Michigan CFL Net-to-Gross Advisory Panel
Final Report

April 14, 2014

Presented to:
Michigan Public Service Commission
Energy Optimization Collaborative Group
on behalf of

Consumers Energy
DTE Energy

Presented by:
Cadmus
Navigant
NMR Group

This report is a deliverable submitted to Consumers Energy and DTE Energy as part of multi-year, independent evaluation contracts to conduct impact, process, and market assessment studies of residential Energy Optimization programs administered by the Companies. The project participants thank the members of the Energy Optimization collaborative group, as well as members of the advisory panel, for their insight and input.

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Table of Contents

ES1. Executive Summary

The evaluation teams serving Consumers Energy and DTE Energy worked collaboratively during 2013 to conduct a range of research activities to estimate the portion of energy savings that should be attributed to standard compact fluorescent light bulb (CFL) sales through the utilities' upstream lighting programs in 2014 and 2015.[1] The research effort convened an advisory panel during the fall of 2013 to provide expert judgment. Drawing on the results of the evaluation teams' research as well as their own industry knowledge of the market, the panelists estimated a net-to-gross ratio (NTGR) for standard CFLs that will be sold by Consumers Energy and DTE Energy in 2014 and 2015.

The results of this research effort were presented to Michigan Public Service Commission's (MPSC) Energy Optimization stakeholder collaborative group (EO collaborative) in January 2014.[2] The EO collaborative approved the evaluation teams' recommendation to adopt the NTGR findings resulting from the advisory panel process. This paper summarizes the results of the CFL NTGR research effort.

ES1.1. Background

Following passage of Public Act 295[3] in 2008 ("the Act"), Michigan utilities began offering energy efficiency programs in 2009. A central component in the utilities' residential energy efficiency program portfolios has been an upstream lighting program. These programs, in which the utilities offer instant discounts to customers through participating retailers, comprise the majority of electricity savings resulting from the utilities' residential energy efficiency programs. Standard spiral shaped CFLs make up the vast majority of sales through the programs. Recognizing that findings from research in other jurisdictions indicate a decline in the impact of such programs as markets mature, the MPSC called for a careful examination of the NTGR appropriate for use in evaluating savings for Consumers Energy's and DTE Energy's upstream program sales of standard CFLs in future years.

In orders approving the Energy Optimization plans submitted by DTE Energy and Consumers Energy in 2012, the MPSC directed both utilities to assess the appropriate NTGR for standard CFLs promoted through upstream lighting programs for 2014-2015. To ensure consistency in approach, the independent evaluators for the two utilities worked together to study the influence of the programs on customer lighting choices. The evaluation teams reviewed the approach to establishing the NTGR with the EO collaborative group at multiple points during the study, and the collaborative group provided input on the evaluation teams' plans for the advisory panel, including the format as well as the types of panelists invited to participate.

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[1] DTE Energy's independent evaluator is Navigant Consulting. Consumers Energy's independent evaluation team includes Cadmus and NMR Group.

[2] The MPSC staff facilitates an Energy Optimization collaborative group in which a wide range of stakeholders participate. The stakeholders include utilities, energy efficiency service providers, environmental advocates, and other interested parties. The collaborative group provides a forum to discuss a wide range of program design and evaluation topics in support of the successful implementation of energy efficiency programs. The group works to reach consensus on issues such as establishment of deemed savings values and approaches to tracking and claiming savings.

[3] http://www.legislature.mi.gov/documents/2007-2008/publicact/pdf/2008-PA-0295.pdf

ES1.2. Evaluator Net-to-Gross Ratio Analysis

Each utility employed multiple methods to assess program influence. These methods represented some of the most robust approaches for measuring influence of programs on participating customers, and they included a combination of traditional methods as well as more innovative approaches. The evaluation teams made an effort to include methods that would capture the broader influence of programs on the market for energy efficient lighting in Michigan. With the exception of the multistate regression modeling which was conducted in 2010-2011, all research was conducted in 2013. Table 1 provides a summary of the methods employed, the NTGR components addressed by each method, and the resulting NTGR estimate.

Table 1. Overview of NTGR Methods and Values

Method	Measurement	NTGR Value
CFL Market Model	Free Ridership, Participant Spillover, Nonparticipant Spillover, and Market Effects	1.03
Multistate Regression Model	Free Ridership, Participant Spillover, and Nonparticipant Spillover	0.71
Consumer Self-Report Surveys		0.70
Retail Store Manager Interviews	Spillover	1.24 to 1.33
Price Response Model	Free Ridership	0.72
Revealed Preference Demand Model		0.80
Revenue Neutral Sales Model		0.61

Source: Consumers Energy and DTE Energy evaluation teams.

ES1.3. Advisory Panel Process

The evaluation teams convened an advisory panel to review the range of NTGR results associated with the body of research conducted up to that point, and to bring the expert panelists' own market knowledge to bear in establishing a single estimate of NTGR for both companies to use for 2014-2015. In order to represent a broad range of perspectives, the evaluation teams invited panelists from each of the following types of organizations:

- Program administrator and market support organizations
- Evaluators and consultants
- Government, regulatory, and advocacy organizations
- Manufacturers and retailers

The analysis involved a two-stage process. During Stage 1 of the panel, which started in September 2013, panelists provided initial NTRG estimates, accompanied by their rationale. Stage 1 responses were summarized and then presented back to the panelists. In Stage 2, panelists had the opportunity to modify their initial response based on the Stage 1 responses of other panelists. Individual panelist results were not reported, though input was summarized for each of the four participant groups.

Panelists were asked to provide NTGR estimates for the retrospective period of 2009-2013 as well as for the 2014-2015 period. Of 32 invited panelists, eighteen participated in Stage 1 and all eighteen went on to complete the second stage of the process.

ES1.4. Key Findings and Recommendations

In Stage 1, panelists provided estimates of 2009-2013 NTGR values that ranged from 0.71 to 1.10 and averaged 0.89; 2014-2015 NTGR values ranged from 0.60 to 1.00 and averaged 0.80. In Stage 2, 2009-2013 NTGR values ranged from 0.75 to 1.03 and the average remained unchanged at 0.89.The range of Stage 2 NTGR values for 2014-2015 remained the same, though the average NTGR increased slightly to 0.82.

The NTGR values found in this study are higher than those found in prior NTGR research conducted in other jurisdictions. The following factors likely contributed to the higher values resulting from this research effort:

- The explicit inclusion of multiyear market effects in the definition of net-to-gross (NTG) in Michigan (and the explicit exclusion of market effects from the definition of NTG in Massachusetts)
- The weaker condition of the Michigan economy relative to other regions may have inhibited customer purchases of discretionary products, such as CFLs
- The Michigan programs have only operated since 2009, a much shorter duration than programs in some other regions, including Massachusetts
- Advancements in methods for estimating NTGR yield more reliable and accurate results

The evaluation teams presented the results of the various research efforts and the advisory panel results to the EO collaborative on January 21, 2014. The collaborative group unanimously agreed to accept the recommendation of the evaluation teams to adopt a NTGR of 0.82 for standard CFL bulbs promoted through upstream lighting programs in 2014-2015.

1. Introduction and Objectives

The evaluation teams serving Consumers Energy and DTE Energy (the Companies) worked collaboratively during 2013 to estimate the portion of energy savings from standard CFL sales through Consumers Energy's and DTE Energy's upstream lighting programs that should be attributed to the programs in 2014 and 2015. The research effort culminated in the evaluation teams convening an advisory panel during the fall of 2013 to provide expert judgment. This paper presents the results of this comprehensive CFL net-to-gross (NTG) research effort.

The report is organized as follows:

Section 1 provides background information describing the context for the research conducted.

Section 2 summarizes the research approach employed by the evaluation teams.

Section 3 presents a summary of the program background data and market data presented to advisory panelists for their consideration.

Section 4 provides an overview of the research methods associated with the net-to-gross ratio (NTGR) results presented to advisory panelists for their consideration.

Section 5 presents the results of the advisory panel process.

Section 6 summarizes key findings and recommendations. Appendices to the report are available in a separate file.

In late 2012 and early 2013, the Michigan Public Service Commission issued orders approving the Energy Optimization plans for the Companies. In those orders, the Commission continued deemed NTGR values for the majority of programs offered, but directed both Companies to utilize a research-based NTGR value for standard CFLs promoted through upstream lighting programs in program years 2014 and 2015. Excerpts from each of the Companies' orders are shown below.

> **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[s] 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 CFL[s]."*
>
> **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."*

Given the common objectives, the Companies worked together to develop a NTGR for upstream lighting programs for 2014-2015. Early in the process, the Companies engaged the Energy Optimization

collaborative group (the collaborative) to review the proposed approach, provide input to help guide the research activities, and to establish agreed-upon definitions of the key elements of NTGR.[4]

In May 2013, the teams presented the research plan which described both the individual analysis activities pursued on behalf of each of the utilities and the proposed advisory panel. The advisory, or Delphi, panel was envisioned as a culminating event in which industry experts would: a) review program and market data and the results of the NTGR research conducted, and b) provide estimates of NTGR based on the information provided and their own expertise and knowledge. A second presentation to the collaborative group was made in September 2013. This presentation provided a status report on the individual research activities as well as a detailed discussion of the advisory panel process. In addition, a list of potential advisory panel invitees was shared.

The collaborative agreed on the following definitions:

- **Net Savings** are changes in energy use attributable to a particular energy efficiency program, while a **NTGR is the** ratio of net savings to gross savings, and is applied to convert gross savings to net savings.

  NTGR = 1 – Free Ridership + Spillover + Market Effects

- **Free Ridership** is savings from an energy-efficiency measure that the participant would have installed **without any program incentives**, but that they received a financial incentive or rebate for ***anyway***.
- **Spillover** is savings from an energy-efficient measure which someone was **influenced by a program** to adopt and that qualifies for financial incentives or rebates, ***but for which no incentive was received.***
- **Market effects are savings resulting from** a change in market structure or market actor behavior **due to program influence** that results in the ***(un-incented)*** **adoption of energy-efficiency measures.**[5]

[4] The MPSC staff facilitates an Energy Optimization collaborative group in which a wide range of stakeholders participate. The stakeholders include utilities, energy efficiency service providers, environmental advocates, and other interested parties. The collaborative group provides a forum to discuss a wide range of program design and evaluation topics in support of the successful implementation of energy efficiency programs. The group works to reach consensus on issues such as establishment of deemed savings values and approaches to tracking and claiming savings.

[5] Overlap can exist between market effects and some forms of spillover. Generally, market effects are considered adoption of such measures that result from structural changes in the market rather than unsystematic examples of measure adoption.

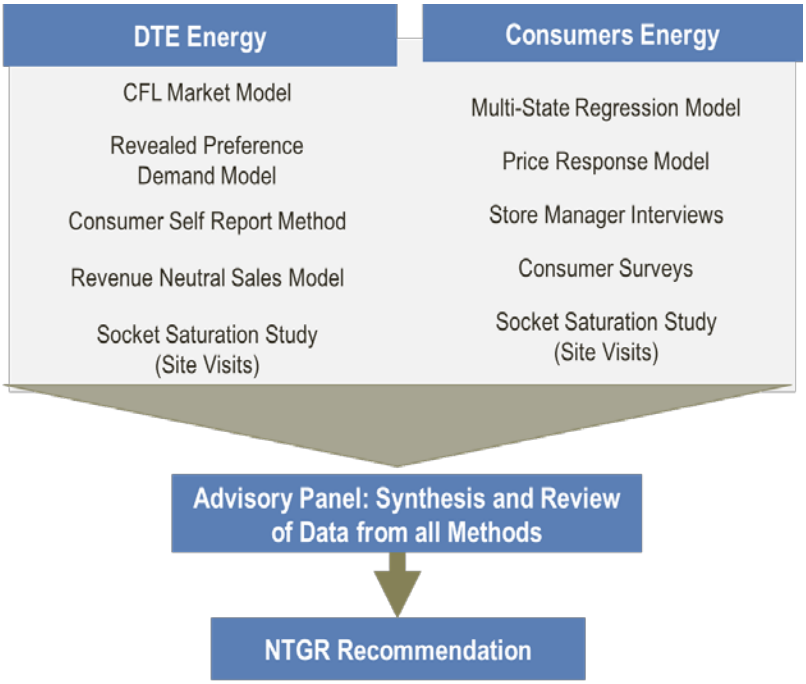
2. Approach

The Companies and the collaborative recognized early in the process that no single research method would fully inform the estimate of a NTGR. Each Company developed a research plan that included analysis of program and market data, along with specific studies to measure various elements of a NTGR.

With the specific NTG studies, a range of NTGR values was estimated for each Company's service area. In order to develop a single NTGR estimate, the evaluation teams, with guidance from the collaborative, convened an advisory panel of industry experts to review the NTG research and provide their opinion on the appropriate NTGR for use by the Companies.[6] Because much of the research used historical data, advisory panel members were asked to provide NTGR values for the program years 2009-2013 and for the prospective time period of 2014-2015.

The advisory panel process was the culminating event of the NTGR development process. The panelists interpreted the various research efforts and provided their estimates of NTGR. Figure 1 lists the various research activities conducted for each Company and presented to the advisory panel for their review.

Figure 1. Overview of the NTGR Research Process



Source: Consumers Energy and DTE Energy evaluation teams.

[6] In initial meetings with the collaborative, the evaluation teams used the term Delphi Panel to describe the group of industry experts. In order to communicate more clearly, and clarify the role of the panelists, the teams began using the term advisory panel.

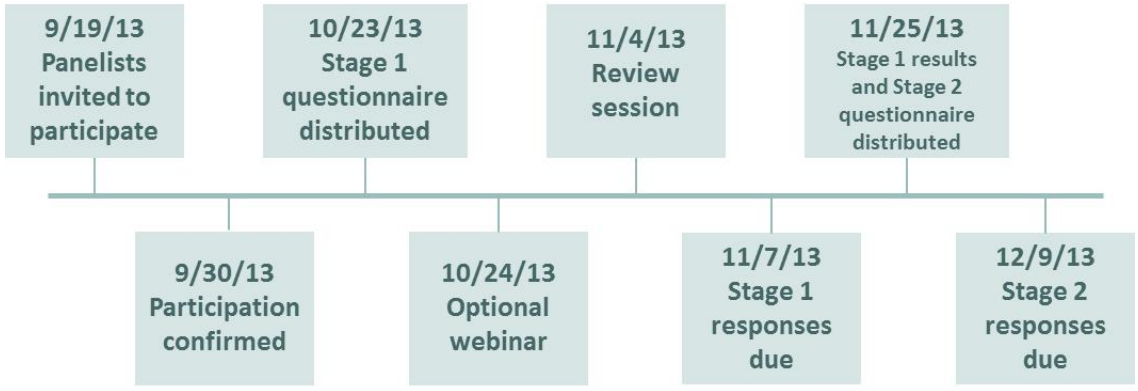
The evaluation teams invited 32 industry experts to participate, 18 agreed to participate and all 18 completed the process. The advisory panel reflected a broad range of perspectives and expertise, representing the following organization types:

- Program administrators and market support organizations, including (non-Michigan) utility program staff, regional market transformation organizations, and third-party implementers (six of seven invitees participated)
- Evaluators and consultants (four of six invitees participated)
- Government, regulators, and energy/environmental advocates (four of six invitees participated)
- Retailers and manufacturers (four of 13 invitees participated)

Anticipating that the retailers and manufacturers would be the least likely to participate, the evaluation teams over-recruited for this group.

The advisory panel process included two stages. In the first stage, the evaluation teams presented participants with the information they had prepared and asked the panelists to provide their best NTGR estimates. In the second stage, the evaluation teams shared the results, organized by participant group (i.e., manufacturers and retailers, program administrators and market support groups, evaluators and consultants, government/regulatory and advocate groups), with the panelists, along with some of the reasoning panelists provided to support their proposed NTGR values. Panelists were given the opportunity to modify their original NTGR values after reviewing the values and rationale provided by others. Figure 2 provides an overview of the advisory panel process and the key points of communication with the group.

Figure 2. Advisory Group Process and Timeline



Source: Consumers Energy and DTE Energy evaluation teams.

In addition to the information provided to panelists, the evaluation teams conducted an introductory webinar and a review session. Panelists could submit questions during those sessions via an anonymous chat function or over email. The evaluation teams addressed some questions during the sessions, and for other questions they conducted data collection or validation then responded via email. All of the questions and answers were also posted to a Website site for panelists to review when needed.

3. Program and Market Data

The evaluation teams provided the panelists with data describing the program offerings in both the Michigan and national residential lighting markets, which helped inform their estimate of the influence the utility programs have had on CFL sales. Program and market data were provided in the initial background information and questionnaire presented to panelists. Other program and market data were collected and summarized in response to panelists' questions throughout the process.

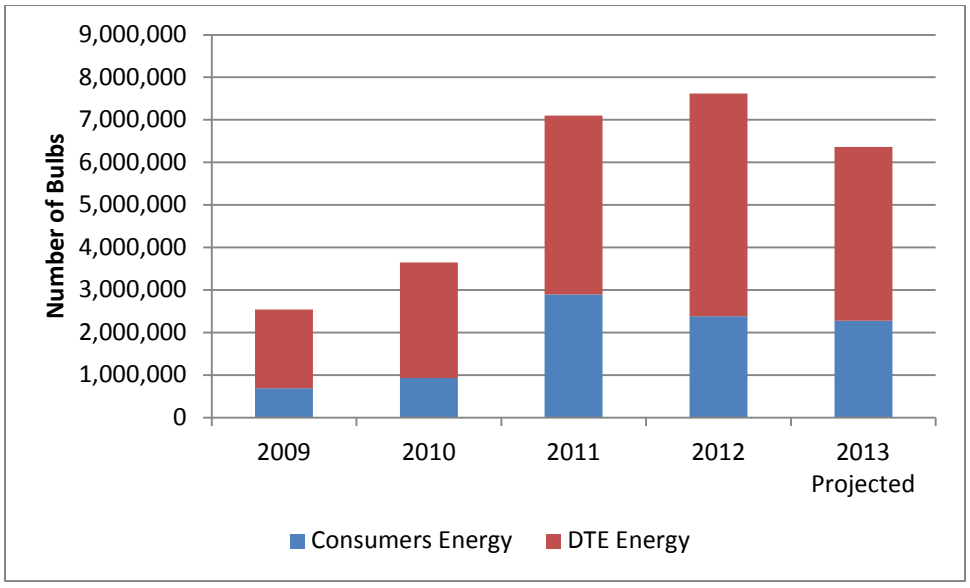
3.1 Program Data

The evaluation teams provided panelists with a broad range of information to help them understand the programs offered by the Companies. This information included the following:

- Annual program sales
- Incentive or buy-down levels
- Investment in marketing
- Description of marketing activities and messaging
- Listing of retailers, number of retail outlets, and sales by retailer type

Launched in 2009, both companies' programs have undergone significant growth. Figure 3 shows the annual number of standard CFL bulbs discounted by the Companies, the sum of which increased from 2.5 million in 2009 to over 7 million in 2012. Sales of discounted bulbs were projected to decrease slightly in 2013 to reflect a shift in program goals and priorities.

Figure 3. Standard CFLs Distributed through Programs



Source: Consumers Energy and DTE Energy program sales data, 2009-2012 (2013 is projected).

Through their programs, the Companies make CFLs available to customers through a wide variety of retailers, including do-it-yourself (DIY) stores, discount retailers, and mass market retailers. The number

of participating retail outlets across the two utility service areas has nearly doubled from just over 400 stores in 2009 to over 800 stores in 2013.

The average bulb discount for each Company is shown in Table 2. Due to a shortage in rare earth metals used in the production of CFLs, wholesale prices at participating retailers increased by 25% starting in the third quarter of 2011. These price increases led to a greater differential between retail prices for CFLs and prices for less expensive and less efficient alternatives. Both Companies increased incentives for CFLs starting in November 2011 to help overcome this widening price gap.

Table 2. Average Standard CFL Discount by Utility by Year

Year	Consumers Energy	DTE Energy
2009	$1.01	$0.90
2010	$0.98	$0.89
2011	$1.00	$1.02
2012	$1.16	$1.23
2013	$1.18	$1.14

Source: Consumers Energy and DTE Energy program data, 2009-2013.

Both companies' programs are implemented by ICF International (ICF) and Applied Proactive Technologies, Inc. (APT). ICF administers the program and is responsible for overseeing program processes and procedures, managing budgets, and achieving program goals. APT is responsible for negotiating agreements with manufacturers and retailers and providing field support. Through a network of field representatives, APT conducts retailer and consumer education, holds in-store promotional events, and ensures that products are properly priced and displayed with program signage, per retailer agreements. Over the life of the programs, field representatives have logged thousands of store visits and tens of thousands of training touch points. Training and education topics include product features and benefits, EISA efficiency standards, ENERGY STAR requirements, CFL recycling, point-of-purchase (POP) materials use, and program participation processes.

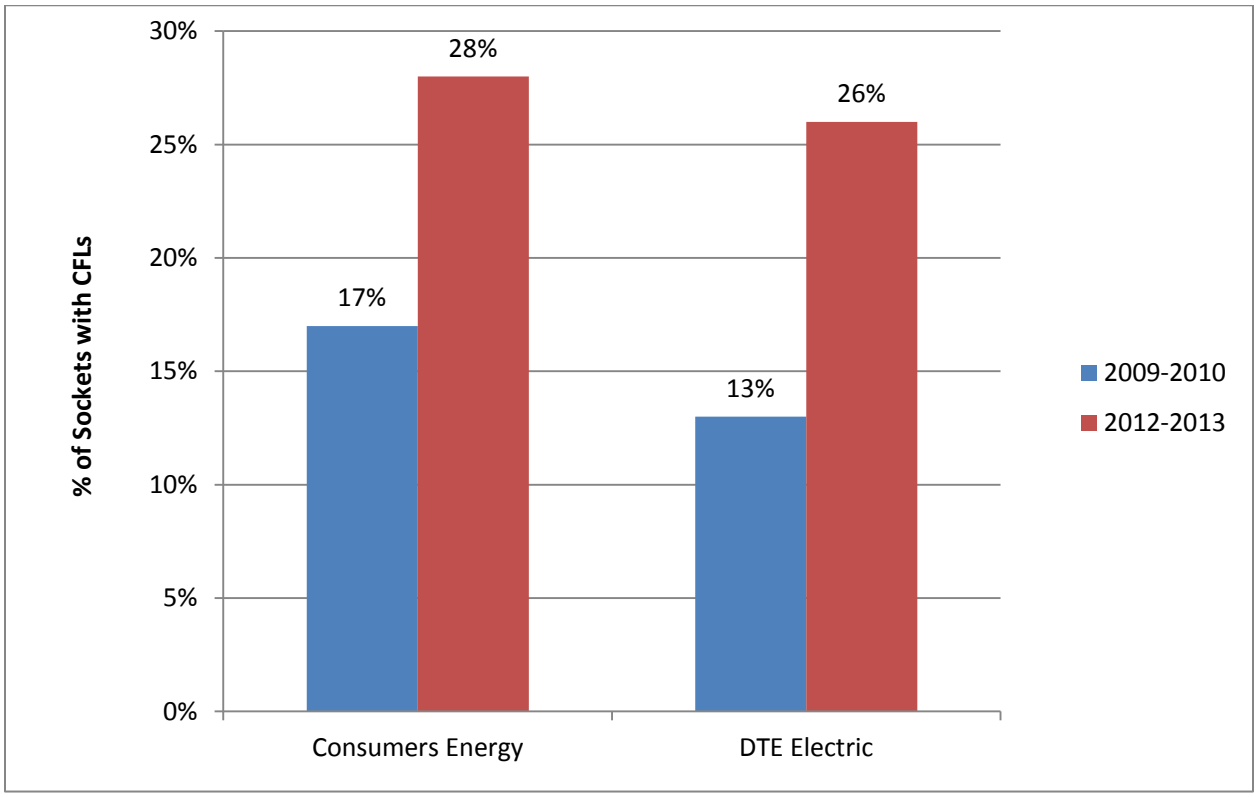
3.2 Market Data

In addition to program-specific data, the evaluation teams presented panelists with four sources of market data:

1. Socket saturation data (i.e., the percentage of eligible light sockets filled with CFLs) collected in the Companies' service territories
2. Projections of national market share for CFLs and other bulbs that compete within the same residential medium screw-base bulb market
3. U.S. CFL sales data
4. U.S. Census data comparing key demographic measures across the Companies' service territories, as well as for the U.S. as a whole

Figure 4 shows that socket saturation has increased by more than 10 percentage points in each utility territory since the upstream lighting programs were first launched in 2009. The Consumers Energy territory increased from 17% to 28%, while the DTE Energy territory increased from 13% to 26%.

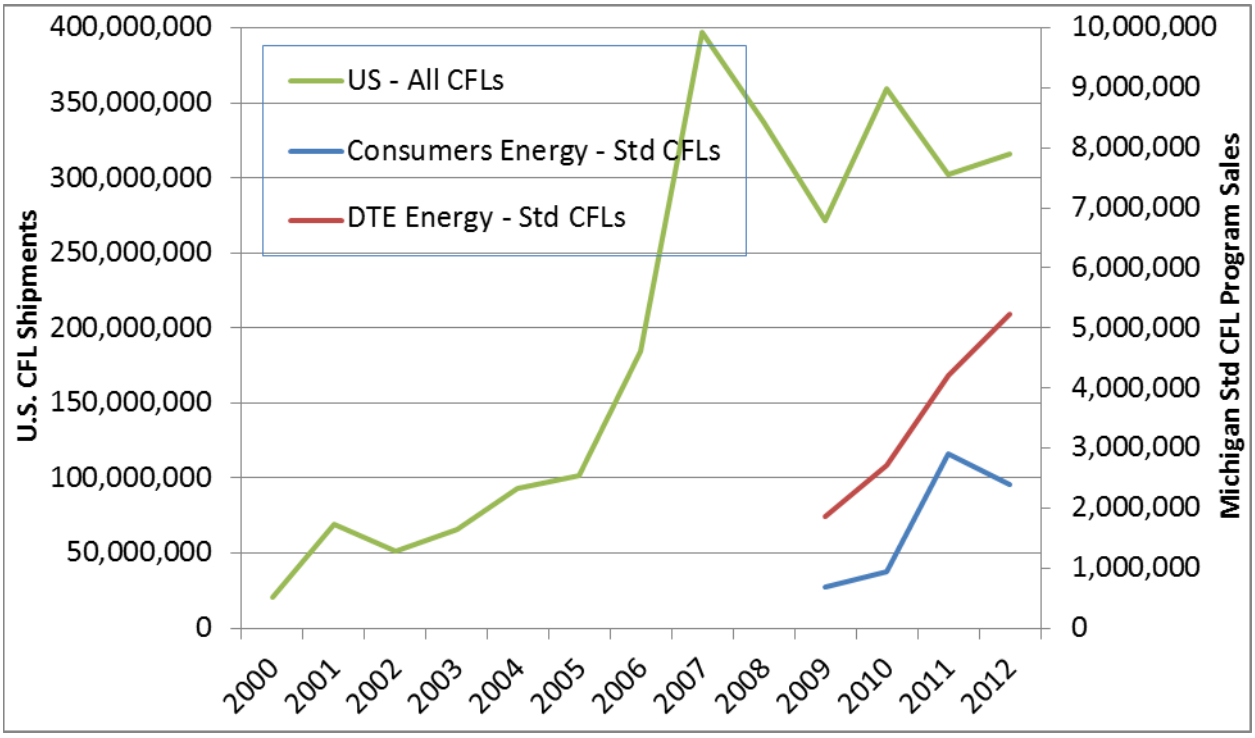
Figure 4. Socket Saturation Data Showing Increase in CFL Use Since Program Inception



Sources: Consumers Energy: 2009-2010 – Statewide Baseline Study, Cadmus and ODC; 2012-2013 – Lighting Saturation Survey, Cadmus; DTE Energy: 2009-2010 – Statewide Baseline Study, Cadmus and ODC; 2012-2013 – Lighting Saturation Survey, Navigant.

As shown in Figure 5, for the 2009-2012 period following the Companies' introducing upstream lighting programs, as national shipments of CFLs (a key indicator of CFL sales) underwent fluctuations and leveled off, CFL sales in the DTE Energy and Consumers Energy service territories grew steadily. The 2007 peak in national sales corresponded with Wal-Mart's 100 million CFL bulb sales promotion. In 2008, when the Wal-Mart promotion had ended and a recession hit, national CFL sales dropped significantly.

Figure 5. U.S. CFL Sales Comparison



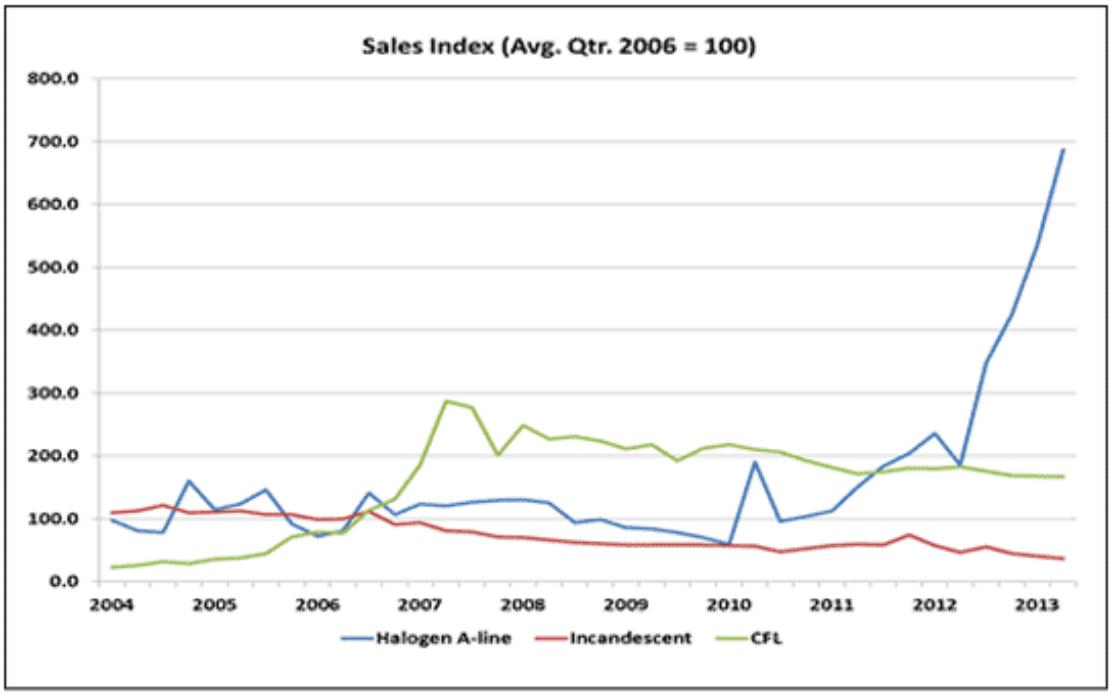
Sources: U.S. International Trade Commission – Import Statistics; DTE Energy and Consumers Energy upstream lighting program sales data 2009-2012

The National Electric Manufacturers Association (NEMA) collects market data from member manufacturers that they report accounts for 95% of the U.S. lighting manufacturing industry.[7] NEMA publishes a sales index showing both historical and projected changes in sales of the three primary bulb types competing in the medium screw-base bulb market: halogen A-line (marketed as "energy efficient" because they are minimally compliant with the new Energy Independence and Security Act of 2007 (EISA) efficiency standards), incandescents, and CFLs. As presented in Figure 6, the index shows a steady increase in sales of halogen A-line bulbs during 2013. This reflects a changing market dynamic for CFLs in the wake of EISA energy-efficiency standards. Even though the market for CFLs has matured substantially in the last decade, CFLs now have growing competition in the market for "energy efficient" bulbs. Though LEDs will play a larger role in the market in the future, the more concerning competitor is the A-line halogen as these bulbs are cheaper than CFLs. Therefore, they have the potential to erode the market share currently held by CFLs.[8]

[7] National Electric Manufacturers Association. "NEMA Position on Repeal of Light Bulb Efficiency Standards." Accessed March 3, 2014. https://www.nema.org/Policy/Energy/Documents/NEMA%20Position%20on%20Repeal%20of%20Light%20Bulb%20Efficiency%20Standards.pdf.

