



Attributing Savings of Utility Midstream Energy Efficiency Programs

Standardizing a Protocol to
Estimate Free Ridership

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Estimating Free Ridership of Midstream Programs

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Typical Utility Energy Efficiency Equipment Rebate Programs and Measuring Attributable Savings

- North American utilities have offered rebates to their customers for buying energy efficient equipment.
- Utility stakeholders and regulators want to know gross savings and net (or additional) savings.
- The most common method to estimate net savings is to survey customers to estimate free ridership and spillover.
- Net-to-Gross (NTG) = $1 - \text{Free Ridership (FR)} + \text{Spillover (SO)}$
- Net Savings = Gross Savings * $(1 - \text{FR} + \text{SO})$



Survey-Based Method to Estimate Free Ridership

Exploring customer decision-making: program influence and counterfactual



Risks of Self-Report Surveys

- Social desirability bias
- Self-serving bias
- Hindsight bias



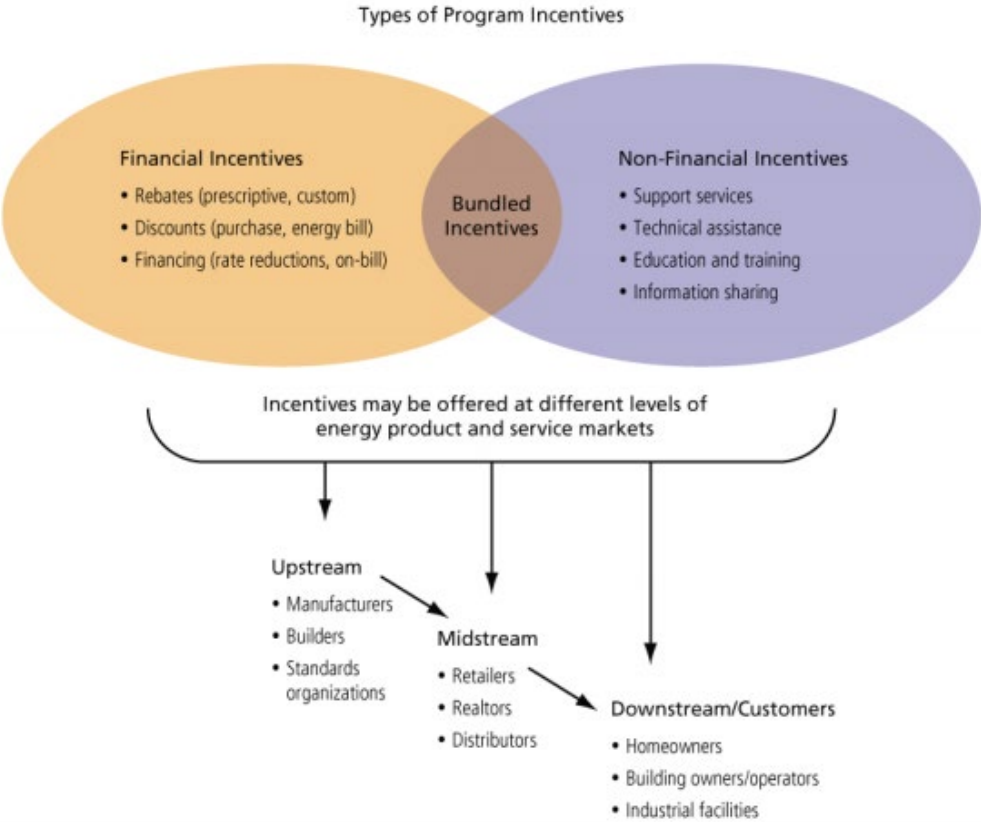
Mitigated by Industry-Leading Practices

- Survey design
- Sampling
- Timing
- Question wording

Midstream Programs

Increase market share by paying incentives to distributors who in turn

- Increase stocking of high efficiency units
- More frequently upsell high efficiency options to contractors
- Offer training or marketing for trade allies



Source: National Action Plan for Energy Efficiency 2010

Efficiency Program	Measure	Incentive Amount	Increase in Participation
Efficiency Maine	ENERGY STAR Heat Pump Water Heater (HPWH)	\$600	423% (PY1)
Efficiency Vermont	ENERGY STAR HPWH	\$300/\$500	750%
Energize Connecticut	ENERGY STAR HPWH and Natural Gas Water Heaters	\$300 for gas; \$600 for HPWH	1,000% (PY2)
	ENERGY STAR Natural Gas Boiler and Furnaces	\$450-\$800	234% (PY2)

