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Reporter's Signature: Karen Sue Gibson

Date Submitted:

BEFORE THE PUBLIC UTILITIES COMMISSION OF OHIO

- - -

In the Matter of the Application of Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company for Authority to Provide for a Standard Service Offer Pursuant to R.C. 4928.143 in the Form of an Electric Security Plan.	:	Case No. 14-1297-EL-SSO

- - -

PROCEEDINGS

before Mr. Gregory Price, Ms. Mandy Chiles, and Ms. Megan Addison, Attorney Examiners, at the Public Utilities Commission of Ohio, 180 East Broad Street, Room 11-A, Columbus, Ohio, called at 9:00 a.m. on Friday, October 16, 2015.

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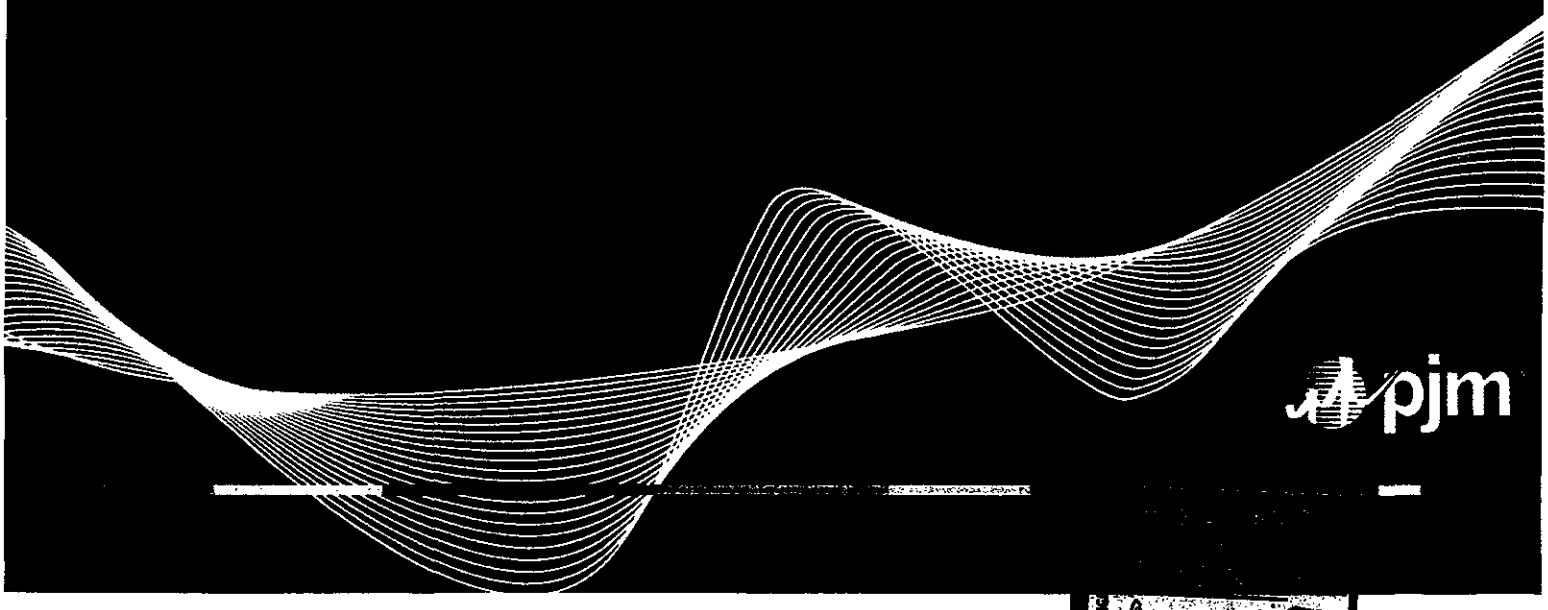
The Evolution of Demand Response in the PJM Wholesale Market

PJM Interconnection

October 6, 2014



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Introduction

In any market, the participation of consumer response to price is essential to healthy and competitive market outcomes. This axiom holds true for wholesale electric markets as with any other market. The more that demand actively participates in our wholesale electricity markets, the more competitive and robust the market. Additionally, demand response, if visible and dependable, can and has proven to be an operational tool that assists in maintaining reliability, both in regards to real-time security and long-term resource adequacy. For these reasons, PJM Interconnection remains committed to finding ways to preserve the value that demand response provides to both our system and market operations. PJM also notes our market experience has demonstrated the value of competition among service providers, which has fostered demand response innovations. The market would benefit by preserving this competitive dynamic.

Since the May 2014 decision by the D.C. Circuit Court of Appeals (the "*EPSA*" decision), PJM has considered alternative approaches that would permit demand response to continue to participate in our markets in a manner consistent with the division of jurisdictional responsibility between the states and the Federal Energy Regulatory Commission described in the *panel decision. This paper presents PJM's thoughts and rationale to support an approach that would meet these objectives* and do so without exposing PJM and its members to unacceptable litigation risk and uncertainty as to settled market outcomes.

Different approaches, other than the approach PJM advances in this paper, are conceptually possible under the *EPSA* decision. Moreover, stakeholders hold differing views generally as to (1) the value of demand response to PJM's markets and operations and (2) its lawful participation in wholesale electricity markets. Indeed, at least one group of PJM stakeholders, and perhaps the FERC itself, will request appeal of the *EPSA* decision to the U.S. Supreme Court, leaving open the possibility of a return to the status quo before the *EPSA* decision. PJM offers this paper to illustrate a viable path forward to evolve demand response in light of the *EPSA* decision, should the FERC decide, after considering its options under the *EPSA* decision (including possible further appeal), that such a path is needed. Ultimately, any path forward will be subject to stakeholder comment and critique and acceptance by the FERC and state regulators. PJM is committed to working with state regulators to develop strategies to monetize the benefits of consumer demand response in the wholesale markets.

Where We Have Come from – a Thumbnail Sketch

Demand response has come to mean many things. Therefore, offering some precise definitional terms helps to promote a shared understanding of options. Currently, curtailment participates most commonly in PJM as a "demand resource." By this (and despite what may appear to be a contradiction in terms) we mean demand resources offer into the PJM markets and *are paid as "supply-side" resources. As such, demand resources are expected to perform (more or less) comparably to* traditional supply-side resources (generation). In this paper, the term "demand *resource*" describes the supply-side participation of demand, and the term "demand *response*" describes demand (as load) making a curtailment commitment and, in so doing, avoiding costs and charges it otherwise would incur. Peak shaving, active load management and PJM's "price responsive demand" rules are examples of "demand response."

While PJM market rules offer both "demand resource" and "demand response" opportunities, most activity in recent years has taken the form of "demand resource" (i.e. supply-side) participation. There are logical and policy arguments on both sides of the "demand resource" paradigm.[1] The path forward advanced in this paper does not reflect a preference on the part of PJM between these competing economic and policy arguments. Rather, the proposal is informed by the law and analysis represented by *EPSA* and by practicalities which favor an approach that would reduce lengthy litigation risk and the potential for disrupting settled transactions – particularly in the context of the three-year "forward" capacity market administered by PJM.

The Law Following the *EPSA* Decision and Practicalities

The reach of the *EPSA* decision is subject to debate. Technically, the decision vacated FERC Order No. 745, which was confined only to the payment of demand resources in the wholesale energy market. However, the jurisdictional analysis applied by the majority to reach the *vacatur* suggests a precedent that could apply, when litigated, to PJM's Reliability Pricing Model capacity market. The FERC will need to confront this question; indeed, it has been put in play by FirstEnergy's May 23, 2014, filing of a complaint with the FERC seeking to remove demand resources from the 2014 RPM Base Residual Auction. PJM will answer this complaint on or about October 22, 2014. Suffice to note here, PJM's answer will oppose FirstEnergy's complaint and its requested relief.

In considering the implications of *EPSA* to PJM's capacity market, we once again face the question of what is capacity? Arguments can be offered that, unlike energy, capacity is a product (albeit abstract in nature) that can be sold for resale. Whether a product or service, capacity is a uniquely wholesale market concept – one not subject to state regulation and one over which the FERC exercises expansive jurisdictional authority as evidenced by recent decisions out of the Third and Fourth Circuit Courts of Appeal. While PJM acknowledges arguments of this nature, they are uncertain and untested.

Moreover, the linkage between the capacity and energy markets is undeniably strong. After all, the theory underlying the purpose of capacity markets is the recognition that energy markets alone are impeded in providing sufficient compensation to supply – due in part to the suppressing effect of offer caps, reserve margins and other features giving rise to a "missing money" problem that capacity markets are designed to solve. PJM's unfolding capacity performance initiative more explicitly defines capacity in reference to a resource's performance in the energy markets, further suggesting that capacity is simply a form of inchoate energy or a call on energy. The derivative and interdependent nature of the capacity market vis-a-vis the energy market raises the question under *EPSA* whether a commitment to curtail in the capacity market (a demand resource) is functionally any different than a commitment to curtail in the energy market.

The *EPSA* decision is more explicit in focusing on curtailment as the action defining a demand resource and further regarding this action as within the jurisdiction of the states and not the FERC. Yet, PJM does not believe the *EPSA* court squarely addressed the notion of "wholesale curtailment." PJM recognizes this notion. Load serving entities, in partnership with their customers (often under state programs), can manage their wholesale consumption, lower their forecast demand

[1] A thorough treatment of these positions can be found in the comments and the FERC decision finalizing Order No. 719.

requirements and actively manage their consumption of energy at the peaks to lower their capacity obligations. PJM can and does account for these actions in making planning and procurement decisions in the wholesale market. Nothing in the *EPSA* decision prevents PJM from taking such actions to recognize wholesale curtailment actions. In PJM's view, the jurisdictional divide between wholesale and retail under the *EPSA* reasoning allows PJM to account for curtailment only to the extent it reflects the action of a wholesale entity, such as a load-serving entity or competitive retail service provider, and only to the extent such curtailment reflects that entity's own wholesale load.

Finally, PJM will be the first to agree that the *EPSA* decision, both in regards to its scope and its division of state and federal responsibilities, raises numerous unanswered questions and is open to various differing, reasonable interpretations. Accordingly, as noted earlier, one could propose different paths forward and argue such approaches are consistent with or distinguishable from *EPSA*. In arriving at its proposed path forward, PJM sought first to maximize the continuing value of demand in its markets and operations and, second, to do so in a manner compatible with a reasonable interpretation of *EPSA*.

But a third consideration deserves equal weight: risk. Litigation risk can upset market and settlement outcomes as evident from appellate court decisions in recent years remanding transmission cost allocation methodologies and marginal loss surplus allocations. These disruptions, often many years into the future, would upset what were thought to be settled market and billing outcomes and could lead to default and default allocations to members. PJM is particularly mindful of this risk when considering its capacity market. The three-year-forward commitment feature in PJM's capacity market raises a host of complications when it comes to resettling auction outcomes. The amount of money subject to disgorgement can be considerable, and the change in clearing prices given the sensitivity of the supply and demand curves in the auction can be dramatic.

Demand resources participate today in PJM's energy markets under pre-*EPSA* rules. PJM will be clearing capacity auctions in 2015, including the Base Residual Auction in May 2015. The form by which demand is eligible to participate in these auctions ideally would be known before conducting such auctions. Pursuing creative but untested notions of demand as a demand resource in upcoming capacity market auctions and thus facing the prospect of several years of uncertain administrative and judicial litigation serves to undermine completely the very purpose of the capacity market – namely, to provide a certain stream of forward revenues to assist capital formation for resource investment.

In considering PJM's market and operational objectives in maximizing demand participation along with the law and practicalities (including risks) associated with the *EPSA* ruling, PJM proposes an approach to have demand participate in PJM's energy and capacity markets under the following broad terms:

1. As demand response (i.e. demand side). PJM's markets would not separately compensate demand as a supply-side resource. The economics and incentives in having demand participate would result from avoided costs and obligations. State programs, of course, could offer added incentives to both wholesale and retail market participants.

