



Better Buildings Alliance
Renewables Integration
Technical Research Team

Team Call -
Bridging the Gap
Between Efficiency &
Demand Response

November 5, 2019
1:00 – 2:00 PM EST

Welcome!

RENEWABLES INTEGRATION

<https://betterbuildingsinitiative.energy.gov/alliance/technology-solution/renewables-integration>



Strategic use of renewables can help businesses reduce energy costs and their environmental footprint. The Renewables Integration Technology Research Team is pleased to provide resources, information and guidance on integrating renewable energy into your building portfolio.



Renewables Integration – Team Goals

- Strategic use of renewables
- Building load flexibility
- Grid coordination
- Provide resources, information, and guidance on these topics to building owners and managers

Call Agenda

- Introduction & Quick Announcements
 - Rois Langner, NREL
- Technical Presentations:
 - Dan York, ACEEE
 - Craig Wright, Aurora Public Schools
 - Gregg Fischer, Tishman Speyer
- Discussion and Q&A
 - Rois Langner, NREL
 - Theo Kassuga, Navigant

Renewables Integration – Team Players

Technical Team Lead:

Rois Langner

Commercial Buildings Research Group,
NREL

E: Rois.Langner@nrel.gov

P: 303-204-7026



Renewables Integration – Team Players

Technical Team Support:



Theo Kassuga

Managing Consultant, Energy
Navigant



Bill Goetzler

Managing Director, Energy
Navigant

Announcements – GSA Proving Ground/HIT Catalyst

GSA Proving Ground Program – Request for Information (RFI)

- DOE & GSA [joint RFI](#) was released October 9th
- [Informational Webinar](#) on November 7th
- Goals:
 - Identify technologies, solutions, energy/services to cost-effectively provide building load flexibility as part of a GEB strategy
 - Coordinated packages of measures, controls, and/or services to be implemented at a test site

Announcements – Recent Publications

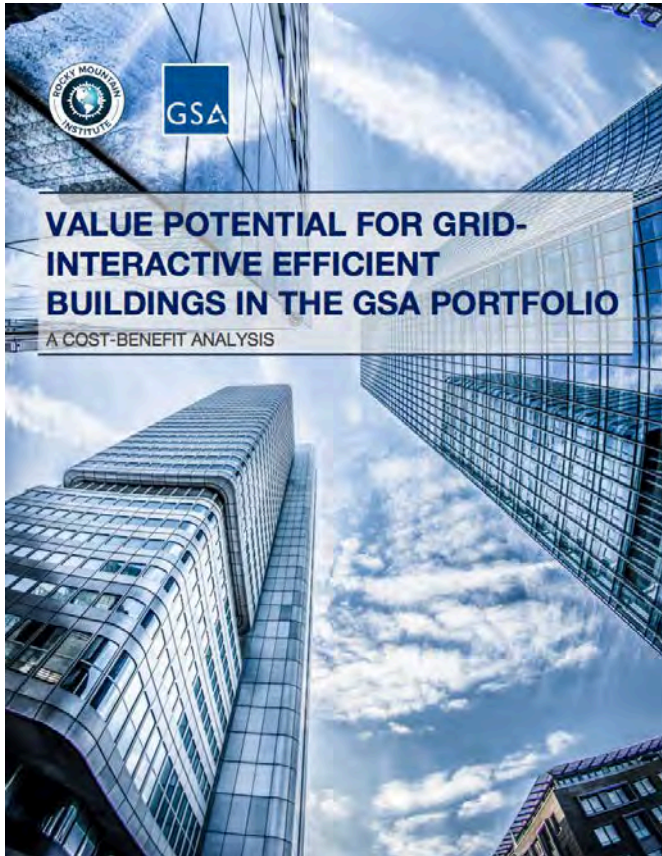


Grid-Interactive Efficient Buildings: Overview

DOE: https://www.energy.gov/sites/prod/files/2019/04/f61/bto-geb_overview-4.15.19.pdf

- Building demand flexibility and associated grid services
- Grid-interactive efficient buildings
 - Characteristics
 - Strategies for optimization
 - Knowledge gaps & future research opportunities

Announcements – Recent Publications



Value Potential for Grid-Interactive Efficient Buildings in the GSA Portfolio: A Cost-Benefit Analysis

RMI: <https://rmi.org/insight/value-potential-for-grid-interactive-efficient-buildings-in-the-gsa-portfolio-a-cost-benefit-analysis/>

Announcements – Study Participation

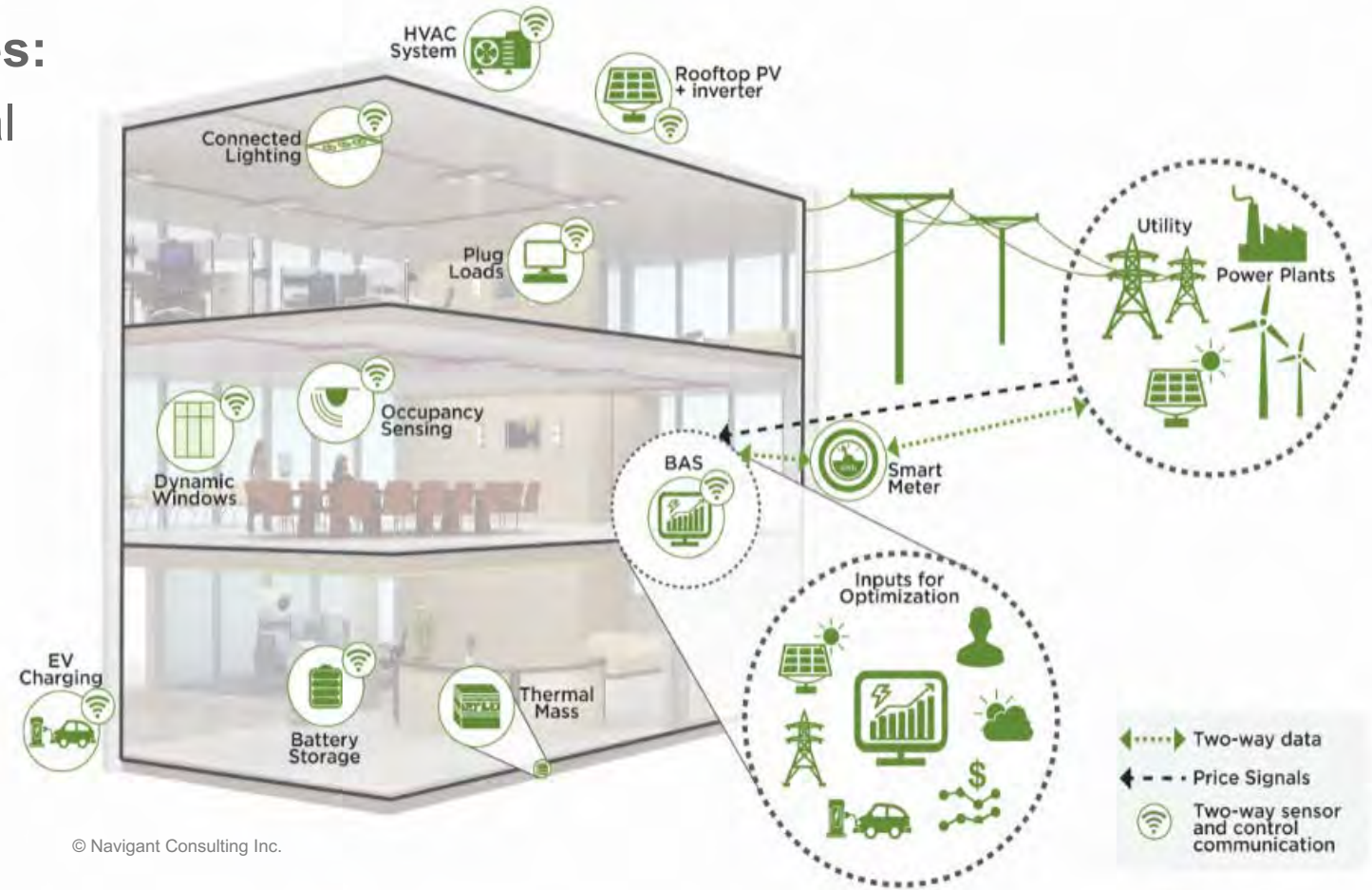
Looking for participants for two studies:

- Portfolio analysis: understand potential for load flexibility (optimized demand management)

Interested? Email us!

Rois Langner: Rois.Langner@NREL.gov

Theo Kassuga: Theo.Kassuga@Navigant.com



Announcements – Team Calls

Better Buildings Alliance *Renewables Integration* Team

Team Calls

- **New topics every couple months**
- **Did you miss the last one?**
 - Find it on the Better Buildings Solution Center:
 - **April 9th:** [Building Load Flexibility and Grid Coordination](#)
 - **June 25th:** [EV's – Buildings as the New Gas Station](#)



Have questions? Email us!

Rois Langner:

Rois.Langner@NREL.gov

Theo Kassuga:

Theo.Kassuga@Navigant.com

Today's Presenters



Dan York
Senior Fellow
ACEEE



Craig Wright
Natural & Renewable Resources Manager
Aurora Public Schools



Gregg Fischer
Director of Energy Systems
Tishman Speyer



Technical Presentation:
Dan York, ACEEE





Integrated Energy Efficiency and Demand Response Programs

Dan York

Senior Fellow, Utilities and Local Policy

5 November 2019

Better Buildings Alliance Renewables Integration Team

Agenda

- Scope of research
- Benefits of integration
- Enabling technologies
- Findings
 - Levels of program integration
 - Program landscape and examples
- Barriers to integrated programs
- Related development: GEBs

Scope of integrated EE/DR research

- Research focused on programs that integrate energy efficiency and demand response
- Research goals:
 - Characterize the landscape of integrated programs
 - Identify benefits, barriers, enabling mechanisms, and challenges to integration
 - Provide lessons for integrating programs

Benefits of integration

Commonly realized benefits:

- Customer bill savings
- Increased participation and program satisfaction
- Lower program costs

Emerging benefits:

- Increased resource adequacy and grid reliability
- Grid congestion relief
- Earnings opportunities (e.g. shareholder incentives)

Benefits not yet realized:

- Increased wholesale competition & lower wholesale prices
- Increased availability of ancillary services

For residential buildings, enabling technologies are:

- Smart and Wi-Fi enabled thermostats & appliances
- Advanced metering infrastructure (AMI)
- Direct load control switches
- Mobile apps and marketplaces



For commercial buildings, integrated EE/DR requires these capabilities:



Central control system



Smart components



Equipment with embedded controls

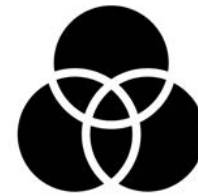
Research findings

Despite benefits—are still few fully integrated EE/DR programs

- Starting data set: 52 largest electric utilities (includes IOUs and munis)
- Of 44 utility plans ACEEE reviewed, found only 5 programs at highest level of integration
- Only 22 programs with some degree of integration
- Most programs are residential – few C/I programs
- Smart thermostats are prevalent: gateway to integration

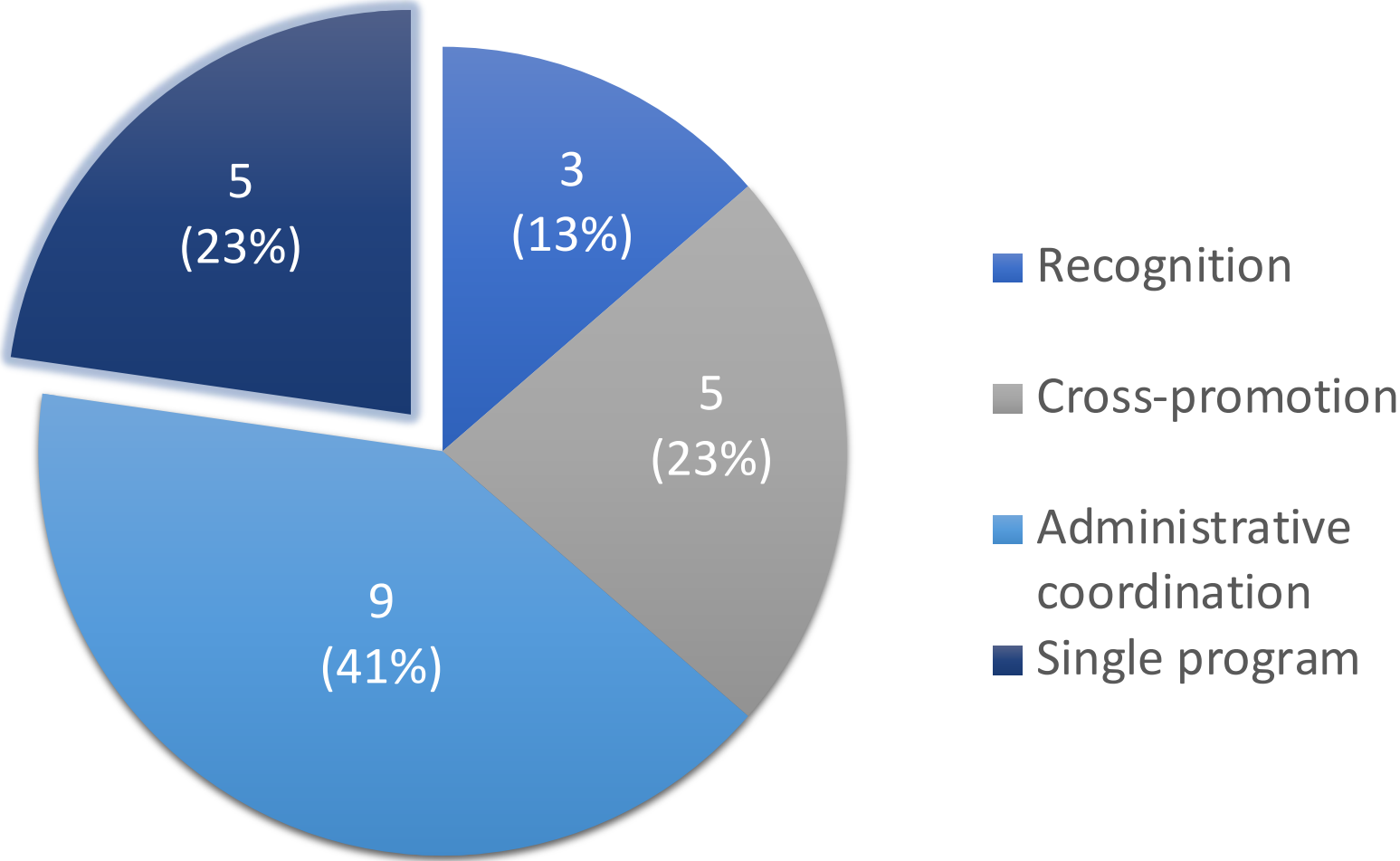
We found 4 levels of integration

- Level 1: Recognition of EE or DR capabilities
- Level 2: Cross promotion of programs
- Level 3: Administrative coordination
- Level 4: Single fully integrated program



