Results of Net-to-Gross Research in Michigan
Standard CFLs in Upstream Lighting Programs

Presentation to Energy Optimization
Collaborative

January 21, 2014

Agenda

1	**Introduction and Background**
2	**Market Data and Net-to-Gross Methods Review**
3	**Detailed Results**
3a	**2009-2013 Results**
3b	**2014-2015 Results**
4	**Q&A/Next Steps**

Commission Orders

- DTE Energy – Case No. U-17049 - December 20, 2012

  "Thus, the Commission finds it reasonable to revisit the appropriate net-to-gross for conventional CFL in 2013, for 2014 and 2015 planning and evaluation purposes. To clarify, for program years 2012-2013, a net-to-gross of 0.90 may be used for calculating energy savings for conventional CFLs."

- Consumers Energy – Case No. U-17138 – January 31, 2013

  "The company will use a net-to-gross ratio of 0.90 for calculating energy savings for its conventional CFLs for 2012-2013. The parties agree that the Commission shall revisit the appropriate net-to-gross ratio for conventional CFLs in 2013 for the 2014 and 2015 program years."
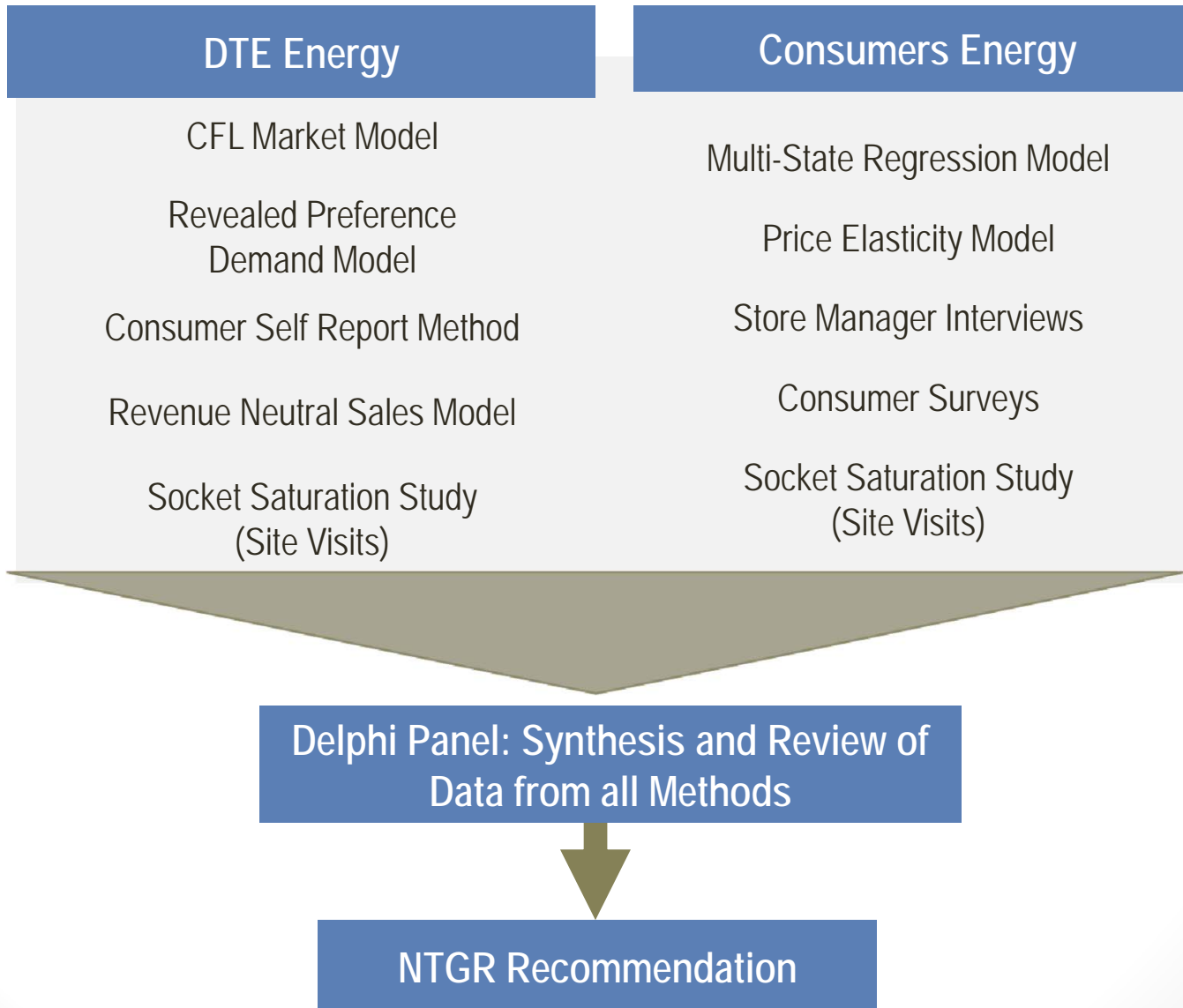
Objectives of Net-To-Gross Research

- Respond to the Commission orders to revisit the net-to-gross ratio (NTGR) for standard CFLs for 2014-2015 program years

- Collaborate in an attempt to establish consistent approaches to measuring the NTGR within the state

- If possible, determine a common NTGR for use by DTE Energy and Consumers Energy for 2014 and 2015 for standard CFLs

Scope of NTG Research

- Utilities worked collaboratively
- Invested in intensive research activities spanning many months, and employing the best-available methods
  - 20-25 percent of the Residential Energy Portfolio Evaluation budgets for 2013 for each of the utilities
- Drew on knowledge of experts from across the country

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CFL NTG Research Activities

DTE Energy	Consumers Energy
CFL Market Model	Multi-State Regression Model
Revealed Preference Demand Model	Price Elasticity Model
Consumer Self Report Method	Store Manager Interviews
Revenue Neutral Sales Model	Consumer Surveys
Socket Saturation Study (Site Visits)	Socket Saturation Study (Site Visits)

Delphi Panel: Synthesis and Review of Data from all Methods

NTGR Recommendation

Advisory (Delphi) Panel

- Goal: Draw on industry experts' knowledge of CFL markets, past and present, to help evaluators estimate programs' influence

- Net Impact = NTGR * Program Sales, *where*
  - NTGR is the ratio of "net" or "program-attributable" sales, to "gross" sales of program-incented bulbs

- NTGR = 1 – Free Ridership + Participant Spillover + Non-Participant Spillover + Market Effects
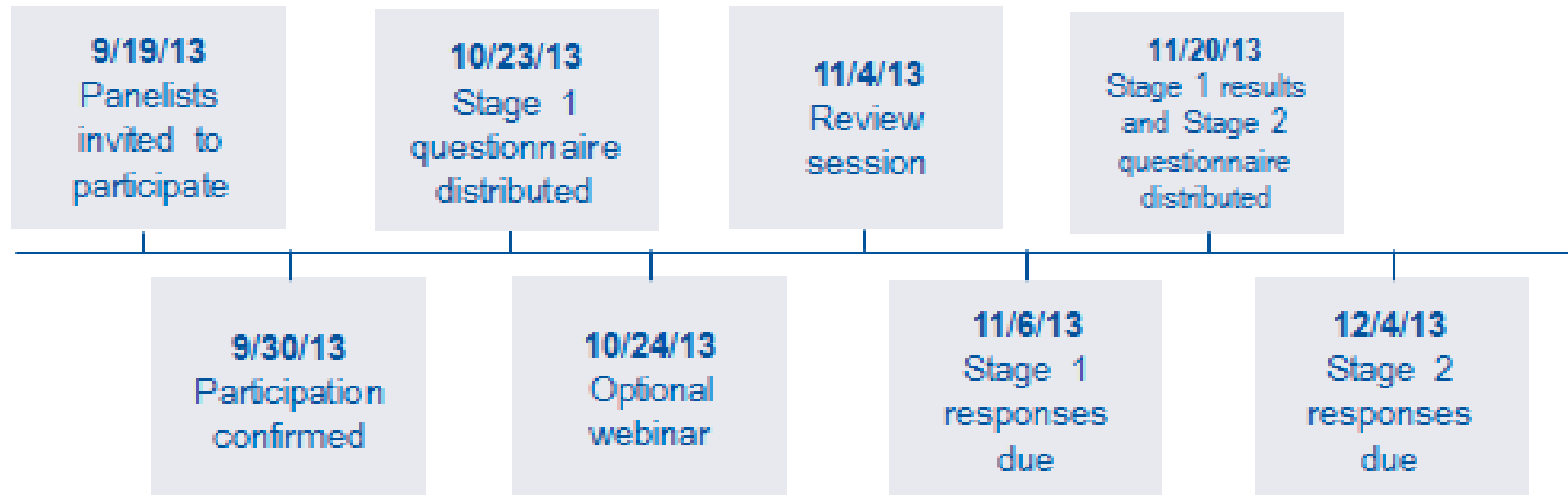
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Panel Participation