2. Through load-serving entities. PJM would base planning and procurement decisions on commitments bid into PJM's markets by wholesale market entities. These entities, by definition, have control over, or an obligation to serve, specified retail load and can commit to reduce their wholesale load based on curtailment commitments or alternate supply (behind the meter) which they arrange with their end-use retail load. We envision that in many states third-party curtailment service providers will serve a continuing and important function by partnering with load-serving entities to provide their customer management expertise.

Demand Response in Specific Markets Going Forward

Capacity Market

Consistent with the foregoing, PJM describes below a modified approach to demand response participation in the capacity market and, in addition, proposes a transition mechanism to address the question of cleared demand resource bids from past base and incremental capacity auctions.

Wholesale demand response would bid into the capacity auction as a commitment to curtail by wholesale market entities (load serving entities, including competitive retail providers). This alternative would enable wholesale (load-serving entity-based) load to participate on the demand side of the capacity market as "demand response" and would be modeled as a reduction in capacity obligation. The demand would bid a curtailment commitment into the capacity auction at a price. This curtailment commitment bid would affect the demand curve, could set the capacity price and, if cleared, would avoid paying the capacity clearing price. This cleared curtailment would result in PJM procuring less capacity for that load-serving entity in the same amount as the cleared curtailment bid quantity. Under this approach, PJM would define the eligibility characteristics of a curtailment commitment and would establish measurement, verification, penalty and credit requirements as necessary to ensure performance and compliance. The curtailment commitment is essentially a commitment by the load-serving entity to reduce its wholesale demand at PJM's request during the established compliance period. If the demand response curtailment commitment is called to perform in the energy market, it may receive no additional energy market payment,[2] but would avoid an energy payment for the demand reduced.

PJM believes a transition mechanism can be developed based on this alternate approach to minimize disruption to participation by wholesale demand response that is already committed through a capacity auction for delivery years 2015/16, 2016/17 and 2017/18. The proposed transition mechanism is as follows:

- PJM would review demand resource commitments to determine which are load-serving-entity-based and can be directly converted to demand response curtailment commitments.

[2] In implementing *EPSA*, the FERC will decide whether the court decision leaves open any room for the FERC to direct PJM to offer affirmative payments for wholesale curtailment. PJM would have concern with any theory upon which such FERC authority is based, should such a theory be "creative" and subject to the uncertainty of credible and protracted litigation.

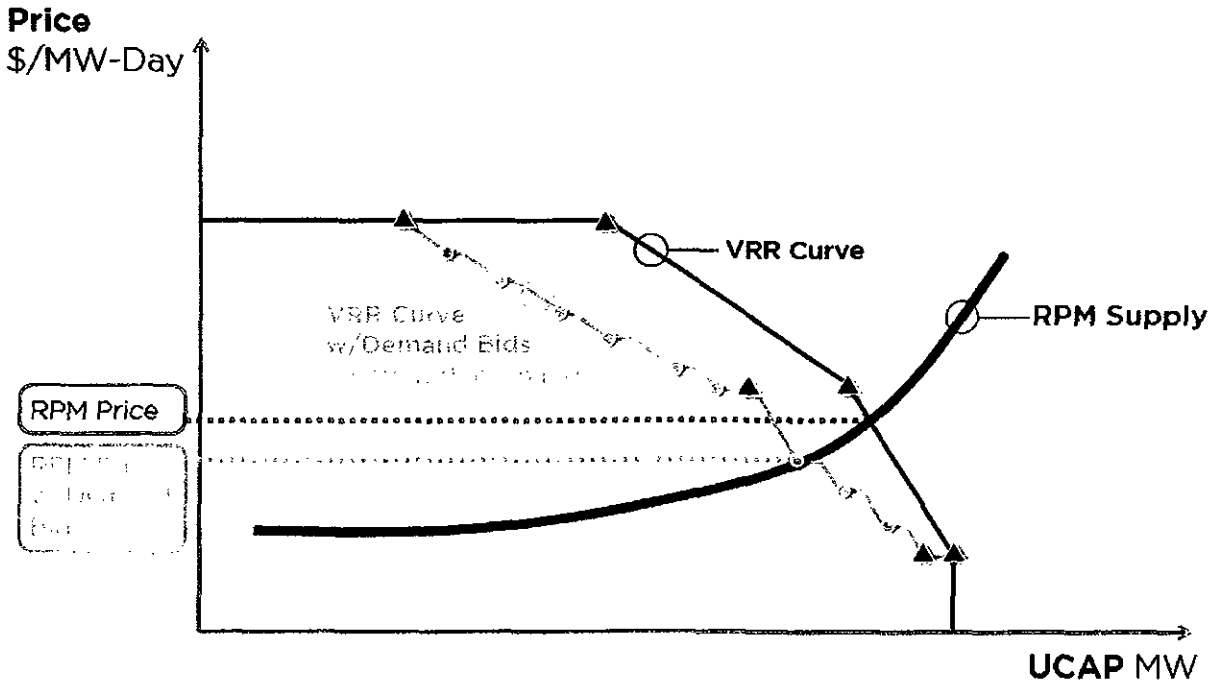
- PJM would develop a mechanism to work with curtailment service providers, states and load-serving entities to explore how demand resource commitments may be transitioned to load-serving entity-based curtailment commitments through assignment arrangements and the like.

- PJM would establish procedures for demand resources that cannot be converted to release them from their capacity commitment. Such resources would receive no capacity credit for their released commitment and retain no curtailment obligation in the delivery year.

- Similar to the pending rules transitioning demand resources affected by the new 30-minute notification requirement, PJM would account for the quantity of released demand resources in the remaining incremental auctions for the three transition delivery years and, if necessary, purchase additional capacity to replace the released demand resources. Additionally, load-serving-entity-based demand response would be eligible to bid into the incremental auctions as demand-side participants.

- The terms of the curtailment commitment in the energy market for each type of demand resource (limited, extended summer and annual) would be preserved during the transition.

Figure 1: *Integration of Demand Response Bids with RPM Demand Curve*



Shown based on existing PJM Variable Resource Requirement Curve.
PJM has proposed an alternative demand curve as part of the triennial review process.

Energy Market

Depending on the FERC's decisions for demand response compensation, demand reduction in the PJM energy markets may not receive direct compensation from the wholesale market. The PJM Day-Ahead Energy Market permits price responsive demand bids in which load-serving entities can specify a price at which they choose not to consume energy rather than pay energy market clearing prices. The PJM Tariff also includes provisions for Price-Responsive Demand in the Real-Time Energy Market. Under these provisions, a load-serving entity can provide a forecast of aggregated price responsive demand which PJM will model in the regional dispatch to avoid dispatch of generating resources in anticipation of price responsive demand reduction.

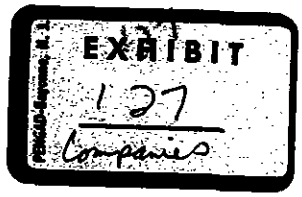
Ancillary Service Markets

The participation of demand in PJM's ancillary service markets in light of *EPSA* strikes PJM as presenting a different legal argument than participation by demand in capacity and energy markets. While we would regard any legal basis allowing demand to continue to participate in energy and capacity markets as a demand resource as an intolerably uncertain, PJM believes ancillary service markets might be different. Ancillary services are well-defined wholesale products and services closely tied to the FERC's federal authority over interstate transmission service. They were defined as required elements of open access transmission service in FERC Orders Nos. 888 and 889. Ancillary services are not directly bought or sold at retail by, or from, end users. As such, they are not matters historically under state purview. While ancillary services support the consumption and delivery of electric energy, they are discretely recognized and not, by PJM's way of thinking, so closely linked as capacity might be to energy.

At this time, PJM would propose to pay demand that is eligible to provide frequency regulation and synchronized reserve, as a resource in the markets that PJM operates for those services. Under PJM's construct, demand resource offers in the frequency regulation and synchronized reserve markets could continue to be submitted by both load-serving and non-load-serving entities.

Conclusion

PJM sets forth this approach for consideration by regulators and stakeholders and will address these ideas further in responding to the FirstEnergy complaint. PJM believes it appropriate at this critical time to lay out this "road map" for continued participation by demand in wholesale markets – one that fits within reasonable interpretation of *EPSA*. We do so with the hope that it advances our stakeholder and regulator's consideration of options to restore confidence and certainty in the PJM markets. PJM respects and seeks to understand other views and suggested options. Given the day-to-day continuing operation of our markets and our reliance on these markets to fulfill important aspects of PJM's larger mission (notably, ensuring adequate resources in the face of a changing fuel mix of generation resources), we admittedly will place a premium on policy approaches that can be quickly implemented and that bring certainty, with a minimum risk of protracted litigation or threat of judicial disruption.



Low-Income Program Evaluation, Measurement and Verification Report 2014

Prepared for FirstEnergy Ohio Companies:

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The Cleveland Electric Illuminating Company
The Toledo Edison Company

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Table of Contents

1. Executive Summary

During 2014, the Ohio operating companies, The Cleveland Electric Illuminating Company ("CEI"), Ohio Edison Company ("OE"), and The Toledo Edison Company ("TE") (collectively "Companies") continued the Low-Income Program (also known as the "Community Connections program"). 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 or energy efficiency measures.

A total of 4,858 low-income households received energy efficiency services through the Low-Income Program in 2014. The numbers of participants in each service territory are shown in Table 1-1[1]:

Table 1-1: Program Participation by Utility

Utility	Number of Participants
CEI	2,453
OE	1,783
TE	622
All Companies	4,858

Estimates of the gross energy savings (kWh) and peak demand reductions (kW) for the program in the three service territories are reported in Table 1-2.

[1] Unique project numbers were used to tally participant count. Some projects may span calendar years, in which case the Companies' tracking and reporting system only counts the participant in the year savings first appear for the project.

Table 1-2 Impact Evaluation Results

Utility	Ex Ante Expected Gross Savings		Ex Post Verified Gross Savings		
	kWh	kW	kWh	kW	Realization Rate
CEI	3,635,662	520	3,636,414	521	100.02%
OE	2,675,032	376	2,673,999	378	99.96%
TE	686,056	92	687,666	92	100.24%
Total	**6,996,750**	**988**	**6,998,079**	**991**	**100.02%**

The gross ex post kWh savings total shown in Table 1-2 reflect a realization rate of 100%, as determined by the ratio of verified total kWh savings to expected gross kWh savings. The replacement of refrigerators and freezers with ENERGY STAR® models and the installation of energy efficient lighting accounted for 97% of the verified total kWh savings.

Key findings from the process evaluation of the 2014 Low-Income program include:

- **Agencies face new challenges in their ability to leverage funds across utility and state programs that can strain their capacity or effectively utilize Community Connections funds**. Mandatory changes in how customers are prioritized for the state's Home Weatherization Assistance have begun to limit agencies' ability to leverage funding in order to provide maximum benefit for customers

- **Agency staff report concerns with funding levels for seasonal measures and as a result several agencies reported focusing program funds on base-load measures such as CFLs and refrigerators.**

- **The program operates smoothly, with all program actors and participants reporting positive interactions with others involved in the program.** The Companies continued to report very positive working relationships with OPAE, and vice-versa. Agencies receive good response from the Companies on CC System questions and generally find their communications from OPAE open and constructive.

2. Introduction and Purpose of Study

Under contract with the Companies, ADM is performing measurement and verification (M&V) activities to confirm the energy savings and demand reduction being realized through the energy efficiency programs that the Companies are implementing in Ohio in 2014. The purpose of this report is to present the results of the impact evaluation effort undertaken by ADM to verify the energy savings and peak demand reductions that resulted from the program during 2014. Additionally, this report presents the results of the process evaluation of the program focusing on participant and program staff perspectives.

The impact evaluation component of this report estimates annual gross energy savings and peak demand reduction as framed by the following research questions:

- How many customers participated in the program?
- How many and which measure types were installed through the program?
- What percentage of each measure type can be verified as installed?
- What are the annual energy savings in kWh achieved by the program?
- What was the peak demand reduction (kW) achieved by the program?

The goal of the process evaluation component was to determine how effective the program is in terms of customer satisfaction, customer awareness, and stakeholder interaction. The process evaluation was framed, therefore, by the following research questions.

