# Connecticut C2117
# RCx Persistence Study

Utility Kickoff Meeting

March 10, 2022

**Michaels**Energy

# Agenda

**1** Study Background and Outcomes

**2** Overview of Study Activities

**3** Anticipated Challenges & Solutions

**4** Timeline & Budget

# Study Background and Outcomes

## Study Need

- Priority of 2019-2021 C&LM Plan to deliver comprehensive energy savings
- Industry uncertainty about persistence of RCx savings persistence
- Last CT RCx study covered PY 2008-2010 and investigated persistence of compressed air leaks only

CT C2117 Kickoff

# Study Outcomes

- Characterization of the types of RCx measures and their savings installed in CT in past 5-10 years
- Effective life estimates for 4-6 RCx measures expected to be installed in CT over the next 5 years
- Recommendations of 3-5 RCx measures for field study to better estimate persistence

CT C2117 Kickoff

# Research Questions

| Researchable Questions | Interviews: Utility Staff | Interviews: RCx Service Providers/ Market Actors | Utility Data Review | Literature Review |
|---|---|---|---|---|
| What are the 4-6 most common RCx measures installed in the past 5-10 years? | ✓ | | ✓ | |
| Will the mix of RCx measures change in the next 5 years? | ✓ | ✓ | | ✓ |
| What is the best estimate of life for RCx measures expected to be installed in CT during the next 5 years? | | ✓ | | ✓ |
| What are common reasons for the failure of RCx measures and recommendations on how to remedy persistence issues? | ✓ | ✓ | | ✓ |
| What RCx measures should be studied in the field in CT? | | | | ✓ |
| How has/might COVID affected programs and retrocommissioning strategies? | ✓ | ✓ | ✓ | ✓ |

CT C2117 Kickoff

# Program Background

- Retro-commissioning targets malfunctioning and outdated control logic that causes a buildings management system (BMS) to use more energy and prevent it from operating at peak performance
- Buildings must be:
  - >100k SF
  - Have a BMS with trending capability
  - Have a current ENERGY STAR Benchmark

CT C2117 Kickoff

# Example RCx Opportunities

✓ Optimizing fresh air economizer operations
✓ AHU supply fan static pressure
✓ Reheat and variable air volume control sequences
✓ Condenser water temperature
✓ VFDs for pumps and fans
✓ BMS operation sequence – confirmation to meet current scheduling requirements

✓ Review of humidity set point ranges for data centers
✓ Demand-based ventilation system improvements
✓ Chiller discharge temperature – automation of reset
✓ Free-cooling control sequence improvements
✓ Electric unit heaters – addition of control schemes
✓ Identification and elimination of simultaneous heating and cooling situations

CT C2117 Kickoff

# Overview of Study Activities

❯ Utility Data
Analysis

❯ Utility Staff
Interviews

❯ RSP Interviews

❯ Literature
Review

❯ Analysis and
Reporting

# Utility Data Analysis

- Analyze program tracking data from past 5 years
- Identify most implemented measures/groups
- Review measures by year to identify trends
- Identify participating vendors and market actors

- Priority measures
  - CAV to VAV AHU Conversion
  - AHU Scheduling and Optimization
  - Occupancy Sensors
  - ChW Controls
  - Exhaust Fan Controls
- These measures represent 82% of electric and 75% of natural gas savings

CAV = constant air volume    VAV = variable air volume
ChW = Chilled water    AHU = Air handling unit

Utility Data Analysis

# Priority Measures

- **CAV to VAV AHU Conversion** – Adding variable speed controls to allow central units to slow down and match the load, which saves both fan energy and heating and cooling energy
- **AHU Scheduling and Optimization** – Turning off equipment during unoccupied times or periods with load loads. Optimizations include allowing the equipment to operate more efficiently at part-load conditions
- **Occupancy Sensors** – Only providing ventilation, space conditioning, or lighting to occupied spaces