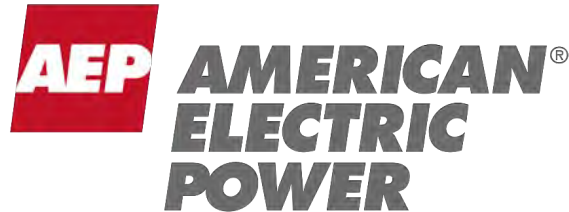
RECOGNIZE → PROMOTE → COORDINATE → INTEGRATE

Program offerings



Some programs use creative ways to combine EE and DR value streams.

- AEP It's Your Power: Energy management app for homeowners
- PG&E ADR Program: Additional EE incentives for DR customers
- Southern Company Smart Neighborhoods: Aggregating DERs



AEP Ohio: It's your power

- Smart home and demand response program with 3 elements:
 - Mobile app with marketplace
 - Energy Bridge
 - Connected equipment and devices



Source: AEP OH

Baltimore Gas & Electric: Home Energy Check-Up and PeakRewards

- Simultaneous enrollment
 - Quick home energy check-up
 - Provides measures including LEDs, smart power strips, faucet aerators
 - Peak rewards demand response program



Commercial/industrial programs

- Level 1: Recognition
 - **ComEd: Smart Buildings Operations Pilot:** real-time energy optimization program—primarily EE, includes DR targets
 - **Duke Carolinas/Duke Progress: EnergyWise Business Program—**HVAC cycling DR program, some t-stat EE savings
- Level 2: Cross Promotion
 - **ComEd:** Smart t-stat included in multiple programs—EE and DR are cross promoted
 - **Eversource Massachusetts:** facilitate enrollment in EE and DR – promote technologies eligible for both
 - **National Grid New York:** Electric C&I Retrofit Program – promotes connected tech to enroll customers in DR programs

Commercial/industrial programs

- Level 3: Administrative coordination
 - **Xcel Energy Colorado:** Energy Management Systems Program offers incentives for peak demand and energy reductions
 - **Oncor:** 3rd parties administer Load Management Standard Offer program; some also offer EE programs
 - **Southern California Edison:** coordinates program administration—applications, marketing, education, and outreach.
- Level 4: Integration
 - **NV Energy:** PowerShift Commercial Energy Services – single program and appointment to offer rebates for EE equipment, assessments, and smart t-stats that can be enrolled for DR

Barriers and challenges

- **Internal organization of utilities** – separate teams/business units for EE and DR (silos)
 - Different goals, budgets, business cases
 - Difficulties in coordination and communication
- **Regulatory hurdles**
 - Evaluating cost-effectiveness
 - Rate structures, funding
- **Conflicting objectives:** saving kWh vs. targeted kW
- **Technologies:** despite advances, still can be problems



Key Takeaways

- There are few fully integrated programs
- New technologies are creating opportunities for integration
- Residential smart thermostat programs are the most prevalent among current offerings.
- Organizational changes and supportive regulation will reduce barriers to integration.

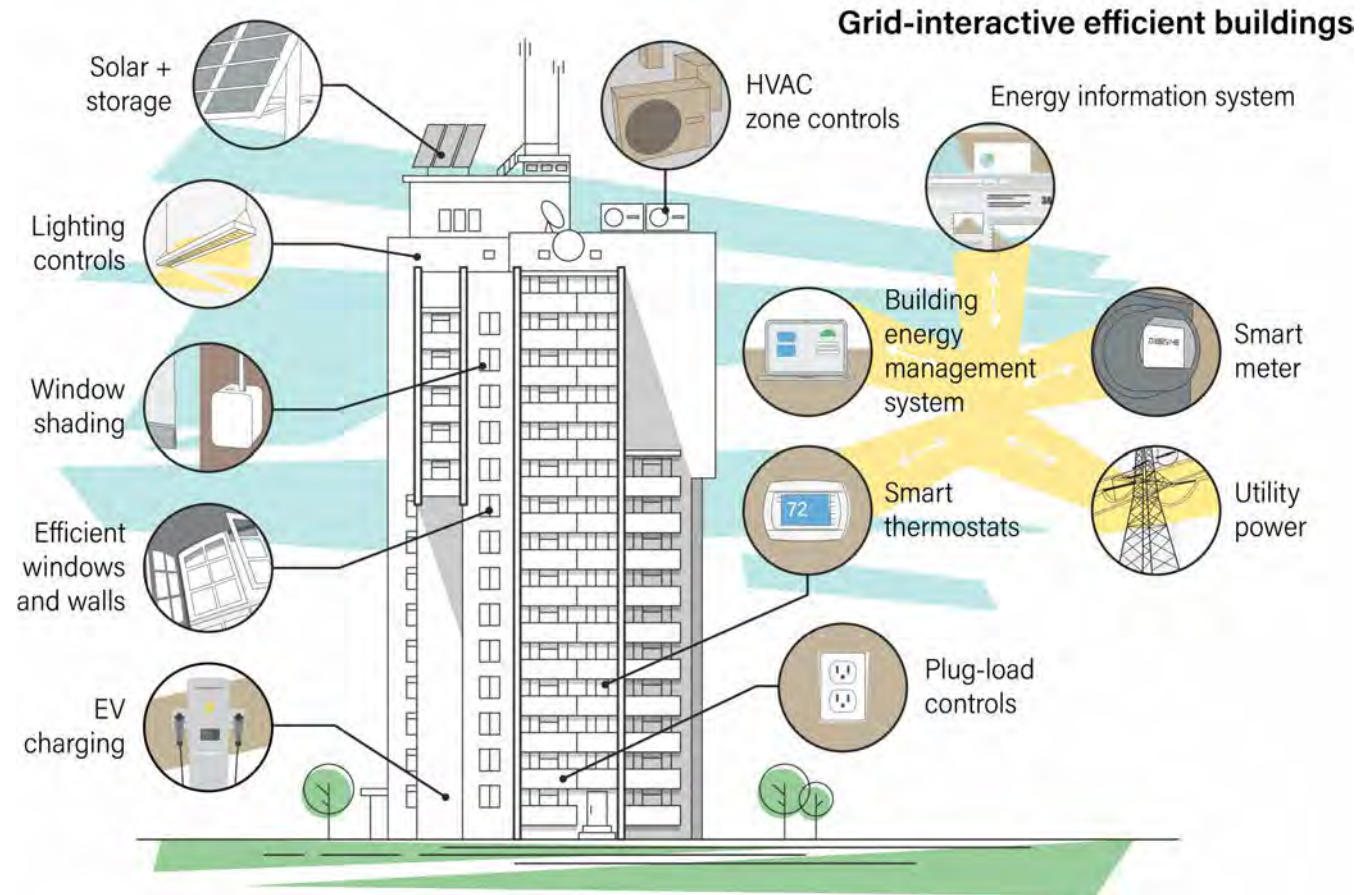
Administrators should pursue integrated programs when the net benefits outweigh the costs of integration.