Customers

- How satisfied are participants with the products/services provided through the program?
- How did the participants hear about the program?
- What factors influenced the participants to participate in the program?
- Do the participants notice a change in their energy usage as a result of the new product?

Contractors and Agencies

- How satisfied are they with the program in general?
- Do they feel that there was enough programmatic support?
- How satisfied is OPAE with the utility managers monitoring the program?

- How satisfied are the Agencies with OPAE administering the program?
- Do they think that there was enough effective marketing to encourage customers to participate in the program?
- Do they have any recommendations for improvements in the design and/or delivery of the program?

Program Managers & OPAE

- How satisfied are they with the program in general?
- How satisfied are they with the implementers administering the program?
- Do they think that there was enough effective marketing to encourage customers to participate in the program?
- Do they feel that there was enough programmatic support?
- Do they have any recommendations for improvements in the design and/or delivery of the program?
- Were previous issues and/or concerns resolved in 2014? Were there any lessons learned in resolving previous issues?

3. Description of Program

The Low-Income Program provides weatherization measures, energy efficient products and services, as well as client education to low-income customers who receive electric service from the Companies.

The Low-Income Program for 2014 was a continuation of the program that began in 2003. In the state of Ohio, there is a collaborative effort that leverages federal, state, utility, and other funding sources to provide weatherization and energy saving products and services to low income customers. OPAE, a trade association that also does low-income advocacy work, administers the Low-Income program and serves as the coordinator between utilities and the local agencies that perform the work. The program targets residential customers at or below 200% of Federal Poverty Guidelines and/or landlords of residents eligible for one of the following:

- Low Income Home Energy Assistance Program (LIHEAP), a federally-funded energy payment assistance program known in Ohio as HEAP
- Percentage Income Payment Program (PIPP), an energy payment assistance program
- Home Weatherization Assistance Program (HWAP), a federally-funded energy assistance program designed to increase the energy efficiency of dwellings owned or occupied by income-eligible Ohioans

OPAE allocates weatherization and energy efficient products and services funding to counties based upon the number of LIHEAP applications received.

In general, OPAE and local agencies do not market the program in the traditional sense. Rather, prioritized customers are identified and offered the services. Many agencies operate with a substantial on-going backlog of eligible customers – some agencies have customers waiting months, some up to a year, before receiving weatherization and energy efficient products and services.

Participation in the program is straightforward for customers. Most local agencies interviewed had on-staff "inspectors" who visit the customer's home. Inspectors meter the customer's refrigerator to monitor the electrical use and, if applicable, the freezer to log usage. The inspector talks with the client to understand energy use in the home and to provide energy conservation education. As part of the discussion, the inspector identifies which lights in the home are used more than 2.5 or 3 hours per day. Light bulbs are replaced with compact fluorescent lamps (CFLs) for the fixtures that meet the minimum use criteria and refrigerators and/or freezers are replaced if the meter reads a certain kWh per hour based on unit size and type (i.e. chest, upright, etc.). The local agencies determine how best to leverage all of the funds (federal, state, utility, and other) available to the customer by taking into account what improvement and replacement equipment the customer needs. Other non-lighting measures that are

administered through the program include: installation of insulation, air infiltration reduction (blower door test), and water heater measures (water heater wraps, low flow shower heads, and faucet aerators). Health and safety measures include roof repairs/replacement, electric wiring repairs and upgrades and other custom measures.

In addition, the cost to provide health & safety measures are not to exceed 15% of the Eligible Measures billed to the Companies during the 2012-2014 Program Years as part of the Community Connections Program. (OPAE further distributes this allotment at 15 percent of the agency's total job spending per year). Measures can include roof repairs or electrical wiring work. The Companies also recently added a seasonal allowance spreadsheet to the program, which allows agencies to determine what shell or electric heating/cooling reducing measures the customer is eligible for based on their electric consumption.

The table below details the ex-ante savings per measure for program year 2014.

Table 3-1: Annual kWh & kW ex ante Estimates per Unit

Energy Efficiency Measures: Non-Lighting	**kWh**	**kW**	**Source**
Central AC replacement	Varies by Project	Varies by Project	Ohio TRM
Hot water pipe insulation	Varies by Project	Varies by Project	Ohio TRM
HVAC Tune Up	Varies by Project	Varies by Project	Ohio TRM
Install 11-15 cu. ft. chest freezer	1,131	0.175	Ohio TRM
Install 14-16 cu. ft. refrigerator w/top freezer	1,251	0.192	Ohio TRM
Install 16-18 cu. ft. upright freezer	1,131	0.175	Ohio TRM
Install 16-20 cu. ft. chest freezer	1,131	0.175	Ohio TRM
Install 17-19 cu. ft. refrigerator w/top freezer	1,251	0.192	Ohio TRM
Install 19-21 cu. ft. upright freezer	1,251	0.192	Ohio TRM
Install 19-22 cu. ft. refrigerator w/bottom freezer	1,251	0.192	Ohio TRM
Install 20-22 cu. ft. refrigerator w/top freezer	1,251	0.192	Ohio TRM
Install 20-23 cu. ft. side by side refrigerator	1,251	0.192	Ohio TRM
Install 24-26 cu. ft. side by side refrigerator	1,251	0.192	Ohio TRM
Install 5-10 cu. ft. chest freezer	1,131	0.175	Ohio TRM
Install 9-15 cu. ft. upright freezer	1,131	0.175	Ohio TRM
Install faucet aerator w/o shut- off valve	30.9	0.004	Ohio TRM
Install faucet aerator w/shut-off valve	30.9	0.004	Ohio TRM
Install low flow showerhead	219.7	0.028	Ohio TRM
Install R-10 attic insulation (average)	Varies by Project	Varies by Project	Ohio TRM
Install R-10 attic insulation (difficult)	Varies by Project	Varies by Project	Ohio TRM
Install R-11 foundation wall insulation (average)	Varies by Project	Varies by Project	Ohio TRM
Install R-11 foundation wall insulation (difficult)	Varies by Project	Varies by Project	Ohio TRM
Install R-11 sidewall insulation - brick veneer (average)	Varies by Project	Varies by Project	Ohio TRM
Install R-11 sidewall insulation - framed siding (average)	Varies by Project	Varies by Project	Ohio TRM
Install R-11 sidewall insulation - framed siding (difficult)	Varies by Project	Varies by Project	Ohio TRM
Install R-19 attic insulation (average)	Varies by Project	Varies by Project	Ohio TRM
Install R-19 attic insulation (difficult)	Varies by Project	Varies by Project	Ohio TRM
Install R-27 attic insulation (average)	Varies by Project	Varies by Project	Ohio TRM
Install R-27 attic insulation (difficult)	Varies by Project	Varies by Project	Ohio TRM
Insulate <52 gallon water heater	79	0.009	Ohio TRM
Insulate > or = 52 gallon water heater	79	0.009	Ohio TRM
Insulate band joist to R-11 (average)	Varies by Project	Varies by Project	Ohio TRM
Retirement of additional freezer	1,244	0.2	Ohio TRM
Retirement of additional refrigerator	1,376	0.22	Ohio TRM
Seal air leakage by 100 CFM50	Varies by Project	Varies by Project	Ohio TRM

Energy Efficiency Measures: Lighting	kWh	kW	Source
Install .03 nightlight	0.12	0.000	Ohio TRM
Install .5 watt nightlight	1.01	0.000	Ohio TRM
Install 15 watt dimmable CFL	30.44	0.003	Ohio TRM
Install 15 watt globe CFL	30.44	0.003	Ohio TRM
Install 15 watt or less outdoor CFL	26.38	0.003	Ohio TRM
Install 16-20 watt floodlight	35.64	0.004	Ohio TRM
Install 16-20 watt outdoor CFL	39.6	0.004	Ohio TRM
Install 16-20 watt spiral CFL	35.64	0.004	Ohio TRM
Install 21 watt or above floodlight	50.99	0.006	Ohio TRM
Install 21 watt or above outdoor CFL	46.91	0.005	Ohio TRM
Install 21 watt or above spiral CFL	60.64	0.007	Ohio TRM
Install 3-way circle line CFL	67.3	0.007	Ohio TRM
Install 3-way dimmable torchiere CFL	112.17	0.012	Ohio TRM
Install 3-way spiral CFL	39.6	0.004	Ohio TRM
Install 7-9 watt candelabra	16.24	0.002	Ohio TRM
Install 9 watt globe CFL	18.26	0.002	Ohio TRM
Install 9-15 watt spiral CFL	41.83	0.005	Ohio TRM

The following Health and Safety measures were also installed through the program:

- Electric repair/upgrades
- Roof repair/replacement

4. Methodology

The following sections provide a detailed explanation of all methods used to evaluate the impacts and processes associated with the 2014 Low-Income program.

The methods used to calculate kWh savings and kW reductions for measures installed through the Low-Income 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.

Verification of quantity of Measures Installed

ADM administered telephone surveys to 137 program participants to verify receipt of energy efficiency measures and services claimed by records and to estimate customer satisfaction of the 2014 Low-Income Program. The survey was also used to review CFL installation practices among customers who received CFLs as well as to review customer experiences with the contractors who performed the measure installations and the health and safety repairs.

Out of the initial sample of surveyed customers ADM randomly selected a subset of thirty-one additional sample points. Site visits were conducted for this population of customers.

4.1 Sampling Strategy

ADM developed a sampling plan enabling us to accomplish an unbiased review of a sample of participant records to determine the level of correlation between job-level savings reported by the program (i.e., *ex ante* expected savings as reported by the program through the AEG/Vision Database) and actual savings (i.e., *ex post* verified savings that were verified using the evaluation methodologies described in this EM&V Report).

ADM utilized the Dalenius-Hodges' stratification methodology to achieve the required sampling precision. ADM's stratified sampling plan utilized a four to five strata per Operating Company. Strata boundaries per Operating Company were designed to minimize the coefficient of variance (CV) for all strata. The sample design used for selecting program projects allows estimates of savings to be determined with ±10% precision at a 90% confidence interval for the program.

Table 4-1: Ex Post Stratified Sampling Plan

Utility	CV	Sample Size	Precision @ 90% Confidence	Additional Field Visits Performed
CEI	1.04	74	0.02	5
OE	1.16	36	0.06	12
TE	0.91	27	0.06	14
Total		**147**		**31**

4.2 Calculating Gross Annual kWh and kW Savings

Engineering and Deemed savings calculations were performed for a census of program measures. Detailed methodology descriptions are outlined for each subprogram in the sections below.

Senate Bill 310 (SB 310), passed in 2014, states that the following is countable toward compliance requirements:

> Energy efficiency savings and peak demand reduction achieved on and after the effective date of S.B. 310 of the 130th general assembly shall be measured on the higher of an as found or deemed basis, except that, solely at the option of the electric distribution utility, such savings and reduction achieved since 2006 may also be measured using this method.

The incremental savings resulting from using the existing equipment as the baseline were calculated for the 2014 program year. The existing equipment baselines were taken from the Ohio TRM. Some measure baselines have been adjusted as applicable based on the savings provisions of Ohio Senate Bill 310 and are reflected in the sections below.

4.3 Analysis of Savings – Lighting Measures

The lighting measures installed through the Low-Income Program are direct install CFLs of varying wattages. kWh savings per measure are calculated per procedures set out in the Ohio Technical Reference Manual (TRM).[2]

[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.

The following formula was used to calculate annual kWh *ex post* savings in accordance with the formula specified in the TRM. As set out in the TRM,

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

ΔWatts = CFL watts * delta watts multiplier

CFL watts = wattage of installed CFL, as verified

Delta watts multiplier = (see table 4-2)

ISR = In Service Rate (0.81)

Hours = Average hours of use per year; (1,040 hours).

WHFe = Waste Heat Factor for energy (1.07)

Per the TRM, summer coincident peak demand savings (kW) per lighting measure are calculated according to the following formula.