18 of 32 invited experts participated, representing a broad range of perspectives

| Program Administrators and Market Support (6 of 7)	Evaluators and Consultants (4 of 6)	Government, Regulators, and Energy/ Environmental Advocates (4 of 6)	Manufacturers and Retailers (4 of 13)
• Northwest Energy Efficiency Alliance • Efficiency Vermont • Xcel Energy • Lockheed Martin • Northeast Energy Efficiency Partnerships • Midwest Energy Efficiency Alliance • Consortium for Energy Efficiency	• California Institute for Energy and Environment • Apex Analytics • D&R International • NYSERDA • Itron • Ecova	• Department of Energy • NY Public Service Commission • Environmental Protection Agency • American Council for an Energy Efficient Economy • Alliance to Save Energy • Natural Resources Defense Council	• Feit Electronics • GE • Greenlite • NEMA/Sylvania • Phillips • TCP • Globe Electric • Meijer • Home Depot • Walmart • ACO Hardware • Menards • Maxlite

Two Stage Process

Timeline of Panel Process

9/19/13
Panelists invited to participate

9/30/13
Participation confirmed

10/23/13
Stage 1 questionnaire distributed

10/24/13
Optional webinar

11/4/13
Review session

11/6/13
Stage 1 responses due

11/20/13
Stage 1 results and Stage 2 questionnaire distributed

12/4/13
Stage 2 responses due

Stage One

- Introductory webinar (recorded)
  - Answered panelist questions during and afterwards

- Excel instrument provided program history, market data, NTG results from multiple research methods

- Panelists were asked to:
  - Rate accuracy of each of seven NTG methods/estimates
  - Estimate joint NTGR for 2009-2013
    - Estimate individual NTGR for CE and DTE, if justified
  - Estimate joint NTGR for 2014-2015
  - Explain rationale for all responses

- Optional study session
 - Additional Q and A

Questionnaire Structure

A. Introductions and Instructions	Provides overall instructions, background and definitions for panelists to consider when completing the questionnaire. Panelists should review this tab FIRST
B. Utility Background Data	Briefly reviews the history and current structure of the Consumers Energy and DTE Electric Residential Lighting Programs
C. Market Background Data	Provides key indicators, over time, of program and market activity in Michigan and elsewhere
D. EISA and Shipment Trends	Presents the timeline for the phase-in of EISA standards, and presents market share data trends for CFLs
E. Net-to-Gross Methods and Values	Explains how the various net-to-gross estimates were developed
F. Questions to Complete	Includes the questions that we are requesting you provide responses for

Visualizing NTG Components
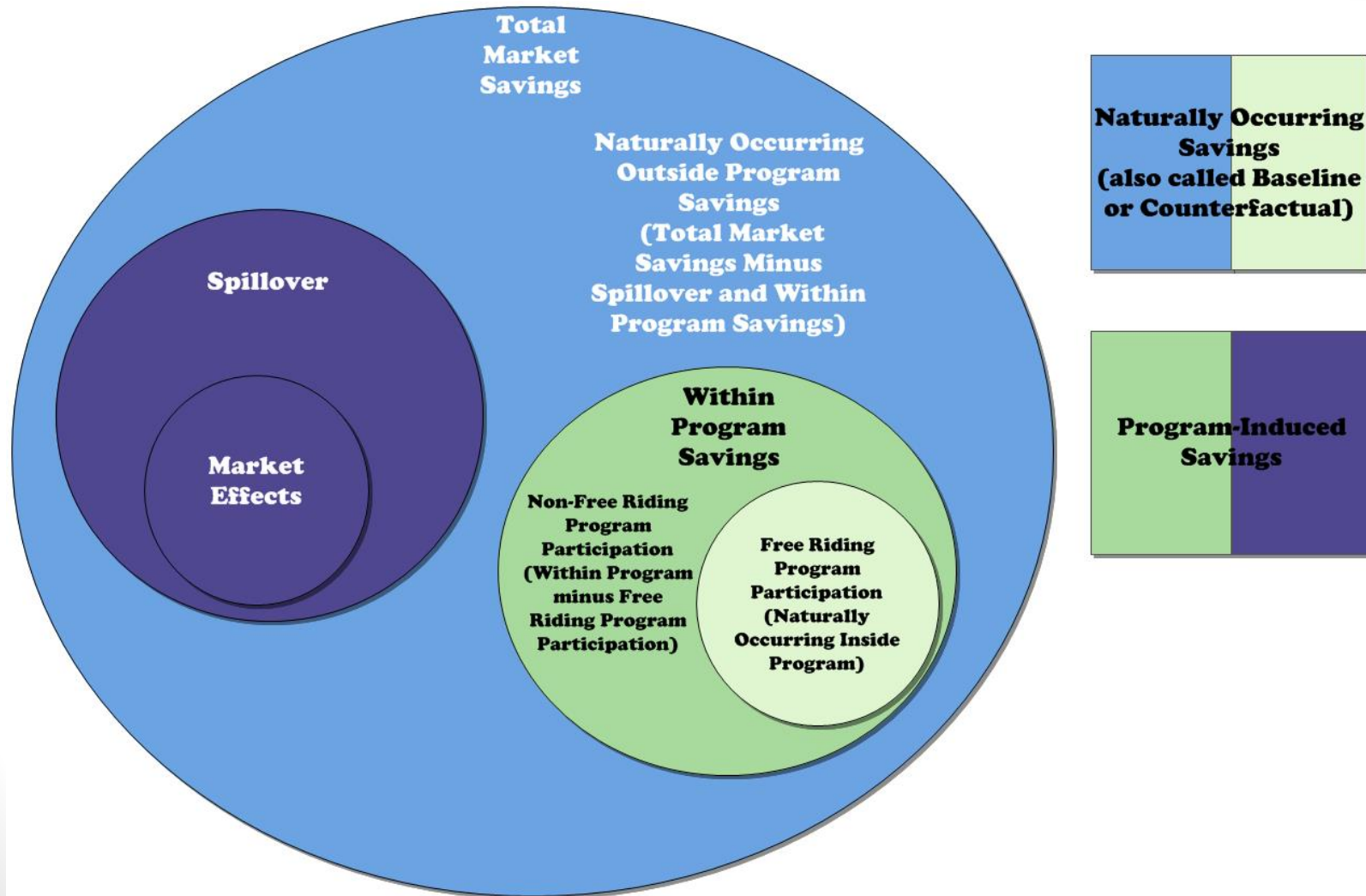
Components not to scale.

