Emerging Technologies Summit

MAKING THE CONNECTION:

From Energy Efficiency Innovation to Delivery

April 19 – 21, 2017

Successful Company Engagement Strategies

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Applying decision science methods to identify non-economic factors to energy efficiency investments in the commercial sector

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Emerging Technologies Summit, 2017

Carnegie Mellon University
Engineering & Public Policy

GRFP
NSF GRADUATE RESEARCH FELLOWSHIP PROGRAM

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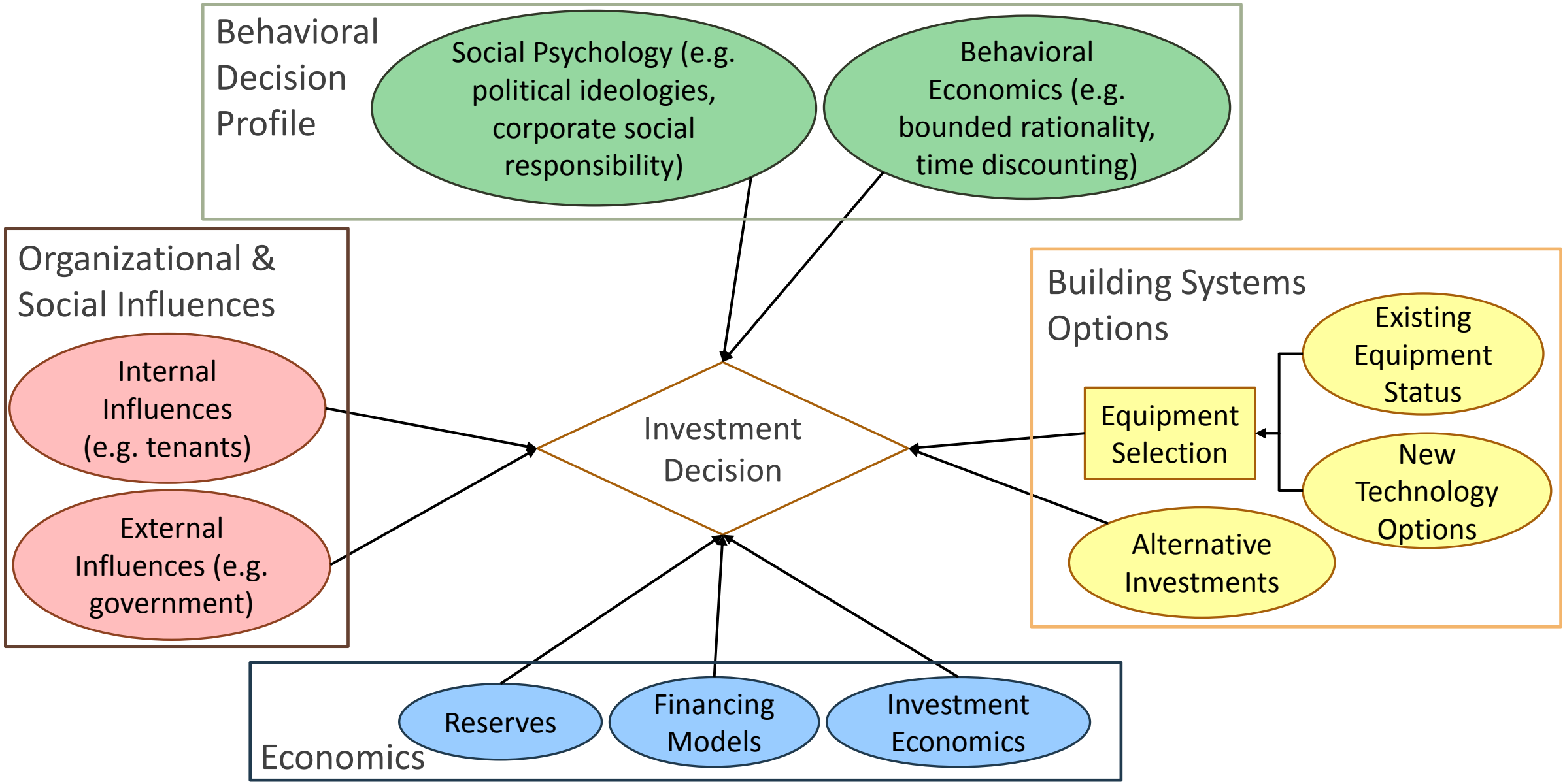
Decision model from the literature



Interview protocol

EE climate in Pittsburgh → Motivations/ barriers in EE → Social Influences → Ranking Exercises

Q: Can you describe what, if any, areas of the market have had less penetration in regard to EE?

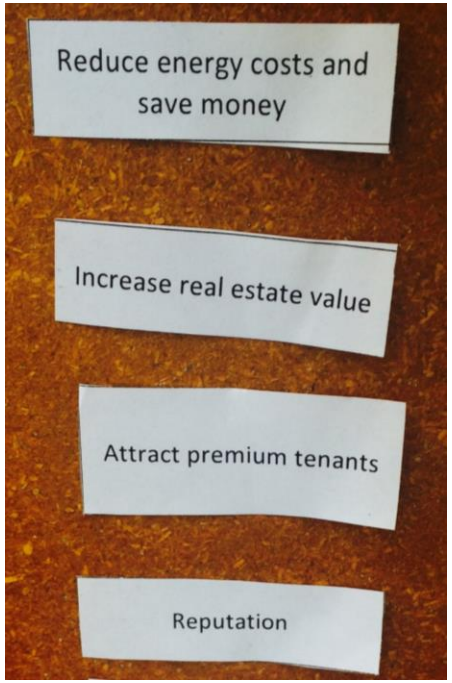
A: “Medium sized manufacturers. They probably represent the biggest sector in Pittsburgh’s economy. They operate on such a margin. They are worried about making payroll and getting product out the door.”

Q: What do you believe motivates building owners to pursue EE?

A: “It’s probably broken up into 3 categories: mission-oriented, best practice, and saving money.”

Q: Can you list any buildings and/or companies that you perceive as energy efficient?

A: “A building like 11 Stanwix with Chris Pinelli is an example of a building that is really operating well.”



Method of analysis

Open-ended responses

- Transcription → Coding
- Open-coding procedure (Strauss, 1987)
- Inter-rater reliability by pairwise agreement – *to be completed* (Neuendorf, 2002)
- Frequency of mention & code pairings

Ranking data

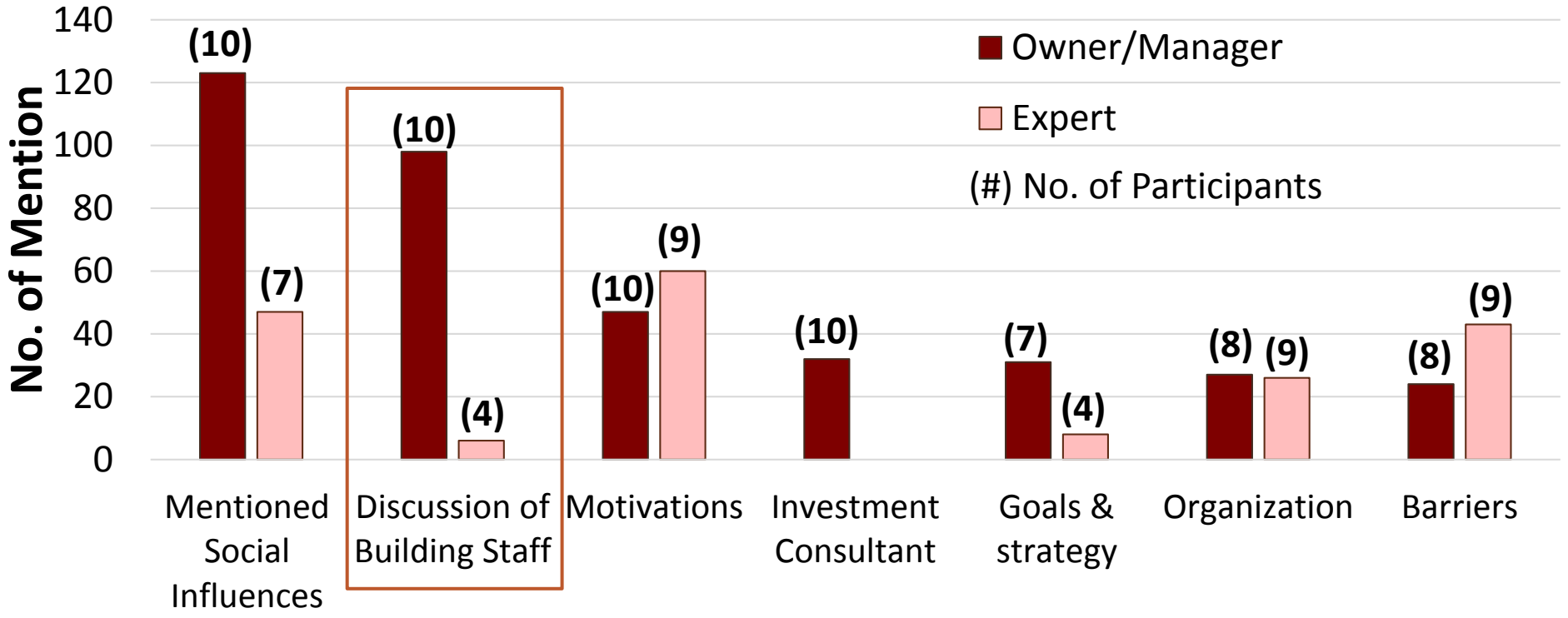
- Exploratory data analysis
  - Comparative frequency plots
  - Comparative ranking plots
- Fisher's Exact Test
  - Experts vs. Owners/Managers
  - Motivations & Barriers

	Listed	Not Listed	
Expert	A	B	A+B
Owner/Manager	C	D	C+D
	A+C	B+D	

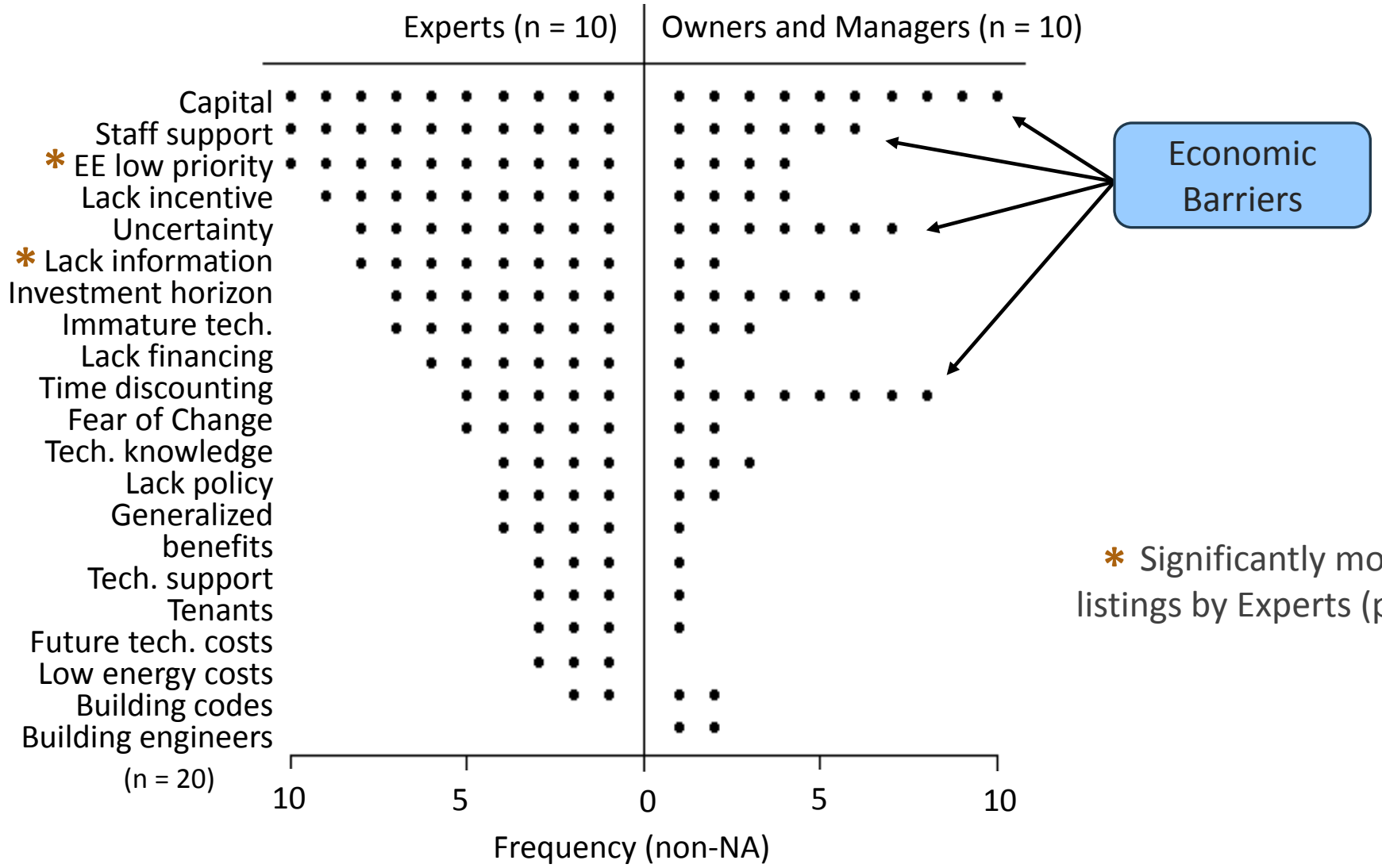
$$P(A = a) = \binom{A + B}{A} p_e^A (1 - p_e)^B$$