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

ΔWatts = CFL watts * delta watts multiplier:

CFL watts = wattage of installed CFL, as verified

Delta watts multiplier = factor to account for baseline conditions = 3.25 (from TRM)

ISR = In Service Rate (0.81);

WHFd = Waste Heat Factor for Demand (1.21)

CF = Summer Peak Demand Coincidence Factor (0.11)

4.4 Analysis of Savings – Non-Lighting Measures

The following types of non-lighting measures were installed through the Low-Income Program in 2014:

- Refrigerator replacement
- Freezer replacement
- Central air conditioning replacement
- Attic and Wall Insulation
- Water Heater Wraps

- Low Flow Showerhead
- Faucet Aerators

For each non-lighting measure installed in 2014, 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 methods used to determine per-unit kWh and peak demand savings for the non-lighting measures are described in sections below.

Refrigerator Replacement

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 Low-Income Program. In 2014, modified values for UECexisting, UECES, and UECbase were used in the evaluation calculations, based on the information in the approved TRM. The modified savings values used for the 2014 evaluation are reported in Table 4-3.

Table 4-2: TRM Deemed Values for kWh & kW

	Per Unit kWh/kW
Average Annual **kWh Savings** per Unit *Remaining life of existing unit (8 years)*	1,251 kWh
Average Summer Coincident Peak **kW Savings** per Unit. *Remaining life of existing unit (8 years)*	0.192 kW

Freezer Replacements

The TRM does not have procedures for calculating annual kWh savings and peak demand savings for replacement of 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.[3] 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

[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, pp. 23-24.

households to estimate the savings for replacement of freezers for such households.[4] The resulting savings values that were used in the 2014 evaluation are reported in Table 4-4.

Table 4-3: TRM Deemed Values for kWh & kW

	Per Unit kWh/kW
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

Water Heater Wraps

Program-level energy (kWh) and peak demand (kW) savings from installing water heater wraps was calculated using the deemed savings values for this measure in the TRM.[5] The deemed annual energy savings value is 79 kWh per unit, and the deemed summer coincident peak demand savings is 0.009 kW.

Low Flow Showerheads

Program-level energy (kWh) and peak demand (kW) savings from installing low-flow showerheads was calculated using savings values based on information submitted in the approved TRM. Energy savings of 173 kWh per gallons per minute (gpm) was used in 2014 for the calculation. Consistent with the TRM values it is determined that installation of a low flow showerhead would change the water flow from 2.87 gpm to 1.6 gpm. Thus, the annual energy savings value used was 219.7 per showerhead, and the summer coincident peak demand savings used was 0.0281 kW.

Faucet Aerators

Program-level energy (kWh) and peak demand (kW) savings from installing faucet aerators were calculated using savings values from the TRM. Values provided by the

[4] *For freezer kWh savings, calculation is (1244/1376)*1251 = 1,131 kWh. For freezer kW savings,* calculation is (0.20/0.22)*0.192 = 0.175 kW

[5] VEIC, State of Ohio Energy Efficiency Technical Reference Manual, Draft of August 6, 2010, pp. 131-132.

TRM for a 1.5 gpm installation were used in 2014. The annual energy savings value used was 30.9 kWh per unit, and the deemed summer coincident peak demand savings used was 0.0039 kW.

Attic Insulation

For attic insulation measures, kWh cooling savings per measure were calculated per procedures set out in the TRM:

$$\Delta kWh = ((1/Rexist - 1/Rnew) * CDH * DUA * Area) / 1000 / \eta Cool$$

Rexist = existing effective whole-assembly R-value.

Rnew = new total effective whole-assembly R-value.

CDH = Cooling Degree Hours

DUA = Discretionary Use Adjustment[6]

Area = Square footage of insulated area

ηCool = Efficiency of Air Conditioning equipment

For attic insulation measures, kWh heating savings per measure were calculated per procedures set out in the TRM:

$$\Delta kWh = ((1/Rexist - 1/Rnew) * HDD * 24 * Area) / 1000000 / \eta Heat$$

Rexist = existing effective whole-assembly R-value.

Rnew = new total effective whole-assembly R-value.

HDD = Heating Degree Days for location

Area = Square footage of insulated area

ηHeat = Average Net Heating System Efficiency (Equipment Efficiency * Distribution Efficiency)

For attic insulation measures, kW savings per measure were calculated per the TRM:

$$\Delta kW = \Delta kWh / FLHcool * CF$$

ΔkWh = Cooling Savings

FLHcool = Full load cooling hours

6 Accounts for the fact that people do not always operate their air conditioning system when the outside temperature is greater than 75°F.

CF = Summer Peak Coincidence Factor for measure

Wall Insulation

For wall insulation measures, kWh savings were calculated per the TRM:

$$\Delta kWh = ((1/Rexist - 1/Rnew) * CDH * DUA * Area) / 1000 / \eta Cool$$

Rexist = existing effective whole-assembly R-value.

Rnew = new total effective whole-assembly R-value.

CDH = Cooling Degree Hours

DUA = Discretionary Use Adjustment[7]

Area = Square footage of insulated area

ηCool = Efficiency of Air Conditioning equipment

For wall insulation measures, kW savings per measure were calculated per the TRM:

$$\Delta kW = \Delta kWh / FLHcool * CF$$

ΔkWh = Cooling Savings

FLHcool = Full load cooling hours

CF = Summer Peak Coincidence Factor for measure

Central AC Replacement

For Central AC Replacements, kWh savings were calculated per the TRM,[8]

ΔkWh for remaining life of existing unit
= (FLHcool * BtuH * (1/SEERexist - 1/SEERee))/1000

FLHcool = Full load cooling hours

BtuH = Size of equipment in Btuh (note 1 ton = 12,000Btuh)

7 Accounts for the fact that people do not always operate their air conditioning system when the outside temperature is greater than 75°F.

8 The TRM calculation for lifetime savings for this measure uses existing equipment to calculate savings for the first five years and baseline (or code) equipment for the next 13 years. Since a conservative measure life of 8 years is being applied to all measures in the low income program, only the existing equipment baseline calculation was used.

SEERexist = SEER Efficiency of existing unit

SEERee = SEER Efficiency of ENERGY STAR unit

SEERbase = SEER Efficiency of baseline unit

For Central AC Replacement measures, kW savings were calculated per the TRM:

ΔkW = ((BtuH * ((1/EERexist) - (1/EERee))) / 1000) * CF

BtuH = Size of equipment in Btuh (note 1 ton = 12,000Btuh)

EERexist = EER Efficiency of existing unit

EERee = EER Efficiency of ENERGY STAR unit

CF = Summer Peak Coincidence Factor for measure

Air Infiltration Reduction

For Air Filtration Reductions, kWh cooling savings were calculated per the TRM:

ΔkWh = (((CFM50Exist – CFM50New) / N-factor) *60 * CDH * DUA * 0.018) / 1000 / ηCool

CFM50Exist = Existing Cubic Feet per Minute at 50 Pascal pressure differential as measured by the blower door before air sealing.

CFM50New = New Cubic Feet per Minute at 50 Pascal pressure differential as measured by the blower door after air sealing.

N-Factor = Conversion factor to convert 50-pascal air flows to natural airflow.

60 = Constant to convert cubic feet per minute to cubic feet per hour

CDH = Cooling Degree Hours

For Air Filtration Reductions, kWh heating savings were calculated per the TRM:

ΔkWh = (((CFM50Exist – CFM50New) / N-factor) *60 * 24 * HDD * 0.018) / 1000000 / ηHeat * 293.1

CFM50Exist = Existing Cubic Feet per Minute at 50 Pascal pressure differential as measured by the blower door before air sealing.

CFM50New = New Cubic Feet per Minute at 50 Pascal pressure differential as measured by the blower door after air sealing.

N-Factor = Conversion factor to convert 50-pascal air flows to natural airflow.

60 = Constant to convert cubic feet per minute to cubic feet per hour

HDD = Heating Degree Days (60° base temperature) for location

293.1 = Constant to convert MMBTU to kWh

For Air Infiltration Reduction measures, kW savings were calculated per the TRM:

$\Delta kW = \Delta kWh / FLHcool * CF$

ΔkWh = Cooling Energy Savings

FLHcool = Full load cooling hours

CF = Summer Peak Coincidence Factor for measure

Hot Water Pipe Insulation

For Domestic Hot Water Pipe Insulations, kWh savings were calculated per the TRM,

$\Delta kWh = ((1/Rexist - 1/Rnew) * (L * C) * \Delta T * 8{,}760) / \eta DHW / 3413$

Rexist = Pipe heat loss coefficient of *uninsulated* pipe (Btu/hr-°F-ft)

Rnew = Pipe heat loss coefficient of *insulated* pipe (Btu/hr-°F-ft)

L = *Length of pipe from water heating source covered by pipe wrap (ft)*

C = Circumference of pipe (ft) (Diameter (in) * π * 0.083)

ΔT = Average temperature difference between supplied water and outside air temperature (°F)

8,760 = Hours per year

ηDHW = Recovery efficiency of electric hot water heater

3413 = Conversion from Btu to kWh

For Hot Water Pipe Insulation measures, kW savings per measure were calculated per procedures set out in the TRM:

$\Delta kW = \Delta kWh / 8760$

ΔkWh = Energy Savings

4.5 Calculation of Lifetime kWh Savings per Measure

Lifetime kWh savings were calculated by multiplying annual kWh savings for each measure by a deemed effective useful life of 8 years.

4.6 Process Evaluation Methodology

The process evaluation component of this report was designed to answer the following research questions:

Customers

- How satisfied are participants with the products/services provided through the program?
- How did the participants hear about the program?
- What factors influenced the participants to participate in the program?
- Do the participants notice a change in their energy usage as a result of the new product?

Contractors and Agencies

- How satisfied are they with the program in general?
- Do they feel that there was enough programmatic support?
- How satisfied is OPAE with the utility managers monitoring the program?
- How satisfied are the Agencies with OPAE administering the program?
- Do they think that there was enough effective marketing to encourage customers to participate in the program?
- Do they have any recommendations for improvements in the design and/or delivery of the program?

Program Managers & OPAE

- How satisfied are they with the program in general?
- How satisfied are they with the implementers administering the program?
- Do they think that there was enough effective marketing to encourage customers to participate in the program?
- Do they feel that there was enough programmatic support?
- Do they have any recommendations for improvements in the design and/or delivery of the program?
- Were previous issues and/or concerns resolved in 2014? Were there any lessons learned in resolving previous issues?

Program, Implementation, and Action Agency Interviews

Tetra Tech, working in conjunction with ADM, conducted in-depth interviews with staff from the Companies, OPAE, and local agencies. Interviews were conducted in February 2015 and March 2015. Tetra Tech completed interviews with three Company staff and three OPAE staff. In addition, Tetra Tech completed nine interviews with participating community action agencies.

Participating Customer Survey

Quantitative surveys were completed with participating customers by VuPoint Research, a professional survey firm, during February 2015. A total of 137 surveys were completed across all three operating companies. Table 4-5 shows the number of completed surveys by electric distribution company (EDC).

Table 4-4: Number of Completed Process Surveys

	CEI	OE	TE
Quantity	74	36	27

All analysis on participant data in this report is unweighted. In addition, all questions in the telephone survey were optional; therefore, respondents could choose not to respond. Respondents could also choose "don't know" or "refused" as options. Total reported n's for each question exclude any blank, "don't know," or "refused" response.

5. Detailed Impact Evaluation Findings

Impact Evaluation Results

Table 5-1 shows the quantities of energy efficient lighting measures that were installed for participants through the Low-Income Program and Table 5-3 shows the quantities of energy efficient non-lighting measures that were installed for the participants in 2014. Table 5-4 shows the number of health and safety measures and the number of energy education consultations that were conducted under the Low-Income Program in 2014.

Applying the methods described in Chapter 4 produced estimates of savings per unit on a measure-by-measure basis.