Source: ENERGY STAR 2017

Approaches to Estimate Net Savings of Midstream Programs

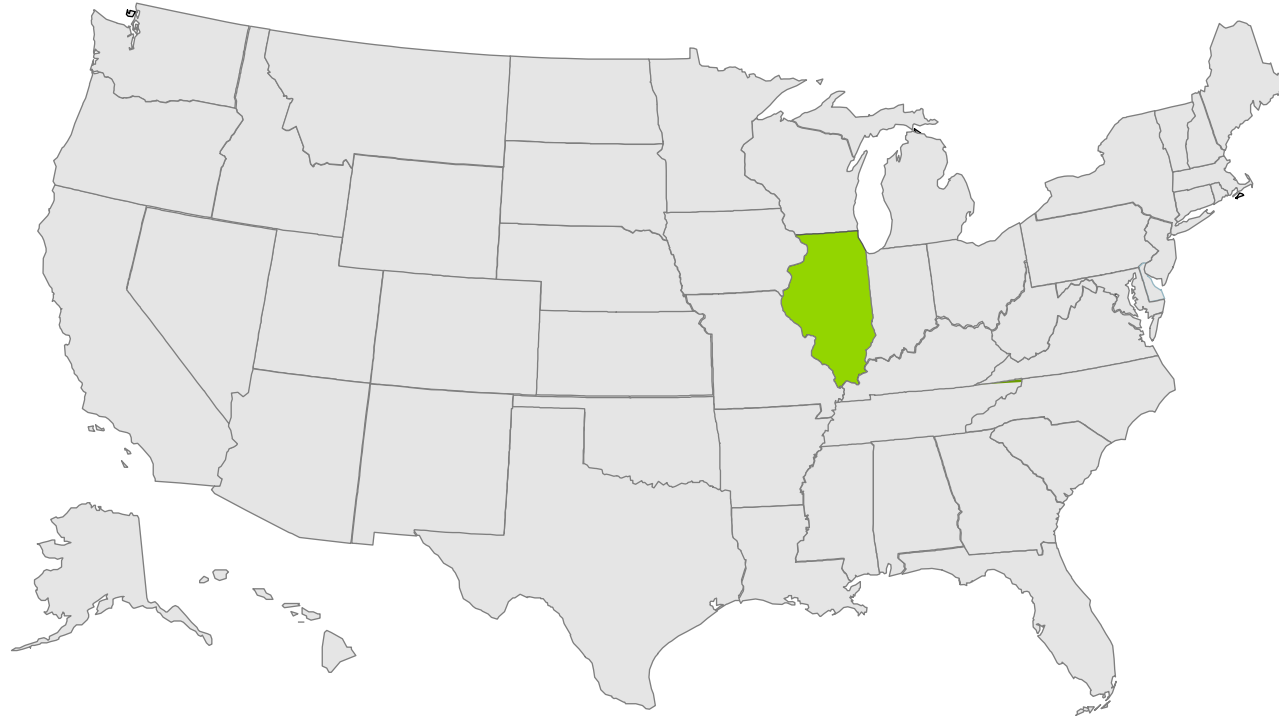


- Consumption data analysis
- Market sales data
- Structured expert judgment
- Common practice baseline assumption

Utility Energy Efficiency Programs Regulated by State

Regulators in Illinois directed evaluators to standardize NTG methods in 2016

- State Technical Reference Manual to standardize methods to calculate:
 - Gross savings
 - Free ridership and spillover
- Technical working groups:
 - Evaluator-led
 - Subject matter experts
 - Utility program managers
 - Program implementers
 - Regulators
 - Energy efficiency stakeholders



2019 NTG Working Group Drafted Standard for Midstream =

Industry-Leading Practices to Estimate Free Ridership for Downstream Programs +
Distributor Perspective + End-User Perspective

Estimating Distributor Free Ridership

Exploring customer decision-making: program influence and counterfactual

Industry-Leading Practices

Multiple questions that:

- Use numbers from the respondent
- Explore program influence and the counterfactual
- Reference specific distributor strategies



