Efficiency Works™

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Efficiency Works Business

The Cutting Edge of Efficiency

July 17, 2019

WELCOME!

Loveland Water and Power

- Safety information
- Bathrooms / kitchen downstairs
- Remember to sign in!
- Upcoming trainings/events

Power your business in new ways

August 29, 2019
Now a webinar – look for details soon!

Fourth annual service provider appreciation social

November 14, 2019
4:00 - 6:30 pm
Budweiser Event Center, The Ranch Bar & Grill

Guest Speaker

Kevin Andrews, E Source

Senior Analyst, Demand-Side Management

Advice for Keeping Large Business Customers Engaged and Enrolled in Utility-Run Programs

Kevin Andrews

Watch E Source senior research analyst Kevin Andrews present the results of the 2016 E Source Large Business Gap and Priority Benchmark and suggest ways to combat the opt-out trend by encouraging large customers to participate in utility-run efficiency programs.

Best Practices for Cost-Effective DSM Programs

Part of the Next Generation of Energy Savings Project

Liza Minor, Kevin Andrews

It can be difficult to maintain program cost-effectiveness in a postlighting world. To help you learn how to build lasting cost-effectiveness, we identified best practices for four core program types as part of our series on the "Next Generation of Energy Savings."

Energy Efficiency in Business

Current landscape and future trends

Kevin Andrews

Research Manager, E Source

E Source

Efficiency Works Business Training

POWERING WHAT'S NEXT

Who we are

A research and consulting firm focused exclusively on utilities and their customers