Program History: Program Marketing and Education Efforts
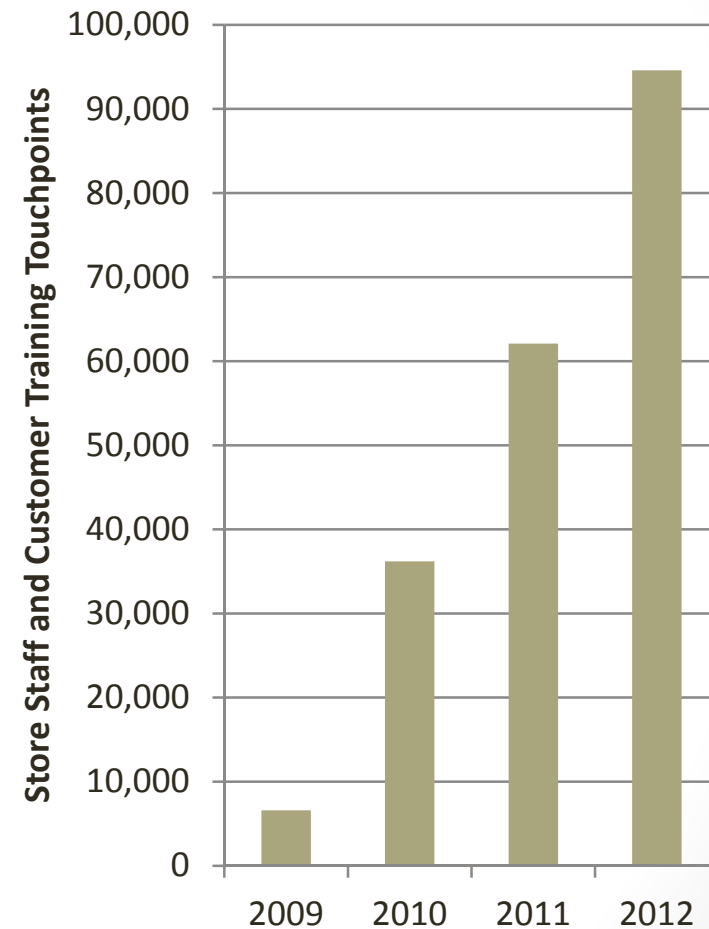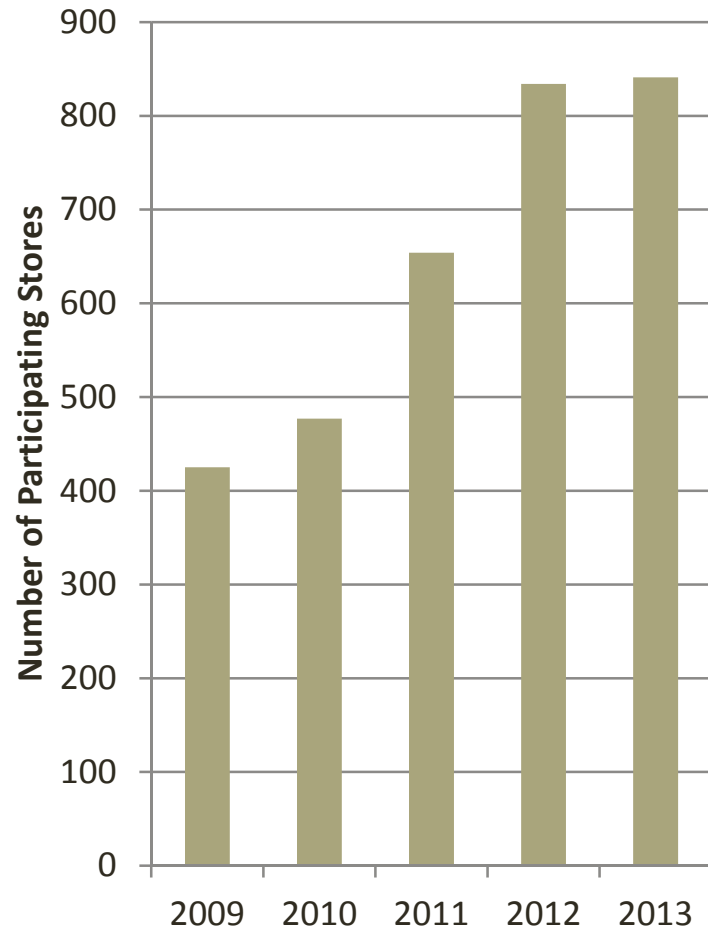
Source: DTE Energy and Consumers Energy Tracking Databases

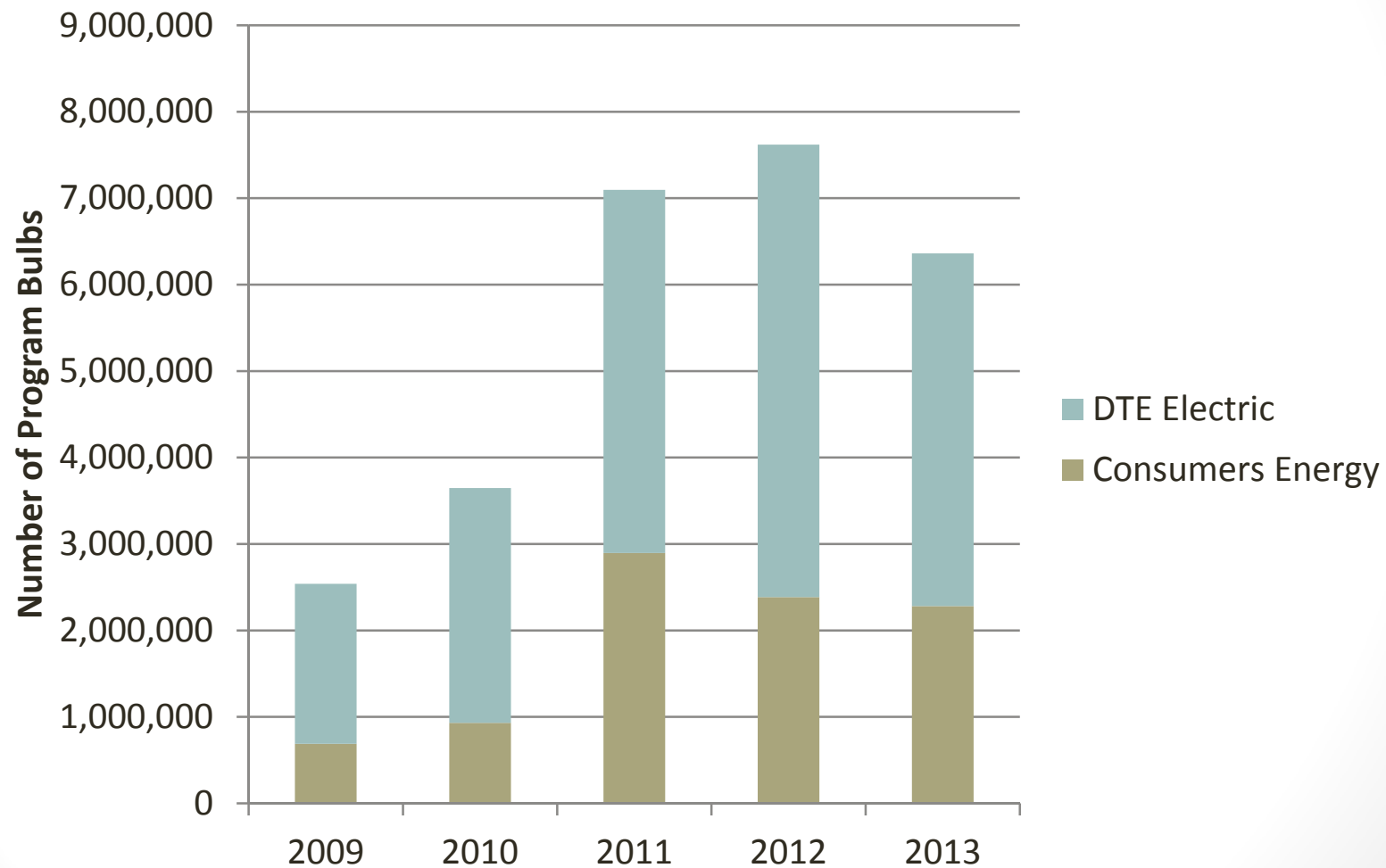# Program History: In-Store Promotions and Events