Investment Decision Process – Organizational & Social Influences

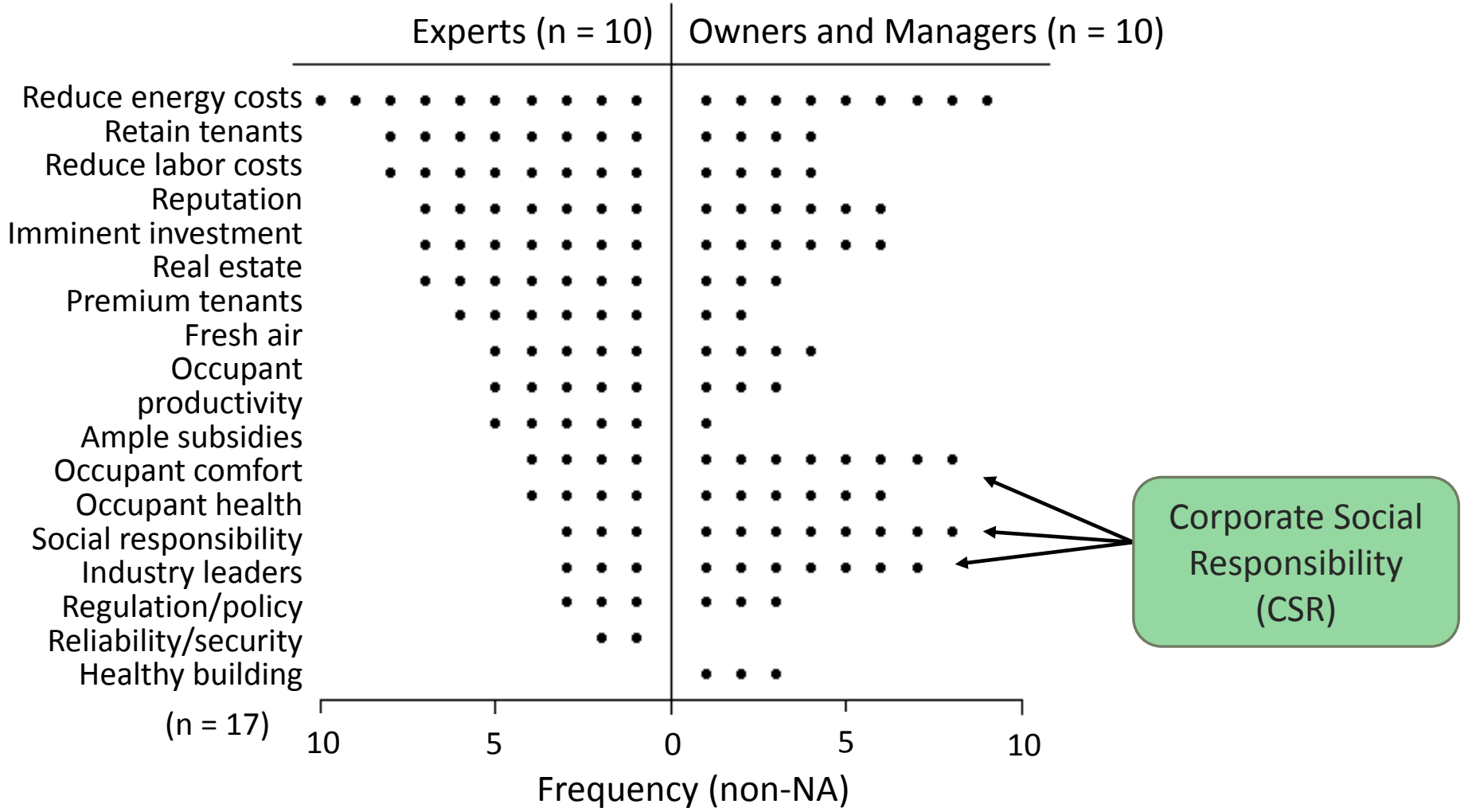
"My guys are really good. They like learning about this stuff [energy efficiency], so they went to school for it. I'm confident in their abilities" – Owner/Manager



Comparison of **barriers** between experts and owners/managers



Comparison of **motives** between experts and owners/managers



Key findings from interviews:

- **Information** is a barrier recognized by interviewed experts; interviewed owners/managers value input from sources **unaffiliated with products**
- Interviewed owners/managers did not list EE as a low priority, despite experts perceptions
- **Economic barriers** to owners/managers listed often
- **Heterogeneity** among interviewed experts and owners/managers regarding value of **CSR**
- Potential emerging concepts identified in interviews suggest **psychological and social influences** are promising areas of research in EE investment decision making

References

Neuendorf, K. (2002). The Content Analysis Guidebook. Thousand Oaks, CA: Sage Publications.

Strauss, A. (1987). Qualitative Analysis for Social Scientists. Press Syndicate of the University of Cambridge, New York, NY.

Contact me for paper which is in review for literature review (slide 2).

Back-up Slides

Low EE adoption rates among commercial buildings

- Commercial buildings account for ~20% of US energy consumption (CBECS, 2012)
- Annual energy reduction of 3% per year is achievable (DOE, 2014)

(Emerging Scholars, 2012)

- Policy initiatives – Better Buildings Initiative 20% reduction by 2020
- 3.5 billion square feet of commercial building space committed out of 85 billion square feet (DOE, 2015)

Despite efforts and potential, adoption rates low

Quotes about IDP, CSR, and Public Subsidies

Investment Decision - Economics: 20(8) | 25 (9) *Ex. No. Ment. (No. Participants) | O/M No. Ment. (No. Participants)*

"This is a generalization, but certain federal governments are looking for upwards of a 15 year payback, higher education looks for upwards of a 10 year payback, healthcare looks for 5 to 6 year payback, commercial office building owners are looking for somewhere between 3 and 5 year paybacks, and industrial sector is looking for less than a 3 year payback"

Motive – Mission & Leadership: 26(7) | 14(5)

"I think the people can change when there is a change from the top. If management says, 'We're going to do this – we now want to focus on sustainability, it's important to our business,' then the team will get on board"

Public Policy Interventions – Public Subsidies: 1(1) | 2(2)

"They watch you so much and if you don't do it right then you have to pay them back. So there are strings attached. I like small governments"

Quotes about potential emerging topics

Fear of change: 13(5) | 4 (3) *Ex. No. Ment. (No. Participants) | O/M No. Ment. (No. Participants)*

"The facilities people aren't working all the time… so if an Energy Manager came in, they would require more work and that would result in a Fear of Change. And the [facilities] people don't always choose the projects, but they are certainly instrumental in the savings over time"

Somebody else's money: 1(1) | 0(0)

"It's this mentality that it's somebody else's money that makes it easier to do things.

The downside of that is it makes it very easy to pollute… it makes it easy to do any kind of abuse when it's not affecting them."

Investor constraints: 1(1)| 3(2)

"This is a more recent trend that we've found… buildings that are backed by some kind of fund are often constrained… investors definitely want to see that their money is being spent on ecological activities."

Energy Star pushes the team: 1(1) | 6(4)

"I think [Energy Star] pushes the team that works here, I think it really pushes them to see the results of it, and it really keeps everyone's mind sharp. It kind of works when you feel good about what you do."

Quick Demographic Comparisons

- Participant Demographics
  - 60% Male
  - 95% Between 18-64 yrs; 5% ≥ 65 yrs
  - Bachelor's Degree or higher – 25+: 85%
- Pittsburgh Demographics[1]
  - 48% Male
  - 70% between 18-64 yrs; 14% ≥ 65 yrs
  - Bachelor's Degree or higher – 25+: 36%

1. U.S. Census Bureau: State and County QuickFacts. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, County Business Patterns, Economic Census, Survey of Business Owners, Building Permits, Census of Governments

2030 Districts

- Green Building Alliance 2030 Districts
  - 11 separate districts in North America, spanning Seattle and Toronto; comprising 231 million sq. ft. of building space (of 91 billion square feet[2]) committed to 50% reduction in energy use, water consumption and transportation emissions by 2030[1]
  - Districts comprise 70% of real estate square footage in Pittsburgh[1]

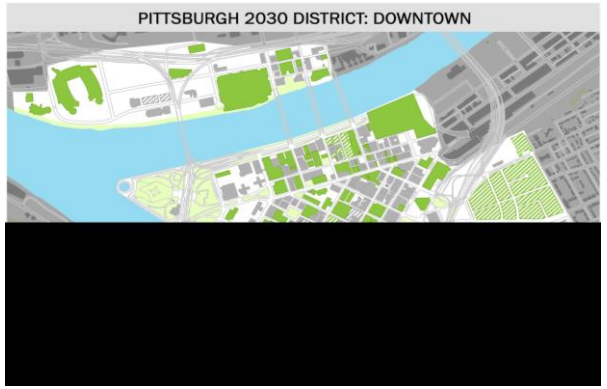


Image source: Green Building Alliance 2030 District: http://www.2030districts.org/about-2030-districts

Image source: Green Building Alliance 2030 Districthttp://www.2030districts.org/sites/default/files/atoms/files/Pittsburgh%202030%20District%202013%20Progress%20Report.pdf

1. Green Building Alliance 2030 District: http://www.2030districts.org/about-2030-districts
2. Commercial Building Energy Consumption Survey: http://www.eia.gov/consumption/commercial/data/2012/#b2

Study region, recruitment process, and participants

- **Building types:** large commercial buildings ≥ 50,000 ft^2 (Pittsburgh, PA)
- **Recruitment:** Green Building Alliance and snowball sampling
- **20 Interview participants (22 hrs)**
  - 10 Experts
    - 5 Energy Efficiency
    - 3 Real Estate
    - 1 Policy
    - 1 Academic
  - 10 Owners/Managers
    - 6 Class A commercial buildings
    - 2 University
    - 1 Biology lab
    - 1 Hospital

Potential emerging topics in building EE

Interview Finding	Mapping to Investment Decision Diagram	Potential Mapping to Literature	Total Mentions (No. Participants) Experts	Owners/ Managers
Fear of Change	Behavioral Decision Profile	Resistance to change (Oreg, 2003); aversion to technology (Craske et al., 2013)	13 (5)	4 (3)
Somebody else's money	Behavioral Decision Profile	Mental accounting (Thaler, 1985)	1 (1)	0 (0)
Investor constraints	Behavioral Decision Profile	R&D agenda setting (Frickel et al., 2009)	1 (1)	3 (2)
Energy Star pushes the team	Behavioral Decision Profile	Social demand characteristics (Orne, 1961); team collaboration & job satisfaction (Rosenstein, 2002)	1 (1)	6 (4)

Successful Company Engagement Strategies

COMMERCIAL STRATEGIC ENERGY MANAGEMENT PROGRAMS BEST PRACTICES AND APPROACHES

ET Summit
April 20, 2017

Jay Luboff, Navigant Consulting, Inc.

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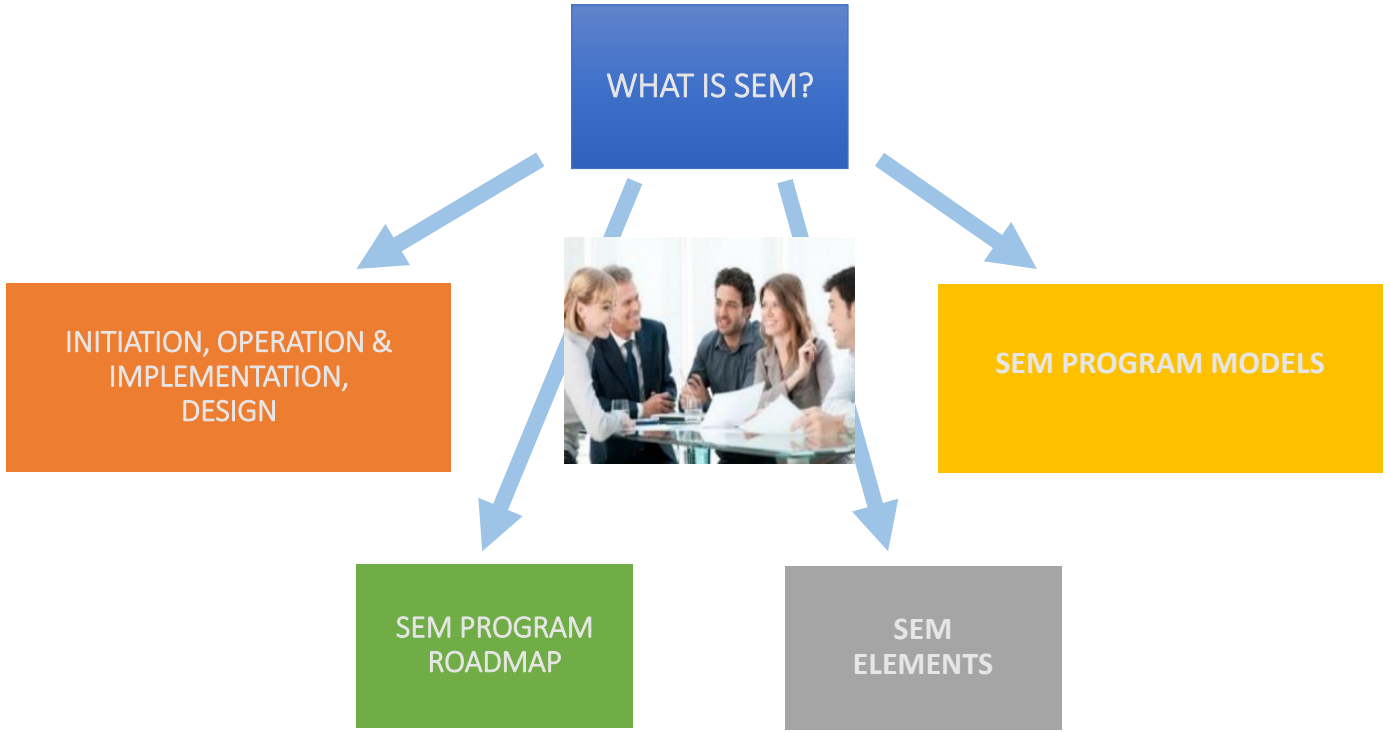
Best Practices in SEM

Purpose: To present findings from a national study on best practice strategies and design of commercial Strategic Energy Management (SEM) programs for DTE Energy.



