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**Subject** Focus on Energy Evaluation

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**2008 Sector-based CFL Net-to-Gross Analysis**

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This memo presents estimates of the 2008 Net-to-Gross (NTG) ratio developed from the analysis of compact fluorescent light bulb (CFL) sales data provided by retailers participating in the Focus on Energy (Focus) ENERGY STAR lighting program. We present NTG estimates for the residential, commercial, multifamily, and agricultural sectors, as well as the overall program. This analysis presents the sole NTG estimates for the commercial, multifamily, and agricultural sectors as well as a secondary NTG estimate for the residential sector, where the primary estimate was developed through the multistate modeling task.<sup>1</sup>

In conducting this analysis of NTG using CFL sales data, we are following an approach utilized in past evaluations.<sup>2</sup> One difference in the evaluation method this year is that we did not attempt to estimate CFL sales for non-participating retailers in Wisconsin. This was done because the “lift,” or additional sales attributable to the program in previous years, came almost entirely from participating stores. Therefore, we believe it is reasonable to rely solely on sales data from participating stores in order to assess the program NTG.

There were three major steps involved in this analysis. The first step was the analysis of the retailer-provided 2008 CFL sales data and a review of sales data and NTG values developed from evaluation research conducted in Wisconsin and elsewhere. The second step was the analysis of the 2008 CFL reward database, and the final step was the calculation of NTG estimates.



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<sup>1</sup> Lisa Wilson-Wright, Chris Russell, and Lynn Hoefgen, NMR Group. *Focus on Energy Evaluation, Residential Programs: Results of the Multistate CFL Modeling Effort, Final Report*. March 17, 2010.

<sup>2</sup> Rick Winch and Tom Talerico, Glacier Consulting, Group, LLC. *Second Annual Comprehensive CFL Market Effects Study – Final Report*. September 30, 2008.

## Analysis of CFL Sales Data

Given their existing relationships with retailers, Wisconsin Energy Conservation Corporation (WECC) was responsible for obtaining the CFL sales data from retailers participating in the Focus ENERGY STAR Lighting program. We requested sales data for stores located in Wisconsin, Michigan, and Indiana. In the past, Michigan had served as the baseline comparison state; however, CFL programs were launched there in the fall of 2008. Therefore, Indiana, which has not operated CFL programs, was selected as the comparison state for telephone surveys and on-site lighting inventories conducted in 2009.<sup>3</sup> We requested sales data from Michigan in order to provide continuity with past evaluation research and from Indiana in order to provide a “pure” non-program comparison state.

WECC was able to collect 2008 sales data from six retailers, four of which supplied data that could be used in the NTG analysis. One retailer did not have any stores located in either Michigan or Indiana, and therefore we were not able to estimate baseline sales for this retailer. A second retailer aggregated sales data for Wisconsin and Michigan and was not willing to split out sales between the two states.

In addition, we encountered issues with the sales data received from two of the four retailers who did provide sales data that were used in the NTG analysis. In order to preserve their confidentiality, we identify them as “Retailer A” and “Retailer B.”

**Retailer A.** One retailer provided data for “unit sales” in Wisconsin and Michigan that appear to represent packages rather than the number of bulbs, but with no accompanying package size information. While it is not clearly evident that the data represent either packages or bulbs, we believe that they represent packages based on a comparison to the 2007 sales data of packages and bulbs. In addition, this retailer sent two different sales data spreadsheets, with differences of roughly one-third between the total quantities reported in the two spreadsheets. Because this retailer was not responsive to requests to clarify these issues or provide new data with package size information, we utilized the 2008 sales data that seemed to be more reasonable in light of the 2007 sales data.

In order to estimate the number of bulbs sold in 2008 by this retailer, we applied the average bulbs per package from the 2007 data to the 2008 package sales. This was done separately for each state, as the average bulbs/package was slightly different for Wisconsin (2.1) and Michigan (2.5).