Clients

We work with over 300 utilities and their partners

Founded

Founded in 1986, we've been in the industry for over 30 years

Headquartered

Boulder, CO

Presentation outline

Current landscape of business energy efficiency

Remaining opportunities with lighting & controls

Business program trends and expenditures

Next-generation business programs and technologies

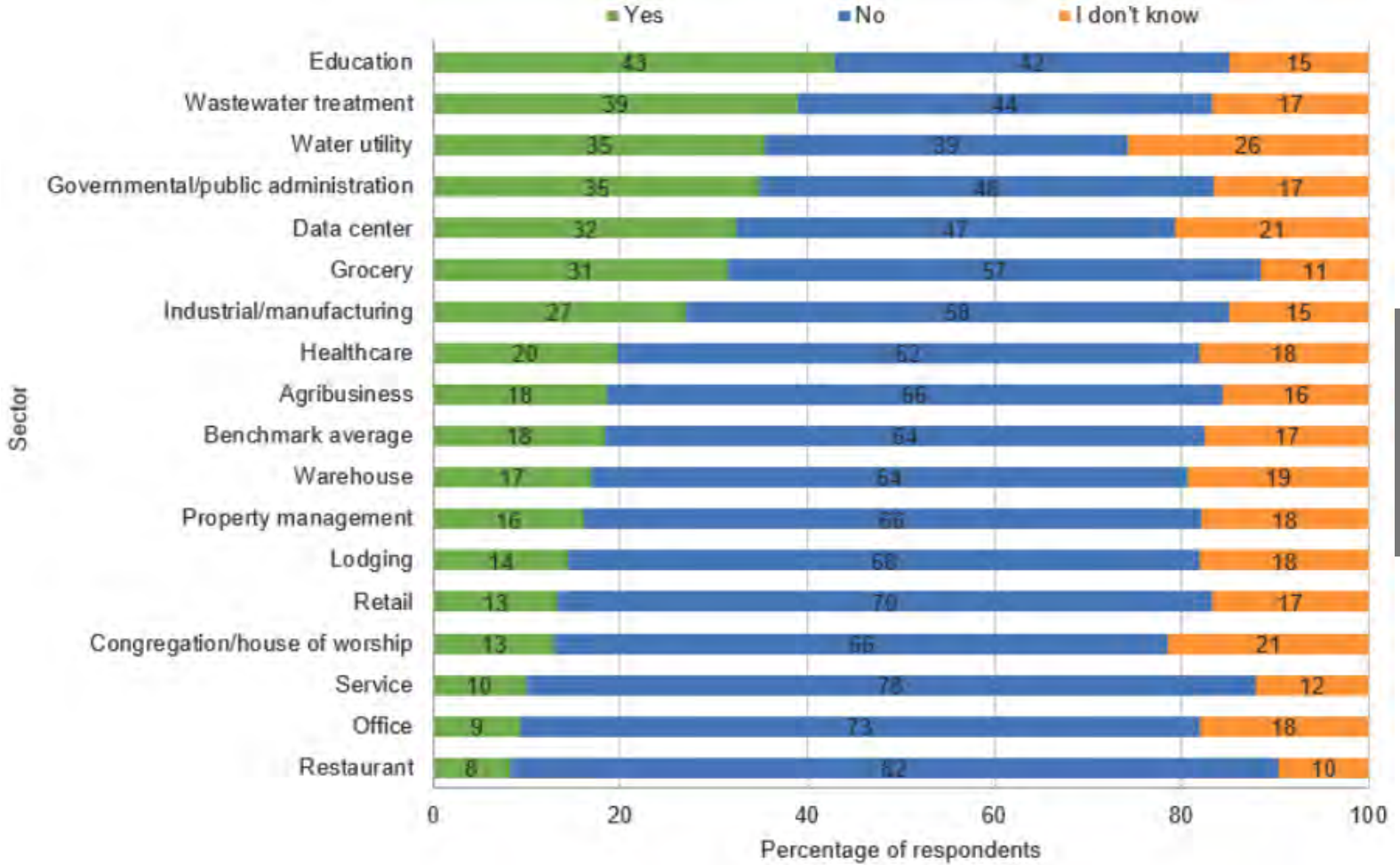
The current (lighting) landscape

This is the million dollar question for the industry

Significant gaps for portfolios, 60% of savings still from lighting, on average

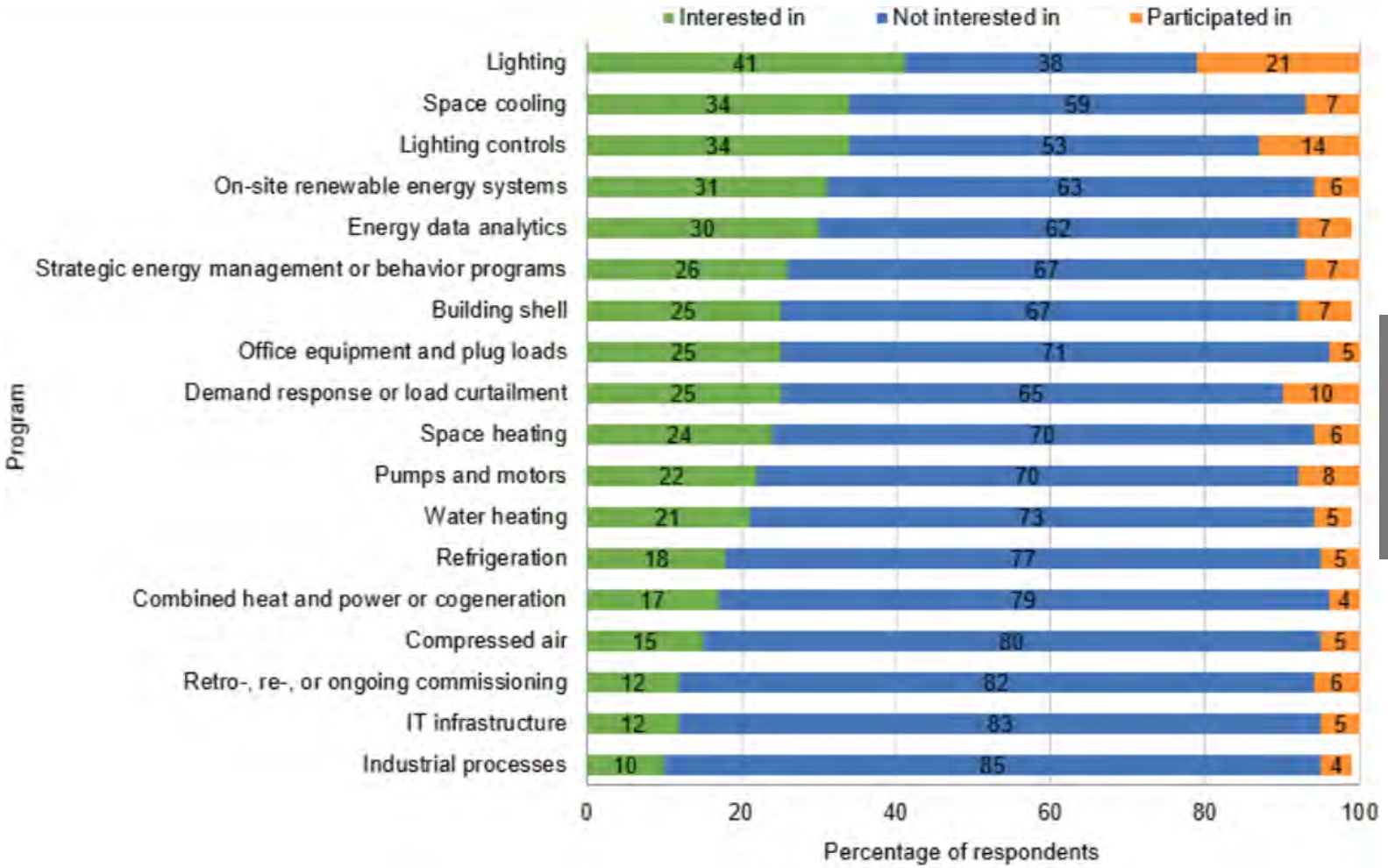
Residential and SMB will be impacted most

Shift to commercial portfolio



Energy Efficiency Program Participation
(n =6,027)

© E Source (2018 Gap and Priority Benchmarks)

