

**Before The
Public Utilities Commission of Ohio**

**Ohio Edison Company
The Cleveland Electric Illuminating Company and
The Toledo Edison Company**

**Energy Efficiency & Peak Demand Reduction
Program Portfolio Status Report**

For the Period January 1, 2010 through December 31, 2010

May 23, 2011

**Docket No. 11-2956-EL-EEC
Docket No. 11-2958-EL-EEC
Docket No. 11-2959-EL-EEC**

I. INTRODUCTION

Pursuant to Section 4901:1-39-05, O.A.C., Ohio Edison Company (“Ohio Edison” or “OE”), The Cleveland Electric Illuminating Company (“CEI”) and The Toledo Edison Company (“Toledo Edison” or “TE”) (collectively, “Companies”) submit their Portfolio Status Report (“Report”) for the period January 1, 2010 through December 31, 2010 (“Reporting Period”). This Report addresses the Companies’ compliance with the energy efficiency (“EE”) and peak demand reduction (“PDR”) benchmarks set forth in R.C. § 4928.66(A) for the Reporting Period.

A. History and Background

On December 15, 2009, the Companies filed their respective three year Energy Efficiency and Peak Demand Reduction Plans (“EEPDR Plans”) in Case No. 09-1947-EL-POR et al (“Portfolio Case”).¹ On October 27, 2009, as allowed by R.C. § 4928.66(A)(2)(b) and Commission Rule 4901:1-39-05(J), Ohio Administrative Code, the Companies, for various reasons, requested an amendment to their 2009 statutory EE benchmarks in Case No. 09-1004-EL-EEC et al (“2009 Amendment Case”).² Pursuant to the January 7, 2010 Finding and Order issued by the Public Utilities Commission of Ohio (“Commission”) in the 2009 Amendment Case, the Companies’ 2009 statutory benchmarks for EE were amended to zero, contingent on the Companies meeting revised benchmarks in subsequent years that would be determined as part of the Commission’s review of the Companies’ EEPDR Plans in the Portfolio Case. No similar contingency was placed on the Companies’ 2009 PDR benchmark requirements.

Because the Commission had not issued an Order in the Portfolio Case by the end of 2010, the Companies, on January 11, 2011, submitted an application for an amendment to their respective 2010 EE and PDR benchmarks, *if and only to the extent* one was necessary for the Companies to be in compliance with their yet-to-be-defined revised benchmarks (“2010 Amendment Case”).³ As of March 9, 2011, the Commission had not issued a ruling in the 2010 Amendment Case, but on that date, in a Finding and Order in that case, the Commission extended the deadline for submitting the Companies’ Report for the Reporting Period from March 15, 2011 to May 15, 2011.⁴

On March 23, 2011, the Commission issued its Order in the Portfolio Case (“Portfolio Order”), stating:

¹ See generally, *In re, Application of [the Companies] for Approval of Their Energy Efficiency and Peak Demand Reduction Program Portfolio Plans for 2010 Through 2012 and Associated Cost Recovery Mechanism*, Case No. 09-1947-EL-POR et al, Application and Related Reports (Dec. 15, 2009).

² See *In the Matter of the Application of [the Companies] to Amend Their 2009 Energy Efficiency Benchmarks*, Application (Oct. 27, 2009).

³ See generally, *In re Application of [the Companies] to Amend Their 2010 Energy Efficiency and Peak Demand Reduction Benchmarks*, Case No. 11-126-EL-EEC et al, Application (Jan. 11, 2011).

⁴ *Id.*, Finding and Order, p. 2 (Mar. 9, 2011).

Based upon the record in this proceeding, the Commission finds that it is unnecessary to further revise the specific statutory benchmarks for 2010, 2011 and 2012, provided that [the Companies] meet the cumulative energy efficiency savings for the three years implicit in Section 4928.66(A)(1)(a), Revised Code.^[5]

As of May 15th, the Commission had not yet addressed the Companies' request for amendments to their various benchmarks in the 2010 Amendment Case. Therefore, on May 16, 2011, they filed a motion for an extension of time in which to file this Report until 10 days after the Commission issued a ruling in the 2010 Amendment Case.⁶ In a May 19, 2011 Finding and Order, the Commission granted the Companies' motion and ruled on the Companies' Application for Amendments to their 2010 EE and PDR benchmarks.⁷ In the Order, the Commission found the request for an amendment of either CEI's or Toledo Edison's 2010 benchmarks to be moot, saying:

[The Companies] represent that CEI and TE met their statutory energy efficiency benchmarks and that the application for an amendment was only necessary if the Commission amended their statutory 2010 energy efficiency benchmarks. Since those benchmarks were not amended by the Commission, it is unnecessary to grant the application for an amendment of CEI's and TE's energy efficiency benchmarks.^[8]

The Commission further concluded that, based on R. C. § 4928.66(A)(2)(b), Ohio Edison's request for amendments to its 2010 EE and PDR benchmarks to actual levels achieved during 2010 should be granted due to regulatory reasons beyond its control, provided that the company meets the cumulative energy savings mandated by statute by 2012.⁹

It is based upon the foregoing rulings that the Companies submit this Report.

B. Outstanding Issues that Affect this Report.

There are several issues that affect how the information included in this Report is presented. First, there are a number of applications still pending approval at the Commission that will affect the final actual results in both 2009 and 2010.¹⁰ The exhibits included with this Report bifurcate the results, showing the results from both (i) all applications and programs

⁵ Portfolio Case, Finding and Order, p. 6 (Mar. 23, 2011).

⁶ The Motion was filed on May 16th because May 15th was a Sunday.

⁷ 2010 Amendment Case, Case No. 11-126-EL-EEC, et al, Finding and Order, p. 2 (May 19, 2011).

⁸ Id. at 4-5.

⁹ Id. at 5.

¹⁰ See e.g., cases listed in footnotes 12 and 13, *infra*.

approved as of March 2, 2011¹¹; and (ii) all applications still pending before the Commission as of March 2, 2010, assuming the latter applications and related results are approved as filed.

Further, the Companies are once again challenged by the fact that Section 4901:1-39-05(C), O.A.C., requires that this Report include “all *approved* energy efficiency and peak demand reduction programs in [the Companies’] *program portfolio plan[s]*.” (Emphasis added.) As of December 31, 2010, the EEPDR Plans were not yet approved. Therefore, there are no program results from *approved* EEPDR Plans to address for the Reporting Period in this Report. Instead, this Report provides results on those programs in effect during 2010 that were either independently approved by the Commission (Interruptible Demand Reduction, Home Energy Analyzer and Community Connections); or authorized by statute (Mercantile Customer Program and the T&D Program) (collectively “2010 Programs”).

And finally, while the Commission reiterated in its Portfolio Order its policy to determine energy savings based on a pro rata, rather than an annualized accounting methodology,¹² this issue is the subject of an Application for Rehearing, submitted by the Companies in the Portfolio Case on April 22, 2011.¹³ Therefore, because this issue has not yet been ultimately resolved, this Report includes results determined based upon the pro rata methodology, with annualized savings results included as Appendix A.¹⁴

C. Summary of Results

The aforementioned 2010 Programs resulted in actual energy savings during the Reporting Period of 91,147 MWh (59,854 MWhs - OE; 17,938 MWhs – CEI; and 13,355 MWhs - TE) and peak demand reduction capabilities/results of 237.60 MWs (64.82 MWs – OE; 48.84 MWs – CEI; and 123.94 MWs – TE). A summary of the 2010 results for each Company by program is attached hereto as Exhibit 1. Further, the Companies have a number of applications still pending before the Commission that, if approved as filed, would result in significant additional EE and PDR savings, which is also reflected on attached Exhibit 1. In addition to the 31 Mercantile Customer Projects already approved by the Commission (“Approved Mercantile Projects”) and included in the 2010 results¹⁵, there are another 58 Mercantile Customer

¹¹ This deadline was necessary in order to provide sufficient time for EM&V reports to be completed in a timely manner.

¹² Portfolio Case, Case No. -9-1947-EL-POR, et al, Finding and Order, p. 21 (Mar, 23, 2011).

¹³ *Id.*, Companies’ Application for Rehearing (Apr. 22, 2011).

¹⁴ While page 8 of Appendix A indicates the differential between pro rata and annualized savings as 6,365 MWhs – OE; 2,717 MWhs – CEI and 6,709 MWhs - TE, this relatively minor differential is due to the fact that a significant portion of the 2010 results were based on historic mercantile customer projects, where full year savings could be recognized under either savings determination methodology. The Companies anticipate this differential being significantly greater in future status reports as approved programs are implemented.

¹⁵ See Feb. 11, 2010 Finding and Orders issued in Case Nos. 09-0595-EL-EEC, 09-1100-EL-EEC, 09-1101-EL-EEC, 09-1102-EL-EEC; 09-1200-EL-EEC, 09-1201-EL-EEC.

applications¹⁶, and two T&D applications¹⁷ still pending approval at the Commission. If approved as filed, these various projects would result in additional energy savings of 476,258 MWhs. (104,511 MWhs – OE; 255,138 MWhs – CEI and 116,609 MWhs – TE).¹⁸

As demonstrated on attached Exhibit 2, based on actual results from approved programs, and projected results from pending programs, assuming they are approved as filed, CEI and Toledo Edison both exceeded their respective 2010 statutory EE and PDR benchmarks.¹⁹ Ohio Edison had a statutory benchmark of 197,959 MWhs, and achieved 164,365 MWhs, thus meeting its amended 2010 EE benchmark, which was amended to actual levels achieved. It also had a statutory PDR benchmark of 90.20 MWs, achieving 73.26 MWs, thus meeting its amended 2010 PDR benchmark, which was also amended to actual levels achieved.

II. 2010 COMPLIANCE DEMONSTRATION

Section 4901:1-39-05(C)(1), O.A.C., requires that a utility demonstrate the actual energy savings and demand reductions, and the expected demand reductions that the utility's EE&PDR programs have achieved during the reporting period, relative to the utility's corresponding baselines. In doing so, a utility must provide: (i) an update to the initial benchmark report; (ii) a comparison with the applicable benchmark; and (iii) an affidavit of compliance. Each requirement as applicable to the Companies is discussed below.

A. Benchmark Update

The Companies' Initial Benchmark Reports (for the years 2009 through 2012) were submitted for Commission approval as part of their respective EEPDR Plans.²⁰ The initial benchmarks included in the EEPDR Plans incorporated projected amounts contributed by mercantile customer projects filed for approval by December 1, 2009. Therefore, those benchmarks have been updated, as shown in Exhibits 7 and 8 to reflect only the amounts contributed by the Approved Mercantile Projects. No other adjustments to the initial benchmarks have been made.

¹⁶ For a list of outstanding mercantile customer applications, see attached Exhibit 5.

¹⁷ *In the Matter of the Energy Efficiency and Peak Demand Reduction Program Portfolio of Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company*, Case No. 09-951-EL-EEC et al.; *In the Matter of the Energy Efficiency and Peak Demand Reduction Program Portfolio of Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company*, Case No. 10-3023-EL-EEC, et al.

¹⁸ See Exhibit 1.

¹⁹ Toledo Edison also exceeded its PDR requirements based solely on approved programs and projects.

²⁰ Each Company's Initial Benchmark Report was included in the Companies' respective EEPDR Plan as Section 1.0, Table 4. See Application, Case Nos. 09-1947-EL-POR et al. The Benchmark Report for CEI as set forth in its Plan was corrected during the evidentiary hearing in that proceeding.

B. 2010 Benchmark Requirements

1. Energy Efficiency Benchmark Requirements

Exhibit 2 demonstrates that CEI and Toledo Edison exceeded their statutory EE benchmarks by 122,500 MWhs and 48,760 MWhs, respectively, when results from approved and pending applications are considered.²¹ Ohio Edison had a statutory benchmark of 197,959 MWhs, and achieved 164,365 MWhs, thus meeting its amended 2010 EE benchmark, which was amended to actual levels achieved.

2. Peak Demand Reduction Benchmark Requirements

Exhibit 2 demonstrates that CEI and Toledo Edison had the capability to reduce peak demand during 2010 by 71.73 MWs and 148.91 MWs, respectively, thus exceeding their statutory benchmarks of 71.70 MWs and 35.20 MWs by 0.03 MWs and 113.71 MWs, respectively, when projected results from pending applications are included.²² Ohio Edison had a statutory PDR benchmark of 90.20 MWs, achieving 73.26 MWs, thus meeting its amended 2010 PDR benchmark, which was amended to actual levels achieved.

C. Affidavit of Compliance

Attached hereto as Exhibit 9 is an affidavit of Compliance executed by John C. Dargie, Vice President, Energy Efficiency.

III. PROGRAM PERFORMANCE ASSESSMENT

Section 4901-1-39-05(C)(2), O.A.C., requires a demonstration by an electric distribution utility of the successful implementation of “the energy efficiency and demand-reduction programs *approved* in its program portfolio plan[s]” (italics added), which should include: (i) a description of each approved EE&PDR program implemented in the previous calendar year; (ii) an evaluation, measurement and verification (“EM&V”) report documenting the actual EE and PDR results and the cost effectiveness of each program; and (iii) recommendations concerning the continuation of each program. Inasmuch as the Commission had not approved the Companies’ EEPDR Plans prior to December 31, 2010, the Companies cannot provide information on *approved* programs included in the Companies’ respective EEPDR Plans for the Reporting Period. Instead, the Companies provide the following information regarding the 2010 Programs.

²¹ The Companies intend to bank any surplus energy savings and apply such savings toward future energy efficiency benchmarks to the extent permitted by law.

²² Based only on approved programs and projects, Toledo Edison exceeded its 2010 statutory PDR benchmark by 88.74 MWs.

A. Description of the 2010 Programs

The 2010 Programs include: (i) The Home Energy Analyzer; (ii) Community Connections Program; (iii) the Companies' Mercantile Customer Programs; (iv) Interruptible Demand Reduction Program; and (v) The T&D Projects Program. A description²³ of each of the 2010 Programs is attached as Exhibit 3, including a summary of the key activities,²⁴ and program recommendations.²⁵ In Exhibit 4, the Companies present more detailed company-specific information regarding the 2010 Programs, including the number and type of participants,²⁶ actual savings for each of the Companies and each 2010 Program,²⁷ as well as anticipated savings over the life of the program.²⁸ In Exhibit 5, the Companies also present a summary of all EE and PDR results attributable to the Approved Mercantile Projects, along with the anticipated results should the remaining applications currently pending before the Commission be approved.²⁹ Finally, while not yet approved, a list and description of the Companies' 2009 and 2010 T&D projects that are the subject of separate applications still pending before the Commission is included as Exhibit 6.³⁰

B. Evaluation, Measurement and Verification Report

Pursuant to Rule 4901:1-39-05(C)(2)(b), an electric distribution utility must include an Evaluation, Measurement and Verification ("EM&V") report that documents "the energy savings and peak-demand reduction values and the cost-effectiveness of each energy efficiency and demand-side management program reported in the electric utility's portfolio status report," including (i) "documentation of any process evaluations and expenditures"; (ii) "measured and verified savings"; and (iii) the "cost-effectiveness of each program." The EM&V Report must confirm that the measures were actually installed, the installation meets reasonable quality standards, and the measures are operating correctly and are expected to generate the predicted savings. Although the Technical Reference Manual for Ohio (the "TRM") remains under development,³¹ EM&V was generally conducted consistent with the most current draft, except where issues identified by Ohio's electric distribution companies in their joint comments filed in Case No. 09-512-GE-UNC are in dispute. For details on how EM&V was conducted, see the applicable reports included as Appendices B-D.³²

²³ Section 4901:1-39-05(C)(2)(a), O.A.C.

²⁴ Section 4901:1-39-05(C)(2)(a)(i), O.A.C.

²⁵ Section 4901:1-39-05(C)(2)(c), O.A.C.

²⁶ Section 4901:1-39-05(C)(2)(a)(i), O.A.C.

²⁷ *Id.*

²⁸ *Id.*

²⁹ Section 4901:1-39-05(C)(2)(a)(ii), (iii), O.A.C.

³⁰ Section 4901:1-39-05(C)(2)(a)(iv), O.A.C.

³¹ *See, generally*, docket for Case No. 09-512-GE-UNC.

³² These EM&V reports were prepared consistent with a template provided to the Companies in February, 2011, by the Commission's EM&V consultant.

C. Recommendations Concerning 2010 Programs

The Companies have been able to achieve significant energy savings and peak demand reduction capabilities that warrant a continuation of the 2010 Programs, as set forth in Exhibit 3 and Appendices B-D. These programs will be supplemented in 2011 by various other programs included in the EEPDR Plans when launched throughout the remainder of 2011.

IV. REQUEST FOR WAIVERS

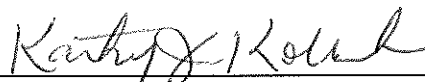
The requirements of Section 4901:1-39-05(C), O.A.C., are challenging given that the foundation for the requirements of that section is a reporting on programs "*approved*" by the Commission in a utility's three-year program portfolio plan; and the Companies' respective plans had not been approved during the Reporting Period. These challenges are further exacerbated by the fact that the Commission has yet to approve the technical reference manual, which was intended to provide savings values for many of the measures included in those plans. As a result, the Companies have presented the best information available regarding the 2010 Programs. But, in light of the foregoing constraints, the Companies respectfully request a waiver of Section 4901:1-39-05(C), O.A.C., to the extent the information available and presented does not conform to the unattainable requirements of that Section.

V. CONCLUSION

In sum, each of the Companies achieved their respective 2010 EE and PDR benchmarks. Toledo Edison did so based upon actual results achieved during 2010 for its PDR requirements, and actual results and projected results from applications still pending approval by the Commission for its EE requirements. CEI, met its EE and PDR benchmarks based on actual results and projected results from applications still pending before the Commission. And Ohio Edison met its benchmarks based upon the amendments to its 2010 EE and PDR benchmarks as set forth in the Commission's May 19, 2011 Finding and Order in the 2010 Amendment Case. The Companies' thank the Commission for the opportunity to provide information on their

energy efficiency and peak demand reduction activities during 2010 and are available to address any questions, concerns or other issues arising from any aspect of this Report.

Respectfully submitted,



Kathy J. Kolich, Counsel of Record
Carrie M. Dunn
FIRSTENERGY SERVICE COMPANY
76 South Main Street
Akron, OH 44308
(330) 384-4580 (telephone)
(330) 384-3875 (fax)
kjkolich@firstenergycorp.com
cdunn@firstenergycorp.com

ATTORNEYS FOR APPLICANTS, OHIO
EDISON COMPANY, THE CLEVELAND
ELECTRIC ILLUMINATING COMPANY,
AND THE TOLEDO EDISON COMPANY

EXHIBIT-1

Summary of 2010 Partial Year Actual and Potential Results ¹

Approved Programs	Ohio Edison		Cleveland Electric		Toledo Edison		Program Totals	
	MWh	MW	MWh	MW	MWh	MW	MWh	MW
Community Connections ²	1,206	0.04	1,077	0.05	403	0.02	2,686	0.11
Home Energy Analyzer	4,440	1.08	3,173	0.74	1,222	0.31	8,835	2.13
Interruptible Demand Reduction ³	0	59.44	0	46.65	0	121.91	0	228.00
Mercantile Customer	54,208	4.26	13,688	1.40	11,730	1.70	79,626	7.36
Subtotal Actual Results	59,854	64.82	17,938	48.84	13,355	123.94	91,147	237.60
Pending Programs								
Mercantile Customer	92,942	8.44	251,770	22.89	111,905	24.97	456,617	56.30
Transmission and Distribution	11,569	0.00	3,368	0.00	4,704	0.00	19,641	0.00
Subtotal Potential Results	104,511	8.44	255,138	22.89	116,609	24.97	476,258	56.30
Total Results	164,365	73.26	273,076	71.73	129,964	148.91	567,405	293.90

Note:

¹ *Ex ante* partial year results from approved 2010 Programs; potential results from 2010 applications pending before the Commission. Values include adjustments by appropriate loss factors with the exception of Interruptible Demand Reduction and Transmission and Distribution values. Community Connections values are from program inception to date; 2009 savings results are from similar installations that were subject to M&V in 2010 with demonstrated *ex post* savings.

² Community Connections *ex ante* MW savings calculation based on 2009 results. OPAE did not provide *ex ante* MW savings data for 2010.

³ The PDR capability associated with the Companies' Interruptible Demand Reduction program is calculated using the Load Modifying Resource MWs claimed at MISO as capacity through the Module E Tariff provisions of the MISO OATT. Customers who are taking service under the Companies' Economic Load Response Rider are the Load Modifying Resources.

EXHIBIT-2

Comparison of 2010 Partial Year Results to Benchmarks

Energy Efficiency Benchmarks and Results (MWh)						Peak Demand Benchmarks and Results (MW)				
Utility	2009 Statutory Benchmark	Updated 2010 Compliance Benchmark	Savings from Approved Programs (B)	Savings from Pending Programs (C)	Savings from Approved and Pending Programs (D)	2009 Statutory Benchmark	Updated 2010 Compliance Benchmark	Savings from Approved Programs (F)	Savings from Pending Programs (G)	Savings from Approved and Pending Programs (H)
OE	76,783	197,959	59,854	104,511	164,365	52.78	90.20	64.82	8.44	73.26
CEI	58,155	150,576	17,938	255,138	273,076	41.59	71.70	48.84	22.89	71.73
TE	31,349	81,204	13,355	116,609	129,964	20.07	35.20	123.94	24.97	148.91
Total	166,287	429,739	91,147	476,258	567,405	114.44	197.10	237.60	56.30	293.90

Notes:

(A): The derivation of the Companies' updated EE benchmarks is set forth in Exhibit 7.