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Commercial SEM Programs and Best Practices

SEM IS A HANDSHAKE

TO SAVE ENERGY OVER A LONG-TERM CYCLE

BETWEEN A PROGRAM ADMINISTRATOR AND A BUSINESS or ORGANIZATION'S OWNER/ OPERATOR

"We'll focus on O&M and any capital improvements we can identify!"

Process/O&M improvement project

- Turning equipment off when not needed
- Fixing compressed air leaks
- Compressed air system optimization
- Production scheduling optimization
- Formalizing equipment shutdown procedures
- Improving process yield and associated capital Improvements

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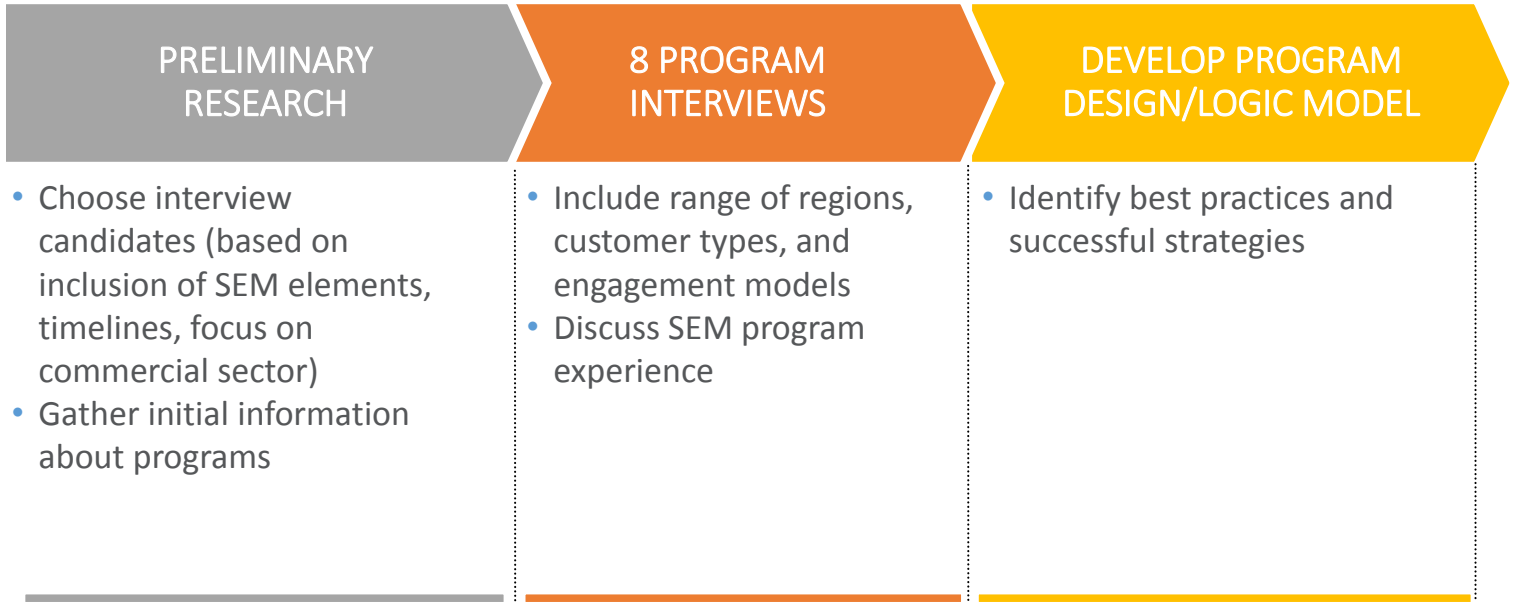
STUDY APPROACH

Navigant focused on SEM best practices of successful commercial SEM programs nationwide



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CUSTOMER PROFILE

SEM Program Interviews

Customer Type	AEP OHIO	Efficiency Vermont	EnergyTrust of Oregon	focus on energy	neea	neea	Xcel Energy	PSE Puget Sound Energy
Conv. Center			X					
Government								X
Grocery	X							
Hospitals	X	X	X	X		X	X	
Labs	X							
Offices			X		X			X
Restaurant			X					
Retail					X		X	
Schools		X					X	X
University	X						X	

Source: Navigant

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Three SEM Program Models

Cohort

SEM multi-customers attend group workshops, or cohorts, over a 4-18 month period; customers share insights and results

EnergyTrust of Oregon · AEP OHIO · PSE PUGET SOUND ENERGY · neea

Flagship

Build SEM Program starting with one site and expand to others after that

focus on energy℠ Partnering with Wisconsin utilities

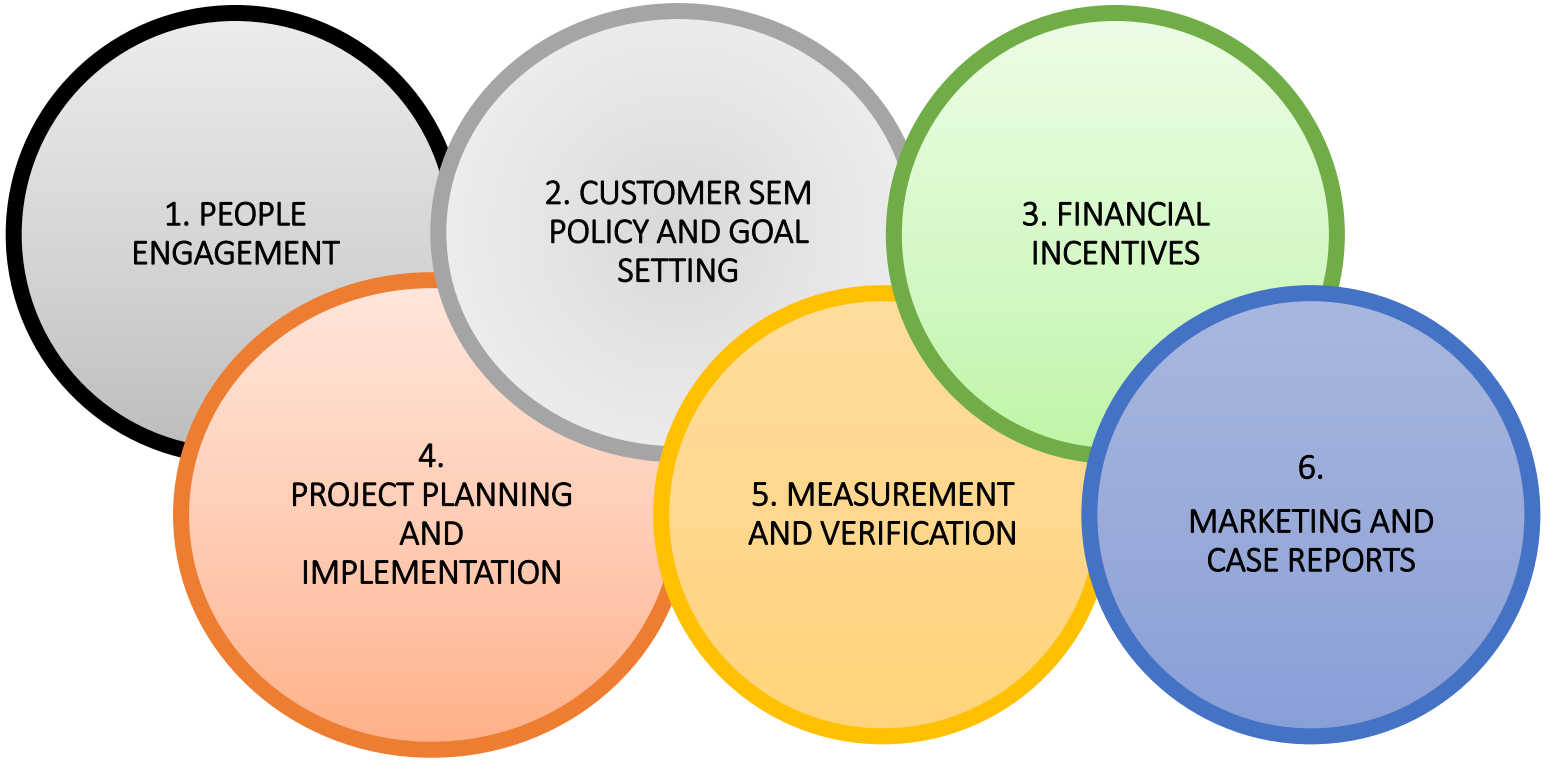
Top-Down

Recruit customer executives who then mandate SEM initiatives across their constituent sites

neea · Xcel Energy

NAVIGANT · DTE Energy Know Your Own Power

Best Practice SEM elements



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Best Practices in People Engagement, Customer Policy, Goals and Financial incentives

People Engagement

- ***A handshake*** with **Organization Management, Champions, Internal Energy Teams is critical**
- ***Maintain ongoing contact*** and encourage energy teams to include employees at all levels

Energy Policy and Goals

- ***Set Energy Goals as Targets*** for **Executive Oversight** and **Energy Team Focus** = more $ savings
- ***Support Goals and Policies*** development for later **Program Administrator Progress Tracking**

Financial Incentives

(Three Types)

- ***Energy Savings Incentives*** at ± $ 0.02/kwh and $0.20/therm
- ***Measure-Based Incentives*** use DEEM incentives for specifically defined SEM projects
- ***Lump-Sum Incentives*** provides large monetary amount to meet SEM/ISO50001 standards

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Best Practices in Project Planning, Implementation, M&V, and Marketing and Case Studies

Project Planning and Implementation

- ***Establish a system*** for customers to identify and implement savings opportunities
- ***System planning*** needs to be ongoing not just focused on low-hanging fruit

Measurement and Verification

- ***Establish long-term data collection*** to determine savings persistence
- ***Estimate savings*** based on at least ***12 months of savings*** to capture seasonal effects
- **Account for changes** in economics, etc.