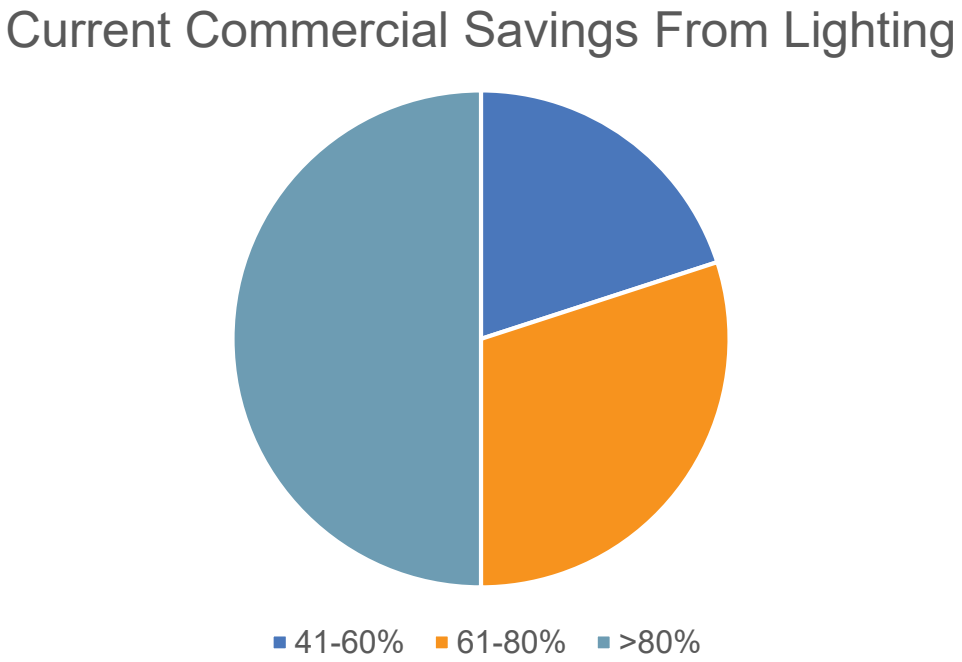


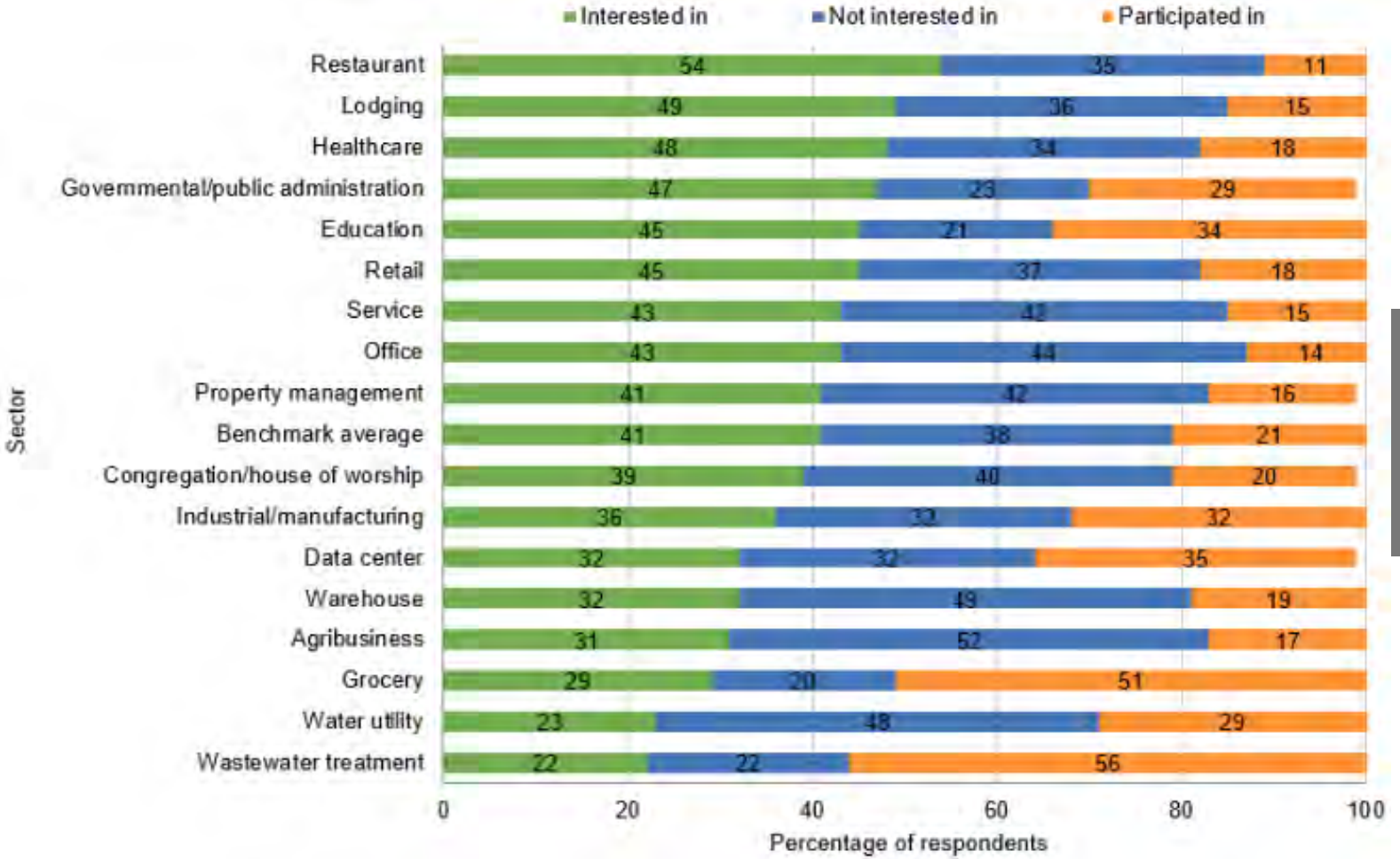
Customer Interest and Participation Rates
(n =5,383)

© E Source (2018 Gap and Priority Benchmarks)

Lighting: Current and Future Opps

Lighting still dominates C&I portfolios





Sector-specific Interest in Lighting (n =5,383)

© E Source (2018 Gap and Priority Benchmarks)

Penetration of LEDs is inching forward

Application	2016 installed penetration
Small directional (MR)	47.6%
Parking garage/lot	32.5%
Building exterior	31.2%
Streetlighting	28.3%
Downlighting	19.8%
Low/High bay	9.4%
Directional (R, BR, PAR)	6.7%
Linear fixtures	6.0%

Source: Adoption of Light-Emitting Diodes in Common Lighting Applications, U.S. Dept. of Energy

Advanced lighting controls

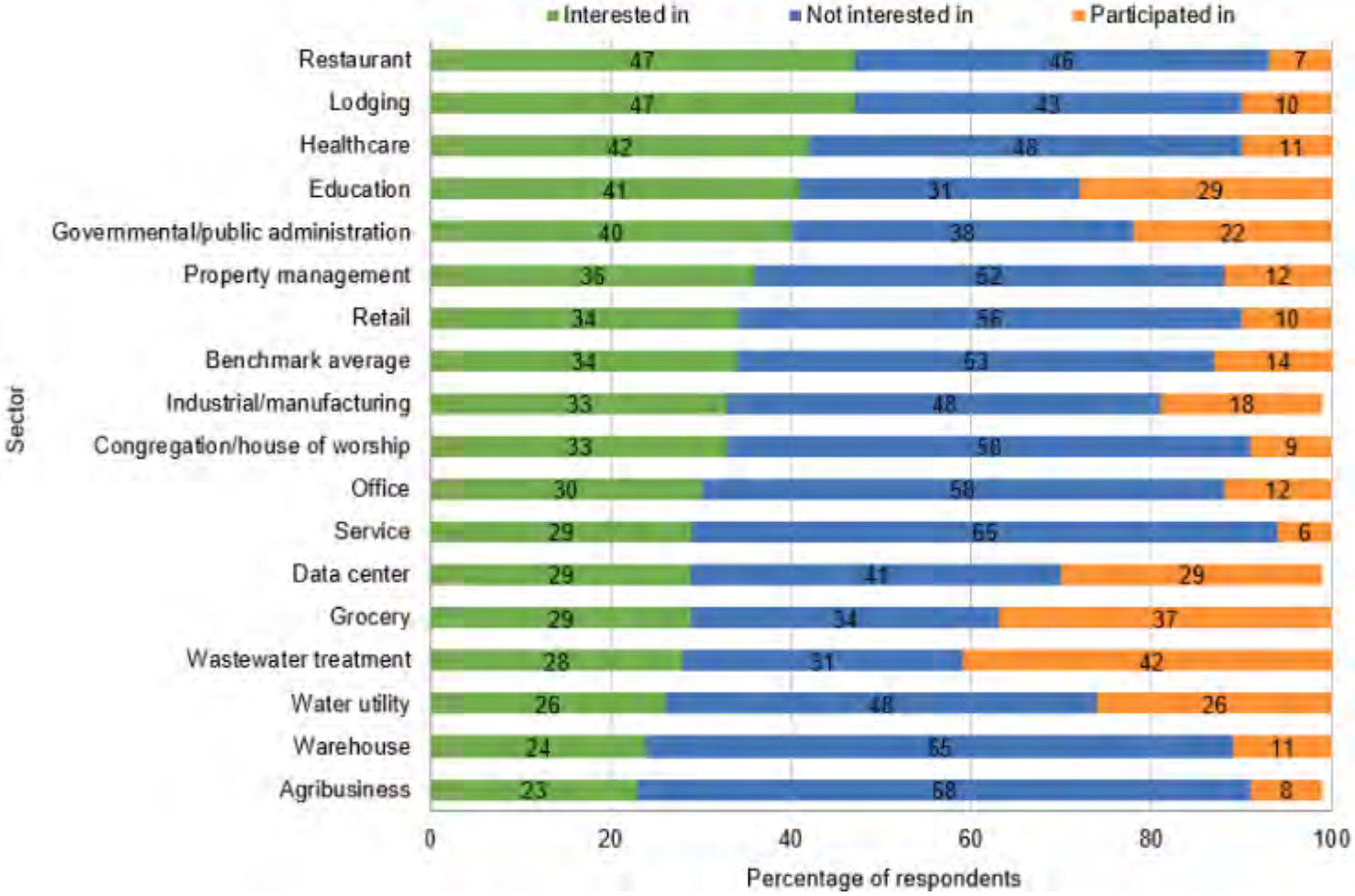
Strategy	Average lighting energy savings from LBNL (%)
Scheduling	n/a
Occupancy-based	24
Daylight harvesting	28
Personal Tuning	31
Task Tuning	36
Combined	38