(B): The Companies' *ex ante* EE partial year savings reflect the expected savings for the 2010 Programs, including the Approved Mercantile Projects.

(C): The Companies' potential *ex ante* EE partial year savings reflect the projected savings from the 2009 and 2010 T&D and mercantile applications still pending before the Commission.

(D): The Companies' sum total *ex ante* EE partial year savings from approved 2010 Programs as well as the projected savings from the T&D and mercantile applications still pending before the Commission.

(E): The derivation of the Companies' updated PDR benchmarks is set forth in Exhibit 8.

(F): The Companies' *ex ante* PDR partial year savings reflect capabilities/results expected for the 2010 Programs, including the Approved Mercantile Projects.

(G): The Companies' potential *ex ante* PDR partial year savings reflect projected capabilities/results from the pending mercantile applications.

(H): The Companies' sum total *ex ante* PDR partial year savings from approved 2010 Programs as well as the projected savings from the mercantile applications still pending before the Commission.

EXHIBIT-3

The Companies' 2010 Approved Programs			
Program	Program Description	Key Activities	Program Recommendation
Community Connections	The Community Connections Program provides weatherization measures, energy efficient solutions, and client education to the Companies' low-income customers. This program is administered by Ohio Partners for Affordable Energy (OPAE) and includes working with a network of community-based agencies and subcontractors to perform weatherization measures, energy efficient solutions, and customer education.	<ul style="list-style-type: none"> • Replaced incandescent light bulbs with Compact Fluorescent light bulbs • Replaced inefficient refrigerators and freezers with Energy Star units • Repaired or replaced roofs • Performed electrical upgrades or repairs • Provided services to 2,393 participants 	The Companies recommend that this program continue, consistent with the ESP Stipulation in Case No. 10-388-EL-SSO and as set forth in the Companies' three-year EE&PDR Plan.
Home Energy Analyzer	The Home Energy Analyzer tool is a software program that provides the Company with the necessary tools needed to properly supply customers with the information and education required to lower their energy costs through energy efficiency program participation and other actions.	<ul style="list-style-type: none"> • Implemented/Updated Bill Prism - new module in Aclara where a customer can analyze bills • Provided services to 43,575 participants 	The Companies recommend that this program continue, as set forth in the Companies' three-year EE&PDR Plans.
Interruptible Demand Reduction	The objective of the Interruptible Demand Reduction program is load curtailment.	<ul style="list-style-type: none"> • Conducted monthly test of the curtailment notification system to ensure interruptible customers receive required notifications • Provided services to 32 participants 	The Companies recommend that this program continue, consistent with the ESP Stipulation in Case No. 08-935-EL-SSO through May 2011. The Companies will update the recommendation in their 2011 status report.
Mercantile Customer	All customers that meet the definition of "mercantile customer" as defined in R.C. § 4928.01 (A) (19) are eligible for this program.	<ul style="list-style-type: none"> • Reviewed documentation for 89 mercantile applications to validate the information provided supports the calculation of EE&PDR savings • Responded to data requests for applications pending Commission approval • Received Commission approval for 31 mercantile applications 	The Companies recommend that this program continue, as set forth in the Companies' three-year EE&PDR Plans.
Transmission and Distribution Projects	Past and present Transmission and Distribution infrastructure improvement projects will be filed in accordance with Commission rules with savings calculated based on pre-project and post-project electrical system parameters using a load flow analysis tool.	<ul style="list-style-type: none"> • Re-conductoring of lines • Substation improvements • Adding capacitor banks • Replacement of regulators 	The Companies recommend that this program continue, as set forth in the Companies' three-year EE&PDR Plans.

EXHIBIT-4

The Ohio Edison Company 2010 Program Performance Assessment							
Approved Programs	# of Participants	Type of Participants	Partial Year Savings ¹		Anticipated Lifetime Savings		Cost Effectiveness (TRC)
			MWh	MW	MWh	MW	
Community Connections ³	1,517	Residential Low-Income	1,206	0.04	4,605	0.07	\$3,161,259 0.26
Home Energy Analyzer	22,164	Residential	4,440	1.08	4,440	1.08	\$236,579 1.38
Mercantile Customer ⁴	15	Small Enterprise / Mercantile Utility	54,208	4.26	813,120	4.26	\$560,135 1.56 ⁵
Interruptible Demand Reduction	25	Mercantile Utility	0	59.44	0	59.44	\$3,704,576 N/A ⁶
Subtotal Actual Results			59,854	64.82	822,165	64.85	\$7,662,549
Pending Programs							
Mercantile Customer	26	Small Enterprise / Mercantile Utility	92,942	8.44	1,394,130	8.44	Included in costs referenced above 1.56 ⁵
Subtotal Potential Results			92,942	8.44	1,394,130	8.44	\$0
Total Results			152,796	73.26	2,216,295	73.29	\$7,662,549

Notes:

- ¹ Ex ante partial year results from approved 2010 Programs; potential results from 2010 applications pending before the Commission. Values include adjustments by appropriate loss factors with the exception of Interruptible Demand Reduction values. Community Connections values reflect program inception to date; 2009 savings results are from similar installations that were subject to M&V in 2010 with demonstrated ex post savings.
- ² Community Connections 2010 charges are recovered under Rider DSM; Interruptible Demand Reduction 2010 charges are recovered under Rider DSE1; Home Energy Analyzer and Mercantile Customer 2010 charges are included in the 2011 rate for Rider DSE2.
- ³ Community Connections ex ante MW savings calculation based on 2009 results; OP&E did not provide ex ante MW savings data for 2010; Lifetime Savings based on ex post results as ex ante data provided by OP&E did not support this calculation.
- ⁴ Mercantile Customer expenditures reflect all administrative, legal and Administrator fees associated with the Mercantile Program through the end of 2010. Also includes a forecast of costs associated with the EM&V Report as well as cash rebates and variable Administrator fees for the two applications approved on March 2, 2011, under the Mercantile Pilot Auto Approval Process (Docket Numbers 10- 2026 and 10-2081).
- ⁵ The TRC test calculations for the Mercantile Projects does not include mercantile customer costs, making the number equal to a Utility Cost Test ("UCT").
- ⁶ Approved as a result of the Commission's findings in Case No. 08-935-EL-SSO. Accordingly, no TRC test is required.

EXHIBIT-4

The Cleveland Electric Illuminating Company 2010 Program Performance Assessment							
Program	# of Participants	Type of Participants	Partial Year Savings ¹		Anticipated Lifetime Savings		Cost Effectiveness (TRC)
			MWh	MW	MWh	MW	
Community Connections ³	2,205	Residential Low-Income	1,077	0.05	8,041	0.13	\$4,100,503 0.23
Home Energy Analyzer	15,126	Residential	3,173	0.74	3,173	0.74	\$178,243 1.25
Mercantile Customer ⁴	9	Small Enterprise / Mercantile Utility	13,688	1.40	205,320	1.40	\$347,906 453 ⁵
Interruptible Demand Reduction	2	Mercantile Utility	0	46.65	0	46.65	\$4,322,857 N/A ⁶
Subtotal Actual Results			17,938	48.84	216,534	48.92	\$8,949,509
Pending Programs							
Mercantile Customer	14	Small Enterprise / Mercantile Utility	251,770	22.89	3,776,550	22.89	Included in costs referenced above 453 ⁵
Subtotal Potential Results			251,770	22.89	3,776,550	22.89	\$0
Total Results			269,708	71.73	3,993,084	71.81	\$8,949,509

Notes:

- ¹ Ex ante partial year results from approved 2010 Programs; potential results from 2010 applications pending before the Commission. Values include adjustments by appropriate loss factors with the exception of Interruptible Demand Reduction values. Community Connections values reflect program inception to date; 2009 savings results are from similar installations that were subject to M&V in 2010 with demonstrated ex post savings.
- ² Community Connections 2010 charges are recovered under Rider DSM; Interruptible Demand Reduction 2010 charges are recovered under Rider DSE1; Home Energy Analyzer and Mercantile Customer 2010 charges are included in the 2011 rate for Rider DSE2.
- ³ Community Connections ex ante MW savings calculation based on 2009 results; OPAE did not provide ex ante MW savings data for 2010; Lifetime Savings based on ex post results as ex ante data provided by OPAE did not support this calculation.
- ⁴ Mercantile Customer expenditures reflect all administrative, legal and Administrator fees associated with the Mercantile Program through the end of 2010. Also includes a forecast of costs associated with the EM&V Report as well as cash rebates and variable Administrator fees for the application approved on March 2, 2011, under the Mercantile Pilot Auto Approval Process (Docket Number 10-1990).
- ⁵ The TRC test calculations for the Mercantile Projects does not include mercantile customer costs, making the number equal to a Utility Cost Test ("UCT").
- ⁶ Approved as a result of the Commission's findings in Case No. 08-935-EL-SSO. Accordingly, no TRC test is required.

EXHIBIT-4

The Toledo Edison Company 2010 Program Performance Assessment							
Program	# of Participants	Type of Participants	Partial Year Savings ¹		Anticipated Lifetime Savings		Cost Effectiveness (TRC)
			MWh	MW	MWh	MW	
Community Connections ³	486	Residential Low-Income	403	0.02	1,318	0.02	0.12
Home Energy Analyzer	6,285	Residential	1,222	0.31	1,222	0.31	0.97
Mercantile Customer ⁴	7	Small Enterprise / Mercantile Utility	11,730	1.70	175,950	1.70	319 ⁵
Interruptible Demand Reduction	5	Mercantile Utility	0	121.91	0	121.91	N/A ⁶
Subtotal/Actual Results			13,355	123.94	178,490	123.95	\$7,059,951
Pending Programs							
Mercantile Customer	18	Small Enterprise / Mercantile Utility	111,905	24.97	1,678,575	24.97	Included in costs referenced above
Subtotal/Potential Results			111,905	24.97	1,678,575	24.97	\$0
Total Results			125,260	148.91	1,857,065	148.92	\$7,059,951

Notes:

- ¹ Ex ante partial year results from approved 2010 Programs; potential results from 2010 applications pending before the Commission. Values include adjustments by appropriate loss factors with the exception of Interruptible Demand Reduction values. Community Connections values reflect program inception to date; 2009 savings results are from similar installations that were subject to M&V in 2010 with demonstrated ex post savings.
- ² Community Connections 2010 charges are recovered under Rider DSM; Interruptible Demand Reduction 2010 charges are recovered under Rider DSE1; Home Energy Analyzer and Mercantile Customer 2010 charges are included in the 2011 rate for Rider DSE2.
- ³ Community Connections ex ante MW savings calculation based on 2009 results; OPAE did not provide ex ante MW savings data for 2010; Lifetime Savings based on ex post results as ex ante data provided by OPAE did not support this calculation.
- ⁴ Mercantile Customer expenditures reflect all administrative, legal and Administrator fees associated with the Mercantile Program through the end of 2010. Also includes a forecast of costs associated with the EM&V Report as well as cash rebates and variable Administrator fees for the application approved on March 2, 2011, under the Mercantile Pilot Auto Approval Process (Docket Number 10-2135).
- ⁵ The TRC test calculations for the Mercantile Projects does not include mercantile customer costs, making the number equal to a Utility Cost Test ("UCT").
- ⁶ Approved as a result of the Commission's findings in Case No. 08-935-EL-SSO. Accordingly, no TRC test is required.

EXHIBIT-5

Ohio Edison Company Mercantile Applications Filed as of: Dec 31, 2010				
Customer Name	Docket Number	MWh	MW	Date Filed
PCC Airfoils LLC	09-1200	1,776	0.20	7/28/2009
Heinz Frozen Foods - Weight Watchers	09-1201	11,572	0.00	7/29/2009
Automated Packaging	09-1202	626	0.09	10/15/2009
Cardington Yutaka	09-1203	1,917	0.00	10/15/2009
U S Foodservice	09-1204	1,476	0.13	10/23/2009
Elyria Foundry Company	09-1205	9,346	0.00	10/28/2009
McGraw Hill Company Incorporated	09-1207	2,362	0.43	11/12/2009
Coastal Pet Products	09-1208	1,242	0.20	12/9/2009
Sterling Jewelers Inc.	09-1209	1,355	0.20	11/4/2009
Whirlpool Corporation Plant	09-1210	7,360	0.84	11/25/2009
Republic Engineered Products ¹	09-1212	2,052	0.33	11/25/2009
	09-1212	5,492	0.76	03/29/2010
Quaker City Castings	09-1214	483	0.00	12/23/2009
Ellwood Engineered Castings	09-1216	491	0.16	12/23/2009
Discount Drug Mart Inc.	10-2081	1,140	0.22	12/30/2010
Rubbermaid Inc.	10-2026	5,519	0.69	12/30/2010
Approved Application Subtotal		54,209	4.26	
Plastipak Packaging	09-1206	8,603	0.00	10/28/2009
Ohio Star Forge Company	09-1217	936	0.45	12/28/2009
PPG	09-1224	8,159	0.95	12/23/2009
Johnny Appleseed Broadcasting	09-1226	181	0.02	12/8/2009
McMaster Carr	09-1228	1,315	0.32	12/31/2009
AK Steel	09-1231	36,261	0.00	12/31/2009
Lowes Home Centers	10-2008	8,263	1.40	07/28/2010
Stanley Electric	10-2010	450	0.00	4/19/2010
Kovatch Castings	10-2011	324	0.03	8/23/2010
Fedex Custom Critical	10-2012	697	0.00	2/1/2010
A.I. Root Company	10-2013	314	0.06	6/9/2010
Steere Enterprises	10-2014	288	0.03	6/9/2010
Mateo Tools	10-2015	363	0.07	5/6/2010
Ashland City School District	10-2018	414	0.00	9/9/2010
Energizer Battery Manufacturing	10-2019	2,340	0.25	8/23/2010
Ashland County West Holmes Joint Vocational S	10-2021	80	0.03	09/09/2010
The Cleveland Clinic Foundation	10-2025	548	0.00	08/03/2010
General Motors Company LLC	10-2033	3,584	0.35	12/30/2010
IRG Rubber City LLC	10-2035	6,443	1.49	12/30/2010
Bendix Commercial Vehicle Systems LLC	10-2037	926	0.10	6/9/2010
Hitachi Medical Systems America	10-2039	42	0.01	9/10/2010
McMaster Carr	10-2045	291	0.09	8/23/2010
Sterling Jewelers Inc.	10-2053	113	0.04	8/23/2010
Youngstown State University	10-2055	9,150	2.55	12/30/2010
Giant Eagle Inc.	10-2064	2,856	0.19	12/30/2010
Pending Application Subtotal		92,942	8.44	
Total		147,150	12.70	

Note:

Data associated with the Approved Mercantile Projects are highlighted in the tables above.

¹ Additional project added to Docket Number 09-1212 on 03/29/2010.

2010 Mercantile Self Direct Application Details

EXHIBIT-5

The Cleveland Electric Illuminating Company Mercantile Applications Filed as of: Dec 31, 2010				
Customer Name	Docket Number	MWh	MW	Date Filed
Progressive Casualty Insurance Company	09-0595	3,344	0.00	7/15/2009
Lubrizol Corporation	09-1100	1,500	0.35	7/28/2009
Automated Packaging	09-1101	846	0.11	10/29/2009
Polychem Corporation	09-1102	947	0.10	11/4/2009
Parma General Community Hospital	09-1103	2,420	0.00	11/4/2009
The Sherwin Williams Company	09-1107	1,210	0.28	12/31/2009
Metrohealth Medical Center	09-1109	2,432	0.36	12/30/2009
Energizer Battery Manufacturing	09-1116	354	0.08	12/30/2009
Discount Drug Mart Inc.	10-1990	635	0.12	12/30/2010
Approved Application Subtotal		13,688	1.40	
4Cs	09-1105	359	0.05	12/23/2009
Charter Steel	09-1117	25,630	5.23	12/23/2009
Catanzarite Investment Company	09-1118	262	0.12	12/31/2009
ISG - ArcelorMittal	09-1120	166,014	13.20	12/30/2009
Lowes Home Centers	10-1907	3,130	0.52	8/3/2010
Cuyahoga Community College	10-1910	7,868	1.57	06/04/2010
John Carroll University	10-1911	1,447	0.35	1/4/2010
American Brazing	10-1912	484	0.10	5/7/2010
North Royalton School District	10-1920	176	0.00	12/30/2010
The Cleveland Coca-Cola Bottling Company	10-1925	666	0.09	8/23/2010
North Olmsted Associates	10-1928	233	0.06	8/3/2010
Ashtabula Rubber Company	10-1942	967	0.18	12/29/2010
The Cleveland Clinic Foundation	10-1956	42,317	1.41	8/3/2010
Giant Eagle Inc.	10-1970	2,218	0.00	12/30/2010
Pending Application Subtotal		251,770	22.89	
Total		265,457	24.29	

Note:

Data associated with the Approved Mercantile Projects are highlighted in the tables above.

EXHIBIT-5

The Toledo Edison Company Mercantile Applications Filed as of Dec 31, 2010				
Customer Name	Docket Number	MWh	MW	Date Filed
Sauder Woodworking	09-1300	2,284	0.30	11/04/2009
Worthington Steel	09-1301	2,725	0.39	10/28/2009
Comfort Line	09-1302	658	0.16	11/04/2009
Atlas Industries	09-1307	1,014	0.05	12/09/2009
Kamco Industries Inc.	09-1305	1,272	0.21	12/31/2009
Kelsey-Hayes Company	09-1306	2,867	0.47	12/06/2009
Johnson Controls Incorporated	10-2135	910	0.13	12/29/2010
Approved Application Subtotal		11,730	1.70	
Calphalon	09-1303	1,607	0.00	12/31/2009
North Star Bluescope Steel LLC	09-1309	12,119	1.46	12/31/2009
Toledo Correctional Institute	09-1315	1,526	0.17	12/23/2009
Marsulex Incorporated	09-1317	3,718	0.46	12/29/2009
Johns Manville	09-1318	2,233	0.18	12/31/2009
Rexam Beverage Can	09-1320	4,205	0.50	12/31/2009
Walgreen's Distribution Center	09-1321	1,033	0.21	12/31/2009
Johnson Controls Incorporated	09-1326	1,323	0.15	12/31/2009
Lowes Home Centers	10-2109	1,909	0.34	07/28/2010
One Government Center	10-2114	674	0.35	05/20/2010
AK Tube	10-2115	666	0.10	04/19/2010
Owens-Illinois Levis Park	10-2119	765	0.34	08/23/2010
Fulton County Health Center	10-2120	1,574	4.94	06/24/2010
Kraft Foods Global Inc	10-2121	564	0.06	05/28/2010
General Motors LLC	10-2126	51,735	8.40	12/30/2010
General Motors LLC	10-2127	20,019	6.28	12/30/2010
Reino Linen Service Inc.	10-2138	640	0.06	12/30/2010
Campbell Soup Supply Company LLC	10-2140	5,594	0.97	12/29/2010
Pending Application Subtotal		111,905	24.97	
Total		123,635	26.67	

Note:

Data associated with the Approved Mercantile Projects are highlighted in the tables above.

EXHIBIT-6

Projected Results Transmission and Distribution Projects					
In-Service Year	Company	Project	Project Description	Actual In-Service Date	2010 Partial Year MWh Loss Reduction ¹
2010	ATSI ²	Lakeview 34.5 kV Cap Bank (18.9 MVAR)	Installed cap bank and breaker at Lakeview Sub.	1/4/2010	0.2
2010	ATSI ²	New 138 kV delivery point to Cleveland Public Power	R/P Breaker and added 138 kV exit at Ivy Sub	7/12/2010	0.9
2009	ATSI ²	Cordington-Tungy 69kV line - Phase 3 - 2009 R/C	Reconductor 3/0 ACSR and 1/0 ACSR with 336.4 ACSR.	12/31/2009	0.70
2009	ATSI ²	Avon 92-AV-T New Transformer	Addition of a new autotransformer, 92-AV-T, operating in parallel with existing unit (91-AV-T).	6/1/2009	2.50
2009	ATSI ²	Babb (50 MVAR) (609)	Install a 50 MVAR, 138 kV capacitor bank at Babb Substation	6/1/2009	0.73
2009	ATSI ²	Hubbard Sub - Add 23 kV, 7.2 Mvar capacitor bank	Add 23 kV, 7.2 MVAR capacitor bank with reactor at Hubbard Substation.	10/1/2009	0.10
2010	OE	Reconductor line along North St.	Relocated 4000 ft. of 3-phase distribution line	7/12/2010	0.018
2010	OE	Jefferson Sub - R/P Transformer #2	R/P 5 MVA XFMR with 7 MVA XFMR at Jefferson Sub.	10/26/2010	0.01
2010	OE	Capacitors - OE Distr. Additions - 2010	Install 38.4 MVAR of capacitance throughout OE distribution system	6/1/2010	0.11
2009	OE	OE-Southington exit reconductor.	Reconductor 3/0 ACSR with 336.4 ACSR	8/7/2009	0.073
2010	TE	Weston Sub - Replace #2 Transformer	R/P XFMR at Weston Sub with 69-13.2 kV Mod sub	5/26/2010	0.165
2010	TE	St. Charles Hospital - New Substation	Customer was moved from 12.47 kV distribution to 69 kV transmission	9/29/2010	0.06
2010	TE	Replace Transformers Program 2010	Replace a number of heavily loaded distribution transformers throughout TE	12/31/2010	0.181
2010	TE	Capacitors - TE Distribution Additions - 2010	Install 15 MVAR of capacitance throughout TE distribution system	6/1/2010	0.31
2009	TE	Levis Park - Install 2nd Mod Sub	Installed a 138-12.47 kV, 11.2/14 MVA Mod Sub at the Levis Park Substation	5/29/2009	0.04
2009	TE	Lime City - Install 2nd Mod Sub	Installed 69 kV-12 kV, 11.2/14 MVA Mod Sub at the Lime City Substation	5/22/2009	0.321
2010	CEI	Clifford Line Reconductor (Bagley Rd.)	Reconductor 4-808 feet of 336.4 AAC with 636kcmil conductor	7/20/2010	0.051
2009	CEI	Creswood Transformer Replacement- Replace failed 138kV to 13.8kV 30 MVA	Replaced failed 138kV to 13.8kV, 20,226.973.6 MVA transformer with 138kV to 13.2kV, 33.4 MVA transformer.	6/5/2009	0.055
Total					6.5
					19,641

Notes:

¹ See Exhibit 6, pg. 2 for partial-year energy savings (MWh) calculations for each Company.

