WARREN ENERGY ENGINEERING, LLC

Evaluation Considerations
for Programs
that Utilize Embedded Billing Analysis

August 19, 2019

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

	Implementation	Both	Evaluation
Benefits	▪ Customer targeting		
	▪ Customer engagement and acquisition		
	▪ Enabling hard-to-M&V Program Types (behavior, tune-ups)		
	▪ Early feedback on failing projects (CRR, CUSUM)		
		▪ Savings Load Shapes	
Challenges		▪ 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	
			▪ No measure disaggregation
			▪ Little information about Why

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All billing analysis requires adjustment

Population	Applicable Sectors	Baseline Adjustment Technique
Homogenous	Residential	Comparison group

Savings = (Baseline Period Energy – Reporting Period Energy)

+/- Routine Adjustments +/- Non Routine Adjustments

| Population	Applicable Sectors	Baseline Adjustment Technique
Heterogeneous	Nonresidential	NRA
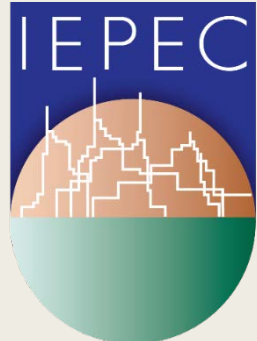
Flavors of Ex-ante 2.0
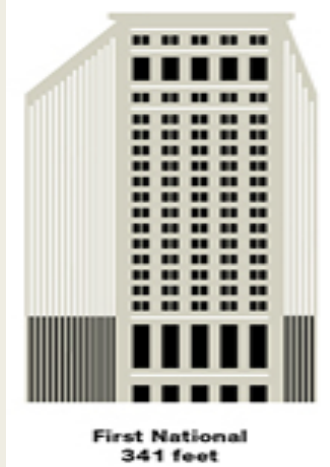
Ex-ante 2.0 Flavor	Treatment of NRAs
Population with Comparison	Embedded billing analysis with a comparison group
Population w/o Comparison	Embedded billing analysis without a comparison group
Embedded Option C	Embedded billing analysis of all participants while attempting to identify and quantify NRAs at high rigor.
Raw Site Level	No NRA

First National
341 feet

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Evaluating Ex-ante 2.0 Programs

| Ex-ante 2.0 Flavor	Evaluation Approach
Population with Comparison	Review analysis, review comparison group
Population w/o Comparison	Comparison group analysis, difference of differences
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?"

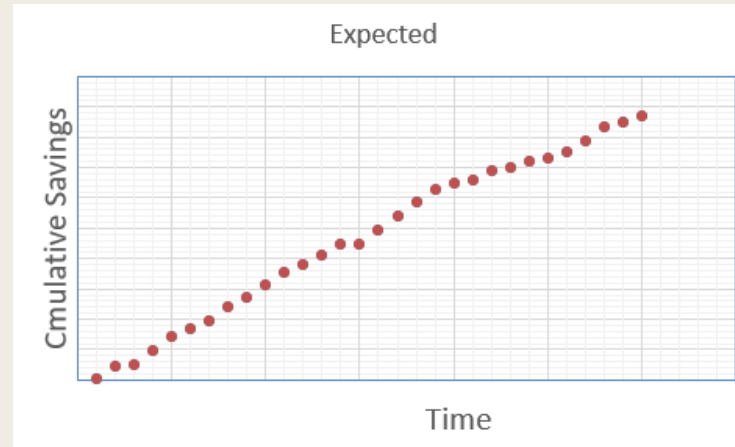First National
341 feet

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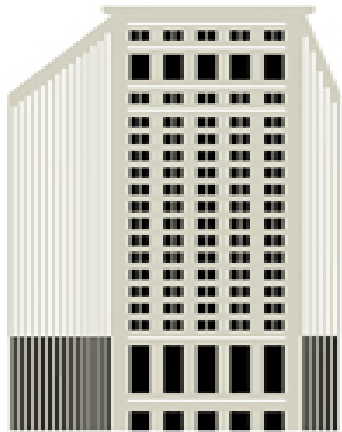
Leveraging Program Billing Data in Evaluation

- Savings Load Profiles

- New sampling methods using CRR and CUSUM
    - *CRR = Claimed-to-Reserved Ratio*

      Claimed (ex-ante) / Reserved
   - *CUSUM Plots*

CUSUM

Expected

Or a seasonal measure?