**Retailer B.** For 2008, this retailer provided package sales data *without* accompanying data regarding package size. However, this retailer provided package sales data for 2009 *with* accompanying data regarding package size. The retailer has pledged to send 2008 data with package size information, but we have not yet received it. In order to estimate the number of bulbs sold in 2008 by this retailer, we applied the average bulbs per package from the 2009 data to the 2008 package sales. This was done separately for each state, as the average bulbs/package was slightly different for Wisconsin (1.9) and Michigan (2.3).

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<sup>3</sup> Tom Mauldin, Greg Clendenning, and Lynn Hoefgen, NMR Group. *Focus on Energy Evaluation: The Market for CFLs in Wisconsin, Final Report*. February 1, 2010

## Past Trends in Sales and NTG

In addition to the sales data received from four retailers, we also estimated 2008 NTG values for several other retailers who represented a substantial number of CFLs rewarded in 2008. For two retailers we estimated NTG values based on past trends in sales and NTG estimates in Wisconsin; in order to protect the confidentiality of these retailers, we do not discuss in detail the underlying data or assumptions. In addition, we assumed a NTG value of 0.90 for discount retailers based on a study recently completed in California.<sup>4</sup> Overall, we opted for what we consider to be reasonable NTG estimates given the uncertainty involved in the analysis.

## Analysis of CFL Reward Data

The next step in this analysis was to analyze the 2008<sup>5</sup> residential, commercial, agricultural, and multi-family CFL reward data. We categorized stores where customers purchased CFLs into one of four retail channels, as done in prior evaluations:

- Hardware
- Home improvement
- Drug & mass merchandise
- Grocery & other.

Next we calculated the number of CFLs redeemed by customers from each of the sectors through each of the four retail channels (Table 1).<sup>6</sup>

**Table 1. CFL Rewards by Customer Sector and Retail Channel, 2008**

Retail Channel	Residential	Commercial	Multifamily (ACES)	Agriculture	Overall
Hardware	32%	54%	36%	27%	34%
Home improvement	37%	19%	27%	42%	35%
Drug and mass merchandise	22%	18%	24%	13%	22%
Grocery and other	9%	9%	12%	18%	10%
<b>Total</b>	1,755,675	151,029	101,649	43,511	2,051,864

<sup>4</sup> KEMA, Cadmus, Itron, PA Consulting, and J. J. Analytics. *Final Evaluation Report: Upstream Lighting Program, Volume 1*. Prepared for the California Public Utilities Commission, Energy Division. February 8, 2010.

<sup>5</sup> Because the retailers provided sales data for the 2008 calendar year, we analyzed the CFL rewards data for the 2008 calendar year also.

<sup>6</sup> In 2008, mail-in and instant coupons represented 58 percent of rewarded CFLs and buydowns represented 42 percent of rewarded CFLs. Although the type of customer is only recorded on mail-in and instant coupons, WECC allocates buydown rewards by customer sector based on past purchase patterns from mail-in and instant coupons.

The CFL rewards data were also used to determine the number of CFLs rewarded in 2008 at all of the Wisconsin stores for each of the retailers that provided CFL sales data. The four retailers who provided 2008 sales data represent 65 percent of the CFLs rewarded through the program in 2008. The retailers who we assumed NTG values for represent an additional 20 percent of the CFLs rewarded in 2008.

## NTG Estimation

The NTG ratio is calculated as sales in the program area minus estimated baseline sales, all divided by program-supported sales. For Wisconsin, the formula is as follows:

$$\text{Net-to-Gross ratio} = \frac{(\text{Wisconsin CFL bulb sales} - \text{Baseline CFL bulb sales})}{\text{Focus CFL bulbs rewarded}}$$

We follow an approach similar to that used in past evaluations, which begins with calculating CFL bulb sales per store location for each retailer in each state where sales data were available. We assume that the sales per store in Michigan or Indiana represent the baseline sales per store in Wisconsin. We then multiply the number of stores in Wisconsin by the baseline sales per store in order to estimate statewide baseline sales.