Marketing and Case Reports

- ***Publish case studies*** to use to advertise the value of SEM for recruitment
- ***Use past contacts*** and ***direct approaches***, which are also used effectively by some programs

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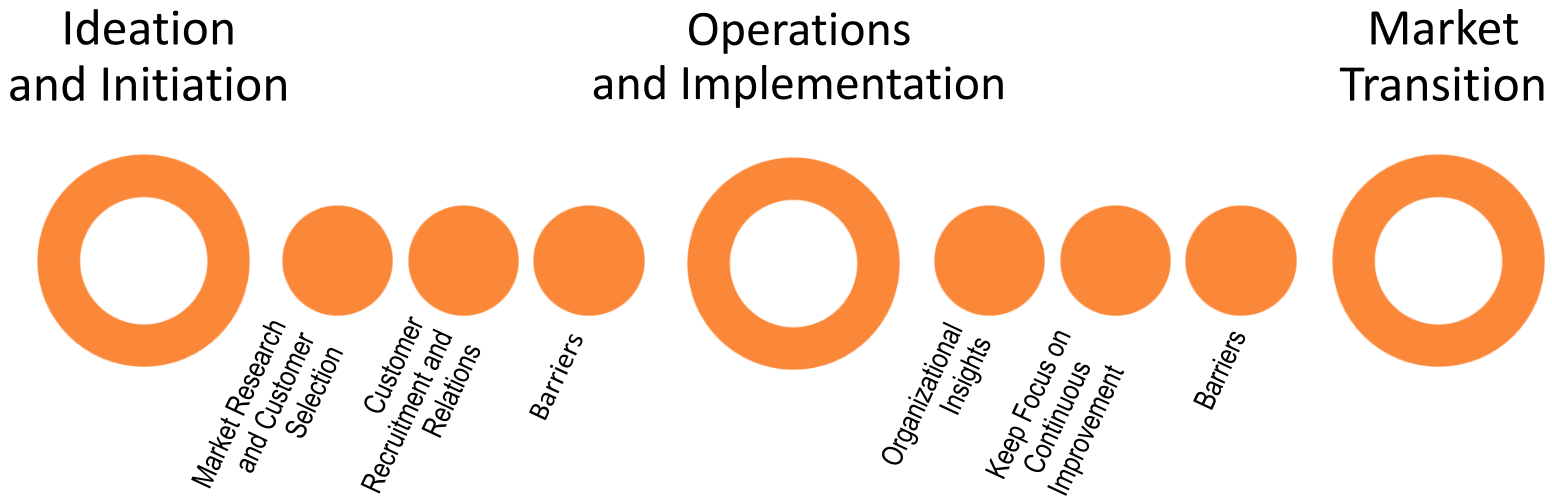
SEM Program Roadmap



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Best Practice Insights: Initiation and Recruitment

RELATIONSHIP BUILDING

- Leverage existing networks or establish new ones
- If lacking in-house resources/experts, recruit experienced Third-Party Implementer

MARKET RECONNAISSANCE

- Research the market, identify customer needs
- Understand customer's organizational structure (e.g., command-and-control vs. collaborative)

ACCESSING CUSTOMERS

- Utilize Account Managers
- Leverage Channel Partners or Professional Associations
- Engage Customer Executives (If Top-Down SEM model)

SELECTING CUSTOMERS

- Identify the low-hanging fruit
- Be Selective
- Customer Eligibility Criteria Are Flexible

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Best Practice Insights: Operations and implementation

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Best Practice SEM: Program Design

Identify Internal and Market Barriers

Internal

- Lack of SEM policies and goals
- Lack of resources for SEM planning and implementation
- Challenges conducting EM&V
- Limited qualified contractors with SEM knowledge and expertise

Market

- Lack of Awareness of benefits
- High upfront project costs
- Lack of customer motivation
- Uncertainty of savings realization

Select Strategies to Overcome Barriers

Strategies

1. Marketing and case reports
2. People engagement
3. Customer SEM Policy and goal setting
4. Financial incentives
5. Project planning and implementation
6. Measurement and verification

Choose Activities to Implement Strategies

Activities

- Publish SEM articles and case studies
- Target high-potential committed customers
- Utilize account managers and trades association to recruit SEM
- Establish energy teams and internal champions and meet regularly
- Organize or sponsor trainings
- Support customers developing policies and goals and savings opportunities
- Provide energy based or performance based incentives
- Use standard M&V protocols, provide tools and software as needed

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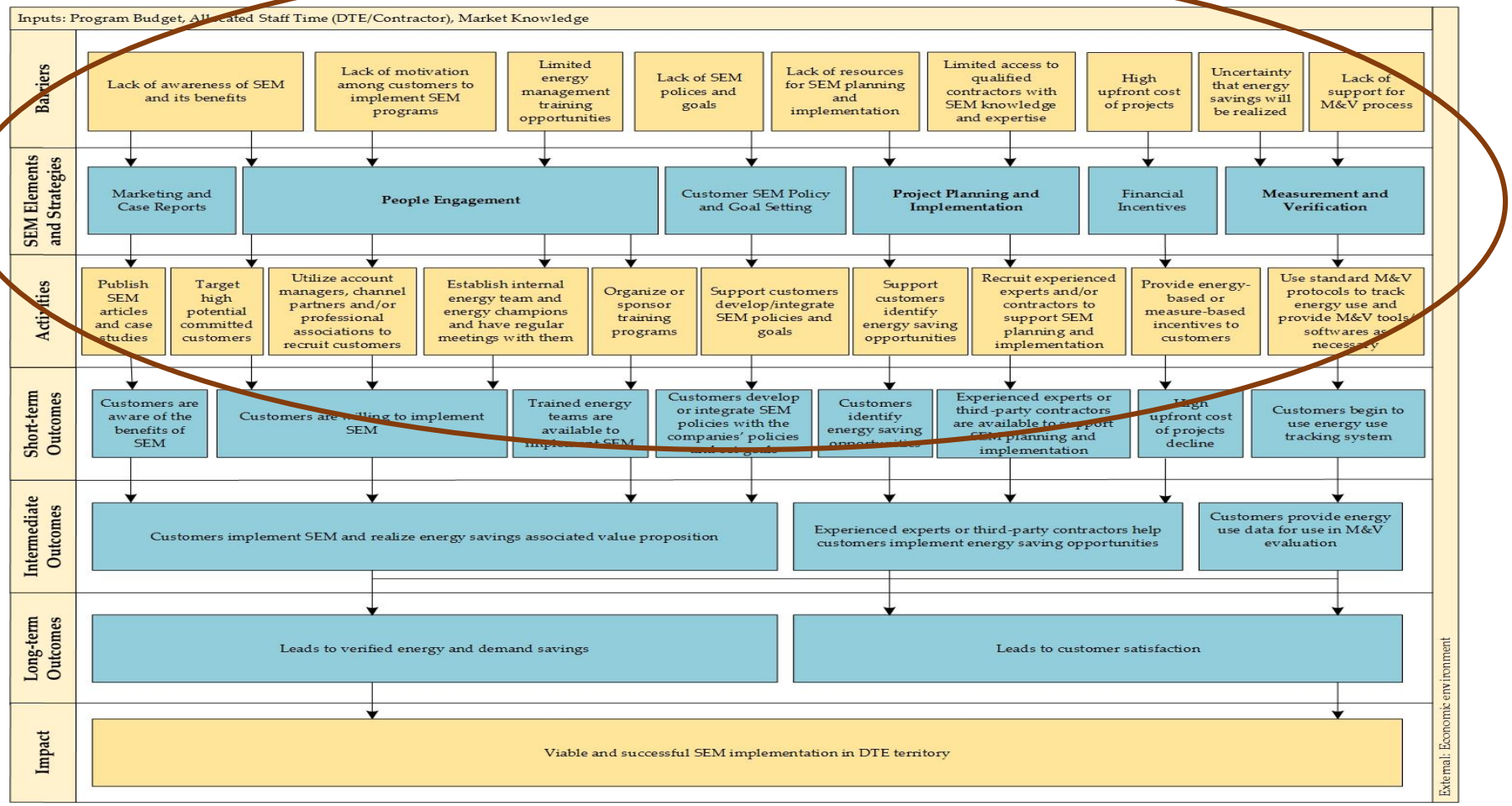
Best Practices Program Design: Theory of change/logic model



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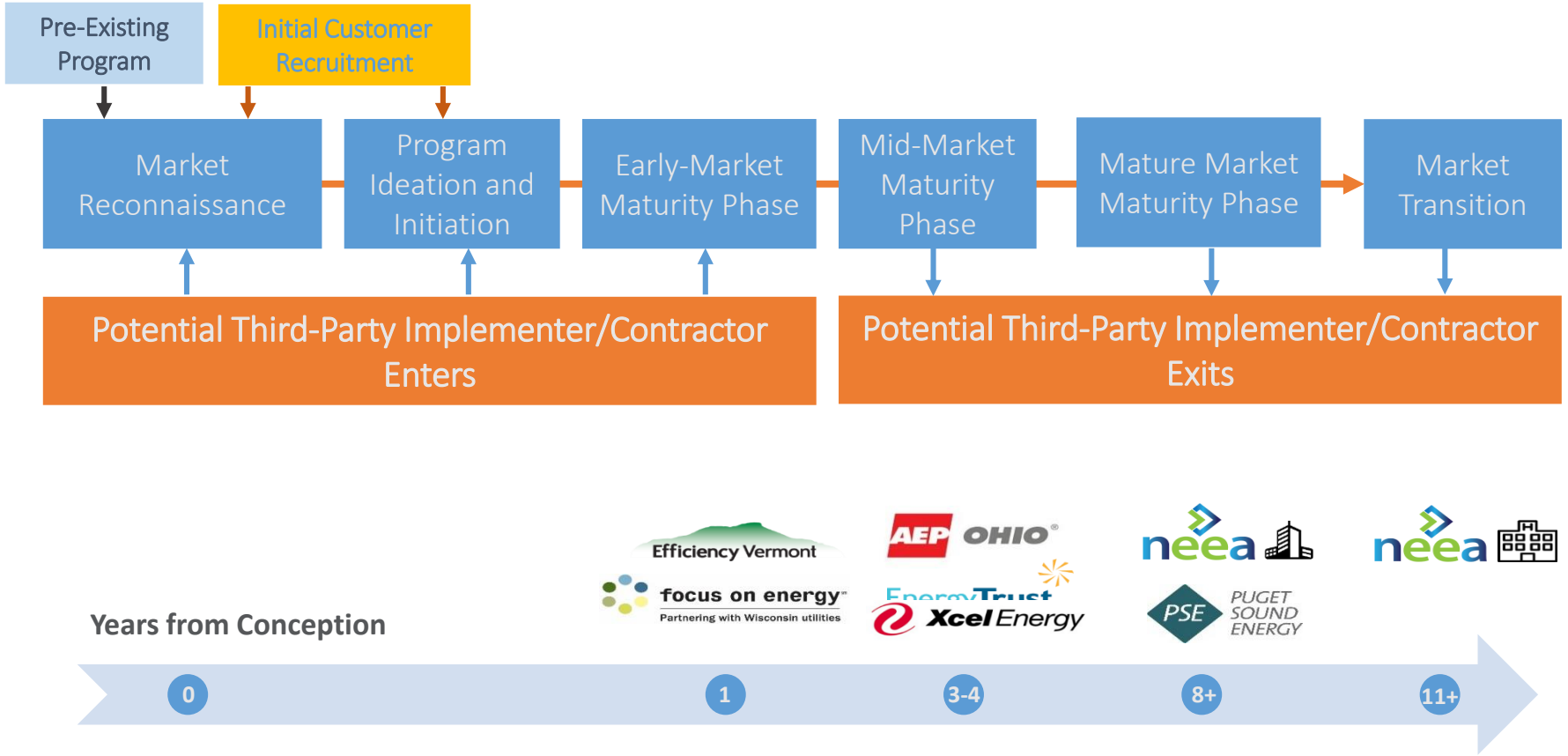
Operation Lifecycle of SEM Programs



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COMMERCIAL SEM BEST PRACTICES AND APPROACHES

QUESTIONS?

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UTILITY CUSTOMER ENGAGEMENT CASE STUDIES

Aaron Panzer

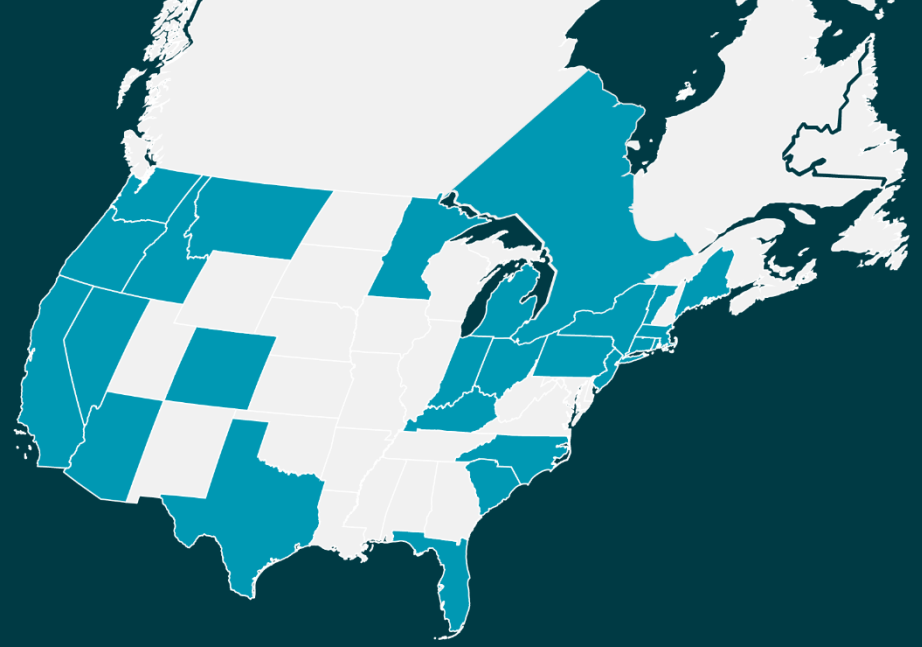
Director of Business Development

Ecova

April 20, 2017

ECOVA UTILITY SOLUTIONS

Utility Clients	50+
Lifetime Energy Saved	129 TWh
Customer Engagement Rate	4x+ increase
Client Retention Rate	96%



conEdison
Toronto Hydro
nationalgrid
ppl
Xcel Energy
PG&E
EnergyTrust of Oregon
Eversource
CNG
Vermont Energy Investment Corporation
nyserda
ENGIE
Seattle City Light
NV Energy
Efficiency Vermont
NIPSCO
Unitil
DUKE ENERGY
CenterPoint Energy
PUGET SOUND ENERGY
SRP
DTE Energy
ipl
ui
PECO
New Jersey's cleanenergy program
UniSource Energy Services
aps
WMECo
energize CONNECTICUT
OTTER TAIL POWER COMPANY
SOUTHERN CALIFORNIA EDISON
TEP
VECTREN Live Smart
Southern Connecticut Gas Service First!
Cape Light Compact
efficiency MAINE
Duquesne Light
neea
SoCalGas