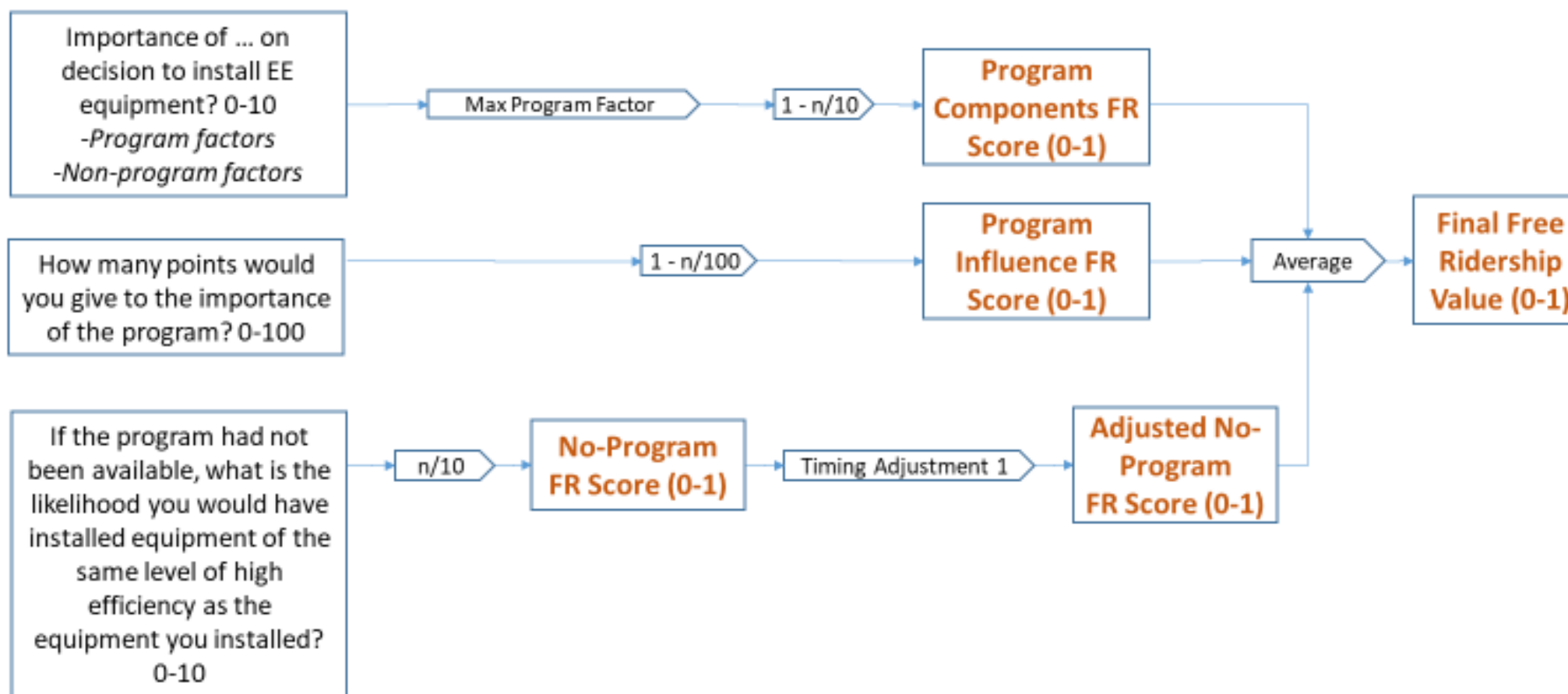
Distributor Considerations

- Strategies to sell program equipment to trade allies
- Program factors that may influence distributors

Estimating Distributor Free Ridership

For nonresidential program, average of three scores

$$(\text{Program Components FR Score} + \text{Program Influence FR Score} + (\text{No-Program FR Score} * \text{Timing Adjustment 1})) / 3$$



Source: Illinois Technical Reference Manual Version 9.0 <https://www.ilsag.info/technical-reference-manual/il-trm-version-9/>

Note: for Distributor FR, this algorithm for end-user surveys for downstream programs would be modified so that "stock, promote, and sell" would replace "install".