© E Source; data from the Illuminating Engineering Society and the US Department of Energy

Advanced Lighting Controls

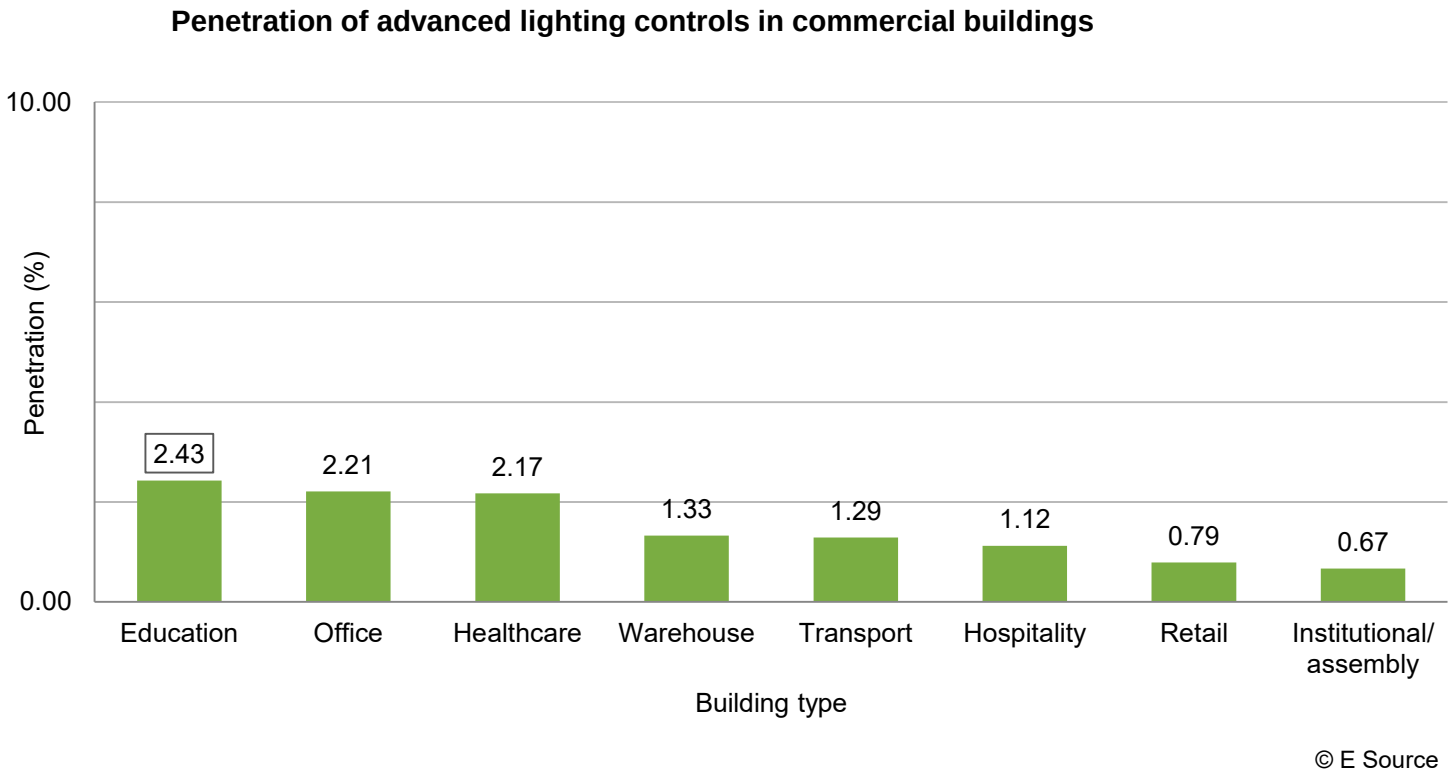
- DesignLights Consortium has specification for Networked Lighting Controls, qualified products list, & case studies

Building Type	# of Buildings	Savings
Assembly	5	23%
School	7	28%
Manufacturing	28	30%
Retail	29	44%
Restaurant	2	47%
Office	39	63%
Warehouse	4	82%
Overall	114	47%



Sector-specific Interest in Lighting Controls
(n =5,383)

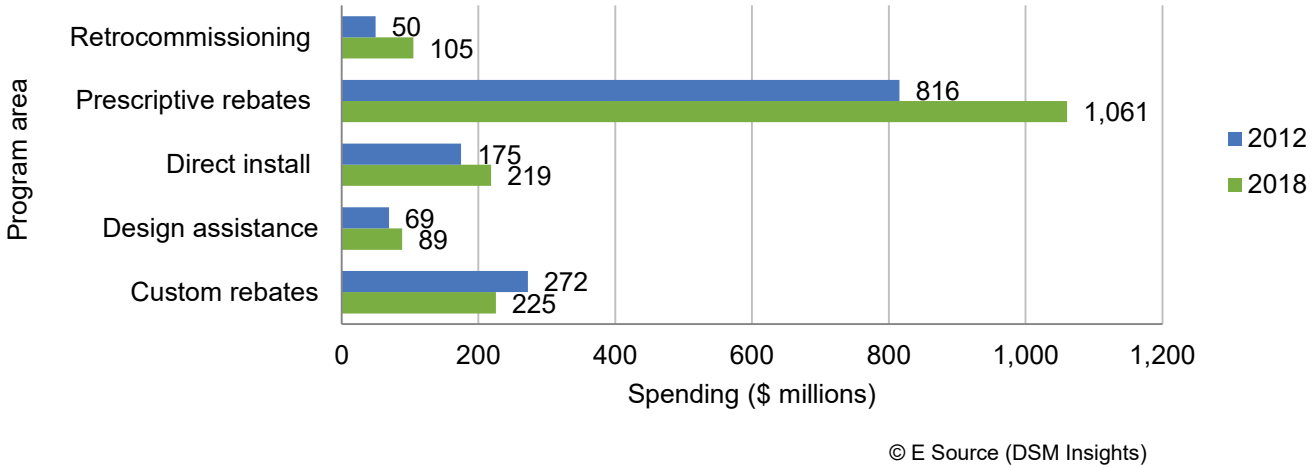
Advanced lighting controls need help



Source: *Commercial Advanced Lighting Control Demonstration and Deployment*, U.S. Dept. of Energy

