TESTIMONY OF ROSHENA M. HAM
MANAGER, MEASUREMENT AND VERIFICATION
DUKE ENERGY BUSINESS SERVICES LLC
ON BEHALF OF
DUKE ENERGY INDIANA, INC.
CAUSE NO. 43955 DSM-2 BEFORE THE
INDIANA UTILITY REGULATORY COMMISSION

I. INTRODUCTION AND PURPOSE

Q1. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A1. My name is Roshena M. Ham and my business address is 550 South Tryon Street, Charlotte, North Carolina.

Q2. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A2. I am employed as Manager, Measurement and Verification for Duke Energy Carolinas, LLC ("Duke Energy Carolinas"). In that role, I perform services for the Duke Energy affiliated utility companies, including Duke Energy Indiana, Inc. ("Duke Energy Indiana" or "Company").

Q3. PLEASE BRIEFLY DESCRIBE YOUR EDUCATIONAL BACKGROUND AND BUSINESS EXPERIENCE.

A3. I have a Bachelor's degree in engineering from Vanderbilt University and a Masters of Business Administration from Georgetown University.

From 1999-2001, I was in the management associate rotation program at Enron. From 2001-2004, I was co-founder and partner of Liberty Power Corporation, a retail electric provider in deregulated markets. From 2004-2008, I was a consultant on various energy projects including energy efficiency, renewable energy and energy procurement, and also during that time I taught business courses at Central Piedmont

Community College. From 2006-2009, I worked for Duke University Nicholas School of the Environment as the Energy and Environment program manager. In 2009, I began working for Duke Energy Business Services LLC, a wholly-owned service company subsidiary of Duke Energy Corporation ("Duke Energy"), as an energy efficiency program manager, managing the implementation of Non-Residential Smart $aver Custom Incentives. In 2013, I assumed my current role as Manager, Measurement and Verification.

Q4. PLEASE BRIEFLY DESCRIBE YOUR DUTIES AND RESPONSIBILITIES AS MANAGER, MEASUREMENT AND VERIFICATION.

A4. As Manager, Measurement and Verification, I have responsibilities for a variety of analytical functions in support of product development and operations, including managing evaluation studies, energy load analysis and cost-effectiveness analysis. In this role, I oversee Evaluation, Measurement and Verification ("EM&V") services for Duke Energy affiliates, including Duke Energy Indiana.

Q5. HAVE YOU PREVIOUSLY TESTIFIED IN A REGULATORY PROCEEDING?

A5. Although I have not testified before the Indiana Utility Regulatory Commission, I have filed testimony in proceedings in the Duke Energy jurisdictions of Ohio and Carolinas.

Q6. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A6. My testimony will provide an overview of EM&V and address the processes that Duke Energy Indiana uses to conduct EM&V and how those processes comport with

the Indiana DSM rules and Commission Orders. I will also discuss how EM&V factors into developing forecasts and true-ups for the EE Rider and provide an update on EM&V results. I will explain modeling and the use of DSMore. Finally, I will provide the cost-effectiveness test results for Duke Energy Indiana's proposed 2015 EE portfolio.

II. OVERVIEW OF EVALUATION, MEASUREMENT AND VERIFICATION

Q7. WHAT IS EM&V?

A7. Evaluation, measurement and verification of energy efficiency programs involves documenting program benefits, or impacts, and program effectiveness. Measurement and verification encompasses data collection, monitoring, and analysis associated with the calculation of gross energy and demand savings from individual sites or projects, and can be a subset of program evaluation.

Q8. WHY IS EM&V AN IMPORTANT COMPONENT OF ENERGY EFFICIENCY PROGRAMMING?

A8. Aside from complying with Commission rules and orders, Duke Energy Indiana believes that successful, reliable and cost-effective energy efficiency programs require EM&V activities for several reasons. First and foremost, reliably measuring savings achieved from energy efficiency provides certainty for resource planning and provides accountability to customers and shareholders. Second, properly executed evaluation activities support program improvements. Accurately understanding savings estimates and program efficacy enables Duke Energy Indiana to drive increased energy savings through improved design, including insights on the targeting

and marketing of specific programs to improve overall participation and how to most cost-effectively generate kW and kWh yield from our energy efficiency investments.