Table 5-1: Quantities of Lighting Measures

CFL Category	CEI	OE	TE	Total
Install 9-15 watt spiral CFL	10,953	13,644	5,669	30,266
Install 16-20 watt spiral CFL	4,907	2,072	1,509	8,488
Install 9 watt globe CFL	209	140	8	357
Install 15 watt dimmable CFL	9	265	10	284
Install .5 watt nightlight	10	135	3	148
Install 21 watt or above spiral CFL	4,104	1,908	1,520	7,532
Install 3-way circle line CFL	14	48	0	62
Install 3-way spiral CFL	61	578	36	675
Install .03 nightlight	0	4	3	7
Install 7-9 watt candelabra	265	1,178	94	1,537
Install 15 watt globe CFL	288	1,048	27	1,363
Install 15 watt or less outdoor CFL	2	296	0	298
Install 16-20 watt outdoor CFL	4	356	0	360
Install 21 watt or above outdoor CFL	26	83	1	110
Install 3-way dimmable torchiere CFL	0	11	0	11
Install 16-20 watt floodlight	0	193	0	193
Install 21 watt or above floodlight	0	98	0	98
Total	20,852	22,057	8,880	51,789

Table 5-2: Quantities of Non - Lighting Measures

Measure Category	CEI	OE	TE	Total Companies
Central AC replacement	0	5	6	11
Hot water pipe insulation	0	1	1	2
Install 11-15 cu. ft. chest freezer	92	41	12	145
Install 14-16 cu. ft. refrigerator w/top freezer	173	241	17	431
Install 16-18 cu. ft. upright freezer	103	80	15	198
Install 16-20 cu. ft. chest freezer	18	9	0	27
Install 17-19 cu. ft. refrigerator w/top freezer	838	462	113	1,413
Install 19-21 cu. ft. upright freezer	16	15	5	36
Install 19-22 cu. ft. refrigerator w/bottom freezer	2	20	12	34
Install 20-22 cu. ft. refrigerator w/top freezer	494	281	56	831
Install 20-23 cu. ft. side by side refrigerator	204	129	26	359
Install 24-26 cu. ft. side by side refrigerator	158	104	14	276
Install 5-10 cu. ft. chest freezer	177	68	1	246
Install 9-15 cu. ft. upright freezer	27	46	1	74
Install faucet aerator w/o shut- off valve	0	85	3	88
Install faucet aerator w/shut-off valve	1	45	2	48
Install low flow showerhead	1	73	0	74
Install R-10 attic insulation (average)	0	0	1	1
Install R-10 attic insulation (difficult)	0	1	2	3
Install R-11 foundation wall insulation (average)	0	0	1	1
Install R-11 sidewall insulation - brick veneer (average)	0	1	0	1
Install R-11 sidewall insulation - brick veneer (difficult)	0	1	0	1
Install R-11 sidewall insulation - framed siding (average)	0	2	0	2
Install R-11 sidewall insulation - framed siding (difficult)	0	21	1	22
Install R-19 attic insulation (average)	0	2	0	2
Install R-19 attic insulation (difficult)	0	1	0	1
Install R-27 attic insulation (average)	0	0	1	1
Install R-27 attic insulation (difficult)	0	3	3	6
Insulate <52 gallon water heater	0	5	1	6
Retirement of additional freezer	0	2	0	2
Retirement of additional refrigerator	0	4	0	4
Seal air leakage by 100 CFM50	0	9	7	16
Total Non-Lighting Measures	2,304	1,757	301	4,362

Table 5-3: Quantities Health & Safety and Education Measures

Measure Category	CEI	OE	TE	Total Companies
Electrical Repairs	506	37	43	586
Roof Repairs	3	27	0	30
Replace Electric Stove	0	0	0	0
Replace Well-Pump	0	0	0	0
Energy Education Consultations	0	2	4	6
Total Health & Safety and Education Measures	509	66	47	622

Tables 5-5 through 5-8 below detail the ex-post savings values and realization rates calculated per measure during program year 2014.

Table 5-4: Estimates of Annual kWh Savings by Measure (Non-Lighting)

Measure	Ex-Ante kWh	Ex Post Savings kWh	Realization Rate
Central AC replacement	8,755	8,755	100%
Hot water pipe insulation	434	431	99%
Install 11-15 cu. ft. chest freezer	163,995	163,994	100%
Install 14-16 cu. ft. refrigerator w/top freezer	539,181	539,181	100%
Install 16-18 cu. ft. upright freezer	223,938	223,936	100%
Install 16-20 cu. ft. chest freezer	30,537	30,537	100%
Install 17-19 cu. ft. refrigerator w/top freezer	1,767,663	1,767,663	100%
Install 19-21 cu. ft. upright freezer	40,716	40,716	100%
Install 19-22 cu. ft. refrigerator w/bottom freezer	42,534	42,534	100%
Install 20-22 cu. ft. refrigerator w/top freezer	1,039,581	1,039,581	100%
Install 20-23 cu. ft. side by side refrigerator	449,109	449,109	100%
Install 24-26 cu. ft. side by side refrigerator	345,276	345,276	100%
Install 5-10 cu. ft. chest freezer	278,226	278,224	100%
Install 9-15 cu. ft. upright freezer	83,694	83,693	100%
Install faucet aerator w/o shut- off valve	2,156	2,718	126%
Install faucet aerator w/shut-off valve	1,176	1,483	126%
Install low flow showerhead	15,709	16,259	104%
Install R-10 attic insulation (average)	2,475	2,475	100%
Install R-10 attic insulation (difficult)	7,876	7,876	100%
Install R-11 foundation wall insulation (average)	31	31	100%
Install R-11 sidewall insulation - brick veneer (difficult)	37	37	100%
Install R-11 sidewall insulation - brick veneer (average)	46	46	100%
Install R-11 sidewall insulation - framed siding (average)	61	61	100%
Install R-11 sidewall insulation - framed siding (difficult)	1,764	1,764	100%
Install R-19 attic insulation (average)	3,683	3,683	100%
Install R-19 attic insulation (difficult)	13	13	100%
Install R-27 attic insulation (average)	20	20	100%
Install R-27 attic insulation (difficult)	10,901	10,901	100%
Insulate <52 gallon water heater	474	472	100%
Retirement of additional freezer	2,488	2,488	100%
Retirement of additional refrigerator	5,504	5,504	100%
Seal air leakage by 100 CFM50	2,243	2,165	97%
Grand Total	5,070,299	5,071,628	100%

Table 5-5: Estimates of Annual kWh Savings by Measure (Lighting)

Measure	Ex-Ante Savings kWh	Ex Post Savings kWh	Realization Rate
Install .03 nightlight	161	161	100%
Install .5 watt nightlight	3,413	3,413	100%
Install 15 watt dimmable CFL	10,233	10,233	100%
Install 15 watt globe CFL	49,112	49,112	100%
Install 15 watt or less outdoor CFL	10,738	10,738	100%
Install 16-20 watt floodlight	8,809	8,809	100%
Install 16-20 watt outdoor CFL	15,566	15,566	100%
Install 16-20 watt spiral CFL	367,009	367,009	100%
Install 21 watt or above floodlight	4,944	4,944	100%
Install 21 watt or above outdoor CFL	5,549	5,549	100%
Install 21 watt or above spiral CFL	416,138	416,138	100%
Install 3-way circle line CFL	4,915	4,915	100%
Install 3-way dimmable torchiere CFL	1,418	1,418	100%
Install 3-way spiral CFL	46,049	46,049	100%
Install 7-9 watt candelabra	29,537	29,537	100%
Install 9 watt globe CFL	7,718	7,718	100%
Install 9-15 watt spiral CFL	945,143	945,143	100%
Grand Total	1,926,452	1,926,452	100%

Table 5-6: Estimates of Peak Demand kW Reductions by Measure (Non-Lighting)

Measure	Ex-Ante kW	Ex Post Savings kW	Realization Rate
Central AC replacement	10	10	100%
Hot water pipe insulation	0	0	100%
Install 11-15 cu. ft. chest freezer	25	25	100%
Install 14-16 cu. ft. refrigerator w/top freezer	83	83	100%
Install 16-18 cu. ft. upright freezer	35	35	100%
Install 16-20 cu. ft. chest freezer	5	5	100%
Install 17-19 cu. ft. refrigerator w/top freezer	271	272	100%
Install 19-21 cu. ft. upright freezer	6	6	100%
Install 19-22 cu. ft. refrigerator w/bottom freezer	7	7	100%
Install 20-22 cu. ft. refrigerator w/top freezer	160	160	100%
Install 20-23 cu. ft. side by side refrigerator	69	69	100%
Install 24-26 cu. ft. side by side refrigerator	53	53	100%
Install 5-10 cu. ft. chest freezer	43	43	100%
Install 9-15 cu. ft. upright freezer	13	13	100%
Install faucet aerator w/o shut- off valve	0	1	239%
Install faucet aerator w/shut-off valve	0	0	155%
Install low flow showerhead	2	2	139%
Install R-10 attic insulation (average)	0	0	100%
Install R-10 attic insulation (difficult)	0	0	100%
Install R-11 foundation wall insulation (average)	0	0	100%
Install R-11 sidewall insulation - brick veneer (difficult)	0	0	100%
Install R-11 sidewall insulation - brick veneer (average)	0	0	100%
Install R-11 sidewall insulation - framed siding (average)	0	0	100%
Install R-11 sidewall insulation - framed siding (difficult)	1	1	100%
Install R-19 attic insulation (average)	0	0	100%
Install R-19 attic insulation (difficult)	0	0	100%
Install R-27 attic insulation (average)	0	0	100%
Install R-27 attic insulation (difficult)	0	0	100%
Insulate <52 gallon water heater	0	0	100%
Retirement of additional freezer	0	0	100%
Retirement of additional refrigerator	1	1	100%
Seal air leakage by 100 CFM50	2	2	100%
Grand Total	785	788	100%

Table 5-7: Estimates Peak Demand kW Reductions by Measure (Lighting)

Measure	Ex-Ante kW Savings	Ex Post Savings kW	Realization Rate
Install .03 nightlight	0	0	0%
Install .5 watt nightlight	0	0	0%
Install 15 watt dimmable CFL	1	1	100%
Install 15 watt globe CFL	5	5	100%
Install 15 watt or less outdoor CFL	1	1	100%
Install 16-20 watt floodlight	1	1	100%
Install 16-20 watt outdoor CFL	2	2	100%
Install 16-20 watt spiral CFL	39	39	100%
Install 21 watt or above floodlight	1	1	100%
Install 21 watt or above outdoor CFL	1	1	100%
Install 21 watt or above spiral CFL	44	44	100%
Install 3-way circle line CFL	1	1	100%
Install 3-way dimmable torchiere CFL	0	0	0%
Install 3-way spiral CFL	5	5	100%
Install 7-9 watt candelabra	3	3	100%
Install 9 watt globe CFL	1	1	100%
Install 9-15 watt spiral CFL	100	100	100%
Grand Total	203	203	100%

Overall the ex ante and ex post kWh and kW savings calculation resulted in similar savings. The difference in saving values are explained by measure below.

Faucet Aerators

The realization rate for the faucet aerators is high due to the ex ante estimates use of a deemed savings value that's lower than what is specified in the TRM for this measure.

6. Detailed Process Evaluation Findings

The following section provides the key findings associated with the 2014 Process Evaluation of the Low-Income program.

6.1 Program, Implementation, and Agency Staff Detailed Findings

The Companies Program Staff Administration and Oversight

The Companies contract with OPAE to administer the Community Connections program. This arrangement is mandated by the Public Utilities Commission of Ohio. The Companies program staff reports that the working relationship with OPAE remains very good.

The Companies program staff use the Community Connections (CC) database system for tracking, reporting, and invoicing by the local agencies. The CC system is discussed in more detail below.

Program Staffing

Overall, there were no immediate concerns about the qualifications of program and implementation staff. Each group of interviewees (The Companies staff, OPAE, and local agencies) expressed respect for the knowledge and expertise of all involved.

Local agency contractors receive substantial training through OPAE, who has established performance standards that govern the program. Local agencies also provide training to their staff. Many interviewees reported longevity working with low-income and weatherization programs, with several stating that they had been involved with some type of low-income or weatherization program for over a decade. Therefore, most staff were familiar with these programs and their requirements.