² See Exhibit 6, pg. 2 "Notes" for loss allocation percentages applied to individual ATSI projects.

EXHIBIT-6

T&D Project 2010 Partial Year Energy Savings and Costs By Company

	OE	CEI	TE	Total
	MWh			
Transmission System Partial Year Energy Savings ¹	11,173	3,155	2,914	17,242
Distribution System Partial Year Energy Savings	396	213	1,790	2,399
Total Energy Savings	11,569	3,368	4,704	19,641

	OE	CEI	TE	Total
	2010 Program Costs ²			
	\$4,990	\$3,845	\$2,074	\$10,909

Notes:

¹ Energy savings realized through ATSI projects was allocated to each Company based on the number of transmission line miles within each Company's territory as a percentage of the total transmission line miles contained within all of the Companies' service territories. The resulting allocation factors are as follows:
CEI = 18.30%; OE = 64.80%; and TE = 16.90%

² Administrative, legal and filing fees.

EXHIBIT-7

Energy Efficiency Compliance Baselines and Benchmarks (MWh) ¹													
Electric Utility	Year	Sales	Weather Adjustment	Weather Adjusted Retail Sales	Mercantile Addbacks as Filed in Initial Benchmark	Fully Adjusted Sales as Filed in Initial Benchmark	Planning Baseline (F)=(C) through (E)	Remove Mercantile Addbacks as Filed in Initial Benchmark	Approved Mercantile Addbacks	Fully Adjusted Sales (I)=(E) through (H)	Compliance Baseline (J) = Average of (I)	% Target of Cumulative Annual Savings (K)	Compliance Benchmark (L)=(J)*(K)
OE	2007	26,052,000	(184,134)	25,867,866	61,126	25,928,992		(61,126)	6,282	25,874,148			
	2008	25,279,000	(61,319)	25,217,681	91,320	25,309,001		(91,320)	27,155	25,244,836			
	2009	22,857,000	212,710	23,069,710	127,262	23,196,972		(127,262)	45,830	23,115,540			
							24,811,655				24,744,841	0.80%	197,959
CEI	2007	19,718,000	(189,341)	19,528,659	188,197	19,716,856		(188,197)	6,326	19,534,985			
	2008	19,302,000	(111,932)	19,190,068	217,208	19,407,276		(217,208)	9,768	19,199,836			
	2009	17,639,000	79,362	17,718,362	248,609	17,966,971		(248,609)	12,867	17,731,229			
							19,030,368				18,822,017	0.80%	150,576
TE	2007	10,690,000	(81,149)	10,608,851	28,026	10,636,877		(28,026)	4,486	10,613,337			
	2008	10,281,000	(26,163)	10,254,837	54,385	10,309,222		(54,385)	7,772	10,262,609			
	2009	9,503,000	61,635	9,564,635	90,305	9,654,940		(90,305)	10,884	9,575,519			
							10,200,346				10,150,488	0.80%	81,204
Ohio	2007	56,460,000	(454,624)	56,005,376	277,349	56,282,725		(277,349)	17,094	56,022,470			
	2008	54,862,000	(199,414)	54,662,586	362,913	55,025,499		(362,913)	44,695	54,707,281			
	2009	49,999,000	353,707	50,352,707	466,176	50,818,883		(466,176)	69,582	50,422,289			
							54,042,369				53,717,347	0.80%	429,739

Notes:

(A) and (B): These numbers for 2007 and 2008 are explained in further detail in Exhibit 1 to the Direct Testimony of Katherine M. Kettlewell, which was submitted in support of the Companies' EE&PDR Plans, Case Nos. 09-1947-EL-POR *et al.* (the "Kettlewell Testimony"). The weather-adjustment process is also explained in the Kettlewell Testimony.

(D) and (G): These data were updated to include those mercantile customer self-directed projects that were submitted for approval through March 2, 2011.

(H): Includes only the Approved Mercantile Projects as of March 2, 2011.

EXHIBIT-8

Peak Demand Compliance Baselines and Benchmarks (MW) ¹													
Electric Utility	Year	Sales	Weather Adjustment	Weather Adjusted Retail Peaks	Mercantile Addbacks as Filed in Initial Benchmark	Fully Adjusted Peaks as Filed in Initial Benchmark	Planning Baseline	Remove Mercantile Addbacks as Filed in Initial Benchmark	Approved Mercantile Addbacks	Fully Adjusted Sales	Compliance Baseline	% Target of Cumulative Annual Savings	Compliance Benchmark 2
		(A) ¹	(B) ¹	(C)=(A)+(B)	(D) ²	(E)	(F)=(C) through (E)	(G) ²	(H) ³	(I)=(E) through (H)	(J) = Average of (I) ³	(K)	(L)=(J)*(K)
OE	2007	5,344.7	-	5,344.7	5.4	5,350.1		(5.4)	0.7	5,345.4			
	2008	4,996.6	-	4,996.6	7.8	5,004.5		(7.8)	2.0	4,998.7			
	2009	4,682.1	-	4,682.1	11.0	4,693.2		(11.0)	3.1	4,685.2			
							5,015.9				5,009.7	1.80%	90.2
CEI	2007	4,154.6	-	4,154.6	20.0	4,174.6		(20.0)	4.7	4,159.2			
	2008	3,985.9	-	3,985.9	23.3	4,009.2		(23.3)	5.1	3,990.9			
	2009	3,789.8	-	3,789.8	26.8	3,816.6		(26.8)	5.4	3,795.2			
							4,000.1				3,981.8	1.80%	71.7
TE	2007	2,002.5	-	2,002.5	5.3	2,007.7		(5.3)	0.9	2,003.4			
	2008	1,898.8	-	1,898.8	9.4	1,908.2		(9.4)	1.3	1,900.1			
	2009	1,964.2	-	1,964.2	15.3	1,979.5		(15.3)	1.7	1,965.9			
							1,965.1				1,956.5	1.80%	35.2
Ohio	2007	11,501.7	-	11,501.7	30.7	11,532.4		(30.7)	6.2	11,508.0			
	2008	10,881.3	-	10,881.3	40.5	10,921.8		(40.5)	8.4	10,889.7			
	2009	10,436.1	-	10,436.1	53.1	10,489.3		(53.1)	10.2	10,446.3			
							10,981.2				10,948.0	1.80%	197.1

Notes:

¹ (A) and (B): These numbers for 2007 and 2008 are explained in further detail in Exhibit 3 to the Kettlewell Testimony. The weather-adjustment process is also explained in the Kettlewell Testimony. Some data has been revised to reflect more current information.

² (D) and (G): These data were updated to include those mercantile customer self-directed projects that were submitted for approval through March 2, 2011.

³ (H) and (J): These data were updated to include only Mercantile Projects approved through March 2, 2011.

BEFORE THE
PUBLIC UTILITIES COMMISSION OF OHIO

Case Nos. 11-2956-EL-EEC
11-2958-EL-EEC
11-2959-EL-EEC

Affidavit of John C. Dargie – Exhibit 9

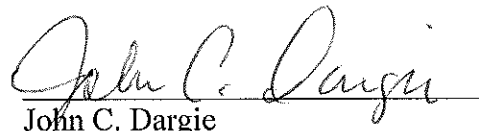
STATE OF OHIO)
)
COUNTY OF SUMMIT) SS:

I, JOHN C. DARGIE, being first duly sworn in accordance with law, deposes and states as follows:

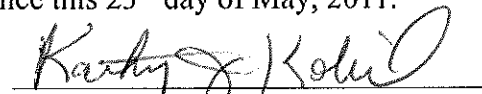
1. I am the Vice President of Energy Efficiency for FirstEnergy Service Company.
As part of my duties, I am responsible for ensuring that Ohio Edison Company (“Ohio Edison”), The Cleveland Electric Illuminating Company (“CEI”) and The Toledo Edison Company (“Toledo Edison”) (collectively, “Companies”) comply with energy efficiency (“EE”) and peak demand reduction (“PDR”) requirements imposed at either the federal or state level.
2. I have personal knowledge of the information and matters set forth herein, and offer this affidavit pursuant to Section 4901:1-39-05(C)(1)(c) of the Ohio Administrative Code.
3. Each of the Companies achieved the EE and PDR results as set forth in the Companies’ 2010 Status Report (“Report”) being filed in the above-referenced proceeding.
4. As indicated in the Report, both CEI and TE exceeded their 2010 statutory EE and PDR benchmarks – Toledo Edison did so, based upon actual PDR results, but relied upon both actual results and projected results from applications still

pending approval before the Commission, assuming the latter are approved as filed, in order to comply with its 2010 EE benchmarks. CEI, relied on both actual results and projected results from pending applications similar to Toledo Edison in order to meet both its EE and PDR benchmarks. Ohio Edison had a statutory benchmark of 197,959 MWhs, and achieved 164,365 MWhs, thus meeting its amended 2010 EE benchmark, which the Commission amended on May 19, 2011, in Case No. 11-126-EL-EEC, to actual levels achieved. It also had a statutory PDR benchmark of 90.20 MWs, achieving 73.26 MWs, thus meeting its amended 2010 PDR benchmark, which was also amended by the Commission on May 19th to actual levels achieved.

FURTHER AFFIANT SAYETH NAUGHT.


John C. Dargie

Sworn to before me and subscribed in my presence this 23rd day of May, 2011.


Kathy J. Kolich, Esq.

My commission has no
expiration date. R.C. 147.03

APPENDIX A

Summary of 2010 Annualized Actual and Potential Results ¹

Approved Programs	Ohio Edison		Cleveland Electric		Toledo Edison		Program Totals	
	MWh	MW	MWh	MW	MWh	MW	MWh	MW
Community Connections ²	1,485	0.04	1,746	0.05	454	0.02	3,685	0.11
Home Energy Analyzer	7,067	1.08	4,823	0.74	2,004	0.31	13,894	2.13
Interruptible Demand Reduction ³	0	59.44	0	46.65	0	121.91	0	228.00
Mercantile Customer	54,691	4.26	13,688	1.40	11,730	1.70	80,109	7.36
Subtotal Actual Results	63,243	64.82	20,257	48.84	14,188	123.94	97,688	257.60
Pending Programs								
Mercantile Customer	94,613	8.44	251,770	22.89	116,341	24.97	462,724	56.30
Transmission and Distribution	12,876	0.00	3,766	0.00	6,143	0.00	22,785	0.00
Subtotal Potential Results	107,489	8.44	255,536	22.89	122,484	24.97	485,509	56.30
Total Results	170,732	73.26	275,793	71.73	136,672	148.91	583,197	293.90

Notes:

¹ *Ex ante* annualized results from approved 2010 Programs; potential results from 2010 applications pending before the Commission. Values include adjustments by appropriate loss factors with the exception of Interruptible Demand Reduction and Transmission and Distribution values. Community Connections values are from program inception to date; 2009 savings results are from similar installations that were subject to M&V in 2010 with demonstrated *ex post* savings.

² Community Connections *ex ante* MW savings calculation based on 2009 results. OPAE did not provide *ex ante* MW savings data for 2010.

³ The PDR capability associated with the Companies' Interruptible Demand Response program is calculated using the Load Modifying Resource MWs claimed at MISO as capacity through the Module E Tariff provisions of the MISO OATT. Customers who are taking service under the Companies' Economic Load Response Rider are the Load Modifying Resources.

APPENDIX A

Comparison of 2010 Annualized Results to Benchmarks

Utility	Energy Efficiency Benchmarks and Results (MW _h)					Peak Demand Benchmarks and Results (MW)				
	2009 Statutory Benchmark	Updated 2010 Compliance Benchmark	Savings from Approved Programs	Savings from Pending Programs	Savings from Approved and Pending Programs	2009 Statutory Benchmark	Updated 2010 Compliance Benchmark	Savings from Approved Programs	Savings from Pending Programs	Savings from Approved and Pending Programs
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
OE	76,783	197,959	63,243	107,489	170,732	52.78	90.20	64.82	8.44	73.26
CEI	58,155	150,576	20,257	255,536	275,793	41.59	71.70	48.84	22.89	71.73
TE	31,349	81,204	14,188	122,484	136,672	20.07	35.20	123.94	24.97	148.91
Total	166,287	429,739	97,688	485,509	583,197	114.44	197.10	237.60	56.30	293.90

Notes:

- (A): The derivation of the Companies' updated EE benchmarks is set forth in Exhibit 7.
- (B): The Companies' *ex ante* EE annualized savings reflect the expected savings for the 2010 Programs, including the Approved Mercantile Projects.
- (C): The Companies' potential *ex ante* EE annualized savings reflect the projected savings from the 2009 and 2010 T&D and mercantile applications still pending before the Commission.
- (D): The Companies' sum total *ex ante* EE annualized savings from approved 2010 Programs as well as the projected savings from the T&D and mercantile applications still pending before the Commission.
- (E): The derivation of the Companies' updated PDR benchmarks is set forth in Exhibit 8.
- (F): The Companies' *ex ante* PDR annualized savings reflect capabilities/results expected for the 2010 Programs, including the Approved Mercantile Projects.
- (G): The Companies' potential *ex ante* PDR annualized savings reflect projected capabilities/results from the pending mercantile applications.
- (H): The Companies' sum total *ex ante* PDR annualized savings from approved 2010 Programs as well as the projected savings from the mercantile applications still pending before the Commission.

APPENDIX A

The Ohio Edison Company 2010 Program Performance Assessment				
Approved Programs	# of Participants	Type of Participants	Annualized Savings ¹ MWh	MW
Community Connections	1,517	Residential Low-Income	1,485	0.04
Home Energy Analyzer	22,164	Residential	7,067	1.08
Mercantile Customer	15	Small Enterprise / Mercantile Utility	54,691	4.26
Interruptible Demand Reduction	25	Mercantile Utility	0	59.44
Subtotal Actual Results		23,721	63,243	64.82
Pending Programs				
Mercantile Customer	26	Small Enterprise / Mercantile Utility	94,613	8.44
Subtotal Potential Results		26	94,613	8.44
Total Results		23,747	157,856	73.26

Notes:

¹ *Ex ante* annualized results from approved 2010 Programs; potential results from 2010 applications pending before the Commission. Values include adjustments by appropriate loss factors with the exception of Interruptible Demand Reduction values. Community Connections values reflect program inception to date; 2009 savings results are from similar installations that were subject to M&V in 2010 with demonstrated *ex post* savings.

APPENDIX A

The Cleveland Electric Illuminating Company 2010 Program Performance Assessment				
Approved Programs	# of Participants	Type of Participants	Annualized Savings ¹	
			MWh	MW
Community Connections	2,205	Residential Low-Income	1,746	0.05
Home Energy Analyzer	15,126	Residential	4,823	0.74
Mercantile Customer	9	Small Enterprise / Mercantile Utility	13,688	1.40
Interruptible Demand Reduction	2	Mercantile Utility	0	46.65
Subtotal Actual Results			20,257	48.84
Pending Programs				
Mercantile Customer	14	Small Enterprise / Mercantile Utility	251,770	22.89
Subtotal Potential Results			251,770	22.89
Total Results			272,027	71.73

Notes:

¹ Ex ante annualized results from approved 2010 Programs; potential results from 2010 applications pending before the Commission. Values include adjustments by appropriate loss factors with the exception of Interruptible Demand Reduction values. Community Connections values reflect program inception to date; 2009 savings results are from similar installations that were subject to M&V in 2010 with demonstrated ex post savings.

APPENDIX A

The Toledo Edison Company 2010 Program Performance Assessment				
Approved Programs	# of Participants	Type of Participants	Annualized Savings ¹	
			MWh	MW
Community Connections	486	Residential Low-Income	454	0.02
Home Energy Analyzer	6,285	Residential	2,004	0.31
Mercantile Self Direct	7	Small Enterprise / Mercantile Utility	11,730	1.70
Interruptible Demand Reduction	5	Mercantile Utility	0	121.91
Subtotal Actual Results			14,188	123.94
Pending Programs				
Mercantile Self Direct	18	Small Enterprise / Mercantile Utility	116,341	24.97
Subtotal Potential Results			116,341	24.97
Total Results			130,529	148.91

Notes:

¹ Ex ante annualized results from approved 2010 Programs; potential results from 2010 applications pending before the Commission. Values include adjustments by appropriate loss factors with the exception of Interruptible Demand Reduction values. Community Connections values reflect program inception to date; 2009 savings results are from similar installations that were subject to M&V in 2010 with demonstrated ex post savings.

APPENDIX A

Projected Results Transmission and Distribution Projects					Annualized MW Loss Reduction	Annualized MW Loss Reduction
In-Service Year	Company	Project	Project Description	Actual In Service Date		
2010	ATSI ²	Lakeview 34.5 kV Cap Bank (18.9 MVAR)	Installed cap bank and breaker at Lakeview Sub.	1/4/2010	0.2	741
2010	ATSI ²	New 138 kV delivery point to Cleveland Public Power	R/P Breaker and added 138 kV exit at Ivy Sub.	7/12/2010	0.9	3,335
2009	ATSI ²	Cardington-Tungy 69kV line - Phase 3 - 2009 R/C	Reconductor 3/0 ACSR and 1/0 ACSR with 336.4 ACSR.	12/31/2009	0.70	2,598
2009	ATSI ²	Avon 92-AV-T New Transformer	Addition of a new autotransformer, 92-AV-T, operating in parallel with existing unit (91-AV-T).	6/1/2009	2.50	9,260
2009	ATSI ²	Babb (50 MVAR) (6/09)	Install a 50 MVAR, 138 kV capacitor bank at Babb Substation	6/1/2009	0.73	2,705
2009	ATSI ²	Hubbard Sub - Add 23 kV, 7.2 Mvar capacitor bank	Add 23 kV, 7.2 MVAR capacitor bank with reactor at Hubbard Substation.	10/1/2009	0.10	363
2010	OE	Reconductor line along North St.	Relocated 4000 ft. of 3-phase distribution line	7/12/2010	0.018	49
2010	OE	Jefferson Sub - R/P Transformer #2	R/P 5 MVA XFMR with 7 MVA XFMR at Jefferson Sub.	10/26/2010	0.01	27
2009	OE	Capacitors - OE Distr. Additions - 2010	Install 38.4 MVAR of capacitance throughout OE distribution system	6/1/2010	0.11	257
2010	TE	Weston Sub - Replace #2 Transformer	Reconductor 3/0 ACSR with 336.4 ACSR	8/7/2009	0.073	200
2010	TE	St. Charles Hospital - New Substation	R/P XFMR at Weston Sub with 69-13.2 kV Mod sub	5/26/2010	0.165	451
2010	TE	Replace Transformers Program 2010	Customer was moved from 12.47 kV distribution to 69 kV transmission	9/29/2010	0.06	164
2010	TE	Capacitors - TE Distribution Additions - 2010	Replace a number of heavily loaded distribution transformers throughout TE	12/31/2010	0.181	495
2009	TE	Lewis Park - Install 2nd Mod Sub	Install 15 MVAR of capacitance throughout TE distribution system	6/1/2010	0.31	816
2009	TE	Lime City - Install 2nd Mod Sub	Installed a 138-12.47 kV, 11.2/14 MVA Mod Sub at the Lewis Park Substation	5/29/2009	0.04	109
2010	CEI	Clifford Line Reconductor (Bugsby Rd.)	Installed 69 kV-12 kV, 11.2/14 MVA Mod Sub at the Lime City Substation	5/22/2009	0.321	877
2009	CEI	Crestwood Transformer Replacement- Replace failed 138kV to 13.8kV 30 MVA	Reconductor 4,808 feet of 336.4 AAC with 636kcmil conductor	7/20/2010	0.051	139
			Replaced failed 138kV to 13.8kV, 20,276.9/33.6 MVA transformer with 138kV to 13.2kV, 33.4 MVA transformer.	6/5/2009	0.055	150
Total					6.5	22,746

Notes:

¹ See Appendix A, pg. 7 for annualized energy savings (MW%) calculations for each Company.

² See Appendix A, pg. 7 "Notes" for loss allocation percentages applied to individual ATSI projects.