Each retailer is categorized into one of the four retail channels discussed earlier: hardware, home improvement, drug and mass merchandise, and grocery and other. We sum each of the three sales figures (Wisconsin CFL bulb sales, baseline CFL bulb sales, and Focus CFL bulbs rewarded) for all retailers in each retail channel. Then we calculate a NTG ratio for each retail channel using the equation displayed above. This approach assumes, for each retail channel, that retailers who did not provide 2008 sales data or who we were unable to estimate a 2008 NTG value for have the same NTG value as retailers who we could estimate a NTG value for.

Once we have developed a NTG ratio for each of the retail channels, we estimate a weighted NTG ratio for each of the customer sectors based on the percent of CFL rewards in each sector (Table 1).

### **Baseline Sales Estimation**

Because CFL programs were launched in Michigan in 2008, we would prefer to use Indiana as the baseline state. However, while all four retailers provided sales data for Michigan, only two also provided data for Indiana. Therefore, we created two separate scenarios to address this issue: one scenario using only Michigan as the baseline for all four retailers and a second scenario using Michigan as the baseline for two retailers and Indiana sales for the other two retailers.

In addition, because CFL programs were launched in 2008 in Michigan, we subtracted the number of CFLs incentivized through the Michigan program from the sales of the two retailers who participated in the program. The program sales represented less than 20 percent of total Michigan sales for each retailer.

### NTG Estimates by Channel

We present NTG estimates for two different scenarios in order to provide insight on how the assumption regarding the appropriate baseline—whether to use Michigan for the baseline sales or an average of Michigan and Indiana sales—affects the analysis (Table 2). In order to preserve the confidentiality of the retailers who provided sales data, we present only the NTG estimates, rather than the actual sales and reward data, for the hardware and drug/mass merchandise channels, which are the only two channels affected by the selection of baseline state. Shifting the baseline state from solely Michigan to an average of Michigan and Indiana (where Indiana sales data are available) slightly increases the estimated baseline sales for the hardware and drug/mass merchandise channels, which slightly decreases NTG estimates.

**Table 2. NTG Estimates for Hardware and Drug / Mass Merchandise Channels, 2008**

Retail Channel	NTG Ratio (MI Baseline only)	NTG Ratio (MI & IN Baseline)
Hardware	1.07	1.01
Drug and mass merchandise	0.54	0.48

Because of the similarity of the NTG estimates for the two baseline scenarios, we averaged the NTG estimates to develop a single point estimate for each retail channel. Compared to the 2007 results, the 2008 NTG estimates are substantially lower for the hardware and drug/mass merchandise channels, as might be expected given the increase in CFL sales nationwide (Table 3). The NTG is higher for the home improvement channel, primarily because of a shift in participation away from retailers with lower NTG and towards retailers with higher NTG. Because no retailers from the grocery/other channel provided sales data, we estimated a NTG value based on the 2007 Wisconsin analysis and the results of a recent study completed in California.<sup>7</sup> The California study found different NTG values for grocery chains (0.31) and small grocery stores (0.90). We applied these NTG values to the Wisconsin data, which yielded a grocery/other channel NTG value of 0.36 due to the predominance of chains among grocery store participants. However, because the grocery stores in California are different from those in Wisconsin, we opted to average the 2007 NTG value (0.97) and the California-derived estimate of 0.36, resulting in a final estimate of 0.66.

**Table 3. NTG Estimates by Retail Channel, 2007 & 2008**

Retail Channel	2007	2008
Hardware	1.53	1.04
Home improvement	0.27	0.46
Grocery and other	0.97	0.66
Drug and mass merchandise	1.00	0.51

<sup>7</sup> KEMA, Cadmus, Itron, PA Consulting, and J. J. Analytics. *Final Evaluation Report: Upstream Lighting Program, Volume 1*. Prepared for the California Public Utilities Commission, Energy Division. February 8, 2010.

### NTG Estimates by Sector

We calculated the NTG ratios for each customer sector by weighting the channel-based NTG estimates presented in Table 3 by the percentage of rewards from each channel presented in Table 1. Table 4 presents the 2007 and 2008 NTG estimates for each of the four customer sectors and the program overall. The NTG estimates decline in each of the sectors, continuing a trend seen in past evaluations.