Smaller agencies may have only one or two staff and changes in funding can dramatically affect their staff make-up. One such agency relied solely on Community Connections funding and the main staff person was working quickly to become familiar with situations that may arise during home visits. The agency's director and its board members had become certified to complete base load jobs to minimize the costs associated with using a contractor.

Funding

Discussions about funding with the program staff, implementers, and the agencies focused on several interrelated issues that affect the agencies' abilities to spend Community Connections' funds in ways that will maximize energy saving and benefit to customers. These include decreased flexibility to leverage funds from multiple sources,

constraints on the health and safety funds, shortfalls between the allowances indicated by the seasonal allowance spreadsheet or the price list and the cost of the measures.

HWAP's Priority Point System and Opportunities to Leverage Community Connections Funds

The state of Ohio changed the way customers are prioritized to receive Home Weatherization Assistance in 2014. Points are awarded for different reasons—e.g., high energy consumption, primary heat source, utility expenditures, elderly in the home, disabled person in the home, children under age 6. Agencies delivering HWAP services must serve clients based on their priority score, and, to fulfill their HWAP contracts, must spend their allocations and weatherize a certain number of homes within their contract year.

The mandatory point system introduces challenges for agencies who also deliver services through Community Connections. First, agencies have less flexibility to draw upon utility and HWAP funds to serve a customer. Previously, the agency might assign a priority point if customers had multiple sources of funding; they could leverage funds from multiple sources that allowed them to deliver maximum benefit to the customer and stretch their HWAP dollars farther.

Health and Safety Funds

Previous years' evaluation reports have discussed the changing levels of health and safety funding in Community Connections. Originally unlimited, the funds were restricted to 30 percent of total budget spent per agency in 2011; in 2012, it was further reduced to 15 percent of total budget spent per agency. In discussions this year, agencies' abilities to adjust to the 15 percent level varied.

Seasonal Allowance Funding/Spreadsheet

The previous year's evaluation discussed the addition of the Seasonal Allowance spreadsheet. The FirstEnergy Human Services website automatically calculates the amount of funding available for shell and heating/cooling measures based on a customer's electric consumption. While most agencies were familiar with the spreadsheet, program staff reported that they had noticed situations where agencies were not using the funds specified in the spreadsheet when the funding did not cover the entire measure. The program staff were reviewing the spreadsheet with plans to increase the funding for non-base-load measures.

In interviews with agencies this year, all but one was familiar with and using the seasonal allowance spreadsheet.[9] Agencies felt the worksheet was easy to work with,

[9] The one agency that did not use the seasonal allowance spreadsheet is a very small agency that lacks an in-house inspector and only provides refrigerators and lightbulbs through the programs.

appreciated the enhancements, and noted that the tool was superior to what they have with other utilities: *"...pull up the customer's account, [FirstEnergy's website] will [fill] in the seasonal allowance worksheet for you automatically, and you don't have to do anything, just print it out."* However, agencies still lean heavily towards delivering base-load measures under Community Connections.

Price Lists

The current price list was foremost on the minds of most agencies. In particular, all of them are struggling to deliver refrigerators that meet the new energy efficiency standards within the Community Connections allowance. Agencies have been working intensively with their vendors to identify models that met the standards, could be supplied in sufficient quantity and at a cost they could bear.

Agencies appreciated guidance from OPAE that allowed them to install units that met the prior standard through December 31st as well as OPAE's efforts to negotiate a revised price list with the Companies (under review at the time of this report), but the gap between costs and reimbursement remains a significant concern. Several agencies are "going in the hole" on the refrigerators and are unable to source models that meet the new standards at a sustainable price.

Communications with the Companies, OPAE, and Local Agencies

OPAE serves as the program administrator and directly interacts with the Companies' program staff, other utility program staff, and the local agencies. Overall, both OPAE and the Companies report that communications are excellent between their respective organizations. OPAE staff members noted: "*We have monthly conferences with [First Energy Staff] for communication and they're really a great group of people to work with.*" And, *"[t]hey know what they're doing. They've got experience in this and it really shows."*

Agencies have little or no direct communication with the Companies, although one agency noted the e-newsletter that the Companies recently started distributing and believes this could be helpful. Otherwise, the little communication that does occur directly with the Companies is in regards to the Community Connections tracking system, and agencies felt these questions were dealt with promptly.

Agency staff generally spoke highly of OPAE. One agency called out specifically that OPAE is especially prompt with paying invoices: *"We're thrilled to death with prompt payment. When we're dealing with [other programs], we sometimes have payments going out three, four, five, even six months or longer and through OPAE we're getting the bills paid in two weeks, which is phenomenal."* Another agency appreciated OPAE's work on behalf of the program and the agencies: "*OPAE is really involved at the agency level, understanding how our processes work and what would cause us too much [difficulty so that] we couldn't do the program.*"

Community Connections (CC) System

The CC System was developed by the Companies to track its low-income programs as well as for invoicing. Since contracting with OPAE, the CC System has been implemented across the state since June 2011. OPAE, local agencies, and two other electric utilities contracting with OPAE are now using the tracking system. The CC System has quality controls built in to assure required data are entered before invoices can be processed. The use of this system by OPAE, utilities, and agencies creates opportunities for statewide benchmarking of programs across utilities.

The Companies' program staff provides training and support of this system to all users. Support involves responding to agency questions about invoicing issues and the system not working. Program staff report there has not been a need for extensive training this past year: No new utilities picked up the system and all agencies implementing the program have experience with it.

In previous years' evaluations, agencies offered suggestions to improve the CC System. While some of the same concerns persist, in general, it works well for smaller agencies that implement few programs and only install refrigerators and light bulbs.

Agencies suggested improvements to the CC System. These include adding fields that would allow them to use their CC System entries to fully track their jobs, such as the inspector who did the job, which is a required entry for each of the agency's other programs and the associated databases. It would also be helpful if error messages about incomplete or incorrect entries displayed when entering data on that screen.

Marketing and Energy Education

In general, the Community Connections program is not directly marketed to customers in Ohio, although a few smaller agencies reported that they do some outreach through events and published announcements. None of the agencies felt there was a segment of the population that was not being reached by the program. Elderly individuals are sometimes more reluctant to accept help, and households in rural areas may not be as connected to the network of social service agencies and community organizations that assist vulnerable households in urban areas.

Energy education is a core component of all agencies' delivery of the program. During the home visit, inspectors discuss ways the customers can use less energy. Customers are given a packet of information that is reviewed with the inspector and the customer must sign a consumer education form.

Additional Needs

When asked what additional measures or education the Companies should include within the Community Connections program, agencies felt that the current program offerings were sufficient. Pressed for suggestions or anything that customers had

requested, agencies mentioned cook stoves, carbon monoxide detectors, smoke detectors, and circuit protector strips.

None of the local agencies interviewed raised any concerns with the income-eligibility requirements for the Community Connections program. Almost all agencies noted the extensive need for assistance among eligible households, and the waiting lists themselves attest to this.

Customer Satisfaction

Agencies report that they receive positive feedback from the customers they serve through the Community Connections and other programs. One stated, *"We get so many thank you cards and we also do a 90-day survey letter. We do get a lot of praise and thank you's and saying how polite our guys are [who] explained everything and [they] learned about their house, etc."* The very limited negative feedback stems from requests that are not eligible under the program, such as requesting replacement of a refrigerator or freezer that is outside the livable space.

6.2 Program Participant Findings

Audit Experience

Approximately eight out of every ten program participants (86 percent) reported having their appliances tested for efficiency as part of their participation in the Community Connections program. Refrigerators and freezers were the most common tested appliances. "Other" appliances were also tested, which included washers, dryers, and stoves. Table 6-1 reports the number of participants who recalled having an appliance tested and which appliances were tested, by each EDC.[10]

[10] Although the number of observations is too small to support tests of statistical significance, we note differences that may be substantively meaningful.

Table 6-1: Auditor/Inspector Tested Appliances and Types of Appliances Tested

	CEI		OE		TE		Total	
	n	Percent	n	Percent	n	Percent	n	Percent
Tested any appliance								
Yes	60	87.0%	34	94.4%	20	74.1%	114	86.4%
No	9	13.0%	2	5.6%	7	25.9%	18	13.6%
Appliances tested								
Refrigerator	55	96.5%	32	94.1%	16	84.2%	103	93.6%
Freezer	26	45.6%	17	50.0%	6	31.6%	49	44.5%
Other	14	24.6%	6	17.6%	2	10.5%	22	20.0%
Electric heat pump / Furnace	1	1.8%	4	11.8%	7	36.8%	12	10.9%
Electric water heater	2	3.5%	3	8.8%	4	21.1%	9	8.2%
Wall A/C	0	0.0%	1	2.9%	2	10.5%	3	2.7%
Central A/C	0	0.0%	1	2.9%	1	5.3%	2	1.8%

Respondents were asked if they had noticed any savings in their energy bills after having received weatherization services. About one-half had noticed energy savings (52 percent), but one-quarter had not (26 percent), and roughly 20 percent were not sure.[11] The number of customers who noticed savings on their electric bill varied by each EDC (see Table 6-2). Approximately 60 percent of the surveyed participants in the Cleveland Electric Illuminating territory reported noticeable energy savings (60 percent) compared with only about 30 percent of Toledo Edison customers. Overall, of those that had

[11] In surveys of similar populations conducted by Tetra Tech, we have found that customers may not notice changes in their energy bill because they have a fixed payment plan that proportionally distributes their total annual energy costs in fixed amounts each month regardless of consumption. Customers that use automatic payment options, such as a checking account withdrawal, also may be less likely to notice changes in bill amounts.

noticed energy savings, three-fourths of them were very satisfied with the savings they had seen (76 percent).[12]

Table 6-2: Energy Savings After Weatherization Services

	CEI		OE		TE		Total	
	n	Percent	n	Percent	n	Percent	n	Percent
Noticed savings on electric bill								
Yes	44	60.3%	18	50.0%	8	30.8%	70	51.9%
No	15	20.5%	10	27.8%	10	38.5%	35	25.9%
Not sure	14	19.2%	8	22.2%	8	30.8%	30	22.2%
Satisfaction with energy savings								
Very satisfied with energy savings	35	79.5%	14	77.8%	4	50.0%	53	75.7%

Satisfaction with Program

Respondents were asked to rate their satisfaction with various aspects of the program (see Table 6-3). Satisfaction with the scheduling of the audit, information received from the audit, and the program overall were similar, with about three-quarters of surveyed program participants reporting "very satisfied." Ohio Edison customers reported the highest rates of satisfaction across each of the dimensions and almost 90 percent were very satisfied with the program overall.

[12] *For this and other satisfaction questions, respondents were asked to rate whether they were* "very dissatisfied," "somewhat dissatisfied," "neither satisfied nor dissatisfied," "somewhat satisfied," or "very satisfied." The analyses contrast respondents who answered "very satisfied" with all other categories.

Table 6-3: Satisfaction with the Program

	CE		OE		TE		Total	
	n	Percent	n	Percent	n	Percent	n	Percent
Satisfaction with Community Connections								
Very satisfied with information from the audit	55	77.5%	28	84.8%	18	66.7%	101	77.1%
Very satisfied with scheduling of audit/visit	54	73.0%	29	80.6%	22	81.5%	105	76.6%
Very satisfied with program overall	48	67.6%	31	88.6%	19	73.1%	98	74.2%

When asked if they had any suggestions to improve the program, most respondents did not (73 percent). Those who did suggested receiving additional measures services such as windows, stoves, and insulation.

Household Characteristics

Table 6-4 shows rates of home ownership, type of residence, and year of construction. Two-thirds of the program participants who completed the survey owned their home, and the vast majority lived in a single-family home. Only 12 percent lived in a multifamily home. Overall, most of the homes were older: about 85 percent were built before 1980 and two-thirds were at least 55 years old (built before 1960). The housing stock among Cleveland Electric Illuminating customers is noticeably older: 75 percent of their homes were built before 1960.