Next Generation Programs & Technologies

Planned nonresidential expenditures



- Similar to the residential sector, the growth in prescriptive rebate spending is likely due to energy-efficiency program maturation. This moves more measures to prescriptive programs and away from custom rebates. The direct-install program growth is largely from lighting.
- The increase in retrocommissioning program spending represents a trend in utilities seeking out low- and no-cost tune-up projects and a shift to capital-based measures.
- Design assistance spending reflects increases in new-construction projects within the commercial sector.

New non-residential trends

- **Strategic energy management**
- **Pay for performance**
- New cost-effectiveness treatments
- **Integrated DSM**
- Codes and standards
- **Upstream and midstream**
- **Rethinking SMB customers**
- **HVAC & HVAC controls**
- Robust trade ally networks
- Deeper retrofits
- Revised evaluation inputs
- Joint fuel program delivery
- **New motor technologies**

Strategic energy management programs

Pay for Performance

6

programs and pilots

Technology agnostic

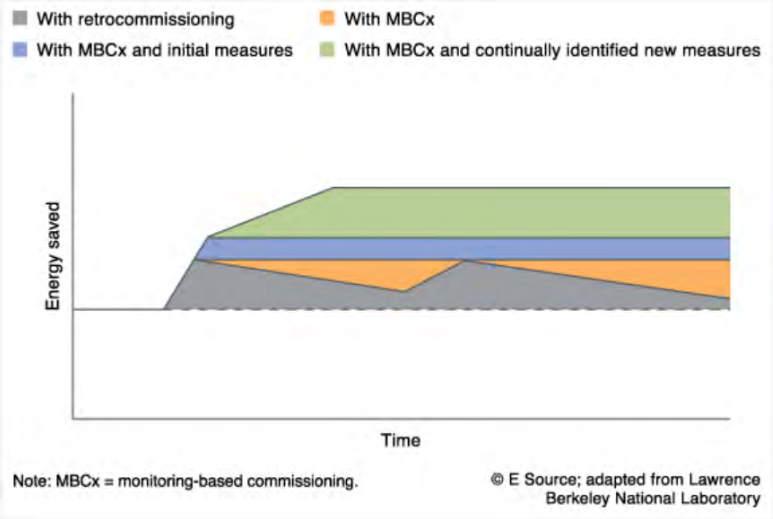
Encourages deeper savings

Potential to lower M&V costs long-term

Keeping the Savings with Monitoring-Based Commissioning

FIGURE 1: Monitoring-based commissioning can save more energy than retrocommissioning

Savings from monitoring-based commissioning are more resilient in a number of ways. By constantly monitoring energy use, the process allows for increased persistent savings along with further gains as new measures are identified to further increase savings over time.

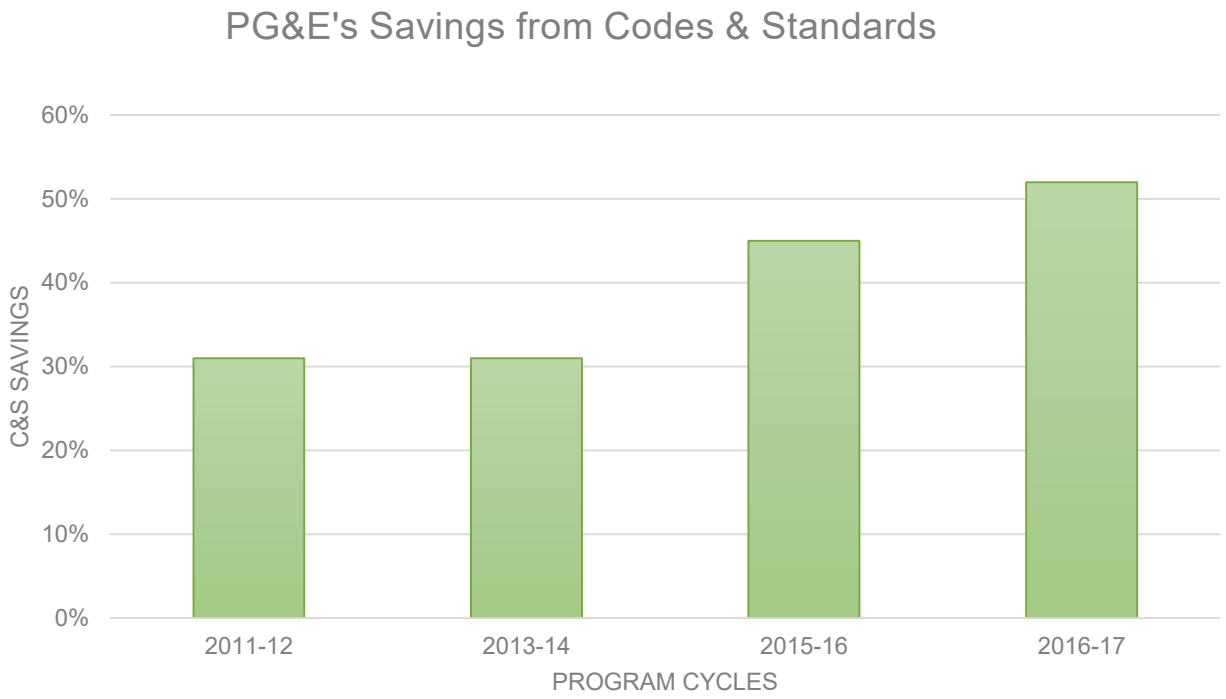


Vendors Include:

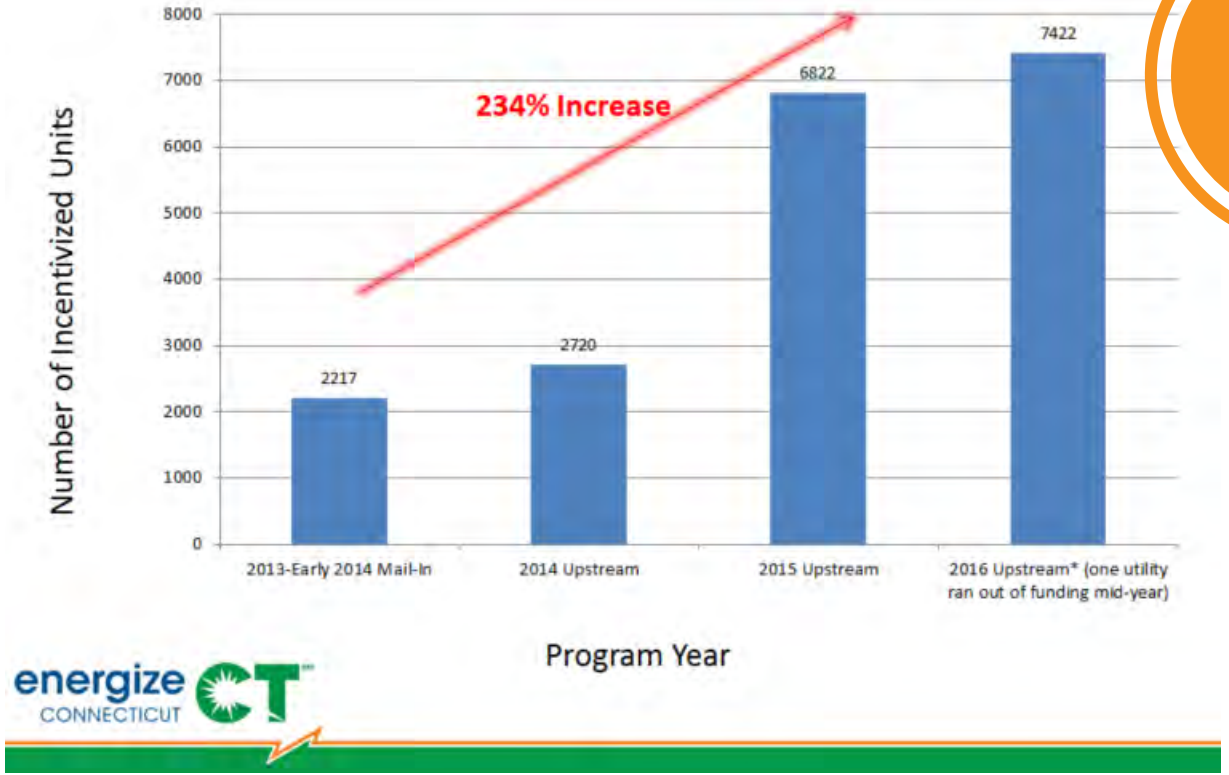
- Cascade Energy
- EnerNOC
- Energent
- eSight Energy
- Panevo
- Lucid
- Pulse Energy
- RtTech Software
- Northwrite
- Energy ICF
- Johnson Controls

Integrated DSM

Codes & standards



Midstream Programs



Natural Gas Boiler & Furnace

energize CONNECTICUT

Rethinking SMBs

17. Advanced Controls for Small and Midsize Businesses Advanced in 2017

Andrea Salazar

We saw a proliferation of advanced energy management offerings for small and midsize businesses (SMBs) in 2017. The development of more-advanced controls for SMBs is significant because this sector can't afford costly building automation syste therefore, SMBs control their systems manually (or not at all), resulting in an estimated energy waste (or a savings potential) of to 25% per building, according to the Pacific Northwest National Laboratory report Small- and Medium-Size Building Automation and Control System Needs: Scoping Study (PDF). Some offerings include:

- 75F
- BAYweb
- Building Energy Management Open Source Software
- Ecobee
- Encycle
- Energy360
- Honeywell
- Incenergy
- Nest
- Network Thermostat
- Pelican Wireless Systems
- Proliphix
- Radio Thermostat Company of America
- Schneider Electric
- Siemens
- Venstar
- Volttron
- XBOS: An Extensible Building Operating System

Some of these offerings are simply smart thermostats applied to small businesses while others are more traditional but modifie building automation platforms that target the SMB market. Many of these products only control HVAC systems, but some can al control lighting and other miscellaneous loads.

What Are the Options for Small Commercial HVAC Energy Management?

Unit coordination

Unit coordination mitigates peak demand spikes by managing multiple HVAC units so that no more than necessary are operating at any one time. Products incorporating this strategy require some means to observe building loads and HVAC unit operation, and typically use proprietary algorithms to determine the optimal prioritization of unit operation. Where multiple HVAC units serve an open space, some of these products prioritize the most efficient units to get energy savings as well. Some also include demand-response (DR) modules.

Unit coordination uses proprietary algorithms to determine the optimal prioritization of unit operation.

We're aware of three current vendors and a potential future vendor of unit-coordination technology. Encycle offers a unit-coordination product that originally required small boxes to be installed in packaged rooftop units (RTUs). These Swarm Logic boxes used a wireless network to communicate among themselves and make decisions about the best combination of units to operate at any given moment. Encycle's product now works with Internet-connected thermostats and includes a DR module. Sacramento Municipal Utility District (SMUD) tested the original product and reviewed it in Evaluation of Envirogrid Technology Performance (PDF). mCloud offers an Internet-connected, thermostat-based product that uses algorithms developed by researchers at Purdue University. And eCurv claims to use protocols developed by the telecommunications industry. The final vendor is Transformative Wave. This company mainly produces retrofit kits to upgrade the controls in packaged RTUs. It's developing a unit-coordination module, but that module hasn't

Cloud thermostat systems are a lower-cost alternative to building automation systems and produce similar savings.

Cloud thermostat systems offer much of the functionality of building automation systems for about one-eighth to one-fourth of the cost. Despite their lower cost and simplicity, we expect the savings achieved by these devices to approach those available from more-sophisticated building automation systems. A school district in the Pacific Northwest installed cloud thermostats in 60 portable classrooms and cut the overall energy consumption of those units by about half. For more information on this study, please see the Bonneville Power Administration report Web-Enabled Programmable Thermostats (PDF). Two E Source reports, Web-Enabled Thermostats in Commercial Applications and Realizing the Sky-High Potential of Cloud Thermostats, provide more information on the savings expected from cloud thermostats in commercial buildings. Even in the absence of such verification, we're cautiously optimistic that cloud thermostats will bring to small and midsize commercial buildings the energy management opportunities that until now were limited to large buildings.