Program History: In-Store Education and Signage

Program History: Program Sales

Source: DTE Energy and Consumers Energy Tracking Databases

Stage Two

- Distributed Word document that summarized all Stage One responses

  - Customized with individual responses for ease of reference and comparison with results presented by panelist category and overall

- Provided opportunity for each panelist to revise their Stage One responses

- All Stage One respondents completed the second questionnaire

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2	Market Data and Net-to-Gross Methods Review
3	Detailed Results

3a	2009-2013 Results
3b	2014-2015 Results

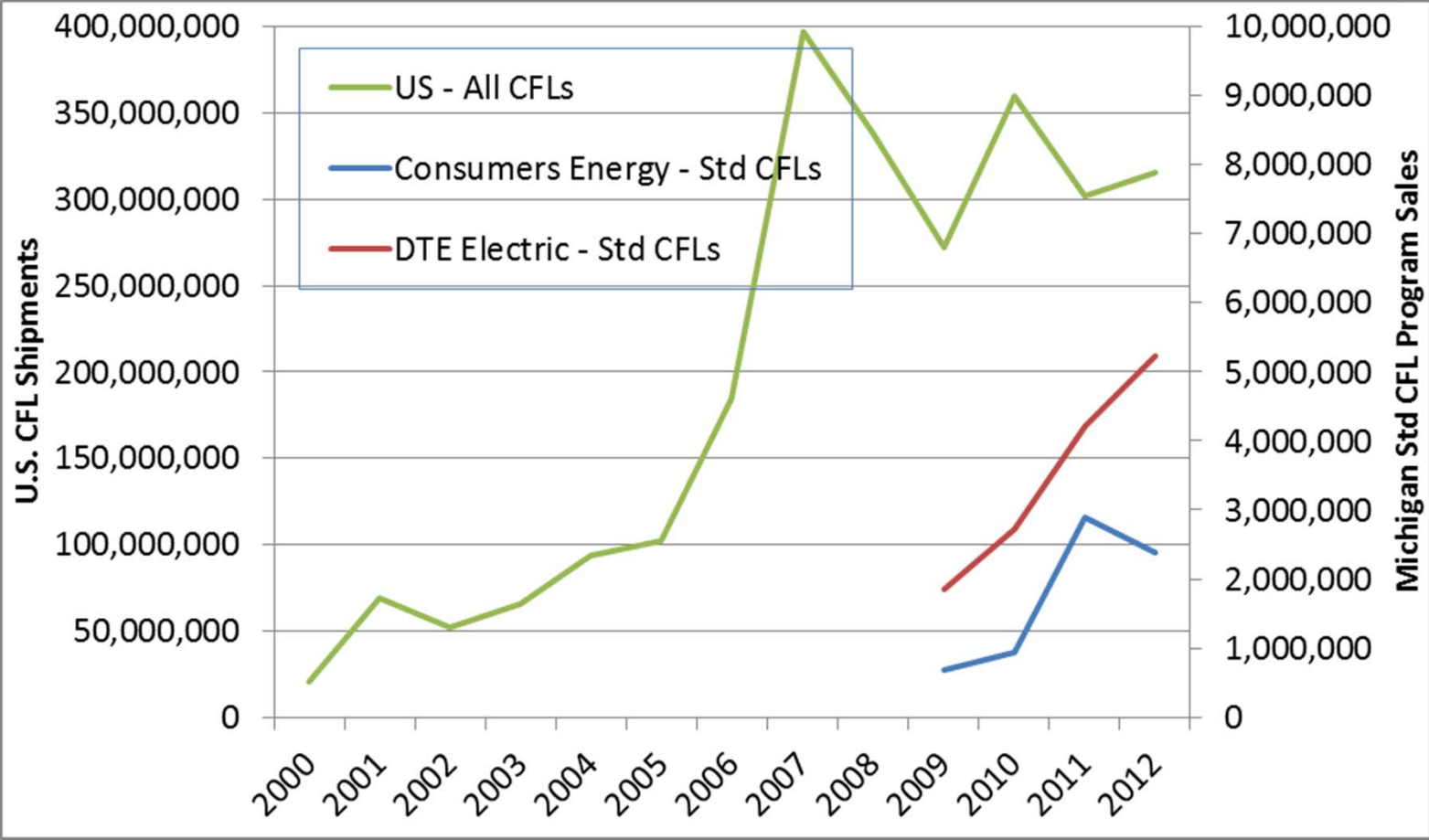| 4	Q&A/Recommendation/Next Steps

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Market Data: Increase in CFL Use
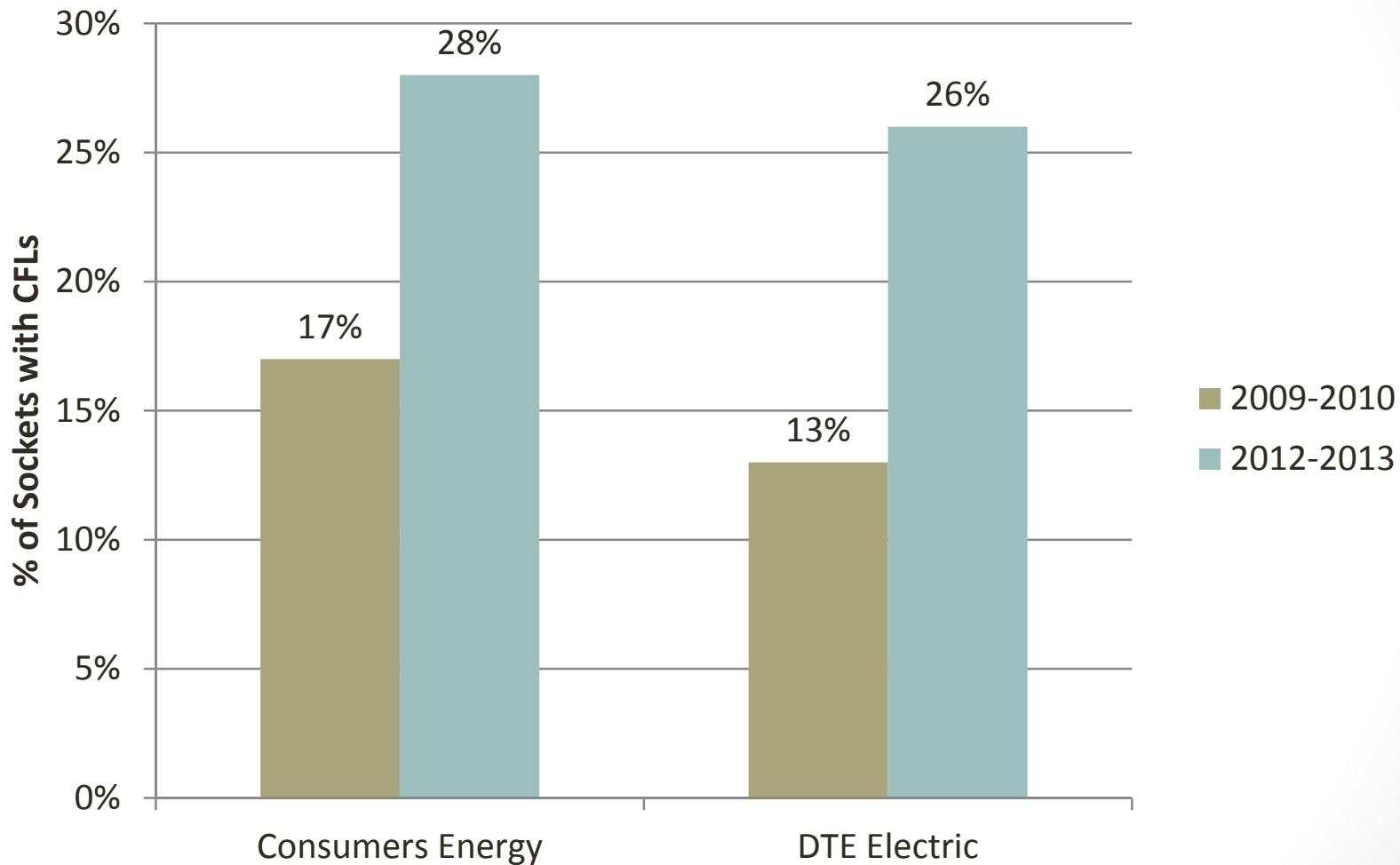
Source:
Consumers Energy: 2009-2010 – Statewide Baseline Study, Cadmus and ODC; 2012-2012 – Lighting Saturation Survey, Cadmus
DTE Electric: 2009-2010 – Statewide Baseline Study, Cadmus and ODC; 2012-2012 – Lighting Saturation Survey, Navigant
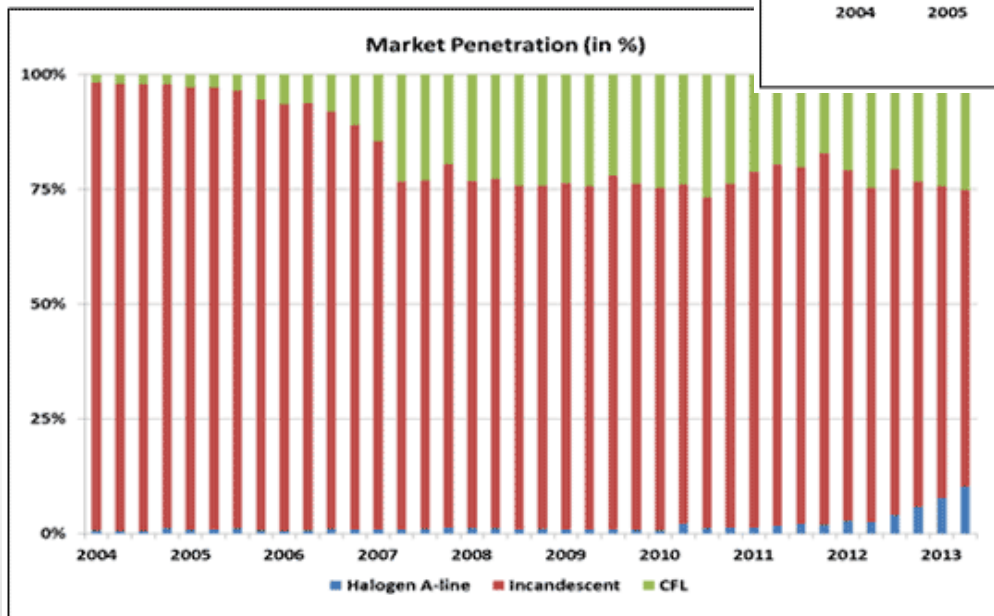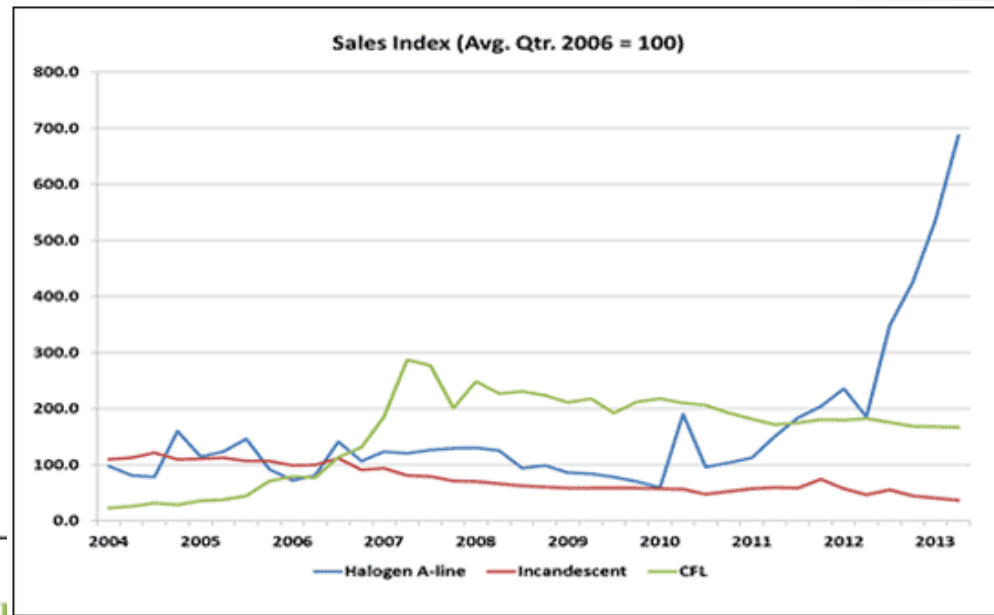
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Market Data: U.S. Sales Comparison

National CFL Shipments 2000-2012 and Michigan Program Standard CFL Sales 2009-2012

Market Data: Lighting Market Shares

- NEMA market share data indicate growth in halogen A-line market concurrent with EISA phase-in
- New competition for CFLs

Source: NEMA Lamp Indices, October 2013

Source: NEMA Lamp Indices, October 2013

NTGR Research Methods Review:

1. CFL Market Model

Elements of NTGR Addressed
- This method captures free ridership, market effects (including spillover).
- *NTGR = 1 – FR + ME*
- *NTGR = 1.03 = 1 – 0.27 + 0.31**

*Does not sum to 1.03 due to rounding.

Key Data Sources
- Actual U.S. socket saturation data (DOE), and DTE socket saturation data (ODC and Navigant) at selected points from 2008 to 2012.
- U.S. International Trade Commission CFL import data 1996-2012.
- DTE program CFL sales and distributions 2009-2012.

Summary
- Applies Bass diffusion modeling and stock turnover modeling to estimate a naturally occurring baseline, estimating market conditions absent the program.
- Triangulates several data sources to break saturation data down into component parts, isolating the portion likely driven by program activity.