CT C2117 Kickoff

Utility Data Analysis

# Priority Measures, Continued

- **ChW Controls** – Changing how chillers are operated to allow them to most efficiently meet the load by slowing down pumps, properly staging equipment, or maximizing heat transfer in the system
- **Exhaust Fan Controls** – Eliminates fan energy and space conditioning energy by avoiding exhausting conditioned air during unoccupied periods

CT C2117 Kickoff

# Utility Staff Interviews

- Interviews with program staff from Eversource and UI
- Topics Covered:
  - Context around past program offerings/ measures
  - Expected changes to measure mix
  - Other persistence factors:
    - Customer training
    - Participation in other programs
    - Business turnover

# RCx Service Provider and Market Actor Interviews

- Interviews with:
  - Participating RSPs (n=2)
  - Controls vendors and other market actors (n=8)
- Topics Covered:
  - In-field observations about measure/savings persistence
  - Expectations for measures to be installed in next 5 years
  - Reasons for measure failures or savings decrease
  - How best to increase measure/savings persistence
  - Training of customers
  - Effect of COVID-19 on RSP practices, customer uptake, and continuation of RCx measures
  - Accounting of changes in baselines due to COVID-19

# RCx Service Provider and Market Actor Interviews

- We may need to interview multiple people at each firm
- If we see large variation in responses, we will consider conducting follow-up interviews to iterate on findings
- Examples of controls vendors
  - Johnson Controls
  - Environmental Systems Corporation
  - SNE Building Systems
  - Automated Building Systems

CT C2117 Kickoff

# Literature Review

- Thorough review of past RCx persistence research
- Initial focus on Northeast and programs/measures most similar to CT
  - Will likely broaden scope to cover all of US and Canada
- Topics Covered:
  - Papers and conference proceedings
  - Studies and materials from regional energy efficiency associations
  - Materials from national laboratories
  - Utility program evaluation-related materials
- Review of sources will uncover additional sources for review

Examples of studies
- 2018 ComEd (Seventhwave)
- 2020 ETO (DNV)
- 2017 ETO (DNV)
- 2018 PSE (DNV)

CT C2117 Kickoff

# Analysis

| Data Source | Analysis | Output |
|---|---|---|
| Staff Interviews | Qualitative | Summary of findings |
| RSP/Market Actor Interviews | Qualitative | Summary of findings |
| Utility Data Review | Quantitative | Descriptive Statistics (e.g., range, mean, median) |
| Literature Review | Qualitative/ Quantitative | - Descriptive Statistics (e.g., range, mean, median)<br>- Summary of findings |

CT C2117 Kickoff

# Reporting

- Report will include:
  - Characterization of past and projected RCx measures
  - Best estimates of RCx measure persistence for PSD
  - Recommendations on best practices to increase persistence in future
  - List of studies and other relevant research to aid future reviews

- Michaels will also develop a plan for future RCx persistence research
  - 3-5 measures for further study
  - High-level evaluation plan for field study
- Report will meet requirements of Evaluation Roadmap
  - E.g., Include abstract, comparison to other jurisdictions/programs and past years

CT C2117 Kickoff

# Anticipated Challenges and Solutions

# Anticipated Challenges and Solutions

- Differing measure names/descriptions may complicate comparability across studies
  - Michaels will group similar measures to increase comparability
- Limited population of RSPs and potential Covid-related survey reluctance
  - Offering $50 incentive for interview
- High variability or large error bounds in persistence estimates
  - Michaels will rate our confidence in rigor of sources when developing persistence estimates
- Many studies may be based on limited number of sources
  - Literature review will follow references to the original source and use the original sources in our analysis

# Timeline and Budget

CT C2117 Kickoff

# Timeline and Budget

- Literature Review
  - Jan-March 2022
- RSP/Vendor Interviews
  - March-April 2022
- Draft Report
  - April 2022
- Final Report
  - May 2022

| Task | Budget |
|---|---|
| Material Review and Interviews | $36,000 |
| Analysis and Reporting | $14,000 |
| **TOTAL** | **$50,000** |

CT X2001 Kickoff

# Questions?

Jake Millette
Associate Director, Research & Evaluation
jbmillette@michaelenergy.com

**Michaels**Energy

23