

BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Annual Verification of)
the Energy Efficiency and Peak Demand)
Reductions achieved by the Electric) Case No. 12-665-EL-UNC
Distribution Utilities Pursuant to Section)
4928.66, Revised Code.)

COMMENTS OF DUKE ENERGY OHIO, INC.

Section 4928.66 Revised Code, sets forth detailed requirements for energy efficiency and peak demand reduction that must be met by Ohio electric distribution utilities. In addition to the mandates set forth therein, the law requires that the Public Utilities Commission of Ohio (Commission) annually verify the levels of energy efficiency and peak demand reduction achieved by each utility. In order to develop a methodology for this requirement, the Commission opened a docket to facilitate the creation of a technical reference manual (TRM) that would provide protocols for measurement and verification of energy efficiency and peak demand reduction measures.

In Case No. 09-512-EL-UNC, the Commission issued a request for proposal and selected a consultant to assist the Commission Staff in creating a TRM. In that same docket, the Commission received comments from interested parties and held a workshop to allow discussion on the matter. Most of this occurred in 2009. It was anticipated at the time of the Commission's entry setting up procedural requirements, that the consultant would file a framework TRM no later than November 2009 and a draft of the 2010 TRM by the end of second quarter of 2010.

In January of 2010, the Commission directed its Staff to obtain a consultant in order to provide Energy Efficiency Independent Program Evaluator Services. In February of this year, the Commission directed Evergreen Economics (Evergreen), an evaluator that consists of the employees of the original entity (EcoNorthwest) to continue the work of EcoNorthwest, that entity that had been awarded the Commission's contract. Evergreen was directed to continue to investigate and obtain documents from the utilities and serve as the statewide Independent Program Evaluator (Evaluator) to prepare and file a Report of the Independent Program Evaluator's activities and conclusions in monitoring, verifying, and evaluating the energy savings and peak-demand reductions resulting from the electric utility's programs and mercantile activities, consistent with the requirements set forth in Rule 4901:1-39-05(D), O.A.C. (the Evaluator's Report or Report). The Evaluator's Report was filed by Staff with the Commission on August 29, 2012. On October 3, 2012, the Commission established a comment period to assist the Commission in its review of the Evaluator's Report. Below are Duke Energy Ohio's comments on the matters raised in the Report.

I. General Comments

It is anticipated that the Commission will consider the application of the values or estimates contained within the Evaluator's Report in reviewing the utilities' currently pending portfolios. Duke Energy Ohio, Inc. (Duke Energy Ohio) does not support the use of the Draft TRM values or estimates. There are significant issues with the Draft TRM including absence of an effective date, the lack of clarity on whether the numbers in the TRM constitute minimums, should only be used for *ex ante* estimates, or can be updated with defensible M&V. As of this date, it is Duke Energy Ohio understanding that recommendations to update the TRM were still being incorporated. Important documentation has been submitted to the docket and there has

been no final resolution of many of the issues outstanding in that docket. As a result, there has been no opportunity for meaningful input. Also, industry practices are such that M&V results should be used to develop and update TRM values, instead of a backwards approach where M&V is updated to match a TRM. M&V is more accurate with current and state appropriate information. Finally, the current Draft TRM shelf life is coming to an end as it was developed with data that is not appropriate for application in Ohio.

II. Comments Regarding Free Ridership

The Draft TRM incorporates a concept wherein a survey with limited questions is applied to make a determination regarding free ridership. The questions posed are not adequate for the purposes of determining whether Ohio utilities should report net energy savings v. gross energy savings. A more rigorous battery of free ridership questions should be developed as indicated in the recommendation for residential and non-residential programs on pages 65 and 74 of the Independent Evaluator's Draft Report. And a net savings review should also include measurement of spillover. This was not addressed in the Evaluator's Draft Report.

III. Comments Regarding Specific Recommendations

Recommendation Number 1: The Evaluator argues that it is standard practice to assume an installation rate of less than 100 percent for Compact Fluorescent Lamps (CFLs) to reflect the fact that not all CFLs will be installed.¹ The Draft TRM recommends using an installation rate of 81 to 86 percent depending upon the delivery mechanism (i.e., point-of-sale versus direct install).