APPENDIX A

T&D Project 2010 Annualized Energy Savings By Company

	OE	CEI	TE	Total
	MWh			
Transmission System Annualized Energy Savings ¹	12,313.3	3,477.4	3,211.3	19,002
Distribution System Annualized Energy Savings	563	289	2,932	3,784
Total Energy Savings	12,876	3,766	6,143	22,786

Notes:

¹ Energy savings realized through ATSI projects was allocated to each Company based on the number of transmission line miles within each Company's territory as a percentage of the total transmission line miles contained within all of the Companies' service territories. The resulting allocation factors are as follows:
 CEI = 18.30%; OE = 64.80%; and TE = 16.90%

2010 Annualized vs. Partial Year *Ex Ante* Savings Comparison ¹

	Ohio Edison		CEI		Toledo Edison	
	MWh	MW	MWh	MW	MWh	MW
Updated 2010 Benchmark	197,959	90.20	150,576	71.70	81,204	35.20
2010 Annualized Ex Ante Results	170,731	73.27	275,792	71.73	136,672	148.91
% of Benchmark	86%	81%	183%	100%	168%	423%
2010 Part Year Ex Ante Results	164,366	73.27	273,075	71.73	129,963	148.91
% of Benchmark	83%	81%	181%	100%	160%	423%
Delta ²	6,365	0.00	2,717	0.00	6,709	0.00

Notes:

¹ Partial year savings are calculated based on installation date.

² The differential between the partial year and annualized savings is relatively minor due to the fact that a significant portion of the 2010 results were based on historic mercantile customer projects, where full year savings could be recognized under either savings determination methodology. The Companies anticipate this differential being significantly greater in future status reports as approved programs are implemented.

APPENDIX B

IMPACT EVALUATION OF 2010 COMMUNITY CONNECTIONS PROGRAM

**Final Report
April 22, 2011**

Prepared for:

**The Cleveland Electric Illuminating Company
Ohio Edison Company
The Toledo Edison Company**

Prepared by:

ADM  Associates, Inc. TM

**3239 Ramos Circle
Sacramento, CA 95827
916-363-8383**

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1. EXECUTIVE SUMMARY

During 2010 the Community Connections Program was implemented in the service territories of The Cleveland Electric Illuminating Company (“CEI”), Ohio Edison Company (“Ohio Edison”), and The Toledo Edison Company (“Toledo Edison”) (collectively “Companies”). The program was targeted to low-income residential customers, either directly or through landlords of such customers. The program was administered by Ohio Partners for Affordable Energy (“OPAE”), which worked with subcontractors to deliver weatherization services, energy efficient solutions, and customer education to participating low-income customers. For each participating customer, a walk-through audit of the residence was conducted to determine whether it was feasible and appropriate to install one or more weatherization measures.

A total of 2,393 of low-income households in the service territories of the Companies received energy efficiency services through the Community Connections Program in 2010. The numbers of participants for each service territory were as follows:

- CEI 1,304
- Ohio Edison 887
- Toledo Edison 202

Estimates of the gross energy savings (kWh) and peak demand reductions (kW) for the program in the three service territories are reported in Table 1-1.

Table 1-1. Overall Evaluation Results

<i>Utility</i>	<i>Program Goals</i>		<i>Ex Ante Expected Gross Savings</i>		<i>Ex Post Verified Gross Savings</i>	
	<i>Gross kWh</i>	<i>Gross kW</i>	<i>Gross kWh</i>	<i>Gross kW</i>	<i>Gross kWh</i>	<i>Gross kW</i>
CEI	879,000	251	1,015,218	- ¹	966,540	131
Ohio Edison	1,309,000	373	858,445	-	551,612	72
Toledo Edison	446,000	127	175,261	-	164,894	22
All First Energy	2,634,000	751	2,048,924	-	1,683,045	226

¹ The *ex ante* peak demand reduction (kW) was not reported in the data that ADM received from OPAE.

2. INTRODUCTION AND PURPOSE OF THE STUDY

During 2010 the Community Connections Program was implemented in the Companies' service territories. The program was targeted to low-income residential customers, either directly or through landlords of such customers. The program was administered by OP&A, which worked with subcontractors to deliver weatherization services, energy efficient solutions, and customer education to participating low-income customers.

The purpose of this report is to present the results of the evaluation effort undertaken by ADM Associates to verify the energy savings and peak demand reductions that resulted from measures installed through the Community Connections Program during 2010.

The methods used to calculate energy savings and peak demand reductions depended on whether or not a measure was a lighting measure.

- The lighting measures that were installed through the Community Connections Program were mainly compact fluorescent lamps ("CFLs") of different wattages that were directly installed. For each such CFL measure, total kWh savings and total peak demand savings for that measure were determined as a product of the number of measures verified as being installed and the savings per measure. The quantities of CFLs installed through the Community Connections Program were verified through a telephone survey of a randomly-selected sample of households that participated in the Community Connections Program during 2010. Savings per bulb installed were determined using values from the current draft of the *State of Ohio Energy Efficiency Technical Reference Manual*.²
- The types of non-lighting measures installed through the Community Connections Program in 2010 included replacements of refrigerators and / or freezers, installation of attic or wall insulation, reduction of air infiltration, and installation of water heater wraps, low flow showerheads, or faucet aerators. For each such non-lighting measure, total kWh savings and total peak demand savings for that measure was determined as a product of the number of measures verified as being installed and the savings per measure. The quantities of non-lighting measures installed through the Community Connections Program were verified through a telephone survey of a randomly-selected sample of households that participated in the Program during 2010. Per-unit savings for non-lighting measures were determined using values either from the current draft of the *State of Ohio Energy Efficiency Technical Reference Manual* ("TRM") or from October 4, 2010 Ohio TRM Joint Objections and Comments, Case Number 09-512-GE-UNC.

² Vermont Energy Investment Corporation (VEIC), *State of Ohio Energy Efficiency Technical Reference Manual*, Prepared for Public Utilities Commission of Ohio, Draft of August 6, 2010.

3. DESCRIPTION OF PROGRAM

The Community Connections Program that was implemented during 2010 provided weatherization measures, energy efficient solutions, and consumer education to low-income households in Ohio that are electric service customers of one of the Companies. The program targeted residential customers and landlords of residents eligible for one of the following:

- Ohio Home Weatherization Assistance Program (HWAP);
- PIPP; or
- Home Energy Assistance Program (HEAP).

The Community Connections Program for 2010 was a continuation of the program that began in 2003. As in previous years, the program was administered during 2010 by OP&A, which worked with subcontractors to deliver the weatherization services, energy efficient solutions, and customer education. For each participating low-income customer, a walk-through audit was conducted to determine whether it was feasible and appropriate to install one or more weatherization measures. The audit also identified where health and / or safety measures were also needed. Weatherization and health / safety measures that could be installed are listed in Table 3-1. All work in installing these measures was done pursuant to appropriate government permits and inspected as required. In particular, measures installed met Weatherization Program standards for the State of Ohio.

Table 3-1. Measures That Could Be Installed through Community Connections Program

<i>Energy Efficiency Measures: Lighting</i>	<i>Energy Efficiency Measures: Non-Lighting</i>	<i>Health/Safety Measures</i>
CFL – 3 way (13/20/25)	Appliance replacement – Refrigerator	Compressor replacement (A/C or heat pump)
CFL – 7 Watt candle	Appliance replacement – Freezer	Electric repair/upgrade
CFL – 9 Watt candle	Insulation – Attic	Furnace repair
CFL – 9 Watt globe	Insulation – Floor	Roof repair
CFL – 11 Watt	Insulation – Wall	Roof replacement
CFL – 13 Watt outdoor	Air Infiltration Reduction (“Blower Door”)	Stove replacement
CFL – 15 Watt	Water Heater Wrap	Well pump replacement
CFL – 15 Watt dimmable	Water Heating – Low Flow Showerhead	
CFL – 15 Watt outdoor	Water Heating – Faucet Aerators	
CFL – 15 Watt “torch”		
CFL – 18 Watt		
CFL – 18 Watt outdoor		
CFL – 20 Watt		
CFL – 23 Watt		
CFL – 23 Watt outdoor		
CFL – 29 Watt		

For qualified customers, weatherization measures recommended through the audit were installed at no cost to the customer. Landlords of qualified low-income residential customers received weatherization measures and energy efficiency solutions at 50 percent of cost.

4. METHODOLOGY

As specified in the Evaluation Plan prepared by the Statewide Evaluator³, kWh savings and kW reductions for a program are to be calculated measure-by-measure. For measures installed through programs in 2010, the Statewide Evaluator⁴ expected that savings would be calculated using values from the TRM. However, alternative methods can be used in cases where measures are not included in the TRM. In such cases, documentation is to be provided that justifies the use of values not specified in the TRM.

The methods used to calculate kWh savings and kW reductions for measures installed through the Community Connections Program are presented in this chapter. The methods used depended on whether or not a measure was a lighting measure. The methods used to calculate savings for lighting and non-lighting measures are therefore described separately in the following sections.

4.1 METHODS USED TO CALCULATE SAVINGS FOR LIGHTING MEASURES

As discussed in Chapter 3, the lighting measures that were installed through the Community Connections Program were CFLs of different wattages that were directly installed. For each such CFL measure, total kWh savings and total peak demand savings for that measure are determined as a product of the number of measures verified as being installed and the savings per measure. The methods used to determine verified installations and per-unit kWh and peak demand savings are described in this section.

4.1.1 Verification of Number of Measures Installed

The quantities of CFLs installed through the Community Connections Program were verified through a telephone survey of a randomly-selected sample of 70 households that participated in the Community Connections Program during 2010⁵.

4.1.2 Calculation of kWh Savings per Lighting Measure

For each lighting measure, annual, first-year and lifetime kWh savings were calculated through the following procedures.

4.1.2.1 Calculation of Annual kWh Savings per Lighting Measure

The lighting measures that were installed through the Community Connections Program were CFLs of different wattages that were directly installed. For these measures, kWh savings per

³ ECONorthwest, Inc., *Ohio Independent Evaluator 2010 Evaluation Plan*, Prepared for Public Utilities Commission of Ohio, December 6, 2010.

⁴ *Ibid.*, p. 4.

⁵ The study's sampling criteria employed a sample large enough to ensure $\pm 10\%$ precision at the 90% confidence interval.

measure were calculated per procedures set out in the Technical Reference Manual.⁶ As set out in the TRM,

$$\text{kWh Savings} = \Delta \text{kWh} = \left(\frac{\Delta \text{Watts}}{1,000} \right) * \text{ISR} * \text{Hours} * \text{WHFe}$$

where:

ΔWatts = CFL watts * delta watts multiplier;

CFL watts = wattage of installed CFL, as verified

Delta watts multiplier = factor to adjust for change in baseline conditions resulting from Energy Independence and Security Act of 2007. For 2010, this multiplier was 3.25.

ISR = In Service Rate (i.e., percentage of units rebated that are actually installed);

Hours = Average hours of use per year; (TRM specifies a value of 1,040 hours).

WHFe = Waste Heat Factor for energy (to account for cooling savings from efficient lighting).

TRM-specified values were used in the calculation of kWh savings, with Hours = 1,040 and WHFe = 1.07.

The value for ISR specified in the TRM is 0.81. However, this value was based on the analysis for Time of Sale measures. For measures that are directly installed, ISR should be higher. Accordingly, a value of 0.89 was used in calculating kWh savings, per a recommendation from Duke Energy based on an evaluation of their CFL program.

4.1.2.2 Calculation of First-Year Savings per Lighting Measure

First-year savings for lighting measures were calculated by determining the average date of installation for measures and using this date to determine the percentage of annual savings that would be assigned as first-year savings.

4.1.2.3 Calculation of Lifetime kWh Savings per Lighting Measure

Lifetime kWh savings for a measure were calculated by multiplying annual kWh savings by the deemed life for the measure, as determined in the TRM.

4.1.3 Calculation of Summer Coincident Peak Demand Savings per Lighting Measure

Per the TRM, summer coincident peak demand savings per lighting measure were calculated according to the following formula.

$$\text{Summer Coincident Peak Demand Savings} = \left(\frac{\Delta \text{Watts}}{1,000} \right) * \text{ISR} * \text{WHFd} * \text{CF}$$

⁶ Ibid., pp. 17-22.

where:

$\Delta \text{Watts} = \text{CFL watts} * \text{delta watts multiplier}$:

CFL watts = wattage of installed CFL, as verified

Delta watts multiplier = factor to adjust for change in baseline conditions resulting from Energy Independence and Security Act of 2007. For 2010, this multiplier was 3.25.

ISR = In Service Rate (i.e., percentage of units rebated that are actually installed);

WHFd = Waste Heat Factor for Demand (to account for cooling savings from efficient lighting);

CF = Summer Peak Demand Coincidence Factor

TRM-specified values for WHFd and CF were used in the calculation of summer coincident peak demand savings, with WHFd = 1.21 and CF = 0.11. However, as with the calculation of kWh savings, the value used for ISR was 0.89 rather than 0.81 (to reflect the effects of the CFLs being directly installed).

4.2 CALCULATION OF SAVINGS FOR NON-LIGHTING MEASURES

The following types of non-lighting measures were installed through the Community Connections Program in 2010.

- Refrigerator replacement
- Freezer replacement
- Attic insulation
- Wall insulation
- Air Infiltration Reduction ("Blower Door")
- Water Heater Wraps
- Low Flow Showerhead
- Faucet Aerators

For each such non-lighting measure, total kWh savings and total peak demand savings for that measure are determined as a product of the number of measures verified as being installed and the savings per measure. The methods used to determine verified installations and per-unit kWh and peak demand savings for the non-lighting measures are described in this section.

4.2.1 Verification of Number of Non-Lighting Measures Installed

Verification of the quantities of non-lighting measures installed through the Community Connections Program during 2010 was accomplished through a telephone survey of a randomly-selected sample of 70 households that participated in the 2010 Community Connections Program.

4.2.2 Calculation of Energy & Peak Demand Savings for Refrigerator Replacements

The procedures for calculating annual kWh savings and peak demand savings for replacement of a refrigerator for a low-income household are set out in the TRM. These procedures were used to calculate savings for the refrigerators replaced through the Community Connections Program, but modified values for UECexisting, UECES, and UECbase were used in the evaluation calculations, based on the information submitted in the October 4, 2010 Ohio TRM Joint Objections and Comments, Case Number 09-512-GE-UNC on the TRM.⁷ The modified savings values used for the evaluation are reported in Table 4-1, as are the savings values presented in the TRM.

*Table 4-1. Modified Values for kWh and Peak Demand Savings
Used to Evaluate Savings for Early Replacement of Refrigerators
through Community Connections Program*

	<i>TRM Savings Value</i>	<i>Modified Savings Value Used for Evaluation</i>
Average Annual kWh Savings per Unit		
Remaining life of existing unit (8 years)	976 kWh	1,251 kWh
Average Summer Coincident Peak kW Savings per Unit		
Remaining life of existing unit (8 years)	0.156 kW	0.192 kW

4.2.3 Calculation of Energy & Peak Demand Savings for Freezer Replacements

The TRM does not have procedures for calculating annual kWh savings and peak demand savings for replacement of a refrigerator or a freezer for a low-income household. However, procedures are presented to calculate savings for freezers that are replaced in households that are not low-income.⁸ The deemed savings values for kWh and kW savings for refrigerators and freezers reported in the TRM were used to calculate ratios between the freezer and refrigerator savings values. These calculated ratios were applied to the modified savings values for replacement of refrigerators for low-income households (in Table 4-2) to estimate the savings for

⁷ October 4, 2010 Ohio TRM Joint Objections and Comments, Case Number 09-512-GE-UNC , 2010 Ohio Technical Reference Manual– Residential Market Sector, p. 7.

⁸ Vermont Energy Investment Corporation (VEIC), *State of Ohio Energy Efficiency Technical Reference Manual*, Prepared for Public Utilities Commission of Ohio, Draft of August 6, 2010, pp. 23-24.

replacement of freezers for such households.⁹ The resulting savings values that were used in the evaluation are reported in Table 4-2.

*Table 4-2. Values for kWh and Peak Demand Savings
Used to Evaluate Savings for Early Replacement of Freezers
through Community Connections Program*

	<i>Savings Value Used for Evaluation</i>
Average Annual kWh Savings per Unit Remaining life of existing unit (8 years)	1,131 kWh
Average Summer Coincident Peak kW Savings per Unit Remaining life of existing unit (8 years)	0.175 kW

4.2.4 Calculation of Energy & Peak Demand Savings for Attic Insulation

Energy (kWh) and peak demand (kW) savings for residences where attic insulation was installed were calculated using the procedures set out in the TRM.¹⁰ Table 4-3 shows the values used in the formulae to calculate cooling savings, heating savings, and peak demand reduction for housing units receiving attic insulation.

Table 4-3. Values Used to Calculate Energy and Peak Demand Savings for Attic Insulation

<i>Variable</i>	<i>Value</i>	<i>Source/Description</i>
Rexist	16	Assume base case is R-5 for building materials + on average, R11 pre-existing
Rnew	54	Assume base case is R-5 for building materials + on average, R49 by program design.
CDH	3,986	TRM, Akron
HDD	4,848	TRM, Akron
DUA	0.75	TRM
Area	1,000	Assume typical footprint is 1000sf
EffCool	10	Typical for central AC or effective SEER if room AC(zoning helps)
Eff Heat	0.7	
FLH Cool	476	

⁹ For freezer kWh savings, calculation is $(1244/1376) \times 1251 = 1,131$ kWh. For freezer kW savings, calculation is $(0.20/0.22) \times 0.192 = 0.175$ kW

¹⁰ VEIC, *State of Ohio Energy Efficiency Technical Reference Manual*, Draft of August 6, 2010, pp. 36-39.

CF	0.5
COP	2.05

Table 4-4 shows the per-house savings values for attic insulation that were calculated using the variable values shown in Table 4-3.

Table 4-4. Per-House Savings for Attic Insulation

Cooling Energy Savings	13 kWh
Cooling Peak Demand Reduction	0.0138 kW
Heating Savings, Non-Electric MMBtu	7 MMBtu
Electric Heating Savings, Resistive Strip	2,143 kWh
Electric Heating Savings, Heat Pump	1,045 kWh

As the values in Table 4-4 show, the program-level savings that would result from attic insulation depended on the percentage of residences that were heated with electric resistance heating and electric heat pumps. However, the type of heating equipment was not reported in the tracking data for the residences that received attic insulation. Data from secondary sources were therefore used to estimate the percentage of houses that were heated with these two types of electric heating equipment.

Only residences in the service territory of Ohio Edison received attic insulation through the Community Connections Program during 2010. The percentages of such houses that were likely to be heated either with electric resistance heating or with electric heat pumps were estimated using data for the Columbus metropolitan area from the 2002 American Housing Survey for that area.¹¹ Data from Table 2-20 of that report were used to estimate the percentages of housing units that were heated with electric resistance heating or electric heat pumps among units occupied by households with annual incomes of \$40,000 or less. Based on these data, 4.8% of the housing units were heated with electric heat pumps and 3.2% with electric resistance heating.

To check on these estimates, data on annual kWh usage that were collected for Ohio Edison customers who participated in the Community Connections Program were reviewed. Data on annual kWh usage that was available for 401 customers showed average annual kWh usage to be 9,350 kWh, with a standard deviation of 6,018 kWh. Given these distribution parameters, it was assumed that customers using over 20,000 kWh per year were likely to be using electric heating. Customers with annual kWh usage over 20,000 kWh were 6.7% of the 401 customers. Thus, the data from the two sources were in reasonable agreement on the likely percentages of housing units with electric heating.

¹¹ U.S. Census Bureau, Current Housing Reports, Series H170/02-25, *American Housing Survey for the Columbus Metropolitan Area: 2002*.

4.2.5 Calculation of Energy & Peak Demand Savings for Wall Insulation

Energy (kWh) and peak demand (kW) savings for residences where wall insulation was installed were calculated using the procedures set out in the TRM.¹² Table 4-5 shows the values used in the formulae to calculate cooling savings, heating savings, and peak demand reduction for housing units receiving wall insulation.

Table 4-5. Values Used to Calculate Energy and Peak Demand Savings for Wall Insulation

<i>Variable</i>	<i>Value</i>	<i>Source/Description</i>
Rexist	5	Assume base case is R-5 for building materials + on average, 0 pre-existing
Rnew	10	Assume base case is R-5 for building materials + on average, 5 by program design.
CDH	3,986	TRM, Akron
HDD	4,848	TRM, Akron
DUA	0.75	TRM
Area	960	Assume typical footprint is 1000sf
EffCool	10	Typical for central AC or effective SEER if room AC(zoning helps)
Eff Heat	0.7	
FLH Cool	476	
CF	0.5	
COP	2.05	

Table 4-6 shows the per-house savings values for wall insulation that were calculated using the variable values shown in Table 4-5.

Table 4-6. Per-House Savings for Wall Insulation

Cooling Energy Savings	29 kWh
Cooling Peak Demand Reduction	0.301 kW
Heating Savings, Non-Electric MMBtu	16 MMBtu
Electric Heating Savings, Resistive Strip	4,677 kWh
Electric Heating Savings, Heat Pump	2,280 kWh

As the values in Table 4-6 show, the program-level savings that would result from wall insulation depended on the percentage of residences that were heated with electric resistance heating and electric heat pumps. The percentages of houses that were heated with these two types of electric heating equipment were calculated as described in Section 4.2.4.

¹² VEIC, *State of Ohio Energy Efficiency Technical Reference Manual*, Draft of August 6, 2010, pp. 100-103.

4.2.6 Calculation of Energy & Peak Demand Savings for Air Infiltration Reduction

Energy (kWh) and peak demand (kW) savings for residences where air infiltration was reduced were calculated using the procedures set out in the TRM.¹³ Table 4-7 shows the values used in the formulae to calculate cooling savings, heating savings, and peak demand reduction for housing units where air infiltration was reduced.