[8] LEDs also compete in the market for energy efficient bulbs but have played a relatively small role in the market up to this point due to their significantly higher price. LEDs are expected to play a much more significant role in the market going forward.

Figure 6. NEMA Sales Index, Medium Screw-Base Bulb Market[9]

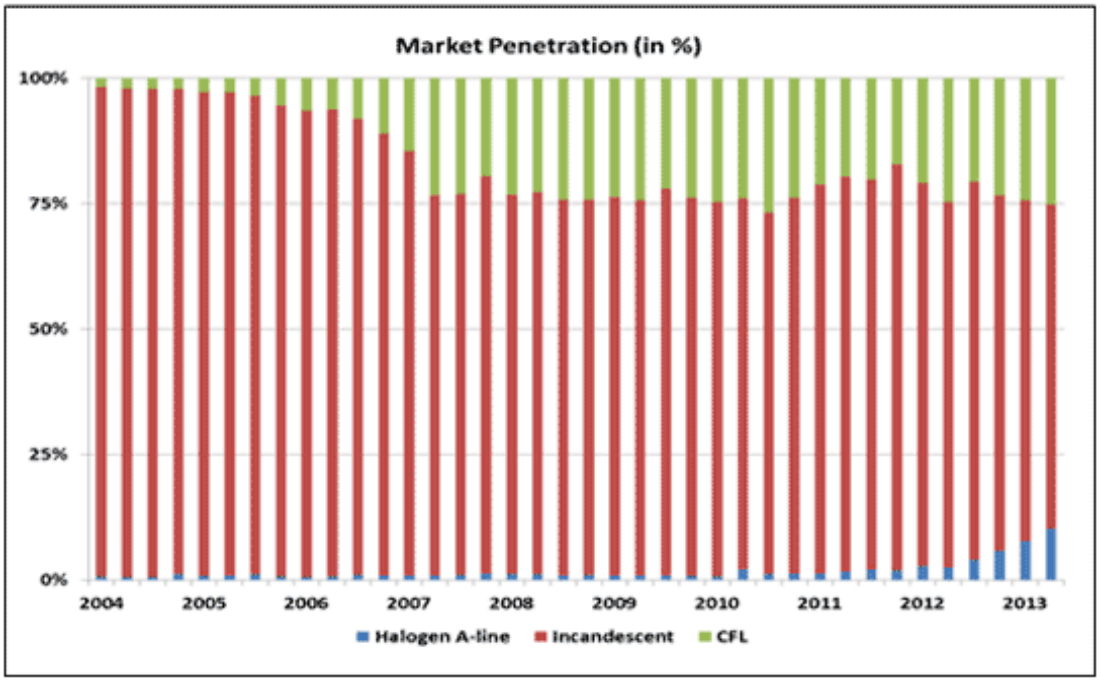


Source: NEMA Lamp Indices, "Incandescent Lamp Shipments Wane During Second Quarter." Available at: http://www.nema.org/Intelligence/Pages/Lamp-Indices.aspx. Obtained October 2013.

Figure 7 presents NEMA market penetration data in the medium screw-base bulb market. It shows halogen A-lines gradually gaining market share, filling the gap left from a decline in incandescent bulb sales in response to EISA standards. Meanwhile, the CFL market share has remained relatively stable since 2007.

[9] NEMA lamp indices are composite measures of NEMA member shipment data and are intended to track shifts in demand for various products. Shipment data are drawn from periodic statistical surveys, and are adjusted to account for regular seasonal shifts in sales.

Figure 7. NEMA Market Penetration Data, Medium Screw-Base Bulb Market



Source: NEMA Lamp Indices, "Incandescent Lamp Shipments Wane During Second Quarter." Available at: http://www.nema.org/Intelligence/Pages/Lamp-Indices.aspx. Obtained October 2013.

As noted previously, the evaluation teams also reviewed U.S. Census data to explore whether significant demographic differences exist between the DTE Energy and Consumers Energy service territories, and whether these territories' demographics differ significantly from that of the U.S. as a whole. The Census data revealed no major differences between the demographic characteristics of the Companies' service territories; however, the data did reveal that Michigan is more economically disadvantaged than the rest of the nation.

4. Evaluator Net-to-Gross Analysis

This section presents a summary of the NTG analyses conducted on behalf of the Companies by the evaluation teams and presented to the advisory panel. Due to the inherent difficulty of estimating what would have happened in the absence of the DTE Energy and Consumers Energy programs (i.e., the counterfactual), no single method for estimating NTG is perfect. The evaluation teams selected a range of methods specifically for this research effort, with an emphasis on methods that capture spillover and market effects in addition to free ridership. Analyses conducted previously were also included.

The NTG analysis methods the teams employed, along with the corresponding section number in this report, are listed here:

- 4.1 CFL Market Model
- 4.2 Revealed Preference Demand Model
- 4.3 Consumer Self-Report
- 4.4 Revenue Neutral Program Sales Model
- 4.5 Multi-State Model
- 4.6 Price Response Model
- 4.7 Store Manager Interviews

Table 3 provides a summary of the methods employed, the NTGR components addressed by each method, and the resulting NTGR estimates.

Table 3. Overview of NTGR Methods and Values

Method	Measurement	NTGR Value
CFL Market Model	Free Ridership, Participant Spillover, Nonparticipant Spillover, and Market Effects	1.03
Multistate Regression Model	Free Ridership, Participant Spillover, and Nonparticipant Spillover	0.71
Consumer Self-Report Surveys		0.70
Retail Store Manager Interviews	Spillover	1.24 to 1.33
Price Response Model	Free Ridership	0.72
Revealed Preference Demand Model		0.80
Revenue Neutral Sales Model		0.61

Source: Consumers Energy and DTE Energy evaluation teams.

Each method is outlined in the sections that follow, along with the elements of the NTGR it addresses, the data sources included, and an overall summary of the approach[10].

4.1 CFL Market Model

4.1.1 Elements of the Net-to-Gross Ratio Addressed

This method captures free ridership (FR) and market effects (ME). For purposes of this analysis, market effects includes spillover (SO). The NTGR elements addressed by this method are represented in the following equation:

$$NTGR = 1 - FR + ME$$

$$NTGR = 1.03 = 1 - 0.27 + 0.31^{11}$$

4.1.2 Data Sources

This method employs the following data sources:

- Actual U.S. socket saturation data (U.S. Department of Energy (DOE)), and DTE Energy socket saturation data (Opinion Dynamics Company (ODC) and Navigant) at selected points from 2008 to 2012
- U.S. International Trade Commission CFL import data, 1996-2012
- DTE Energy program CFL sales and distributions, 2009-2012

4.1.3 Summary

This method applies Bass diffusion modeling and stock turnover modeling to estimate a naturally occurring baseline (a counterfactual estimate of market conditions absent the program). It triangulates several data sources to divide saturation into the component parts (i.e., market effects, program-influenced participants, free riders and naturally occurring non-participants, as defined in this section), isolating the portion likely driven by program activity. [12] Finally, it compares the hypothetical (i.e., counterfactual) market scenario to actual socket saturation data to estimate the net impacts of DTE Energy programs. This method uses saturation data, rather than relying only on annual sales data, to account for year-over-year program influences, which addresses a limitation of many other NTGR calculation methods. Key definitions relevant to this method are summarized in Table 4.

[10] More detailed summaries of each approach are available online through December 2014: www.nmrgroupinc.com/?p=830 (password: CFL2014).

[11] Total does not sum due to rounding.

[12] The terms "Naturally Occurring Non-Participants," "Program-Influenced Participants" and "Free riders" refer to lamp purchases by customers who fall into these categories, not actual numbers of customers.

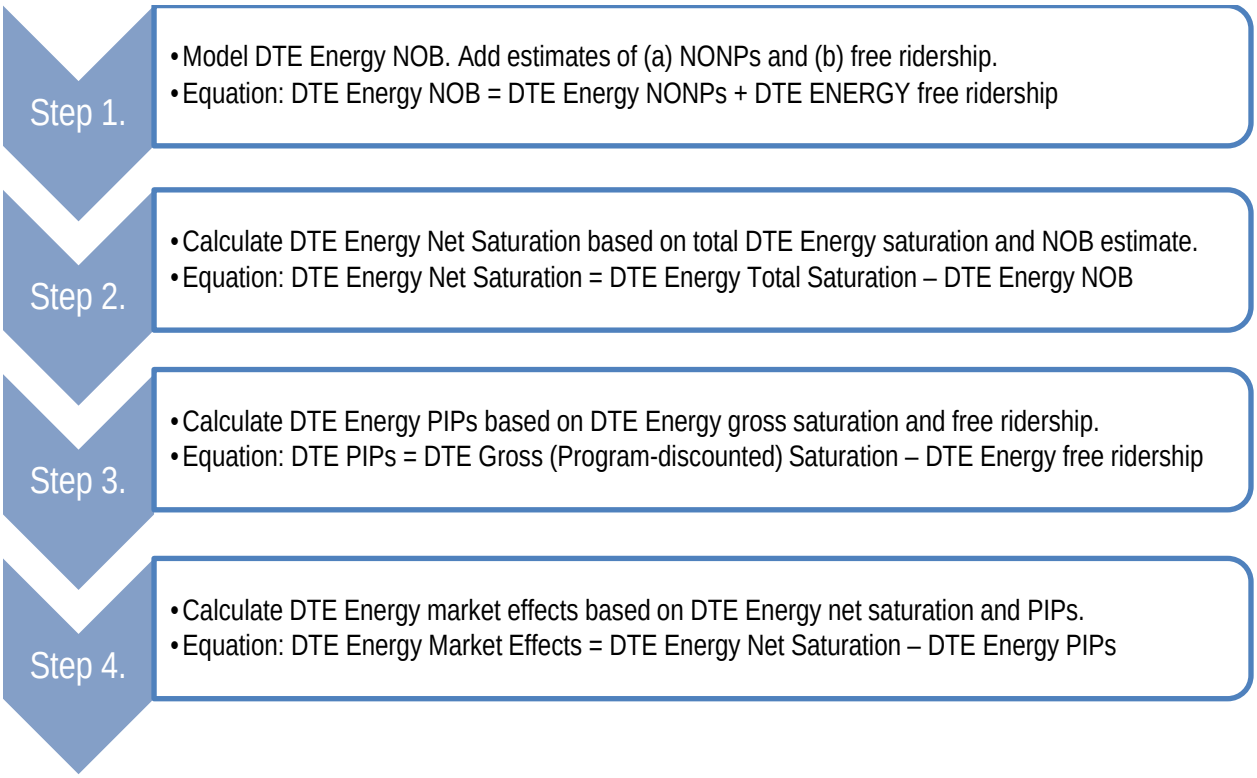
Table 4. CFL Market Model Definitions

Naturally Occurring Non-Participants (NONPs)	Purchasers of non-program-discounted energy-efficient measures who would have purchased the measure in the absence of the program.
Socket Saturation ("Saturation")	Percentage of total eligible household sockets in which CFLs are installed.
Program-Influenced Participants (PIPs)	Participants who installed a measure discounted by the program.
Naturally Occurring Baseline (NOB)	Volume of measure installations that would have occurred in the absence of a program (NOB= NONPs + Freeriders).
Free riders	Purchasers of a discounted measure who would have purchased the measure in the absence of a program.

Source: Navigant analysis

Using a four step process, Navigant leveraged U.S. and DTE Energy sales and socket saturation data to estimate the portion of DTE Energy saturation that was driven by program activity (known as the DTE Net Saturation). Figure 8 presents a summary of the CFL market model methodology.

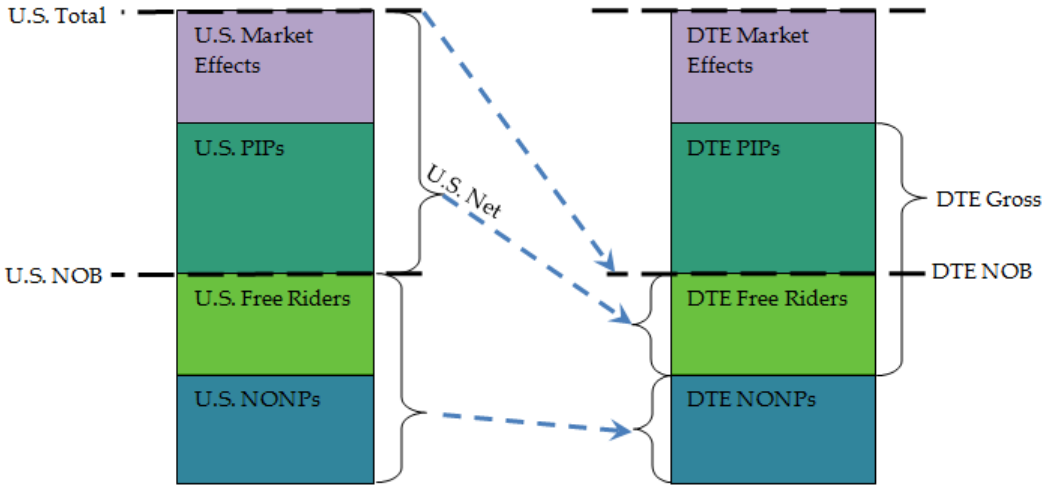
Figure 8. CFL Market Model Methodology



Source: Navigant analysis.

Data limitations required Navigant to develop relationships between U.S. data and DTE Energy data. In the resulting framework, U.S. net saturation became the proxy for DTE Energy free riders, and U.S. NOB became the proxy for DTE Energy NONPs. Figure 9 summarizes this first step of the CFL Market Model method.

Figure 9. Framework for Step 1: Relationship Between Components of U.S. and DTE Energy Total Market Saturation



Source: Navigant analysis

To estimate the U.S. NOB, Navigant used U.S. sales data and Bass diffusion modeling to project the national trend in CFL sales. Building on historical sales data through 2000, the evaluation team used a Bass diffusion model to project a U.S. NOB (i.e., national CFL market activity in the absence of any utility, regional, or national programs and other influences) from 2001 through 2012. Navigant chose the year 2000 as the national pivot point since little program activity had occurred anywhere in the country up to that point. To calculate NOB in terms of saturation, Navigant ran annual sales data through a stock accounting model.

Drawing on the results of Step 1, Navigant completed the remaining 3 steps, which involved calculating: DTE Energy Net Saturation, DTE Energy program-influenced participation, and DTE Energy market effects. Taking the ratio of DTE Energy Net Saturation to DTE Energy Gross Saturation resulted in a NTGR of 1.03.

4.2 Revealed Preference Demand Model (RPDM)

4.2.1 Elements of the Net-to-Gross Ratio Addressed

The method captures free ridership only. The NTGR elements addressed by this method are represented in the following equation:

$$NTGR = 1 - FR$$

$$NTGR = 1 - 0.20 = 0.80$$

4.2.2 Data Sources

The data sources used to implement this method included:

- **Customer Intercept Survey Data**: Navigant completed in-store surveys in August-September of 2013 with 183 customers (representing approximately 1,000 bulbs) from 22 participating stores (representing six different retailers).[13]
- **Shelf Survey Data**: Concurrent with customer survey data collection, Navigant collected data on the price, availability, location, promotional materials' presence, and other bulb characteristics.

Key definitions relevant to this method are summarized in Table 5.

Table 5. Definitions

Equivalent Bulbs	Non-discounted bulbs competing in the same market as discounted standard CFLs (i.e., non-discounted standard CFLs, standard LEDs, specialty CFLs, incandescents or halogens with medium screw base, and A-line shape).
Logistic Model	The type of regression model used when there is a limited dependent variable (e.g., the dependent variable takes on a value of 1 or 0 rather than being continuous).

Source: Navigant analysis

4.2.3 Summary

This method applies data on actual purchase behavior and store conditions as the basis for modeling the counterfactual (i.e., the probability of purchasing a discounted standard CFL in the absence of the discount) and estimating free ridership. It leads to an estimated free ridership value of 0.20.

The method accomplishes the following:

1. Estimates the probability of purchasing a discounted standard CFL under actual program conditions (P_p), and
2. Predicts the probability of purchasing the same standard CFL under non-program conditions (P_{np})

Free ridership is calculated as the fraction of program sales that would have occurred in the absence of the program, as shown in the following revealed preference demand model (RPDM) equation:

$$Free\ ridership = \frac{P_{np}}{P_p}$$

[13] For this survey effort, the Navigant evaluation team collected data from 277 customers in 29 stores, but for this analysis used data only for discounted standard CFLs or equivalent bulbs from stores with data for purchases of multiple bulb types.

To calculate the probabilities, Navigant estimated a logistic model using *equivalent light bulbs* as the unit of observation, weighted by the number of bulbs purchased. The model includes variables representing store characteristics (e.g., prices of CFLs relative to other bulbs) and customer characteristics (e.g., intent to purchase CFLs when entering the store).

As shown in Table 6, Navigant found that the probability of purchasing a discounted CFL increases most with prior knowledge of the discount, prior intentions to purchase a CFL, availability of CFLs in stores, and the presence of DTE Energy promotional materials.

Table 6. Estimated Coefficients Resulting from Revealed Preference Demand Model

Model Parameter	Estimated Coefficients	Program Scenario	Non-Program Scenario
Intercept	-2.37*	1.00	0.00
Knowledge of Discount	**1.53****	**0.40**	**0.00**
Planned to Purchase CFL	**1.54****	**0.45**	**0.45**
Average CFL Price	-0.44**	3.75	4.54
Average CFL Discount	0.74*	1.45	0.00
Average LED Price	0.10**	17.15	17.15
Average Price of Other Equivalent Bulbs	-0.27*	2.64	2.64
Availability of CFLs Relative to Equivalent Bulbs in Store	**1.48***	**0.58**	**0.58**
Presence of End Cap with DTE Energy-Sponsored Promotional Material	**1.27****	**0.54**	**0.00**

Source: Navigant Analysis of RPDM.
*Note: * significant at the 5% level, ** significant at the 1% level.*

Applying the RPDM equation (in which free ridership is the ratio of the probability of purchasing a bulb without the program to the probability of purchasing a bulb with the program in place), Navigant estimated a free ridership rate of 0.20.

Table 7. Freeridership Estimate from Revealed Preference Demand Model

Probability of Purchase Without Program	Probability of Purchase With Program	Estimate of Freeridership ($\frac{P_{np}}{P_p}$)
0.15*	0.74*	0.20

Source: Navigant Analysis of RPDM.
*Note: * significant at the 1% level.*

4.3 Consumer Self-Report

4.3.1 Elements of a Net-to-Gross Ratio Addressed

This method captures free ridership and spillover.[14] The NTGR elements addressed by this method are represented in the following equation:

$$NTGR = 1 - FR + SO$$

$$NTGR = 1 - 0.37 + 0.07 = 0.70$$

4.3.2 Data Sources

This method used data from the same customer survey effort used in the RPDM. Freeridership estimates were informed by 116 surveys completed by buyers of discount standard CFLs and 27 surveys completed by buyers of discount specialty CFLs. Surveys of 15 purchasers of non-discount standard CFLs informed the spillover analysis.[15]

4.3.3 Summary

Surveys that asked discounted CFL buyers whether they would have made the same purchase in the absence of the discount indicate a program free ridership of 0.37 for standard CFLs. The evaluation team developed two measures of free ridership for each respondent:

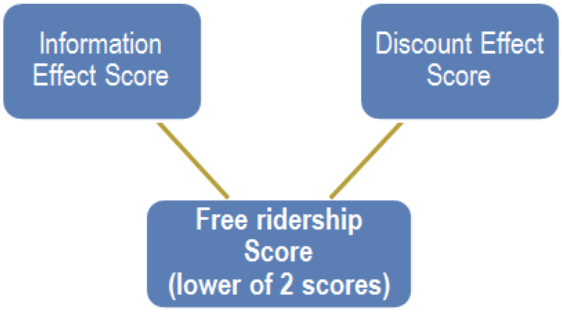
1. ***Discount Effect:*** based on the predicted actions customers reportedly would have taken absent the discount.
2. ***Information Effect:*** based on the influence of in-store information and staff assistance in customers' decision to purchase CFLs.

The team assigned respondents to the lower of the two free ridership scores to ensure the program was not penalized for cases in which respondents were highly motivated by one factor but not the other (see Figure 10).

[14] This method captures only a narrow component of spillover pertaining to purchases of additional bulbs by program participants: participant spillover. While the method does not formally capture market effects, free ridership was adjusted to account for some market effects.

[15] For the survey effort, the Navigant evaluation team collected data from a total of 277 customers in 29 stores. The data used for this analysis only included purchases of discounted standard CFLs or equivalent bulbs and only from stores with data for purchases of multiple types of bulbs.

Figure 10. Schematic Overview of Consumer Self-Report Free Ridership Algorithm



Source: Navigant analysis.

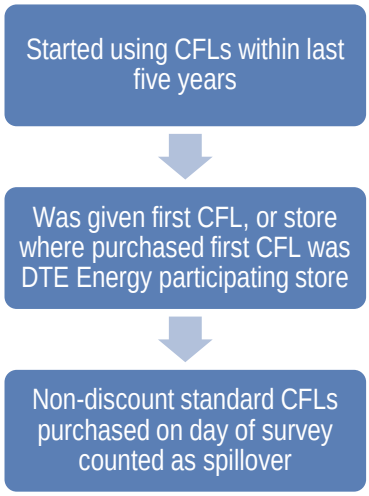
Nearly half of the respondents' reported that their purchase behavior would have differed in the absence of the incentive, resulting in fewer purchases of energy-efficient bulbs. Navigant adjusted free ridership to account for related market effects, as participants may have forgotten past influences of the program. Using the same questions from the spillover analysis, Navigant explored whether earlier program experiences motivated future purchases. For the 19 respondents in which this was the case, Navigant reduced free ridership by 25%.[16]

Questions about potential past program influences on purchases of non-discount bulbs yielded a 7% spillover estimate. The team calculated spillover based on 15 respondents who purchased 83 non-discounted standard CFLs on the day they were surveyed. As shown in Figure 11, sales of non-discounted CFLs were considered spillover if that customer had: 1) started using CFLs during the period of time in which DTE Energy's program has been offered, and 2) been given their first CFL (likely through a DTE Energy-sponsored initiative), or they purchased the CFL in a store in which DTE Energy incentives are offered. This is a narrow but defensible estimate of spillover.[17] Actual spillover (i.e., including purchases made at nonparticipating stores) may be much larger.

[16] Navigant adjusted the self-reported free ridership estimates by 25% for these 19 respondents to account for the possibility they *may* never have adopted CFLs without those past program experiences. This 25% is a midpoint between no market effects adjustment and an aggressive 50% adjustment, which would have amounted to equally weighting responses about past program experiences and responses about the discount with information that participants experienced on the day they were surveyed. The 25% reduction essentially places a greater weight on participants' responses to questions about their purchases that day than on their responses to questions about experiences that may have occurred up to five years ago.

[17] This method is defensible because it relies on customer knowledge of the stores in which they typically purchase light bulbs. The customer does not likely know which stores offer incentives (aside from the store in which they were shopping at the time of the survey), thus limiting potential social desirability bias.

Figure 11. Conditions Necessary for Counting Spillover Using Consumer Self-Report Method



Source: Navigant analysis.

The evaluation team weighted data to account for differences between event day (i.e., a day on which the program implementer had a table set up in the store to promote program-discounted products) and non-event day free ridership. Though Navigant found a significantly lower free ridership level for event days than for non-event days, the number of event days relative to total shopping days is so low that the weighting did not significantly affect the outcome. After adjusting for market effects, this method yielded a program-wide standard CFL NTGR of 0.70. At a 90% confidence level, the sample precision of all CFL purchases is calculated as 11% (i.e., the true value is within 11% of the estimated value with a 90% level of confidence).

Table 8. Final Customer Self-Report Results

Day Type	Freeridership	Spillover	NTGR
Event Day	0.22	0.05	0.83
Non-Event Day	0.37	0.07	0.70
Total Program (weighted)	**0.37**	**0.07**	**0.70**

Source: Navigant analysis of store-intercept survey data.

4.4 Revenue Neutral Program Sales Model

4.4.1 Elements of the Net-to-Gross Ratio Addressed

The method only captures free ridership. The NTGR elements addressed by this method are represented in the following equation:

$$NTGR = 1 - FR$$

$$NTGR = 1 - 0.39 = 0.61$$

4.4.2 Data Sources

The team used 2013 DTE Energy retailer participation agreements (memoranda of understanding or MOUS) as the data source for this analysis method. The MOUs between DTE Energy and each retailer listed retail prices with and without the program, as well as the number of bulbs that DTE Energy would incent. The only missing data point for the analysis is the number of bulbs the retailer would have sold without the program. Based on the premise of this method—the assumption that retailers will only participate if revenues of program sales exceed projected non-program CFL sales revenues—the team solved for this missing term.

4.4.3 Summary

This method relies on the assumption that a retailer's decision to participate is contingent on the total revenue from program bulbs not decreasing as a result of participation (i.e., remaining at least revenue neutral). Based on the assumption that retailers will only participate if revenues of program sales exceed projected non-program CFL sales revenues, Navigant used program data to estimate a maximum free ridership rate of 39%. This method calculates a theoretical maximum value for free ridership associated with an upstream lighting program.[18] Stated differently, this methodology defines a floor below which NTGR will not fall.

Freeridership is the ratio of bulb sales without the program to bulb sales with the program (i.e., the proportion of bulbs sold with the program that would have been sold in the absence of the program), as shown in the revenue neutral program sales model equation below. It is possible that the program design (e.g., marketing and outreach activities) could cause a retailer to sell a volume of bulbs that exceeds the allotted DTE energy incentive quantity, in which case revenues would be even more favorable than the revenue neutrality-based planning estimate. If this were to occur, actual free ridership would be lower than that estimated by this method. This suggests that the ratio of prices provides an upper bound on the free ridership estimate, resulting in the theoretical maximum.

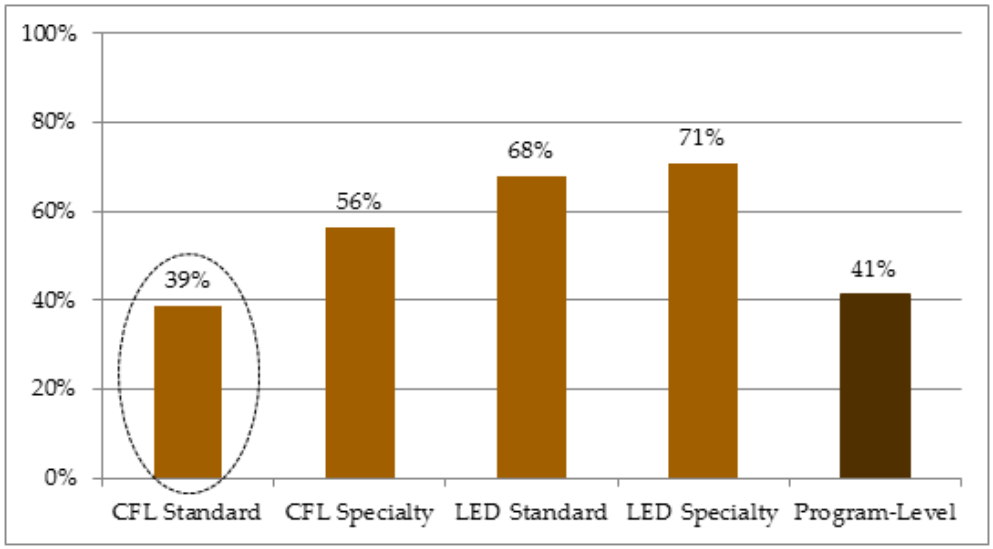
$$FR = \frac{Quantity_{Without\ Program}}{Quantity_{With\ Program}} \leq \frac{Price_{With\ Program}}{Price_{Without\ Program}}$$

As shown in Figure 12, application of this method results in a maximum free ridership estimate of 0.39 for standard CFLs. This yields a NTGR of 0.61.[19]

[18] This method was developed by ODC and APT. Buhr, T. and S. Mertz. "The Revenue Neutral Sales Model: A New Approach to Estimating Lighting Program Free Ridership." 2013 International Energy Program Evaluation Conference, Chicago, IL. The underlying assumption of this model is that retailers only consider revenues associated with program sales in their decision to participate.

[19] Strengths and limitations of this method are detailed in the white paper on this topic posted at www.nmrgroupinc.com/?p=830 (password: CFL2014). Navigant pursued this method at the request of DTE Energy in an effort to provide additional NTGR results for consideration by the advisory panel.

Figure 12. Maximum Free Ridership by Bulb Type and Overall, Revenue Neutral Program Sales Method



Source: Navigant analysis of 2013 DTE Energy program sales data.

4.5 Multi-State Model

4.5.1 Elements of the Net-to-Gross Ratio Addressed

This method captures free ridership and spillover for the 2010 Consumers Energy program. The NTGR elements addressed by this method are represented in the following equation:

$$NTGR = 1 - FR + SO$$

$$NTGR = 0.71^{20}$$

4.5.2 Data Sources

The data sources employed by this method are:

- Program data for the 2009-2010 period:
  - Program budgets, the percentage of budget allocated to incentives, marketing and advertising, and overhead
  - Numbers of program CFLs discounted and the percentage of CFLs with specialty features
  - The method of program support (retail coupons, catalog, and/or upstream approaches)
  - Length of program support
- Data collected via telephone surveys and on-site visits with customers:
  - Demographic, economic, and social characteristics
  - Household history of CFL use

[20] This model estimates free ridership and spillover in aggregate, not separately, because NTGR is calculated based on predicted sales.

  - Where CFLs were purchased
  - Various measures of environmental opinions and early adoption behavior
- U.S. Census data on demographics and social characteristics
- Bureau of Labor Statistics data on unemployment rates

4.5.3 Summary

For multi-state modeling, the evaluation team used household-level data collected from different geographic areas across the United States, in randomly selected households, to isolate the net impact of program activity on CFL purchases. The method yields an estimate of CFL purchases in the presence of the program as well as CFL purchases in the absence of the program. The NTGR is calculated using the equation below, except that the values are modeled to control for other factors, such as demographics and attitudes, which can affect CFL purchases.

$$NTGR = \frac{Predicted\ CFLs\ Purchased\ with\ Program - Predicted\ CFLs\ Purchased\ without\ Program}{Average\ Number\ of\ Incented\ CFLs\ per\ Household}$$

For the multi-state modeling effort, the team relied on data from both telephone and on-site surveys, conducted in areas with longstanding CFL programs, newer or smaller programs, and no CFL programs, through June 2010. The team collected household lighting composition data from 1,495 households across 15 different areas. The effort also involved a high level of pre-survey coordination among the various program administrators and their evaluators, leading to comparability among data from different areas.

In each model, CFL purchases in a specific time period serves as the dependent variable. Independent variables include measures of program support, such as the number of CFLs discounted per household by the program or program budget per household, CFL saturation at the beginning of the time period, the length of prior program support in the area, and various household-level measures of demographic, economic, and social characteristics.