Response: Duke Energy Ohio recommends that all CFL savings be adjusted in evaluations for future program years using an installation rate adjustment factor derived from

¹ References to the recommendations refer to the summary recommendations found on page 47 of the *Report of the Independent Evaluator, 2009 and 2010 Ohio Efficiency Programs*, August 29, 2012.

either current evaluation research using primary data collection or else taken from the Draft TRM. The timing of the application of this value is of great significance. It should not be applied retroactively. The Duke Energy Ohio CFL M&V analysis was conducted and finalized in June of 2010. At that time, CFLs were in the early-adopter stage of the market penetration curve. During the early stages of market maturation, CFLs are installed at high rates and storage rates are very low. At that time Duke Energy Ohio's independent evaluator, TecMarket Works and the field of evaluation had not fully adopted an In-Service Rate (ISR) as part of the CFL savings calculation, especially in the Midwest. In addition, the notion of an ISR was not introduced until August 6, 2010 in the draft Ohio TRM, months after Duke Energy's CFL evaluation was complete. The Duke Energy Ohio independent evaluator states that since 2010, the CFL market has matured (though still not saturated) and applying an ISR in future CFL analysis is reasonable. TecMarket Works and Duke Energy Ohio disagree with the Evaluator's recommendation to use evaluation methods prior to the time that the concepts are fully vetted within the evaluation community and especially prior to the period of time that a market is matured to the point where it is a reliable component of the research approach. Both Duke Energy Ohio and its independent evaluator TecMarket Works, agree with the Evaluator that the use of an ISR for maturing market penetration analysis and Duke Energy Ohio has already adopted the use of an ISR in current evaluation efforts for substantially matured markets, including CFLs in Ohio. This effort will be continued as part of the next Ohio CFL M&V analysis anticipated to be completed by the end of 2012. In addition, the evaluation will be done using a "best practice" approach in which the ISR will be derived from the results of the customer M&V surveys, and will not be the deemed value in the Draft TRM because of the unique and targeted nature of Duke Energy Ohio's program. Duke Energy Ohio program design

and targeting typically allows it to reach low-adopter households to maximize potential CFL impacts. Additionally, the deemed ISR in the now outdated Draft TRM reflects an unrealistic condition because it assumes the Ohio CFL market is both static and uniform, and both assumptions are not accurate.

Recommendation Number 2:

The Evaluator asserts that both the 2009 and 2010 versions of Home Energy House Call (HEHC) and Home Energy Comparison Report (HECR) require more rigorous research to estimate impacts. The Evaluator then sets forth his recommendations for acceptable methods. The Evaluator states that savings resulting from installing measures through other Duke Energy Ohio programs where a rebate is provided, (including any upstream lighting programs for CFLs) must be excluded from the savings calculations. If the impact evaluation does not include these components, the Evaluator recommends that zero savings be claimed for the audit and home energy comparison report programs. The Evaluator further asserts that unless the issues with the billing regression can be addressed and a more realistic savings estimate produced, the Evaluator recommends that a simpler impact approach be adopted using impact values from the Draft TRM for the various measures provided in the kit multiplied by the installation rates estimated from the participant phone survey. Short of adopting one of these methods, the Evaluator recommends that zero savings be claimed for the audit and home energy comparison type programs.

Response: Regarding the Home Energy Comparison Report (HECR), early feedback results report, it has been expressed by Duke Energy Ohio to Evergreen, and to the Duke Energy Community Partnership (Ohio Collaborative) that this an early feedback report to provide guidance to product managers on the viability and success of HECR, and marketing and targeting strategy analysis. It was not a full impact report as suggested by the Evaluator. It was

provided in the update filing as a courtesy to show Duke Energy Ohio's dedication to understanding customer response and impacts to behavior programs. These impacts have never been "claimed" and the official impact estimates were to be taken from a later evaluation using a more complete set of billing information so that reliable estimates could be established. Since the update filing, a final HECR report was completed in September 2011, for Ohio only, indicating average impacts of 219 kWh for the type of report Duke Energy Ohio is offering.

In addition, both the preliminary six month early feedback report, and the final impact evaluation report which was based on the necessary full twelve months of data *do* in fact account for measures that may have been installed by customers through their participation in other Duke Energy Ohio efficiency programs. For the early feedback report, this naturally occurred because customers who had never participated in other programs were targeted for the HECR pilot. In addition, the fixed-effects modeling process also isolates the savings attributable only to HECR. More detail on the methodology to account for these programs can be found in a memo from Michael Ozog of TecMarket Works (attached to this response), regarding omitted variable biases.

