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# A Meta-Analysis of Net-to-Gross Estimates in California

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# Overview

- **Objectives**
  - Present the results of a comprehensive review of recent evaluation studies focused on developing an updated set of ex-ante net-to-gross (NTG) ratios
  - Provide comparisons with NTG ratios estimated from previous literature reviews in the 1980s and early 1990s
  - Present an overview of available methods, and advice regarding how to select a method(s) in a specific context
  - Summarize “lessons learned” regarding how and when to use estimates of net savings to adjust future program savings estimates

# Overview of 2008 DEER NTG Update Process

- In January 2008, the CPUC directed the DEER team to update the ex-ante NTG ratios in the DEER database. These values had not been updated since 2001.
- To develop these values, a comprehensive literature review was conducted. Our review included:
  - Recently completed impact evaluations of California statewide and local programs offered from 2002 through 2005
  - Relevant studies from other states
- From these study findings, we developed estimates of NTG ratios by technology, market segment and delivery strategy.

# Scope of 2008 DEER NTG Ratios

- Current CPUC policy (CPUC, 2007) uses a definition of net savings that incorporates free ridership, but excludes spillover and market effects.
  - *Spillover refers to energy savings that are attributed to the presence of energy efficiency programs, but occur outside of the programs.*
- This perspective can be viewed as an indication of marginal program efficacy.
  - *That is, how effective is the current program in influencing current participants to adopt new efficiency measures, regardless of the effects of previous program years.*
- California may consider spillover for some purposes in the future. Evaluation efforts are currently underway to estimate participant spillover and market effects.

# Studies Reviewed

Program Category	# of Studies Reviewed	# of Studies with NTG analysis	# of discrete measures with NTG Analysis
Residential Lighting	3	2	3
Residential HVAC	3	3	10
Residential Energy Star Appliances	2	1	5
Residential New Construction	2	2	5
Residential Multi Family	3	3	7
Residential Appliance Recycling	2	2	2
Residential Direct Install (Third Party Program)	2	1	6
Residential Audit Program	4	3	Many
Nonresidential Prescriptive Rebates	5	2	11
Nonresidential Audit	4	4	5
Nonresidential Direct Install and Other (Third Party Program)	2	2	7
Nonresidential New Construction	2	1	10
Large Nonresidential Custom Rebate	2	2	5
Agricultural Rebates	1	1	1
Retrocommissioning	2	2	Many
Local Government/University Partnership Evaluations	13	4	Many
<b>Total Evaluations Reviewed</b>	<b>52</b>	<b>35</b>	<b>77</b>

# Why is Net Savings Measurement Important?

- Understanding program and portfolio cost-effectiveness
- Improving portfolio design and resource allocation
- Refining program design and tactics
- Understanding market transformation
- Aligning program administrators' financial interests with societal interests
- Understanding how energy efficiency programs affect baseline load forecasts and short-term power procurement decisions

# Review of Methods Used to Estimate NTG Ratios

- 3 categories:
  - Self-Report Methods
  - Sales-Based Methods
  - Econometric Methods

# Self-Report Methods

- *Customer self-reports.* Based on interviews of participating customers exclusively.
- *Supplier self-reports.* Manufacturers/Retailers' predictions of product sales with and without the program rebates used to estimate the NTG ratio.
- *Hybrid approach.* Relies on interviews of both participating customers and the trade allies involved with their project. Results are “triangulated”.

# Sales-Based Methods

- *Per-capita sales comparisons* with a comparable state(s) that does not have a program.
- “*Paired comparison*” approach. Comparison of EE product sales data for a leading big box retailer in a state with rebates versus a similar nearby state without EE product rebates.

# Econometric Methods

- *Discrete choice analysis* estimates EE product purchases made by customers as a function of factors that influence EE demand such as product awareness, product prices, and rebate availability, and customer demographics.
- *Estimating a demand model* to predict the relationship between changes in EE product price, different levels of customer awareness generated by the mass media and incremental EE product sales in different regions of the country.
- *Net billing analysis* can be used for measures that account for a minimum of 5 to 10 percent of total consumption.