Next step for integration:
Grid-interactive efficient buildings (GEBs)
Smart, connected buildings

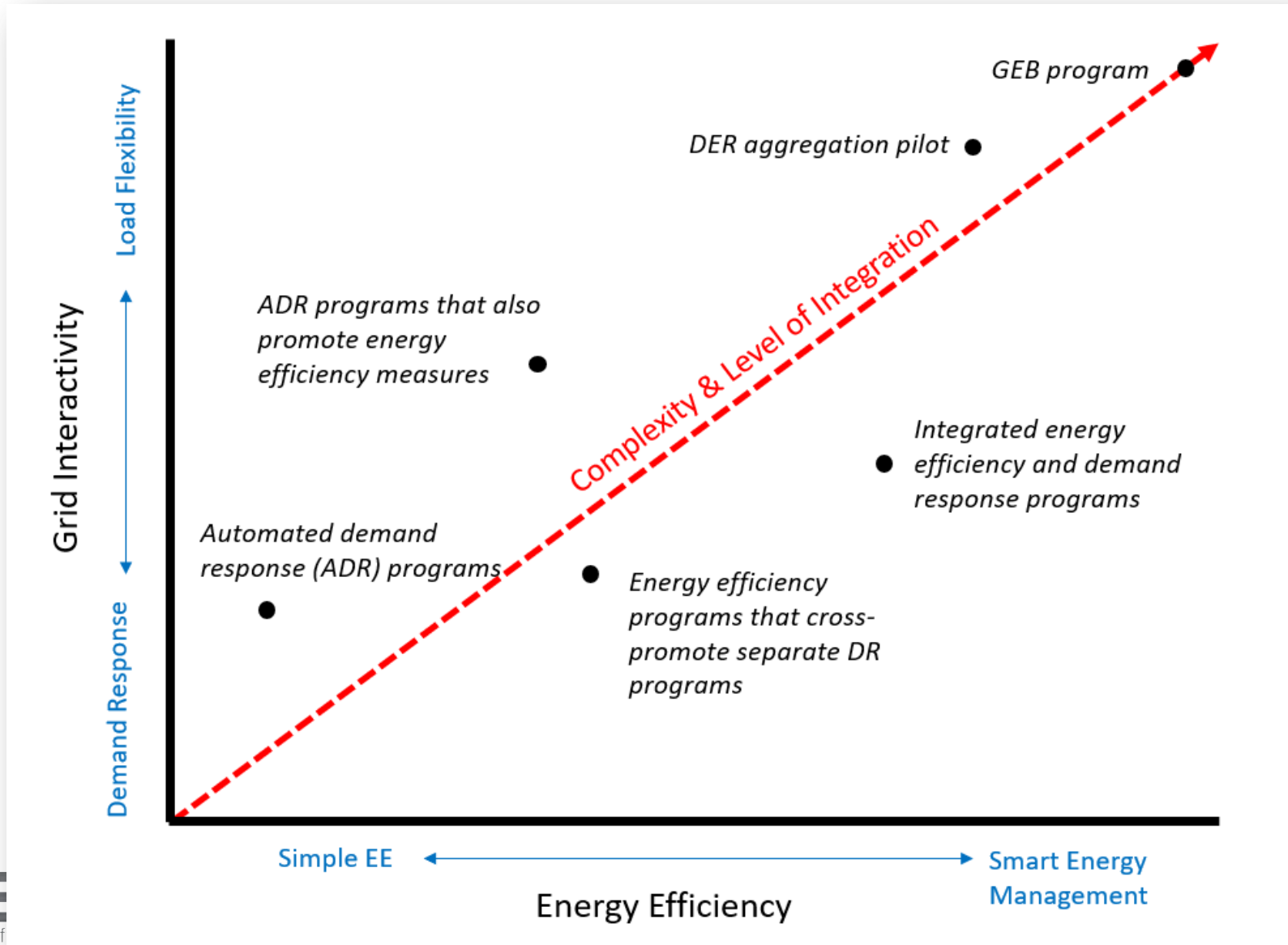
- Grid connectivity is rapidly becoming important --- response to/need created by rapid growth of DERS
- GEBs: Energy-efficient buildings with the ability to be demand flexible
- No real programs yet---mostly research and demonstration projects



Key GEB technologies can save energy and/or interact with the grid



ACEEE research on GEBs: We found no full GEB programs or pilots; Instead, a spectrum of EE and grid interactivity



From an industry perspective, top barriers for smart buildings and GEBs include:



Interoperability



Cybersecurity



Workforce

Thanks! For more info or questions—also our
GEB Utilities Working Group:

Dan York

Email: dwYork@aceee.org

Phone: 608-243-1123

ACEEE Publications

Integrated Energy Efficiency and Demand Response Programs

<https://aceee.org/research-report/u1906>

*State of the Market: Grid-Interactive Efficient Utility
Programs*

<https://aceee.org/white-paper/gebs-103019>





Technical Presentation:

Craig Wright,
Aurora Public Schools





Aurora Public Schools

Demand Response/Mitigation Efforts

Presented by:

Craig Wright – Natural and Renewable Resources Manager
Aurora Public Schools, Aurora, Colorado

Prior Demand Response Experience

- Utility Rebated Pilot Program
- Motivation
 - Utility could send signal to immediately curtail demand
 - District could take advantage of technology's suite of diagnostic and energy conservation capabilities
- Vendor supplied DR software directly interfaced with school's building automation system (BAS)
 - Shed loads by changing setpoints