Regarding HEHC audit program, the billing analysis coupled with robust surveys would be cost prohibitive and would not improve the reliability of the analytical findings. In order to get a representative sample of all possible actions taken, the simplistic approach recommended in the body of the Evaluator's report does not take into consideration the other aspects (both low cost/no cost and capital investments) that a more robust engineering simulation approach coupled with a billing analysis would consider. It is also not clear if all kit items are represented in the Draft TRM.

Duke Energy Ohio and its independent consultant, TecMarket Works, do not agree with using survey data to adjust billing analysis results when a well-specified billing analysis approach is employed. Both the original and the follow-up billing analysis approach used by TecMarket Works for Duke Energy Ohio rely on actual pre- and post-participation energy consumption. The estimated savings are produced via a “difference of differences” analytical process that inherently factors out non-program induced changes. To modify the savings based on the results of a process evaluation survey or an expanded measure-specific impact survey would reduce the statistical reliability of the savings estimate. Likewise, it would be both unnecessary and excessively expensive to increase the number of surveys conducted to account for actions taken at the 90/10 confidence level per action, for the entire participant population. Therefore, Duke Energy Ohio, TecMarket Works and Evergreen Economics have developed and agreed upon a revised M&V Plan for the HEHC Audit. The revised plan will be filed for the Commission’s approval in Duke Energy Ohio’s portfolio application in 2013.

Recommendation Number 3:

The Evaluator argues that Duke Energy Ohio should not use 2009/2010 evaluation results to set *ex ante* savings values for future programs where the evaluation reports do not adequately document savings.

Response:

Duke Energy Ohio and its independent consultant, TecMarket Works, disagree with assessment of the Independent Evaluator with respect to credibility of the savings estimates. However, Duke Energy Ohio has received updated evaluation reports on Personalized Energy Report, (PER) the energy efficiency website, and Energy Efficiency Education Program for Schools. The values from these updated reports, as filed in the 2011 Portfolio Status Update, are

being used as *ex-ante* values. Duke Energy Ohio does not offer a Payment Plus Program or NEED. The Weatherization results listed in the Payment Plus Program and NEED reports are not being used as *ex-ante* impacts.

As indicated in response to Recommendation #2, regarding the HECR results, it has been expressed that this report was an early feedback report to provide guidance to product managers on the viability and success of HECR, and marketing and targeting strategy analysis. It was provided in the update filing as a courtesy to show Duke Energy Ohio's dedication to understanding customer response and impacts to behavior programs, as not much research was available in the market. These impacts have never been "claimed." Since the update filing, a final HECR impact report was completed in September 2011 for Ohio indicating average impacts of 219 kWh for the type of report Duke Energy Ohio is offering.

In addition, both the 6 month early report, and 12 month final report *do* account for measures that may have been rebated through other utility programs. For the early feedback report, this naturally occurred because customers who had never participated in other programs were targeted for the HECR pilot. In addition, the modeling process also isolates the savings attributable only to HECR. More detail on the methodology to account for these programs can be found in a memo from Michael Ozog of TecMarket Works, regarding omitted variable biases.

Regarding the HEHC audit program, the billing analysis coupled with robust surveys would be cost prohibitive. In order to get a representative sample of all possible actions taken, we use the simplistic approach recommended in the body of the report, which does not take into consideration the behavior aspects (both low cost no cost, and capital investments) that a more robust engineering simulation approach coupled with a billing analysis does. It is also not clear

if all kit items are represented in the Draft TRM. Therefore, the revised HEHC M&V Plan, approved by Evergreen Economics will be deployed for the next and future HEHC evaluations.

Recommendation Number 4:

The Evaluator recommends that Duke Energy Ohio develop a complete list of sources for *ex ante* savings values. The Evaluator states that it is not clear from the 2009 and 2010 Portfolio Status Update and evaluation reports where the entire original *ex ante* savings values originate from, although some references are provided in Appendix A. In 2012, the Evaluator recommends that a comprehensive listing of all *ex ante* savings values and full report citations be compiled for future reference.

Response: In the 2012 Portfolio Status Update Filing, Duke Energy Ohio will provide a comprehensive listing of all *ex ante* savings values and full report citations for future reference.