- Compares the hypothetical ("counterfactual") market scenario to actual socket saturation data to estimate the net impacts of DTE's programs.

NTGR Research Methods Review:

2. *Multistate Regression Model*

Elements of NTGR Addressed	• This method estimates a NTGR that includes free ridership and spillover. • *NTGR = [Per Household Purchases with the Program – Per-household purchases without the program] ÷ Per-household CFLs incented by the program* • *NTGR = 0.71*
Key Data Sources	• Consumers Energy CFL sales and other program data. • Consumers Energy and other utility demographic data. • Sales and saturation data from other states with a range of CFL programs from mature to none.
Summary	• Uses non-linear regression techniques to estimate CFL purchases with and without the program. • Values are modeled to control for factors that may affect purchases, such as program spending, duration of program activity, and demographic factors.

NTGR Research Methods Review:

3. *Consumer Self-Report Surveys*

Elements of NTGR Addressed	• This method accounts for the effects of free ridership (adjusted to account for market effects) and participant spillover. • ***NTGR = 1 − FR + PSO** [FR is adjusted to account for some ME]* • ***NTGR = 0.70 = 1 − 0.37 + 0.07***
Key Data Sources	• Analysis draws on 158 customer surveys conducted at 29 participating stores in August to September 2013 (subset of relevant surveys from total 277 completed). • Program discount data [Free ridership questions are structured to reference discount amount for specific bulbs purchased].
Summary	• Estimates free ridership and spillover based on data from recent in-store customer surveys. • FR algorithm considers role of discounts and information provided by the program. It is adjusted to account for a conservative estimate of market effects. • SO algorithm captures purchases of non-discounted CFLs purchased on day of survey that are influenced by prior program experience.

NTGR Research Methods Review:

4. *Store Manager Interviews*

Elements of NTGR Addressed	• This method estimates participant spillover. • **NTGR = 1 + PSO** • **NTGR = 1.24 to 1.33 = 1 + 0.24 to 0.33**
Key Data Sources	• 20 participating store manager interviews accounting for 88% of program sales.
Summary	• Estimates spillover based on interviews with store managers at 20 participating stores. • Spillover reflects the store managers' perceptions of the volume of non-incented CFL sales that are driven by the program relative to total program bulb sales.