SMB strategies to go past lighting

1. Keep conversation going with customers
2. Limited time neighborhood blitzes
3. Work closely with trades on quality, quantity, and comprehensiveness
4. Tiered incentives
5. Focus on refrigeration, controls, food service, and compressed air

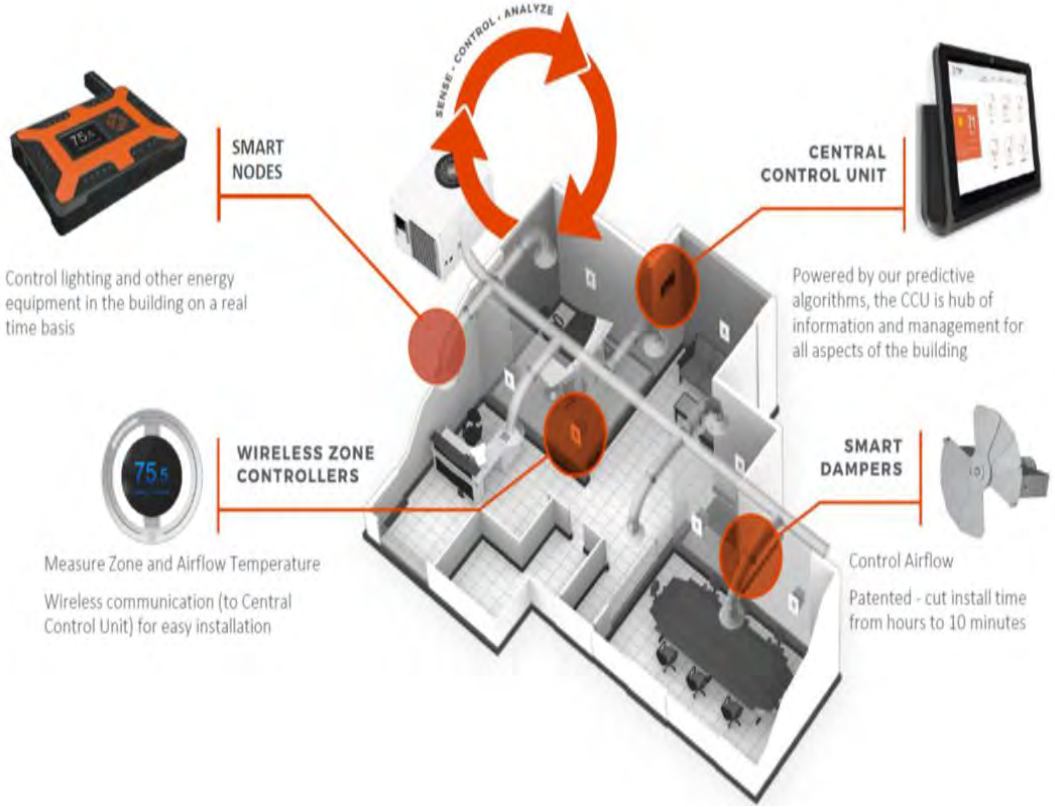
Cloud or Smart Thermostats

- Increased ease of programming
- Ability to remotely adjust temperature setpoints
- Advanced control features like smart recovery or staging
- Occupancy-based control of temperature setpoints
- Increased data on HVAC system performance

HVAC & HVAC Controls: The Problem

Source: IStock

Out-of-the-Box Controls by 75F



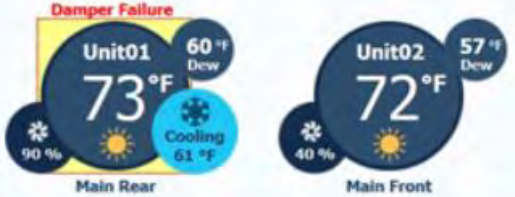
Source: 75F

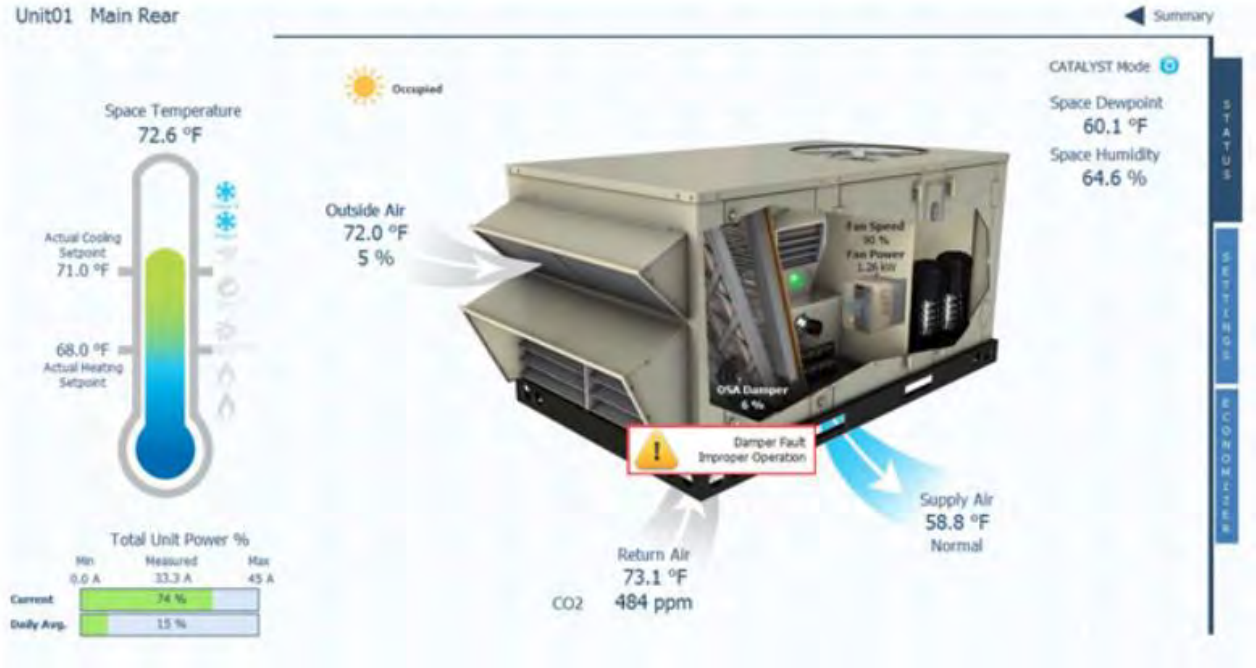
Good Results in Early Testing

- Testing done by Gas Technology Institute
- Comfort problems largely, but not completely, solved
- Controls still somewhat imprecise