Table 4-7. Values Used to Calculate Energy and Peak Demand Savings from Reduction of Air Infiltration

<i>Variable</i>	<i>Value</i>	<i>Source/Description</i>
CFM50exist	5,000	
CFM50new	3,631	
N-factor, cooling	29.4	TRM
N-factor, heating	17.8	TRM
CDH	3,986	TRM, Akron
HDD	4,848	TRM, Akron
DUA	0.75	TRM
EffCool	10	Typical for central AC or effective SEER if room AC(zoning helps)
Eff Heat	0.7	
FLH Cool	476	
CF	0.5	
COP	2.05	

Table 4-8 shows the per-house savings values for reducing air infiltration that were calculated using the variable values shown in Table 4-7.

Table 4-8. Per-House Savings from Reducing Air Infiltration

Cooling Energy Savings	15 kWh
Cooling Peak Demand Reduction	0.0158 kW
Heating Savings, Non-Electric MMBtu	13.8 MMBtu
Electric Heating Savings, Resistive Strip	4,047 kWh
Electric Heating Savings, Heat Pump	1,973 kWh

As the values in Table 4-8 show, the program-level savings that would result from reducing air infiltration depended on the percentages of residences that were heated with electric resistance heating and electric heat pumps. The percentages of houses that were heated with these two types of electric heating equipment were calculated as described in Section 4.2.4.

¹³ VEIC, *State of Ohio Energy Efficiency Technical Reference Manual*, Draft of August 6, 2010, pp. 100-103.

4.2.7 Calculation of Energy & Peak Demand Savings for Water Heater Wraps

Program-level energy (kWh) and peak demand (kW) savings from installing water heater wraps were calculated using the deemed savings values for this measure in the TRM.¹⁴ The deemed annual energy savings value is 79 kWh per unit, and the deemed summer coincident peak demand savings is 0.009 kW.

4.2.8 Calculation of Energy & Peak Demand Savings for Low Flow Showerheads

Program-level energy (kWh) and peak demand (kW) savings from installing low-flow showerheads were calculated using savings values based on information submitted in the Joint Utility Comments on the TRM.¹⁵ A value of 244 kWh saved per gallons per minute was used for the calculation of energy savings. Per the values given in the TRM,¹⁶ it was assumed that installation of a low flow showerhead would the water flow from 2.87 gpm to 2.0 gpm. Thus, the annual energy savings value used was 212.28 per showerhead, and the summer coincident peak demand savings used was 0.000112 kW.

4.2.9 Calculation of Energy & Peak Demand Savings for Faucet Aerators

Program-level energy (kWh) and peak demand (kW) savings from installing faucet aerators were calculated using savings values for this measure calculated in the TRM.¹⁷ Values calculated in the TRM for a 1.5 gpm installation were used. The annual energy savings value used was 24.5 kWh per unit, and the deemed summer coincident peak demand savings used was 0.0031 kW.

¹⁴ VEIC, *State of Ohio Energy Efficiency Technical Reference Manual*, Draft of August 6, 2010, pp. 131-132.

¹⁵ October 4, 2010 Ohio TRM Joint Objections and Comments, Case Number 09-512-GE-UNC , 2010 Ohio Technical Reference Manual– Residential Market Sector, p. 11.

¹⁶ VEIC, *State of Ohio Energy Efficiency Technical Reference Manual*, Draft of August 6, 2010, pp. 93-96.

¹⁷ VEIC, *State of Ohio Energy Efficiency Technical Reference Manual*, Draft of August 6, 2010, pp. 89-92.

5. DETAILED EVALUATION FINDINGS

The numbers of low-income households that received energy efficiency services through the Community Connections Program in 2010 in the service territories of the three Companies are shown in Table 3-2.

Table 5-1. Numbers of Participants in Community Connections Program during 2010

<i>Utility</i>	<i>Number of Participants</i>
CEI	1,304
Ohio Edison	887
Toledo Edison	202
Total	2,393

Table 5-2 shows the quantities of the measures that were installed for these participants through the Community Connections Program. Applying the methods described in Chapter 4 produced estimates of savings per unit on a measure-by-measure basis. Multiplying the quantities in Table 5-2 by the per-measure savings estimates produced the program-level estimates of energy (kWh) savings reported in Table 5-3 and the peak demand (kW) reductions reported in Table 5-4.

Table 5-2. Quantities of Energy Efficiency Measures Installed per Operating Company

	CEI	Ohio Edison	Toledo Edison	Total, All Ohio
<u>Energy Efficiency Measures: Lighting</u>				
CFL – 3 way (13/20/25)	198	96	3	297
CFL – 7 Watt candle	6	428	10	444
CFL – 9 Watt candle	-	77	8	85
CFL – 9 Watt globe	450	136	-	586
CFL – 11 Watt	997	369	-	1,366
CFL – 13 Watt outdoor				-
CFL – 15 Watt	2,952	3,055	795	6,802
CFL – 15 Watt dimmable	-	14	-	14
CFL – 15 Watt outdoor	27	62	-	89
CFL – 15 Watt “torch”	-	3	-	3
CFL – 18 Watt	-	12	301	313
CFL – 18 Watt outdoor	-	8	-	8
CFL – 20 Watt	25	11		36
CFL – 23 Watt	2,503	767	189	3,459
CFL – 23 Watt outdoor	-	9	-	9
CFL – 29 Watt	-	6	-	6
<u>Energy Efficiency Measures: Non-Lighting</u>				
Refrigerator replacement	454	177	75	706
Freezer replacement	6	56	-	62
Insulation – Attic	-	43	-	43
Insulation – Floor	-	-	-	-
Insulation – Wall	-	2	-	2
Air Infiltration Reduction	-	49	-	49
Water Heater Wrap	-	6	8	14
Water Heating – Low Flow Showerhead	-	9	-	9
Water Heating – Faucet Aerators	-	14	-	14
<u>Health and Safety Measures</u>				
Compressor replacement (A/C or heat pump)	-	3	-	3
Electric repair/upgrade	175	203	123	501
Furnace repair	-	3	-	3
Roof repair	64	90	107	261
Roof replacement	-	-	-	-
Stove replacement	2	77	-	79
Well pump replacement	-	1	1	2
<u>Consumer Education</u>				
Consumer Education	7	269	9	285

Table 5-3. Estimates of Annual kWh Savings by Utility and Measure

	CEI	Ohio Edison	Toledo Edison	Total, All Ohio
<u>Energy Efficiency Measures: Lighting</u>				
CFL – 3 way (13/20/25)	12,741	6,178	193	19,112
CFL – 7 Watt candle	135	9,640	225	10,000
CFL – 9 Watt candle	-	2,230	232	2,461
CFL – 9 Watt globe	13,031	3,938	-	16,969
CFL – 11 Watt	35,286	13,060	-	48,346
CFL – 13 Watt outdoor	-	-	-	-
CFL – 15 Watt	142,469	147,440	38,368	328,277
CFL – 15 Watt dimmable	-	676	-	676
CFL – 15 Watt outdoor	1,303	2,992	-	4,295
CFL – 15 Watt “torch”	-	145	-	145
CFL – 18 Watt	-	695	17,432	18,127
CFL – 18 Watt outdoor	-	463	-	463
CFL – 20 Watt	1,609	708	-	2,317
CFL – 23 Watt	185,226	56,759	13,986	255,971
CFL – 23 Watt outdoor	-	666	-	666
CFL – 29 Watt	-	560	-	560
Total Annual kWh Savings, Lighting	391,800	246,149	70,437	708,385
<u>Energy Efficiency Measures: Non-Lighting</u>				
Refrigerator replacement	567,954	221,427	93,825	883,206
Freezer replacement	6,786	63,336	-	70,121
Insulation – Attic	-	5,670	-	5,670
Insulation – Floor	-	-	-	-
Insulation – Wall	-	576	-	576
Air Infiltration Reduction	-	11,722	-	11,722
Water Heater Wrap	-	474	632	1,106
Water Heating – Low Flow Showerhead	-	1,916	-	1,916
Water Heating – Faucet Aerators	-	343	-	343
Total Annual kWh Savings, Non-Lighting	574,740	305,463	94,457	974,660
Total Annual kWh Savings, All Measures	966,540	551,612	164,894	1,683,045

Table 5-4. Estimates of Peak Demand Reductions by Utility and Measure

	<i>CEI</i>	<i>Ohio Edison</i>	<i>Toledo Edison</i>	<i>Total, All Ohio</i>
<u>Energy Efficiency Measures: Lighting</u>				
CFL – 3 way (13/20/25)	1.4	0.7	0.0	2.1
CFL – 7 Watt candle	0.0	1.1	0.0	1.1
CFL – 9 Watt candle	-	0.2	0.0	0.3
CFL – 9 Watt globe	1.4	0.4	-	1.9
CFL – 11 Watt	3.8	1.4	-	5.3
CFL – 13 Watt outdoor	-	-	-	-
CFL – 15 Watt	15.5	16.1	4.2	35.8
CFL – 15 Watt dimmable	-	0.1	-	0.1
CFL – 15 Watt outdoor	0.1	0.3	-	0.5
CFL – 15 Watt “torch”	-	0.0	-	0.0
CFL – 18 Watt	-	0.1	1.9	2.0
CFL – 18 Watt outdoor	-	0.1	-	0.1
CFL – 20 Watt	0.2	0.1	-	0.3
CFL – 23 Watt	20.2	6.2	1.5	27.9
CFL – 23 Watt outdoor	-	0.1	-	0.1
CFL – 29 Watt	-	0.1	-	0.1
Total Peak Demand Reduction, Lighting	42.7	26.9	7.7	77.3
<u>Energy Efficiency Measures: Non-Lighting</u>				
Refrigerator replacement	87.3	34.1	14.4	135.8
Freezer replacement	1.0	9.8	-	10.8
Insulation – Attic	-	0.4	-	0.4
Insulation – Floor	-	-	-	-
Insulation – Wall	-	0.1	-	0.1
Air Infiltration Reduction	-	0.8	-	0.8
Water Heater Wrap	-	0.1	0.1	0.1
Water Heating – Low Flow Showerhead	-	0.2	-	0.2
Water Heating – Faucet Aerators	-	0.0	-	0.0
Total Peak Demand Reduction, Non-Lighting	88.4	45.4	14.5	148.3
Total Peak Demand Reduction, All Measures	131.1	72.3	22.2	225.6

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions:

A total of 2,393 of low-income households in the service territories of the three Companies in Ohio received energy efficiency services through the Community Connections Program in 2010. The numbers of participants for each service territory were as follows:

- CEI 1,304
- Ohio Edison 887
- Toledo Edison 202

The overall evaluation results for estimated gross energy savings (kWh) and peak demand reductions (kW) for the program in the three service territories are summarized in Table 6-1.

Table 6-1. Overall Evaluation Results for Gross kWh and kW Savings

<i>Utility</i>	<i>Program Goals*</i>		<i>Ex Ante** Expected Gross Savings</i>		<i>Ex Post Verified Gross Savings</i>	
	<i>Gross kWh</i>	<i>Gross kW</i>	<i>Gross kWh</i>	<i>Gross kW</i>	<i>Gross kWh</i>	<i>Gross kW</i>
CEI	879,000	251	1,015,218	-	966,540	131
Ohio Edison	1,309,000	373	858,445	-	551,612	72
Toledo Edison	446,000	127	175,261	-	164,894	22
All Ohio	2,634,000	751	2,048,924	-	1,683,045	226

*Goals are based on kWh and kW values used to calculate expected program TRC in program filing.

***Ex ante* expected gross savings are based on expectation that measures installed in a residence would provide savings of 10.8% of annual household kWh usage.

6.2 Recommendations:

For the 2011 Community Connections program, this section provides ADM recommendations pertaining to program data tracking, program stipulated savings values, and the enhancement of ADM's measurement and verification efforts. We offer recommendations in the spirit of improving the reliability of M&V findings as well as achieving the best possible efficiencies in M&V activities.

- Reported energy savings (i.e., *ex ante* energy savings) and demand reduction should be calculated in accordance with methodologies described in the TRM and related documents once they are approved.

-
- In an effort to automate TRM calculations, and to improve data tracking and program evaluation processes, OP&E agencies should utilize the Companies' data tracking system to procure customer and household data and to invoice the Companies for the installation of individual measures.
 - Expenditures on the energy-efficiency measures installed on each participant home should be related to the customer's pre-installation consumption, with relatively higher spending allocated to homes with higher electricity consumption.
 - BPI certification should be required for those who make decisions on what measures to be installed, as well as the program auditors.
 - Given the continuation of Air Infiltration Reduction measure using the CFM 50 reductions, robust data tracking of 'Blower Door' readings and inspections should be performed by the Companies.
 - Where the WAP Standards and procedures are not structured to obtain the most energy savings, such as refrigerator, freezer and window AC replacement, OP&E should utilize the Companies standards and procedures
 - With respect to the use of the Companies' funds for health and safety measures:
 - Company-funded measures should be installed only in qualified residences in which the Companies are also funding – and receiving energy savings from – the installation of energy-efficiency measures.
 - For each qualified residence, the Companies' funding should be limited to a specific proportion of the cost of the Company-funded energy-efficiency measures that are installed in the home.¹⁸

¹⁸ During a November 2010 teleconference with OP&E, the Companies suggested implementing a health and safety funding cap of 15% per home.

7. APPENDIX: REQUIRED SAVINGS TABLES

Tables showing measure-level participation counts and savings for the Community Connections Program were provided in Chapter 5. This appendix provides three additional tables summarizing savings results.

- Table 7-1 reports the first-year kWh savings by utility and measure.
- Table 7-2 reports the lifetime kWh savings by utility and measure.
- Table 7-3 reports the annual gas savings (in MMBtu) by utility and measure.

Table 7-1. First-Year (2010) Energy Savings (kWh)

	CEI	Ohio Edison	Toledo Edison	Total, All Ohio
<u>Energy Efficiency Measures: Lighting</u>				
CFL – 3 way (13/20/25)	4,829	4,287	140	9,255
CFL – 7 Watt candle	51	6,689	163	6,903
CFL – 9 Watt candle	-	1,547	168	1,715
CFL – 9 Watt globe	4,939	2,733	-	7,671
CFL – 11 Watt	13,373	9,062	-	22,435
CFL – 13 Watt outdoor	-	-	-	-
CFL – 15 Watt	53,995	102,308	27,822	184,124
CFL – 15 Watt dimmable	-	469	-	469
CFL – 15 Watt outdoor	494	2,076	-	2,570
CFL – 15 Watt “torch”	-	100	-	100
CFL – 18 Watt	-	482	12,641	13,123
CFL – 18 Watt outdoor	-	321	-	321
CFL – 20 Watt	610	491	-	1,101
CFL – 23 Watt	70,199	39,385	10,142	119,726
CFL – 23 Watt outdoor	-	462	-	462
CFL – 29 Watt	-	388	-	388
Total First-Year Energy Savings, Lighting	148,489	170,801	51,076	370,365
<u>Energy Efficiency Measures: Non-Lighting</u>				
Refrigerator replacement	215,250	153,646	68,035	436,932
Freezer replacement	2,572	43,948	-	46,520
Insulation – Attic	-	3,934	-	3,934
Insulation – Floor	-	-	-	-
Insulation – Wall	-	399	-	399
Air Infiltration Reduction	-	8,134	-	8,134
Water Heater Wrap	-	329	458	787
Water Heating – Low Flow Showerhead	-	1,329	-	1,329
Water Heating – Faucet Aerators	-	238	-	238
Total First-Year Energy Savings, Non-Lighting	217,822	231,378	68,493	517,693
Total First-Year Energy Savings, All Measures	366,311	382,759	119,569	868,639

Table 7-2. Lifetime Energy Savings (kWh)

	CEI	Ohio Edison	Toledo Edison	Total, All Ohio
<u>Energy Efficiency Measures: Lighting</u>				
CFL – 3 way (13/20/25)	101,929	49,420	1,544	152,894
CFL – 7 Watt candle	1,081	77,116	1,802	79,999
CFL – 9 Watt candle	-	17,838	1,853	19,691
CFL – 9 Watt globe	104,246	31,505	-	135,751
CFL – 11 Watt	282,287	104,477	-	386,764
CFL – 13 Watt outdoor	-	-	-	-
CFL – 15 Watt	1,139,753	1,179,521	306,946	2,626,219
CFL – 15 Watt dimmable	-	5,405	-	5,405
CFL – 15 Watt outdoor	10,425	23,938	-	34,362
CFL – 15 Watt “torch”	-	1,158	-	1,158
CFL – 18 Watt	-	5,560	139,458	145,017
CFL – 18 Watt outdoor	-	3,707	-	3,707
CFL – 20 Watt	12,870	5,663	-	18,533
CFL – 23 Watt	1,481,808	454,074	111,890	2,047,772
CFL – 23 Watt outdoor	-	5,328	-	5,328
CFL – 29 Watt	-	4,479	-	4,479
Total Lifetime Energy Savings, Lighting	3,134,398	1,969,188	563,493	5,667,079
<u>Energy Efficiency Measures: Non-Lighting</u>				
Refrigerator replacement	4,848,720	1,772,088	751,272	7,372,080
Freezer replacement	57,933	506,876	-	564,809
Insulation – Attic	-	141,750	-	141,750
Insulation – Floor	-	-	-	-
Insulation – Wall	-	14,391	-	14,391
Air Infiltration Reduction	-	175,834	-	175,834
Water Heater Wrap	-	2,370	3,160	5,530
Water Heating – Low Flow Showerhead	-	19,160	-	19,160
Water Heating – Faucet Aerators	-	3,430	-	3,430
Total Lifetime Energy Savings Non-Lighting	4,906,653	3,150,430	754,432	8,811,514
Total Lifetime Energy Savings All Measures	8,041,051	4,605,087	1,317,925	13,964,063

Table 7-3. Annual Gas Savings (MMBtu)

	CEI	Ohio Edison	Toledo Edison	Total, All Ohio
<u>Energy Efficiency Measures: Lighting</u>				
CFL – 3 way (13/20/25)	(23.2)	(11.2)	(0.4)	(34.7)
CFL – 7 Watt candle	(0.2)	(17.5)	(0.4)	(18.2)
CFL – 9 Watt candle	-	(4.1)	(0.4)	(4.5)
CFL – 9 Watt globe	(23.7)	(7.2)	-	(30.9)
CFL – 11 Watt	(64.2)	(23.7)	-	(87.9)
CFL – 13 Watt outdoor	-	-	-	-
CFL – 15 Watt	(259.0)	(268.1)	(69.8)	(596.9)
CFL – 15 Watt dimmable	-	(1.2)	-	(1.2)
CFL – 15 Watt outdoor	(2.4)	(5.4)	-	(7.8)
CFL – 15 Watt “torch”	-	(0.3)	-	(0.3)
CFL – 18 Watt	-	(1.3)	(31.7)	(33.0)
CFL – 18 Watt outdoor	-	(0.8)	-	(0.8)
CFL – 20 Watt	(2.9)	(1.3)	-	(4.2)
CFL – 23 Watt	(336.8)	(103.2)	(25.4)	(465.4)
CFL – 23 Watt outdoor	-	(1.2)	-	(1.2)
CFL – 29 Watt	-	(1.0)	-	(1.0)
Total Gas Savings, Lighting	(712.4)	(447.5)	(128.1)	(1,288.0)
<u>Energy Efficiency Measures: Non-Lighting</u>				
Refrigerator replacement	-	-	-	-
Freezer replacement	-	-	-	-
Insulation – Attic	-	240.8	-	240.8
Insulation – Floor	-	-	-	-
Insulation – Wall	-	25.6	-	25.6
Air Infiltration Reduction	-	541.2	-	541.2
Water Heater Wrap	-	-	-	-
Water Heating – Low Flow Showerhead	-	2.1	-	2.1
Water Heating – Faucet Aerators	-	0.4	-	0.4
Total Gas Savings, Non-Lighting	-	810.2	-	810.2
Total Gas Savings, All Measures	(712.4)	362.6	(128.1)	(477.8)

APPENDIX C

IMPACT EVALUATION OF 2010 HOME ENERGY ANALYZER PROGRAM

**Final Report
April 7, 2011**

Prepared for:

**The Cleveland Electric Illuminating Company
The Ohio Edison Company
The Toledo Edison Company**

Prepared by:

ADM  Associates, Inc.[™]

**3239 Ramos Circle
Sacramento, CA 95827
916-363-8383**

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1. EXECUTIVE SUMMARY

This report presents final evaluation results for the Home Energy Analyzer (“HEA”) program implemented in 2010 in the service territories of the Ohio operating companies, The Cleveland Electric Illuminating Company (“CEI”), Ohio Edison Company (“Ohio Edison”), and The Toledo Edison Company (“Toledo Edison”) (collectively “Companies”). ADM Associates, Inc. (“ADM”) evaluated the impact of the HEA program by examining the effect of online versus telephone audits (at three levels of audit intensity) on reductions in home electricity consumption using a pretest-posttest control group design over 24 months spanning 2009 and 2010. ADM’s evaluation utilized regression analysis of monthly billing records.

A total of 43,575 customers participated in the HEA program in Ohio in 2010. Most of these customers (65%) used the online audit method. The Companies reported ex ante annual savings of 13,073 megawatt hours (MWh) for 2010. ADM’s M&V activities verified annualized electricity savings of 28,456 MWh attributable to participation in the HEA program in 2010 which yielded a gross realization rate of 218% for the 2010 HEA program. Partial year MWh savings attributable to the 2010 HEA program are 18,122 MWh. The verified critical peak demand reduction for 2010 was 0.187 MW. Indicators of program impact are presented in Table 1-1.

