Evaluation Considerations for Programs that Utilize Embedded Billing Analysis

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IEPEC Denver
“The adjustments all cancel out!” “How can you assume that?!”
Ex-ante 2.0

- Pre/post billing analysis
- Continuous (or at least ongoing)
- All participants
- Embedded in program functions
- Used for more than just savings reconciliation
- Other methods may be used for reserving savings
- Customer targeting
- Customer engagement and acquisition
- Enabling hard-to-M&V Program Types (behavior, tune-ups)
- Early feedback on failing projects (CRR, CUSUM)

Benefits

- Savings Load Shapes
  - Existing conditions baseline required
  - Reasonably deep savings required
  - The need for adjustments
- Calculating NRAs for nonresidential programs
  - Costs may increase
- Not all buildings produce good models
  - Uncertain uncertainty

Challenges

- No measure disaggregation
- Little information about Why

Implementation

Both

Evaluation
All billing analysis requires adjustment

<table>
<thead>
<tr>
<th>Population</th>
<th>Applicable Sectors</th>
<th>Baseline Adjustment Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homogenous</td>
<td>Residential</td>
<td>Comparison group</td>
</tr>
</tbody>
</table>

Savings = (Baseline Period Energy – Reporting Period Energy) +/- Routine Adjustments +/- Non Routine Adjustments

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<tr>
<th>Population</th>
<th>Applicable Sectors</th>
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<tr>
<td>Heterogeneous</td>
<td>Nonresidential</td>
<td>NRA</td>
</tr>
</tbody>
</table>
# Flavors of Ex-ante 2.0

<table>
<thead>
<tr>
<th>Ex-ante 2.0 Flavor</th>
<th>Treatment of NRAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population with Comparison</td>
<td>Embedded billing analysis with a comparison group</td>
</tr>
<tr>
<td>Population w/o Comparison</td>
<td>Embedded billing analysis without a comparison group</td>
</tr>
<tr>
<td>Embedded Option C</td>
<td>Embedded billing analysis of all participants while attempting to identify and quantify NRAs at high rigor.</td>
</tr>
<tr>
<td>Raw Site Level</td>
<td>No NRA</td>
</tr>
</tbody>
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Evaluating Ex-ante 2.0 Programs

<table>
<thead>
<tr>
<th>Ex-ante 2.0 Flavor</th>
<th>Evaluation Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population with Comparison</td>
<td>Review analysis, review comparison group</td>
</tr>
<tr>
<td>Population w/o Comparison</td>
<td>Comparison group analysis, difference of differences</td>
</tr>
</tbody>
</table>
| Embedded Option C | • Sample (after reviewing CUSUMs and CRRs)  
                    • Use Option C for some but not all  
                    • For Opt C, high rigor verify NRAs, missing data, dates |
| Raw Site Level | • Adjust baseline if not existing conditions  
                    • Calculate Realization Rates  
                    • Review reserved savings analysis, site visits, and/or M&V to answer “Why?” |
Leveraging Program Billing Data in Evaluation

- Savings Load Profiles
- New sampling methods using CRR and CUSUM
  - CRR = Claimed-to-Reserved Ratio
    \[ \text{Claimed (ex-ante) / Reserved} \]
  - CUSUM Plots
CUSUM

Or a seasonal measure?

POSSIBLE NRE
### Strata Based on Ex-ante 2.0 Metrics

<table>
<thead>
<tr>
<th>Condition</th>
<th>Reasoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex-ante 2.0 was not used (perhaps because of poor model fitness or small %savings).</td>
<td>By using a different ex-ante method, realization rates for other strata will not be applicable.</td>
</tr>
<tr>
<td>Ex-ante 2.0 model has poor model fitness or small percentage of savings.</td>
<td>Ex-ante savings are very uncertain.</td>
</tr>
<tr>
<td>CUSUM plot shape is traditional and CRR is close to 1.0.</td>
<td>May anticipate small CV for this group.</td>
</tr>
<tr>
<td>CUSUM plot shape is traditional and CRR is not close to 1.0.</td>
<td>No NRE likely, but one may want to explore why claimed and reserved estimates were inconsistent.</td>
</tr>
<tr>
<td>CUSUM plot shape is nontraditional.</td>
<td>Indicating NRE or a failed measure.</td>
</tr>
</tbody>
</table>
# Aligning Savings

<table>
<thead>
<tr>
<th>Ex-ante 2.0 Flavor</th>
<th>Options for Avoiding Surprises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population with Comparison</td>
<td>Involve evaluator in selecting the comparison group</td>
</tr>
<tr>
<td>Population w/o Comparison</td>
<td>Prospective estimate of comparison group delta</td>
</tr>
</tbody>
</table>
| Embedded Option C | Apply prospective RR  
Evaluator feedback on large NRA |
| Raw Site Level | Apply prospective RR |
| Not existing Conditions Baseline | Prospective BAR if not in-situ baseline  
BAR = Lost Opportunity Savings / In-situ Savings |
Ex-ante 2.0

Population with Comparison

Population w/o Comparison

Embedded Option C

Raw Site Level

Claimed to Reserved Ratio

CUSUM

Baseline Adjustment Ratio

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Office Locations

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Outline

- Embedded billing analysis as a program function (ex-ante 2.0)
- Some accepted truths of billing analysis
- Categories of ex-ante 2.0 (from an evaluator’s perspective)
- Evaluation approaches for ex-ante 2.0 programs
- Leveraging program billing data in evaluation (quick intro)
- Options for aligning ex-ante and verified savings