INDUSTRY TRENDS IN CALIFORNIA

- Analytics-enabled Targeted Demand Side Management
- Energy-as-a-service
- Distributed Energy Resources
- Integrated solutions
- Locational value of resources

ANALYTICS HELP SOLVE FOR THESE EMERGING NEEDS

Two successful analytics-enabled customer engagement programs with two different approaches:

1. **Toronto Hydro Case Study**
   Driving new savings opportunities for the commercial midmarket

2. **Maryland Energy Administration Case Study**
   Driving no-cost savings in Maryland schools

MEDIUM COMMERCIAL PROGRAM FOR TORONTO HYDRO

Target

- Prioritize buildings based on energy savings potential data
- Segment customers with high savings potential into appropriate program

~400 commercial buildings between 200 – 500 kW

Engage

- Deliver customized reports with opportunities
- Multichannel approach over 4 months:
  - Print mailers to all customers (2x)
  - Engagement specialist phone calls to medium-to-high potential customers
  - Deeper Webinar report reviews for engaged customers

Send reports to all analyzed customers, with focus on driving savings for top 50%-60%

Convert

- Remotely refine the opportunity as much as possible
- Work with Toronto Hydro to engage contractor network as needed

Goals:

- Increase targeted customers interested in projects
- Increase % of committed customers

TORONTO HYDRO

PROGRAM RESULTS

	Goal vs. Baseline	Result vs. Baseline
Customer Engagement Rate	3x	7.5x
Project Commitment Rate	2x	12x
Measures Per Committed Project	N/A	3.2

OVERVIEW OF MEA "ON RAMP" PROGRAM

OBJECTIVE

- Deploy Ecova meter analytics to target, engage, convert and track no cost operational measures in commercial buildings

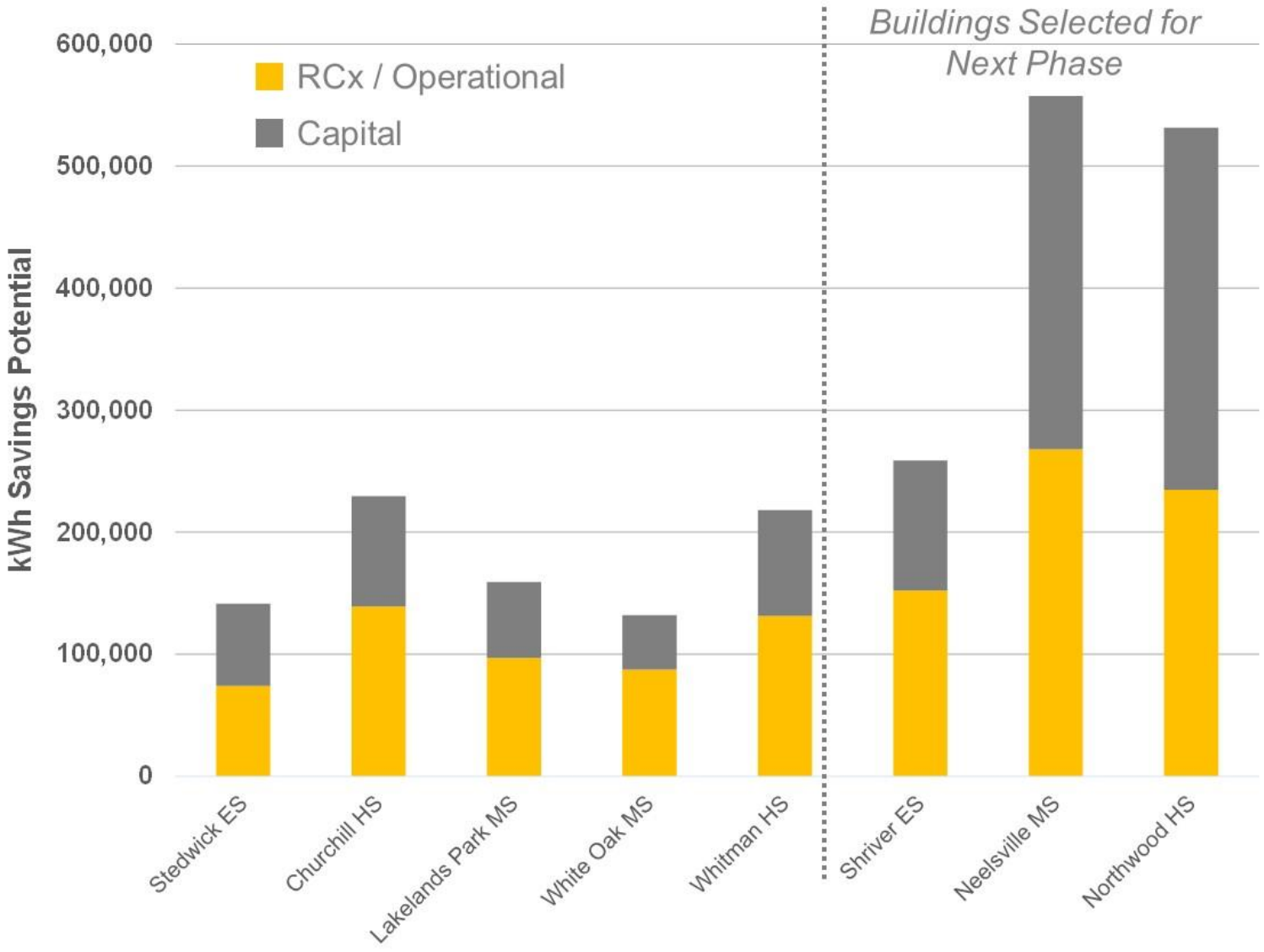
PARTICIPANTS

- **Pilot sponsor:** Maryland Energy Administration
- **Utility sponsor:** Pepco
- **End customer participant:** Montgomery County Public Schools – focused on three buildings (elementary, middle and high school)

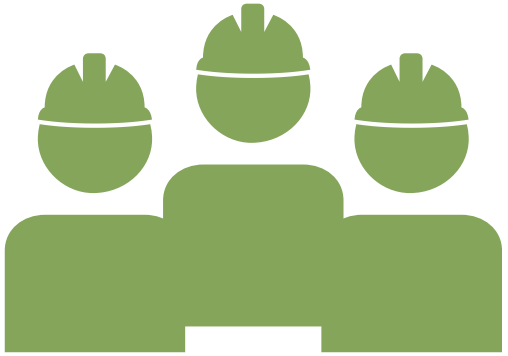
KEY OUTCOMES

- Savings achieved in all three buildings
- Commitment on multiple measures recommended
- Highly satisfied customers

VIRTUAL ENERGY ASSESSMENT ESTIMATED SAVINGS POTENTIAL



REMOTE COACHING AND COORDINATION WITH ALL DECISION MAKERS TO MAKE SAVINGS HAPPEN



School Maintenance Person

School-Level Stakeholders

Central Building Management

What did each stakeholder care about?

Not receiving complaints

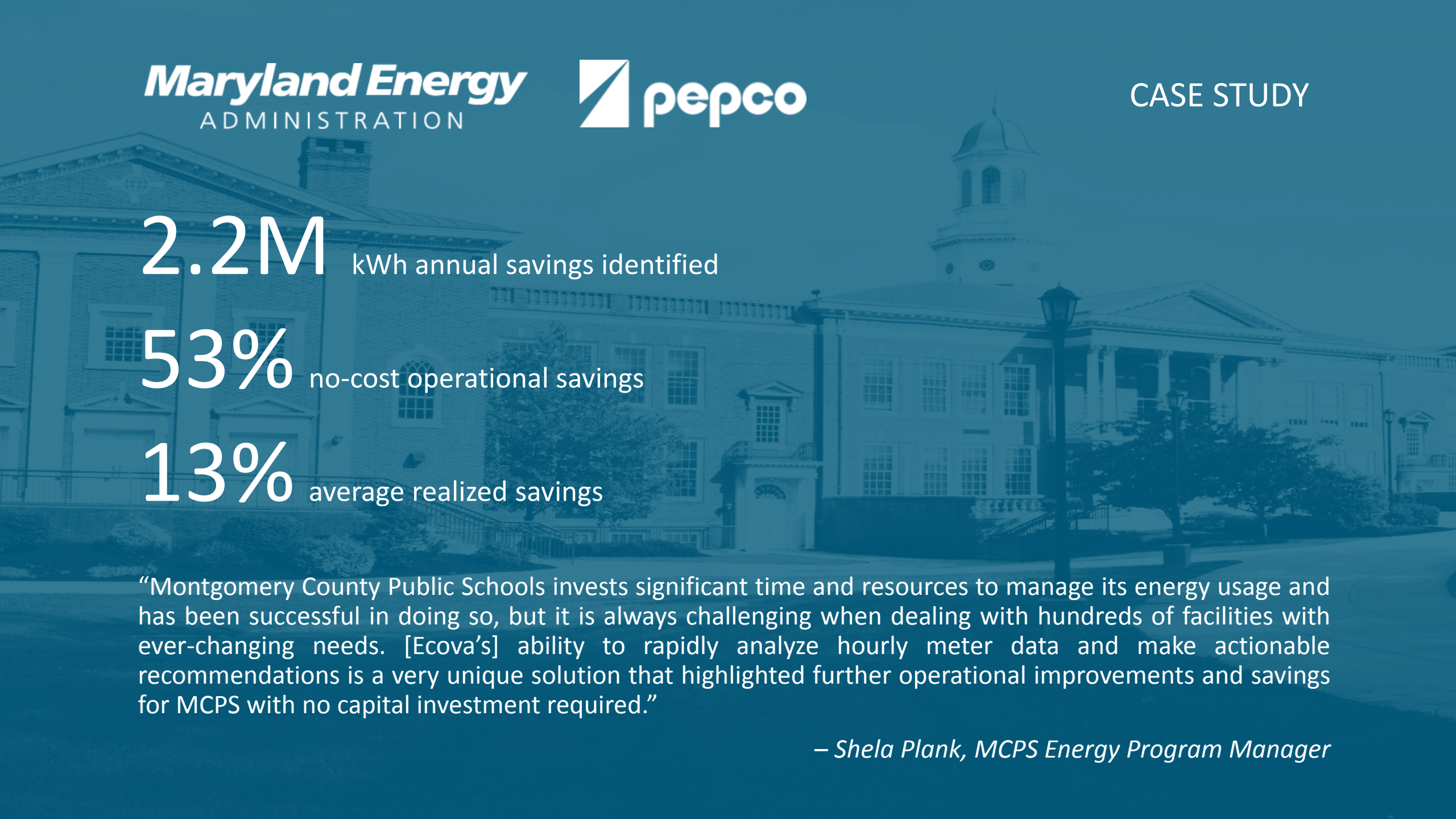
Comfort/temperature of facilities

Energy efficiency, savings

Maryland Energy ADMINISTRATION

pepco

CASE STUDY



2.2M kWh annual savings identified

53% no-cost operational savings

13% average realized savings

"Montgomery County Public Schools invests significant time and resources to manage its energy usage and has been successful in doing so, but it is always challenging when dealing with hundreds of facilities with ever-changing needs. [Ecova's] ability to rapidly analyze hourly meter data and make actionable recommendations is a very unique solution that highlighted further operational improvements and savings for MCPS with no capital investment required."

– Shela Plank, MCPS Energy Program Manager

LESSONS LEARNED AND CONSIDERATIONS

TORONTO HYDRO

- **Customer segment:** Mid-market commercial
- **Types of measures:** Existing capital programs
- **Integration with utility:** more integrated with handoff to their existing programs

Maryland Energy ADMINISTRATION

- **Customer segment:** Schools
- **Types of measures:** Low/no-cost
- **Integration with utility:** less integrated, end-to-end program delivery from Ecova

- Interval analytics can identify and drive deep savings
- Analytics can be a strong customer engagement tool
- Coaching is important to convert recommendations into fully scoped measures – delivery team training critical

THANK YOU!