Table 1-1. Summary of Annualized Energy and Demand Savings Impacts

<i>Program Name</i>	<i>Program Goals</i>		<i>Ex Ante Savings</i>		<i>Ex Post Savings</i>	
	<i>Gross MWh</i>	<i>Gross MW</i>	<i>Gross MWh</i>	<i>Gross MW</i>	<i>Gross MWh</i>	<i>Gross MW</i>
Home Energy Analyzer	3,201	0.91	13,073	2.00	28,456	0.187

The results of the billing analysis indicate that the Companies’ HEA program participants used 5.35% less electricity in 2010 compared to similar customers who did not participate in the HEA program. ADM’s conclusion is that the HEA program was effective in reducing consumption for program participants by roughly 5% in 2010. In Table 1-2, program level results are shown for each of the three Companies.

Table 1-2. Summary of Annualized Gross Ex Post Energy and Demand Savings by Utility

<i>Utility</i>	MWh	MW
CEI	9,954	0.616
Ohio Edison	15,682	0.398
Toledo Edison	2,821	(0.828)

Note: Positive values indicate a decrease in kWh/kW whereas negative values indicate an increase.

Table 1-3 presents percentage savings by audit level, method and utility company. The percentage results presented in Table 1-3 clearly show that phone audits tend to be more

effective than online audits in reducing home electricity consumption at each level of audit intensity. In addition, customers who used the telephone audit method used less electricity in response to warmer weather and had a peak kW reduction as a result.

Table 1-3. Percent Savings by Utility, Level, and Method

<i>CEI</i>			
	Phone	Online	Combined
Lvl 1	10%	1%	2%
Lvl 2	11%	3%	6%
Lvl 3	12%	8%	8%
<i>Ohio Edison</i>			
	Phone	Online	Combined
Lvl 1	11%	-1%	0%
Lvl 2	12%	4%	6%
Lvl 3	13%	8%	8%
<i>Toledo Edison</i>			
	Phone	Online	Combined
Lvl 1	8%	5%	5%
Lvl 2	9%	1%	3%
Lvl 3	10%	9%	9%
<i>Combined Totals All Utilities</i>			
	Phone	Online	Combined
All Levels	11%	3%	5%

Notes: (1) Positive values indicate a reduction in kWh whereas negative values indicate an increase. (2) The combined column is a weighted average by the number of participants for each method at the corresponding level.

Greater savings using the online method were generally associated with higher levels of audit intensity. Alternatively, phone audit users appear to achieve high electricity savings results regardless of audit intensity.

The evaluation study was not a randomized control trial and selection bias has a role in explaining the results. Specifically, the telephone and online audit users come from different customer populations. Telephone audits typically stem from customers calling in with a “high bill” complaint and are generally used to resolve situations related to high levels of home electricity consumption. In fact, ADM found that the average monthly pre-audit electricity bill for telephone audit users was 13% higher than that of online audit users. It appears reasonable, therefore, that the telephone audit users may have differed from the online users in terms of motivation levels bearing on the desire to resolve home energy consumption issues and related costs. The greater savings realized by telephone audit users may also be somewhat of a statistical artifact related to their higher pre-audit levels of electricity consumption. That is, high initial

levels of a measured quantity tend to “regress to the mean” when observed over time after an intervening event, such as participation in a home energy audit.

ADM recommends, however, that any future evaluation of the HEA program include a process evaluation component to determine why customers use the different home energy audit methods and also to identify the actual benefits that users realize from each method. Of particular interest would be to determine the actions taken by customers as a result of a home energy audit.

In terms of promoting the online method for which the HEA program was primarily designed, ADM recommends that the Companies encourage online users to go beyond level 1 in conducting home energy audits. ADM also recommends that the Companies market the HEA program by making potential users aware that greater savings will generally be realized by conducting online audits at levels 2 and 3 rather than at level 1.

Finally, the combined total estimates in Table 5-4 should be used to replace the expected kWh per participant estimates for the program going forward, as displayed in Table 3-1 for the 2010 program year. For example, the combined ex ante estimate of annualized kWh savings for the total program going forward is 416 kWh per participant. If interest is restricted to online audits, then the overall annualized ex ante savings estimate would be 233 kWh per participant.

2. INTRODUCTION AND PURPOSE OF THE STUDY

Under contract with the Companies, ADM undertook studies to estimate and verify the savings being realized through the energy efficiency programs that the Companies implemented in Ohio in 2010. This document is the Final Report for the impact evaluation of the HEA program in Ohio.

The purpose of this evaluation was to answer four major research questions.

- To what extent has the HEA program resulted in net electric energy savings for participating customers (compared to similar nonparticipating customers) in each of the three Ohio utilities, as measured by annualized reductions in kilowatt hours (kWh) per customer?
- How do the two energy audit methods – online vs. telephone – compare in producing electric energy savings for customers?
- How do the three levels of involvement compare in producing electric energy savings?
- How effective is the program for online audit users compared to telephone audit users at each level of audit involvement?

Analysis of the impact of the HEA program on energy savings was conducted using regression analysis of billing data. The main objectives of the analysis were to quantify the impact of the program as a function of level (1 vs. 2 vs. 3) and type (online vs. telephone) of program participation on energy consumption, after controlling for the effects of weather and other factors.

3. DESCRIPTION OF PROGRAM

First implemented in December 2009, Ohio's HEA program allows residential customers in single family and multi-family homes to analyze their home energy use and billing history at no cost to themselves. Participation is on a continuous basis and customers can take a home energy audit at any time during the year. Home energy audits can be conducted in one of two ways:

- By using a personal computer to access the online home energy analyzer software application, developed by Aclara, that is available on the utility's website; or
- By telephone with the assistance of a Contact Center Representative.

Three levels of a home energy analysis report are possible, depending on how deeply the customer chooses to go in conducting a home energy audit.

- In a **Level 1** audit, the customer completes a home profile and receives a Level 1 Report which identifies the customer's top ways to save energy in their home. A Level 1 Report also shows the customer how their home compares to similar homes in the area on electricity usage and a pie chart shows how energy is distributed across various end uses in the home.
- In a **Level 2** audit, the customer completes an appliance profile.
- In a **Level 3** audit, the customer can go in-depth in exploring different ways to save energy in the home. Customers who complete Levels 2 and 3 receive a Home Energy Analysis report. More information is provided in a Level 3 report compared to a Level 2 report. In general, a Home Energy Analysis Report provides a summary of annual energy costs associated with the customer's appliances, a monthly energy use home comparison, and specific energy saving opportunities are identified for the customer's home.

Participation in the HEA program in 2010 is summarized in Table 3-1. Over half (51 percent) of the 2010 participants were in the Ohio Edison service territory and overall, 65 percent of the participants elected the online audit method. Also, over one third of the 2010 participants were involved in telephone audits which resulted from "high bill" customer complaints. In both online and telephone audits, customers were provided with information they could understand and act upon, including such things as the cost of heating and cooling their homes, the reasons their bills may have changed, and whether the customer takes service under the most favorable rate schedule.

Table 3-1 also shows the Companies' expectations for kWh and kW savings per customer and the expected level of savings contribution for the HEA program as a proportion of the Companies total Ohio energy conservation portfolio (EE/DR Ratio).

Table 3-1. Participation Levels and Expected Savings

Utility	Residential Customer Population	Participants			Expected Savings per Participant		EE/DR Ratio
		Online Method	Phone Method	Total Program	kWh	kW	
CEI	272,450	9,447	5,679	15,126	300	.046	.01
Ohio Edison	922,104	14,701	7,463	22,164	300	.046	.01
Toledo Edison	665,064	4,250	2,035	6,285	300	.046	.01
Total Program	1,859,618	28,398	15,177	43,575	300	.046	.03

Note. Participation counts are through December 2010.

4. METHODOLOGY

This chapter describes the methods employed by ADM in evaluating the impact of the HEA program in Ohio in 2010. The goals for the impact evaluation included:

- Designing a regression model to describe the monthly energy consumption of households, and the resulting percent savings associated with program participation.
- Utilizing the regression model to estimate weather sensitive and non-weather sensitive savings and using actual Ohio 2010 weather data to calculate annual kWh savings.
- Applying kW factors independently to weather sensitive kWh and non-weather sensitive kWh savings values to determine peak kW reductions.

These goals were accomplished by using a pretest-posttest control group design with multiple regression analysis of billing data to estimate the impact of the HEA program on energy usage. The steps in the evaluation process included the following:

- Examining the billing database for accuracy and completeness;
- Conducting a Chow Test to determine whether a pooled regression or separate regressions should be run for each utility company;
- Specifying the regression model; and
- Running the regression analysis using the SAS GLM procedure.

Each of these steps is discussed below.

4.1 EXAMINATION OF BILLING DATA

ADM obtained billing data from the Companies for all HEA program participants who had initiated a home energy audit by June 30, 2010. The Companies supplied data to ADM for the following variables for each of the three Ohio utility companies:

- Utility customer ID and premise ID;
- Service address zip code;
- Beginning and end dates of monthly electric bills, and number of days billed;
- Monthly kWh consumption billed for each customer for 24 months (Jan 2009 – Dec 2010);
- Audit method (online or telephone); and
- Dates of completion for each audit level (three possible).

Data for the variables listed above were supplied for 33,356 HEA participants (i.e., the Treatment Group). The same information, except for the HEA install date, was supplied to ADM for a random sample of customers who did not complete the HEA (i.e., the Control Group).

ADM first examined the treatment group database for incomplete strings of customer data (i.e., less than 24 months of billing data) and removed those customers from the analysis file. Next, customers were dropped if there were any irregular billing cycles for any of their kWh readings (i.e. less than 20 days between readings, or greater than 40 days). Any customer with a zero, negative or excessively high (>5000 kWh/Month) kWh entry was removed from the analysis file. Finally, any participant with an audit date after April 1st 2010 was removed from the sample. This was done to increase the duration of the post-audit period of observation. Through this data cleaning process, ADM removed 15,733 of 33,356 (47%) program participants. The final analysis file was therefore composed of a sample of 16,976 participants who passed all three data screening checks. Customers removed from the regression were still accounted for in the final kWh and kW savings calculations, since the data errors detected were simply billing related and had nothing to do with their participation in the program.

The same data cleaning procedure was applied to the control group file and resulted in 29,703 control group members out of 77,098 (39%) being deleted from the regression analysis. The final control group sample consisted of 47,395 the Companies' customers.

4.2 CHOW TEST

ADM conducted a Chow Test to determine whether it would be more accurate to conduct a single regression analysis that pooled the data across the three utility companies or whether separate regressions should be run for each utility company. In the case of the Ohio HEA program, the Chow Test essentially estimates whether the regression results are more accurately represented as a single pooled model or whether there are significant differences between the utility companies which would warrant separate models being run. The results of each Chow Test comparison showed, without a doubt, that each utility company should be run as a separate regression.¹ As a result of the Chow Test, a single regression model was specified but separate regressions were run for each utility company.

4.3 REGRESSION MODEL

Ambient weather conditions are represented in the regression model as heating and cooling degree-hours, calculated in reference to a base temperature of 65°F. Degree-hours are used instead of degree-days because degree-hours provide a more representative measure of the effects of weather conditions. For example, the degree hour variables account for the non-linear response of electricity usage to changes in weather conditions. Depending on their energy-efficiency characteristics and the magnitudes of their solar and internal heat gains, buildings differ in the temperatures at which they begin to require heating or cooling. The degree hours used for a house are calculated to match the periods of time covered in the billing records and the geographic locations of the sample members.

¹ See Appendix A for the Chow Test statistical results.

The regression model takes advantage of the panel nature of the dataset and incorporates all customers (i.e., the sum of treatment group and control group members) studied over the 24 months of observation. A panel dataset by definition has observations that vary across time and by cross sectional unit (i.e., customers). The regression model estimates electricity consumption in kilowatt hours (kWh). The model is specified below:

$$kWh_{it} = \beta_0 + \beta_1 HDD_{it} + \beta_2 CDD_{it} + \beta_3 Treatment_{it} + \beta_4 TL2_{it} + \beta_5 TL3_{it} + \beta_6 Online_{it} + \beta_7 THDD_{it} + \beta_7 (Treatpost * Online * CDD * Level)_{it} + \beta_8 (Treatment * CDD)_{it} + \beta_9 (Treatment * HDD)_{it} + \gamma CustID_i$$

rough time. HDD and CDD refer to heating and cooling degrees days respectively, and are specific to the month and location of the residence. Treatment is a binary variable equaling 1 if the individual is a participant in the program and zero otherwise. Treatpost equals one if the customer is a program participant and has already completed a home energy audit, and zero otherwise. The estimated equation contains a vector of binary variables (CustID) that is unique to each participant household. The purpose of this constant term is to capture the determinants of each customer's energy use that are constant over time, but are unique from participant to participant. This approach controls for the variation in kWh consumption levels between customers. Table 4-1 defines each variable that is included in the models.²

Table 4-1. Variables in ADM's Regression Models

<i>Variable Name</i>	<i>Variable Definition</i>	<i>Measurement Scale</i>
kWh	Monthly kWh for each customer	Continuous variable
CustID	Customer contract account number	Continuous variable
Treatment	Treatment or control group indicator (1=HEA participant, 0 = Control)	Binary variable
CDD	Cooling degree days referenced to 65°F	Continuous variable
HDD	Heating degree days referenced to 65°F	Continuous variable
Treatpost	Billing period for HEA Participants: pre or post HEA completion (1 = Completed HEA, 0 = Otherwise)	Binary variable
Level	Highest Level completed (1, 2 or 3)	Ordinal variable
Online	Phone or Online Method (1=Online, 0=Phone)	Binary Variable
Treatpost*HDD	Interaction of billing period & HDD	Continuous variable
Treatpost*Phone*Level*CDD	Interaction of billing period, Phone, Level & CDD	Continuous variable
Treatment*CDD	Interaction of Treatment group & CDD	Continuous variable
Treatment*HDD	Interaction of Treatment group & HDD	Continuous variable

² In the final analysis, phone audits were collapsed over levels for sample size reasons and because there was no statistically significant difference in the regression model for program impact by level within the phone method.

Each utility company was run as a separate regression and in all three regression models the dependant variable is the natural log of monthly kWh. The final results of the regression analyses are reported in Section 5 below. All effects are for the post-audit period in 2010.

4.4 BASELINE CALCULATION

In order to accurately quantify the results of the program by a measurable metric we need a baseline or consumption level assuming the customer had not completed the online audit. Given that we have two years of billing data for each customer in our sample, we decided to use 2009 data as a baseline since the customer would not have completed the audit program by then and hence their consumption level would be unaltered. That baseline value is then used to calculate the kWh savings by applying the regression results in percentage terms to the baseline number.

The baseline value also serves as the denominator in percentage savings calculations at the program level and when broken down by audit type.

5. DETAILED EVALUATION FINDINGS

This chapter presents the results from the regression analysis and the application of those results to determine the savings from the HEA program.

5.1 RESULTS OF REGRESSION ANALYSIS

Regression coefficients and their corresponding standard errors are reported in Table 5-1 for nine impact variables. Each row in Table 5-1 reports results for a particular group (e.g., Online Audits at Level 1). The impact variables in rows 1-4 of Table 5-1 present results for non-weather sensitive effects. The impact variables in rows 5-9 of Table 5-1 present results for weather sensitive effects. Negative coefficients in Table 5-1 signify energy savings for the program group; positive coefficients do not. The main program-level findings indicated by the results in Table 5-1 are summarized below.

- Online audits at level 2 and above had about the same non-weather related savings effects as telephone audits at any level.
- HEA program participants decreased their electricity consumption in comparison to control group members *regardless of weather conditions*.
- Telephone Audit user *decreased their electricity consumption in response to increasingly hot weather* compared to control group members.
- Online Audit users *increased their electricity consumption in response to increasingly hot weather* compared to control group members.
- HEA participants used *more energy in response to increasingly hot weather* after participating in the program.

5.2 WEATHER SENSITIVE AUDIT EFFECTS BY UTILITY COMPANY

Weather sensitive effects for audit method and audit intensity vary by utility company as summarized in the following bullet points.

- CEI telephone audit users saved electricity in response to warmer weather whereas CEI online audit users at level 2 increased electricity consumption in response to warmer weather.
- Ohio Edison online audit users at all levels increased electricity consumption in response to warmer weather.
- Toledo Edison online audit users increased electricity consumption in response to warmer weather.

Table 5-1. Regression Results for each Utility Company

Impact Variable	Cleveland Electric Illuminating	Ohio Edison	Toledo Edison
	(1)	(2)	(3)
1. Phone*Post	-0.094195 *** (0.015028)	-0.095220 *** (0.018005)	-0.127408 *** (0.030604)
2. Online Lvl1*Post	-0.077659 *** (0.019007)	-0.079435 *** (0.019825)	-0.077646 ** (0.030472)
3. Online Lvl2*Post	-0.095226 *** (0.013976)	-0.094930 *** (0.015297)	-0.093316 *** (0.023503)
4. Online Lvl3*Post	-0.107865 *** (0.021644)	-0.110200 *** (0.021091)	-0.112241 *** (0.032054)
5. Cooling Degree Days*Phone*Post	-0.000404 *** (0.000059)	-0.000547 *** (0.000082)	-0.000156 (0.000122)
6. Cooling Degree Days*Online Lvl1*Post	0.000221 *** (0.000079)	0.000367 *** (0.000094)	0.000291 (0.000192)
7. Cooling Degree Days*Online Lvl2*Post	0.000216 *** (0.000055)	0.000160 ** (0.000067)	0.000305 ** (0.000129)
8. Cooling Degree Days*Online Lvl3*Post	0.000108 (0.000092)	0.000186 * (0.000102)	0.000316 (0.000207)
9. Heating Degree Days*Post	0.000118 *** (0.000019)	0.000119 *** (0.000021)	0.000125 *** (0.000031)
Mean of dependent variable	6.4625	6.4681	6.5070
Sample Size	451,039	1,188,415	355,318
R-Squared	0.0795	0.1033	0.0462

Note 1. The dependent variable is the Natural Log of Monthly kWh for regressions (1), (2) and (3).

Note 2. Statistical significance is denoted with * to indicated the p = 0.10 level; ** to indicate the p = 0.05 level; and *** to indicate the p = the 0.01 levels, respectively.

Note 3. Standard Errors are in parenthesis

Note 4. Cooling degree days are calculated as the sum of cooling degree hours in a month divided by 24.

5.3 ESTIMATES OF GROSS KWH SAVINGS

A total of 43,575 First Energy customers participated in the HEA program in 2010. *Ex ante* savings claimed for the program in 2010 were 13,073 megaWatt hours (MWh). ADM's impact evaluation verified partial year electricity savings of 18,122 MWh for 2010 and annualized savings of 28,456 MWh resulting in a gross realization rate of 218% for the 2010 program. Verified critical peak demand reduction for 2010 was 0.187 MW.

In order to transform the results of the regression in Table 5-1 to annual kWh savings values, we utilized all coefficients of interest that were significant at the 90% confidence level. Each program participant in our sample had their kWh and kW savings calculated based on their

location, group and audit method. The weather sensitive coefficients vary with CDD, so they are applied on an individual, month to month basis depending on the 2010 weather data for the city where the customer resides. The resulting kWh savings are the sum of both those impacts. Table 5-2 presents the ex ante and ex post energy savings along with program-year realization rates for each of the three utility companies.

Table 5-2. Annualized Electric Energy Impact Summary

<i>Utility Company</i>	<i>Measure Category</i>	<i>Ex Post Energy Savings (MWh)</i>	<i>Ex Ante Energy Savings (MWh)</i>	<i>Difference</i>	<i>Realization Rate</i>
CEI	Home Energy Analyzer	9,954	4,538	5,416	219%
Ohio Edison	Home Energy Analyzer	15,681	6,649	9,032	236%
Toledo Edison	Home Energy Analyzer	2,820	1,886	934	150%
Total		28,456	13,073	15,383	218%

Appendix C provides a summary of electric savings by audit level and method for each utility company. Despite the fact that a majority of program participants chose the online method, a large portion of the savings shown in Appendix C comes from the telephone audit participants.

5.4 ELECTRICITY IMPACTS STANDARDIZED AS PERCENT SAVINGS AND SAVINGS PER PARTICIPANT

Table 5-3 presents annualized percentage savings by audit level, method and utility company. The percentage results presented in Table 5-3 clearly show that telephone audits tend to be more effective than online audits in reducing home electricity consumption at each level of audit intensity.

The percentage savings effects show the same main effect pattern as discussed previously in section 5-1. That is, the impact of telephone audits show up at all levels of audit intensity whereas the stronger online effects are for audit levels 2 and 3. That is, greater savings using the online method tend to be associated with higher levels of audit intensity. Alternatively, phone audit users appear to achieve high electricity savings results regardless of audit intensity.

Table 5-3. Percent Savings by Utility, Method, and Level

CEI

	Phone	Online	Combined
Lvl 1	10%	1%	2%
Lvl 2	11%	3%	6%
Lvl 3	12%	8%	8%

Ohio Edison

	Phone	Online	Combined
Lvl 1	11%	-1%	0%
Lvl 2	12%	4%	6%
Lvl 3	13%	8%	8%

Toledo Edison

	Phone	Online	Combined
Lvl 1	8%	5%	5%
Lvl 2	9%	1%	3%
Lvl 3	10%	9%	9%

Combined Totals All Utilities

	Phone	Online	Combined
All Levels	11%	3%	5%

Notes: (1) Positive values indicate a reduction in kWh whereas negative values indicate an increase. (2) The combined column is a weighted average by the number of participants for each method at the corresponding level.

Annualized electricity savings (kWh) per participant are presented in Table 5-4 by utility, audit method, audit level, and for the total program. The same pattern of effects is evident in the findings for savings per participant as was shown for percentage savings.