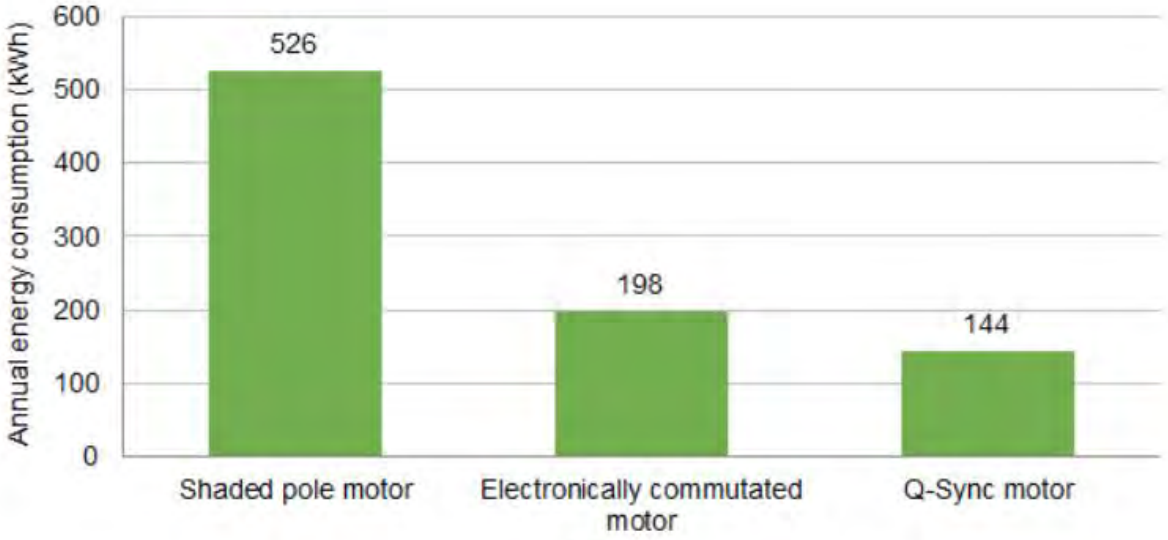
RTU Controls add usability & transparency

- Remote monitoring and control
- Compressor and condenser fan controls
- Advanced thermostat and economizer controls
- Advanced fault detection and diagnostics
- Demand response and management
- Building automation integration
- Building analysis and savings verification


Damper Failure
Unit01
73°F
60 °F Dew
Cooling
61 °F
90 %
Main Rear
Unit02
72°F
57 °F Dew
40 %
Main Front


Unit01 Main Rear
Summary
Occupied
Space Temperature
72.6 °F
Actual Cooling Setpoint
71.0 °F
68.0 °F
Actual Heating Setpoint
Outside Air
72.0 °F
5 %
CATALYST Mode
Space Dewpoint
60.1 °F
Space Humidity
64.6 %
Damper Fault
Improper Operation
Supply Air
58.8 °F
Normal
Return Air
73.1 °F
CO2
484 ppm
Total Unit Power %
Min
Measured
Max
0.0 A
33.3 A
45 A
Current
74 %
Daily Avg.
15 %
STATUS
SETTINGS
ECONOMIZER

Q-Sync Motors



Notes: kWh = kilowatt-hours.
Annual energy consumption is calculated assuming 8,760 hours of operation.

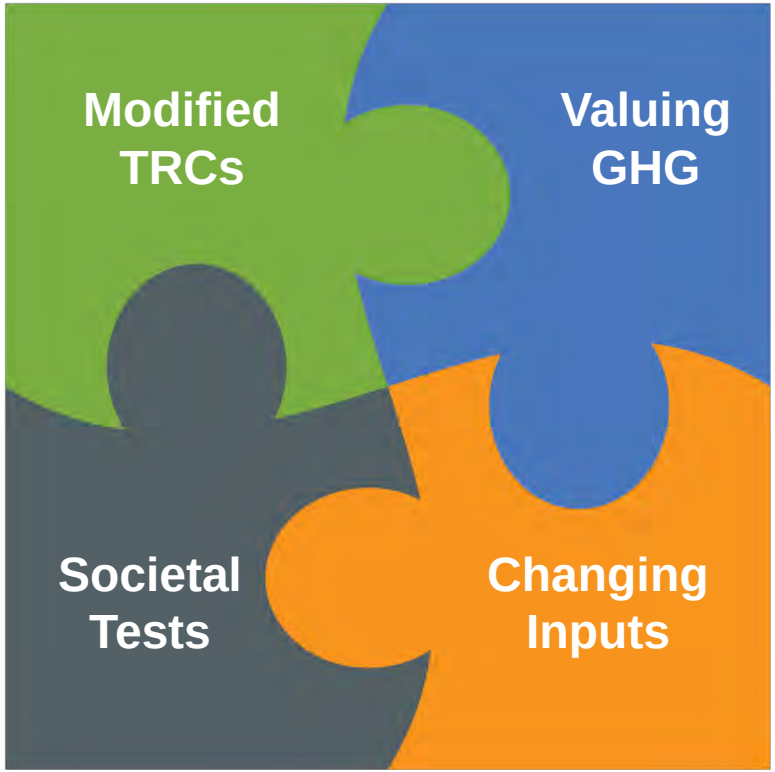
© E Source; data from the US Department of Energy

Q-Sync Field Demonstration Results and Links to Evaluation Reports

Organization conducting tests	Location	Number of motors	Energy consumption compared to ECM
Oak Ridge National Labs (ORNL)	Hy-Vee Supermarket, Kansas City	2	28% ↓
	Albertsons-Safeway, Kansas City	NA	38% ↓
San Diego Gas & Electric (SDG&E)	San Diego	173	37% ↓

For more information, see the E Source report Q-Sync Motors Boost Efficiency of Commercial Refrigeration Evaporator Fans

New Cost-Effectiveness Tests for EE



E Source Next Generation of Energy Savings Project

National Grid	• Current portfolio = 40% lighting • Future focus on non-wires alternatives, hard-to-reach customers, codes and standards, connected homes/businesses and controls
Pacific Gas and Electric Co.	• Current portfolio = < 20% lighting • Future focus on codes and standards, pay for performance, operations and maintenance, conservation, controls and automation, midstream, integrated DSM, AMI targeted outreach
Xcel Energy	• Current portfolio = 70% lighting • Future commercial portfolio = lighting (including LEDs and controls), midstream • Future portfolio = lighting for hard to reach customers

Thank you! Questions?

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