To estimate CFL purchases for this modeling effort, the evaluation team relied on non-linear regression techniques that used a nuanced model (zero-inflated negative binomial), which helps to differentiate between the numerous households that have zero purchases in a particular time period, but for different reasons. For example, some households may not have purchased CFLs because they already had many CFLs installed and did not need any more, while others may not have purchased CFLs because they did not like CFLs and did not have any installed.

The multi-state regression modeling effort estimated a NTGR of 0.71. This NTGR estimate includes free ridership and spillover.

4.6 Price Response Model

4.6.1 Elements of the Net-to-Gross Ratio Addressed

This method only captures free ridership for the 2009-2012 for the Consumers Energy program. The NTGR elements addressed by this method are represented in the following equation:

NTGR = 1 - FR

NTGR = 1-0.28 = 0.72

4.6.2 Data Sources

For this analysis, the evaluation team used weekly sales data broken down by store and SKU number over the 3.5 years of the program from July 2009 to December 2012. The team combined sales data with monthly event data specified by store to create the final dataset used in the price response model.

For each unique combination of retailer, model number, and incentive level, the dataset contained the following relevant fields:

- Original retail price
- Target retail price
- Number of bulbs per package
- Rated wattage
- Model designation (specialty, LED, fixture, standard)
- Number of promotional events
- Program month in which the product was sold

4.6.3 Summary

Cadmus modeled product sales over time as a function of price, number of promotional events, and other relevant variables described below. The team tested a variety of specifications to ascertain the average impact of price—the main instrument affected by the program—on the demand for bulbs over the 3.5 program years. This model assumes that bulb sales are a function of bulb characteristics, seasonal trends, promotional events, and price.

The evaluation team calculated NTGR values for the program using the following methodology. First, the team estimated bulb pack sales under program and non-program scenarios using the price response model. The non-program scenario represents what sales would have been if bulbs had been sold at their original retail prices and there had been no promotional events.

NTGR were calculated using the following formula:

$$NTGR = 1 - FR = \frac{Energy\ savings\ with\ program - Energy\ savings\ without\ program}{Energy\ savings\ with\ program}$$

The team estimated NTGR for the program overall since inception, by bulb type, by year, and by retailer type. As the ratio of incentive to bulb price increased, free ridership decreased. Table 9 shows the NTGR and the incentive-to-price ratio for each of the scenarios and perspectives analyzed.

Table 9. Estimates of NTGR from Price Response Model

Scenario	NTGR	Incentive-to-Price Ratio
Program Overall – 2009-2012	**71%**	**0.74**
Bulb Type		
Standard Bulbs	72%	0.75
Specialty CFLs	65%	0.44
Year		
2009	62%	0.45
2010	73%	0.46
2011	75%	0.62
2012	71%	0.56
Store Type		
DIY	73%	0.54
Discount	85%	0.64
Mass Market	53%	0.55

Source: Cadmus analysis.

4.7 Store Manager Interviews

4.7.1 Elements of the Net-to-Gross Ratio Addressed

This method only captures spillover for the 2012 Consumers Energy program. The NTGR elements addressed by this method are represented in the following equation:

$$NTGR = 1 + SO$$

$$NTGR = 1.24 \text{ to } 1.33$$

4.7.2 Data Sources

Data sources employed by this method include:

- Consumers Energy program sales data, 2012
- Data collected via telephone interviews with store managers

4.7.3 Summary

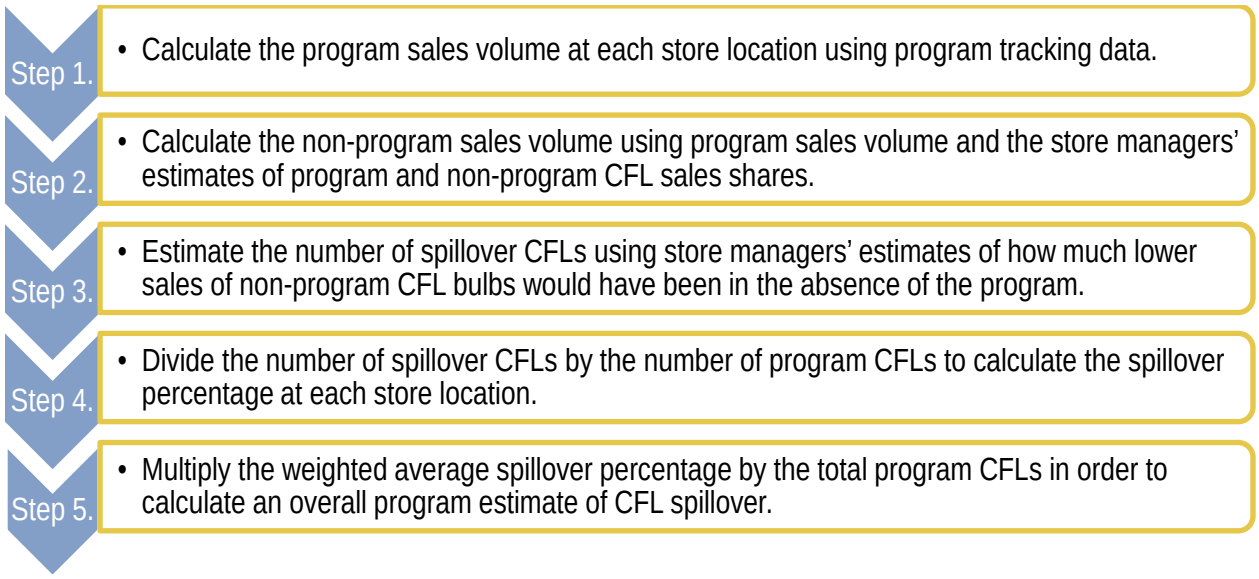
The evaluation team interviewed 20 local retail managers from participating Consumers Energy stores in order to assess participant spillover, in particular by estimating the sales of non-discounted CFLs that resulted from the program's influence. This includes spillover as perceived by the retail managers that responded to the interviews, and does not include other forms of spillover—such as market effects—

that retail managers may not recognize. These 20 interviewees represent nine of the 10 participating retail chains in 2012, collectively accounting for 88% of program sales. The team interviewed multiple store managers from chains that represent a larger share of program bulbs.

Because some participating stores sell more program CFLs than others, and because some participating chains have more stores involved in the program than others, the evaluation team developed two sets of weights for the spillover analysis: a program sales weight and a program store weight. The program sales weight accounts for some stores selling more CFLs than other stores. The program store weight accounts for some chains having more participating stores than other chains.

Figure 13 illustrates the steps undertaken for this methodology.

Figure 13. Store Manager Interview Methodology



Source: NMR analysis.

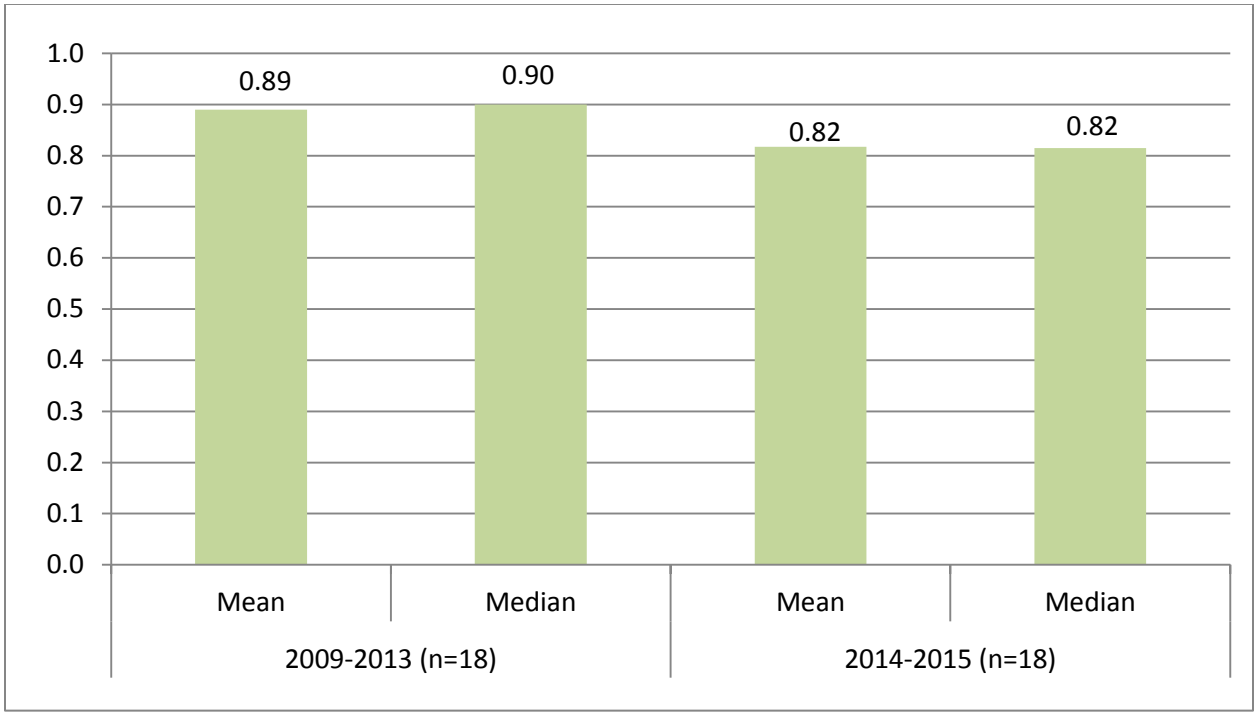
5. Advisory Panel Results

This section presents the overall results of the advisory panel, followed by the detailed results for the 2009-2013 period and the 2014-2015 period.

5.1 Overall Results

Figure 14 displays the final mean and median NTGR estimates from the advisory panel for the 2009-2013 and 2014-2015 periods. For the 2009-2013 period, the final mean and median NTGR values were 0.89 and 0.90, respectively. These values are nearly equivalent to the deemed NTGR value of 0.90 for residential programs. For the 2014-2015 period, the NTGR values were somewhat lower, with mean and median values of 0.82.

Figure 14. Final Mean and Median NTGR Estimates from Advisory Panel



Source: Advisory panel data.

The NTGR values found in this study are higher than those found in prior NTGR research conducted in other jurisdictions, in particular, a similar study using an advisory, or Delphi panel, conducted in 2010 in Massachusetts.[21] The evaluation team identified the following factors that contributed to this outcome. Some of these factors were also mentioned by panelists in explaining the reasoning behind their NTGR estimates:

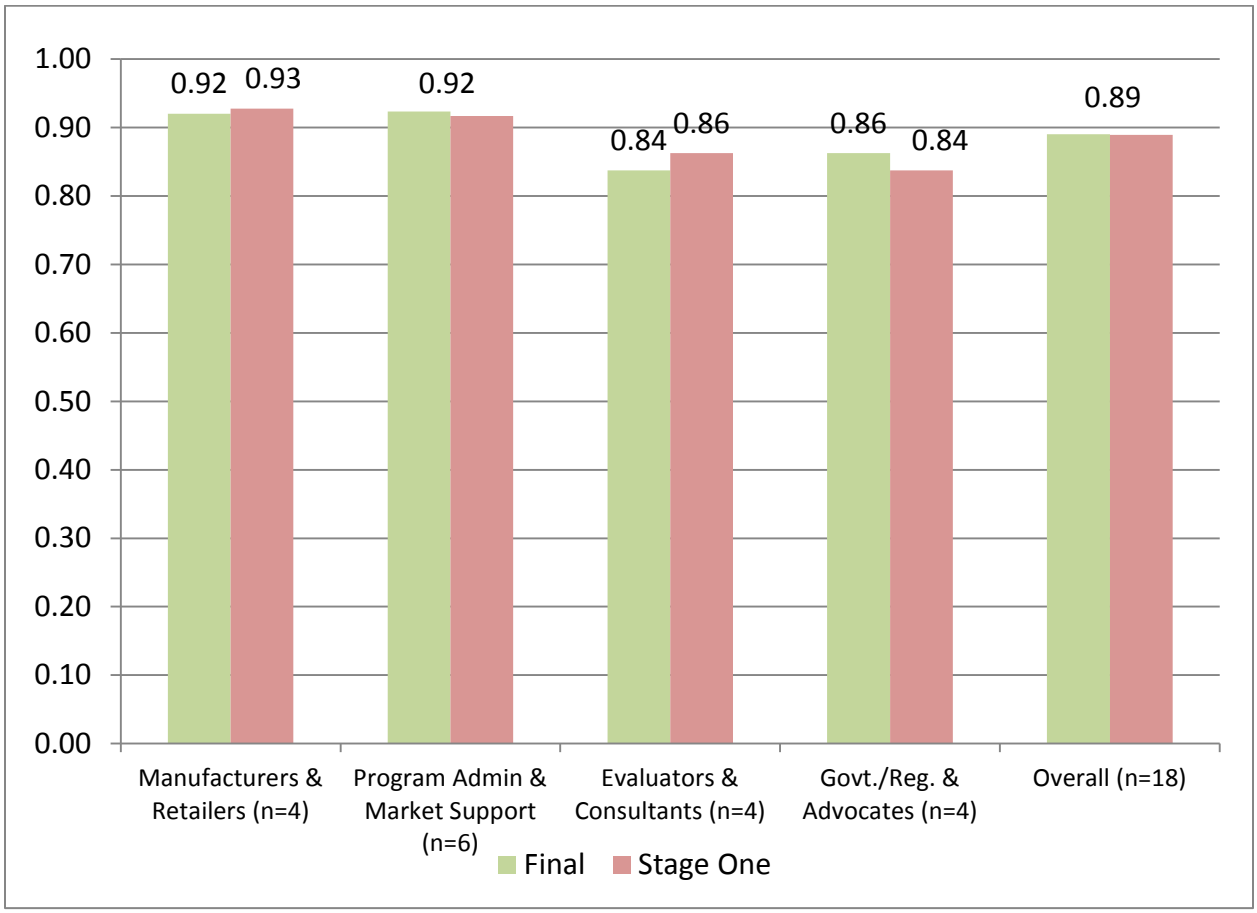
- The explicit inclusion of multiyear market effects in the definition of NTG in Michigan (and the explicit exclusion of market effects from the definition of NTG in Massachusetts)
- The weaker condition of the Michigan economy relative to other regions may have inhibited customer purchases of discretionary products, such as CFLs
- The Michigan programs have operated since 2009, a much shorter duration than programs in some other regions, including Massachusetts
- Advancements in methods for estimating NTGR yield more reliable and accurate results

5.2 2009-2013 Results

Figure 15 displays the mean 2009-2013 NTGR estimates from both stages of the advisory panel for each of the panelist categories. Panelists from the manufacturer/retailer and program administrator/market support groups estimated higher NTGR values (0.92-0.93) than panelists from the evaluator/consultant and government, regulatory, and advocacy groups (0.84-0.86).

[21] NMR Group, The Cadmus Group, Inc., and KEMA. "Massachusetts ENERGY STAR® Lighting Program 2010 Annual Report, Volume 3: Appendices E – G." Submitted to: Energy Efficiency Advisory Council Consultants, Cape Light Compact, NSTAR, National Grid, Unitil, Western Massachusetts Electric. June 15, 2011. Available online: http://www.ma-eeac.org/Docs/8.1_EMV%20Page/2011/2011%20Residential%20Studies/MA%20Res%20Lighting%202010%20Eval%20Overall%20Rpt%20Vol%203.pdf.

Figure 15. Mean NTGR Estimates for 2009-2013 from Advisory Panel



Source: Advisory panel data

Panelists' comments suggest that most of them relied on the NTG method or methods they judged to be most accurate to develop their NTGR estimate. The panelists then adjusted the resulting NTGR value (if it only included free ridership) to include spillover and market effects. Based on the evaluation teams' analysis of participant comments, representative comments provided by three panelists are provided below. The comments are from one panelist each who provided a high, medium, and low NTGR value, respectively.

One panelist from the program administrator and market support group explained the rationale behind the NTGR estimate of 1.03 as follows:

> *"The programs were launched in 2009. This provided four solid years to sell CFLs but by no means is as extensive as other utilities that have been promoting CFL technology for nearly 20 years. The Michigan utilities did not promote CFLs prior to 2009, but have made solid gains in the market in the past 4.5 years. The programs have reached a 27% saturation level, which is respectable but still allows plenty of potential to convert incandescent sockets to energy efficient ones. With the extensive sales, evidence of spillover and intense marketing efforts made by the utilities in the past four years, I believe that the spillover and market effects are substantial."*

One panelist from the government, regulatory, and advocacy group explained the rationale behind the NTGR estimate of 0.85 as follows:

> *"I rated all the studies as 'somewhat accurate.' The reason is simple. Because we are dealing with counterfactuals, it is not possible to test accuracy. As result, I am reluctant to declare any NTGR study as 'very accurate.' On the other hand, all the studies appear to have been well executed and based on sound principles suggesting that the results are likely to be at least 'somewhat accurate.'*
>
> *Overall the most comprehensive studies show some divergence-- 1.03 (CFL Market Model), 0.70 (Consumer Self-Report) and 0.71 (Multi-State Model). Three studies targeting free ridership show a range of 0.61 to 0.80 and a simple average of the three of 0.71. However, I am confident that there is some market effects/spillover.*
>
> *In my judgment the 1.03 of the CFL Market Model is too high, but the 0.70 from the Consumer Self-Report and Multi-State Model studies is too low because the free ridership-only studies suggest that free ridership equals about 0.71 without a spillover/market effects adjustment. As a result, a NTGR of 0.85 seems about right."*

Another panelist from the government, regulatory, and advocacy group explained the rationale behind the NTGR estimate of 0.75 as follows:

> *"We tend to favor data driven methods and several of those methods came in around 0.70. That being said, we do believe that some consideration should be given to the State of Michigan and likelihood that program incentives played perhaps a larger role than they may have in states that were less severely impacted by the recession. We also believe that the NTGR would be higher in the earlier years of the program range provided, so chose an average for the time period."*

Table 10 lists the final minimum, mean, median, and maximum NTGR estimates for the 2009-2013 period for each of the panelist groups. Overall, the minimum value was 0.75 and the maximum value was 1.03. Within each group, the mean and median values are similar, indicating a reasonable distribution of estimates. There were no outlier responses for 2009-2013 NTGR estimates in either stage of the panel.[22]

[22] Outliers are defined as those data points that are at least 1.5 times the interquartile range above the third quartile or below the first quartile; the interquartile range is the difference between the first and third quartiles.

Table 10. NTGR Statistics for 2009-2013 from the Advisory Panel

	Manufacturers and Retailers (n=4)	Program Administrators and Market Support (n=6)	Evaluators and Consultants (n=4)	Government, Regulatory, and Advocacy (n=4)	Overall (n=18)
Minimum	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
Maximum	1.00	1.03	0.90	1.00	1.03

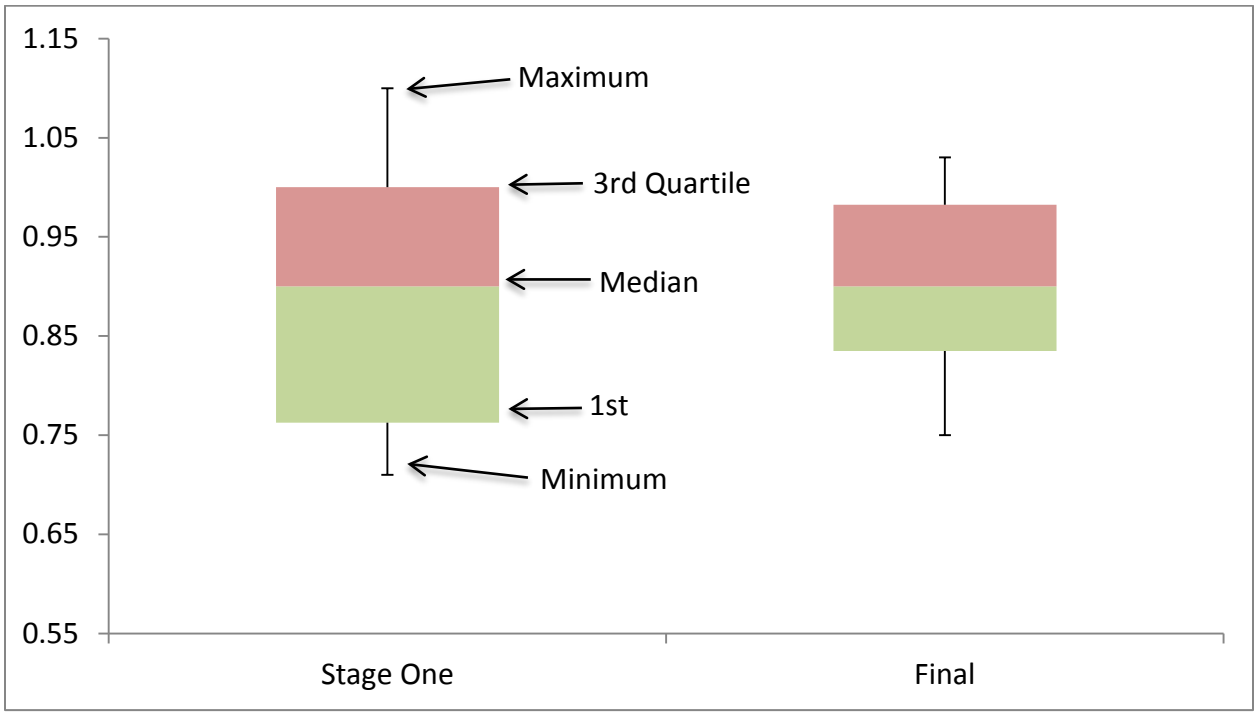
Source: Advisory panel data.

Figure 16 presents a box and whisker plot of the 2009-2013 NTGR estimates. A box and whisker plot is a way of graphically summarizing the distribution of a set of numerical data; the box represents 50% of all responses (i.e., responses ranging from the first quartile to the third quartile).

The narrowing of the box and whiskers between Stage One and the Final illustrates the convergence of the NTGR estimates during the second stage of the panel: six panelists changed their NTGR estimates during stage two:

- Three panelists increased low estimates in order to account for spillover and market effects
- Three panelists decreased high estimates after reviewing other panelists rationales

Figure 16. Box and Whisker Plot of 2009-2013 NTGR Estimates from Advisory Panel



Source: Advisory panel data.

The evaluation teams also asked panelists whether they believe there is a substantial difference between the 2009-2013 NTGR estimates for Consumers Energy and DTE Energy. Fifteen of the 18 panelists believe there is not a substantial difference due to similarities in:

- Program design, implementation team, incentive levels, participating retailers, and launch date
- Retail markets
- Customer demographics
- Socket saturation levels

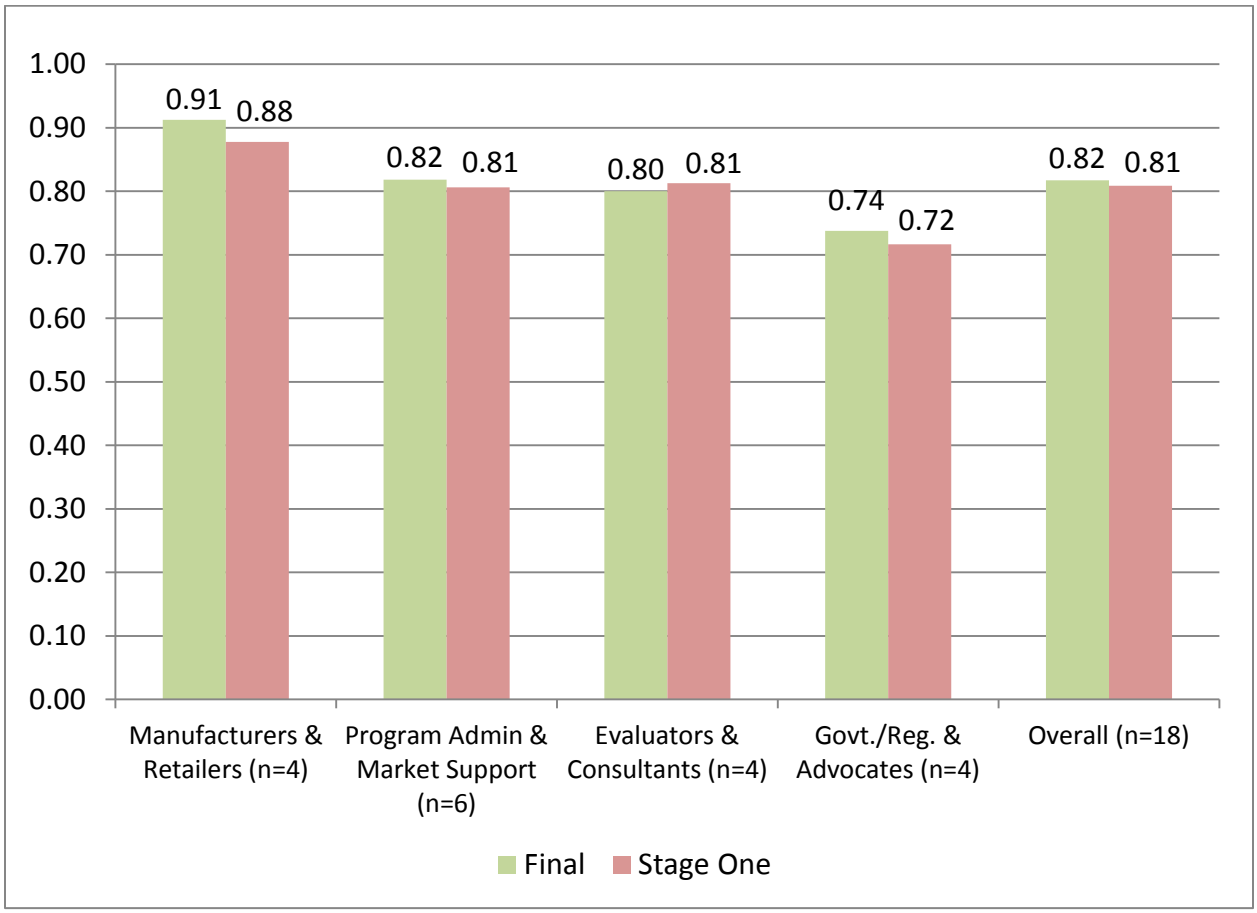
One panelist from the Program Administrator and Market Support group stated the following:

> *"They [Consumers Energy and DTE Energy] have been delivering similar programs for similar periods of time and have roughly comparable demographics. Some of the measures of NTG (e.g. free ridership) shown above were comparable. While DTE [Energy] exhibits larger sales of measures over the time period, Consumers Energy sales were more erratic - very steep growth followed by drop off. They are neighboring, can expect the markets to overlap. More aggressive incentives exist in the smaller territory, which may induce spillover affecting both territories."*

5.3 2014-2015 Results

Figure 17 displays the mean 2014-2015 NTGR estimates from both stages of the advisory panel for each of the panelist groups. Panelists from the manufacturer/retailer group estimated the highest NTGR values (0.88-0.91), while panelists from the government, regulatory, and advocacy group estimated the lowest NTGR values (0.72-0.74). Panelists from the program administrator/market support and evaluator/consultant groups estimated values close to the median and mean values of 0.81-0.82.

Figure 17. Mean 2014-2015 NTGR Estimates from Advisory Panel



Source: Advisory panel data.

Most panelists (12 of 18) provided lower NTGR estimates for 2014-2015 than for 2009-2013, offering the following rationale:

- Lower incremental costs between CFLs and halogens than between CFLs and incandescents may lead customers to purchase CFLs without programs
- Wider availability of halogens, which may increase the extent of customers purchasing CFLs without the program
- Lower prices for LEDs
- As the CFL market matures, free ridership will increase
- Because spillover and market effects have already been captured, they will decline in the future

For these 12 panelists, the mean and median decrease in NTGR vales from 2009-2013 to 2014-2015 was -0.12 and -0.10, respectively. One of the panelists (from the government, regulatory, and advocacy group) who estimated a NTGR value of 1.00 for 2009-2013 and 0.80 for 2014-2015 stated the following:

> *"Much of the initial spillover and market effects [that are] due to the complete absence of utility energy-efficiency programs from 1996 until 2009 have already been captured now, so that will*

> *tend to depress the NTGR. In addition, unfortunately, a fundamental flaw of many common approaches to free ridership estimation is that cumulative program effects from prior years tend to be seen as "free ridership" when assessing a current program. So that will tend to inflate self-reports of free ridership, for example. They could do better than the 0.80 I indicate below, but not with the current limited program design."*

Another panelist (from the evaluators and consultants group) who believes that the NTGR will decline from 0.75 in 2009-2013 to 0.70 in 2014-2015 had this to say:

> *"NTGRs tend to drop steadily over time regardless. In this specific case, EISA raises the cost of the base case product (incandescents), so consumers are slightly more likely to buy CFLs without a utility rebate than they were previously, since their incremental cost is now lower. [However] I'm persuaded by the other panelists' comments that even though free ridership is undoubtedly rising over time, the other spillover and market effects are a counterbalancing factor over the long term, for which the utilities deserve credit."*

Five of the 18 panelists maintained their 2009-2013 NTGR estimate for 2014-2015 due to the following reasons:

- No significant changes in programs
- Lack of clear data on market changes

One of these five panelists, from the evaluators and consultants group, stated the following:

> *"Consumers will have to find alternatives to incandescent bulbs as EISA phases out the higher wattages. If the halogen and LED alternatives were not becoming rapidly available and competitive, the NTGR for CFLs might reasonably decline. However, given the available alternatives, it is plausible that the program may see a decrease in the overall number of incentives for CFLs with a similar NTGR as in prior years. Whereas EISA could be leading to increased free ridership, the continuation of incentives could push people toward CFLs as opposed to the other technologies"*

Another panelist stated this more clearly:

> *"…This will likely have an equal effect on both induced and non-induced (free rider) purchasers, therefore leaving the NTGR unchanged. I agree with other panelists that as markets mature, we typically see NTGRs decreasing over time, but with all the complicating factors in this market I have doubts about that and could not venture a guess as to how the NTGR would change, if at all, in the next two years."*

Table 11 lists the final minimum, mean, median, and maximum NTGR estimates for the 2014-2015 period for each of the panelist groups. Overall, the minimum value was 0.60 and the maximum value was 1.00. Within each group, the mean and median values are similar, indicating a reasonable distribution of estimates. There were no outlier responses for 2014-2015 NTGR estimates in either stage of the panel.

