# Polishing a Hidden Gem: A Novel Evaluation Method for Energy Codes & Standards Programs

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## Objective

Calculate the energy savings attributable to the Rhode Island Code Compliance Enhancement Initiative (CCEI) during the 2018-2020 period.

## Methodology

**Assess Attribution**

1. Analyze measure-level compliance improvements
2. Estimate baseline compliance without CCEI
3. Analyze measure-level impact of CCEI activities
4. Assess impact of other efforts to boost compliance
5. Approximate Naturally Occurring Market Adoption
6. Estimate residential & commercial attribution scores
7. Project attribution across 2018-2020

**Estimate Savings**

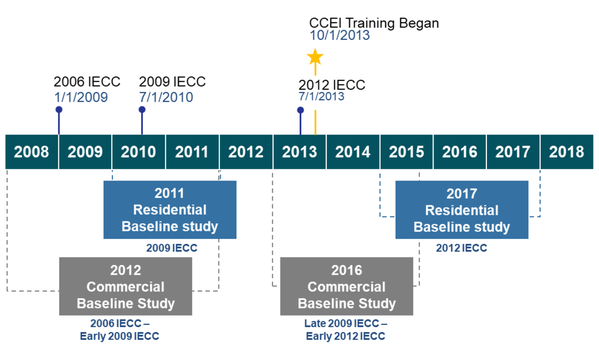
Gross Technical Potential

Project new construction growth

Calculate GTP per unit

**Net Program Savings**

## R.I. Code Adoption & Compliance Study Timeline




## Process

### 1. Analyze measure-level compliance improvements

Measures with improved efficiency identified by comparing compliance studies conducted before and after CCEI was implemented

| | Measure | Improved Efficiency | Relative Importance |
|---|---|---|---|
| Residential | Window and skylight | Yes ↑ | 20% |
| | Air leakage | Yes ↑ | 19% |
| | Above grade wall insulation | Yes ↑ | 17% |
| | Flat ceiling insulation | Yes ↑ | 12% |
| | Duct leakage to the outside | Yes ↑ | 10% |
| | Frame floor insulation | Yes ↑ | 8% |
| | Lighting | Yes ↑ | 8% |
| | Slab insulation | Yes ↑ | 3% |
| | Foundation wall insulation | No ↓ | 3% |

| | Measure Category | Improved Efficiency | Relative Importance |
|---|---|---|---|
| Commercial | HVAC | Yes ↑ | 46% |
| | Building Envelope | Yes ↑ | 39% |
| | Lighting | No ↓ | 15% |

### 2. Estimate baseline compliance without CCEI

Timeline for future code changes unclear; assumed buildings completed between 2018-2020 would be built under 2012 IECC

### 3. Analyze measure-level impact of CCEI activities

CCEI training focus areas correlated with participant feedback

| | Measure | Training Focus | Impact of Training |
|---|---|---|---|
| Residential | Window and skylight | Low ↓ | Low ↓ |
| | Air leakage | High ↑ | High ↑ |
| | Above grade wall insulation | Medium — | Medium — |
| | Ceiling insulation | Medium — | Medium — |
| | Duct leakage | Medium — | High ↑ |
| | Frame floor insulation | Low ↓ | Medium — |
| | Lighting | Low ↓ | Low ↓ |
| | Slab insulation | Low ↓ | Low ↓ |
| | Foundation wall insulation | Low ↓ | Low ↓ |

| | Measure Category | Training Focus | Impact of Training |
|---|---|---|---|
| Commercial | HVAC | Low ↓ | Low ↓ |
| | Building Envelope | High ↑ | Medium — |
| | Lighting | Medium — | High ↑ |

### 4. Assess impact of other efforts to boost compliance

No compelling reason to incorporate other organizations into the attribution assessment

| Organization | Code Compliance |
|---|---|
| Rhode Island Building Code Commission (RIBCC) | Indirect support ☆ |
| Rhode Island Builders Association | Indirect support ☆ |
| Rhode Island American Institute of Architects (AIAri) | Indirect support ☆ |

### 5. Approximate Naturally Occurring Market Adoption

Massachusetts data provided a proxy for NOMAD in Rhode Island

| | Measure | Was improved efficiency in RI > NOMAD? |
|---|---|---|
| Residential | Window and skylight | No ↓ |
| | Air leakage | Yes ↑ |
| | Above grade wall insulation | Yes ↑ |
| | Ceiling insulation | No ↓ |
| | Duct leakage | Yes ↑ |
| | Frame floor insulation | No ↓ |
| | Lighting | Yes ↑ |
| | Slab insulation | -- |
| | Foundation wall insulation | -- |

### 6a. Estimate residential attribution score

**Residential measures that justified attribution:**

✓ air leakage
✓ above grade wall insulation
✓ duct leakage
✓ lighting

| Measure | Assign Attribution to CCEI? | Relative Importance (A) | % Attributable to CCEI (B) | Attribution Score (A*B) |
|---|---|---|---|---|
| Window and skylight | No ↓ | 20% | 0% | 0% |
| Air leakage | Yes ↑ | 19% | 60% | 11% |
| Above grade wall insulation | Yes ↑ | 17% | 35% | 6% |
| Ceiling insulation | No ↓ | 12% | 0% | 0% |
| Duct leakage and insulation | Yes ↑ | 10% | 45% | 5% |
| Frame floor insulation | No ↓ | 8% | 0% | 0% |
| Lighting | Yes ↑ | 8% | 20% | 2% |
| Slab insulation | No ↓ | 3% | 0% | 0% |
| Foundation wall insulation | No ↓ | 3% | 0% | 0% |
| ***Attribution Score (Sum of Component Scores)*** | | | | ***23%*** |

### 6b. Estimate commercial attribution score

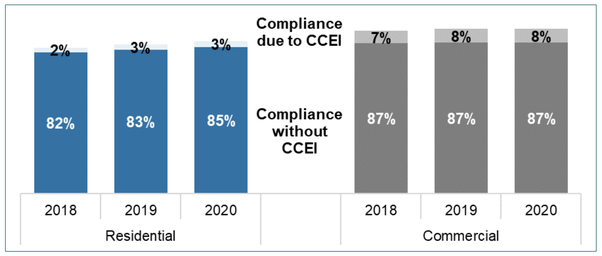
**Measure Categories' relative attribution:**
Building Envelope (55%) → HVAC (45%) → Lighting (25%)

| Measure Category | Attribution Ranking | Relative Importance (A) | % Attributable to CCEI (B) | Attribution Score (A*B) |
|---|---|---|---|---|
| HVAC | Medium — | 46% | 45% | 21% |
| Building Envelope | High ↑ | 39% | 55% | 21% |
| Lighting | Low ↓ | 15% | 25% | 4% |
| ***Attribution Score (Sum of Component Scores)*** | | | | ***46%*** |

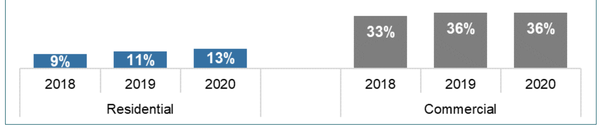
## Results

### 7. Project attribution across 2018-2020

Pre- and post-CCEI compliance rates from baseline studies modified by attribution scores from Step 6




**Maximum Potential Improvement due to CCEI**




## Conclusions / Recommendations

- Design energy code support programs to capture a variety of data
- Proactively identify data sources that aid estimation of NOMAD
- Prioritize maintaining alignment between program planning and code update cycles
- Appliance and equipment standards present an opportunity to extend this approach

**Study offers robust and replicable framework for codes & standards program savings attribution**