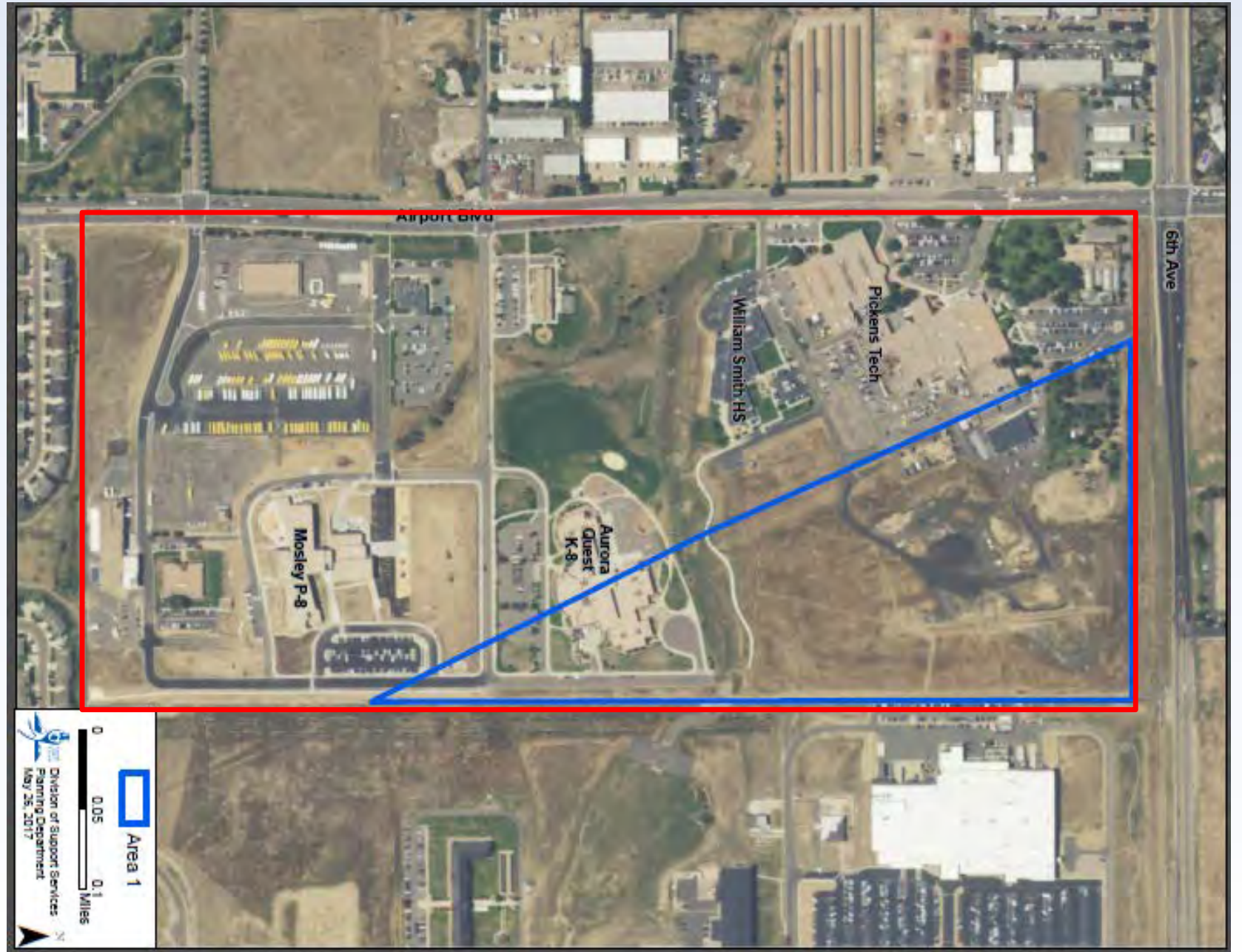


Lessons Learned

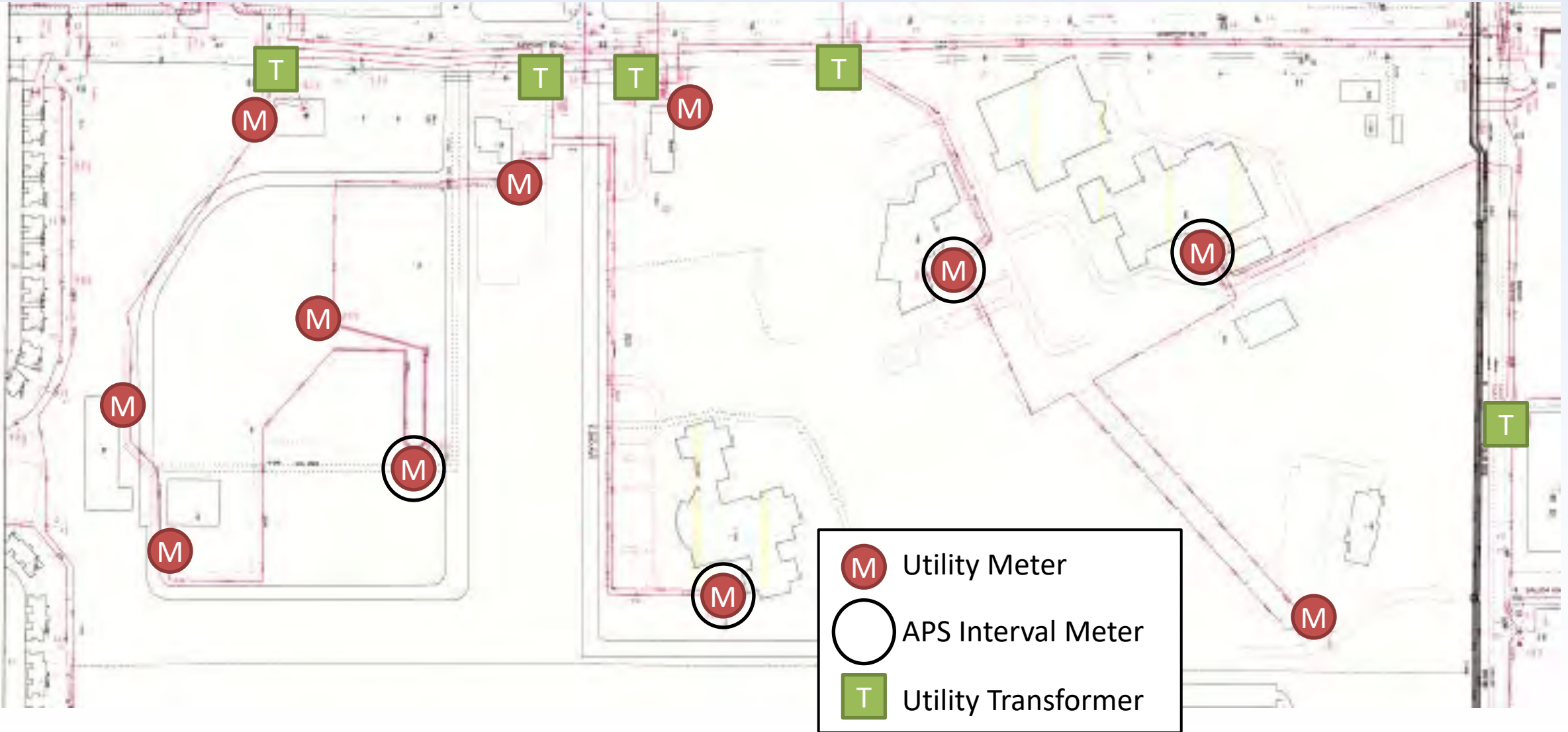
- Common goals:
 - DR Vendor – Ease of connectivity depends on consistent, well annotated programming (i.e. Project Haystack)
 - BAS Installation/Service Provider – View technology as an opportunity, not a threat
 - Owner – Train technicians on what system will and wont do. Buy-in to limitations
 - Utility – Develop technical competency to support implementation