Table 6-4: Household Characteristics

	CEI		OE		TE		Total	
	n	Percent	n	Percent	n	Percent	n	Percent
Home Ownership								
Own	41	56.9%	26	74.3%	21	77.8%	88	65.7%
Rent	31	43.1%	9	25.7%	6	22.2%	46	34.3%
Type of home								
Single-family, detached construction	54	76.1%	28	77.8%	19	79.2%	101	77.1%
Single-family, manufactured or mobile home	4	5.6%	7	19.4%	3	12.5%	14	10.7%
Multi-family home	13	18.3%	1	2.8%	2	8.3%	16	12.2%
Year home built								
Before 1960	39	76.5%	14	50.0%	11	61.1%	64	66.0%
1960 to 1979	8	15.7%	6	21.4%	4	22.2%	18	18.6%
1980 or later	4	7.8%	8	28.6%	3	16.7%	15	15.5%

7. Conclusions and Recommendations

The following sections provide ADM conclusions and recommendations pertaining to program performance and improvement.

Conclusions

A total of 4,858 low-income households received energy efficiency services through the Low-Income Program in 2014. The numbers of participants in each service territory were as follows:

- CEI 2,453
- OE 1,783
- TE 622

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 7-1 below.

Table 7-1: Impact Evaluation Results

Utility	*Ex Ante Expected Gross Savings*		*Ex Post Verified Gross Savings*		
	kWh	kW	kWh	kW	Realization Rate
CEI	3,635,662	520	3,636,414	521	100%
OE	2,675,032	376	2,673,999	378	100%
TE	686,056	92	687,666	92	100%
Total	**6,996,750**	**988**	**6,998,079**	**991**	**100%**

The gross kWh savings shown in Table 7-1 reflects a realization rate of 100%, as determined by the ratio of verified gross kWh savings to expected gross kWh savings.

Recommendations

Overall, the program continues to run smoothly, with agencies continuing to adapt to funding shifts. OPAE and local agency staff have many years of experience administering and implementing low-income weatherization and energy efficiency programs. There are, however, a few recommendations offered for consideration.

Assess ways to increase the Companies contact with the community agencies and to involve the Companies' technical staff in communications with the agencies. Agencies spoke positively of the Companies' support and training on the CC system, and the new initiative to circulate monthly e-newsletters was also noted appreciatively. However, agencies registered interest in greater direct communication with the Companies, especially technical representatives, as well as OPAE's technical staff. OPAE is readily accessible by telephone and email to address specific questions and the annual weatherization conference provides an opportunity for updates as well. In the face of continued funding constraints and competing requirements across programs serving the same populations, there is a growing need for communication on how to effectively spend funds in ways that will provide the best value to the Companies and maximize the benefits to customers.

8. Appendix A: Required Savings Table

This appendix provides a summary of all the relevant savings associated with the program.

Table 8-1: Ex Post Lifetime Energy Savings (kWh)

Utility	Annual kWh Savings	Annual kW Savings	Lifetime kWh Savings
CEI	3,636,414	521	29,091,314
OE	2,673,999	378	21,391,993
TE	687,666	92	5,501,330
Total	6,998,079	991	55,984,637

9. Appendix B: Surveys and Interview Guides

2014 Low-Income Program
Participant Telephone Survey

EDC	Code
Illuminating Company	1
Ohio Edison	2
Toledo Edison	3

A1 *Hello, my name is (interviewer name), and I am calling on behalf of (name of EDC), your electric utility company. May I speak with (name of respondent)?*

Yes	01	
No	02	[IF *NOT AVAILABLE, ASK FOR ANOTHER ADULT FAMILIAR WITH HOUSEHOLD'S PARTICIPATION IN COMMUNITY CONNECTIONS PROGRAM]*

A2 *I'm with ADM Associates, an independent research firm. We are speaking with households that participated in the (name of EDC's) Low-Income Program. You will receive a $10 gift card for participating in this survey.*

Through this program you would have received energy efficient light bulbs called compact fluorescent lights or CFLs for short; or you might have had your refrigerator or freezer replaced with an energy efficient Energy Star refrigerator or freezer; or you might have received electrical wiring or roof repairs. Do you recall participating in this program?

Yes	01	[SKIP TO A6]
No	02	
Don't Know	98	
Refused	99	[THANK AND TERMINATE]

A3 *You may have received these services through a subcontractor from another company. It is possible you worked with an energy auditor or inspector from the Ohio Home Weatherization Assistance Program (HWAP), or the Electric Partnership Program (EPP), or the Warm Choice or House Warming Program, or the Home Energy Assistance Program (HEAP). Do you recall participating in Low-Income through any of these other programs?*

Yes	01	[SKIP TO A6]

No	02	
Don't Know	98	
Refused	99	[THANK AND TERMINATE]

A4 *Is it possible that someone else in your household would be familiar with the items you received through this program?*

Yes	01	
No	02	[THANK AND TERMINATE]
Don't Know	98	[THANK AND TERMINATE]
Refused	99	[THANK AND TERMINATE]

A5 *May I speak with that person?*

Yes	01	[RECYCLE THROUGH A2 & A3 WITH NEW RESPONDENT]
No	02	[THANK AND TERMINATE]
Don't Know	98	[THANK AND TERMINATE]
Refused	99	[THANK AND TERMINATE]

A6 *Great, thank you. First I want to assure you that I'm not selling anything. I just want to ask your opinion about the program. Your responses will be kept confidential. For quality and training purposes, this call will be recorded. May I take a few minutes of your time to talk with you now about the equipment and services you received and how that has worked out for you?*

Yes	01	[PROCEED WITH INTERVIEW]
No	02	[THANK TERMINATE]
Refused	99	[THANK AND TERMINATE]

A7. Would you be interested in scheduling a follow-up home visit with ADM associates as an additional step of verification of the measures installed at your home? You will receive an additional 10.00 gift card for your courtesy at the time of the appointment.

Yes	01	[SCHEDULE INTERVIEW]
No	02	[PROCEED WITH INTERVIEW]
Refused	99	[PROCEED WITH INTERVIEW]

Appointment Date _____

Appointment Time _____

Confirmed Address _____
_____
_____

THE INTERVIEW

Name of Respondent: _____

Premise ID Number: _____ **Phone Number:** _____

1. *I would like to start by asking you about the equipment and services you received through the program. Our records indicate that you received the following items from Low-Income.* ***Please tell me if you received these items or not.***

[READ ITEMS THAT WERE RECEIVED ACCORDING TO RECORDS
RECORD ANSWER INDICATED BY RESPONDENT]

	Yes	No	DK	NA
a. Compact fluorescent light bulbs, called CFLs	01	02	98	99
b. Energy Star Refrigerator	01	02	98	99
c. Energy Star Freezer	01	02	98	99
d. Energy Saving Showerheads	01	02	98	99
e. Faucet Aerators	01	02	98	99
f. Electrical Repairs	01	02	98	99
g. Roof Repairs	01	02	98	99
h. Energy Education	01	02	98	99
i. Water heater pipe insulation	01	02	98	99
j. Seal Air Leakage / Duct Sealing	01	02	98	99
k. Water Heater	01	02	98	99
l. Attic Insulation	01	02	98	99
m. Side Wall Insulation	01	02	98	99
n. Night Lights	01	02	98	99
o. Central AC Replacement	01	02	98	99
p. Torchiere	01	02	98	99

CFLS

[ASK Q2-Q9 IF Q1A = 1 OR Q1P=1]

2. *You indicated that you received CFLs from the program.*
   a. *Our records indicate you received* _____ *CFLS* **(INSERT # FROM RECORDS)**
   b. *As best as you can recall, is that number correct or did you receive a different number of CFLs?*

Number of CFLs in record is correct	01	[GO TO Q4]
Received a different number of CFLs	02	
Don't know	98	[GO TO Q8]
Refused	99	[GO TO Q8]

3. *What is the correct number of CFLs that you received then?*

Number of CFLs received: _____

4. *Of the _____ CFL bulbs you received, how many [READ LIST; ENTER NUMBER FOR EACH]*

   a. *Are currently installed?* _____
   b. *Were installed and removed?* _____
   c. *Have never been installed?* _____

[ASK Q5 IF Q4B > 0]

5. *Why were some CFLs removed? (SELECT ALL THAT APPLY)*

CFL broke or burned out	01
CFL not working as needed (e.g., lights too dim)	02
Using them in another home or at work	03
Storing them for later use	04
Gave them away	05
Returned them to the program	06
Other (specify)	07

a) Other reason: _____

[ASK Q6 *IF Q4C > 0]*

6. *Why were some of the CFLs never installed? [RECORD VERBATIM RESPONSE]*

7. *As best you can recall, how many of the CFLs received through the program -- that are currently installed -- are installed in each of the following room locations?*

Room Location	Code	# CFLs Installed
Bedrooms	1	
Bathrooms	2	
Living Room	3	
Kitchen	4	
Entry Way	5	
Dining Room	6	
Garage	7	
Basement	8	
Den	9	
Stairway	10	
Office	11	
Other (specify)	12	

Note: Total should not exceed number in Q4a

a) Specify other room location: _____

8. Please tell me which of the following statements is most correct. [READ STATEMENTS; ALLOW ONE RESPONSE]

An auditor or inspector installed all of the CFLs	01
An auditor or inspector installed some of the CFLs	02
An auditor or inspector did not install any of the CFLs	03
Don't know	98
Refused	99

Comments: _____

9. What type of lighting equipment did the CFLs replace? [SELECT ONE]

Standard incandescent light bulbs	01
Other CFLs	02
Both incandescent light bulbs and CFLs	03
Other (specify)	04
Don't Know	98
Refused	99

a) Other lighting: _____

REFRIGERATOR REPLACEMENT

[ASK Q10-11 IF Q1B = 1]

10. You indicated that your refrigerator was replaced. Can you tell me the door style configuration of the new refrigerator that was installed? Is it a... [READ RESPONSE OPTIONS]

Top-freezer refrigerator model	01	
Bottom-freezer refrigerator model	02	
Side-by-Side refrigerator model	03	
Don't know	98	[PROMPT TO LOOK AT THE UNIT]
Refused	99	

11. Our records indicate that your new refrigerator was installed _____. Is this correct?

Yes	01	
No	02	Record Month _____
Don't recall	98	[GO TO Q12]
Refused	99	[GO TO Q12]

FREEZER REPLACEMENT

[ASK Q12-13 IF Q1C = 1]

12. You indicated that your freezer was replaced. Can you tell me the type of new freezer that was installed? Is it an... [READ RESPONSE OPTIONS]

Upright freezer model	01	
Chest freezer model	02	
Don't know	98	[PROMPT TO LOOK AT THE UNIT]
Refused	99	

13. Can you tell me the month in which the new freezer was installed? What month was that?

Month of installation: _____

Don't recall	98	[GO TO Q14]
Refused	99	[GO TO Q14]

ENERGY EDUCATION

[ASK Q14-Q18 IF Q1H = 1]

14. You indicated that you received energy education from the program. Did the auditor or inspector provide you with information about ways you can save energy in your home?