**Table 4. NTG Estimates by Customer Sector, 2007 and 2008**

Customer Sector	2007	2008
Residential	0.75	0.67
Commercial	1.11	0.84
Multifamily (ACES)	0.78	0.64
Agricultural	0.91	0.85
<b>Overall</b>	<b>0.76</b>	<b>0.69</b>

There is some evidence of channel shifting between the retail channels. In 2007, home improvement stores represented 57 percent of CFL rewards in 2007, but declined to 35 percent in 2008.<sup>8</sup> Because the program has shifted away from home improvement stores, which had the lowest NTG in 2007 (and again in 2008), the program has maintained a reasonable NTG in the face of a substantial decline in NTG for the hardware and drug/mass merchandise channels.

While the sales data analysis worked well in 2007 and appears to work reasonably well again in 2008, the approach becomes increasingly problematic in 2009 and beyond. First, as the program shifts away from mail-in and instant rewards and toward buydowns, we are reliant on increasingly dated information regarding past purchases in order to identify the type of customer who purchased buydown CFLs. Therefore, the estimation of NTG by customer sector becomes less reliable. In addition, an even larger issue is the lack of a suitable non-program comparison state for estimating baseline sales. While we did adjust for the presence of CFL programs in Michigan in 2008, the programs expanded substantially in 2009, making such an adjustment less valid in the future. Using Indiana as the new baseline state would be preferable; however, the analysis is, as always, contingent on the sales data provided by participating retailers, and their level of cooperation may be declining.

For the residential sector, the NTG estimate of 0.67 is similar to the 0.62 value estimated through the multistate modeling.<sup>9</sup> While the sales data analysis was not intended to provide the primary NTG estimate for the residential sector, the similarity of the two values does suggest that the multistate modeling NTG estimate for the residential sector is reasonable. We prefer the multistate modeling estimate for the residential sector for several reasons. First, the 2008

<sup>8</sup> Rick Winch and Tom Talerico, Glacier Consulting, Group, LLC. *Second Annual Comprehensive CFL Market Effects Study – Final Report*. September 30, 2008.

<sup>9</sup> Lisa Wilson-Wright, Chris Russell, and Lynn Hoefgen, NMR Group. *Focus on Energy Evaluation, Residential Programs: Results of the Multistate CFL Modeling Effort (Revised Draft Report), Final Report*. March 17, 2010.

sales data allowed state-to-state comparisons for only four retailers, requiring assumptions about other retailers based on past trends and other research; given the rapid changes in the CFL market over the past few years, those assumptions may not be appropriate. In addition, the modeling approach has the following advantages:

- Modeling avoids reliance on one or two comparison states, one of which has launched CFL programs.
- It has the ability to isolate the effects of the program on CFL use and purchases, controlling for household-level variation that may influence CFL-related behavior.
- It draws on a large sample size of households and a diversity of states with varying histories of supporting CFLs through marketing, rebate, and upstream approaches.
- It focuses on market-level effects taking into account both free-ridership and spillover that may affect sales not only at participating retailers but at non-participating retailers as well.
- It accounts for a number of non-program factors that appear to be key drivers of CFL use, including, but not limited to, duration of CFL use, size of home, and the demographic characteristics of the household.
- It documented a relationship between CFL saturation with both CFL use and CFL purchases, though further exploration is needed to document the likely complex and reinforcing ways in which these three variables affect each other.

The multistate modeling approach also has issues with reliability and validity, as discussed in the report.<sup>10</sup> However, the evaluation team believes that those issues are considerably less problematic than the issues surrounding the 2008 sales data approach. For the nonresidential sectors, the sales data approach is the only option available. Given the similarity of the residential NTG estimates from the multistate modeling and the sales data approach, the team believes that it is reasonable to rely on these nonresidential NTG estimates.

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<sup>10</sup> Lisa Wilson-Wright, Chris Russell, and Lynn Hoefgen, NMR Group. *Focus on Energy Evaluation, Residential Programs: Results of the Multistate CFL Modeling Effort (Revised Draft Report)*. February 16, 2010.