Aaron Panzer

Director of Business Development

Ecova

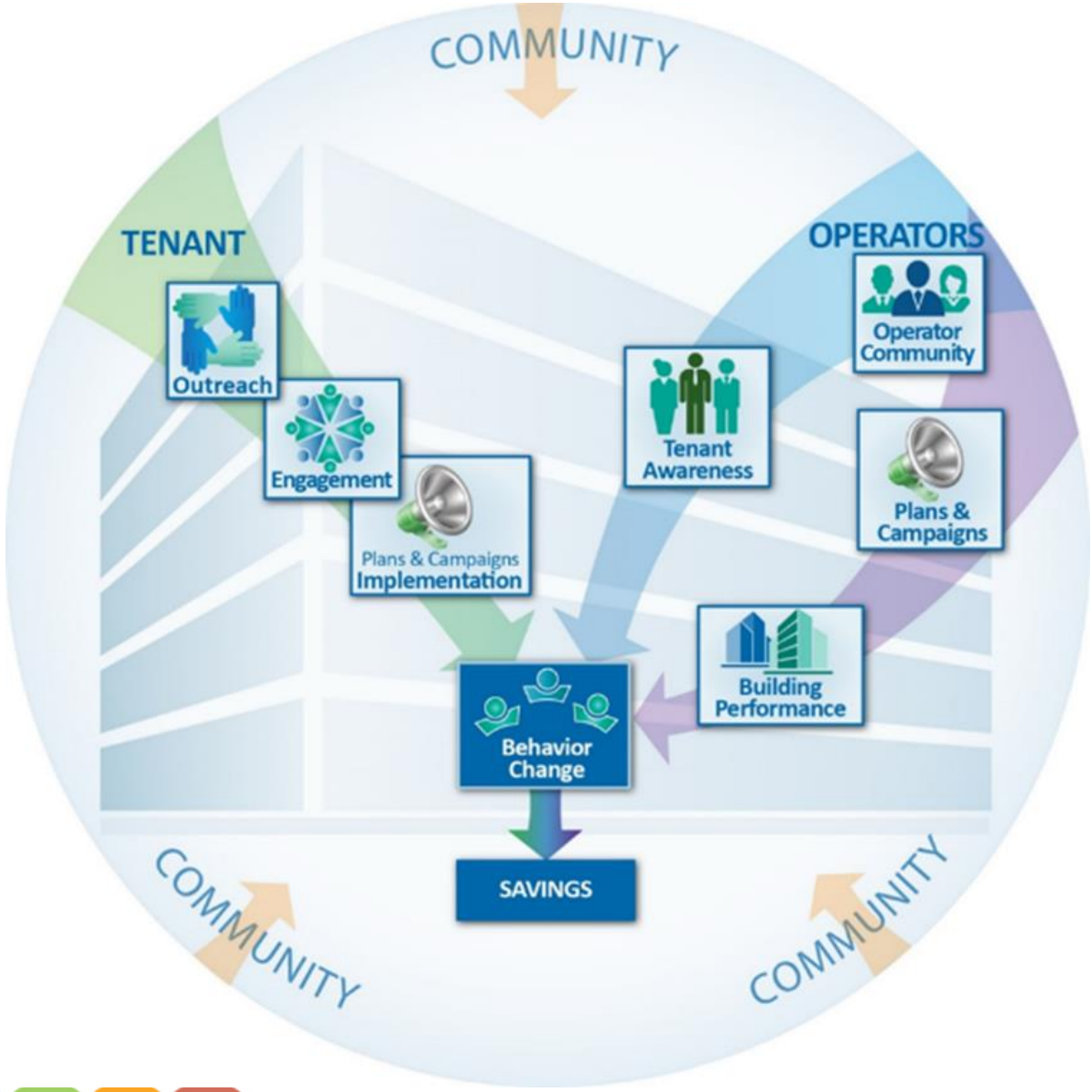
April 20, 2017

Smart Energy in Offices

Julie Hyde – Program Manager, Duke Energy

What is SEiO?

SEiO is a no-to-low cost behavioral and energy management program which helps our customers save energy, reduce operating costs, and meet their sustainability goals.



Current State

- **121** buildings have participated in at least one Operator Campaign
- **136** buildings have taken actions in a Tenant Challenge
- **108** buildings have utilized the ENERGY STAR benchmarking feature

5 SEiO Cities representing

9 distinct Communities

Ballantyne
Center City
North Charlotte
South Charlotte
West Charlotte
Durham
Greensboro
Winston-Salem
Greenville, SC

ENERGY SAVED
48.92 GWh saved - enough to power **65** schools for 1 year!

15,537 INDIVIDUAL ACTIONS TAKEN

178,600+ employees
(at ~200 sq ft per employee)

217 BUILDINGS
representing 35,725,000+ sq ft

OPERATOR campaigns:
54%
of organizations participating

50% of buildings BENCHMARKED

March 2017

Who Plays a Role in a Successful SEiO?

Coaches and Captains

Tenants

Building Operators

DUKE ENERGY. | Smart Energy in Offices

Program Manager
Julie Hyde

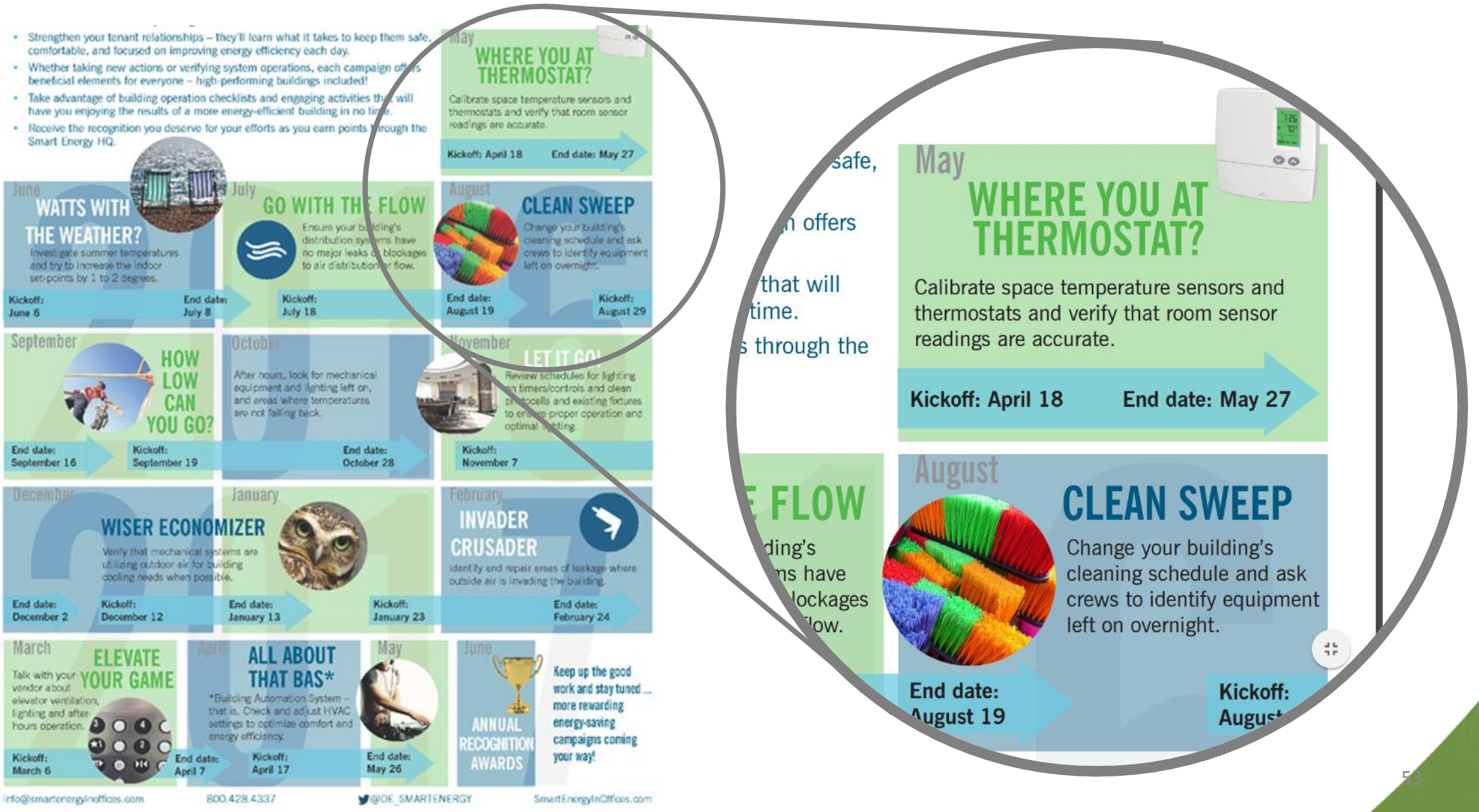
Engagement Manager
Gina Zahran

Engagement Manager
Mike Trofe

Accelerated Innovations

UNC CHARLOTTE
The WILLIAM STATES LEE COLLEGE *of* ENGINEERING

Operator Campaign Calendar



Operator Campaign Highlights

Where you at Thermostat?

- 11 buildings found discharge air temps were outside expected range
- 7 buildings made adjustments as a result of verifying thermostats

Working towards Annual Awards Next round June 2017

"Some of the stuff we have discovered was because of SEiO, and we are really glad we participate!"

Shane Woycik, senior chief engineer
Trinity Partners Ally Center

"The program has made the little things that sometimes get lost rise back to the surface."

Participant of "Where you at Thermostat?"

"I'm deeply grateful for all the help from the SEiO team."

Participant of "Shake Up Your Wake Up"

Smart Energy HQ

Automated Benchmarking

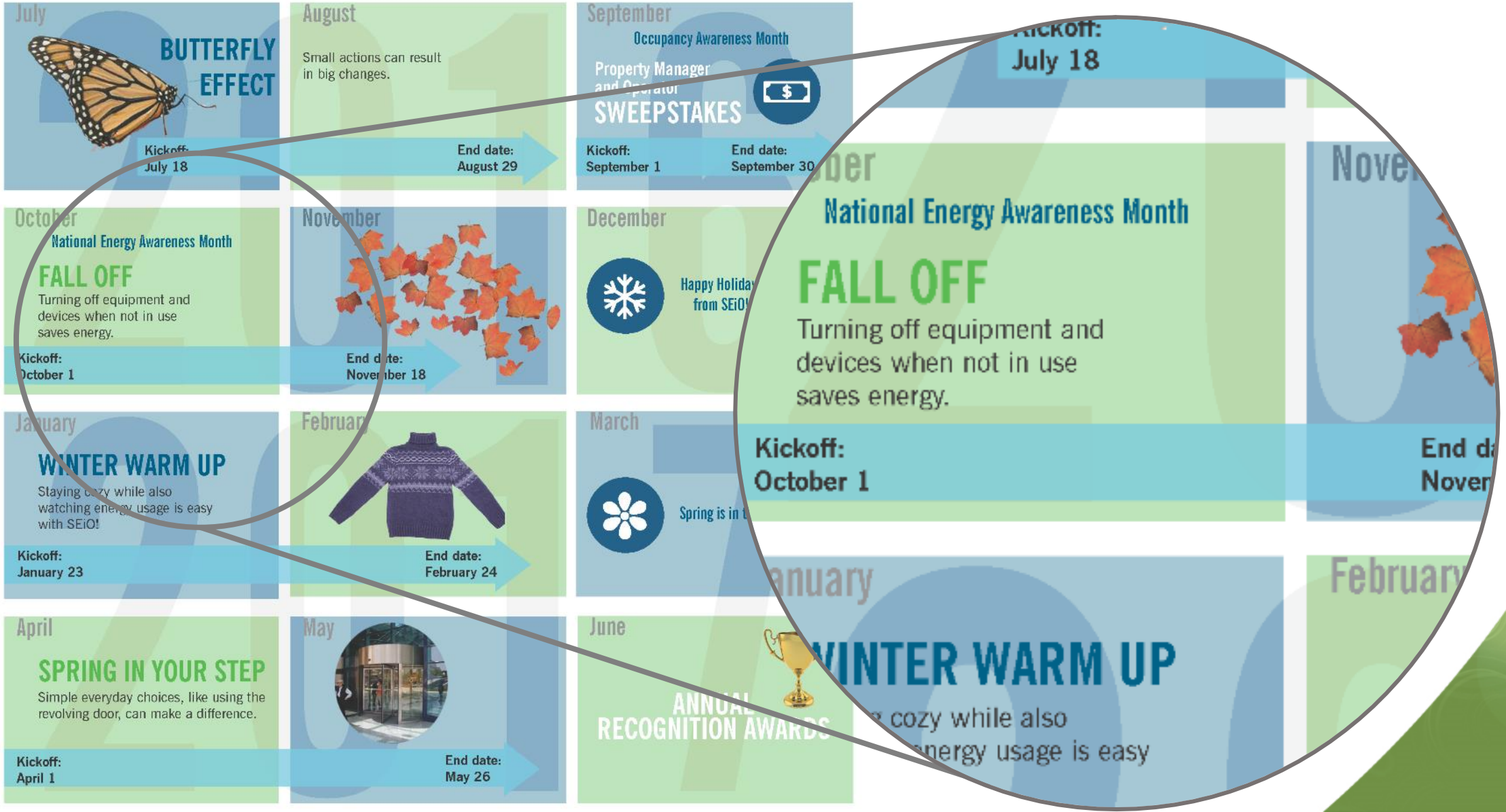
Usage Data/Comparisons

Engagement Content

Tenant Focus

- Quarterly community challenges
  - Add it Up
  - July 2016 Butterfly Effect
  - October 2016 Fall Off
  - January 2017 Winter Warm Up
  - April 2017 Spring In Your Step
- Creates awareness, education and energy saving habits
- Relieves property managers
- Helps with corporate sustainability goals