Recommendation Number 5:

The Evaluator recommends that Duke Energy Ohio adopt the process evaluation recommendations presented in the Company's independent evaluator's reports. The process evaluation work conducted by TecMarket Works resulted in a series of recommendations on how to improve the Duke Energy Ohio programs (the recommendations are not repeated in this report). The Independent Evaluator did review the recommendations and the research supporting them. The Evaluator states that the TecMarket process evaluation report conclusions are sound and therefore recommends that the report findings should be considered by Duke Energy Ohio.

Response:

Duke Energy Ohio considers all recommendations provided by TecMarket Works. Duke Energy Ohio's response to TecMarket Works' recommendations is discussed at length with participants in Duke Energy Ohio Collaborative meetings.

Recommendation Number 6:

The Evaluator states the Duke Energy Ohio should update evaluation research to be more current and Ohio-specific.

Response:

Duke Energy Ohio's evaluations rely on primary data collected from Ohio customers. The timing of the evaluations is dependent on program participation, and the timing of program approvals under Duke Energy Ohio's cost recovery mechanism. It has not always been possible to align the evaluation with a single calendar year.

Recommendation Number 7:

The Evaluator notes that full citations are needed for secondary research and all adjustment factors. Future evaluations should include complete references for all such studies.

Response:

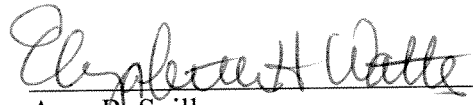
Duke Energy Ohio's will work with its independent consultant, TecMarket Works to ensure that full citations are included in evaluation reports and will include full references where appropriate. To date, Duke Energy Ohio has presented M&V reports to the Ohio Collaborative and when appropriate the Company has been responsive to the feedback that it has received regarding the citations in the reports.

IV. Conclusion

The Evaluator's Report may be of assistance to the Commission in reaching conclusions with respect to the utilities' programs and evaluations. However, it has been produced at a time considerably well down the path of compliance. This presents a significant timing and fairness problem. The Draft TRM has not yet been approved by the Commission, however, Duke Energy Ohio has achieved energy efficiency and peak demand reduction under its original save-a-watt

Rider, DR-SAW, and the successor to DR-SAW, Rider EE-PDR, since 2009. Despite a lack of clarity regarding the applicability of the proposed Ohio TRM, the Company has continued its planning and deployment of programs in order to comply with its annual energy efficiency mandates based on the most up to date and pertinent EM&V data it has. It is anticipated that the Commission will take this timing issue into consideration when considering the application of the Evaluator's findings.

Respectfully submitted on behalf of
Duke Energy Ohio, Inc.,

A handwritten signature in cursive script, appearing to read "Elizabeth H. Watts".

Amy B. Spiller
Elizabeth H. Watts
Duke Energy Business Services LLC
139 E. Fourth Street, 1303 Main
Cincinnati, Ohio 45202

Memorandum

To: Ashlie Ossege Duke Energy

From: Michael Ozog, Integral Analytics

Date: December 5, 2011

Subject: The effect of not account for participation in other programs

There has been a lot of concern recently that our billing data analyses are somehow flawed because we do not adjust for measures that may have been installed through other energy efficiency programs. While this argument does make intuitive sense, it fails upon further examination. This memo presents a rather technical discussion of this issue. The first part of the memo presents a formal discussion of the issue, and the second part indicates what this need not be a concern given the approach we use in the billing data analysis.

Issue

Technically, the idea that the estimated savings for a program that is developed through a regression model may be incorrect if it does not account for participation in other program is a perfect example of what is termed in the literature omitted variable bias. It is straightforward to show that in a model with one included independent variable (X) and omitted independent variable (Z), the bias of the estimated coefficient $\hat{\beta}_x$ on the included variable can be stated as:

$$E(\widehat{\beta}_x) = \beta_x + \left[\frac{Cor(X,Z) \cdot \sigma_z}{\sigma_x} \right] \beta_z ,$$

where β_x is the true effect of X on the dependent variable, β_z is the true effect of Z on the dependent variable, and σ_x and σ_z are the standard deviation of X and Z, respectively.¹

¹ For the where there are more than one included independent variables (X_I) and more than one excluded variables (X_O), the equation becomes:

$$E(\hat{\beta}_I) = \beta_I + (X_I' X_I)^{-1} X_I' X_O$$

(See Green Econometric Analysis, Fifth Edition, 2003, page 148-149.