Table 11. NTGR Statistics for 2014-2015 from the Advisory Panel

	Manufacturers and Retailers (n=4)	Program Administrators and Market Support (n=6)	Evaluators and Consultants (n=4)	Government, Regulatory, and Advocacy (n=4)	Overall (n=18)
Minimum	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
Maximum	1.00	0.89	0.90	0.80	1.00

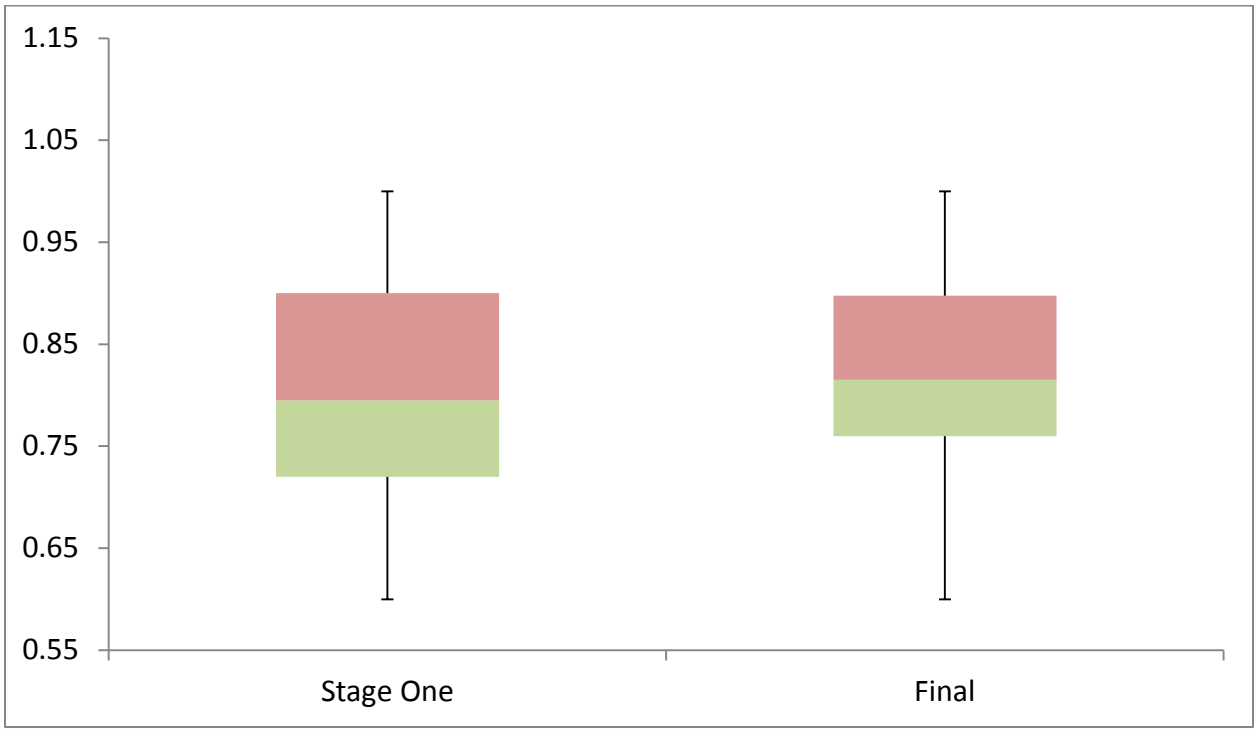
Source: Advisory panel data.

Figure 18 presents a box and whisker plot of the 2014-2015 NTGR estimates. The narrowing of the box between Stage One and the Final illustrates the convergence of the NTGR estimates during the second stage of the panel: seven panelists changed their NTGR estimates during Stage Two:

- Four panelists increased low estimates in order to account for spillover and market effects
- Three panelists decreased high estimates after reviewing other panelists rationales

In addition, one panelist provided a 2014-2015 NTGR estimate in Stage Two that had not done so in Stage One.

Figure 18. Box and Whisker Plot of 2014-2015 NTGR Estimates from the Advisory Panel



Source: Advisory panel data.

6. Key Findings and Recommendations

Based on the findings of this study, the evaluation teams recommended that the EO collaborative adopt the NTGR value of 0.82 for standard CFLs distributed through Consumers Energy and DTE Energy upstream lighting programs for program years 2014-2015, recognizing that the findings represent the following:

- A consensus view supported by industry experts representing various stakeholder groups.
- The results of a panel informed by groundbreaking research efforts to measure the full range of NTGR components, including market effects.
- A successful advisory panel process: there were no outliers; some panelists changed their values based on the input from other panelists; and the overall dispersion of answers narrowed during Stage 2.

At its meeting on January 21, 2014, the EO collaborative voted to accept the recommend NTGR value of 0.82. The MPSC staff agreed to develop an advisory memo for submission to the Michigan Public Service Commission documenting the decision of the collaborative group.

Appendix A, Delphi Panel Stage 1 Instrument

Estimating the Net-to-Gross Ratios for Michigan's Residential Standard CFL Programs

Thank you for sharing your experience and market expertise as a participant in this study. The primary goal of this study is to develop a joint net-to-gross ratio (NTGR, see definition below) for the Consumers Energy and DTE Electric residential standard CFL programs for the 2014-2015 period. The evaluation team will summarize the responses to this survey and send them to you and the other panel members, and ask you to review the results to decide if you would like to change any of your responses. It is possible that your responses and your explanations could influence other panel members in the second (and final) round of the study.

We are requesting your assessment of the Consumers Energy and DTE Electric NTGR estimates for 2009-2013 as well as the development of a single joint NTGR estimate for 2009-2013 and a prospective joint NTGR estimate for 2014-2015. The 2009-2013 NTGR estimates are described in more detail (in the tab "E. Net-to-Gross Methods & Values") to help inform your assessment.

INSTRUCTIONS

1. Review each of the sheets included in this document (listed below according to tab color)
2. Answer all questions included in the "Questions to Complete" sheet
3. Save and return the completed Excel document to jessica.minor-baetens@navigant.com by **Wednesday, November 6**

Please contact Jessica Minor-Baetens with questions that arise at any point in your participation in this study: (734) 794-4865 or jessica.minor-baetens@navigant.com

A. Introduction 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 & Shipment Trends	Provides information on the EISA phaseout schedule and national shipments by bulb type
E. Net-to-Gross Methods & 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

BACKGROUND AND DEFINITIONS

This study is focused solely on residential **standard CFL bulbs**, and does not include specialty CFL bulbs, CFL fixtures, or LED bulbs. For the purposes of this study, the term "standard CFL" includes only bare, spiral medium screw-base CFL bulbs. All covered bulbs, 3-way bulbs, dimmable bulbs, bug lights, or non-medium screw-base CFL bulbs are considered specialty bulbs.

In this document, when we use the terms 'Michigan' or 'statewide', we are referring to the combined Consumers Energy and DTE Electric service territories, which represent most of the state. A service territory map is included in the "B. Utility Background Data" sheet for your reference.

Net Savings are changes in energy use attributable to a particular energy efficiency program; a NTG Ratio (ratio of net savings to gross savings, or "NTGR") is applied to convert gross savings to net savings. There are two ways to measure a NTGR, using a "market-level" approach or a "program-level" approach.

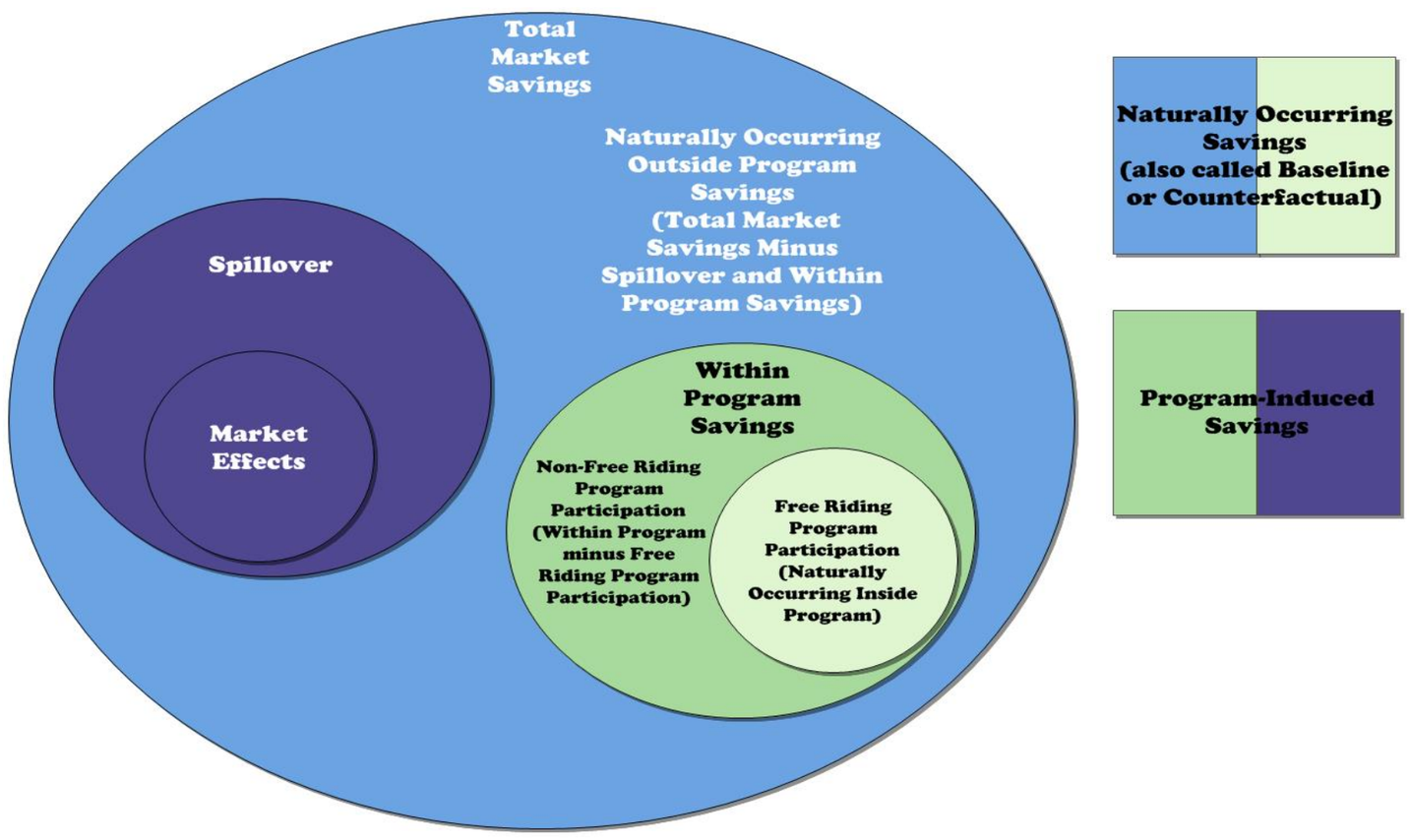
The **"market-level"** NTGR is calculated as: (market-level sales [or savings] - baseline sales [or savings]) / program-supported sales [or savings]

The **"program-level"** NTGR is calculated as: Net-to-Gross Ratio = 1 - Free Ridership + Participant Spillover + Nonparticipant Spillover + Other Market Effects

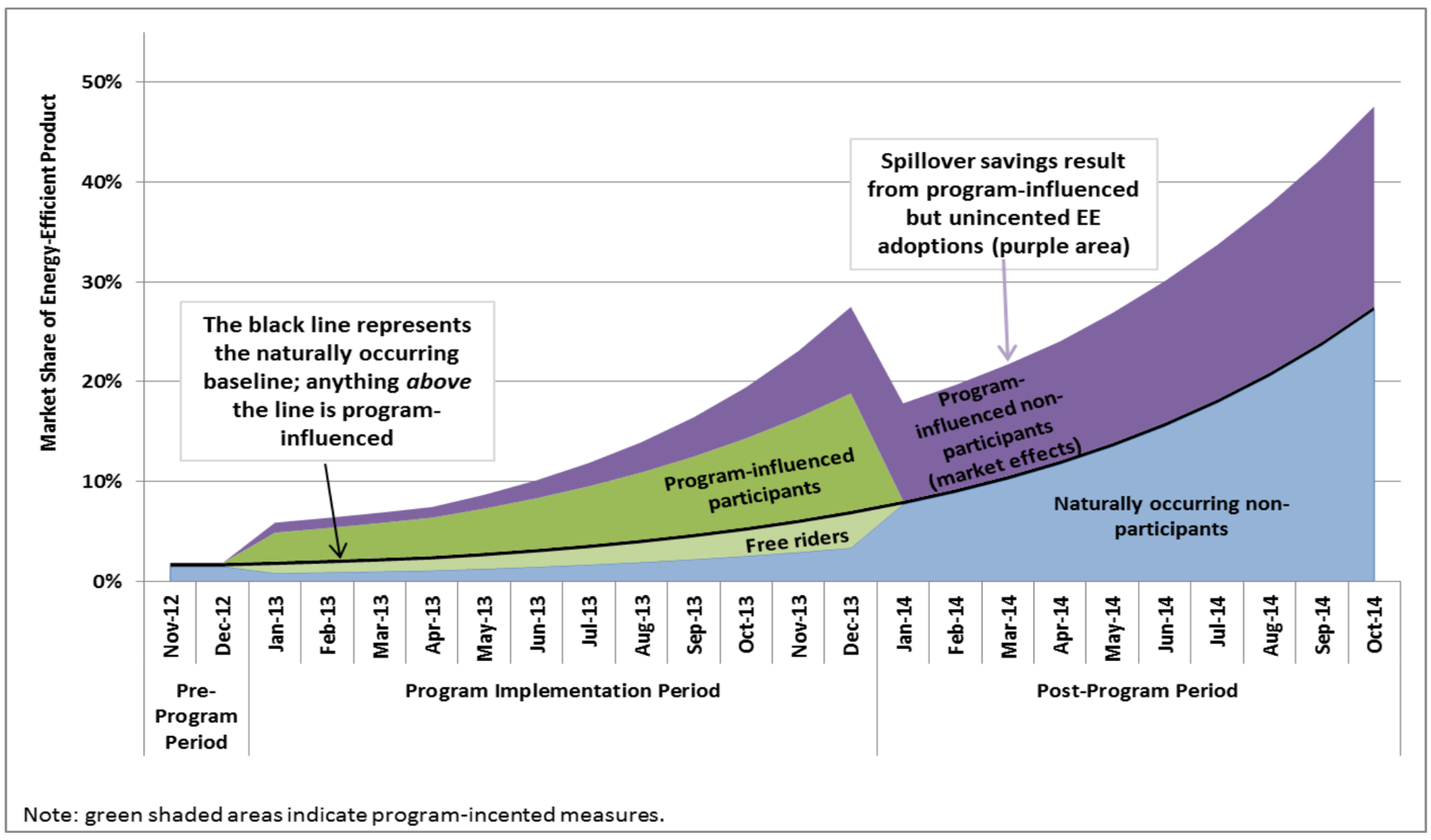
A few additional useful definitions and examples:

- **Free ridership (FR)** is savings from someone who would install an energy-efficiency measure without any program incentives, but receives a financial incentive or rebate anyway. For example, customers who enter a store with definite plans to purchase CFL bulbs and just happen to purchase program incentivized CFLs.
- **Participant spillover (PSO)** is savings from participants influenced by a program to adopt energy-efficiency measures that qualify for financial incentives or rebates, but do not receive them. For example, customers who purchase program incentivized CFLs and have a positive experience using them and therefore later purchase non-program CFLs create participant spillover.
- **Non-participant spillover (NPSO)** is savings from a non-participant influenced by a program to adopt energy-efficiency measures; this can include both direct and indirect influences. For example, customers who are influenced by a newspaper advertisement sponsored by the program that emphasizes the benefits of CFLs, to later purchase CFLs which happen to be non-program CFLs, generate non-participant spillover.
- **Other Market Effects (ME)** are "spillover savings that reflect significant program-induced changes in the structure or functioning of energy efficiency markets" (Prahl, Ridge, Hall, & Saxonis). For example, manufacturers, retailers, and customers in program or non-program areas who, because of the influence of programs, increase their offerings of CFLs, decrease prices, or purchase more CFLs and therefore generate energy savings that would not have happened without the program. These market effects may develop over multiple years and therefore reflect the cumulative impact of the programs on the market.

The below diagram displays the relationship between these NTG concepts. The diagram is merely illustrative; the size of the circles bears no relationship to their actual magnitude.



The below chart illustrates the relationship between these NTG concepts over time. The values and timeline presented are merely examples used to illustrate the general trends.



Note: green shaded areas indicate program-incented measures.

The Consumers Energy and DTE Electric Residential Lighting Programs

The Consumers Energy and DTE Electric Residential Lighting Programs are on-going coordinated efforts by each utility to encourage the use of ENERGY STAR-qualified light bulbs among residential customers. The lighting programs are coordinated with and designed to support the national ENERGY STAR program.

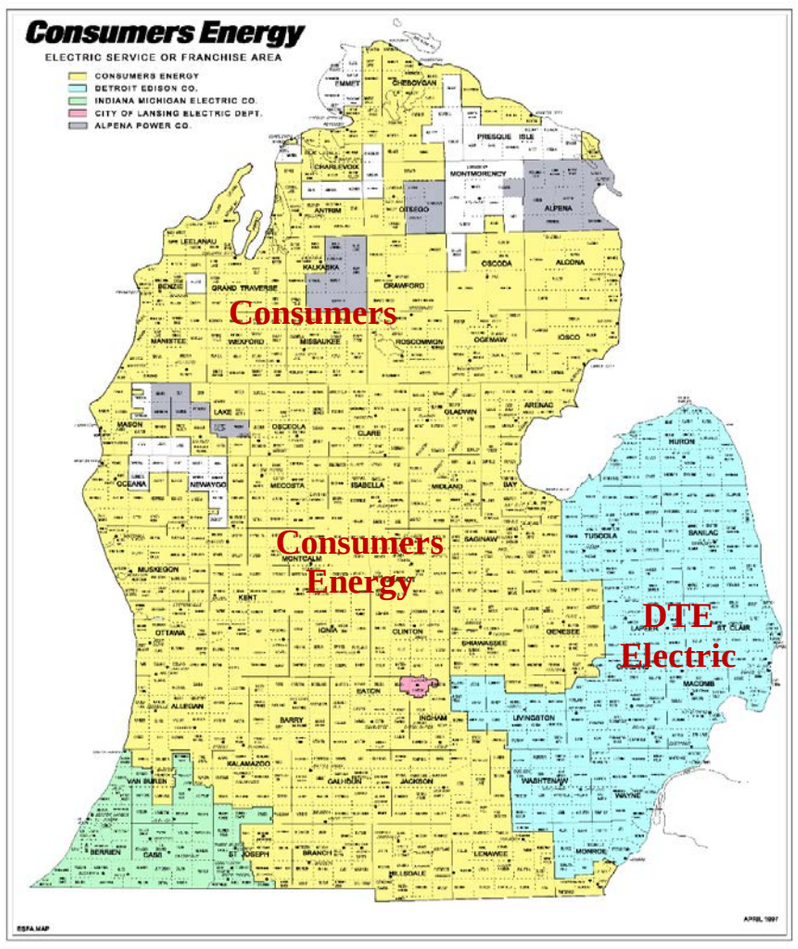
In July 2009, Consumers Energy and DTE Electric launched the ENERGY STAR lighting program which utilizes a markdown or buydown approach, a high-volume sales initiative offered in conjunction with manufacturers and retailers. The programs solicit industry partners to propose plans where the manufacturer or retailer is paid an incentive (based on sales records) for each discounted bulb sold. This mechanism provides reduced product pricing for the consumer, who frequently may have no indication that s/he is taking part in the program. The program also provides staff training and promotional support such as advertising, point-of-purchase (POP) materials, and consumer education activities.

Since the programs launched in July 2009, they have largely supported standard spiral CFLs (about 90% of all CFL bulbs incentivized), with the remainder made up of a selection of specialty CFLs. Home improvement stores, discount stores, and warehouse stores (price clubs) have dominated the list of participating retailers and, therefore, sold most of the program-supported bulbs. Other retailers have sold limited numbers of CFL bulbs; these include traditional hardware and bargain stores and for Consumers Energy, grocery stores too. In 2011, the savings goals were increased and the programs broadened participation to include additional retailers. In 2013, a total of 14 retailers participated across the two programs representing about 800 store locations.

Key Program Data	2009	2010	2011	2012	2013 (planned)*
Program Distribution of Standard CFL Bulbs to Residential Customers					
Consumers Energy	688,692	931,509	2,895,086	2,385,226	2,281,218*
DTE Electric	1,850,966	2,715,563	4,201,960	5,234,383	4,080,000*
Weighted Average Program Incentive Level per Standard CFL Bulb					
Consumers Energy	$2.50	$1.00	$1.00	$1.00	$1.05
DTE Electric	$0.90	$0.89	$1.02	$1.23	$1.14

The Consumers Energy and DTE Electric Service Territories

The map to the right displays the electric service territories for Consumers Energy and DTE Electric. The Consumers Energy service territory (in yellow) is comprised of southern, central, and western Michigan. The DTE Electric service territory (in blue) covers all of the metropolitan Detroit area.



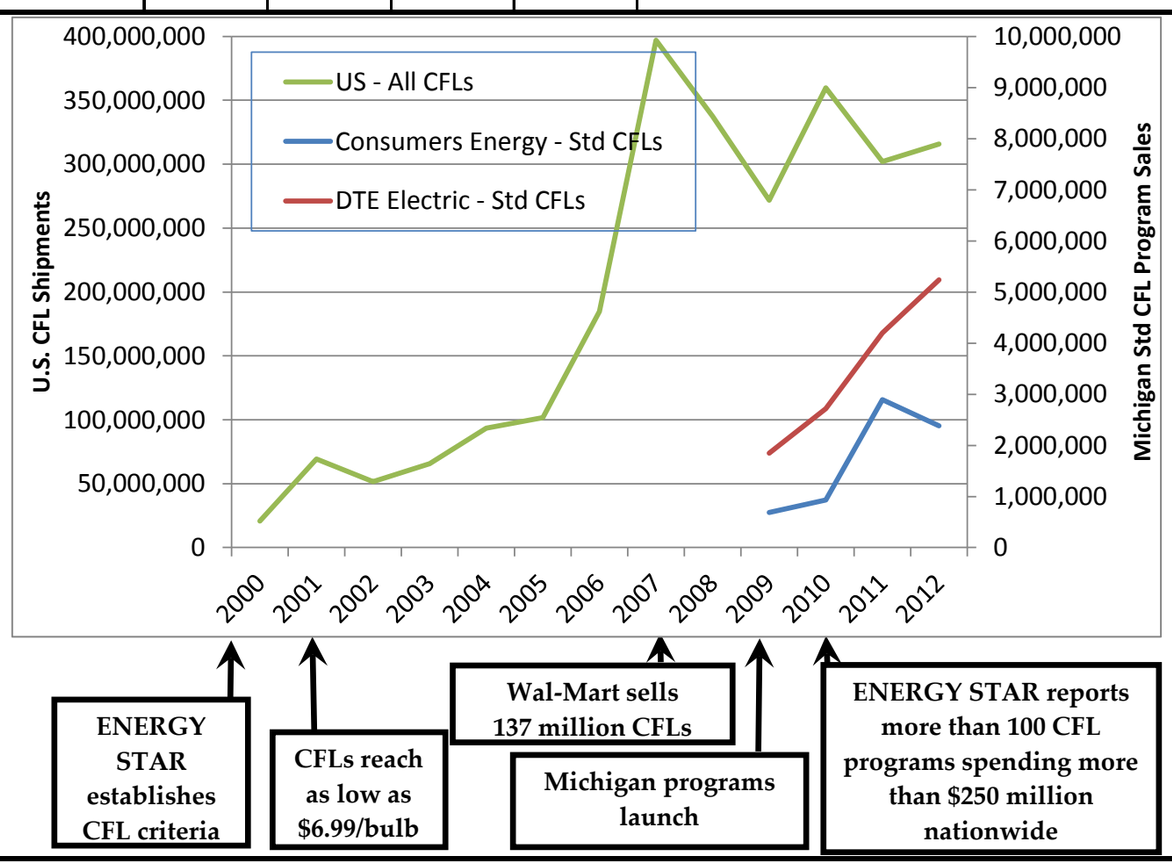
The below data compares the demographic characteristics of the customers residing in the Consumers Energy and DTE Electric service territories from the American Community Survey (2009-2011). Overall, the two service territories exhibit similar characterisics in terms of homeownership, home type, age, education, and income. In addition, demographic data for the entire U.S. is included for reference.

Own or Rent	Consumers Energy	DTE Electric	United States
Total occupied housing units	1,607,690	1,890,313	114,931,864
Own	74%	71%	65%
Rent	26%	29%	35%
Home Description	**Consumers Energy**	**DTE Electric**	**United States**
Total occupied & unoccupied housing units	1,917,082	2,164,494	131,826,591
Detached single-family home	73%	69%	62%
Attached single-family home	3%	6%	6%
Mobile home or manufactured home	7%	3%	7%
Two-, three-, or four-unity building	5%	6%	8%
Building with five or more units	12%	15%	18%
Age	**Consumers Energy**	**DTE Electric**	**United States**
Adult population	3,063,733	3,606,494	226,048,039
20 to 24	10%	9%	10%
25 to 34	16%	16%	18%
35 to 44	17%	19%	18%
45 to 54	20%	21%	20%
55 to 59	9%	9%	9%
60 to 64	8%	8%	8%
65 to 74	10%	9%	10%
75 to 84	6%	6%	6%
85 years and over	3%	3%	2%
Educational Attainment	**Consumers Energy**	**DTE Electric**	**United States**
Population 25 and older	2,745,336	3,292,814	204,348,469
Less than high school	11%	12%	14%
High school or GED	33%	28%	28%
Some college	25%	24%	21%
Associate’s degree	9%	8%	8%
Bachelor’s degree	15%	17%	18%
Advanced or graduate degree	8%	11%	11%
Household Income	**Consumers Energy**	**DTE Electric**	**United States**
Total households	1,607,690	1,890,313	114,931,864
Less than $25,000	27%	25%	24%
$25,000 to less than $50,000	28%	24%	24%
$50,000 to less than $75,000	19%	18%	18%
$75,000 to less than $100,000	11%	12%	12%
$100,000 to less than $150,000	10%	12%	12%
$150,000 to less than $200,000	3%	4%	5%
$200,000 or more	2%	4%	4%

The tab "C. Market Background Data" provides more information on the program in juxtaposition with other market activity.

Background Data on Program and Market Activity in Michigan and Elsewhere

This sheet presents program and market data for Michigan, including the Consumers Energy and DTE Electric service territories. Where available, data for two other Midwestern states, Wisconsin and Indiana, are also listed. Wisconsin has a long history of supporting CFLs and previously used Michigan as a baseline state for evaluation research. In contrast, Indiana launched programs in 2010, after Michigan did. Massachusetts data are also included, as that state has a long history of supporting CFLs and provides a source of regular market and program data.

Indicator	2009	2010	2011	2012	2013	Notes	Sources
Program Distribution of CFLs							
Consumers Energy + DTE Electric	2,539,658	3,647,072	7,097,046	7,619,609	6,361,218*	Standard CFLs only. *2013 figures represent planning estimates.	Program Records
Consumers Energy	688,692	931,509	2,895,086	2,385,226	2,281,218*	Standard CFLs only. *2013 figures represent planning estimates.	Program Records
DTE Electric	1,850,966	2,715,563	4,201,960	5,234,383	4,080,000*	Standard CFLs only. *2013 figures represent planning estimates.	Program Records
Indiana				2,053,220		Standard CFLs only.	Tecmarket Works, ODC, and Cadmus report
Massachusetts	3,318,081	2,618,856	4,022,321	5,196,318		All CFLs	Program Records
National Market-Level Shipments of CFLs							
U.S. - All CFLs	271,681,591	359,614,939	302,119,136	315,746,305		The Department of Commerce data are counts of actual CFL imports as required by law; virtually all CFLs are imported. There is probably a lag of a few weeks between shipments and sales. *Note that these figures include CFLs that ended up in both program and non-program states, so this is not a pure comparison area*	Dept. of Commerce shipment figures
Program-supported CFLs per Household							
Consumers Energy + DTE Electric	0.7	1.0	2.0	2.2	1.8*	Standard CFLs only. *2013 figures represent planning estimates.	Program Records, EIA data on number of customers
Consumers Energy	0.4	0.6	1.8	1.5	1.4*	Standard CFLs only. *2013 figures represent planning estimates.	Program Records, EIA data on number of customers
DTE Electric	1.0	1.4	2.2	2.7	2.1*	Standard CFLs only. *2013 figures represent planning estimates.	Program Records, EIA data on number of customers
Indiana				0.8		Standard CFLs only	Tecmarket Works, ODC, and Cadmus report
Massachusetts	1.3	1.1	1.6	2.1		All CFLs	Program Records
National Market-Level Shipments of CFLs per Household							
U.S. - All CFLs	2.4	3.1	2.4	2.5		*Note that these figures include CFLs that ended up in both program and non-program states, so this is not a pure comparison area. The per household U.S. figures are reduced by 10% to account for non-residential (e.g., commercial) sales.*	Dept. of Commerce shipment figures
Average number of CFLs installed per home across all homes							
Consumers Energy + DTE Electric	5.9			11.8		Standard CFLs only; Weighted average reflecting relative mix of customers	Cadmus, NMR, and Navigant reports
Consumers Energy	7.2			12.1		Standard CFLs only	Cadmus and NMR reports
DTE Electric	4.8		10.5	11.6		Standard CFLs only	ODC (2009 and 2011) and Navigant (2013) reports
Wisconsin	9.6					Standard CFLs only	Cadmus and NMR report
Indiana	8.0					Standard CFLs only	Cadmus and NMR report
Massachusetts	9.9	11.3		11.6	11.8	All CFLs	2009, 2010—NMR-KEMA on-site household estimates; 2012, 2013—NMR On-site report
CFL Household Penetration: Proportion of homes with at least one CFL installed							
Consumers Energy + DTE Electric	66%			88%		Standard CFLs only; Weighted average reflecting relative mix of customers	Cadmus, NMR, and Navigant reports
Consumers Energy	80%			92%		Standard CFLs only	Cadmus and NMR reports
DTE Electric	55%		86%	85%		Standard CFLs only	ODC (2009 and 2011) and Navigant (2013) reports
Wisconsin	87%					All CFLs	PA Consulting and NMR report
Indiana	81%			83%		All CFLs	PA Consulting and NMR report; Tecmarket Works, ODC, and Cadmus report
Massachusetts	88%	92%		96%	96%	All CFLs	2009, 2010—NMR-KEMA on-site household estimates; 2012, 2013—NMR On-site report
CFL Socket Saturation: Percent of sockets containing CFLs							
Consumers Energy + DTE Electric	15%			27%		Standard CFLs as a percent of all screw-based sockets; Weighted average reflecting relative mix of customers	Cadmus, NMR, and Navigant reports
Consumers Energy	17%			28%		Standard CFLs as a percent of all screw-based sockets	Cadmus and NMR reports
DTE Electric	13%		23%	26%		Standard CFLs as a percent of all screw-based sockets	ODC (2009 and 2011) and Navigant (2013) reports
Wisconsin	20%					All CFLs as a percent of all sockets	Cadmus and NMR report
Indiana	19%			18%		All CFLs as a percent of all sockets	PA Consulting and NMR report; Tecmarket Works, ODC, and Cadmus report
Massachusetts	25%	26%	27%	28%		All CFLs as a percent of all sockets	2009, 2010—NMR-KEMA on-site household estimates; 2012, 2013—NMR On-site report
Average number of CFLs in storage across all homes							
Consumers Energy + DTE Electric	3.1			3.4		Standard CFLs only; Weighted average reflecting relative mix of customers	Cadmus, NMR, and Navigant reports
Consumers Energy	3.5			3.6		Standard CFLs only	Cadmus and NMR reports
DTE Electric	2.7		3.3	3.3		Standard CFLs only	ODC (2009 and 2011) and Navigant (2013) reports
Wisconsin	1.4					All CFLs	Cadmus and NMR report
Indiana	1.1					All CFLs	Cadmus and NMR report
Massachusetts	1.4	2.6		1.6	2.1	All CFLs	2009, 2010—NMR-KEMA on-site household estimates; 2012, 2013—NMR On-site report
National CFL Shipments 2000-2012 and Michigan program standard CFL sales 2009-2012							Derived from Navigant report

EISA Schedule and National Shipments by Bulb Type

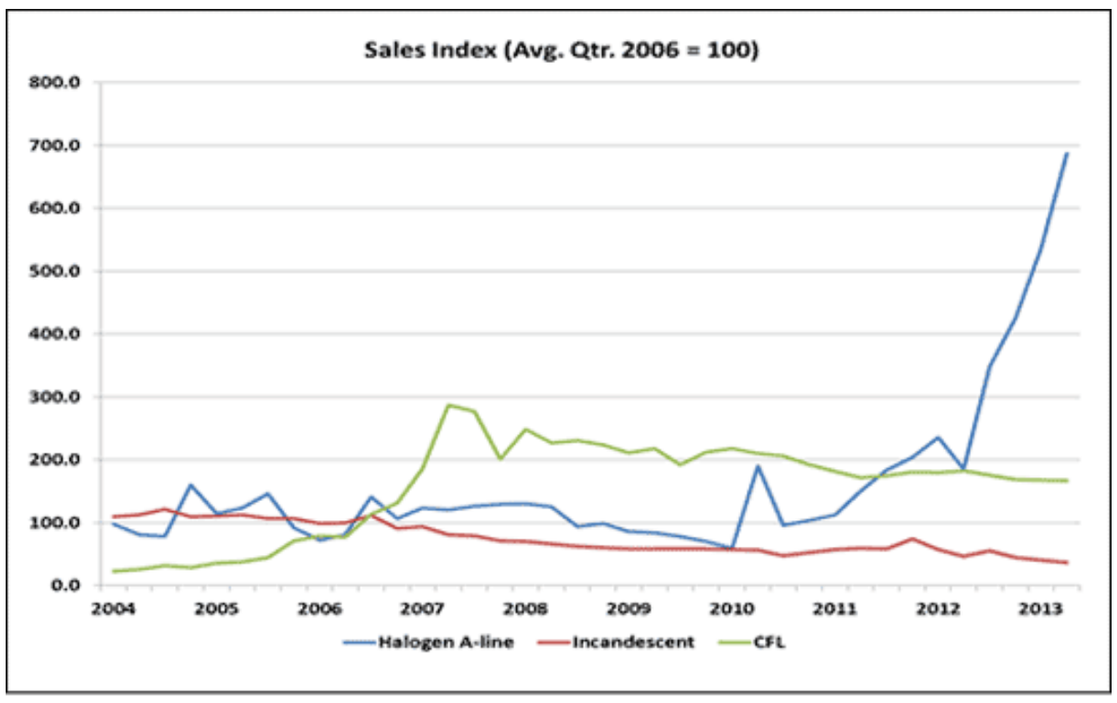
The Energy Independence and Security Act of 2007 (EISA) calls for the gradual phaseout of traditional incandescent bulbs because they do not meet the higher efficacy criteria required by EISA. The below table presents the EISA phaseout dates and the percent of incandescent bulbs found in Michigan homes by wattage category. The 40W-60W category represents the largest share of incandescent bulbs (77%) and will be phased out in January 2014. Note that the EISA phaseout date represents the date when the manufacture or import of traditional incandescent bulbs is banned; however, supplies of these incandescent bulbs may be available in some retail stores for months or longer beyond the phaseout date. Note, also, that EISA exempts certain decorative and niche-bulb categories, meaning that a subset of incandescent bulbs in these wattage categories will not be held to the new standards.