Yes	01	
No	02	SKIP TO Q19
Don't recall	98	SKIP TO Q19
Refused	99	SKIP TO Q19

15. How was this information provided to you? [DO NOT READ; SELECT ALL THAT APPLY]

Auditor discussed ways to save energy with customer	01
Auditor provided customer energy education materials	02
Other (specify)	03

Specify Other: _____

16. Because of the information you received from the auditor or inspector, do you feel you now know more about how to save energy in your home? [SELECT ONE]

Yes, know more now	01
No, about the same as before	02

Don't know	98
Refused	99

17. *On a scale of 1 to 5 where 1 is not at all useful and 5 is extremely useful, how useful was the energy education information you received from the auditor or inspector?*

_____ [ENTER 01 TO 05]

[ASK Q18 IF Q17]

18. *What information could the auditor have provided that would have been more useful to you?* RECORD VERBATIM RESPONSE

HOME IMPROVEMENT RETROFITS

[ASK Q20-Q22 IF Q1L=01]

Attic Insulation

19. *Please rank-order **the top three factors** in your decision to have additional attic insulation installed in your home. Select 1 for the most important factor; 2 for the second-most important factor; and 3 for the third most important factor.*

a.	The retrofit recommendation seemed credible			
b.	Wanted to improve home comfort	1	2	3
c.	Impact of attic insulation on reducing my electric bill	1	2	3
d.	Other (Specify: _____)	1	2	3

20. *Using the satisfaction scale below, please indicate how satisfied you are with the following aspects of the attic insulation that was installed:*

	VD	D	N	S	VS	DK
a. Insulation performance after installation						
b. Home Comfort level after installation						
c. Savings on electric bill						

[ASK Q22 IF Q21 = VD or D]

21. *Why weren't you satisfied with this aspect of your insulation after the installation?*

[ASK Q23-Q25 IF Q1M=01]

Wall Insulation

22. *Please rank-order **the top three factors** in your decision to have additional wall insulation installed in your home. Select 1 for the most important factor; 2 for the second-most important factor; and 3 for the third most important factor.*

a.	The retrofit recommendation seemed credible	1	2	3
b.	Wanted to improve home comfort	1	2	3
c.	Impact of wall insulation on reducing my electric bill	1	2	3
d.	Other (Specify: _____)	1	2	3

23. *Using the satisfaction scale below, please indicate how satisfied you are with the following aspects of the wall insulation that was installed:*

	VD	D	N	S	VS	DK
a. Insulation performance after installation						
b. Home comfort level after installation						
c. Savings on electric bill						

[ASK Q25 IF Q24 = VD or D]

24. *Why weren't you satisfied with this aspect of your insulation performance after the installation?*

[ASK Q26-Q28 IF Q1J=01]

Duct Sealing

25. *Please rank-order **the top three factors** in your decision to have the ducts in your home sealed. Select 1 for the most important factor; 2 for the second-most important factor; and 3 for the third most important factor.*

a.	The retrofit recommendation seemed credible	1	2	3
b.	Wanted to improve home comfort	1	2	3
c.	Impact of sealed ducts on reducing my electric bill	1	2	3
d.	Other (Specify: _____)	1	2	3

26. *Using the satisfaction scale below, please indicate how satisfied you are with the following aspects of the duct sealing job that was performed:*

	VD	D	N	S	VS	DK
a. Home comfort level after installation						
b. Duct performance after installation						

c. Savings on electric bill

[ASK Q28 IF Q27 = VD or D]

27. Why weren't you satisfied with this aspect of your ducts after the duct sealing job?

SATISFACTION

The final set of questions is about your satisfaction with the equipment you received and other aspects of the program. Using a scale of 1 to 5 where:

Very dissatisfied	01
Somewhat dissatisfied	02
Neither satisfied nor dissatisfied	03
Somewhat satisfied	04
Very satisfied	05

please tell me how satisfied you are with:

[ASK Q29 IF Q1A = 1]

28. ...the CFLs you received through the program?

_____ [ENTER 01 TO 05]

[ASK Q30 IF Q1B = 1]

29. ...the Energy Star refrigerator you received through the program?

_____ [ENTER 01 TO 05]

[ASK Q31 IF Q1C = 1]

30. ...the Energy Star freezer you received through the program?

_____ [ENTER 01 TO 05]

[ASK Q32 IF Q1F = 1]

31. ...the electrical repairs you received through the program?

_____ [ENTER 01 TO 05]

[ASK Q33 IF Q1G = 1]

32. ...the roof repairs you received through the program?

_____ [ENTER 01 TO 05]

[ASK Q34 IF Q29 OR Q30 OR Q31 OR Q32 OR Q33 <3]

33. Why weren't you satisfied with (type of product or service)?

[RECORD VERBATIM RESPONSE AND IDENTIFY ITEM(S) CUSTOMER IS DISSATISFIED WITH]

34. In the course of participating in the <UTILITY> program, how often did you contact <UTILITY> or program staff with questions?

Never	01	[ASK Q37]
Once	02	
2 or 3 times	03	
4 times or more	04	
Refused	98	
Don't know	99	

35. How did you contact them? [CHECK ALL THAT APPLY]

Phone	01
Email or Fax	02
Letter	03
In person	04
Refused	98
Don't know	99

36. And how satisfied were you with your communications with <UTILITY> and program staff? Would you say you were:

Very dissatisfied	01	[ASK Q38]
Somewhat dissatisfied	02	[ASK Q38]
Neither satisfied nor dissatisfied	03	[ASK Q38]
Somewhat satisfied	04	[ASK Q39]
Very satisfied	05	[ASK Q39]
Refused	98	[ASK Q38]

Don't know	99	[ASK Q38]

37. Why were you dissatisfied?

38. *Have you noticed any savings on your electric bill since installing your new [MEASURE_GENERIC]/removing your old [APPLIANCE]?*

Yes	01	[ASK Q40]
No	02	[ASK Q41]
Not sure	03	[ASK Q41]
Refused	98	[ASK Q41]
Don't know	99	[ASK Q41]

39. *How satisfied are you with any savings you noticed on your electric bill since installing your new [MEASURE_GENERIC]/removing your old [APPLIANCE]? Would you say you were:*

Very dissatisfied	01
Somewhat dissatisfied	02
Neither satisfied nor dissatisfied	03
Somewhat satisfied	04
Very satisfied	05
Refused	98
Don't know	99

39. *Using a scale of 01 to 05 where 01 is very dissatisfied and 05 is very satisfied, Using a scale of 1 to 5 where:*

Very dissatisfied	01
Somewhat dissatisfied	02
Neither satisfied nor dissatisfied	03
Somewhat satisfied	04
Very satisfied	05

please tell me how satisfied you are overall with the (name of EDC) Low-Income Program?

_____ [ENTER 01 TO 05]

40. *Why do you give it that rating? [RECORD VERBATIM RESPONSE]*

41. Do you have any suggestions for improving the program?

Yes	01	
No	02	SKIP TO Q45

42. What suggestions do you have for improving the program?

[RECORD VERBATIM RESPONSE:]

HOME DEMOGRAPHICS

I'd like to finish up by asking you some questions about your home.

43. Which of the following best describes your home? [READ LIST: OPTIONS 01-07]

Single-family home, detached construction	01
Single-family home, factory manufactured/modular	02
Mobile home	03
Row house	04
Two or Three family attached residence	05
Apartment with 4+ families	06
Condominium	07
Other	08
Don't Know	98
Refused	99

Specify Other: _____

44. Do you own or rent this residence?

Own	01
Rent	02
Don't Know	98
Refused	99

45. Approximately when was your home built? [DO NOT READ RESPONSE OPTIONS]

Before 1960	01

1960-1969	02
1970-1979	03
1980-1989	04
1990-1999	05
2000-2005	06
2006 or Later	07
Don't know	98
Refused	99

46. How many square feet is the above-ground living space?

Square Feet: _____	
Don't know	98
Refused	99

[ASK Q49 IF Q48 = 98 OR 99]

47. Would you estimate the above-ground living space is about:

Less than 1,000 square feet	01
1000-2000 square feet	02
2000-3000 square feet	03
3000-4000 square feet	04
4000-5000 square feet	05
Greater than 5000 square feet	06
Don't know	98
Refused	99

48. How many square feet of below-ground living space is heated or air conditioned?

Square Feet: _____	
Does not apply	88
Don't know	98
Refused	99

[ASK Q51 IF Q50 = 98 0R 99]

49. Would you estimate the below-ground living space is about:

Less than 1,000 square feet	01
1000-2000 square feet	02
2000-3000 square feet	03
3000-4000 square feet	04
4000-5000 square feet	05
Greater than 5000 square feet	06
Don't know	98
Refused	99

That's all the questions I have. Thank you for your time.

You will receive your gift card within the next 30 days. Do you have any questions?

OK. Good bye

Ohio | Public Utilities Commission

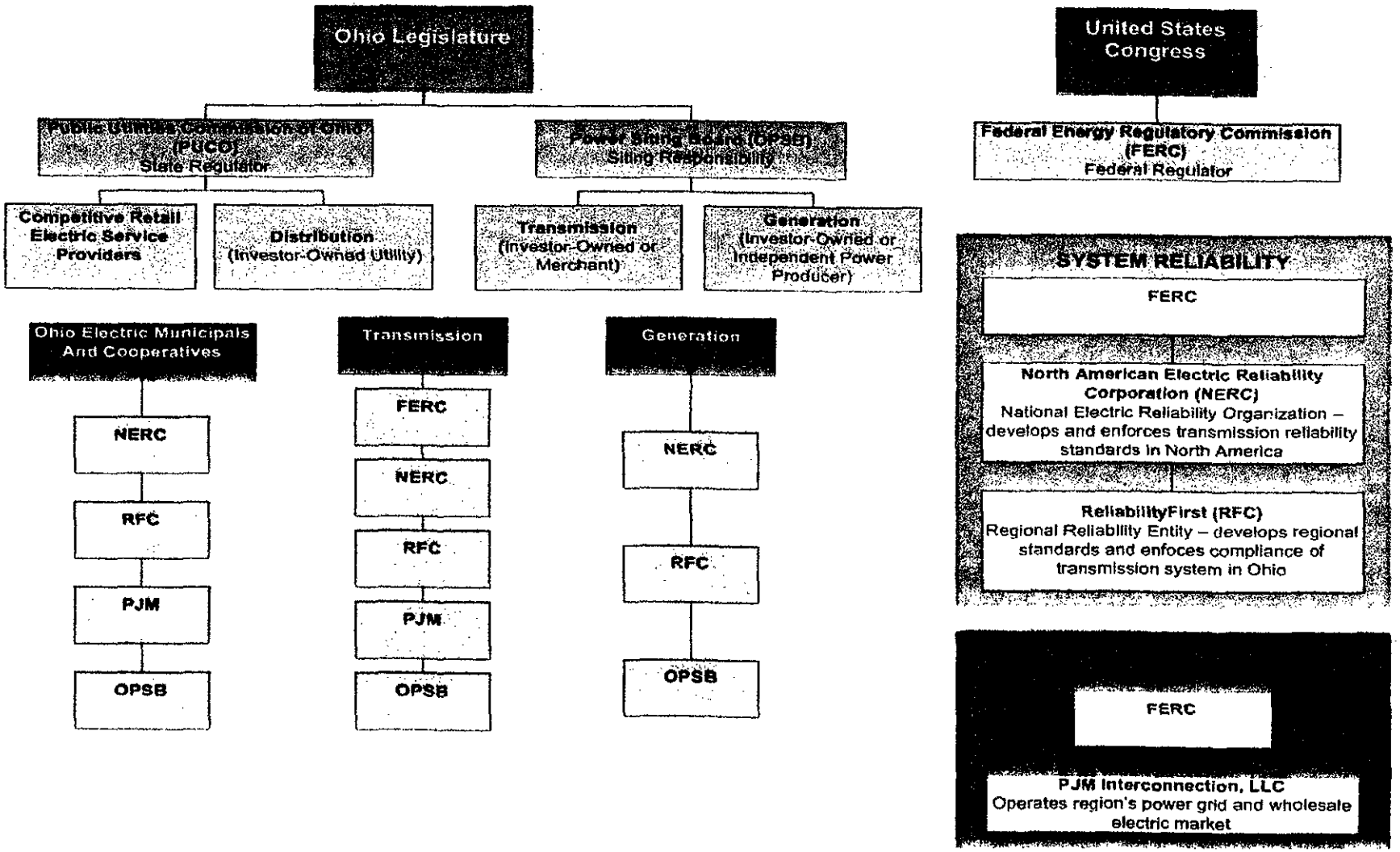
House Public Utilities Committee Briefing

March 4, 2015

Thomas W. Johnson, Chairman
Angela M. Hawkins, Interim Chief of Staff
Patrick Donlon, Director of Rates and Analysis
John Williams, Director of Service Monitoring and Enforcement

Ohio | Public Utilities Commission

Electric Regulation



FERC oversight

- Wholesale electricity - sales for resale
- Bulk power system
- Transmission tariffs
- Wholesale market monitoring
- Reliability assurance (North American Electric Reliability Corporation)

State oversight

- Retail electric sales
- Distribution system reliability/safety
- Intrastate infrastructure maintenance/siting
- Renewable portfolio standards/energy efficiency standards (if applicable)