POSSIBLE NRE
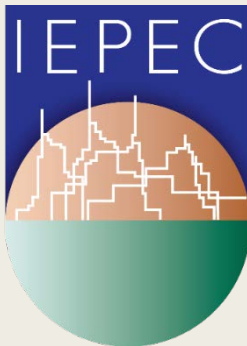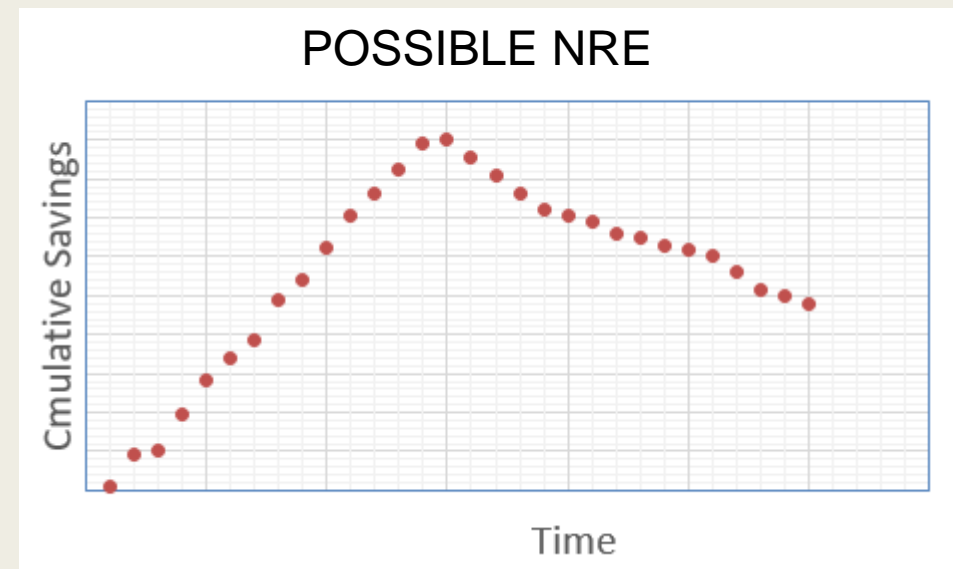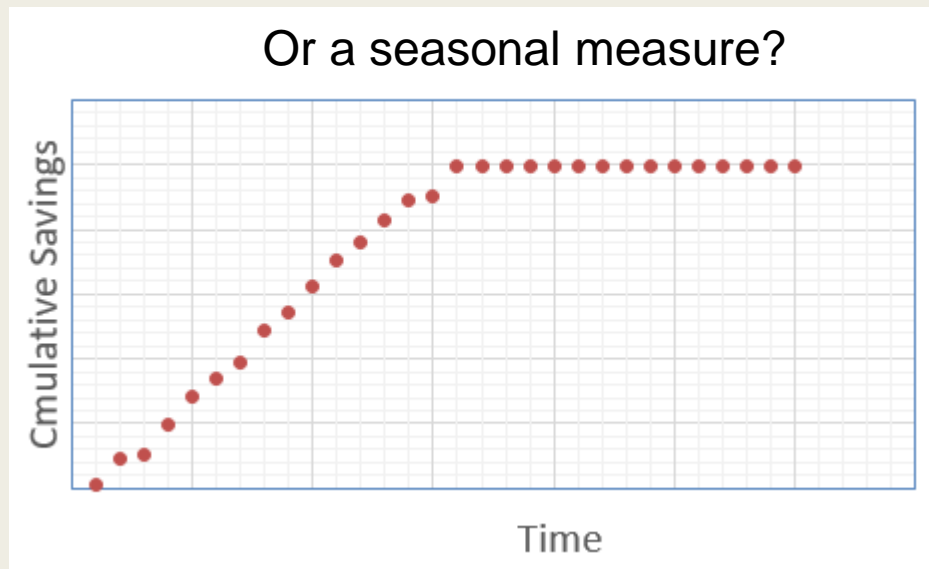
Strata Based on Ex-ante 2.0 Metrics

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

Aligning Savings

First National
341 feet
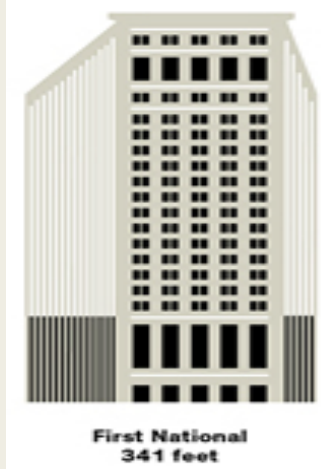
Ex-ante 2.0 Flavor	Options for Avoiding Surprises
Population with Comparison	Involve evaluator in selecting the comparison group
Population w/o Comparison	Prospective estimate of comparison group delta
Embedded Option C	Apply prospective RR Evaluator feedback on large NRA
Raw Site Level	Apply prospective RR

Not existing Conditions Baseline	Prospective BAR if not in-situ baseline BAR = Lost Opportunity Savings / In-situ Savings

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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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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