Tenant Campaign Calendar



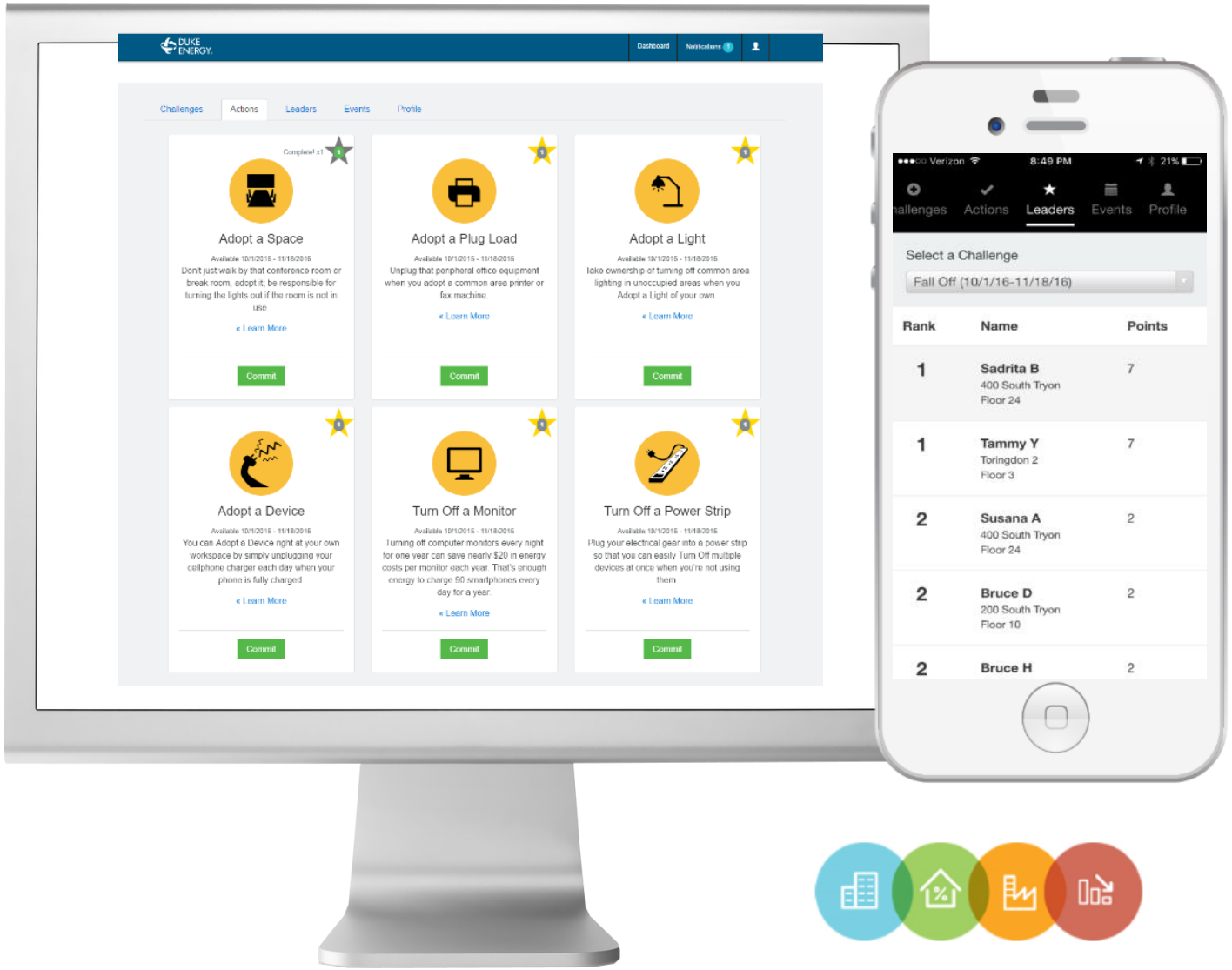
Butterfly Effect Community Challenge

- Work with property managers to push targeted weekly messaging to tenants
- Help launch by hosting tables with giveaways
- Some property managers offer incentives

7,865

Energy Saving Actions taken!

Where to Engage



myenergychallenge.com

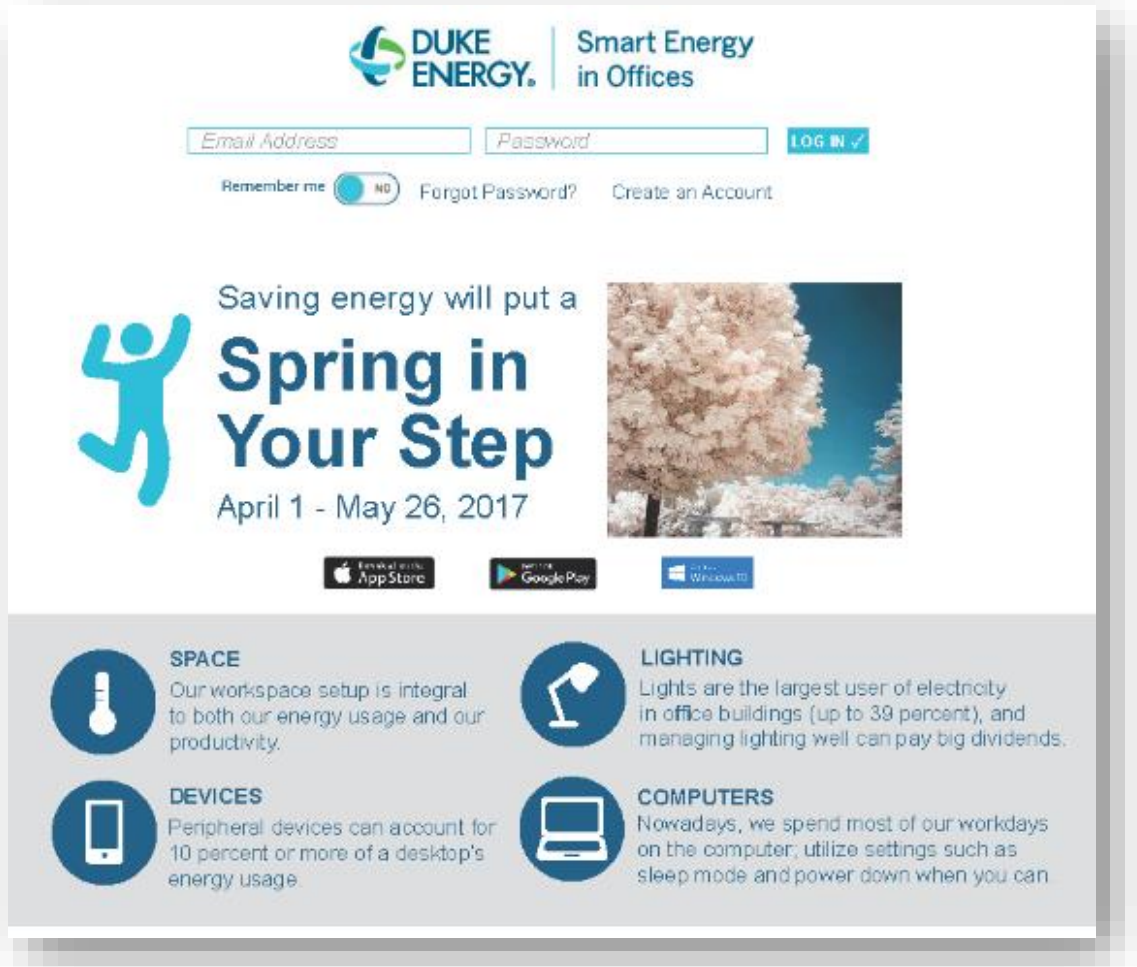
Happen.

App Store
Google Play

@DE_SmartEnergy

What's next for SEiO?

- Healthcare pilot program
- Other Jurisdictions
- Going beyond offices - SEiB
  - Universities
  - Hotels
  - Retail
  - Industrial
- Modeling tool
- Leads
- Strategic energy management (SEM)



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Empowering you to make smart energy choices

Clean Energy Communities

Emerging Technologies Summit
April 20, 2017

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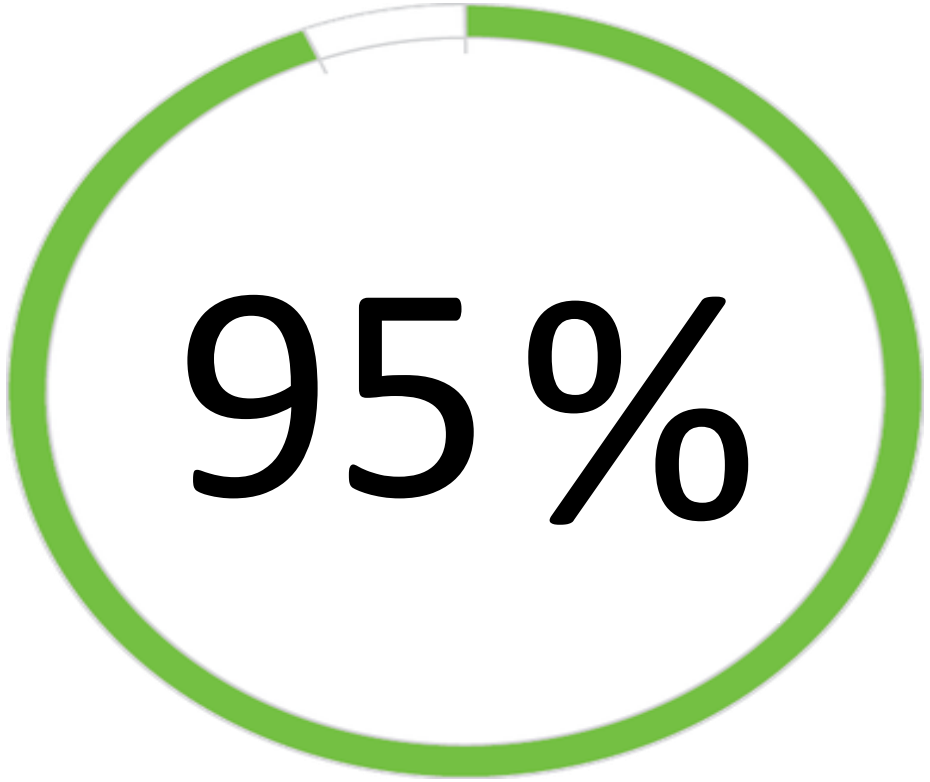
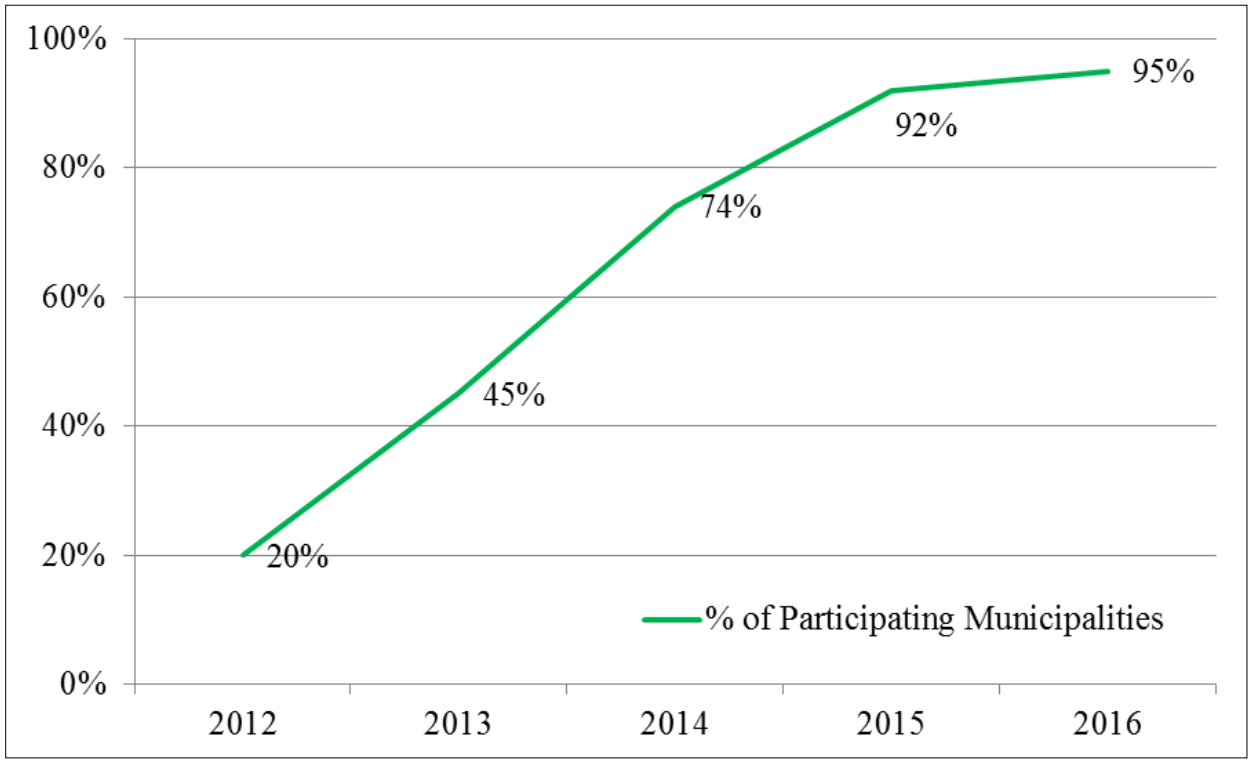
Clean Energy Communities