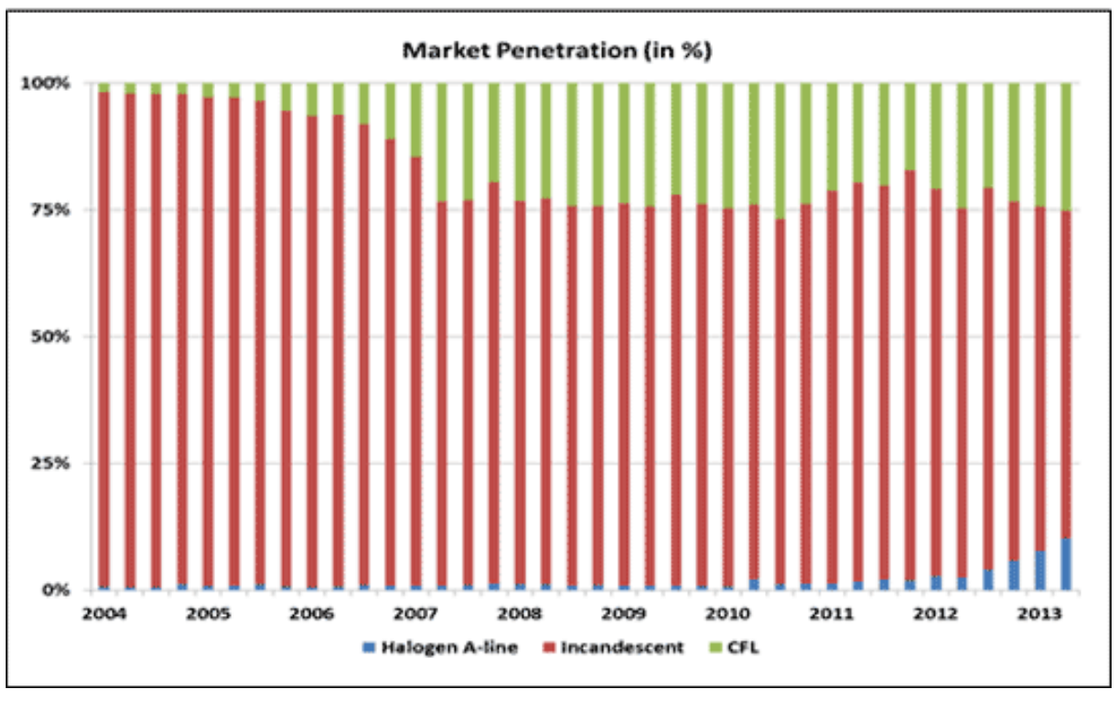
In response to the EISA phaseout of traditional incandescent bulbs, the Michigan programs have reduced gross annual electricity savings per standard CFL bulb in 2014 by over 25% in order to reflect the declining baseline wattage.

Incandescent Wattage Category	EISA Phaseout Date for Traditional Incandescent Bulbs	Percent of incandescent bulbs installed in Michigan homes that fall into each wattage category
100W - 173W (mostly 100W)	January 1, 2012	10%
70W - 98W (mostly 75W)	January 1, 2013	9%
21W - 69W (mostly 40W & 60W)	January 1, 2014	77%
		Source: On-site lighting inventory data collected at Consumers Energy homes, 2009

National Trends in Light Bulb Shipments

The below two charts from NEMA illustrate the national shipment trends for incandescent, CFL, and halogen bulbs since 2004. The charts indicate that shipments of incandescents have declined over the past ten years, CFLs increased in 2006-2007 and have remained relatively stable since then, while halogens have increased over the past few years. As the NEMA website states "Incandescent lamps fell to a share of 64.5 percent during the quarter (Q2 2013) compared to 25.1 and 10.4 percent, respectively, for CFLs and halogen A-line lamps. "





"The NEMA Lamp Indices are composite measures of NEMA member companies' U.S. shipments of a variety of lamp types, including compact fluorescent, fluorescent, halogen, high intensity discharge, and incandescent, and is designed to track underlying demand for these types of lamps. Product shipments data are drawn from NEMA statistical surveys conducted regularly by NEMA and are adjusted for regularly recurring seasonal fluctuations."

http://www.nema.org/Intelligence/Pages/Lamp-Indices.aspx

http://www.nema.org/news/Pages/Incandescent-Lamp-Shipments-Wane-During-Second-Quarter.aspx

Description of Net-to-Gross Research Methods

Below is a brief discussion of each of the **net-to-gross (NTG)** research methods used by the evaluation teams to estimate a NTGR for standard CFLs for DTE Electric and Consumers Energy. All methods estimate the NTGR (or some of its NTG components); the NTG elements included in each method are specified. Follow the hyperlinks included with each NTG method summary to obtain more detailed descriptions of each method. Note that there are many factors that may affect CFL sales and purchases that are not directly addressed with any of these methods, including the Energy Independence and Security Act of 2007 lighting standards, changes in energy prices, improvements in lighting technology, awareness of climate change, and others.

DEFINITIONS

Net Savings are changes in energy use attributable to a particular energy efficiency program; a NTG Ratio (ratio of net savings to gross savings, or "NTGR") is applied to convert gross savings to net savings. There are two ways to measure a NTGR, using a "market-level" approach or a "program-level" approach.

The **"market-level"** NTGR is calculated as: (market-level sales [or savings] - baseline sales [or savings]) / program-supported sales [or savings]

The **"program-level"** NTGR is calculated as: 1 - Free Ridership + Participant Spillover + Nonparticipant Spillover + Other Market Effects

A few additional useful definitions and examples:

• **Free ridership (FR)** is savings from someone who would install an energy-efficiency measure without any program incentives, but receives a financial incentive or rebate anyway. For example, customers who enter a store with definite plans to purchase CFL bulbs and just happen to purchase program incentivized CFLs.

• **Participant spillover (PSO)** is savings from participants influenced by a program to adopt energy-efficiency measures that qualify for financial incentives or rebates, but do not receive them. For example, customers who purchase program incentivized CFLs and have a positive experience using them and therefore later purchase non-program CFLs create participant spillover.

• **Non-participant spillover (NPSO)** is savings from a non-participant influenced by a program to adopt energy-efficiency measures; this can include both direct and indirect influences. For example, customers who are influenced by a newspaper advertisement sponsored by the program that emphasizes the benefits of CFLs, to later purchase CFLs which happen to be non-program CFLs, generate non-participant spillover.

• **Other Market Effects (ME)** are "spillover savings that reflect significant program-induced changes in the structure or functioning of energy efficiency markets" (Prahl, Ridge, Hall, & Saxonis). For example, manufacturers, retailers, and customers in program or non-program areas who, because of the influence of programs, increase their offerings of CFLs, decrease prices, or purchase more CFLs and therefore generate energy savings that would not have happened without the program. These market effects may develop over multiple years and therefore reflect the cumulative impact of the programs on the market.

EXAMPLES

A NTGR of 1.0 would indicate that the program is responsible for exactly as many CFL sales as the program supported in a specific time period (the 2009-2013 period); if the program had not existed, market-level sales would have been reduced by an amount equal to the number of CFLs supported by the program.

A NTGR of 2.0 would indicate that the program is responsible for market-level sales that are two times the number of CFL sales supported by the program in a specific time period (the 2009-2013 period); if the program had not existed, market-level sales would have been reduced by twice the number of CFLs supported by the program.

A NTGR of 0.5 would indicate that the program is responsible for only half as many sales as it supports in a specific time period (the 2009-2013 period); if the program had not existed, market-level sales would have been reduced by one-half the number of CFLs supported by the program.

SUMMARY OF NTGR VALUES

Because no single NTGR estimate covers all components of NTG for the entire five-year period, the below chart depicts the NTG components and years covered by each NTGR estimate.

NTG Element	2009	2010	2011	2012		2013	
Free Ridership		5. Price Elasticity Analysis = 0.72				6. Revealed Preference Demand Model = 0.80 7. Revenue Neutral Sales Model = 0.61	3. Consumer Self-report Surveys = 0.70
Participant Spillover		2. Multistate Regression Model = 0.71		1. CFL Market Model = 1.03	4. Retail Store Manager Interviews = 1.24 to 1.33		
Nonparticipant Spillover							
Other Market Effects							

In order to provide more detail on the values of the individual NTG components that comprise the above NTGR estimates, the below table lists values for the individual NTG components.

Method	Free Ridership	Participant Spillover	Nonparticipant 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 Market Effects	0.70
4. Retail Store Manager Interviews		+0.24 to +0.33			1.24 to 1.33
5. Price Elasticity Analysis	-0.28				0.72
6. Revealed Preference Demand Model	-0.20				0.80
7. Revenue Neutral Sales Model	-0.39				0.61

SUMMARY DESCRIPTIONS OF NTG METHODS

1. CFL Market Model

For more information see: www.nmrgroupinc.com/?p=830 *Password = CFL2014*

Navigant used national and DTE-specific socket saturation data (data on the average percentage of total bulbs in sockets in a home that are CFLs), and bass diffusion curve modeling (a widely proven equation for the rate of adoption of a new technology), to effectively "back cast" the saturation that would have existed in DTE's service territory in 2012 in the absence of the program. This result was compared with data reflecting actual saturation of CFLs in 2012. The result is a NTGR estimate that accounts for the long-term, cumulative effects of the program on the market.

Measurement: NTGR = 1.03. Captures free ridership, participant spillover, nonparticipant spillover and other market effects.

Strengths: 1) This is the only method that has a mechanism for capturing the long-term, cumulative effects of the program on the market. 2) The method allows for proper accounting of bulbs in use versus those in storage. 3) Avoiding the inherent limitations of asking individuals to report on how behavior or market conditions would have differed in the absence of the program, this method relies on modeling tools commonly used across many industries to predict the diffusion of a technology into a market.

Limitations: 1) Like any model, the precision of the model result is limited by the precision of the data on which it is based. Navigant's most recent saturation data reflect sampling that achieved a high level of statistical confidence and precision (90% ± 10%). However, Navigant had less control over other data inputs used in this analysis. 2) The model is based on the assumption that "100% acceptance" occurs for a CFL when CFL price per bulb equals the price of an incandescent bulb. 3) Because the program relies on socket saturation data, and comparison saturation data points were for all CFLs (not just standard CFLs) it reflects conditions present in the DTE Electric service territory as a whole. Specifically, it reflects the socket saturation for both standard and specialty CFLs, and the market effects reflect the impacts of all DTE Electric programs, not just the ENERGY STAR Products program. [Note that the ENERGY STAR Products program is responsible for distributing 83% of all residential CFLs distributed by DTE Electric since 2009.]

2. Multistate Regression Model

For more information see: www.nmrgroupinc.com/?p=830 *Password = CFL2014*

Multistate modeling used household-level data collected from different geographic areas across the United States, in randomly selected households, to isolate the net impact of program activity on CFL purchases. The method yields an estimate of CFL purchases in the presence of the program as well as CFL purchases in the absence of the program. NTGR is calculated using the equation ([Per Household Purchases with the Program – Per-household purchases without the program] ÷ Per-household CFLs incented by the program) except that the values are modeled to control for other factors that can affect CFL purchases. The models include areas with long-standing CFL programs, with newer CFL programs, and with no sustained CFL programs. In each model, CFL purchases in a specific time period serves as the dependent variable. Independent variables include measures of program support, such as the number of CFLs incented per household by the program or program budget per household, CFL saturation at the beginning of the time period, the length of prior program support in the area, and various household-level measures of demographic, economic, and social characteristics. The 2010 modeling effort relied on non-linear regression techniques to estimate CFL purchases that utilized a nuanced model (zero-inflated negative binomial) that helps to differentiate between the numerous households that have zero purchases in a particular time period, but for different reasons—for example, some households may have purchased zero CFLs because they had many CFLs installed and didn't need any more, while others may have purchased zero CFLs because they didn't like them and didn't have any installed. The effort also involved a high level of pre-survey coordination among the various program administrators and their evaluators, leading to comparability among data from different areas.

Measurement: NTGR = 0.71. Captures free ridership, participant spillover, and nonparticipant spillover

Strengths: This method reduces the need for an "ideal" comparison area because the model controls for factors at the household level, and thus creates a statistically modeled baseline or control area. One of the factors that can be controlled for is presence and strength of CFL programs, because data are included from areas with and without programs, and from areas with programs of varying strength and longevity. The modeling allows the identification of key drivers of CFL purchases in real-world conditions. Because it includes a variable for saturation, the model takes into account the possibility that past program activity could affect CFL sales in the current year.

Limitations: The estimate of CFL purchases in a given time period is obtained by having study team members walk through homes asking the occupants when they had purchased each individual CFL, which leads to error and reliability issues. (Note that this reliability is somewhat mitigated by the fact that a subsample of homes that had been included in a similar study a year prior were included again, allowing comparison of change in the number of CFLs installed with respondents' estimates of purchases in the previous year; the results were similar.) Also, only the factors for which data are available are included in the model (or were considered and found to be unimportant); hence the model provides an incomplete explanation of CFL purchases. Although the model uses household-level purchase and demographic data, the program data are the same for all households in an area, reducing variability. This method addresses only residential CFL sales/purchases, not non-residential; other studies have estimated that non-residential CFL sales make up about 5% to 10% of total CFL sales.

3. Consumer Self-Report Surveys

For more information see: www.nmrgroupinc.com/?p=830 *Password = CFL2014*

This method estimates free ridership and spillover based on data collected from customer surveys conducted in 29 participating retail locations during late August through September 2013. Data were collected during 12 event days (days during which APT field staff were stationed at stores promoting CFLs) and 28 non-event days (at all but one store where data was collected on an event day; additional surveys were completed during the following non-event day at the same store). Overall, 116 intercept surveys were completed by respondents purchasing DTE-discounted standard CFLs and 27 intercept surveys were completed by respondents purchasing DTE-discounted specialty CFLs, and those responses form the basis of the free ridership analysis presented in this memo. An additional 15 intercept surveys were completed by respondents purchasing non-discounted standard CFLs and those responses form the basis of the spillover analysis.

The algorithm used to estimate free ridership takes into consideration both: a) "discount effect" (i.e., how a customer reports that their purchase behavior would have differed in the absence of the incentive), and b) "information effect" (i.e., a customer's rating of the importance of program information, if any information was seen). Each score is reported in the form of a free ridership percentage. For example, if a customer rates the program information as very important, the free ridership estimate would be a low percentage (i.e., indicating they would not likely have purchased the bulb in the absence of the information provided by the program). Free ridership is estimated for each respondent who purchased CFLs by taking the lesser of the discount effect score and the information effect score.

For those customers who purchased non-discounted CFLs, spillover is estimated by asking them when and under what circumstances they first started using CFLs, and whether that first experience influenced their decision to purchase additional CFLs in the future. If their first experience was program-related (e.g., they were given their first CFL by DTE, or they purchased it at a participating store), and it motivated them to purchase more CFLs in the future, their non-discounted bulb(s) purchased on the day of the survey are considered spillover.

Customer survey data were analyzed for non-response bias, and no statistically significant bias was identified. Raw free ridership results were weighted to account for event day versus non-event day activity (i.e., significantly lower free ridership scores were found on event days, and these scores are weighted to reflect an estimate of the actual volume of CFLs sold on event days versus non-event).

Measurement: NTGR = 0.70. Captures free ridership, participant spillover, and nonparticipant spillover

Strengths: 1) This method reflects actual CFL customer feedback regarding the role of program discounts and information on their buying experience, and provides estimates for both free ridership and spillover. 2) The free ridership algorithm reflects the importance of both price and information communicating messages to customers about the benefits of CFLs and the presence of discounts

Limitations: It is inherently difficult for customers to state what they would have done under alternative conditions. Social desirability bias may come into play, though it's not clear whether this will manifest itself in the form of customers defending their purchase decisions (e.g., I make good decisions, and I would have purchased a CFL even if it cost a lot more), or trying to please the survey staff person (e.g., I should convey that the program is important because that's what they want to hear). The method for calculating spillover is fairly conservative, only capturing spillover associated with standard CFLs purchased on that day. At the same time, the method makes some assumptions that cannot be verified (e.g., that if they purchased their first CFL at a program participating store, that purchase was influenced by the program).

4. Retail Store Manager Interviews

For more information see: www.nmrgroupinc.com/?p=830 *Password = CFL2014*

Twenty local retail managers from participating stores were interviewed in order to assess spillover, in particular by estimating the sales of CFLs for which the program did not provide incentives but which resulted from the program's influence. This includes spillover as perceived by the retail managers that responded to the interviews, and does not include other forms of spillover – such as market effects – that they may not recognize. In addition, this analysis does not assess free-ridership. These twenty interviewees represent nine of the ten participating retail chains in 2012 which accounted for about 88% of program sales. Multiple store managers were interviewed from chains that represent a larger share of program bulbs.

Measurement: NTGR = 1.24 to 1.33. Captures participant spillover only.

Strengths: This is a simple and straightforward way of calculating NTGR, relying on local store managers to estimate the decline in sales of non-program CFLs in the absence of the program. In addition, it represents the perspectives of a broad array of participating retailers.

Limitations: Asking respondents to estimate the counterfactual sales requires a hypothetical question. In addition, it was evident that some retail managers (who were later screened out from the interviews) could not clearly identify which CFLs were program incentivized models. Also, while local retail managers do have direct contact with customers purchasing CFLs in their stores, they do not make the decisions to purchase CFLs. This method may not take into account the possibility that past program activity could affect CFL sales in the current year. Finally, retailers may have an inherent self-interest in the continuation of the program, and therefore may be biased.

5. Price Elasticity Analysis

For more information see: www.nmrgroupinc.com/?p=830 *Password = CFL2014*

Price response modeling (i.e., estimation of the price elasticity of demand) was performed using information from the program tracking database, including SKU, retail price, incentive amount, store, date, and promotional events. In addition, the estimation also requires that the retailers (or at a minimum, types of retailers) where the price variations occur account for a majority of the program sales. The data is modeled as a panel, with a cross-section of program package quantities modeled over time (from program inception) as a function of price, incentive, number of promotional events, store type, and bulb type (standard vs. specialty). Using these estimates, sales are predicted with and without the program (that is, at the original retail price and without promotional events). The difference in sales scenarios yields the "sales lift" attributable to the program. The ratio of sales lift to total incented sales equals 1 minus freeridership: (Sales with Program-Sales without Program)/(Sales with Program).

Measurement: NTGR = 0.72. Captures free ridership only.

Strengths: Price response models use program activity data rather than self-report surveys, which often includes questions of a hypothetical nature. In addition, the data used for the model represents a census of tracking data, so there is no sampling error. The methodology isolates the effect of marketing events on program sales. Lastly, the price response model provides detailed results by different strata, such as store type and program year.

Limitations: Statistical models always include an inherent amount of error. The evaluation team is not able to capture all variables that affect sale of CFLs, such as the use of endcap displays, thus there may be a bias due to omitted variables. In addition, in order to perform the modeling, it is necessary that some of the bulbs incur price variations over the program period, and those that did are representative of the program as a whole.

6. Revealed Preference Demand Model

For more information see: www.nmrgroupinc.com/?p=830 *Password = CFL2014*

The Revealed Preference Demand (RPD) model estimates free ridership using regression analysis to predict the counterfactual (i.e., the probability that a customer would purchase a discounted standard CFL if the bulb was not discounted). This research method relies on customer intercept survey data and shelf survey data collected during late August through September of 2013 representing 183 customer purchases of over 1,000 bulbs at 22 participating DTE stores. The model includes variables representing the characteristics of the store, such as the prices of equivalent CFLs, LEDs, and other bulbs, the availability of CFLs relative to other equivalent bulbs, the incentive levels provided by DTE Energy's ENERGY STAR Lighting program, and whether promotional materials were present on an end-cap in the store. The independent variables also included customer characteristics such as whether they had planned to buy CFLs that day and whether they were aware of the DTE-sponsored discounts prior to entering the store.

Using the RPD model Navigant can (1) estimate the probability of purchasing a CFL under actual program conditions (P_p), and (2) predict the probability of purchasing a CFL under non-program conditions (P_np). Free ridership is calculated as the fraction of program sales that would have occurred in the absence of the program:

Free Ridership=P_np/P_p

Measurement: NTGR = 0.80. Captures free ridership only.

Strengths: This method has the benefit of reflecting the role of price, product information, placement, as well as availability of alternative bulbs. The model uses data based on actual bulb purchases and store environments, as well as real time customer recall of their intent to purchase lighting, and their knowledge of DTE's lighting program.

Limitations: 1) Like any model, this model cannot perfectly predict customer purchasing behavior in the absence of the program. 2) Although Navigant attempted to collect as robust and varied a data set as possible, collecting data at a range of different store types, there were some practical limitations that kept the data collected from being perfectly representative of actual program participation across all retailers.

7. Revenue Neutral Sales Model

For more information see: www.nmrgroupinc.com/?p=830 *Password = CFL2014*

The Revenue Neutral Program Sales model relies on the assumption that retailers will participate in a lighting program with manufacturer and retailer discounts only if revenues of program sales are, at a minimum, maintained (i.e., program sales of a particular product are high enough to offset the drop in revenue due to discounted price of the product). Based on this assumption, the model uses data from Memoranda of Understanding (MOU) between manufacturers, retailers and DTE Electric regarding the price of the bulbs discounted through the program and the regular retail price of the bulbs to effectively back-calculate the quantity of sales that would have existed in the absence of the program. Comparing the quantity of sales allotted in the MOU to the estimated quantity of sales in the absence of the program (using the ratio of program discounted prices to non-discounted prices as a mathematical proxy), this analysis calculates a maximum free ridership value that, theoretically, reflects the assumptions retailers apply when deciding whether and under what conditions they will participate in the program.

Measurement: NTGR = 0.61. Captures free ridership only.

Strengths: 1) Given the data limitations that make NTGR estimation difficult, this method provides a cost-efficient means by which to estimate free ridership making use of the MOU data that are available to evaluators. 2) Authors supporting this approach report having conducted interviews with retailers that indicate the method is representative of actual decision-making.

Limitations: 1) The assumption of revenue neutrality of program sales as a necessary condition for participation in a lighting program contradicts standard economic theory that firms act to maximize profit. 2) The model does not consider the portfolio of products sold by a retailer (i.e., a retailer may accept something less than revenue neutrality for one discounted bulb type as long as it is offset by strong results from another discounted product, and a retailer may consider how the program will affect sales of lighting products overall, not just those that are discounted). 3) The model does not account for strategic interactions between firms.

Estimating the Net-to-Gross Ratios for Michigan's Residential Standard CFL Programs

Please complete the following sections in this sheet.
Section I: Provide **feedback on specific NTGR estimates that apply to the 2009-2013 program period**.
Section II: Drawing on your market knowledge and expertise, as well as the evaluator-generated NTGR values for 2009-2013, **provide your best estimate of a "statewide" NTGR (that can be applied to both Consumers Energy and DTE Electric territories) for the 2009-2013 program period**. This section is intended to establish the foundation for the following section, which is the ultimate objective of this study.
Section III: Considering your NTGR estimate for the 2009-2013 program period as well as potential changes that may occur in the market going forward (see "D. EISA & Shipment Trends" sheet), estimate a single NTGR value for both Consumers Energy and DTE Electric during the 2014-2015 program period, assuming no major changes in program implementation occur.

Please respond to the questions below to the best of your ability (completing all three sections) and record your responses in the cells shaded in this color of blue. Be sure to save your work frequently as you complete the sheet.

As you respond to the survey, some question text and entry cells may change to reflect your responses to questions that appear earlier in the survey. If an entry cell is shaded black, please skip that question.

When you explain your reasoning for a given response, please consider carefully—your comments (whole or in part) will be shared (anonymously) with other panel members in the second (and last) round of this survey, and could affect their assessments in the second round.

Please return your completed Excel document to jessica.minor-baetens@navigant.com by **Wednesday, November 6**. Feel free to call Jessica Minor-Baetens with questions at any time at (734) 794-4865. If she cannot answer your question directly she can direct you to someone who can.

Comments and Questions

I. Assessing the 2009-2013 NTGR Estimates for Standard CFLs

1. CFL Market Model	Captures Free Ridership, Participant Spillover, Nonparticipant Spillover, & Other Market Effects	2012	DTE Electric	Value = 1.03

1a. How accurate do you think this estimate is—that is, how well do you think it reflects the actual, underlying 2009-2013 *net-to-gross ratio* for DTE Electric?

Please select a response from the drop-down menu below

No response recorded yet

PLEASE ANSWER THE ABOVE QUESTION BEFORE CONTINUING

1b. Why do you give this response? Please type an explanation of your reasoning below.

2. Multistate Regression Model	Captures Free Ridership, Participant Spillover, & Nonparticipant Spillover	2010	Consumers Energy	Value = 0.71

2a. How accurate do you think this estimate is—that is, how well do you think it reflects the actual, underlying 2009-2013 *net-to-gross ratio* for Consumers Energy?

Please select a response from the drop-down menu below

No response recorded yet

PLEASE ANSWER THE ABOVE QUESTION BEFORE CONTINUING

2b. Why do you give this response? Please type an explanation of your reasoning below.

3. Consumer Self-Report Surveys	Captures Free Ridership, Participant Spillover, & Nonparticipant Spillover	2013	DTE Electric	Value = 0.70

3a. How accurate do you think this estimate is—that is, how well do you think it reflects the actual, underlying 2009-2013 *net-to-gross ratio* for DTE Electric?

Please select a response from the drop-down menu below

No response recorded yet

PLEASE ANSWER THE ABOVE QUESTION BEFORE CONTINUING

3b. Why do you give this response? Please type an explanation of your reasoning below.

4. Retail Store Manager Interviews	Partial NTGR = 1 + Participant Spillover	2012	Consumers Energy	Value =1.24 to 1.33

4a. How accurate do you think this estimate is—that is, how well do you think it reflects the actual, underlying 2009-2013 *participant spillover* for Consumers Energy?

Please select a response from the drop-down menu below

No response recorded yet

PLEASE ANSWER THE ABOVE QUESTION BEFORE CONTINUING

4b. Why do you give this response? Please type an explanation of your reasoning below.

5. Price Elasticity Analysis	Partial NTGR = 1 - Free Ridership	2009 - 2012	Consumers Energy	Value = 0.72

5a. How accurate do you think this estimate is—that is, how well do you think it reflects the actual, underlying 2009-2013 level of *free ridership* for Consumers Energy?

Please select a response from the drop-down menu below

No response recorded yet

PLEASE ANSWER THE ABOVE QUESTION BEFORE CONTINUING

5b. Why do you give this response? Please type an explanation of your reasoning below.

6. Revealed Preference Demand Model	Partial NTGR = 1 - Free Ridership	2013	DTE Electric	Value = 0.80

6a. How accurate do you think this estimate is—that is, how well do you think it reflects the actual, underlying 2009-2013 level of *free ridership* for DTE Electric?

Please select a response from the drop-down menu below

No response recorded yet

PLEASE ANSWER THE ABOVE QUESTION BEFORE CONTINUING

6b. Why do you give this response? Please type an explanation of your reasoning below.

7. Revenue Neutral Sales Model	Partial NTGR = 1 - Free Ridership	2013	DTE Electric	Value = 0.61

7a. How accurate do you think this estimate is—that is, how well do you think it reflects the actual, underlying 2009-2013 level of *free ridership* for DTE Electric?

Please select a response from the drop-down menu below

No response recorded yet

PLEASE ANSWER THE ABOVE QUESTION BEFORE CONTINUING

7b. Why do you give this response? Please type an explanation of your reasoning below.

Ib. Summary of NTG Methods and Accuracy Ratings

The below table sumamrizes the key characteristics of each of the NTG methods, including the NTG components measured, the year, the NTGR value, and the accuracy rating you provided above. Note: This section is provided for summary purposes only. You do not need to respond to any questions in this section.

NTG Method	NTG Measurement	Year	NTGR Value	Accuracy rating provided above
1. CFL Market Model	Captures Free Ridership, Participant Spillover, Nonparticipant Spillover, and Other Market Effects	2012	1.03	No response recorded yet
2. Multistate Regression Model	Captures Free Ridership, Participant Spillover, and Nonparticipant Spillover	2010	0.71	No response recorded yet
3. Consumer Self-Report Surveys		2013	0.70	No response recorded yet
4. Retail Store Manager Interviews	Partial NTGR = 1 + Participant Spillover	2012	1.24 to 1.33	No response recorded yet
5. Price Elasticity Analysis	Partial NTGR = 1 - Free Ridership	2009 - 2012	0.72	No response recorded yet
6. Revealed Preference Demand Model		2013	0.80	No response recorded yet
7. Revenue Neutral Sales Model			0.61	No response recorded yet

II. Developing a Single 2009-2013 NTGR Estimate for Standard CFLs in Michigan

8a. What do you think is an accurate NTGR value for standard CFL programs in Michigan during the 2009-2013 period? Please type your numerical response in the cell to the right.

