
49,208 kWh and
$4,833 in cost savings
annually

Sector:
Retail

Location:
Saratoga Springs, NY

Case Study

Company Name:
Yonkers Honda Service
Center

Square Footage:
48,500 Sq. Ft.

Energy Savings Results:
370,783 kWh,
$20,000 annually

Sector:
Commercial

Location:
Yonkers, NY

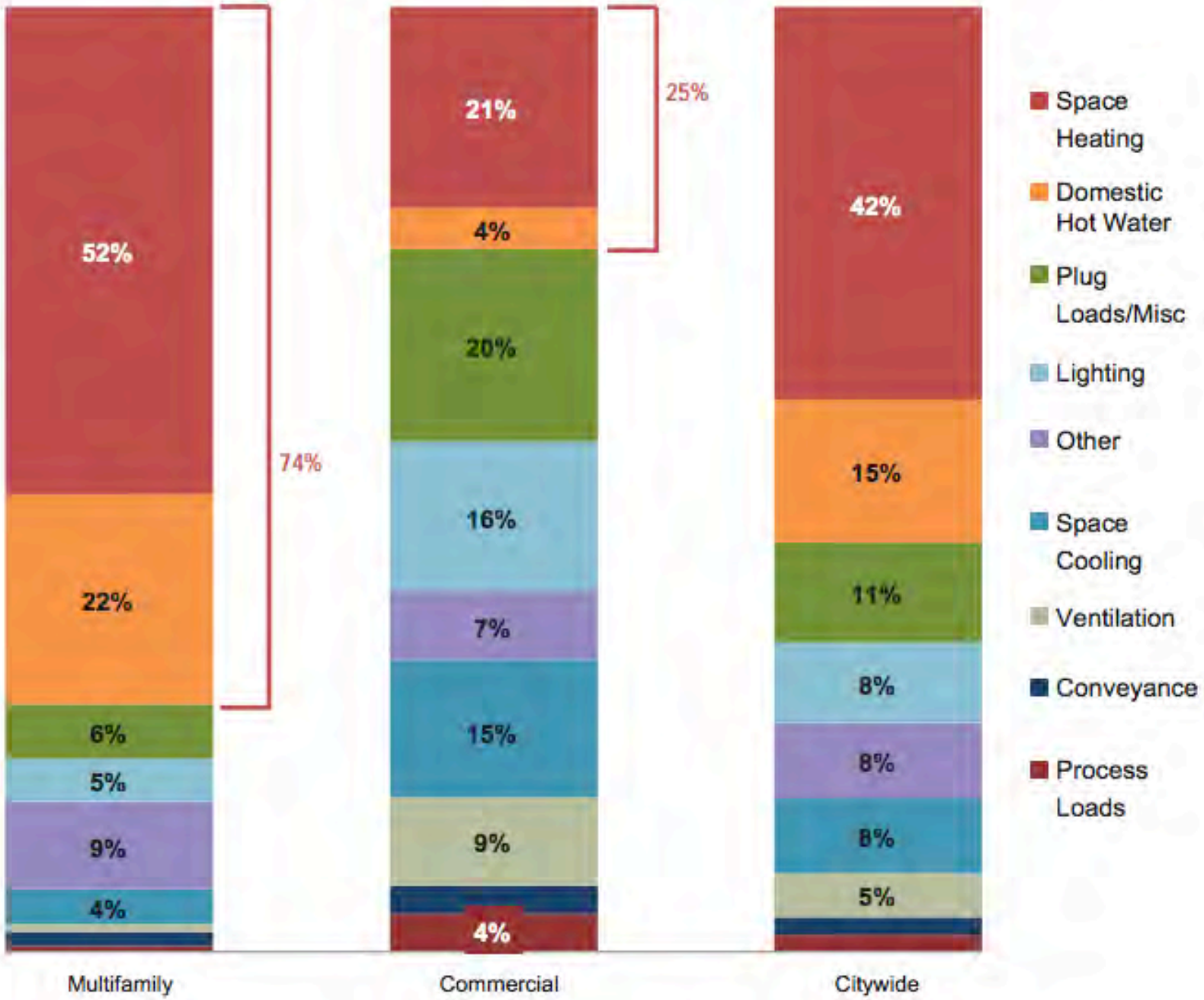
REAL TIME ENERGY MANAGMENT

Continued Evolution

Fig. E4. **Buliding GHG Emissions by End Use***

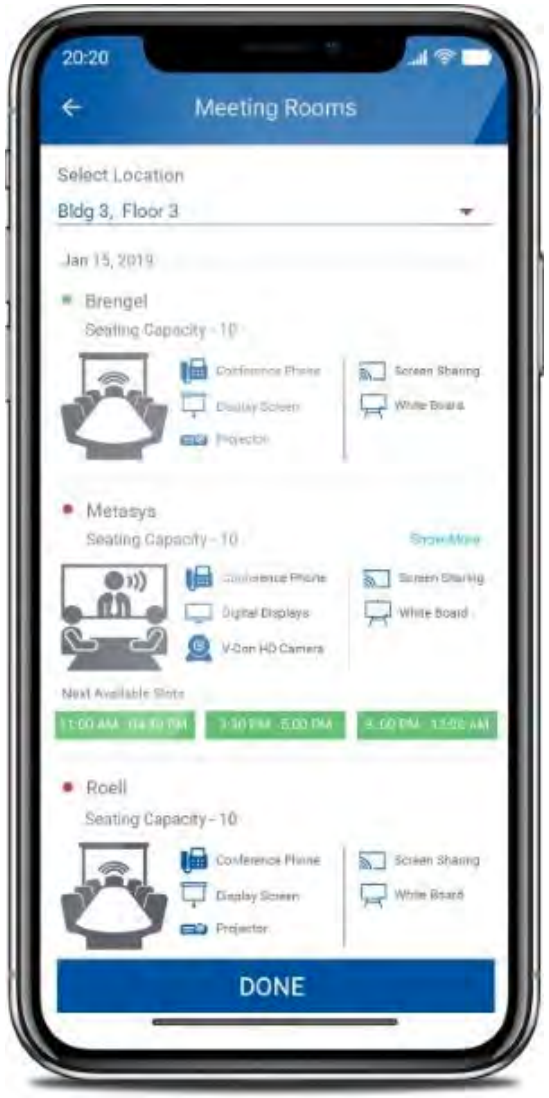
* The energy use breakdown of tenant-owned equipment is not collected in the LL87 submission forms which may impact the overall building energy use breakdown data. Original LL87 data has not been adjusted to accommodate for this limitation.

Sources: NYC Mayor's Office, LL87 Data



Tenant energy management + Wellness

- Increased importance of remote visibility of bldg. operations, indoor air quality, occupancy counting.
- Occupancy down to 2% but energy consumption only down ~15-20% highlights role of tenant-controlled loads.



Questions?

Send through the Question feature in GoTo Meeting

Contact Us

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thomas.yeh@nyserda.ny.gov

Learn more and connect with RTEM:

nyserda.ny.gov/RTEM

Have specific questions? Email:

rtem@nyserda.ny.gov

Final Results on Energy Savings, Costs, and Benefits from the Smart Energy Analytics Campaign

Wednesday, October 28, 2020 1:00-2:00 pm ET

Register Now