*Table 5-4. Electric Energy Savings (kWh) per Participant
Summarized by Utility, Method and Intensity Level*

Cleveland Illuminating Company			
	Phone	Online	Combined
Lvl 1	761	74	141
Lvl 2	1,018	207	495
Lvl 3	1,127	623	704
All Levels	1,003	212	433
Ohio Edison			
	Phone	Online	Combined
Lvl 1	872	-46	37
Lvl 2	1,197	308	538
Lvl 3	1,303	663	730
All Levels	1,170	259	445
Toledo Edison			
	Phone	Online	Combined
Lvl 1	486	274	292
Lvl 2	644	57	210
Lvl 3	628	616	617
All Levels	626	188	274
Combined All Utilities			
	Phone	Online	Combined
All Levels	1,032	233	416

Notes: (1) Positive values indicate a reduction in kWh whereas negative values indicate an increase. (2) The combined column is a weighted average by the number of participants for each method at the corresponding level.

Again, it is clear from Table 5-4 that the telephone audit method is superior to the online method in producing kWh savings per participant across utility companies at each level of audit intensity.

5.5 CRITICAL PEAK DEMAND IMPACTS

Table 5-5 below presents ex post demand reductions expected during First Energy's specified critical peak window.³ Since we have calculated a weather sensitive savings component and a non-weather sensitive component, we apply to each a normalized load shape. One load shape mirrors HVAC consumption and the other represents all end uses in the home averaged over the hours which are specified as critical peak. Those kW values are summed and reported in Table 5-5. At the overall program level, there is a peak kW reduction of 0.187MW. Toledo Edison customers experienced a MW increase as a result of their modeled responses to warm weather. While this may seem to be a counterintuitive result, the regression coefficients representing the response in the post treatment period to increasingly warm weather are strongly positive. This weather related response outweighed the non-weather related savings component during peak hours and resulted in an increase in peak MW.

Table 5-5. Critical Peak Demand Reductions Summary

<i>Utility Company</i>	<i>Measure Category</i>	<i>Ex Post Energy Savings (MW)</i>	<i>Ex Ante Energy Savings (MW)</i>	<i>Difference</i>	<i>Realization Rate</i>
CEI	Home Energy Analyzer	0.616	0.6958	0.080	89%
Ohio Edison	Home Energy Analyzer	0.398	1.0195	0.622	39%
Toledo Edison	Home Energy Analyzer	-0.828	0.2891	1.118	-286%
Total		0.187	2.004	1.817	9%

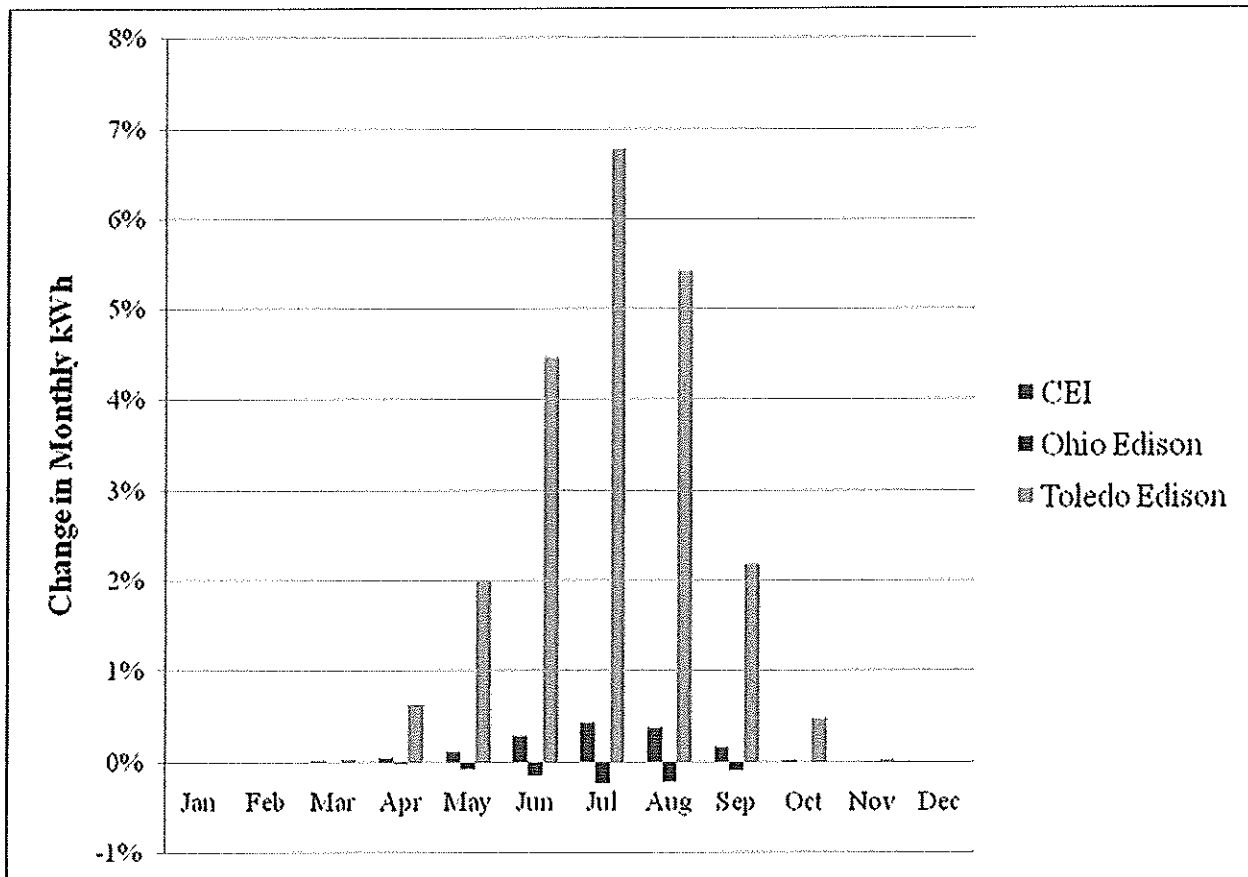
Note: Positive values indicate a reduction in kW whereas negative values indicate an increase.

In Figure 5-1 the issue of how program participants respond to increasingly warm weather is explored in more detail. Specifically the chart shows the percentage change in monthly kWh consumption that is attributable to warmer weather when compared to the control group. The results vary by utility company, but are consistent with the results in Table 5-5.

Of particular note is that Toledo Edison customers increased consumption significantly in response to warmer weather after participating in the program. It should also be noted that while CEI customers show a slight increase in consumption in response to warmer weather, there is an overall reduction in peak kW for CEI when the impact of their non-weather sensitive consumption is factored in. Ohio Edison customers decreased their kWh consumption in response to warmer weather.

³ The critical peak window used was weekdays 3-6 PM June through August.

Figure 5-1 Percentage Change in Monthly kWh in Response to Cooling Degree Days



6. CONCLUSIONS AND RECOMMENDATIONS

A total of 43,575 customers participated in the Companies' HEA program in Ohio in 2010. Most customers (65%) used the online audit method. The Companies reported ex ante annual savings of 13,073 MWh for 2010. ADM's M&V activities verified annualized electricity savings of 28,456 MWh attributable to participation in the HEA program in 2010. The verified critical peak demand reduction for 2010 was 0.187 MW. The verified ex post kWh savings yielded a gross realization rate of 218% for the overall 2010 program.

The telephone audit method generally proved to be more effective than the online audit method. In addition, customers who used the telephone audit method used less electricity in response to warmer weather and had a peak kW reduction as a result.

The evaluation study was not a randomized control trial and selection bias has a role in explaining the results. Specifically, the telephone and online audit users come from different customer populations. Telephone audits typically stem from customers calling in with a "high bill" complaint and are generally used to resolve situations related to high levels of home electricity consumption. In fact, ADM found that the average monthly pre-audit electricity bill for telephone audit users was 13% higher than that of online audit users. It appears reasonable, therefore, that the telephone audit users may have differed from the online users in terms of motivation levels bearing on the desire to resolve home energy consumption issues and related costs. The greater savings realized by telephone audit users may also be somewhat of a statistical artifact related to their higher pre-audit levels of electricity consumption. That is, high initial levels of a measured quantity tend to "regress to the mean" when observed over time after an intervening event, such as participation in a home energy audit.

ADM recommends, however, that any future evaluation of the HEA program include a process evaluation component to determine why customers use the different home energy audit methods and also to identify the actual benefits that users realize from each method. Of particular interest would be to determine the actions taken by customers as a result of a home energy audit.

In terms of promoting the online method for which the HEA program was primarily designed, ADM recommends that the Companies encourage online users to go beyond level 1 in conducting home energy audits. ADM also recommends that the Companies market the HEA program by making potential users aware that greater savings will generally be realized by conducting online audits at levels 2 and 3 rather than at level 1.

Finally, the combined total estimates in Table 5-4 should be used to replace the expected kWh per participant estimates for the program going forward, as displayed in Table 3-1 for the 2010 program year. For example, the combined ex ante estimate of annualized kWh savings for the total program going forward is 416 kWh per participant. If interest is restricted to online audits, then the overall annualized ex ante savings estimate would be 233 kWh per participant.

7. APPENDIX A: RESULTS OF CHOW TESTS

Table 7-1 shows the results of the Chow Test calculations.

Table 7-1. Chow Test Calculations and Test Statistics

	<i>Sum of Squared Residuals</i>	<i>Sample Size</i>	<i>Parameters</i>	<i>Chow Test Statistic</i>	<i>Reference Groups</i>	<i>P-Value</i>
CE	249,680.19	451,039	15	482.81	CE vs (TE+OE)	0.00000
OE	489,368.42	1,188,415	15	708.71	OE vs (CE+TE)	0.00000
TE	97,655.43	355,318	15	324.24	TE vs (CE+OE)	0.00000
TE+OE	591,175.66	903,747	15			
CE+TE	349,400.67	654,932	15			
CE+OE	744,671.47	1,150,893	15			
All	845,350.84	1,354,786	15			

8. APPENDIX B: PARTICIPANT COUNTS IN SAMPLE

Table 8-1 shows the size of the participant samples used in the regression analysis across audit levels and audit types by utility company.

Table 8-1. Sample Participant Counts

<i>Cleveland Electric Illuminating</i>		
	Phone	Online
Level 1	198	952
Level 2	2,277	2,473
Level 3	123	573
<i>Ohio Edison</i>		
	Phone	Online
Level 1	263	1,359
Level 2	2,125	3,772
Level 3	140	998
<i>Toledo Edison</i>		
	Phone	Online
Level 1	78	418
Level 2	572	979
Level 3	18	305

9. APPENDIX C: ANNUALIZED TOTAL SAVINGS IMPACT SUMMARY BY UTILITY

Table 9-1 shows total annualized MWh savings by audit level and method for each utility company and the total HEA program. Despite the fact that a majority of program participants chose the online method, a larger portion of the savings comes from the telephone audit participants. At the total program level, it can be seen in Table 9-1 that 53% of the savings come from telephone audits and 47% of the savings come from online audits.

Table 9-1. Electric Savings (MWh) by Utility Company, Audit Level, and Method

Cleveland Illuminating Company			
	Phone	Online	Combined
Lvl 1	385	442	826
Lvl 2	5,250	2,435	7,685
Lvl 3	363	1,080	1,443
Ohio Edison			
	Phone	Online	Combined
Lvl 1	626	-407	219
Lvl 2	6,757	5,948	12,705
Lvl 3	517	2,240	2,758
Toledo Edison			
	Phone	Online	Combined
Lvl 1	107	778	885
Lvl 2	1,002	303	1,304
Lvl 3	48	583	631
Combined All Utilities			
	Phone	Online	Combined
All Levels	15,055	13,402	28,456
Percentage of Total	53%	47%	100%

Note: Positive values indicate a reduction in MWh whereas negative values indicate an increase.

APPENDIX D

IMPACT EVALUATION OF 2010 MERCANTILE CUSTOMER PROGAM

**Final Report
April 21, 2011**

Prepared for:

**The Cleveland Electric Illuminating Company
Ohio Edison Company
The Toledo Edison Company**

Prepared by:

ADM  Associates, Inc.™

**3239 Ramos Circle
Sacramento, CA 95827
916-363-8383**

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1. EXECUTIVE SUMMARY

Beginning in 2009 the Mercantile Customer Program was implemented in the service territories of The Cleveland Electric Illuminating Company (“CEI”), Ohio Edison Company (“Ohio Edison”), and The Toledo Edison Company (“Toledo Edison”) (collectively “Companies”). The program was targeted at “mercantile customers”, with a mercantile customer being a commercial or industrial customer whose annual electricity usage is for nonresidential purposes and exceeds 700,000 kWh per year or who is part of a national account involving multiple facilities in one or more states.

There were a total of 425 mercantile customer projects enrolled in the program in the service territories of the three Companies by the end of 2010. The numbers of projects for each service territory were as follows:

- Cleveland Electric Illuminating 196
- Ohio Edison 135
- Toledo Edison 94

Estimates of the gross energy savings (kWh) and peak demand reductions (kW) from these projects in the three service territories are reported in Table 1-1.

Table 1-1. Overall Evaluation Results

<i>Utility</i>	<i>Program Goals</i>		<i>Ex Ante Expected Gross Savings</i>		<i>Ex Post Verified Gross Savings</i>	
	<i>Gross kWh</i>	<i>Gross kW</i>	<i>Gross kWh</i>	<i>Gross kW</i>	<i>Gross kWh</i>	<i>Gross kW</i>
CEI	85,955,000	21,805	261,638,036	24,035	243,394,987	27,050
Ohio Edison	123,577,000	31,349	147,836,456	12,494	141,265,386	10,278
Toledo Edison	57,735,000	14,646	127,452,499	26,425	122,965,591	23,543
All Ohio	267,267,000	67,800	536,926,991	62,955	507,625,964	60,871

2. INTRODUCTION AND PURPOSE OF STUDY

Beginning in 2009 the Mercantile Customer Program was implemented in the service territories of the three operating companies in Ohio (i.e., CEI, Ohio Edison, Toledo Edison). Through the program, the Companies worked with mercantile customers to submit applications to the Public Utilities Commission of Ohio (“PUCO”) to commit to the Companies the energy savings and kW reductions achieved through energy efficiency projects undertaken at customers’ facilities. By participating in the program, qualifying customers could “opt out” of the Demand Side and Energy Efficiency (DSE2) Rider established by SB 221 or, beginning in December 2010, receive rebates for past projects.

The purpose of this report is to describe the evaluation effort undertaken to verify the energy savings and peak demand reductions that resulted from projects that customers had enrolled in the Mercantile Customer Program by the end of 2010 and to report the results of that effort.

This report is organized as follows.

- Chapter 3 provides a description of the Mercantile Customer Program.
- Chapter 4 presents and discusses the methods used to verify kWh savings and kW reductions for projects implemented through the program.
- Chapter 5 presents the estimates of verified kWh savings and kW reductions.
- Chapter 6 summarizes the results of the evaluation effort.
- Appendix A provides the M&V results for the projects in the analysis sample.

3. DESCRIPTION OF PROGRAM

The Mercantile Customer Program is targeted at mercantile customers within the service territories of CEI, Ohio Edison, or Toledo Edison that have, since January 1, 2006, implemented projects that resulted in energy efficiency and/or peak demand reductions.

Under Rule 4901:1-39-05(F), Ohio Administrative Code (O.A.C.), a mercantile customer is allowed to file with the PUCO, either individually or jointly with an electric utility, an application to commit the customer's existing demand reduction, demand response, and energy efficiency programs for integration with the electric utility's programs. Customers participating in the Mercantile Customer Program chose to file jointly with the Companies.

To be eligible to participate in the Mercantile Customer Program, a customer had to be a "mercantile customer" as defined in R.C. § 4928.01 (A) (19). Per this definition, a mercantile customer is a commercial or industrial customer who meets either of two criteria:

- Consumes more than 700,000 kWh per year; or
- Is part of a national account involving multiple facilities in one or more states.

Beginning in December, 2010, mercantile customers who participated in the program could choose between two types of incentives:

- An exemption from the Demand Side Energy Efficiency (DSE2) Rider established by SB 221, for a specified period of time, or
- A cash rebate option.

A customer participating in the program could choose to receive an exemption from the DSE2 Rider that was legislated in SB 221. To be eligible for this exemption, a customer had to provide sufficient data to illustrate that it had installed self-directed energy efficiency and/or demand reduction technologies that had produced energy savings and/or peak demand

Calculations for exemption from the DSE2 rider are made on a site-by-site basis, where a site is defined as a location with one or more facilities located on one or more parcels of land, provided that the parcels are contiguous. (e.g. a plant, a hospital complex, or a university located on one or more contiguous parcels of land would qualify as a site.)

Although all accounts related to a given site are eligible for exemption, the exemption is applied only to those accounts identified by a customer on the Joint Application it files with the Companies to the PUCO. Aggregate savings from projects on the site are compared to the aggregate baseline of all accounts included in the application to determine if the site meets the eligibility requirement.

Under the Cash Rebate Option that was introduced for the Mercantile Pilot Program, customers are eligible to receive a cash rebate for a mercantile customer project discounted to 75 percent of the rebate for the same project if offered as a new utility program. The rebates were capped at 50 percent of project costs or \$250,000, whichever was lower. The maximum rebate that any customer could receive is \$500,000 per year. The caps apply per service territory. A customer is defined by its tax identification number.

Several criteria are used to determine whether an energy efficiency project or measure qualifies for an incentive through the Mercantile Customer Program.

- If a customer replaces equipment before its end of life, efficiency savings are eligible as measured against the as-found equipment.
- If a customer replaces equipment at end of life with standard equipment, projects are not eligible for an incentive; however, utilities may count the savings towards compliance goals.
- Behavioral modifications, or operational improvements may qualify for incentives, but only if an investment was made on the customer's part and if the savings are measurable and verifiable. If there was no investment, the customer is not eligible for an incentive; however, utilities may count measureable and verifiable savings towards compliance goals.

There was a total of 425 mercantile customer projects enrolled in the program in the Companies service territories in Ohio by the end of 2010. The numbers of projects for each service territory were as follows:

- | | |
|-----------------------------------|-----|
| • Cleveland Electric Illuminating | 196 |
| • Ohio Edison | 135 |
| • Toledo Edison | 94 |

4. METHODOLOGY

As specified in the Evaluation Plan prepared by the Statewide Evaluator¹, kWh savings and kW reductions for a program are to be calculated measure-by-measure. For measures installed through programs in 2010, the Statewide Evaluator² expected that savings would be calculated using values from the *State of Ohio Energy Efficiency Technical Reference Manual* ("TRM").³ However, most measures installed by customers participating in the Mercantile Customer Program were essentially custom measures for which deemed savings values are not included in the TRM. The methods used to calculate kWh savings and kW reductions for measures installed through the Mercantile Customer Program are presented in this chapter.

4.1 SAMPLING PLAN

Estimation of the gross savings achieved through projects undertaken under the Mercantile Customer Program were developed using data for a sample of projects that had been enrolled in the program by the end of 2010. Data provided by the Companies showed that customers who enrolled in the program by the end of 2010 had implemented and completed 425 projects for the program, which were expected to provide 536,926,991 kWh savings and 62,954 kW reductions.

A sample frame was constructed using information on projects provided by the Companies. The design variable used in developing the sampling plan was *ex-ante* expected gross annual kWh savings. Sample strata were defined by applying the Dalenius-Hodges stratification procedure to the data on *ex ante* kWh savings. The population statistics used to develop the final design sample are shown in Table 4-1.

Table 4-1. Population Statistics Used for Sample Design

<i>Stratum</i>	<i>Stratum Boundaries</i>	<i>Number of Projects</i>	<i>kWh Savings</i>			
			<i>Total</i>	<i>Average</i>	<i>Standard Deviation</i>	<i>Coefficient of Variation</i>
1	Min - 198,251	198	13,701,367	69,199	56,235	0.81
2	209,057 - 499,397	91	31,488,070	346,023	91,574	0.26
3	506,688 - 899,375	62	40,982,997	661,016	117,957	0.18
4	902,496 - 1,382,896	29	33,447,136	1,153,350	158,422	0.14
5	1,481,500 - 4,488,563	26	63,330,830	2,435,801	820,121	0.34
6	4,838,040 - 9,735,087	17	151,701,783	8,923,634	4,409,245	0.49
7	36,261,000 - Max	2	202,274,808	101,137,404	91,749,090	0.91
All		425	536,926,991	1,263,358	8,427,469	6.67

¹ ECONorthwest, Inc., *Ohio Independent Evaluator 2010 Evaluation Plan*, Prepared for Public Utilities Commission of Ohio, December 6, 2010

² Ibid., p. 4.

³ Vermont Energy Investment Corporation (VEIC), *State of Ohio Energy Efficiency Technical Reference Manual*, Prepared for Public Utilities Commission of Ohio, Draft of August 6, 2010.

The efficacy of different allocations of sample points across strata was examined by considering the precision with which total kWh savings could be estimated at the 90 percent confidence level, with 10 percent precision being the target.

As can be seen in Table 4-1, the distribution of kWh savings for projects was highly skewed, with the two projects in Stratum 7 accounting for 38 percent of the total program-level savings. Given the skewness in the distribution of savings, a sample design was developed in which the projects in Stratum 7 (i.e., the projects with the highest kWh savings) were chosen for the analysis sample with certainty, with smaller numbers of projects to be chosen randomly from the other strata. The design allocation of sample points across strata is shown in Table 4-2, which also shows how much of total expected kWh savings in each stratum are accounted for by the projects chosen for the sample. Based on the *ex ante* kWh savings values, the designed analysis sample was projected to allow total program kWh savings to be estimated with a precision of 8.1 percent at the 90 percent confidence level.