As a reminder, NTGR is calculated as:
1 - Free Ridership + Participant Spillover + Nonparticipant Spillover + Other Market Effects

PLEASE ANSWER THE ABOVE QUESTION BEFORE CONTINUING

8b. Why do you provide this particular estimate of NTGR? Please type an explanation of your reasoning below.

8c. Do you think there is a substantial difference in the NTGR estimates for standard CFL programs between Consumers Energy and DTE Electric? The Michigan NTGR estimate you provided for 2009-2013 is displayed to the right.

0.00

Please select a response from the drop-down menu to the right.

No response recorded yet

Please answer question 8c.

Please answer question 8c.

Please answer question 8c.

III. Developing a Single 2014-2015 NTGR Estimate for Standard CFLs in Michigan

9a. Your NTGR estimate for the 2009-2013 standard CFL programs is displayed to the right in yellow. The U.S. residential lighting market is rapidly evolving due to the effects of the EISA phaseout (which is effective for 40W-60W traditional incandescent bulbs beginning on January 1, 2014), the introduction of EISA-compliant halogens, and improving LED technology leading to LED bulbs becoming more widely available at lower prices. Given these changes in the market (and any other changes you foresee in the next few years), do you think the Michigan NTGR for standard CFLs in 2014-2015 will be higher, lower, or about the same as 2009-2013? Please assume that no major changes in program implementation occur during 2014-2015. As noted earlier, the Michigan programs will reduce gross savings per CFL in 2014 in order to reflect the reduced baseline wattage due to EISA.

0.00

Please select a response from the drop-down menu below

no response recorded yet

Please answer question 9a.

Please answer question 9a.

Thank you for your cooperation! ***Please save this file and return it to jessica.minor-baetens@navigant.com.*** **Next we will summarize the responses of all the experts on the panel, and provide you the results along with the second-round (and final) survey. Please feel free to add any additional thoughts in the space below.**

Comment: Please write your response below

Appendix B, Delphi Panel Stage 2 Instrument

Advisory Panel Response Summary

Estimating the Net-to-Gross Ratio for the 2014-2015 Michigan ENERGY STAR Lighting Programs

Dear [PANELIST NAME],

Thank you again for your assistance in the first stage of this study.

As a reminder, in consideration of your time we are offering $500 to you or a charity of your choice after you complete this survey, which is the second and final stage of the study.

This document contains your original responses to the survey plus a summary of the estimates made by the entire panel. We request that you review and reflect on the summary of responses, and either confirm your original responses, or if appropriate, provide revisions to your responses from the first stage. Regardless of whether or not you choose to modify your initial responses, we ask that you complete all questions included in Section 3 of this document.

We estimate that this second, and final, stage should take less of your time than the first stage—probably about one to two hours. **We ask that you submit your responses no later than December 9, 2013**. If you have any questions, please contact Jessica Minor-Baetens at 734-794-4865 or jessica.minor-baetens@navigant.com.

Sincerely,

Jill Steiner
Cadmus, Evaluator for Consumers Energy
503.467.7164
Jill.Steiner@cadmusgroup.com

Nicole Wobus
Navigant, Evaluator for DTE Electric
303-728-2514
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Michigan CFL Net-to-Gross Advisory Panel

Stage One Summary & Stage Two Survey

November 25, 2013

Developed by:
Cadmus
Navigant
NMR Group

Developed For:
Consumers Energy
DTE Energy

Table of Contents

1 Introduction

This document provides the following information:

- An overview of the objectives of the advisory panel;
- A summary of the results from Stage One (see Section 2);
- Questions to complete as part of the Stage Two process (see Section 3);
- An appendix that contains a full listing of all panelists' comments provided in support of their state-level net-to-gross ratio (NTGR) estimates for 2009-2013 and for 2014-2015 (excerpted from completed Stage One questionnaires).

A total of 18 panelists completed the Stage One questionnaire. This provides a strong basis for determining the extent to which the residential lighting programs have impacted the market in Michigan.

The research process that includes this advisory panel will remain in progress until findings are presented to the Michigan Energy Optimization collaborative group. That presentation is expected to take place in early 2014. We will notify panelists when the presentation is scheduled and provide a copy of the report. ***Until that time, we ask that panelists keep the advisory panel materials and preliminary results confidential to ensure the integrity of the process***.

1.1 Objectives

The goal of the advisory panel study is to develop the NTGR for the 2014-2015 Consumers Energy and DTE Electric Residential Lighting Programs in order to estimate their effect on sales of standard compact fluorescent light bulbs (CFLs) in Michigan. The Consumers Energy and DTE Electric Residential Lighting Programs are on-going efforts coordinated by each utility to encourage the use of ENERGY STAR-qualified light bulbs among residential customers. The lighting programs are implemented by the same implementation contractors and are designed to support the national ENERGY STAR program.

The input from the advisory panel will aid in deciding which, if any, of the 2009-2013 NTGR estimates developed are most accurate, and will help develop a single joint NTGR for 2009-2013 and 2014-2015. *We are aware that every NTG method has its own shortcomings, which is why we have convened this panel and are requesting your judgment.*

Below is a summary of the NTGR values estimated by all panelists for the 2009-2013 period and the 2014-2015 period.

Table 1: Overview of NTGR Estimates from Stage One

	Estimated NTGR Value for 2009-2013	Estimated NTGR Value for 2014-2015
Sample Size	*18*	*17*
Mean	0.89	0.81
Median	0.90	0.80
Min.	0.71	0.60
Max.	1.10	1.00

1.2 Process

In Stage One of this study, we asked panelists to rate the accuracy of each of seven methods used to estimate elements of NTG in 2009-2013 and provide their rationales for their ratings. Then we asked each panelist to estimate a single, joint NTGR value that applies to both Consumers Energy and DTE Electric for 2009-2013 and provide their rationales. Lastly, we asked panelists to estimate a single, joint NTGR value for 2014-2015 and once again provide their rationales.

In this document, we have summarized the accuracy ratings, NTGR estimates and rationales provided by you and your fellow panel members. The results are organized into four categories of panelists, including employees of:

1) CFL manufacturers and retailers (n=4)
2) Program administrators, utilities, and market support organizations (n=6)
3) Evaluation contractors and consulting organizations (n=4)
4) Government, regulatory, and energy advocacy organizations (n=4)

In order to complete your participation in this panel, we ask that you:

1. ***Please review the summary of estimates provided by other panel members, the reasoning associated with those estimates, and your initial estimates. In doing so, please consider carefully the estimates and comments of the other respondents. [Note that a full listing of all panelists' comments supporting their state-level NTGR estimates is provided in the appendix to this document.]***
2. ***Complete the questions in Section 3 as follows:***
   a. ***If you wish to modify your Stage One responses:***
      - In the tables provided, mark the appropriate box then enter your revised estimates and please state any reasons for changing your responses. Please understand, however,

that we are most interested in what you believe is most likely, and we are not trying to achieve a consensus. If you find some estimates or comments contrary to your opinion, please consider only those that you believe are plausible and tell us why.

b. ***If you do not wish to modify your Stage One responses:***

- In the tables provided, mark the appropriate box and state any reasons for not modifying your responses

c. Please add any comments on the appropriateness of the other assumptions and comments listed.

3. Return your completed survey:

- Simply save and email this document to jessica.minor-baetens@navigant.com.

1.3 Key Background Information

This section reiterates some key information from the Stage One instrument. Later sections summarize panelists' estimates and their supporting rationales.

First, please recall that summaries of the various NTG studies as well as panelist questions and responses are posted online at www.nmrgroupinc.com/?p=830. The website password is *CFL2014*.

Some of the comments focused on issues with specific NTG methods. We are aware that no one method can be considered definitive, which is why we have asked you and the other panelists to offer your judgments.

Below are a few items to keep in mind.

- This study is focused solely on residential **standard CFL bulbs**, and does not address specialty CFL bulbs, CFL fixtures, or LED bulbs. For the purposes of this study, the term "standard CFL" includes only bare spiral medium screw-base CFL bulbs. All covered bulbs, 3-way bulbs, dimmable bulbs, bug lights, non-medium screw-base, and high-wattage CFL bulbs are considered specialty bulbs.
- The NTGR value is calculated as: 1 - Free Ridership + Participant Spillover + Nonparticipant Spillover + Other Market Effects, where:
  - **Free ridership** is savings from someone who would install an energy-efficiency measure without any program incentives, but receives a financial incentive or rebate anyway. For example, customers who enter a store with definite plans to purchase CFL bulbs and just happen to purchase program incentivized CFLs contribute to free ridership.
  - **Participant spillover** is savings from participants influenced by a program to adopt energy-efficiency measures that qualify for financial incentives or rebates, but do not receive them. For example, customers who purchase program incentivized CFLs and have a positive experience using them and therefore later purchase non-program CFLs create participant spillover.
  - **Non-participant spillover** is savings from a non-participant influenced by a program to adopt energy-efficiency measures; this can include both direct and indirect influences. For example, customers who are influenced by a newspaper advertisement sponsored by the program that emphasizes the benefits of CFLs to later purchase CFLs (which happen to be non-program CFLs) generate non-participant spillover.
  - **Other Market Effects** are "spillover savings that reflect significant program-induced changes in the structure or functioning of energy efficiency markets" (Prahl, Ridge, Hall, & Saxonis). For example, manufacturers, retailers, and

customers in program or non-program areas who, because of the influence of programs, increase their offerings of CFLs, decrease prices, or purchase more CFLs and therefore generate energy savings that would not have happened without the program, contribute to market effects. These market effects may develop over multiple years and therefore reflect the cumulative impact of the programs on the market.

- Because no single NTGR estimate covers all components of NTG for the entire 2009-2013 period, the below table, initially presented in the Stage One questionnaire, lists the components and years covered by each NTGR estimate.

Table 2: Overview of 2009-2013 NTGR Estimation Methods & Values

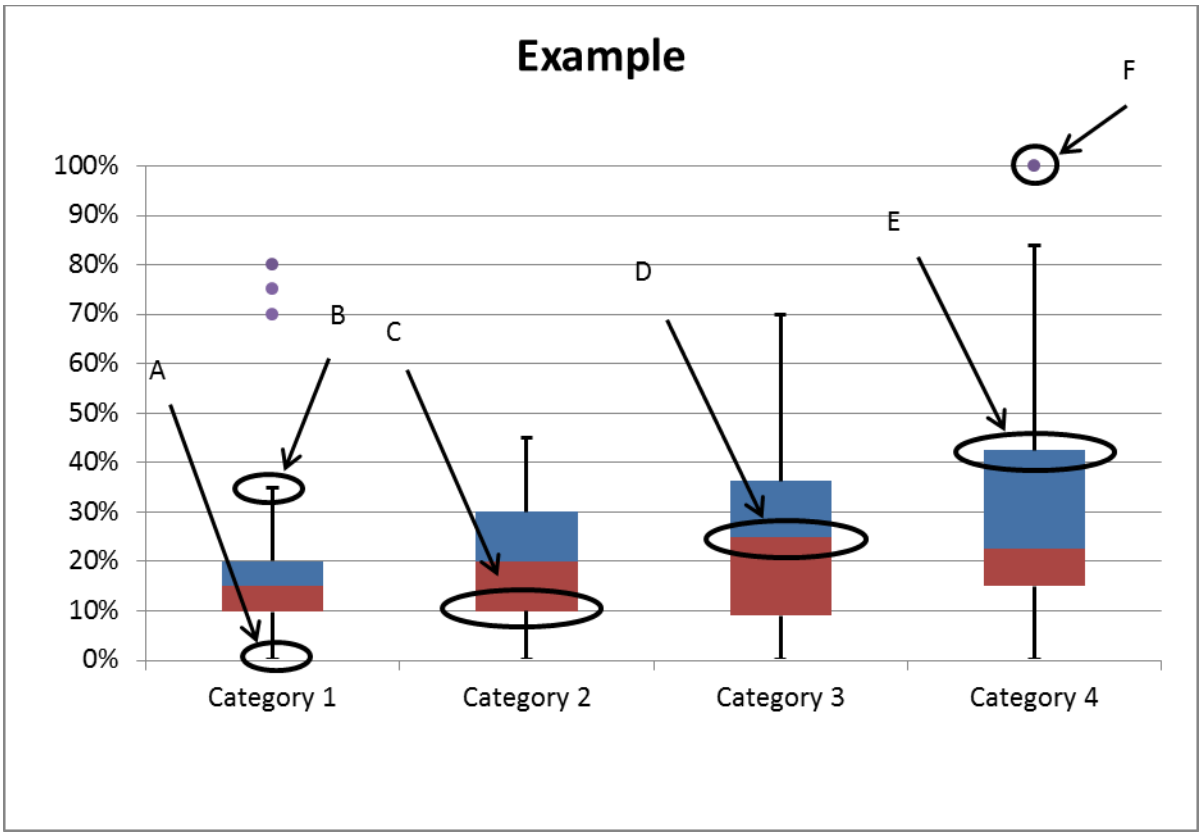
NTG Method	NTG Measurement	Year	NTGR Value
CFL Market Model	Captures Free Ridership, Participant Spillover, Nonparticipant Spillover, and Other Market Effects	2012	1.03
Multistate Regression Model	Captures Free Ridership, Participant Spillover, and Nonparticipant Spillover	2010	0.71
Consumer Self-Report Surveys		2013	0.70
Retail Store Manager Interviews	Partial NTGR = 1 + Participant Spillover	2012	1.24 to 1.33
Price Elasticity Analysis	Partial NTGR = 1 - Free Ridership	2009 - 2012	0.72
Revealed Preference Demand Model		2013	0.80
Revenue Neutral Sales Model			0.61

1.4 Overview of Box and Whisker Plots

We have summarized the NTGR estimates with box and whisker plots, which is a way of graphically summarizing the distribution of a set of numerical data. On the next page is an example of a box and whisker plot. The plot identifies several key data points:

- The lowest response (the bottom whisker, labeled "A")
- The highest response (the top whisker, labeled "B")
- The first quartile response (the bottom of the box (red), labeled "C")
- **The median response (the midpoint of the distribution, labeled "D")**
- The third quartile response (the top of the box (blue), labeled "E")
- In some cases, responses that are significantly higher or lower than nearly all other responses ("outliers") are presented outside of the box plot (labeled "F"), and are not included in the median. In Stage One of this advisory panel, there were no outliers.
- The box represents 50% of all responses (i.e., responses ranging from the first quartile to the third quartile)
- A smaller box, such as the box of responses in Category 1, indicates that responses are clustered across a relatively small range
- A larger box, such as the box of responses in Category 4, indicates that responses are spread across a relatively large range

Figure 1: Example Box-Whisker Plot



* Outliers ("F") are defined as those data points that are at least 1.5 times the interquartile range above the third quartile or below the first quartile; the interquartile range is defined as the difference between the first and third quartiles.

2 Summary of Stage One Responses

In this section we summarize the estimates and rationales provided by all panelists as well as the estimates you have provided. Please consider carefully the estimates and comments of the other panelists.

2.1 Assessing the 2009-2013 NTGR Methods

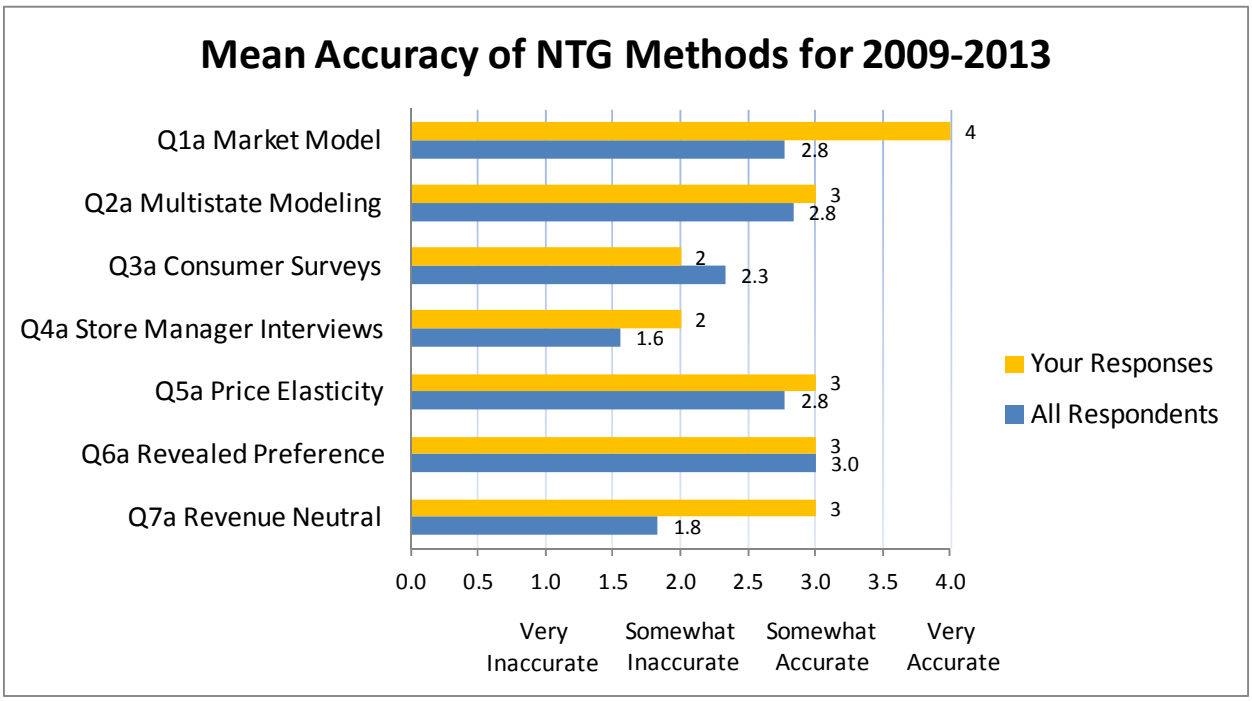
Below we present a summary of panelists' ratings of the accuracy of the NTG methods for the 2009-2013 period. The following table and graph summarize these responses, after which we summarize respondents' rationale for their ratings of each of the NTG methods. In order to provide insight into the logic of individual panelists, we include one quote from a panelist in support of each method and one quote from a panelist contrary to each method. Quotes were chosen that were judged to be both compelling and illustrative, and also to represent the perspectives of different market actors, to the extent feasible.

Note that a full listing of all panelists' comments supporting their state-level NTGR estimates is provided in the appendix to this document.

Table 3: Accuracy Ratings of NTG methods

How accurate do you think these estimates are—that is, how well do you think they reflect the actual, underlying net-to-gross ratio in 2009-2013 for Consumers Energy or DTE Electric?						
SCALE: 1=Very inaccurate, 2=Somewhat inaccurate, 3=Somewhat accurate, 4=Very accurate						
	CFL manufacturers and retailers	**Program administrators, utilities, and market support**	**Evaluation contractors and consultants**	**Government, regulatory, and energy advocacy organizations**	**All Respondents**	**Your responses**
Sample Size	*4*	*6*	*4*	*4*	*18*	
Q.1 CFL Market Model *(NTGR estimate=1.03)*						
Mean	3.0	3.0	3.0	2.0	2.8	
Median	3.0	3.0	3.0	2.0	3.0	
Individual values	2,3,3,4	1,3,3,3,4,4	2,2,4,4	1,1,3,3	Min=1; Max=4	4
Q.2 Multistate Regression Model *(NTGR estimate=0.71)*						
Mean	2.5	2.8	3.3	2.8	2.8	
Median	2.5	3.0	3.0	2.5	3.0	
Individual values	1,2,3,4	2,3,3,3,3,3	3,3,4,4	2,2,3,4	Min=1; Max=4	3
Q.3 Consumer Self-Report Surveys *(NTGR estimate=0.70)*						
Mean	2.5	2.3	2.3	2.3	2.3	
Median	2.5	2.0	2.0	2.5	2.0	
Individual values	2,2,3,3	2,2,2,2,3,3	2,2,2,3	1,2,3,3	Min=1; Max=3	2
Q.4 Retail Store Manager Interviews *(Partial NTGR estimate=1.24 – 1.33)*						
Mean	2.0	1.2	1.5	1.8	1.6	
Median	2.0	1.0	1.5	1.5	1.0	
Individual values	1,2,2,3	1,1,1,1,1,2	1,1,2,2	1,1,2,3	Min=1; Max=3	2
Q.5 Price Elasticity Analysis *(Partial NTGR estimate=0.72)*						
Mean	3.5	2.7	2.8	2.8	2.8	
Median	3.5	3.0	3.0	3.0	3.0	
Individual values	1,3,4,4	2,2,3,3,3,3	2,3,3,3	2,3,3,3	Min=1; Max=4	3
Q.6 Revealed Preference Demand Model *(Partial NTGR estimate=0.80)*						
Mean	2.8	3.2	3.5	2.8	3.0	
Median	3.0	3.0	3.5	3.0	3.0	
Individual values	2,3,3,3	2,3,3,3,4,4	2,3,4,4	2,3,3,3	Min=2; Max=4	3
Q.7 Revenue Neutral Sales Model *(Partial NTGR estimate=0.61)*						
Mean	2.3	1.8	1.5	1.5	1.8	
Median	2.0	2.0	1.0	1.5	2.0	
Individual values	1,2,2,4	1,1,2,2,2,3	1,1,1,3	1,1,2,3	Min=1; Max=4	3

Figure 2: Mean Accuracy of NTG Methods for 2009-2013



2.2.1 CFL Market Model (NTGR estimate=1.03)

The CFL Market model measures free ridership, participant and nonparticipant spillover, and market effects. Most ratings of the CFL Market Model were either 'very accurate' (5 of 18 respondents) or 'somewhat accurate' (7 of 18 respondents). Panelists who believed the approach was accurate cited the following reasons:

- It's the only method that captures all elements of NTG, in particular long-term market effects
- The free ridership value is consistent with other studies
- It avoids reliance on self-reporting methods

One panelist from the program administrator and market support group who rated the method as 'very accurate' had this to say:

> *"I feel that the accuracy is high given the fact that free ridership, participant/non-participant spillover and market effects are taken into consideration. I also like the fact that this model captures both long term and cumulative market effects and the bulbs in use vs. storage which is quite common. I also think that avoiding self-reporting strengthens the overall approach."*

Those panelists who rated the CFL Market Model as inaccurate mentioned the following reasons:

- The model requires many assumptions, which may be subject to bias
- Because CFLs are a mature technology, a diffusion curve may not be applicable
- It's unlikely that spillover plus market effects exceeds free ridership, as most market effects occurred before the Michigan programs launched in 2009

One panelist from the government/regulator and energy advocate category who rated the method as 'somewhat inaccurate' stated the following:

> *"Generalized models of product diffusion are useful conceptually, but unlikely to be able to accurately capture dynamics for specific products in specific markets. The large number of significant inputs and assumptions result in a "reasonable" value, but there is likely a substantial bias towards modifying the model to ensure this result. Equally plausible changes in parameter assumptions could likely result in NTGR value that differs significantly."*

2.2.2 Multistate Regression Model (NTGR estimate=0.71)

The Multistate Regression Model measures free ridership and participant and nonparticipant spillover. Most ratings of the Multistate Regression Model were somewhat accurate (10 of 18 respondents). Panelists who believed the approach was accurate cited the following reasons:

- The cross-sectional nature of the data, in particular the inclusion of comparison areas
- Controls for many variables, including non-program effects
- Use of measurable data, in particular on-site data

One panelist from the evaluators and consultants group who rated the method as 'somewhat accurate' said:

> *"Multistate regression is the best approach in terms of asking the right question: What is the market lift due to the programs? It controls for many variables. The challenge is that the data it relied on suffer threats to validity, since it's based on self-reported purchases rather than actual sales data. In addition, the study was conducted early in the years of interest so may not capture potential spillover."*

Those panelists who rated the Multistate Regression Model as inaccurate mentioned the following reasons:

- Lack of true comparison areas, due to market effects of other programs
- Reliance on self-reported purchase data, which may be subject to recall error
- Study was conducted in 2010 soon after programs launched in 2009, and therefore may not adequately capture spillover

One panelist from the government/regulator and energy advocate category who rated the method as 'somewhat inaccurate' stated the following:

> *"This approach is theoretically appealing, but difficult to effectively do this…especially today. Very difficult to find appropriate comparison group states & too many factors can contaminate the relationships (e.g., independent variables such as the presence of a program and the program budget can obscure important differences in the design and quality of a program and how that might produce or not produce spillover and market effects)."*

2.2.3 Consumer Self-Report Surveys (NTGR estimate=0.70)

The Consumer Self-Report Surveys measure free ridership and participant and nonparticipant spillover. Most ratings of the Consumer Self-Report Surveys were either somewhat accurate (7 of 18 respondents) or somewhat inaccurate (10 of 18 respondents). Panelists who believed the approach was accurate cited the following reasons:

- NTGR result seems reasonable
- The approach asks the appropriate questions

One panelist from the evaluator and consultant category who rated the method as 'somewhat accurate' said:

> *"Sample size is fairly low, but the questions being asked do speak directly to what the utility wants to know, from the perspective of the market actors that matter most (bulb buyers)."*

Those panelists who rated the Consumer Self-Report Surveys as inaccurate mentioned the following reasons:

- Reliance on self-reported data, which might be subject to social desirability bias
- Small sample size with the potential for sample bias
- Question wording may influence the results

One panelist from the program administrator and market support category who rated the method as 'somewhat inaccurate' stated the following:

> *"While this approach has merit and provides some unique insights, I have less confidence in self-reporting than modeling. I have concerns about who chooses to respond to surveys and inherent desire to please the surveyor impacting the ability to accurately reflect actual behavior."*

2.2.4 Retail Store Manager Interviews (Partial NTGR estimate=1.24 – 1.33)

The Retail Store Manager Interviews measure participant spillover only. Most ratings of the Retail Store Manager Interviews were either somewhat inaccurate (6 of 18 respondents) or very inaccurate (10 of 18 respondents). Panelists who believed the approach was accurate cited the following reason:

- Store managers present a valuable perspective on the program

One panelist from the government/regulator and energy advocate category who rated the method as 'somewhat accurate' said:

> *"Store manager interviews make sense for the NTGR toolbox. In this study, the deficiency is that many of the answers are likely to be "best guesses." For example, the estimate of spillover ranged from 0-128% and, even among home improvement centers, the estimates were 3%, 30% and 126%. Research of this type is valuable for identifying trends. Yes, there was likely at least a modest amount of spillover, but pinpointing a percent is a problem. Moreover, this approach did not estimate free ridership."*

Those panelists who rated the method as inaccurate mentioned the following reasons:

- It does not include free ridership
- Small sample size
- Retailers may be inherently biased in order to maintain programs
- Store managers are not knowledgeable enough about programs
- Spillover estimate is unreasonably high

One panelist from the evaluators and consultants group who rated the method as 'very inaccurate' stated the following:

> *"There is no data I know of to support the validity of store manager estimates. The sample sizes are small and the judgments tainted by self-interest."*

2.2.5 Price Elasticity Analysis (Partial NTGR estimate=0.72)

The Price Elasticity Analysis measures free ridership only. Most ratings of the Price Elasticity Analysis were somewhat accurate (11 of 18 respondents). Panelists who believed the approach was accurate cited the following reasons:

- Use of historical program sales and pricing data
- Large volume of data represents a census, rather than a sample
- Avoids reliance on self-reported data
- Free ridership value seems reasonable

One panelist from the government/regulator and energy advocate category who rated the method as 'somewhat accurate' said:

> *"This analysis used a census rather than a sample in a relatively straightforward statistical model. Actual sales rather than self-report improves accuracy. Primary focus on price to the exclusion of other variables limits accuracy."*

Those panelists who rated the method as inaccurate mentioned the following reasons:

- Omitted variables may include data such as in-store product displays and location (e.g. endcaps), as well as the effects of program marketing, advertising, and education
- Method requires that the demand curve be extrapolated to the full non-discounted prices, which is beyond the program discounted prices used to estimate the curve
- Does not include spillover

One panelist from the evaluator and consultant group who rated the method as 'somewhat inaccurate' stated the following:

> *"Price elasticity analysis is a reasonably good method for estimating free-ridership on considered purchases, however, the data suggests that lighting is predominantly not a strongly considered purchase. In general people are very poor predictors of their own behavior for non-considered purchases and are highly susceptible to the influence of the choice architecture. I would not recommend weighting this value highly in any estimate of NTGR."*

2.2.6 Revealed Preference Demand Model (Partial NTGR estimate=0.80)

The Revealed Preference Demand Model measures free ridership only. Most ratings of the Revealed Preference Demand Model were somewhat accurate (10 of 18 respondents). Panelists who believed the approach was accurate cited the following reasons:

- Relies on actual purchase data
- Real-time data collection at the time of purchase
- Includes many variables, including price and non-price factors

One panelist from the program administrator and market support category who rated the method as 'very accurate' said:

> *"I believe that this model yielded an accurate representation of the free ridership. The model looks at actual purchase data and attempts to predict the customer motives and behavior based on the data. Although the model has some logistical drawbacks, I believe that it accurately predicted what the true free ridership was for the program. When you*

apply the spillover and market effects to this model it yields a similar NTGR to the CFL market model.

Those panelists who rated the method as inaccurate mentioned the following reasons:

- Only reflects data collected at certain retail stores
- Small sample size

One panelist from the government/regulator and energy advocate category who rated the method as 'somewhat inaccurate' stated the following:

"Too limited of a conceptualization of consumer behavior, and a very limited sample size."

2.2.7 Revenue Neutral Sales Model (Partial NTGR estimate=0.61)

The Revenue Neutral Sales Model measures free ridership only. Most ratings of the Revenue Neutral Sales Model were either somewhat inaccurate (6 of 18 respondents) or very inaccurate (8 of 18 respondents). Panelists who believed the approach was accurate cited the following reason:

- Simple and easy to replicate

One panelist from the government/regulator and energy advocate category who rated the method as 'somewhat accurate' said:

"The approach has merit, but a focus on only one factor—revenue—is a major drawback. Retailers frequently use multiple, and often complex, rationales for stocking and pricing products. For example, it is not unusual for stores to sell common products (e.g., laundry soap) for little profit, or even at a loss, to help attract people into the store to buy other products with higher profit margins. Retailers may embrace CFLs, not as a profit center, but because they want to project a "green image." Moreover, the method doesn't provide insights into who is actually buying the bulbs….it could be customers that were convinced of the virtue of CFLs because of reading Consumer Reports (no program influence) and are looking for a bargain."