This result shows that there is indeed a bias associated with not including a relevant variable. What is more noteworthy is that it is possible to estimate the sign and the magnitude of the bias. For this situation, where we expect both programs to produce savings (i.e., both β_x and β_z are negative), and the correlation between X and Z is positive, then the coefficient on the included variable will be biased downward (higher savings), consistent with the intuition.

Note however that the magnitude of the bias depends upon the true value for β_z (in the uninteresting case, if $\beta_z = 0$, there is no bias) as well as the correlation between X and Z (if the variables are uncorrelated, there is also no bias). In this sense, one can roughly view the amount of bias as a function of how much of the omitted variable is explained by the included variable.

We can now use this result to get an estimate on how pervasive the omitted variable bias might be in our billing data analysis. This is addressed in the next section.

Extent of Bias

Based on the above discussion, the key to determining the extent of the bias in the estimated savings found through a model that does not incorporate participation in other programs is the correlation between the participation variable in the model and the omitted participation variable. The first critical thing to note is that this is not the same as the percentage of participants who enrolled in both programs. Since the billing analysis uses cross-section/time series data, the “temporal” difference between the dates that the customer participated in each program can have substantial impacts on the value for the correlation, even though the percentage of customers who participated in multiple programs is quite high.

This can perhaps be understood by some simple examples. First, assume that program participation is modeled through binary (1/0) variables, so the participation variables are zero for those months prior to the participation in a program, and one for all months after the participation date. Now consider a few extreme cases:

1. Suppose that every participant in the program in question also participated in another program, but they did so well in advance of their participation in the program being modeled, so far in the past that had the variable indicating participation in the first program (the omitted variable) is one for every customer. Aside from being collinear with the constant term (which indicates that this prior program is inherently incorporated in the baseline), the standard deviation for this variable (σ_z in the above

equation) is zero, as there is no variation in this variable. The implication is that the bias associated with omitted variable goes to zero – there is no omitted variable bias.

2. At the opposite extreme, suppose again that all participants went on to participate in another program, but did so well after they participated in the program in question. In that situation, the omitted variable is primarily zero, and the standard deviation can be quite small, approaching zero. Again, the above equation indicates that the bias will thus approach zero, and there is no bias associated with omitting participation in the other program.
3. Finally, as before, all participants in one program also participated in another program, but this time at the very same time. In this case, the included participation variable and the omitted variable are identical (i.e., they are perfectly correlated), then the bias will be unity. In other words, the coefficient on the included variable will capture all of the effects of the omitted participation as well, and it is impossible to disentangle the separate savings from each program.

Of course, in practice, none of the above cases are likely to be true. In general, only a fraction of participants in one program participate in another program, and if they do, there is usually a significant time difference between the participation dates. In such a case, there may indeed be some bias introduced, but it is likely to be small. For example, looking at the Duke Power's very successful CFL program, something on the order of 35% of all Duke's customers participated in the program. If we ignore the temporal variation, and assume that 35% of participants in any other Duke program will also have participated in the CFL program, then the bias will be 35% of the savings associated with CFLs. If the monthly savings from the CFL program is, for illustration, around 30 kWh, the expected bias is around 10 kWh. This relatively small effect is likely lost in the variation in usage across customers and over time.

Another aspect of the omitted bias issues relates to our use of the fixed-effect model. It can be shown that the fixed-effect specification will automatically eliminate the bias from omitted variables if these variables are either constant over time or constant across customers. For cases where these conditions do not hold (which is probably the case for multiple program participation), the fixed-effect approach does not eliminate the bias, but it does reduce the bias. To appreciate this result, the fixed-effect model:

$$y_{it} = \beta_i + \beta'x_{it} + \varepsilon_{it}$$

Can be estimated (assuming no serial correlations) using the first-difference:

$$\Delta y_i = \beta' \Delta x_i + \mu_i$$

The first difference the two participation variables (the included one X and the omitted one Z), this first difference will convert them from vectors of zeros and ones to a vector with many zeros and only a single value equal to one. This results in a substantial decrease in the correlation between the two variables, thus indicating a very small bias from omitting participation in other programs.