# Differences in 2008 vs. 2001 NTG Values

- For most measures, 2008 DEER values are somewhat lower. In part, this was because 2001 values primarily reflected the application of **default NTG values** of 0.80 for both residential and nonresidential measures.
- The more recent DEER NTG ratios for **CFL screw-in bulbs** incorporate the effects of the rapidly transforming CFL market characterized by lower bulb prices, increased purchases by the general population, and resulting higher free ridership levels.
- The increase in the NTG ratio for the **residential appliance recycling** program category reflects certain changes in the NTG methodology.
- The reduction in the NTG ratio for the **Nonresidential Custom measure** is due to the CPUC Energy Division's elimination of +0.10 and +0.05 adjusters for self-report bias, and participant spillover

# Savings-Weighted NTG Ratio Using Updated DEER NTG Values

- 2008 NTG ratios for each program were weighted by the claimed savings for each program. The resulting savings-weighted NTG estimate is 0.72.
- A 1994 review of program evaluations performed by the California Energy Commission staff found an average NTG ratio of 0.70 based on the results of over 20 evaluation studies.
- A similar review performed for the CEC in 1988 found NTGs of 0.80 for Commercial Audits, 0.60 for Commercial Incentives, 0.70 for Industrial Audits, and 0.50 for Industrial Incentives.
- This suggests that NTG ratios (exclusive of spillover) for large program portfolios in California may have been relatively stable over time.

# Which NTG (Net) Estimation Method Should I Use?

- Answers to the following types of questions can help to guide the choice of method(s):
  - **What are the policy goals of the program?**
    - If the program's goals are short-term program efficacy and resource acquisition, free ridership is likely to be the only metric of interest
    - If its goals are market transformation, measurement methods need to be capable of estimating spillover/market effects in addition to free ridership
  - **How mature is the program?**
    - If the program is in its infancy, a sales-based approach is not useful, since sales levels are likely to be very low at the beginning of the program. An exception may be for products that have been promoted for many years in neighboring jurisdictions (such as CFLs)
  - **What is the program design?**
    - *Does the program work with upstream suppliers or downstream customers?* Customer or supplier self reports may not work.
    - *Does the program promote customized measures only?* Econometric methods are not feasible.

# Which NTG Estimation Method Should I Use? (cont'd)

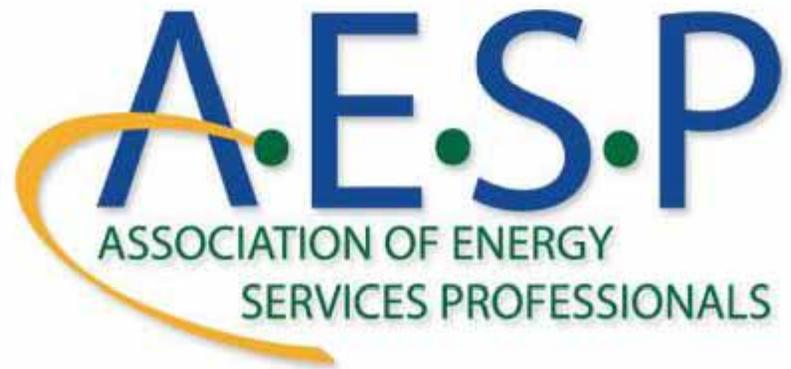
- **How much budget do I have?**
  - A limited evaluation budget may preclude use of more than one method to estimate net program effects.
- **What data is readily available?**
  - Sales-based approaches rely heavily on publicly available data sources for information. These data sources are often incomplete, ruling out the use of such methods.
- **Is a suitable comparison group available?**
  - Sales-based methods and the method involving estimation of a demand model require diversity in market conditions and the availability of “no program” areas.
- **What level of precision is desired?**
  - If a high level of precision is required and the budget is limited, this may rule out the use of multiple methods and/or use of more costly methods such as discrete choice.
- **Are there performance-based metrics which must be met?**
  - If there are performance-based metrics in the program administrator’s goals or contract, the net measurement strategy must be designed to address these metrics.

# Conclusions

- It is important to periodically assess and update free ridership estimates by performing a literature review, as was recently done in California, to discern any underlying trends or changes in assumed NTG ratio levels
- Our review found that despite the widespread changes in equipment markets, and multitude of NTG methodologies, portfolio-level NTG values have been relatively constant since the late 1980s.
- The choice of a specific methodology for measuring program and measure-specific NTG ratios is a complex one, that must consider the:
  - policy context
  - level of market transformation
  - specific program delivery approach
  - size of the evaluation budget
  - availability of comprehensive and reliable data sources

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# Questions?



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# 19<sup>th</sup> National Energy Services Conference & Expo

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