Aurora Community Campus

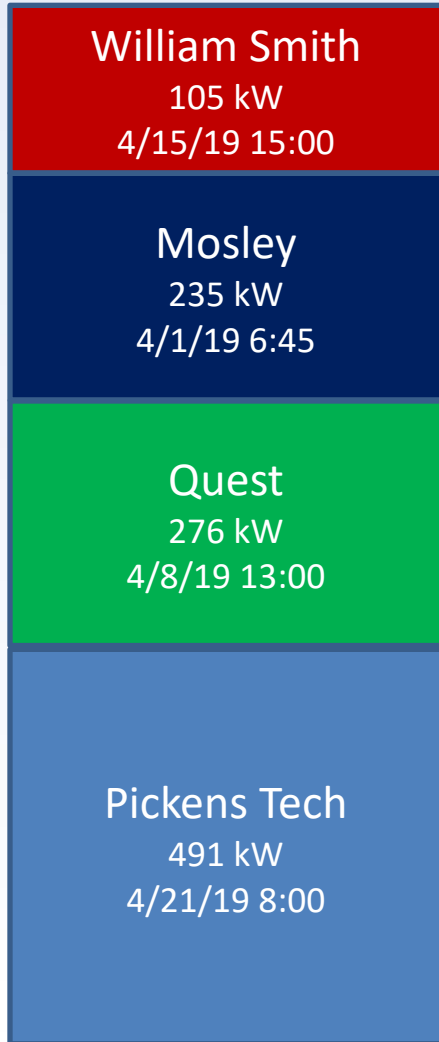


ACC Electrical Infrastructure



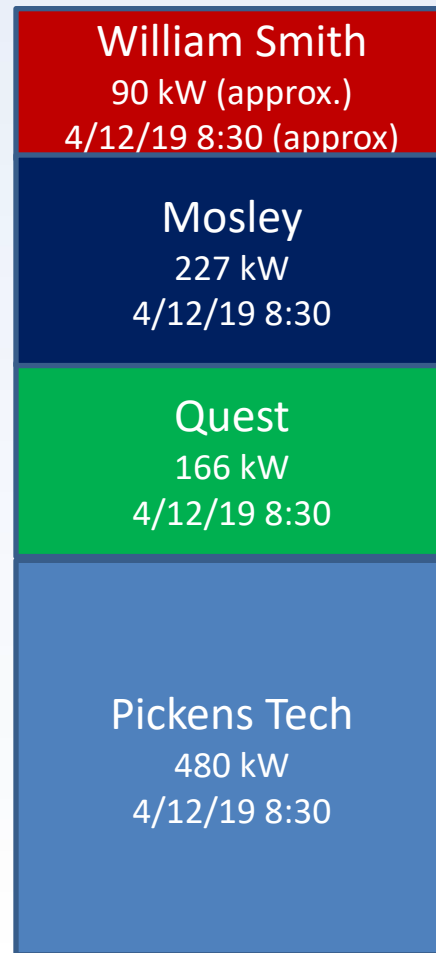
Annual Peak Demand Comparison

APRIL 2019



1107 kW
x \$18.51/kW
\$20,491

8:30, APRIL 12, 2019



963 kW
x \$16.41/kW
\$15,803

Utility Rates

Primary General (PG) = \$16.41/kW

Secondary General (SG) = \$18.51/kW

75% of Building Area



Annual Savings - SG to PG Rate

April Demand Reduction

1,107 kW

- 963 kW

144 kW Saved (13%)

April Cost Reduction

\$20,491 SG

- \$15,803 PG

\$ 4,688 Saved (23%)