NTGR Research Methods Review:

5. *Price Elasticity Analysis*

Elements of NTGR Addressed	• This method accounts for the effects of free ridership. • **NTGR = 1 − FR** • **NTGR = 0.72 = 1 − 0.28**
Key Data Sources	• Consumers Energy program tracking database, including SKU, retail price, incentive amount, store, date, and promotional events. • Includes four years of data on all bulb sales dating back to program inception.
Summary	• Estimates price elasticity of demand using historical program discount and sales data. These results are used to predict sales with and without the program discount. • A cross-section of program package quantities is modeled since program inception, as a function of price, incentive, number of promotional events, store type, and bulb type (standard vs. specialty).

NTGR Research Methods Review:

6. *Revealed Preference Demand Model*

Elements of NTGR Addressed	• This method accounts for the effects of free ridership. • ***NTGR = 1 – FR*** • ***NTGR = 0.80 = 1 - 0.20***
Key Data Sources	• In-store customer survey and shelf survey data collected at 22 DTE-participating stores during August-September, 2013. Data set used for analysis includes 183 customer purchases, representing over 1,000 relevant bulbs. Data were collected from six different retailers including Do-it-Yourself / Hardware and mass merchandise chains.
Summary	• Estimates (using a discrete choice model) the probability of buying a CFL instead of an equivalent bulb with and without the program based on actual observed purchase behavior. • Probability is estimated as a function of bulb prices, program discounts, availability and visibility of equivalent light bulbs, customer's knowledge of CFLs and DTE's lighting program, and the customer's original bulb purchase plans.

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NTGR Research Methods Review:

7. *Revenue Neutral Sales Model*

Elements of NTGR Addressed	• This method accounts for the effects of free ridership. • **NTGR = 1 – FR** • **NTGR = 0.61= 1 – 0.39**
Key Data Sources	• DTE Energy Memoranda of Understanding (MOU) data, specifically pre- and post-program prices and quantity allotted to the retailer, across all bulbs discounted through the DTE Energy ENERGY STAR Lighting program.
Summary	• Approach assumes retailers will offer discounted products only if program sales revenues are high enough to offset the drop in revenue due to discounted product prices. • Using the price (pre-and post-discount) and quantity of sales allotted in the program MOU, the analysis estimates retailers' projected CFL sales in the absence of the program, yielding an estimate of maximum free ridership.

NTGR Research Methods Review:

Summary of Evaluator NTGR Analysis, by NTGR Component

Method	Free Ridership	Participant Spillover	Non-Participant Spillover	Other Market Effects	NTGR Value
1. CFL Market Model	-0.27		+0.31		1.03
2. Multistate Regression Model					0.71
3. Consumer Self-Report Surveys	-0.37		+0.07	Free ridership adjusted to account for some Market Effects	0.70
4. Retail Store Manager Interviews		+0.24 to +0.33			1.24 to 1.33
5. Price Elasticity Model	-0.28				0.72
6. Revealed Preference Demand Model	-0.20				0.80
7. Revenue Neutral Sales Model	-0.39				0.61

Perceived Accuracy of NTG Methods

NTG Method	NTG Measurement	Year	Perceived Accuracy
CFL Market Model	Captures FR, Spillover (Participant & Non-participant) and Other Market Effects	2012	√√√
Multistate Regression Model	Captures FR, Spillover (Participant and Non-Participant)	2010	√√√
Consumer Self-Report Surveys		2013	√√
Retail Store Manager Interviews	Partial NTGR=1+Participant Spillover	2012	√
Price Elasticity Analysis	Partial NTGR=1-FR	2009-2012	√√√
Revealed Preference Demand Model		2013	√√√
Revenue Neutral Sales Model			√√

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Detailed Results: 2009-2013 NTGR

- Mean NTGR values vary somewhat by panelist category

Mean NTGR Estimates for 2009-2013: Final & Stage One
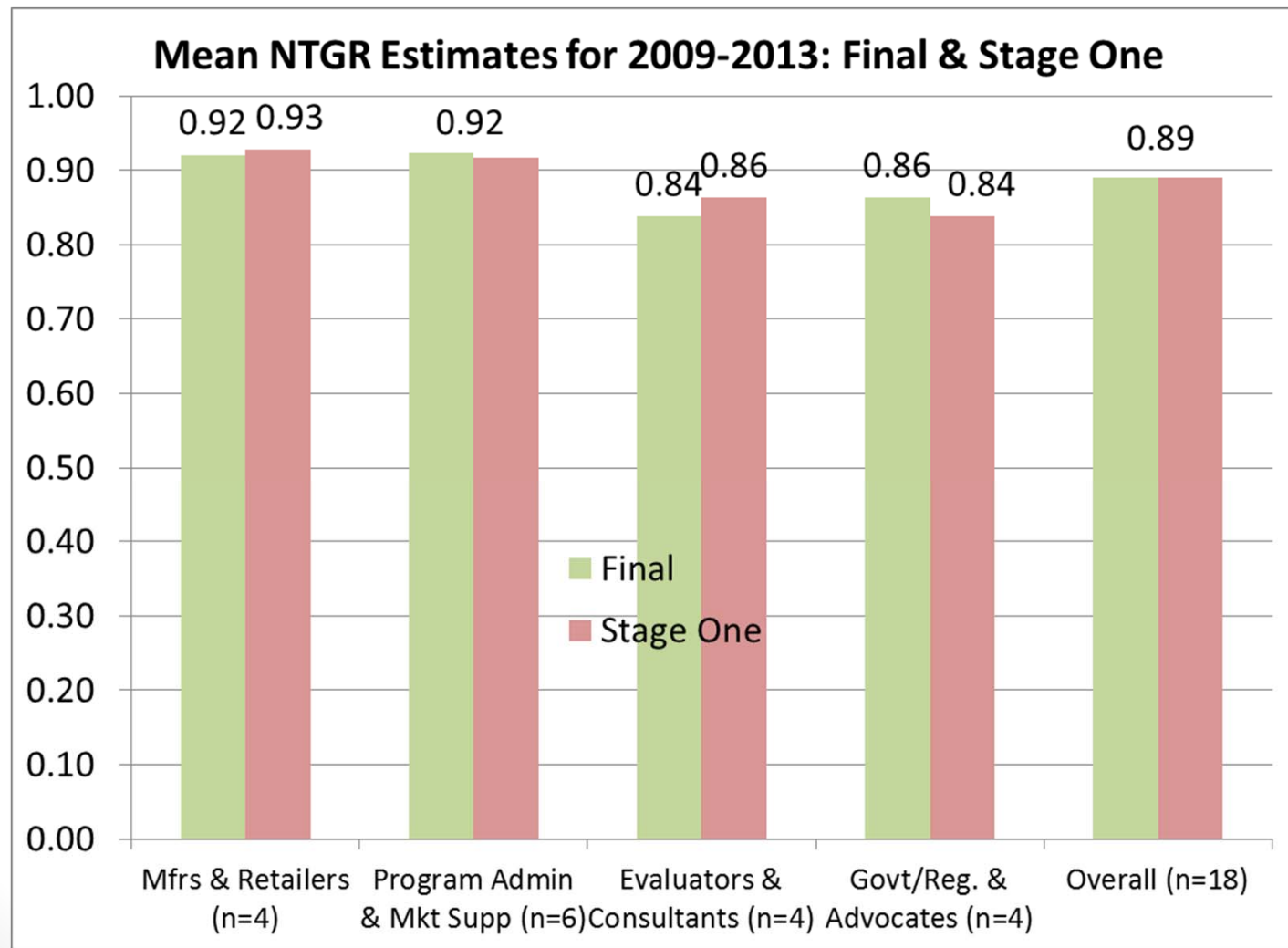
Detailed Results: 2009-2013 NTGR