Estimating End-User Free Ridership

When end user contact information is available

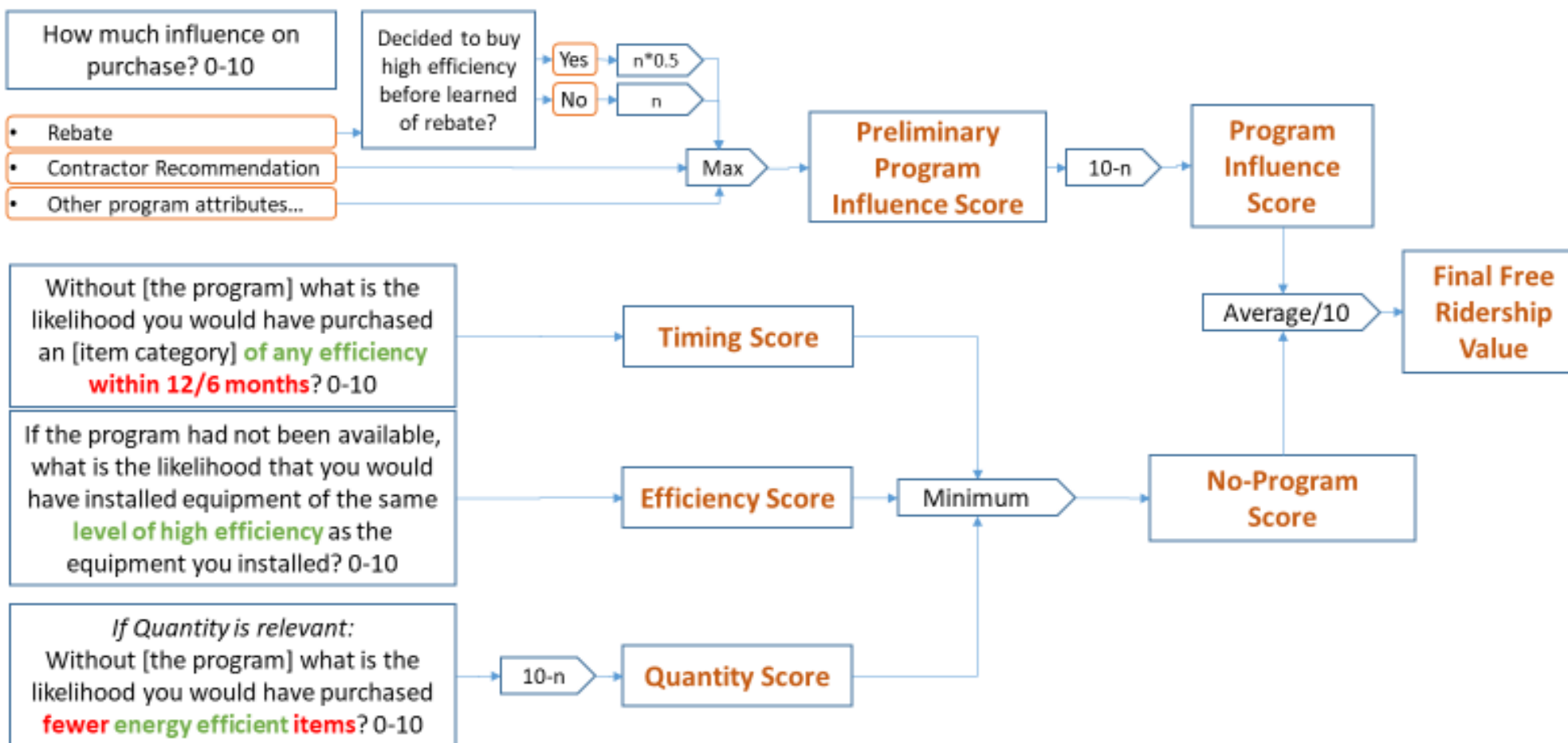
Similar to method for distributor free ridership:

- Use numbers from the respondent
- Explore program influence and the counterfactual



Estimating End-User Free Ridership

For residential program, average of two scores



Source: Illinois Technical Reference Manual Version 9.0 <https://www.ilsag.info/technical-reference-manual/il-trm-version-9/>

Combining Free Ridership of Distributors and End Users

Weight according to likely bias, accuracy, and representativeness of results



Example:

NTG Triangulation Data and Analysis

	Distributor	End User
How likely is this approach to provide an accurate estimate of free ridership?	6	8
How valid is the data collected/analysis?	3	5
How representative is the sample?	8	10
Average Score	5.7	9
Sum of Averages	14.7	14.7
Weight	39%	61%

Source: Illinois Technical Reference Manual Version 9.0 <https://www.ilsag.info/technical-reference-manual/il-trm-version-9/>

Benefits of Standard Protocol to Measure Free Ridership of Midstream Programs

With a protocol that is:

- Based on industry-leading practices
- Designed for the market mechanisms of midstream programs

Stakeholder benefits:

- Consistent assessment of cost-effectiveness
- Simplified comparison across utilities



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