Those panelists who rated the method as inaccurate mentioned the following reasons:

- Only considers revenue for program bulbs. It does not consider other factors such as sales of non-program bulbs, other products, and foot traffic that may also influence the retailer's decision to participate.
- Estimates the maximum, rather than the actual, level of free ridership

One panelist from the manufacturer and retailer group who rated the method as 'very inaccurate' stated the following:

> *"Retailers act on programs for more reasons other than driving sales in the lighting category. Sales can bring customers into stores to look at other high value items. And they can certainly bring customers in to purchase other energy efficient products, some of which are not in the program. Also, utility programs today are highly lucrative for the retailers - the cost of commodity products like spiral CFLs has declined so much in the past 18 months that the average incented cost is going to cover the entire cost of the bulb + the manufacturers margin. Therefore the pricing to the retailer often become zero or a small fraction of the total promotional sale price. Margins are high for the retailer and therefore even though top line sales may be affected, profit is increasing."*

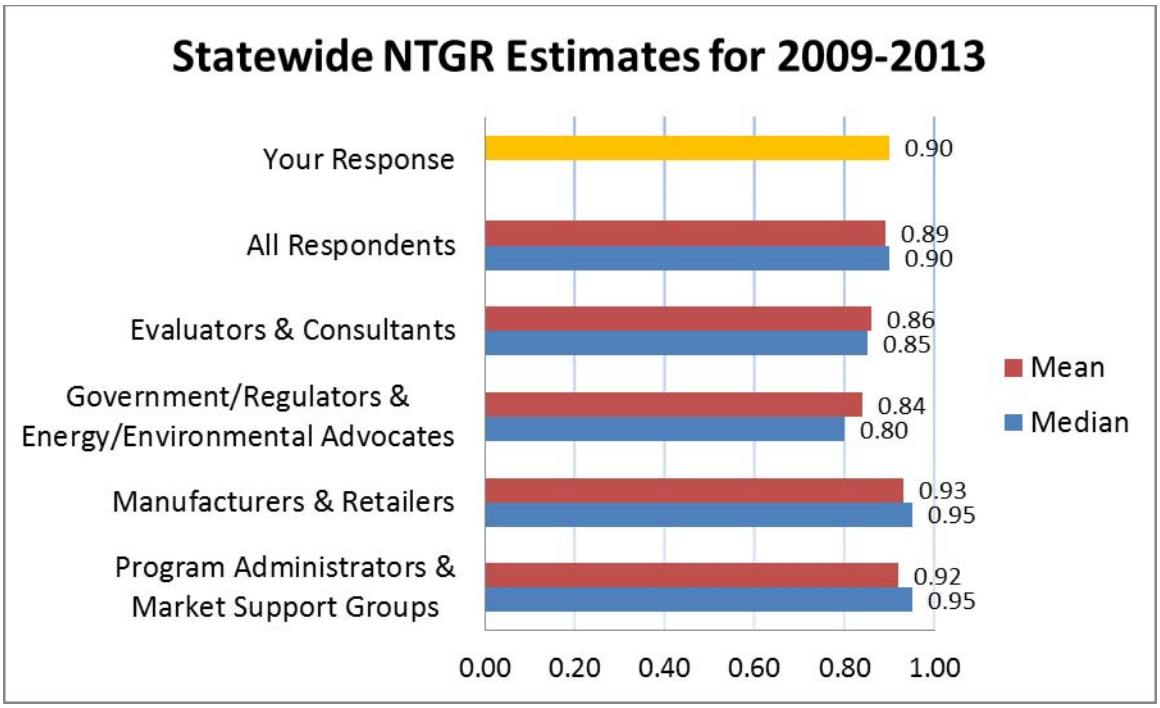
2.3 Statewide 2009-2013 NTGR Estimates

This section presents the estimated statewide NTGR values provided by panelists for the 2009-2013 period. The following table shows the mean, median and individual estimates that panel members provided; the chart immediately following the table displays the mean and median values only.

Table 4: Estimated Statewide NTGR Values for 2009-2013

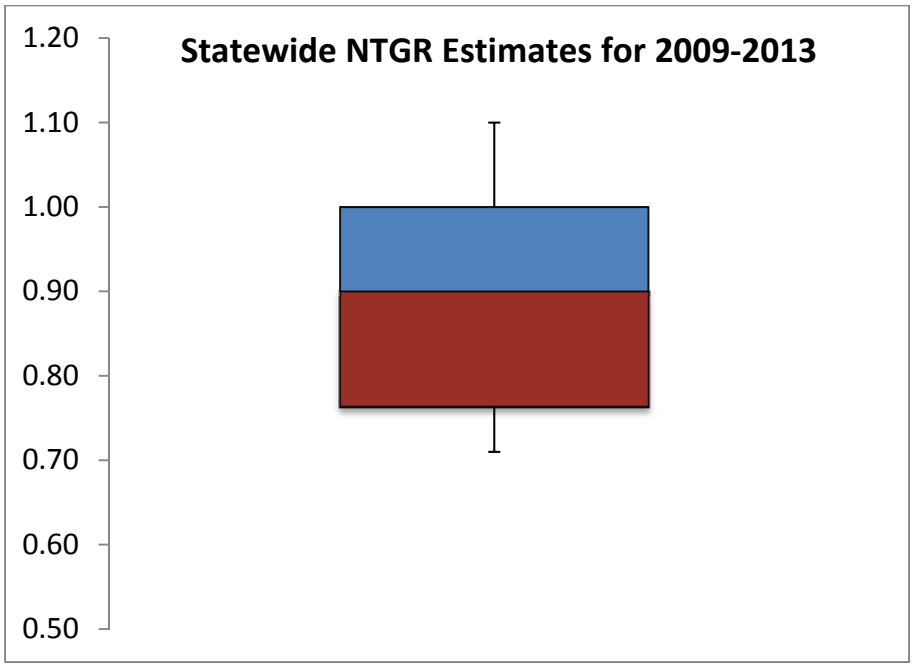
Estimated Statewide NTGR values for 2009-2013						
	CFL manufacturers and retailers	**Program administrators, utilities, and market support**	**Evaluation contractors and consultants**	**Government, regulatory, and energy advocacy organizations**	**All Respondents**	**Your response**
Sample Size	*4*	*6*	*4*	*4*	*18*	
Mean	0.93	0.92	0.86	0.84	0.89	
Median	0.95	0.95	0.85	0.80	0.90	
Individual values	0.71, 0.9, 1.0, 1.1	0.71, 0.83, 0.9, 1.0, 1.03, 1.03	0.75, 0.8, 0.9, 1.0	0.75, 0.75, 0.85, 1.0	Min=0.71; Max=1.1	0.90

Figure 3: Mean & Median Statewide NTGR Estimates for 2009-2013



The following box-and-whisker plot displays 50% of the NTGR estimates within the boxes along with the highest and lowest estimates. Please note that there were no outliers.

Figure 4: Box-Whisker Plot of Statewide NTGR Estimates for 2009-2013



In order to estimate a single, joint NTGR value for 2009-2013, most panelists relied on the NTG estimation method or methods that they judged to be most accurate. They then adjusted the resulting NTGR value, if needed, to include the full range of NTG components, such as spillover and market effects. In order to provide perspective on the spectrum of rationales provided by panelists, below we provide the reasoning from three panelists: one panelist each who provided a high, medium, and low NTGR value, respectively. The full text of each panelist's response can be found in the appendix.

One panelist from the program administrator and market support category explained the rationale behind the NTGR estimate of 1.03 as follows:

> *"The programs were launched in 2009. This provided four solid years to sell CFLs but by no means is as extensive as other utilities that have been promoting CFL technology for nearly 20 years. The Michigan utilities did not promote CFLs prior to 2009, but have made solid gains in the market in the past 4.5 years. The programs have reached a 27% saturation level, which is respectable but still allows plenty of potential to convert incandescent sockets to energy efficient ones. With the extensive sales, evidence of spillover and intense marketing efforts made by the utilities in the past 4 years, I believe that the spillover and market effects are substantial."*

One panelist from the government/regulator and energy advocate group explained the rationale behind the NTGR estimate of 0.85 as follows:

> *"I rated all the studies "somewhat accurate." The reason is simple. Because we are dealing with counterfactuals, it is not possible to test accuracy. As result, I am reluctant to declare any NTGR study as "very accurate." On the other hand, all the studies appear to have been well executed and based on sound principles suggesting that the results are likely to be at least "somewhat accurate."*
>
> *Overall the most comprehensive studies show some divergence-- 1.03 (CFL Market Model), 0.70 (Consumer Self-report) and 0.71 (Multistate Regression). Three studies targeting free ridership show a range of 0.61 to 0.80 and a simple average of the three of 0.71. However, I am confident that there is some market effects/spillover.*
>
> *In my judgment the 1.03 of the CFL Market Model is too high, but the 0.70 from the Consumer Self-report and Multistate Regression studies is too low because the free ridership only studies suggest that free ridership equals about 0.71 without a spillover /market effects adjustment. As a result, a NTGR of 0.85 seems about right."*

One panelist from the manufacturer and retailer group explained the rationale behind the NTGR estimate of 0.71 as follows:

> *"I am at arm's length from the NTG research, and had no bias coming into this panel. My opinion of the NTG for Michigan is mostly based on the research presented, and my*

confidence in the results. The studies that I found had the most validity and accuracy had a NTG value of 0.71-0.72. I also found the revenue neutral model with the lower NTG value accurate, but its' calculation only involved free ridership and no other factors. I feel confident in its free ridership score of 0.61 and add 0.10 to accommodate the Participant Spillover + Nonparticipant Spillover + Other Market Effects. That is consistent with the Multistate Regression Model score and just slightly shy of the Price Elasticity Analysis method."

2.4 Differences in NTGR Values between Consumers Energy & DTE Electric

This section presents the responses regarding the NTGR estimates for Consumers Energy and DTE Electric for the 2009-2013 period. Four of the eighteen panelists believe that Consumers Energy and DTE Electric deserve different NTGR values.

Table 5: Difference in NTGR Values for 2009-2013 between Consumers Energy & DTE Electric

Do you think there is a substantial difference in the NTGR estimates for standard CFL programs between Consumers Energy and DTE Electric?						
	CFL manufacturers and retailers	**Program administrators, utilities, and market support**	**Evaluation contractors and consultants**	**Government, regulatory, and energy advocacy organizations**	**All Respondents**	**Your Response**
Sample Size	*4*	*6*	*4*	*4*	*18*	
Yes	1	1	2	0	4	No
No	3	5	2	4	14	

The fourteen panelists who believe that the NTGR is the same for Consumers Energy and DTE Electric for 2009-2013 mentioned the following reasons:

- The programs were launched at the same time with a similar program design, incentive levels, and participating retailers
- Similar demographic characteristics of customers
- Adjacent service territories with similar retail markets
- Relatively similar socket saturation levels in both service territories

One panelist from the program administrator and market support category stated the following:

> *"They have been delivering similar programs for similar periods of time and have roughly comparable demographics. Some of the measures of NTG (e.g. freeridership) shown above were comparable. While DTE exhibits larger sales of measures over the time period, Consumers Energy sales were more erratic - very steep growth followed by drop off. They are neighboring, can expect the markets to overlap. More aggressive incentives exist in the smaller territory, which may induce spillover affecting both territories."*

The four panelists who believe that Consumers Energy and DTE Electric deserve different NTGR mentioned the following reasons:

- DTE has higher historical CFL sales per household than Consumers Energy

- DTE began with a lower CFL household penetration and socket saturation than Consumers Energy in 2009 but has since almost achieved parity

As one panelist from the evaluator and consultant category stated:

> *"The two service territories are demographically similar and geographically proximate and the two programs are simultaneous, but DTE achieved much greater penetration for incentive levels that were generally similar. Thus, a little more of the net savings from their program should be attributable to their actions than in the case of Consumers Energy."*

The following table shows the mean, median and individual estimates that the four panel members provided for the Consumers Energy and DTE Electric NTGR values for 2009-2013.

Table 6: Estimated NTGR Values for 2009-2013 for Consumers Energy & DTE Electric

	Estimated NTGR values for 2009-2013	
	Consumers Energy	**DTE Electric**
Sample Size	*4*	*4*
Mean	0.85	1.03
Median	0.80	0.99
Individual values	0.65	1.35
	0.72	0.78
	0.88	0.92
	1.15	1.05
Your responses	n/a	n/a

2.5 Statewide 2014-2015 NTGR Estimates

This section presents the estimated statewide NTGR values provided by panelists for the 2014-2015 period. Most of the panelists believe that the 2014-2015 NTGR will be lower than (ten panelists) or the same as (six panelists) the 2009-2013 value.

Table 7: NTGR Value for 2014-2015 relative to 2009-2013 Value

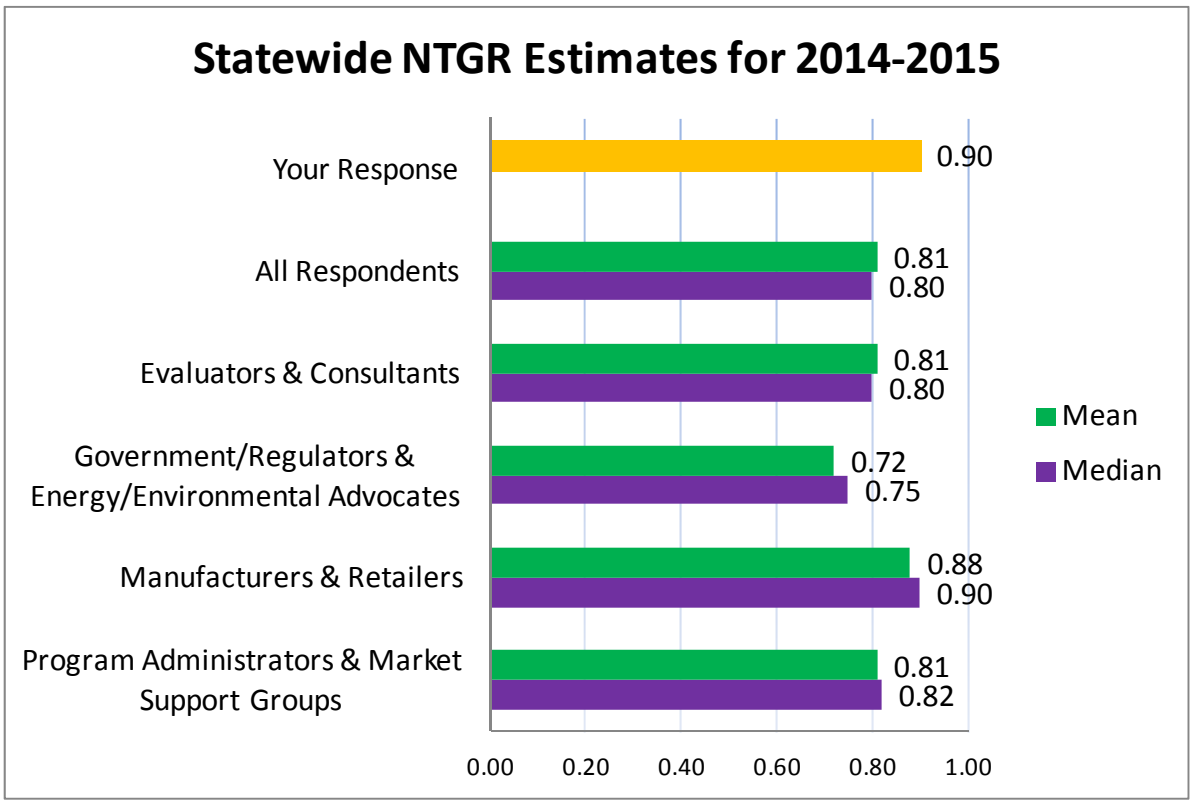
Do you think the Michigan NTGR for standard CFLs in 2014-2015 will be higher, lower, or about the same as 2009-2013?						
	CFL manufacturers and retailers	**Program administrators, utilities, and market support**	**Evaluation contractors and consultants**	**Government, regulatory, and energy advocacy organizations**	**All Respondents**	**Your Response**
Sample Size	*4*	*6*	*4*	*3*	*17*	
Higher	0	1	0	0	1	About the same
About the Same	3	0	2	1	6	
Lower	1	5	2	2	10	

The following table shows the mean, median and individual NTGR estimates that panel members provided for 2014-2015; the chart immediately following the table displays the mean and median values only.

Table 8: Estimated Statewide NTGR Values for 2014-2015

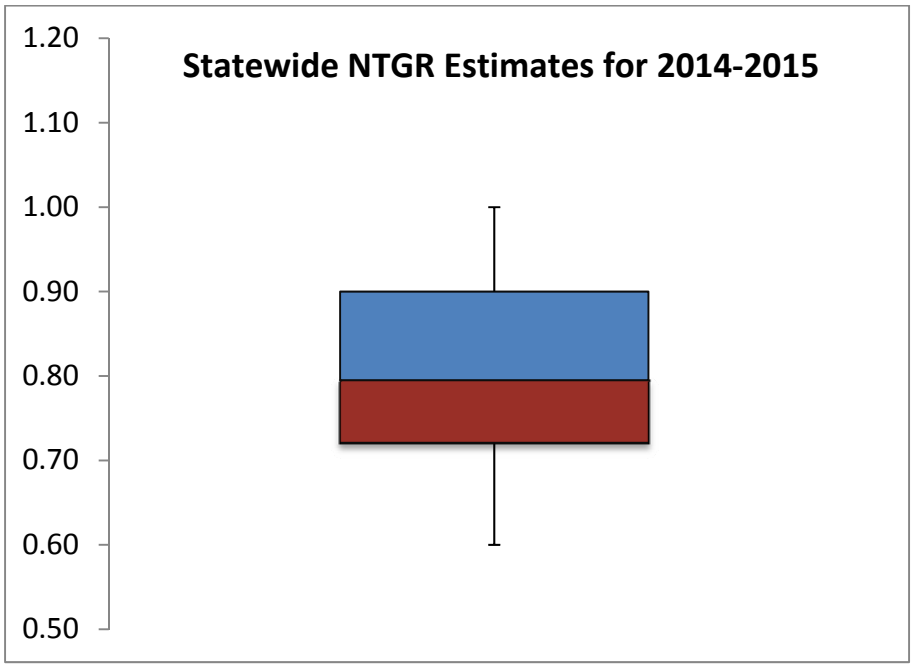
Estimated Statewide NTGR values for 2014-2015						
	CFL manufacturers and retailers	**Program administrators, utilities, and market support**	**Evaluation contractors and consultants**	**Government, regulatory, and energy advocacy organizations**	**All Respondents**	**Your response**
Sample Size	*4*	*6*	*4*	*3*	*17*	
Mean	0.88	0.81	0.81	0.72	0.81	
Median	0.90	0.82	0.80	0.75	0.80	
Individual values	0.71,0.9,0.9,1.0	0.6,0.75,0.79, 0.85,0.92,0.93	0.65,0.7, 0.9,1.0	0.6,0.75,0.8	Min=0.6; Max=1.0	0.90

Figure 5: Mean & Median Statewide NTGR Estimates for 2014-2015



The following box-and-whisker plot displays 50% of the NTGR estimates within the boxes along with the highest and lowest estimates. Please note that there are no outliers.

Figure 6: Box-Whisker Plot of Statewide NTGR Estimates for 2014-2015



In order to estimate a NTGR value for 2014-2015, most panelists adjusted their NTGR estimate for 2009-2013 based on a variety of factors, as outlined below:

- Improved technology, availability and reduced prices for LEDs and halogens may lead to lower CFL sales
- Lower incremental costs between (1) CFLs and halogens than (2) CFLs and incandescents means customers are more likely to purchase CFLs without program incentives
- As the CFL market matures, free ridership will increase and because spillover and market effects have already been captured, they will decline

Some panelists decided not to change their NTGR estimate from 2009-2013 for the following reasons:

- No significant changes in programs
- Lack of clear data on market changes

In order to provide perspective on the spectrum of rationales provided by panelists, below we provide the reasoning from a few panelists who expect that the NTGR in 2014-2015, compared to 2009-2013, will be higher, about the same, and lower, respectively. The full text of each panelist's response can be found in the appendix.

The sole panelist (from the program administrator and market support category) who believes the NTGR in 2014-2015 (NTGR estimate = 0.92) will be higher than in 2009-2013 (NTGR estimate = 0.90) stated the following:

> *"I think LEDs will become more price competitive and halogens even more abundant. These substitutes will increase reliance on programs for the continued success of CFLs."*

Six panelists believe the NTGR in 2014-2015 will be the same as during the 2009-2013 period. One of these panelists (from the manufacturer and retailer group) who estimated the NTGR as 1.0 stated the following:

> *"It should be the same because of new products hitting the market like halogen bulbs that are more energy efficient. Customers who aren't as interested in the CFL products because of light quality and maybe aren't interested in LEDs because of cost will start to reach for halogens because it's in the middle of the two. Therefore future dollars spent on these programs will absolutely be impactful in the marketplace and should be given NTGR that take account these market changes."*

Ten panelists believe the NTGR in 2014-2015 will be lower than during the 2009-2013 period. One of these panelists (from the government/regulator and energy advocate group) who estimated a NTGR value of 1.0 for 2009-2013 and 0.8 for 2014-2015 stated the following:

> *"Much of the initial spillover and market effects captured due to the complete absence of utility energy efficiency programs from 1996 until 2009 have already been captured now, so that will tend to depress the NTGR. In addition, unfortunately, a fundamental flaw of many common approaches to free-ridership estimation is that cumulative program effects from prior years tend to be seen as "free-ridership" when assessing a current program. So that will tend to inflate self-reports of free-ridership, for example. They could do better than the 0.80 I indicate below, but not with the current limited program design."*

Another panelist (from the evaluator and consultant group) believes that the NTGR will decline from 0.75 in 2009-2013 to 0.65 in 2014-2015 had this to say:

> *"NTGRs tend to drop steadily over time regardless. In this specific case, EISA raises the cost of the base case product (incandescents), so consumers are slightly more likely to buy CFLs without a utility rebate than they were previously, since their incremental cost is now lower."*

3 Questions to Complete: Reviewing Your Stage One Responses

In this section, we ask you to review your responses to Stage One and modify your responses if you believe it is warranted.

1a. Now that you have reviewed the summary of statewide 2009-2013 NTGR estimates and rationales provided by all panel members, please review your own NTGR estimate below (shaded in green). If you do not want to modify your response, please indicate with an "**X**" in the appropriate box. If you would like to modify your original response, please indicate with an "**X**" in the appropriate box below and modify your response in the column to the right.

As a reminder, the NTGR value is calculated as: 1 - Free Ridership + Participant Spillover + Nonparticipant Spillover + Other Market Effects

	Your Original Response	Indicate X if you DO NOT want to modify your response	Indicate X if you DO want to modify your response	If yes, Enter New Response Here
Statewide NTGR for 2009 – 2013 (Q8a)	0.90			

1b. Please briefly describe your reasoning for selecting the NTGR estimate you provided in Question 1a above. In addition, if you modified your Stage One response, please briefly describe your reasons for making the change.

Please type your response here:

2a. Now that you have reviewed the summary of responses provided by all panel members regarding the difference between Consumers Energy and DTE Electric NTGR values for 2009 - 2013, please review your own responses below (shaded in green). If you do not want to modify your response, please indicate with an "**X**" in the appropriate box. If you would like to modify your original response, please indicate with an "**X**" in the appropriate box below and modify your response in the column to the right.

	Your Original Response	**Indicate X if you DO NOT want to modify your response**	**Indicate X if you DO want to modify your response**	**If yes, Enter New Responses Here**
Do you think there is a substantial difference in the NTGR estimates for standard CFL programs between Consumers Energy and DTE Electric? (Q8c)	No			
NTGR Value for Consumers Energy for 2009 – 2013 (Q8d)	n/a			
NTGR Value for DTE Electric for 2009 – 2013 (Q8e)	n/a			

2b. Please briefly describe your reasoning for the responses you provided in Question 2a above. In addition, if you modified your Stage One responses, please briefly describe your reasons for making the change.

Please type your response here:

3a. Now that you have reviewed the summary of statewide 2014-2015 NTGR estimates and rationales provided by all panel members, please review your own NTGR estimate below (shaded in green). If you do not want to modify your response, please indicate with an "**X**" in the appropriate box. If you would like to modify your original response, please indicate with an "**X**" in the appropriate box below and modify your response in the column to the right.

As a reminder, the NTGR value is calculated as: 1 - Free Ridership + Participant Spillover + Nonparticipant Spillover + Other Market Effects

	Your Original Response	**Indicate X if you DO NOT want to modify your response**	**Indicate X if you DO want to modify your response**	**If yes, Enter New Response Here**
Statewide NTGR for 2014 – 2015 (Q9a)	0.90			

3b. Please briefly describe your reasoning for selecting the NTGR estimate you provided in Question 3a above. In addition, if you modified your Stage One response, please briefly describe your reasons for making the change.

Please type your response here:

4. Do you have any additional thoughts or comments related to the NTGR outcome, the Advisory panel process itself, or considerations for the implementation of the utilities' upstream lighting program going forward?

Please type your response here:

5. Please provide the name and mailing address that you would like to use for your $500 incentive check. It can be made out to you or a charity of your choice.

Please type your response here:

4 Appendix: List of Panelist Quotes

In this section we present the NTGR estimates and verbatim text of the rationales provided by all panelists. The table below presents the responses for the 2009-2013 NTGR values, sorted in descending order.

Panelist ID Number	Panelist Category	NTGR Estimate for 2009-2013	Rationale
1	Manufacturers & Retailers	1.10	Higher NTGR due to comparing our sales in the non-program stores to program stores, we feel the NTGR numbers listed above are understated.
2	Program Administrators & Market Support Groups	1.03	The programs were launched in 2009; this provided four solid years to sell CFLs but by no means is as extensive as other utilities that have been promoting CFL technology for nearly 20 years. The MI utilities did not promote CFLs prior to 2009, but have made solid gains in market in the past 4.5 years. The programs have reached a 27% saturation level, which is respectable but still allows plenty of potential to convert incandescent sockets to energy efficient ones. With the extensive sales, evidence of spillover and intense marketing efforts made by the utilities in the past 4 years, I believe that the spillover and market effects are substantial. I am giving the state of MI a NTGR of 1.03 thinking that the actual free ridership is in the range of 0.78, and the spillover and market effects are 0.30.
3	Program Administrators & Market Support Groups	1.03	The method used was the one that was most comprehensive in terms of capturing cumulative effects and all elements of NTG. Comparisons of elements between DTE and Consumers Energy indicate that the measurements of FR only indicate similar levels (probably fall within overlapping error bounds) for DTE and Consumers Energy. I note that geographic area of Consumers is significantly larger - likely more stores but program distribution in DTE is twice as large as in Consumers Energy, despite similar demographics; we have no direct information on the relationship of spillover as a function of program distribution, so it would be difficult to know what to use to further adjust the estimate in a way that would increase accuracy statewide). The measure of NTGR for Consumers of .71 does not include market effects, yet we can surmise that there are positive market effects. The lower incentive prices in Consumers may be one indication of a more advanced market. The estimate of 1.03 includes market effects - no way to know what market effects on their own might be from available info.
4	Evaluators & Consultants	1.00	This value is consistent with the results two more accurate methods of analysis.
5	Program Administrators & Market Support Groups	1.00	Based upon review of materials provided.
6	Manufacturers & Retailers	1.00	This is a fair assessment for what these utilities should be gaining from these programs. No more, no less.
7	Government/Regulators & Energy/Environmental	1.00	My preferred method is the 'CFL market model', because it is the only method that conceptually captures FR, SO, and ME. And I believe that the DTE and Consumers Energy program efforts

Panelist ID Number	Panelist Category	NTGR Estimate for 2009-2013	Rationale
	Advocates		likely had some market effects, because Michigan had no utility EE programs at all from 1996 until 2009. I round off the 1.03 to 1.0 for simplicity, and to be a little conservative.
8	Evaluators & Consultants	0.90	This is an imputed value based on the range of other values above considered to be at least somewhat accurate and the components of the NTGR which they represent.
9	Program Administrators & Market Support Groups	0.90	I don't think it's linear across the time period, but getting closer to 1 over time. Elasticity of demand, in addition to own-price, is driven by the availability of viable substitutes. Given that CFLs still have major quality issues and the growth in halogens (EISA qualified) has been substantial in the last couple of years, I think there will be greater reliance on Participant Spillover, i.e., customers will be more driven by incentives for purchasing decisions.
10	Manufacturers & Retailers	0.90	Both the DTE and Consumers promotions in the last few years have been very successful in helping to transform the market. The piece that is missing to help lift the NTGR is marketing, education and data. Data is the most important piece that should accompany any markdown promotion. Marketing and education should help push and promote that the promotions exist, why they exist and why to make the transition. Store signage does not do enough in this aspect. I do not believe there is a perfect answer to NTGR estimation but if you combine a few of the models into an overall program structure, you will have a much better idea as to how you are impacting the market. The programs, as they are run today, are extremely important and successful influencing customer buying habits. The next step is to market and educate other consumers of the promotions and why to utilize them.
11	Government/Regulators & Energy/Environmental Advocates	0.85	I rated all the studies "somewhat accurate." The reason is simple. Because we are dealing with counterfactuals, it is not possible to test accuracy. As result, I am reluctant to declare any NTGR study as "very accurate." On the other hand, all the studies appear to have been well executed and based on sound principles suggesting that the results are likely to be at least "somewhat accurate." Overall the most comprehensive studies show some divergence-- 1.03 (CFL Market Model), 0.70 (Consumer Self-report) and 0.71 (Multistate Regression). Three studies targeting free ridership show a range of .61 to .80 and a simple average of the three of .71. However, I am confident that there is some market effects/spillover. In my judgment the 1.03 of the CFL Market Model is too high, but the about .70 from the Consumer Self-report and Multistate Regression studies is too low because the free ridership only studies suggest that free ridership equals about .71 without a spillover /market effects adjustment As a result, a NTGR of .85 seems about right.
12	Program Administrators & Market Support Groups	0.83	It's a general average of the NTGRs provided by the different methodologies but weighted by my level of confidence.
13	Evaluators & Consultants	0.80	Used the high end of the studies that capture FR (the revealed preference model). Some of the models that estimate market effects even showed a lower NTG than this. The two studies that showed a higher NTG - CFL Market Model and the Store Manager Interviews - appear unreliable to me. If spillover is claimed need to have good examples to demonstrate it. The vast majority of

Panelist ID Number	Panelist Category	NTGR Estimate for 2009-2013	Rationale
			bulbs are being sold through the same channels that sell the majority of CFLs in absence of the program and - in states where distribution channel NTG is calculated - have the lowest NTG ratios.
14	Evaluators & Consultants	0.75	Represents an approximate convergence of the values yielded by the statistical approaches I judged to be the most plausible.
15	Government/Regulators & Energy/Environmental Advocates	0.75	We tend to favor data driven methods and several of those methods came in around .70. That being said, we do believe that some consideration should be given to the state of Michigan and likelihood that program incentives played perhaps a larger role than they may have in states that were less severely impacted by the recession. We also believe that the NTGR would be higher in the earlier years of the program range provided so chose an average for the time period.
16	Government/Regulators & Energy/Environmental Advocates	0.75	I don't think it is possible to develop an "accurate" NTGR value. I think 70-80% is a reasonable value of the partial NTGR (excluding spillover and market effects). Evidence on spillover and market effects is suspect and limited.
17	Manufacturers & Retailers	0.71	I am at arm's length from the NTG research, and had no bias coming into this panel. My opinion of the NTG for Michigan is mostly based on the research presented, and my confidence in the results. The studies that I found had the most validity and accuracy had a NTG value of 0.71-0.72. I also found the revenue neutral model with the lower NTG value accurate, but it's calculation only involved free ridership and no other factors. I feel confident in its free ridership score of 0.61 and add 0.10 to accommodate the Participant Spillover + Nonparticipant Spillover + Other Market Effects. That is consistent with the Multistate Regression Model score and just slightly shy of the Price Elasticity Analysis method.
18	Program Administrators & Market Support Groups	0.71	My choice is based on the reasoning provided for the individual methodologies in Section I. I'm not sure I would use the word "accurate" for it, but "most reasonable" would do. The fact that the household density of program-supported CFLs (CFLs/household) ranges from 1.4 to 2.1 with an average of 1.8, but the average installed CFL density (CFL/home) ranges from 11.6 to 12.1 with an average of 11.8 suggests that a lot of CFLs have been purchased without discounts. But CFLs last a long time, and some of these installed CFLs may have been purchased before the programs became active. So 0.71 may be too high; the NTGR certainly should not be higher. Do the evaluators have an explanation for the difference in household densities?