- Final NTGR estimates clustered within each group and overall

	Manufacturers and Retailers (n=4)	Program Administrators and Market Support (n=6)	Evaluation and Consultants (n=4)	Government / Regulatory and Advocacy (n=4)	Overall (n=18)
Min	0.78	0.83	0.75	0.75	0.75
Mean	0.92	0.92	0.84	0.86	0.89
Median	0.95	0.92	0.85	0.85	0.90
Max	1.00	1.03	0.90	1.00	1.03

Box and Whisker Plot: 2009-2013 NTGR
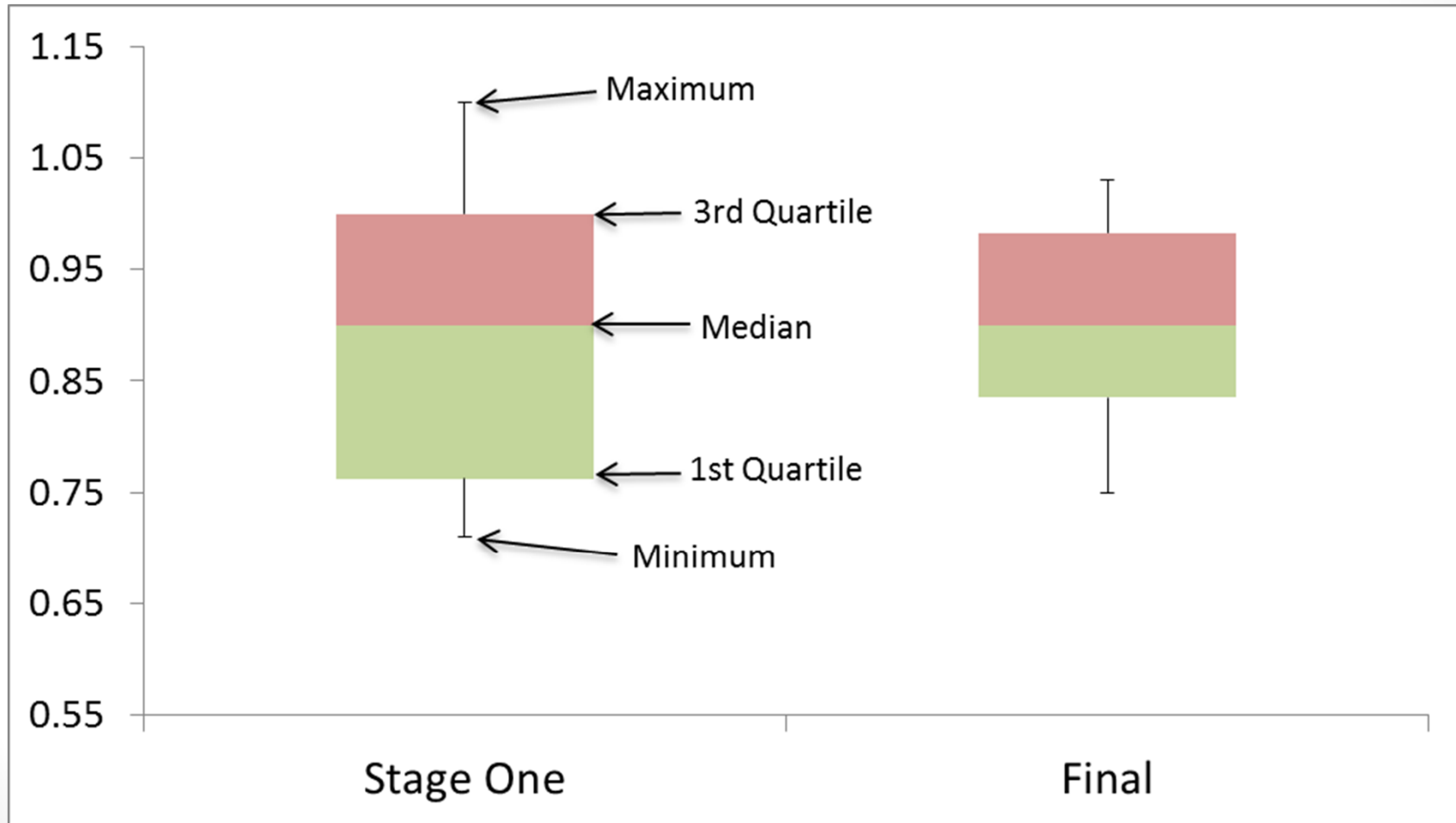
Detailed Results: 2009-2013 NTGR

- Based on the panelist's comments, it appears most relied on the NTG method(s) they judged to be most accurate. They then adjusted the resulting NTGR value, if needed, to include spillover and market effects.

- Six panelists changed NTGR estimates during Stage Two
  - NTGR estimates tended to converge
    - Three panelists increased low estimates
      - Account for spillover and market effects
    - Three panelists decreased high estimates
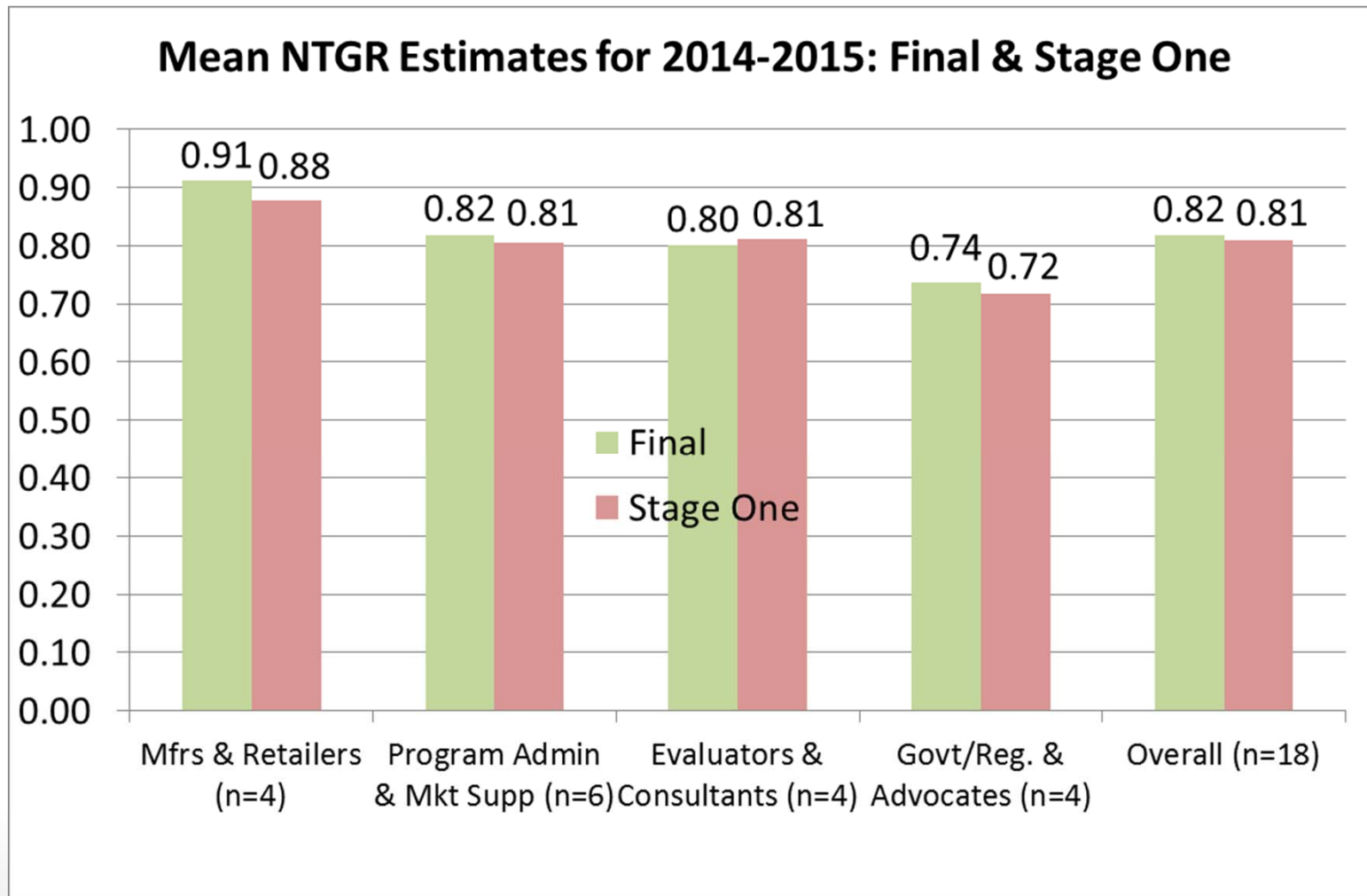   - After reviewing other panelists rationales