Connecticut has 169 towns and cities

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Bubble Gum vs. Sustainability

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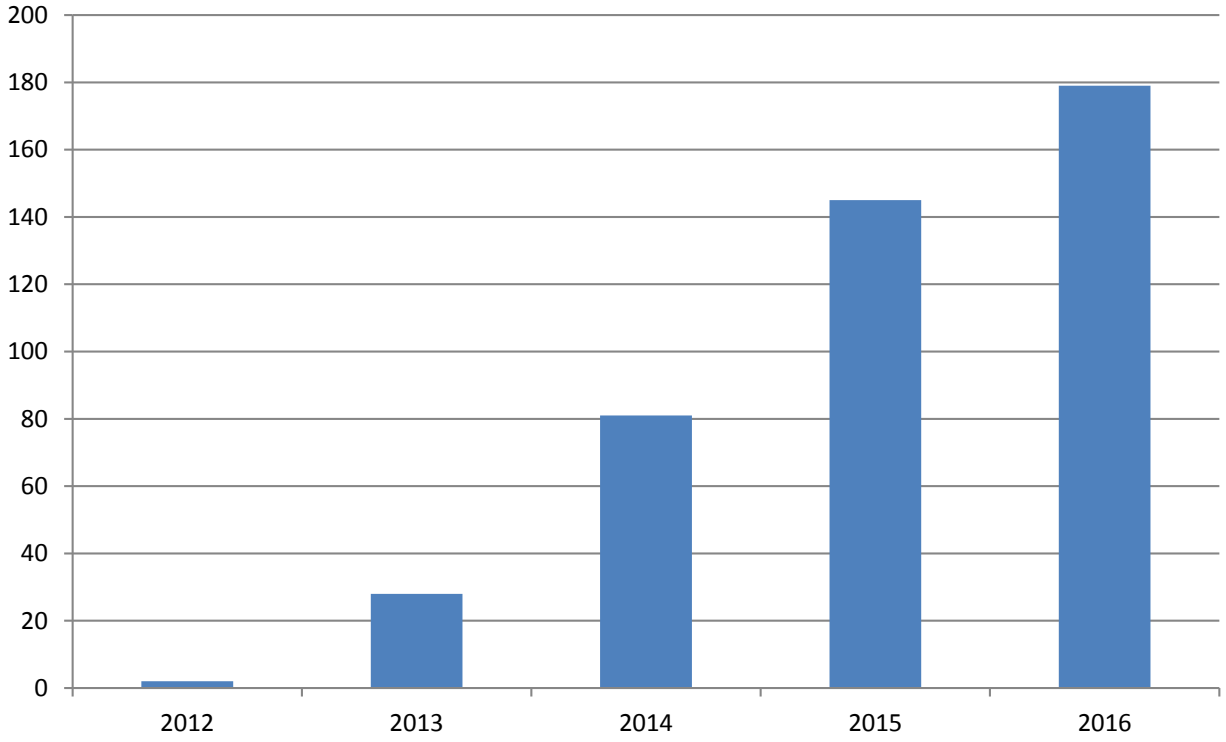
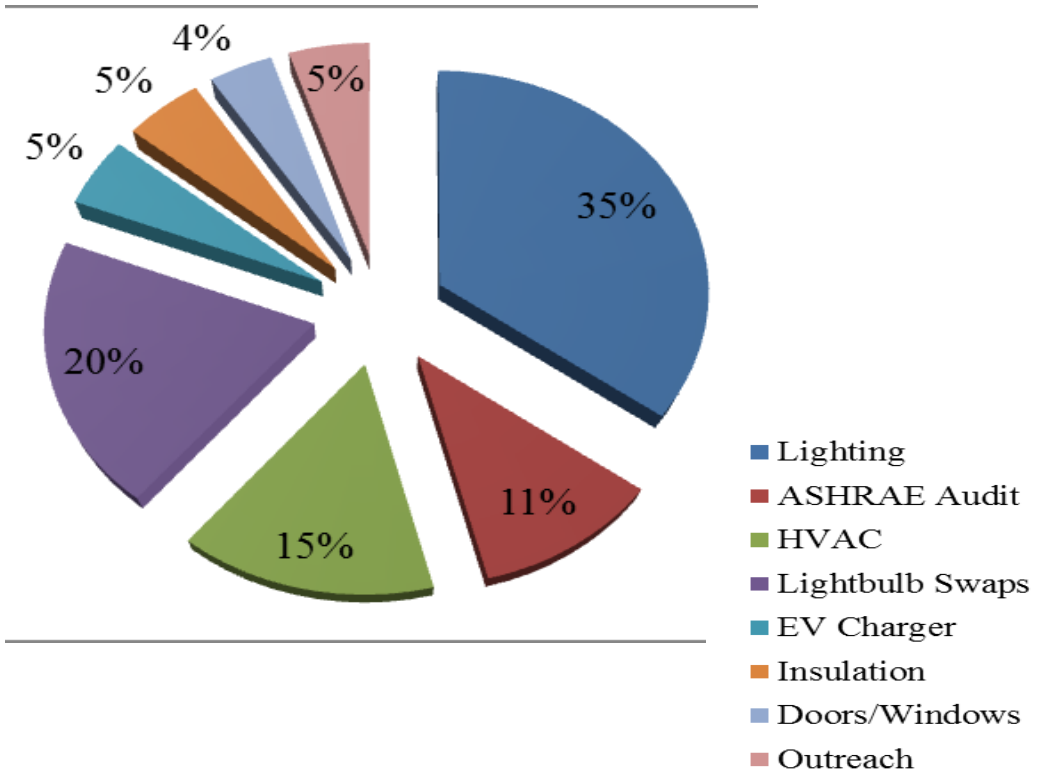
Engaging Our Communities

Engage
Educate
Empower

BIG Rewards Since 2012

- 180 Bright Idea Grants earned
- Over $1 million available for energy efficiency projects





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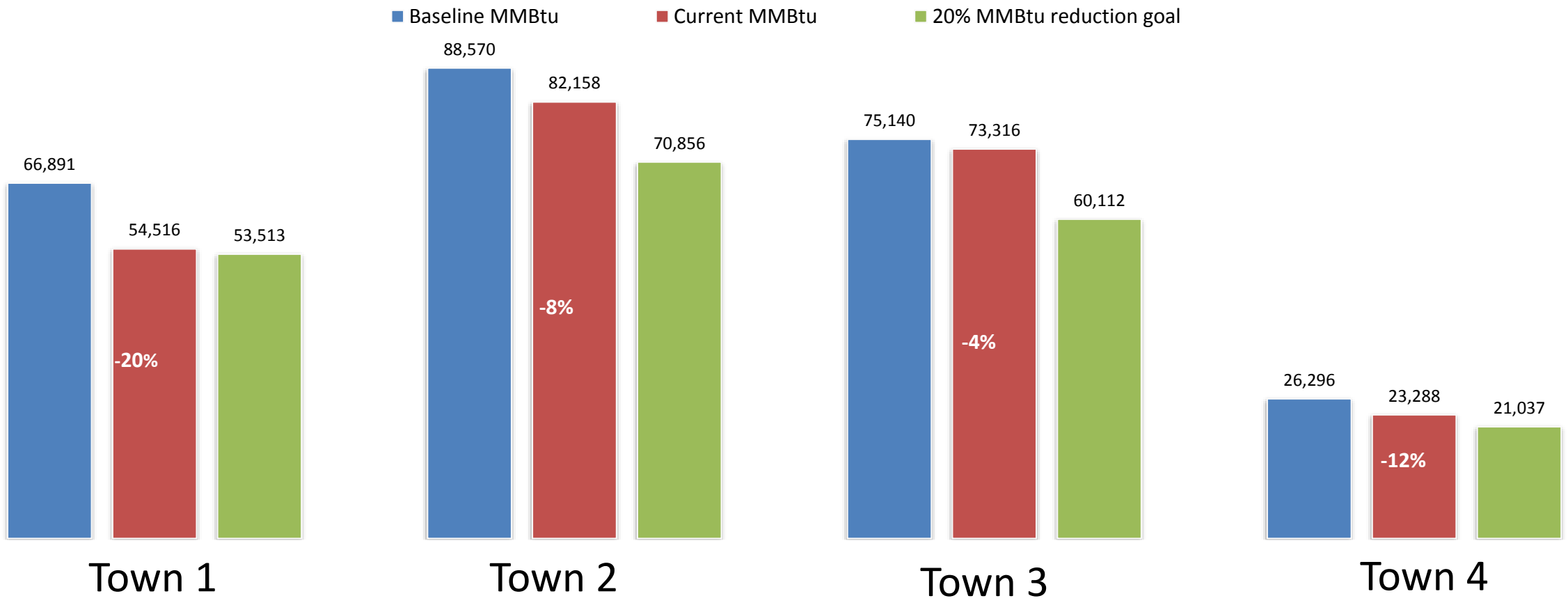
Town Energy Reduction Tracking



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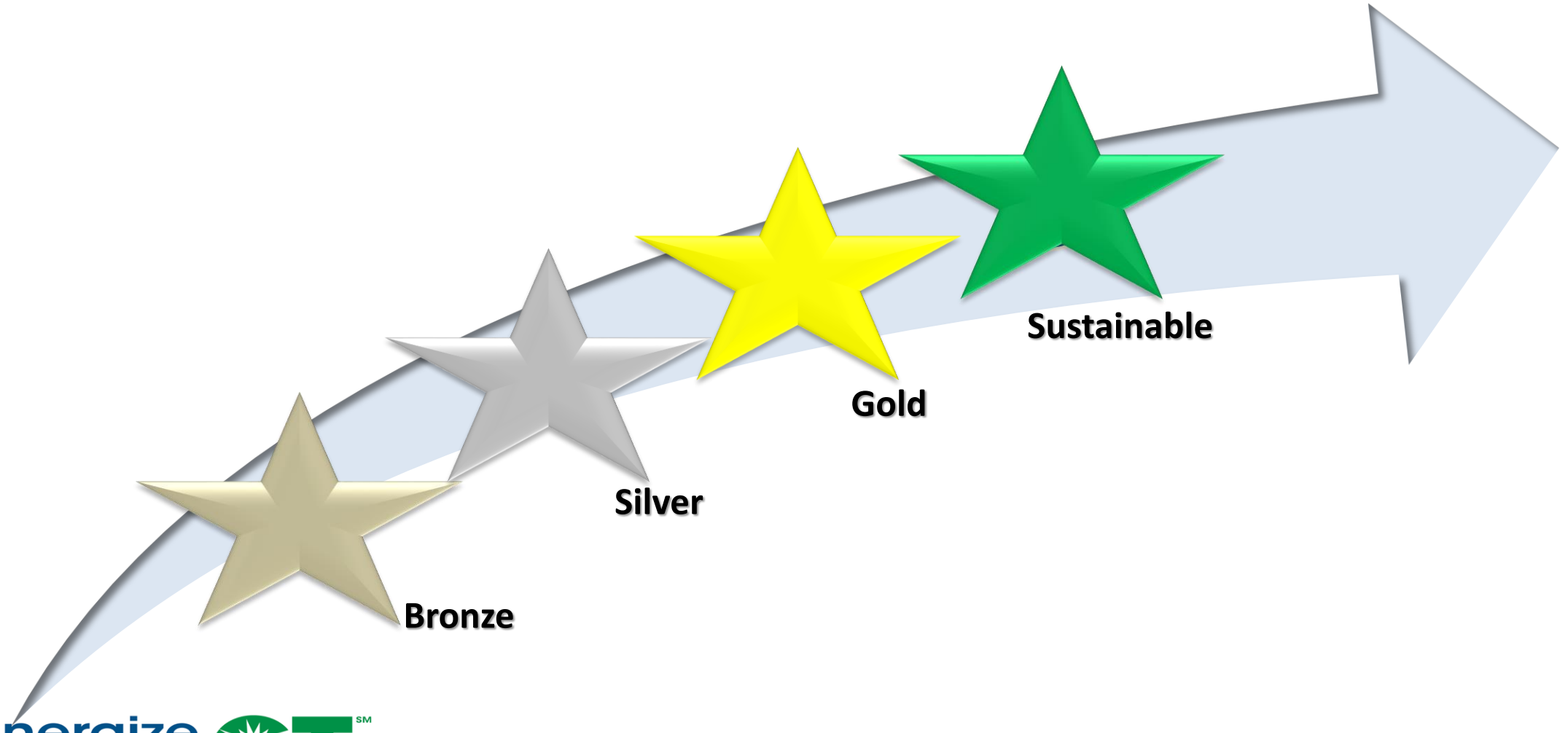
ENERGY STAR® Portfolio Manager®

Clean Energy Communities Recognition



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Clean Energy Communities Level Achievements

Levels	2015 Achievements	2016 Achievements
Bronze	90	63
Silver	53	80
Gold	5	16
Total Communities	**148**	**159**

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Together We Celebrate Success in CT

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Clean Energy Communities in a Flash

1. Take pledge
2. Engage Community
3. Benchmarking energy usage
4. Earn Grants
5. Implement Projects

ENERGY STAR® PortfolioManager®

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Empowering you to make smart energy choices

QUESTIONS?

visit www.ctenergydashboard.com

THANK YOU

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