The below table presents the full responses for the 2014-2015 NTGR values. Responses are listed in order of Panelist ID Number (referenced from the previous table) so that readers can observe similarities or differences across a particular panelist's 2009-2013 and 2014-2015 NTGR estimates.

Panelist ID Number	Panelist Category	NTGR Estimate for 2014-2015	Rationale
1	Manufacturers & Retailers	0.90	As EISA compliant Halogens and lower priced LED's become readily available and the customer understands their benefits, this will affect future CFL sales. CFL will decline in sales overall, both program and non-program supported CFL's.
2	Program Administrators & Market Support Groups	0.85	Because of the EISA legislation and the comprehensive efforts of DTE and Consumer's Energy over the past years, I believe that customers are more likely to purchase CFLs in the future. I the NTGR should be lower moving forward. I also believe that the spillover and market effects have reached their peak and are now on the decline. I would give the state of MI a NTGR of .85 moving forward.
3	Program Administrators & Market Support Groups	0.93	EISA and LEDs combined increase consumer choices that compete with standard CFLs.
4	Evaluators & Consultants	1.00	I expect LED sales to cannibalize CFL sales among both free riders and induce purchasers by an equal measure which will leave the CFL NTG unchanged.
5	Program Administrators & Market Support Groups	0.75	Given the reduction in gross savings and the increase in demand for other specialty bulbs and advanced lighting products.
6	Manufacturers & Retailers	1.00	It should be the same because of new products hitting the market like Halogen bulbs that are more energy efficient. Customers who aren't as interested in the CFL products because of light quality and maybe aren't interested in LED because of cost will start to reach for Halogen because it's in the middle of the two. Therefore future dollars spent on these programs will absolutely be impactful in the marketplace and should be given NTGR that take account for these market changes.
7	Government/Regulators & Energy/Environmental Advocates	0.80	Much of the initial spillover and market effects captured due to the complete absence of utility EE programs from 1996 until 2009 have already been captured now, so that will tend to depress the NTGR. In addition, unfortunately, a fundamental flaw of many common approaches to free-ridership estimation is that cumulative program effects from prior years tend to be seen as "free-ridership" when assessing a current program. So that will tend to inflate self-reports of free-ridership, for example. They could do better than the 0.8 I indicate below, but not with the current limited program design.
8	Evaluators & Consultants	0.90	Consumers will have to find alternatives to incandescent bulbs as EISA phases out the higher wattages. If the halogen and LED alternatives were not becoming rapidly available and competitive, the NTGR for CFLs might reasonably decline. However, given the available alternatives, it is plausible that the program may see a decrease in the overall number of incentives for CFLs with a similar NTGR as in prior years. Whereas EISA could be leading to increased

Panelist ID Number	Panelist Category	NTGR Estimate for 2014-2015	Rationale
			freeridership, the continuation of incentives could push people toward CFLs as opposed to the other technologies.
9	Program Administrators & Market Support Groups	0.92	I think LEDs will become more price competitive and Halogens even more abundant. These substitutes will increase reliance on programs for the continued success of CFLs.
10	Manufacturers & Retailers	0.90	If there are no major changes to the current promotion management I do not see many changes in the NTGR. The big difference in the coming years with EISA being fully implemented is that you have a brand new customer walking into a store that needs to make a choice. Up until EISA we have relied on people that wanted to make the change, thought about making the change or were early adopters. We not have a new customer that needs to make a different purchase in future years and it is extremely important that lighting programs remain as effective as they are today. If retailers can provide more data and utilities/program managers can implement more education/marketing we should see the NTGR be more successfully viewed.
11	Government/Regulators & Energy/Environmental Advocates	0.60	A general rule of thumb is that as markets mature, free ridership increases and spillover opportunities decline. I do not see any reason to believe that this would not hold true for CFLs. I also suspect that EISA will drive increased sales of CFL regardless of the utility programs and LED prices are dropping fast. (Wal-Mart is advertising a 60 watt LED for $8.88.) My vision is that utility CFL programs will need to be revamped to promote specialty CFLs, LEDs and perhaps, on a short term basis, a program designed to discourage consumers from stocking up on incandescent bulbs (i.e., before the bulbs gradually disappear).
12	Program Administrators & Market Support Groups	0.79	It's likely that the free ridership rate with increase given these changes to the market and so the NTGR will decline slightly, but not substantially.
13	Evaluators & Consultants	0.70	Likely to go down as consumers face lower incremental costs in comparing EISA halogens to CFLs. But program can fix that by moving towards specialty bulbs and working in channels such as dollar stores and goodwill more.
14	Evaluators & Consultants	0.65	NTGRs tend to drop steadily over time regardless. In this specific case, EISA raises the cost of the base case product (incandescents), so consumers are slightly more likely to buy CFLs without a utility rebate than they were previously, since their incremental cost is now lower.
15	Government/Regulators & Energy/Environmental Advocates	n/a	We would recommend not adjusting gross savings levels until 2015 since many traditional wattage products will remain in the market well past the effective date of the law. Additionally costs for ENERGY STAR certified CFLs are likely to increase by mid-2014 due to the higher quality standards going into place in September 2014. However, we do recommend revisiting program models after programs reach a certain level of maturity, such as expanding and diversifying programs to include products beyond standard spiral CFLs (specialty CFLs, LED bulbs) and to explore niche markets like multi-family, rental properties etc, to reach more sockets. 2015 will be a good year to re-evaluate with many low cost ENERGY STAR LED solutions and no more incandescent common wattages.

Panelist ID Number	Panelist Category	NTGR Estimate for 2014-2015	Rationale
16	Government/Regulators & Energy/Environmental Advocates	0.75	Any change to the 2009-13 value would be largely arbitrary due to limited data and multiple overlapping changes to the market.
17	Manufacturers & Retailers	0.71	I believe that there is a greater education burden at hand with the amount of change that is occurring with EISA regulations (consumer education), LED pricing, and Halogens. Halogens have had a greater impact on bulbs sales than anticipated, and there is a greater challenge to perform marketing activities and education. The tricky beast is the free ridership, depending if you are looking at it from year to year or over time. I believe the market effects would counter the change in free ridership that may increase as year to year education has a cumulative effect on the population.
18	Program Administrators & Market Support Groups	0.60	EISA is going to force consumers to buy CFLs, halogens, or LEDs (or certain types of specialty incandescents). Continued discounts will help mitigate anger over government interference, but after end-of-year inventories of incandescents run out, will have less influence on the choice of a CFL. There will still be a counterfactual, but it will increase.

Appendix C, Delphi Panel Q&A Memos

NAVIGANT

CADMUS

NMR Group, Inc.

Memorandum

To: Michigan Residential Lighting Advisory Panelists

From: DTE Energy and Consumers Energy evaluation teams

Date: October 30, 2013

Re: Responses to initial set of questions; shelf stocking data

Thank you to those who were able to participate in the introductory webinar on October 24. For those who were unable to participate, a recording is available at: https://insidenci.webex.com/insidenci/lsr.php?AT=pb&SP=EC&rID=78755947&rKey=6420ea06054fd8a2

This memo summarizes responses to questions posed during and prior to the webinar. This memo also presents an additional data element that was not available for inclusion in the Stage 1 questionnaire, but may be of interest to panelists: shelf stocking data from a recent shelf survey conducted by Navigant for the DTE Energy upstream lighting program evaluation.

As noted previously, please direct any additional questions to Jessica Minor-Baetens at jessica.minor-baetens@navigant.com (734) 794-4865.

I. Responses to Panelist Questions

1. ***Q:** [Received prior to webinar] I would like to know about advertising and marketing expenditures and the marketing techniques and messages that were used by the two companies for the years indicated. It would also be useful to know what retailers or retailer types were used to sell the bulbs, if they were sold year round or for limited time, and if there were any other types of promotions or distribution techniques used.*

   A: Both DTE Energy and Consumers Energy programs offer in-store promotional events (involving increased signage, and a table staffed by an APT representative educate customers about the benefits of energy-efficient lighting) and point-of-purchase materials (brochures and signage). Through coordination between APT representatives (the implementation contractor) and local store managers, discounted bulbs are often featured on end-caps present in stores. Implementation staff make frequent visits to participating stores and

provide training to store personnel on lighting technologies, ENERGY STAR, CFL recycling, program requirements and other topics. See the appendix to this memo for a more complete summary of marketing and promotional activities and expenditures since program inception in 2009.

The retailers who participate in both DTE Energy and Consumers Energy's programs include: The Home Depot, Costco, Sams' Club, Walmart, ACE Hardware, ACO Hardware, Walgreens, Dollar Tree, Lowes, Meijer and Menards.

Goodwill Industries participates in DTE Energy's program. Family Dollar previously participated, but ended participating in the program in 2013. Kmart also participated during the earlier years of the program but did not participate in 2012 or 2013.

Additional retailers in Consumers Energy program include: True Value Hardware, Dollar General and Big Lots.

For both companies, CFL lighting discounts are offered throughout the year. However, for some lighting products, for example LEDS, discounts are offered periodically throughout the year.

2. ***Q: Does the task include 3-way & dimmable CFL sales as well as single-wattage CFLs?***

   A: The panelists are not asked to consider 3-way or dimmable CFL sales, as those types of bulbs are considered "specialty" bulbs in both the Consumers Energy and DTE Energy programs.

3. ***Q: Do the socket surveys differentiate between single-wattage CFLs and dimmable & 3-way CFLs?***

   A: The Michigan socket saturation studies did differentiate between "standard" (spiral) and specialty CFLs. The values shown in the questionnaire for Michigan are for standard CFLs, as indicated in the notes column, and as such exclude dimmable and 3-way CFLs.

4. ***Q: Any data regarding LED's and the lower retails in 2013-2015 and how it will affect CFL sales?***

   A: The evaluation teams chose to present panelists with NEMA data that tracks the market share of bulb types up to this point in time. We did consider providing data on projections of market share going forward, but those data were all somewhat dated and did not reflect the role that energy efficient halogens appear to be playing in the market based on current data. We think that some panelists are in a better position to estimate the direction of the market than the projections we had access to.

5. ***Q: Could you clarify "limited number?" Would LED rebate volumes be only a few percent of the CFL volumes or less?***

A: LEDs have made up a relatively small percentage of all incentivized bulb sales up to this point. DTE Energy does not expect LEDs to make up more than 4% of program bulb sales through the end of 2015.

For Consumers Energy, through 2014, LEDs are projected to represent 2% or less of program activity, but are expected to ramp up to 15 percent of program activity by 2017.

Table 1. LED Sales (not including LED holiday lights)

	2012	2013	2014	2015	2016	2017
DTE Energy						
Number of Bulbs	65,815	85,000	200,000	200,000	DK	DK
Percent of Incented Bulbs	1%	2%	4%	4%	DK	DK
Consumers Energy						
Number of Bulbs	2,442[i]	25,000	140,000	140,00	216,000	290,700[iii]
Percent of Incented Bulbs	.001%	1%	5%	5%	10%	15%

[i] From Consumers Energy 2012 EO Certification Report
[ii] From Etracker, LEDs incented in 2013 to date.
[iii] From Consumers Energy 2014-2017 EO Plan

6. ***Q: Are these utilities planning to rebate LEDs in 2014 and 2015?***

   A: See response above.

7. ***Q: Do you consider higher wattage CFLs to be specialty or standard CFLs? Examples would be 32, 42 or 68 watt lamps?***

   A: Those higher wattage lamps are considered specialty CFLs for both the DTE Energy and Consumers Energy programs.

8. ***Q: Were there any CFL rebates or giveaways or advertising campaigns by utilities in these two Michigan service territories prior to 2009, or did that really represent the beginning of utility efforts to promote them in the region?***

   A: DTE Energy and Consumers Energy did not promote CFLs prior to the Energy Optimization program launch in 2009.

9. ***Why are the panelists anonymous?***

   A: The evaluation teams are providing panelists with an opportunity to remain anonymous so they can feel more comfortable providing input, and sharing data and insights. If panelists wish to reveal their identity to the group they are welcome to do so.

10. ***Q: Will the "study session" be recorded for those of us who have a conflict and cannot attend?***

    A: Yes.

11. ***Q: Will a copy of this presentation be sent out to all participants?***

    A: Yes.

II. Shelf Stocking Data, DTE Energy Service Territory

Navigant's evaluation of DTE Energy's upstream lighting program efforts included a shelf survey that documented the types of lamps available on shelves, as well as their pricing and associated shelf space. The shelf survey was conducted in 29 participating stores and six non-participating stores: Family Dollar, K-Mart, Kroger (2 stores), Target, and True Value.

Table 2 presents a summary of the percentage of shelf space devoted to various lamp types. The population of lamps included in the analysis is all medium screw-base CFL standard (spiral / twister) and A-line lamps with no special features (i.e., the population excludes lamps that are dimmable, or 3-way, or colored). This data should be considered as one of several residential lighting market indicators. Shelf stocking data does not necessary correlate with sales volumes and market share.

Table 2. Shelf Stocking Data, DTE Energy

		Participating Stores (29 stores)			Non-Participating Stores* (6 total)			All Stores**		
Bulb Type	**Bulb Style**	Not-Discounted	Discounted	Total	Not-Discounted	Discounted	Total	Not-Discounted	Discounted	Total
CFL	Twister	18%	48%	66%	49%	0%	49%	20%	45%	65%
CFL	A-line	1%	2%	3%	2%	0%	2%	1%	2%	3%
LED	A-line	1%	0%	1%	1%	0%	1%	1%	0%	1%
Halogen	A-line	7%	0%	7%	5%	0%	5%	7%	0%	7%
Incandescent	A-line	22%	0%	22%	43%	0%	43%	24%	0%	24%
Total		49%	51%	100%	100%	0%	100%	52%	48%	100%

* Family Dollar Pontiac; K-Mart Waterford; Kroger Taylor; Kroger Sterling Heights; Target Canton; True Value Farmington)
** Inventory weighted average
Note: DTE Energy's LED discounts are offered periodically throughout the year. LED incentives were not in an active mode during the period in which the shelf survey data were collected.
Source: Shelf surveys conducted in DTE Energy service territory, August - September 2013

Appendix: Summary of Program Marketing and Promotional Activities

Table 3. Consumers Energy (CE) and DTE Energy (DTE) Upstream Lighting Program Activity by Year

Program Year	Lighting Marketing Budgets		Participating Stores		In Store Promotions	
	DTE	CE	DTE	CE	DTE	CE
2009	$154,000	$19,344	287	138	36	18
2010	$325,000	$28,520	348	129	219	204
2011	$325,000	$185,786	453	201	368	265
2012	$500,000	$90,000	570	264	484	302
2013	$450,000	$92,632	441		329*	
* Through September, 2013						

Table 4. DTE Energy Promotional Materials and Techniques Employed by Year

Promotion	Year				
	2009	2010	2011	2012	2013
Articles in community newsletters		✓			
Bag stuffers		✓			
Bill insert	✓	✓			
Branded event items including table cloths, light box, shade banners	✓				
CLF Saturday	✓*	✓*	✓	✓	
CFL calculator on web site	✓	✓	✓	✓	✓
Co-op advertising with ACE Hardware	✓				
Co-op advertising with ACO Hardware		✓			
Customer Connections Newsletter	✓	✓	✓	✓	✓
Dream Cruise Parade sponsor				✓	✓
Earth day employee event and contest		✓			
E-Connections newsletter		✓	✓	✓	✓
Employee communication	✓	✓	✓	✓	✓
Energy Smarts Magazine		✓	✓	✓	✓
Facebook and Twitter			✓	✓	✓
Google Search			✓	✓	✓
In-store events	✓	✓	✓	✓	✓
Interactive house			✓	✓	✓
Lighting blog article			✓		
Lighting brochure	✓	✓	✓	✓	✓
Lighting Guide on web					✓
PA announcements			✓	✓	✓
Plum newspaper insert	✓		✓	✓	✓
Point of Purchase material	✓	✓	✓	✓	✓
Press release	✓				
QR codes			✓		
Store PA announcements		✓			
Tip Cards		✓	✓	✓	✓
Web Site	✓	✓	✓	✓	✓

* This program only operated during October in these years

Source: DTE Energy program records

Table 5. Consumers Energy Promotional Activities by Year

Promotion	Year				
	2009	**2010**	**2011**	**2012**	**2013**
Bill messaging	✓	✓	✓	✓	✓
E-mail outreach					✓
Employee communication and bulb distribution		✓	✓	✓	✓
Energy Solutions newsletter			✓	✓	✓
Food bank distribution				✓	✓
Giveaways		✓	✓	✓	✓
In-store events with branded event items including table cloths, light box, shade banners	✓	✓	✓	✓	✓
Interactive light selector on web			✓	✓	✓
Lighting brochure		✓	✓	✓	✓
Lighting Guide on web					✓
Point of Purchase material	✓	✓	✓	✓	✓
Press releases	✓	✓	✓	✓	✓
Print advertising			✓	✓	✓
Promotional banners				✓	✓
Radio advertising				✓	
Retailer directory	✓	✓	✓	✓	✓
Retailer training	✓	✓	✓	✓	✓
Search engine marketing/banner ads	✓	✓	✓	✓	✓
Television advertising	✓	✓	✓	✓	✓
Tip Cards		✓	✓	✓	✓
Web Site	✓	✓	✓	✓	✓

NAVIGANT

CADMUS

NMR Group, Inc.

Memorandum

To: Michigan Residential Lighting Advisory Panelists

From: DTE Energy and Consumers Energy evaluation teams

Date: November 6, 2013

Re: Responses to questions presented by panelists during November 4 review session

Thank you to those who were able to participate in the review session on November 4. For those who were unable to participate, a recording is available at:

https://insidenci.webex.com/insidenci/lsr.php?AT=pb&SP=EC&rID=78975927&rKey=2c0636cae2524bf2

This memo provides a summary of responses to questions received from panelists during the review session.

As noted previously, please direct any additional questions to Jessica Minor-Baetens at jessica.minor-baetens@navigant.com (734) 794-4865.

1. ***Q: Why did Consumers Energy's incentives start out so high in comparison to DTE's? What was the basis for offering between 2-3 times more money per bulb?***

   Consumers Energy incentive level shown for 2009 was incorrect. This was the incentive level per package rather than the inventive level per bulb. In addition, the 2010-2012 values shown were simple averages rather than weighted. The table below shows the corrected weighted average incentives per bulb for 2009 through 2012. Like DTE, Consumers Energy's average incentive increased beginning in late 2011.

Table 1. Consumers Energy Weighted Average Standard CFL Discounts by Year

Year	Weighted Average Incentive (per standard CFL bulb)
2009	$1.01
2010	$0.98
2011	$1.00
2012	$1.16
2013	$1.18

Source: Consumers Energy program tracking records

2. ***Q: Why have the DTE incentives seen an increasing trend over the program years?***

   Due to a shortage in rare earth metals used in the production of CFLs, DTE's participating retailers saw wholesale price increases on the order of 25% starting in the third quarter of 2011. These price increases led to a greater differential between retail prices for CFLs and less expensive, inefficient alternatives. DTE incentives were raised starting in November, 2011 to help overcome this widening price gap. DTE's sales weighted average incentive levels since program inception are as follows:

Table 2. DTE Weighted Average Standard CFL Discounts by Year

Year	Weighted Average Incentive (per standard CFL bulb)
2009	$0.90
2010	$0.89
2011	$1.02
2012	$1.23
2013	$1.14

Source: DTE Energy program tracking records

3. ***Q: Does the entire incentive per bulb amount get passed on to the consumer or does that amount include what was given for POP, retailer training and other support?***

   The entire incentive flows through to the customer as a discount. All other costs of running the program (e.g., POP materials, retailer training and support) are covered by the implementation expense portion of the overall program budget.

4. ***Q: Did either utility do any television or radio or internet advertising?***

   Consumers Energy has done television advertising that has included information about energy efficient lighting along with promotion of other programs. Radio advertising has been conducted which features information on energy efficient lighting. The cost of the mass media advertising is not included in the program marketing budget provided previously.

   DTE has not done any mass media marketing except for one radio ad promoting holiday lighting during 2011.

5. ***Q: You're asking us to evaluate the accuracy of the research models, but we have relatively little information about the models. It appears that you are really asking us to look at all the information and determine what the NTGR should be. Is that correct?***

   Yes, we are asking you to consider both the results of the analysis done by the evaluation teams, as well as your own market expertise, and then provide your best estimate of the NTGR.

   To confirm, on the NMR website (linked from the questionnaire) there are somewhat detailed summaries of each analysis method (www.nmrgroupinc.com/?p=830, Password: CFL2014)

6. ***Q: Can you please explain how the Consumer Self-Report Model differs from the Revealed Preference Demand Model?***

   The most fundamental difference between the Consumer Self-Report method and the Revealed Preference Demand Model method is that the Self-Report method assesses free ridership based on customers' responses to survey questions, whereas the Revealed Preference Demand Model method looks at actual customer purchase behavior and what was present in the store to predict sales in the presence and absence of the program (i.e., trends in customers' purchase behavior are "revealed" through actual data on customer purchases). In addition, the Consumer Self-Report method results in estimates of both free ridership and spillover whereas the Revealed Preference Demand Model only results in a free ridership estimate.

7. ***Q: Has the program always included the current mix of retailers? And have the shares by program partner varied by year? And what % of sales are by retailer (i.e., are the majority of program sales going through HD/Lowes, and has this been the case since program inception)?***

   In the case of DTE, both Kmart and Family Dollar once participated, but do not currently. Since program inception, the number of retailers has grown as the program has grown. In some cases, it took the retailers some time before their systems were robust enough to facilitate the level of sales data transfer required of program participants.

Table 3. DTE Energy Sales by Retailer Type by Year

Retailer	2009	2010	2011	2012	2013
DIY/Hardware Retailer 1	42%	40%	44%	43%	40%
Mass Merchandise Retailer 1	22%	14%	17%	11%	10%
Mass Merchandise Retailer 2	15%	17%	14%	13%	11%
Mass Merchandise Retailer 3	2%	10%	7%	10%	10%
DIY/Hardware Retailer 2			6%	8%	8%
Mass Merchandise Retailer 4	8%	6%	5%	7%	10%
DIY/Hardware Retailer 3	3%	5%	2%	2%	2%
DIY/Hardware Retailer 4	7%	8%	5%	3%	2%
Discount/Drug Retailer 1			1%	1%	
Discount/Drug Retailer 2				1%	5%
Discount/Drug Retailer 3				1%	1%
DIY/Hardware Retailer 5					1%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Source: DTE Energy program records
Note: 2013 data is current through 10/29/2013

Consumers Energy has steadily added participating retailers to the program. In addition to national and regional chain stores, there are a number of independent retailers. While there is some variation of participants year to year, the majority remain in the program once enrolled.

Table 4. Consumers Energy Sales by Retailer Type by Year

Retailer	2009	2010	2011	2012
DIY/Hardware 1	29.3%	63.2%	33.2%	26.7%
DIY/Hardware 2	4.9%	0.2%	0.5%	
DIY/Hardware 3	2.5%	0.5%	0.8%	0.7%
DIY/Hardware 4			7.0%	6.0%
DIY/Hardware 5	2.1%	0.9%	9.3%	7.1%
DIY/Hardware 6		<0.1%	0.1%	< 0.1%
Discount/Drug 4			0.1%	
Discount/Drug 5				0.7%
Mass Merchandise 1	5.8%	8.7%	4.9%	5.6%
Mass Merchandise 2	6.8%	10.8%	16.5%	15.9%
Mass Merchandise 3		4.2%	16.7%	21.7%
Mass Merchandise 4	48.6%	11.3%	9.5%	13.1%
Mass Merchandise 6		0.1%		0.2%
Other		0.0%	1.4%	2.2%
Total	**100%**	**100%**	**100%**	**100%**

Source: Consumers Energy program records

8. ***Q: Can Nicole clarify why the shelf stocking results (72% program vs. 28% non-program discounted) may indicate high potential for spillover?***

   The comment was in reference to spillover analysis that the Consumers Energy evaluation team conducted, drawing on interviews with store managers. The comment did not directly relate to the shelf stocking results. It came up simply because the shelf stocking survey revealed stocks of non-program bulbs, a necessary condition for spillover.

9. ***Q: For price elasticity and revealed preference, free riders could be price sensitive too. Doesn't seem to cover.***
   Clarification of question/follow on question: The discounted bulbs provide a sales lift, but some customers that are CFL fans may buy the bulb to save money. How are these folks addressed?

   The evaluation teams agree with the assessment that both price and non-price factors play a role in customers' purchase decisions. As a result, the ability of an analysis method to consider both price and non-price-related variables was a key reason several of the analysis methods were chosen.

   The panelist also makes the point that some portion of a free riders' price sensitivity may go unrecognized in the analysis. Not all of the analysis methods capture the full extent of a

customer's price elasticity. However, doing so is not necessary for the purposes of assessing free ridership when using most methods. What really matters is assessing what the customer would have done in the absence of the program, and different methods use different strategies for accomplishing this outcome.

Methods that directly consider the decision-factors affecting purchases, including both price and non-price factors, are noted here:

- The Revealed Preference Demand Model factors in non-price variables including knowledge of the discount, plans to purchase CFLs, CFL availability, and presence of a DTE-focused end-cap in the store.
- The Price Elasticity modeling addresses the price effects of the program by observing sales data for all program participants' (free riders and non-free riders) in aggregate and estimating the average responsiveness to price reductions (the elasticity of demand), controlling for bulb characteristics and retail channel; the model accounts for non-price effects of the program through estimation of the impact of marketing via in-store promotional events.
- The Customer Self-Report method captures what the customers say they would do in the absence of the incentive (e.g., purchase an incandescent/halogen vs. still purchase a CFL/LED), and it factors in the effect of program-sponsored information about CFLs.

10. ***Comment: "Non-discount CFLs can be CFLs that are not ENERGY STAR. Bug lights, colored bulbs, non- standard bulbs. They could not be eligible, unless the programs included all CFLs. These bulbs are important to home use, and there are no ENERGY STAR equivalent."***

    The types of bulbs mentioned to the panelist are important to homeowners, but the focus of this activity is narrower—only standard CFLs. The non-discounted CFLs presented in the background information provided includes only standard CFLs and p both ENERGY STAR and non-ENERGY STAR rated bulbs. They are valid alternatives to program discounted bulbs.

11. ***Q: How is the amount of funding each retailer receives determined?***

    Funding is determined though negotiations between Applied Proactive Technologies (APT), working on behalf of the utilities, and the retailers and manufacturers.

12. ***Q: How much energy has been saved with the CFL programs (either by year or utility)?***

    DTE Energy reported to the Commission audited gross savings for 2009 and 2010, and verified gross savings for 2011, and verified net savings 2012, as shown in Table 5.[1]

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[1] "Audited gross savings" are the savings achieved after corrections are made by independent evaluators to reflect the results from auditing the program-reported savings for accuracy. "Verified gross savings" are that portion of audited gross savings reflecting measures that were actually installed and in use. "Verified net savings" are savings resulting after a net-to-gross ratio (accounting for free riders, spillover and, ideally, market effects) has been applied to the verified gross savings

Table 5. DTE Energy Lighting Program Savings by Year

Program Year	MWh Savings by Program Year		Reporting Basis
	Lighting Program Total	Standard CFL Only	
2009 (June - Dec)	92,378	81,335	Audited Gross[2]
2010	162,566	119,564	Audited Gross
2011	175,944	133,299	Verified Gross
2012	198,684	168,954	Verified Net

Source: DTE Energy Optimization Program Reconciliation Reports, Program Years 1-4.

Similarly, Consumers Energy reported audited gross savings for 2009 and 2010. In 2011 and 2012, Consumers Energy reported verified net savings as shown in Table 6.[3]

Table 6. Consumers Energy Lighting Program Savings by Year

	MWh Savings by Program Year		
Program Year	Lighting Program	Standard CFL Only	Reporting Basis
2009 (June - Dec)	35,533	30,371	Audited Gross
2010	55,753	41,080	Audited Gross
2011	106,034	93,074	Verified Net
2012	78,996	69,782	Verified Net

Source: Consumers Energy – Energy Optimization Program Reconciliation Reports, Years 1-4.

13. ***Q: [Received on 11/5, in reference to the presentation summarizing findings from the Price Elasticity analysis] What does MEMD stand for?***

    MEMD stands for Michigan Energy Measures Database. It is a database of "deemed savings" values that Michigan's electric and gas utilities use for purposes of estimating energy savings values associated with energy-efficiency measures. The MEMD is reviewed and updated annually by the Michigan Energy Optimization Program and Evaluation Working Groups. Further information on the database can be found at: http://www.michigan.gov/mpsc/0,4639,7-159-52495_55129---,00.html.

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value. DTE applied an installation rate adjustments of 0.72 in 2011, based on a single year method, and 0.92 in 2012, based on multi-year method that credits delayed installation of portions of the two prior years' purchased bulbs. In addition, the MPSC deemed net-to gross factor of 0.9 was applied in 2012.

[3] In 2011, Consumers Energy applied both an installation rate adjustment (0.81) and a deemed NTG factor of 0.9 (the deemed value currently in effect in Michigan). Savings in 2012 are calculated using an installation rate adjustment of 0.83 and the deemed 0.9 NTGR

NAVIGANT

CADMUS

NMR Group, Inc.

Memorandum

To: Michigan Residential Lighting Advisory Panelists

From: DTE Energy and Consumers Energy evaluation teams

Date: November 6, 2013

Re: Response to question received on November 5

This memo provides the response to additional questions submitted by a panelist.

As noted previously, please direct any additional questions to Jessica Minor-Baetens at jessica.minor-baetens@navigant.com (734) 794-4865.

1. ***Q: [Regarding the Price Elasticity analysis conducted by Cadmus for Consumers Energy] What is the point of integrating energy savings with and without program when we're looking at the free ridership of the same bulb. CFLs will have the same energy savings per bulb regardless of whether there is or is not a program, right? Please describe the high-level concept of NFRR.***

   Cadmus assessed the impact of programs on both standard CFLs and specialty CFLs. Deemed savings differ between specialty and standard CFLs in Michigan. Incentive levels and in-store demonstrations vary uniquely by bulb type, thus leading to different degrees of program impact (and hence free ridership). Cadmus calculated a savings weighted average to assess the overall impact of the program.

   We used the term NFRR (net-of-free ridership) as alternative to NTGR or partial NTGR. Per the MI EO collaborative, the NTGR = 1-Free ridership + Spillover + Market Effects. The price elasticity modeling only addresses the free ridership element of the NTGR equation. NFRR is a partial measure of the NTG ratio that includes only free ridership (NFRR = 1-FR).

   The formula for NFFR shown in the Price Elasticity summary memo is:

$$NFRR = 1 - FR = \frac{Energy\ savings\ with\ program - Energy\ savings\ without\ program}{Energy\ savings\ with\ program}$$

   We do make the assumption that savings are the same whether a bulb is in the program or not in the program. To expand on the formula above:

$$\text{Energy savings} = (\text{Program Incented Standard CFLs} * 37\ \text{kWh}) + (\text{Program Incented Specialty CFLs} * 44.1\ \text{kWh})$$

with the program and

Energy savings without the program	=	(Standard CFLs sold in the absence of the program * 37 kWh)	+	(Specialty CFLs sold in the absence of the program * 44.1 kWh)

Though the per bulb saving of specialty CFLs is higher than the standard CFLs, the savings weighted average program NFRR (71% or free ridership of 29%) skews more toward the standard CFL value (72% or free ridership of 28%) than the specialty CFL value (65% or free ridership of 35%) because of the significantly higher volume of standard CFLs incented.

The evaluation team will post an updated Price Elasticity summary memo to address this question.