Detailed Results: 2009-2013 NTGR for CE & DTE

- 15 of 18 panelists believe there is not a substantial difference between 2009-2013 NTGR for CE and DTE

- Due to similarities in:
  - Program design, implementation team, incentive levels, participating retailers, and launch date
  - Retail markets
  - Customer demographics
  - Socket saturation levels

- One panelist changed response to 'no difference' during Stage Two
  - Due to lack of 'substantial' difference

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Detailed Results: 2014-2015 NTGR

- Mean NTGR values vary somewhat by panelist category

Mean NTGR Estimates for 2014-2015: Final & Stage One

Legend: Final (green), Stage One (red)

| Category	Final	Stage One
Mfrs & Retailers (n=4)	0.91	0.88
Program Admin & Mkt Supp (n=6)	0.82	0.81
Evaluators & Consultants (n=4)	0.80	0.81
Govt/Reg. & Advocates (n=4)	0.74	0.72
Overall (n=18)	0.82	0.81

Detailed Results: 2014-2015 NTGR

- Final NTGR estimates clustered within each group and overall

	Manufacturers and Retailers (n=4)	Program Administrators and Market Support (n=6)	Evaluation and Consultants (n=4)	Government / Regulatory and Advocacy (n=4)	Overall (n=18)
Min	0.85	0.75	0.70	0.60	0.60
Mean	0.91	0.82	0.80	0.74	0.82
Median	0.90	0.82	0.80	0.78	0.82
Max	1.00	0.89	0.90	0.80	1.00

Box and Whisker Plot: 2014-2015 NTGR
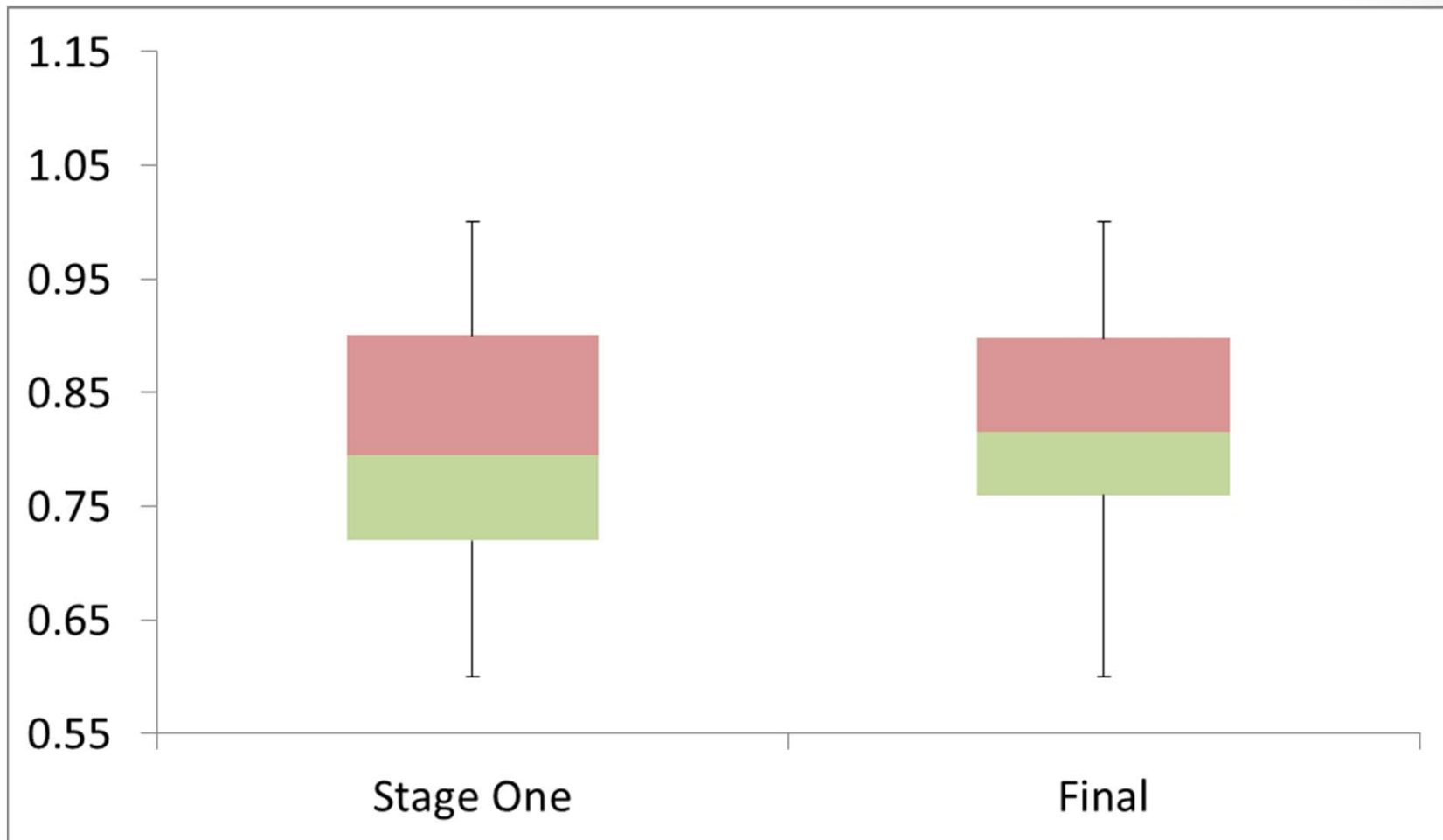
Detailed Results: 2014-2015 NTGR

- Most panelists (12 of 18) provided lower NTGR estimates for 2014-2015 than for 2009-2013, offering the following rationale:
  - Improved technology and availability and reduced prices for LEDs
  - Wider availability of halogens
  - Reduced incremental costs between CFLs and halogens means customers more likely to purchase CFLs without program
  - As the CFL market matures, free ridership will increase
  - Because spillover and market effects have already been captured, they will decline
- Some panelists (5 of 18) maintained their 2009-2013 NTGR estimate for 2014-2015 due to:
  - No significant changes in programs
  - Lack of clear data on market changes

Detailed Results: 2014-2015 NTGR

- Seven panelists changed NTGR estimates during Stage Two*
  - NTGR estimates tended to converge
    - Four panelists increased low estimates
      - Account for spillover and market effects
    - Three panelists decreased high estimates
      - After reviewing other panelists rationales

*One additional panelist provided a 2014-2015 NTGR estimate in Stage Two but did not in Stage One

Questions

Recommendation

The collaborative should adopt the NTGR value of **0.82** for standard CFLs distributed through Consumers' and DTE Energy's upstream lighting programs for program years 2014-2015, recognizing:

1. Consensus view supported by industry experts representing various stakeholder groups

2. The panel was informed by a number of groundbreaking research efforts to measure the full range of NTGR components

3. The Delphi process was successful: some members changed their values based on the input from others and the overall dispersion of answers narrowed in Stage 2

Next Step

- The evaluators will prepare a final report that describes the process, documents results, and substantiates the Energy Optimization Collaborative decision