100% of Building Area

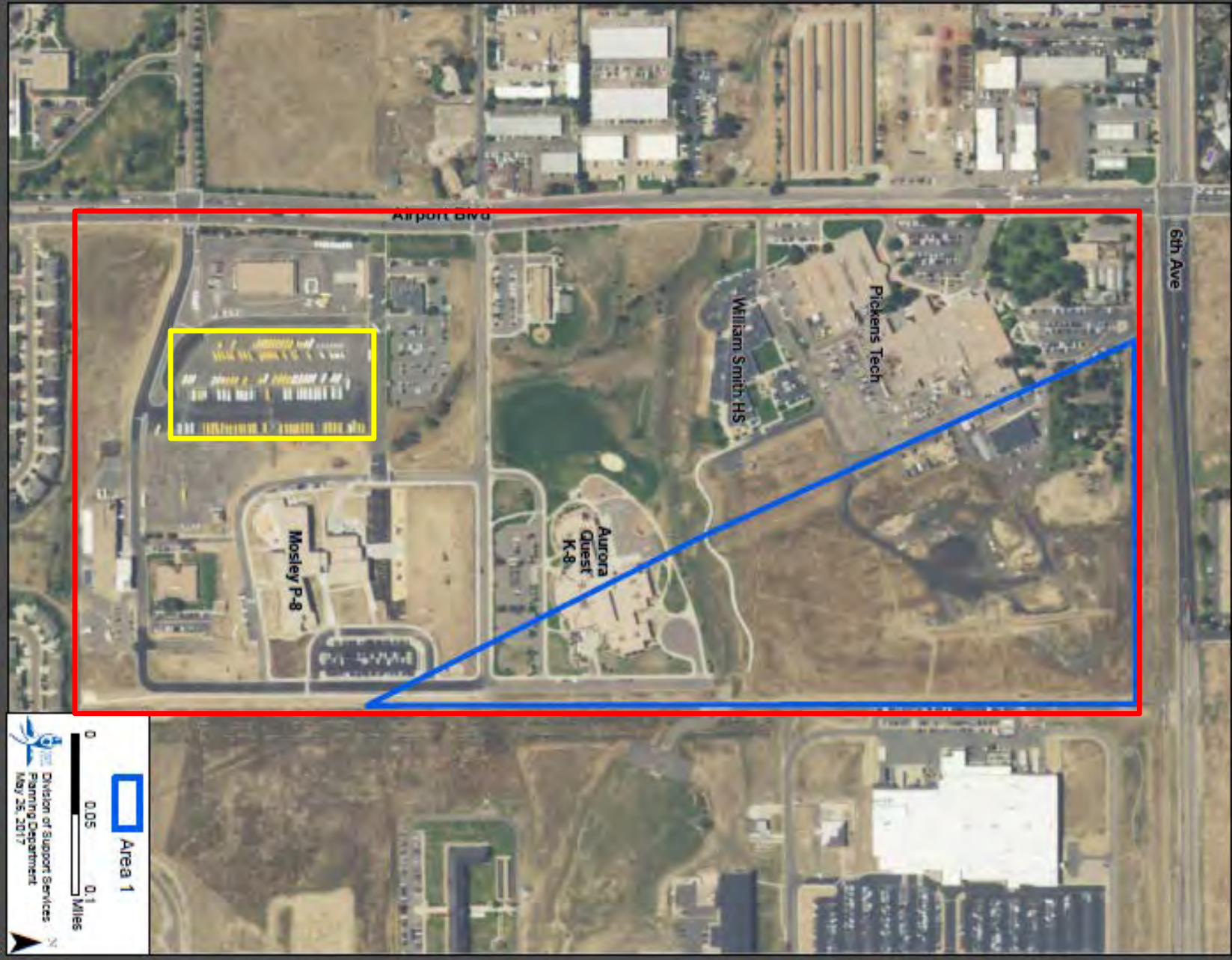
$\$4,688 / 0.75 = \$6,251$

Annual Savings

x 12 months = **\$75,000 saved/year**



Aurora Community Campus Solar+Storage

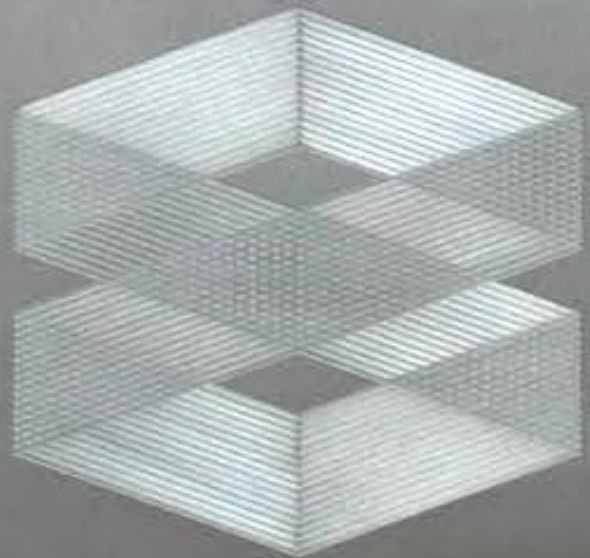




Technical Presentation:

Gregg Fischer, Tishman Speyer





TISHMANSPEYER

- Director of Energy Systems
- Sustainability + Utilities @ Tishman Speyer
- Oversee building and energy systems for the US portfolio (50,000,000 SF)
- Based out of Rockefeller Center in NYC (global HQ)
- Focus:
 - Building Automation
 - Energy Monitoring/Management
 - Fire Alarm
 - Security/Card Access
 - Lighting Controls
 - Energy Supply Contracts
 - Tenant Billing Systems



Tishman Speyer: Company Profile

- Established 1978
- 80,000,000 sqft of class A commercial office space and luxury residential globally
- \$90,000,000,000 in assets in 30 markets, 7 countries and 4 continents
 - Rockefeller Center
 - 200 Park
 - 11 W42nd Street
 - 520 Madison Ave
 - 300 Park
- 2000+ tenants worldwide
- Divisions:
 - Sustainability + Utilities
 - Design & Construction
 - Investment Management
 - Property Management
 - Leasing
 - Acquisition and Development
- 1200+ real estate professionals



Temporary Demand Reduction Programs/Strategy: NYC, WDC, CHI, LA, BOS

MARKET	PROGRAM	AVERAGE		2019		2018		2017		2016		2015		2014		2013	
		# of EVENTS	# of HOURS	# of EVENTS	# of HOURS	# of EVENTS	# of HOURS	# of EVENTS	# of HOURS	# of EVENTS	# of HOURS	# of EVENTS	# of HOURS	# of EVENTS	# of HOURS	# of EVENTS	# of HOURS
NYISO	NYISO SCR	1	4.57	0	0	1	5	0	0	1	5	0	0	0	0	5	22
	ConEd CSR	0.7	2.9	2	8	3	12	0	0	0	0	0	0	0	0	0	0
	ConEd DLRP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PJM	ComEd, PEPCO, DOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ISONE	ADCR	0.7	0.1	0	0	1	3:45	0	0	1	3:30	0	0	0	0	3	13:10
CAISO	LCR	10.5	2.4	11	32	10	25										

New York	Boston	DC	Chicago	California
Fuel Switching	Low Flow/Low Temp	Fan Reduction	Heat Reduction (W)	Battery Storage
Thermal Storage	Lighting	Exhaust Fans	Fan Reduction (S)	
Fan Reduction	Exhaust Fans		Lighting	
Lighting			Exhaust Fans	



ENERGY CONSERVATION DAYS

Reducing energy usage helps conserve natural resources and benefits the environment.

THREE energy-conserving techniques for you to adopt:

1. Shut down equipment after work hours (i.e., copiers, printers, etc.)
2. Lower shades and blinds
3. Turn off lights

Tishman Speyer thanks you for your participation.

To learn more about sustainability initiatives at Tishman Speyer, please visit: tishmanspeyer.com/sustainability



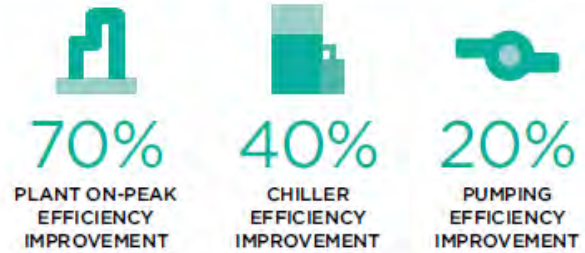
TISHMAN SPEYER



Permanent Demand Reduction Strategy: Thermal Storage



TOTAL ON-PEAK PLANT EFFICIENCY



2019: 20,000 Ton-Hrs of ice
(2,000,000 lbs)