Table 4-2. Number of Sample Projects and Their Expected Savings, by Stratum

<i>Stratum</i>	<i>Number of Projects in Sample</i>	<i>Expected Savings of Projects in Sample</i>	<i>Total Expected Savings for All Projects in Stratum</i>
1	2	363,621	13,701,367
2	1	499,397	31,488,070
3	1	883,397	40,982,997
4	1	1,342,716	33,447,136
5	2	7,777,583	63,330,830
6	9	63,628,255	151,701,783
Certainty	2	202,274,808	202,274,808
Total	18	276,769,777	536,926,991

4.2 REVIEW OF DOCUMENTATION

After the sample of 18 projects was selected, documentation pertaining to those projects was obtained from the Companies. For each project, the available documentation (e.g., audit reports, savings calculation work papers, etc.) for each rebated measure was reviewed, with particular attention given to the calculation procedures and documentation for savings estimates. Documentation was reviewed to determine whether the following types of information had been provided:

- Documentation for the equipment changed, including (1) descriptions, (2) schematics, (3) performance data, and (4) other supporting information
- Documentation for the new equipment installed, including (1) descriptions, (2) schematics, (3) performance data, and (4) other supporting information

-
- Information about the savings calculation methodology, including (1) what methodology was used, (2) specifications of assumptions and sources for these specifications, and (3) correctness of calculations

If project documentation was incomplete or there was uncertainty regarding a project, ADM staff worked with the Companies' staff or with the customer to seek further information to ensure that the M&V analysis was based on proper information.

4.3 ON-SITE DATA COLLECTION

On-site visits were used to collect data on which to base the analysis of savings impacts. The visits to the sites of the sampled projects were used to collect primary data on the measures implemented at those facilities.

During an on-site visit, the field staff accomplished three major tasks.

- First, they verified the implementation status of all measures for which customers received incentives. They verified that the energy efficiency measures were indeed installed, that they were installed correctly and that they still functioned properly.
- Second, they collected the physical data needed to analyze the energy savings that had been realized from the installed improvements and measures. Data were collected using a form that was prepared specifically for the project in question after an in-house review of the project file.
- Third, they interviewed the contact personnel at a facility to obtain additional information on the installed system to complement the data collected from other sources.

Estimates of energy use and savings for energy efficiency measures depend significantly on having accurate data for such factors as operating hours and usage patterns. At some sites, monitoring was conducted to gather such information (e.g., on the operating hours of the installed measures). Monitoring was conducted at sites where it was judged that the monitored data would be useful for further refinement and higher accuracy of savings calculations.

Monitoring was not considered necessary for some sites. This included facilities where project documentation allowed for sufficiently detailed calculations or where this type of information was available from an energy management control system. For other facilities, information could be obtained through relatively simple monitoring using loggers.

4.4 METHODS TO ESTIMATE VERIFIED SAVINGS FOR INSTALLED MEASURES

The method used to determine gross savings impacts depended on the type of measure being analyzed. Measures installed fell into the following categories:

- Lighting measures;
- Process Improvement measures;

-
- Compressed-Air measures; and
 - HVAC measures

The energy savings achieved with these different types of measures were determined using a site-specific M&V approach. This involved determining the savings for the measures installed through a project by using one or more of the M&V Options defined in the IPMVP.⁴

- For process measures that did not involve space conditioning, the specificity of the process generally precluded using an energy analysis model for simulation analysis. Savings from these types of process improvement measures therefore were analyzed through engineering analysis of the process affected by the improvements, with monitoring used to supply information for important variables.
- Savings for lighting measures were assessed using IPMVP Option B, Retrofit Isolation. With IPMVP Option B, savings are calculated using short term or continuous measurement, and savings are determined by field post-measurements of the system(s) to which the measure(s) have been applied, separate from the energy use of the rest of the facility. Short-term or continuous measurements are taken during the post-retrofit period. In fact, however, only a small number of the projects for high tech facilities involved lighting measures (either retrofits or controls).
- Savings from compressed air measures were evaluated through engineering analysis of compressor performance curves, supported by data collected through short-term metering. Nameplate information for the pre-retrofit equipment was obtained either from the project file or during the on-site survey. Performance curve data was obtained from manufacturers. Engineering staff then conducted an engineering analysis of the performance characteristics of the pre-retrofit equipment. Where appropriate, savings calculations were made using AirMaster+.
- HVAC measures were analyzed using IPMVP Option D, which involves calibrated simulation of energy use. For this analysis, the eQuest energy analysis model was used to prepare computer simulations of energy use before and after the HVAC measures were installed at a facility.

These calculations of savings produced two estimates of gross savings for each sample project: an *ex ante* expected gross savings estimate (as reported in the project documentation) and the *ex post* verified gross savings estimates developed through the M&V analysis. Using these two estimates of energy savings, realization rates⁵ were calculated for each project in the M&V

⁴ IPMVP refers to the International Performance Measurement and Verification Protocol, which specifies alternative measurement and analysis methods that can be used to estimate gross energy and demand savings from a measure installed under a program being evaluated. See www.evo-world.org.

⁵ The savings realization rate for a project is calculated as the ratio of the achieved savings for the project (as measured and verified through the M&V effort) to the expected savings (as determined through the project application procedure and recorded in the tracking system for the program).

sample. Sites with relatively high or low realization rates were further analyzed to determine the reasons for the discrepancy between expected and verified energy savings.

Information on the projects in the analysis sample is provided in Appendix A.

4.5 ESTIMATING PROGRAM-LEVEL REALIZED SAVINGS

Program-level savings were developed by applying savings realization rates calculated for the analysis sample to program-level data for expected savings. This procedure for estimating gross savings for the program is an application of ratio estimation.

Given a stratified sample design, a gross realization rate (GRR) for a stratum is defined as the ratio of the sum of the realized savings determined for the M&V sample to the sum of the *ex ante* expected savings recorded in the tracking database for the same sample. The following formula illustrates the calculation made for each stratum:

$$\text{Estimated Verified Savings for Stratum} = \left(\frac{\sum_{\text{sample}} \text{Verified Savings}_i}{\sum_{\text{sample}} \text{Expected Savings}_i} \right) \sum_{\text{Population}} \text{Expected Savings}_i$$

where $\text{Verified Savings}_i$ is an *ex post* estimate calculated for each site i in the analysis sample for the stratum and $\text{Expected Savings}_i$ is the *ex ante* expected savings for site i as recorded in the program tracking database. GRR is given by the term in brackets.

To estimate total verified savings for a program, the estimates of verified savings for the different strata are summed. Note that this gives a realization rate at the program-level that is a weighted average of the realization rates for the different strata, with claimed savings being the weights.

5. DETAILED EVALUATION FINDINGS

To estimate gross kWh savings and peak kW reductions resulting from the projects in the Mercantile Customer program, data were collected and analyzed for a sample of 18 projects. The data collected for these sample projects were analyzed using the methods described in Chapter 4 to estimate project energy (kWh) savings and peak demand (kW) reductions and to determine realization rates. The results from the analysis of the sample projects were then applied to estimate program-level savings and demand reductions. The findings from this evaluation effort are detailed in this section. Project-specific M&V results for the projects in the analysis sample are provided in Appendix A.

5.1 ESTIMATES OF EX POST VERIFIED GROSS KWH SAVINGS

Estimates of *ex post* verified kWh savings for the program are presented in this section.

5.1.1 Results from Analysis of kWh Savings for Sample Projects

For each project in the analysis sample, there are two estimates of gross kWh savings: the *ex ante* (expected) gross kWh savings estimate (as reported in the documentation for a project) and the estimate of *ex post* (verified) gross savings developed through the analysis of the sample projects. Figure 5-1 provides a summary comparison between the two values for the 18 projects in the analysis sample. The correspondence is close, with a correlation of 0.999 (i.e., an R^2 of 0.998) between the two values across the sample projects.

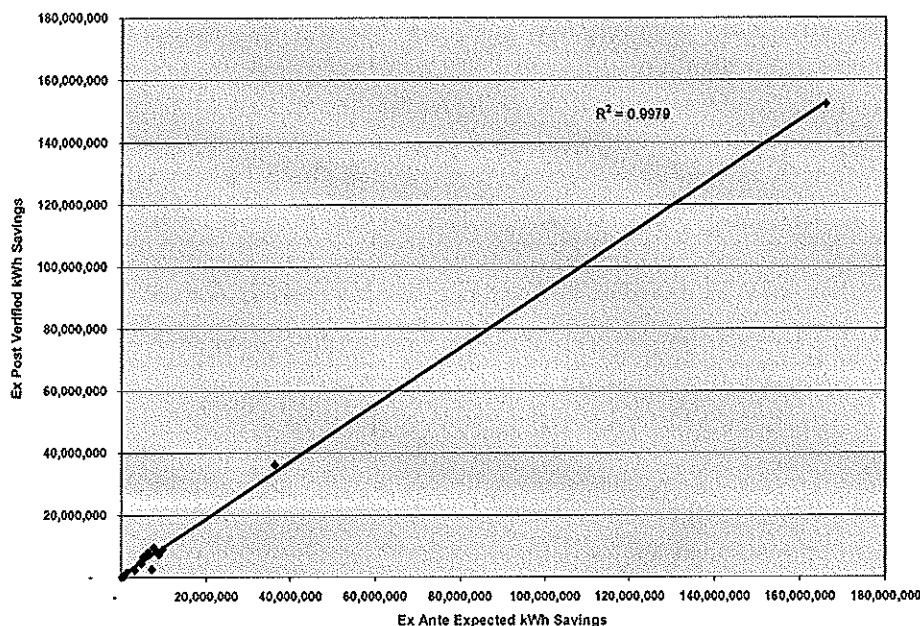


Figure 5-1. Comparison of Ex Post Verified Gross kWh Savings to Ex Ante Expected Gross kWh Savings for Projects in M&V Sample

The estimated realization rates for gross kWh savings for the strata in the analysis sample are shown in Table 5-1. For purposes of calculating these realization rates, sampling strata 1, 2, 3, and 4 were collapsed into one stratum (referred to in Table 5-1 as Stratum 1-4.)

*Table 5-1. Realization Rates for Gross kWh Savings
by Sampling Strata for Projects in M&V Sample*

<i>Stratum</i>	<i>Number of Sample Sites</i>	<i>Total Ex Ante Expected Gross kWh Savings</i>	<i>Total Ex Post Verified Gross kWh Savings</i>	<i>Realization Rates</i>
1-4	5	3,089,131	2,860,984	92.6%
5	2	7,777,583	6,909,532	88.8%
6	9	63,628,255	63,813,639	100.3%
Certainty	2	202,274,808	188,434,587	93.2%
Totals	18	276,769,777	262,018,741	94.7%

5.1.2 Program-Level Verified kWh Savings

The estimated program-level *ex post* (verified) gross kWh savings for the Mercantile Customer Program were developed by applying the stratum-specific realization rates from Table 5-1 to the stratum-level *ex ante* (expected) kWh savings. Table 5-2 shows the estimated *ex post* program-level gross kWh savings resulting from applying this procedure. The overall realization rate was 94.5 percent (with an error bound of ± 8.3 percent at the 90 percent confidence level).

*Table 5-2. Program-Level Ex Ante (Expected)
and Ex Post (Verified) Gross kWh Savings
by Sample Stratum*

<i>Stratum</i>	<i>Ex Ante Expected kWh Savings</i>	<i>Gross Realization Rate</i>	<i>Ex Post Verified kWh Savings</i>
1-4	119,619,570	92.6%	110,785,087
5	63,330,830	88.8%	56,262,517
6	151,701,783	100.3%	152,143,773
Certainty	202,274,808	93.2%	188,434,587
Totals	536,926,991	94.5%	507,625,964

Table 5-3 shows the estimated *ex post* verified program-level gross kWh savings by utility when the stratum-specific realization rates are applied to the *ex ante* expected kWh savings for projects in each utility's service territory.

*Table 5-3. Program-Level Ex Ante (Expected)
and Ex Post (Verified) Gross kWh Savings
by Utility*

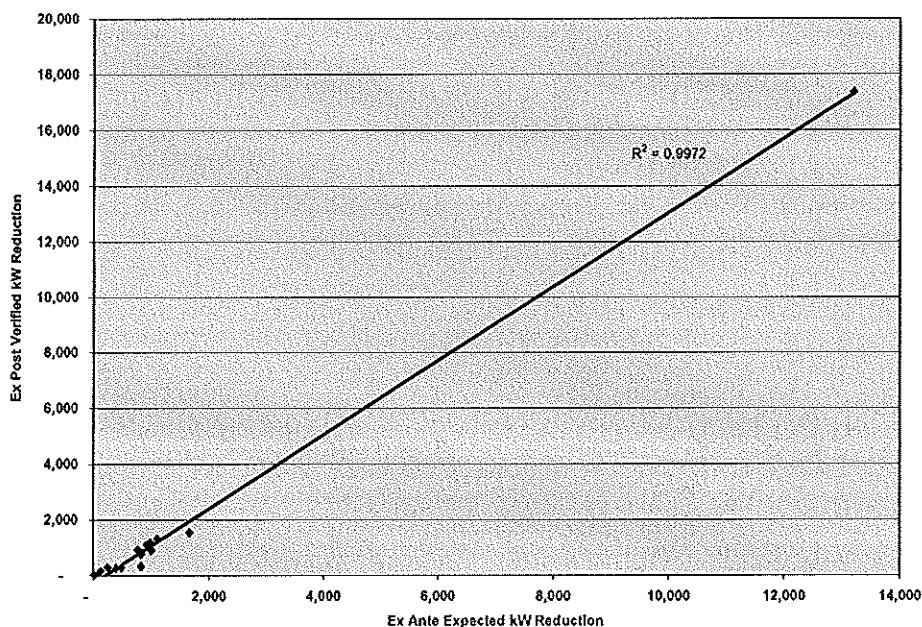
<i>Utility</i>	<i>Ex Ante Expected kWh Savings</i>	<i>Ex Post Verified kWh Savings</i>
CEI	261,638,036	243,394,987
Ohio Edison	147,836,456	141,265,386
Toledo Edison	127,452,499	122,965,591
Totals	536,926,991	507,625,964

5.2 ESTIMATES OF EX POST VERIFIED KW REDUCTIONS

Estimates of *ex post* verified coincident kW reductions for the program are presented in this section.

5.2.1 Results from Analysis of Peak Demand Reductions for Sample Projects

For each project in the analysis sample, there are two estimates of gross kW reductions: the *ex ante* (expected) gross kW reduction estimate (as reported in documentation for a project) and the estimate of *ex post* (verified) gross kW reductions developed through the analysis of the sample projects. Figure 5-2 provides a summary comparison between the two values for the 18 projects in the analysis sample. The correspondence is close, with a correlation of 0.999 (i.e., an R^2 of 0.997) between the two values across the sample projects.



*Figure 5-2. Comparison of Ex Post Verified Gross kW Reductions
to Ex Ante Expected Gross kW Reductions for Projects in M&V Sample*

The estimated realization rates for kW reductions for the strata in the analysis sample are shown in Table 5-4. For purposes of calculating these realization rates, sampling strata 1, 2, 3, and 4 were collapsed into one stratum (referred to in Table 5-4 as Stratum 1-4.)

Table 5-4. Realization Rates for Peak kW Reductions by Sampling Strata for Analysis Sample

<i>Stratum</i>	<i>Number of Sample Sites</i>	<i>Total Ex Ante Expected Peak kW Reductions</i>	<i>Total Ex Post Verified Peak kW Reductions</i>	<i>Realization Rates for kW Reductions</i>
1-4	5	881	755	85.7%
5	2	392	271	69.1%
6	9	8,957	8,943	99.8%
Certainty	2	13,200	17,371	131.6%
Totals	18	23,430	27,340	116.7%

5.2.2 Program-Level Verified kW Reductions

The estimated program-level *ex post* (verified) gross kW reductions for the Mercantile Customer Program were developed by applying the stratum-specific realization rates from Table 5-4 to the stratum-level *ex ante* (expected) kW reductions. Table 5-5 shows the estimated *ex post* program-level gross kW reductions resulting from applying this procedure. The overall realization rate for kW reductions was estimated to be 96.7 percent (with an error bound of ± 8.5 percent at the 90 percent confidence level).

Table 5-5. Program-Level Ex Ante (Expected) and Ex Post (Verified) Gross kW Reductions by Sample Stratum

<i>Stratum</i>	<i>Ex Ante Expected kW Reductions</i>	<i>Gross Realization Rate</i>	<i>Ex Post Verified kW Reductions</i>
1-4	22,029	85.7%	18,878
5	9,969	69.1%	6,892
6	17,757	99.8%	17,729
Certainty	13,200	131.6%	17,371
Total	62,955	96.7%	60,871

Table 5-6 shows the estimated *ex post* verified program-level gross kW reductions by utility when the estimation procedure is applied for projects in each utility's service territory.

*Table 5-6. Program-Level Ex Ante (Expected)
and Ex Post (Verified) Gross kWh Savings
by Utility*

<i>Utility</i>	<i>Ex Ante Expected kW Reductions</i>	<i>Ex Post Verified kW Reductions</i>
CEI	24,035	27,050
Ohio Edison	12,494	10,278
Toledo Edison	26,425	23,543
Total	62,955	60,871

6. SUMMARY AND CONCLUSIONS

There were 425 projects undertaken through the Mercantile Customer Program by the end of 2010 in the service territories of the three companies in Ohio. The numbers of projects for each service territory were as follows:

- Cleveland Electric Illuminating 196
- Ohio Edison 135
- Toledo Edison 94

The overall evaluation results for estimated gross energy savings (kWh) and peak demand reductions (kW) for the program in the three service territories are summarized in Table 6-1.

Table 6-1. Overall Evaluation Results for Gross kWh and kW Savings

<i>Utility</i>	<i>Program Goals*</i>		<i>Ex Ante Expected Gross Savings</i>		<i>Ex Post Verified Gross Savings</i>	
	<i>Gross kWh</i>	<i>Gross kW</i>	<i>Gross kWh</i>	<i>Gross kW</i>	<i>Gross kWh</i>	<i>Gross kW</i>
CEI	85,955,000	21,805	261,638,036	24,035	243,394,987	27,050
Ohio Edison	123,577,000	31,349	147,836,456	12,494	141,265,386	10,278
Toledo Edison	57,735,000	14,646	127,452,499	26,425	122,965,591	23,543
All Ohio	267,267,000	67,800	536,926,991	62,955	507,625,964	60,871

* Program goals are taken from utility program filings.

APPENDIX A: M&V RESULTS FOR PROJECTS IN ANALYSIS SAMPLE

Table A-1 shows the M&V results for the 18 projects in the analysis sample.

Table A-1. M&V Results for Projects in Analysis Sample

Utility	Project Description	Stratum	kWh Savings			kW Reductions		
			Ex ante Expected	Ex Post Verified	Realization Rate	Ex ante Expected	Ex Post Verified	Realization Rate
CEI	Hot Dipped Galv-anneal Line (HDGL)	C	166,013,808	152,173,587	0.917	13,200	17,371	1.316
OE	Reheat Furnace Separation Wall	C	36,261,000	36,261,000	1.000	-	-	
CEI	Installation of MORE System	6	9,735,087	9,021,816	0.927	1,667	1,545	0.927
TE	Compressor Reduction	6	8,829,701	7,479,843	0.847	1,006	903	0.898
TE	Energy Reduction Lighting Upgrade	6	8,152,641	9,103,319	1.117	831	840	1.011
CEI	Lighting Projects	6	7,709,780	9,663,219	1.253	1,107	1,328	1.200
OE	Program Bellis Morcom compressors & reduce facility high air pressure	6	7,286,525	2,604,883	0.357	832	329	0.395
CEI	Lighting Projects	6	6,440,368	8,148,104	1.265	930	1,116	1.200
OE	Phase I Lighting Upgrade	6	5,326,936	6,582,543	1.236	985	1,182	1.200
CEI	Lighting Projects	6	5,309,177	6,684,262	1.259	771	925	1.200
CEI	Melt Shop Enhancement Projects	6	4,838,040	4,525,650	0.935	828	775	0.936
CEI	Reduce Melt Shop Baghouse Fan Runtime	5	4,488,563	4,629,801	1.031	-	-	
TE	ID Fan draft reduction	5	3,289,020	2,279,731	0.693	392	271	0.691

Table A-1, continued. M&V Results for Projects in Analysis Sample

Utility	Project Description	Stratum	kWh Savings			kW Reductions		
			Ex ante Expected	Ex Post Verified	Realization Rate	Ex ante Expected	Ex Post Verified	Realization Rate
OE	Phase II Lighting Retrofits	4	1,342,716	1,657,331	1.234	248	298	1.202
TE	Lighting Upgrade	3	883,397	967,482	1.095	129	154	1.194
CEI	Kitchen Hood Ventilation Controls	2	499,397	11,366	0.023	-	-	
OE	Blow Mold Lighting	1	182,436	199,767	1.095	21	25	1.190
TE	Reduced Cooling - Ice Storage	1	181,185	25,038	0.138	483	278	0.576

This foregoing document was electronically filed with the Public Utilities

Commission of Ohio Docketing Information System on

5/23/2011 4:47:44 PM

in

Case No(s). 11-2959-EL-EEC

Summary: Report of the Status of 2010 Energy Efficiency and Peak Demand Reduction
Benchmarks electronically filed by Ms. Kathy J Kolich on behalf of Ohio Edison Company and
The Cleveland Electric Illuminating Company and The Toledo Edison Company