Today’s Agenda

• Objectives and study need
• Background on multifamily programs
• Overview of study activities
• Data collection & analysis
• Anticipated challenges & solutions
• Key study outputs
• Proposed schedule
Study Objectives

1. Provide recommended updates for the 2019 PSD with multifamily (MF) specific values for measure level savings
   – Conduct a thorough, data-driven review focusing on the most impactful measures

2. Compute program-level realization rates for programs with high MF retrofit savings
   – Based on a comparison of reported vs. installed measures
   – Adjusted by extrapolating findings from on-site field verification for a sample of projects

Why is this study needed?

• No recent PSD review of MF assumptions

• No recent impact evaluations of MF retrofit programs
  – HES Impact Evaluation of 2015-2016 program years excluded MF (R1603, 2019)
    • Only single family was included in the billing analysis
    • MF dwelling units could not be identified in billing data for many projects
  – Process evaluations of the Multifamily Initiative (R157) and HES & HES-IE programs (R4) have been conducted, but identify program improvement opportunities, not savings verification (NMR 2015, 2016)
  – NTG Study for CT Residential New Construction (R1707) studied net-to-gross (NTG) assumptions (NMR 2018)
EnergizeCT Multifamily Initiative

• Overview
  – Provides tiered incentives for direct-install and add-on measures
  – Treats MF buildings holistically
    • Incentivizes tenant and common area measures
    • Provides “single touch point” for customer
  – Provided through Home Energy Solutions (HES) and HES- Income Eligible (HES-IE), Energy Opportunities (EO)

• Project tracking varies by utility
  – Eversource: tracks tenant and common area measures through HES and HES-IE
  – UI: tracks tenant measures through HES and HES-IE; projects with only common area measures are tracked through EO
    • No multifamily “flag” in EO

Overview of Study Activities

<table>
<thead>
<tr>
<th>Objective</th>
<th>Study Activity</th>
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| Update the 2019 PSD with multifamily (MF) specific values | **Data Collection:**
  • Identify MF measures in 2019 PSD for revision
  • Compare assumptions with other states’ TRMs

| Analysis: |
  • Perform engineering review of prioritized measures
  • Propose revisions to PSD values |

| Compute realization rates for programs with high MF retrofit savings for 2016-2018* program years | **Data Collection:**
  • Review Multifamily Initiative documents and databases
  • Conduct engineering review and field verification for a sample of projects |

| Analysis: |
  • Calculate realization rates for sampled projects
  • Extrapolate to program-level and (where possible) measure-level realization rates |

*Also evaluate the 2019 program year if possible
PSD Update: Data Collection

• Review Connecticut’s 2019 PSD for MF assumptions
• Speak with utilities and technical consultants
• Identify TRMs from other states for comparison
  – MidAtlantic, NY, IL, ME, VT, and others
• Identify priority MF measures for revision based on impact on overall savings:
  – High savings per measure
  – High installation volume
  – High level of uncertainty due to age of reference and number of embedded assumptions
• Review recent applicable codes and standards to inform baseline for “lost opportunities” savings
  – Coordinate with ERS to avoid duplicating efforts

PSD Update: Data Collection

• MF measures to be reviewed for possible update include:
  – Frequently installed measures
    • Common area and exterior lighting
    • Water conservation (faucets and aerators)
    • High performance windows
    • HVAC upgrades
  – Measures expected to be installed more frequently in the future
    • Heat pumps
    • W-fi thermostats
• MF measures that need revised calculations include:
  – Air sealing
  – DHW equipment upgrades (including HPHW)
**PSD Update: Process**

1. **Review 2019 PSD for MF-specific measures that need revisions**
2. **Perform engineering review of identified measures to validate algorithms and source data**
3. **Compare with other states’ TRMs**
4. **Draft revisions to identified measures**
5. **Analyze data to identify whether it generally supports the savings estimates of revised measures**
6. **Propose MF-specific revisions to 2019 PSD to reflect MF building characteristics and operations**

**Realization Rate: Data Collection**

- Review previous evaluation reports
- Submit data request using approved procedures
  - Expected data requests
    - Access to 2016-2018 HES, HES-IE, and EO program documents & databases
    - Project files for sampled projects
    - Billing data for sampled projects
  - Piggy back on existing data requests where possible
- Review program documents & databases
- Conduct engineering review and field verification for a sample of projects (details on upcoming slides)
Realization Rate: Sampling Plan

1. Identify MF projects from HES, HES-IE, and EO programs from 2016-2018 program years

2. Design sample for 90% confidence / 10% precision for both utilities’ territories, where possible
   - Sample 82 projects total, 41 projects from each utility:
     • 30 from HES and HES-IE
     • 11 from EO (if MF projects found)
   - Use stratified ratio estimation to capture high savings projects

3. Stratify sample by kWh and maximize confidence / precision for gas

Realization Rate: Field Data Collection

• Conduct comprehensive field verification at sampled sites. Verify:
  – All measures in common areas
  – Tenant measures in a sample of dwelling units (depending on accessibility)

• Purpose is to identify actual installed conditions

**Realization Rate: Analysis**

- Compute project-level realization rates
  - Use existing PSD algorithms and baseline assumptions
  - Adjust project-specific inputs based on field findings and other data collected on-site
  - Calculate project-level realization rates

- Extrapolate from project-level to program-level realization rate based on project case weights

**Anticipated Study Challenges**

- **Challenge:**
  - MF projects tracked in multiple program databases, at least in UI
  - MF projects not always flagged

- **Solution:**
  - Treat HES and HES-IE evaluation separately from EO evaluation
  - Prioritize resources on evaluating HES and HES-IE
  - Estimate savings from MF projects in EO and typical adjustment factor

- **Challenge:**
  - Billing data is limited
  - Some measures may not be matched to building IDs or to specific dwelling units

- **Solution:**
  - Use a combination of billing analysis and engineering principles to adjust realization rates
### Key Study Outputs

<table>
<thead>
<tr>
<th>Objective</th>
<th>Deliverable</th>
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<tbody>
<tr>
<td>PSD update</td>
<td>Recommended specific revisions to 2019 PSD values and algorithms to reflect MF building characteristics and operations</td>
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<td></td>
<td><em>From engineering review of PSD and comparison with other states' TRMs</em></td>
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<tr>
<td>Impact Evaluation</td>
<td>Compute program-level and some measure level realization rates for each program with high MF retrofit savings</td>
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<tr>
<td></td>
<td>• MF-specific savings and realization rate for HES &amp; HES-IE, calculated for each utility</td>
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<td></td>
<td>• Average savings and realization rate for MF projects in EO (with sample size caveat)</td>
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<td><em>From engineering review and field verification of sample projects</em></td>
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### Proposed Schedule

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<th>Stage</th>
<th>Proposed Schedule</th>
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<tr>
<td>Project Design &amp; Kickoff</td>
<td>September – November  &lt;br&gt; <strong>Kick off meeting:</strong> December 6, 2019</td>
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<tr>
<td>Data Collection (Literature review and engineering review)</td>
<td>October – January</td>
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<tr>
<td>Data Collection (On-site verification)</td>
<td>January – March</td>
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<td>Draft PSD Revisions</td>
<td>February – March</td>
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<tr>
<td>Analysis and Reporting</td>
<td>March – July  &lt;br&gt; <strong>Draft report:</strong> June 2020  &lt;br&gt; <strong>Final report:</strong> July 2020</td>
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Thank you