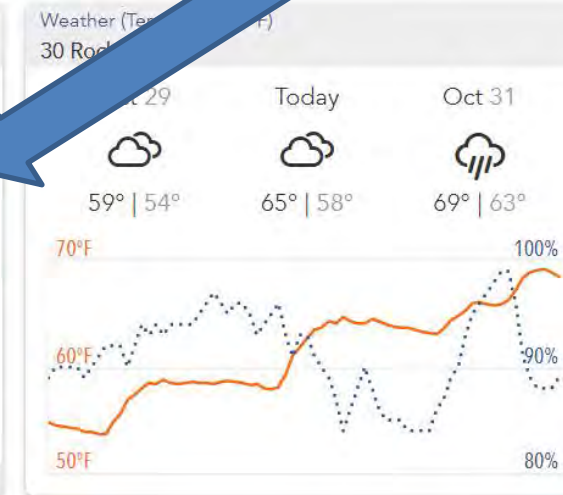
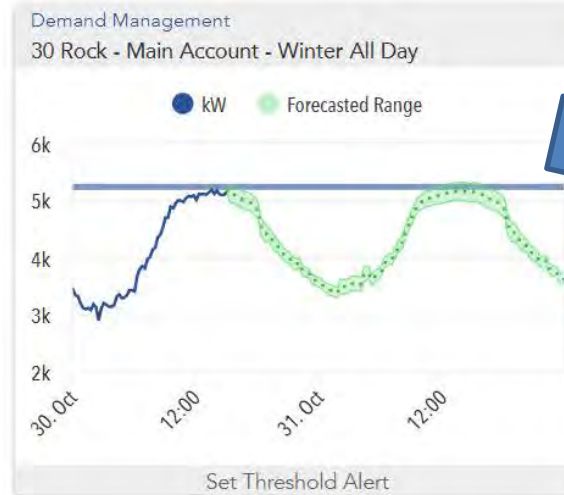
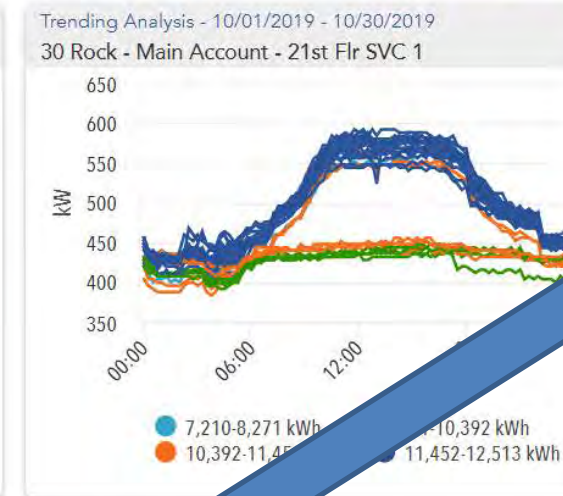
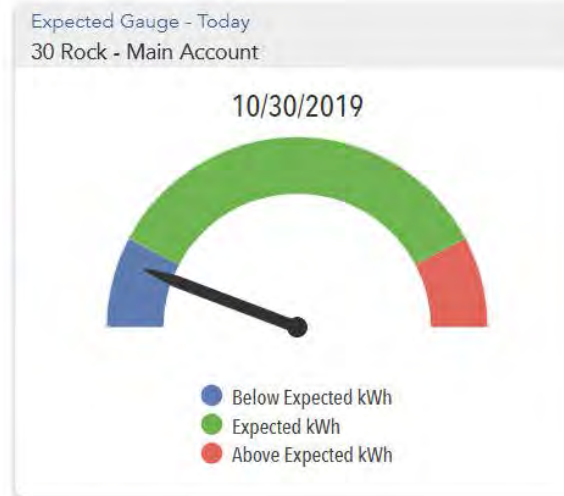
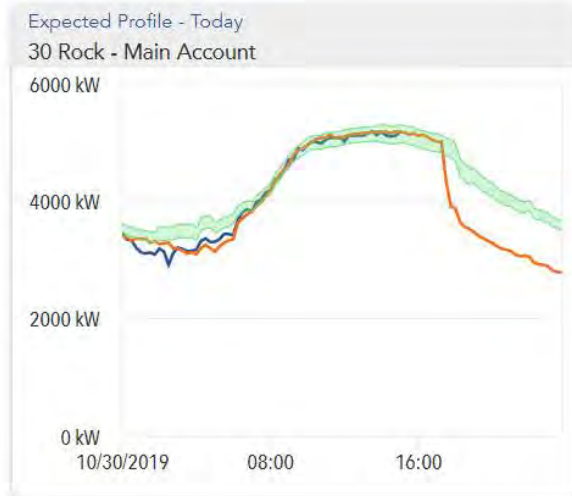
Permanent Demand Reduction Strategy: Energy Management System

Dashboard

Demo Share

TALK WITH AN ADVISOR

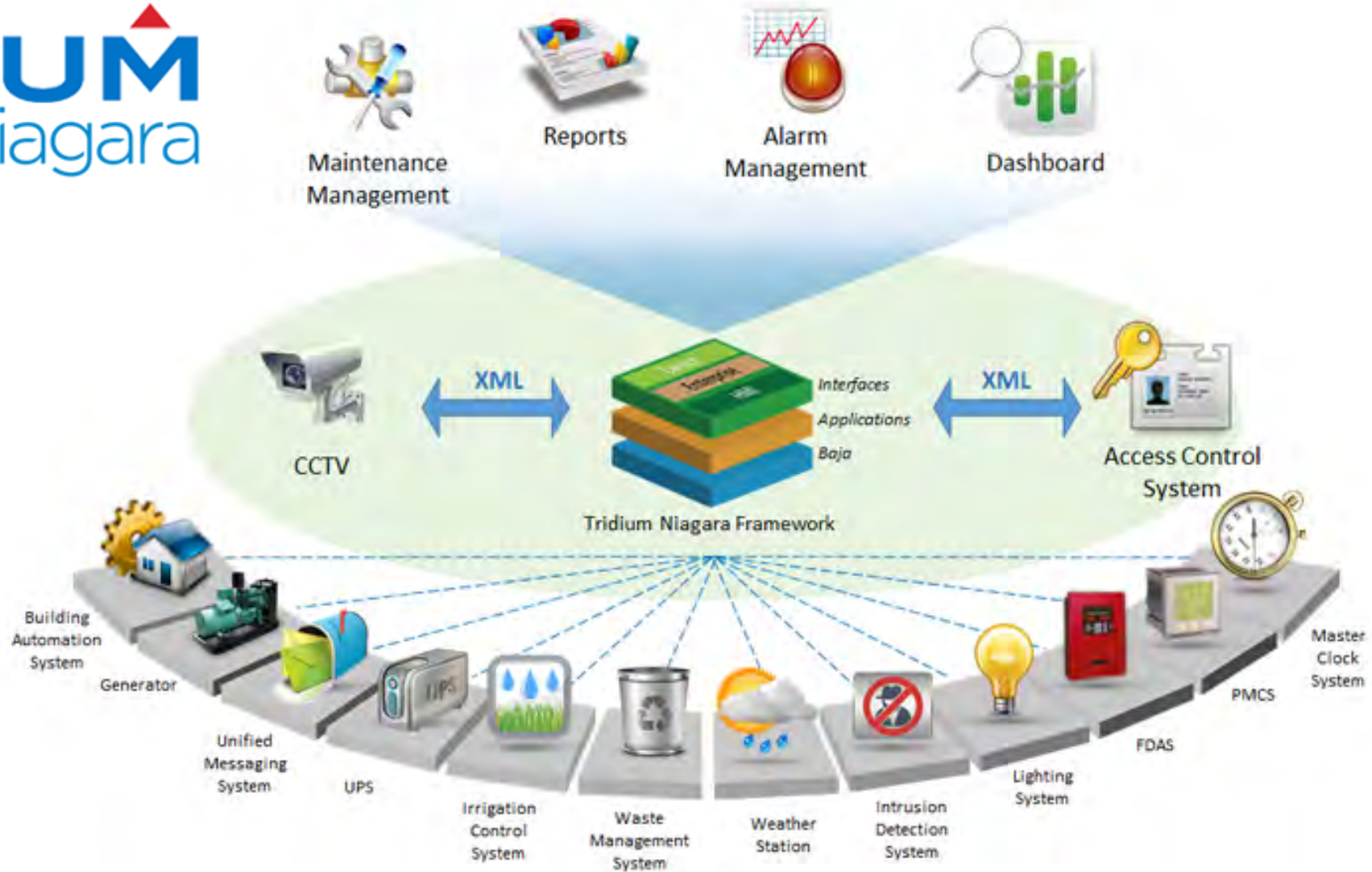
ADD WIDGET VIEW +



- Live demand management
- Limitations for demand response: eclipsing ratcheted peak demand windows
- Possible solutions: ratcheted demand window relief on either side of demand response window

Permanent/Temporary Demand Reduction Tools: Technology





Permanent/Temporary Demand Reduction Tools: Expansion



Comments? Questions?

Please share your thoughts!

Thank you!



Email:

rois.langner@nrel.gov
theo.kassuga@navigant.com
to be added to our listserv.

Stay tuned for announcements on
upcoming BBA Renewables
Integration Team calls!