Q9. WHAT DIFFERENT TYPES OF EVALUATION DOES DUKE ENERGY INDIANA UTILIZE?

A9. There are five types of evaluation that the Company relies upon. First, there is cost effectiveness evaluation; before a program implementation, this requires establishing a set of ex-ante impact assumptions. Second, there is impact evaluation, which strives to estimate the actual energy and demand load reductions realized from a program, known as ex-post impacts, through such methods as billing analysis, engineering analysis, or statistically adjusted engineering models. Third, the Company relies upon measurement, which typically refers to the metering, sub-metering, hours-use logger meter, statistical pre and post analyses, or other modes of measuring load reduction. Usually, measurement is a subset of an impact evaluation. Fourth, there is verification, which refers to the confirmation that customers actually installed the intended measures, that vendors are performing to expectation and that operational factors on the customer site are occurring such that the expected load savings are being realized. Finally, there are also process evaluations that refer to a set of review and auditing methods that ascertain program effectiveness, customer satisfaction and experience, vendor satisfaction and other factors that contribute substantially to program success. We propose to conduct these five types of evaluations through the use of the approaches set forth in Petitioner's Exhibit B-1.

Q10. HOW DOES DUKE ENERGY INDIANA PLAN TO MEASURE, MONITOR AND VERIFY ITS PROGRAM PERFORMANCE?

A10. Duke Energy Indiana's approach for EM&V was presented and approved in Cause No. 43955. Implementation of that approach is in process for the Core Plus programs. This involves verification of customer applications, field verification and monitoring, customer satisfaction surveys, and system performance tests.

- Verification of Customer Applications: Paper or electronic verification will be completed on customer applications for energy efficiency incentives. As part of the application process, specific customer and measure data will be requested from applicants. Data requested will vary depending on the program, the measure, the equipment and the delivery of the application.
- Field Verification and Monitoring: Consistent with industry standard, in most cases a statistically significant, randomly selected sample of installations will be field verified and monitored. On-site field visits verify the installation of the claimed equipment in the proper manner, confirm appropriate contractor or vendor processes and performance, and bring to light potential discrepancies or process improvements for the programs. The size of such samples will be commensurate with the participation and impacts as determined by Duke Energy Indiana. Field training and support will be given to auditors performing assessments, to ensure quality both for communications and technical capabilities.
- Customer Satisfaction Surveys: Customer satisfaction surveys will be utilized

to monitor satisfaction with program delivery and design, seek additional improvements to the program, analyze experimental designs in market messaging, and potentially uncover latent problems or issues with the measure/installation. These surveys will be administered via telephone, web survey instruments, or mail surveys.

- System Performance Tests: System performance tests, called "operability studies" for load control resources will be conducted periodically to ensure that operational systems are working correctly, and that the projected load reductions are reliably available when needed. Load research metering samples and tracking will also be used to verify energy reductions.

Early feedback is an important element in EM&V for all components, including process and impact evaluations, but is also specifically relevant for system performance tests. If a problem is found with the installations or operations, the contractor and customer will be notified to correct the problem. In addition, subsequent work or projects performed by that contractor will be monitored until Duke Energy Indiana is satisfied that the installations or projects are being completed according to program specifications and operational standards. If the problems are not resolved to the satisfaction of Duke Energy Indiana, that contractor, at the Company's discretion, may be eliminated from the program.

Duke Energy Indiana has provided for the independent review and evaluation of its proposed programs by establishing initial evaluation plan summaries that propose specific energy efficiency evaluation studies and activities that will be

competitively bid, and designed, managed, supervised, or conducted by independent and qualified evaluation professionals.

Evaluation studies will generally include methods such as loggers to capture appliance usage times, load research metering for hourly load analysis, statistical pre- and post-billing analysis using comparison control groups, engineering analysis and modeling, reference and comparisons to impact studies conducted in other regions for similar programs, phone and online interviews, and other methods reviewed within the International Performance Measurement and Verification Protocols, the California Evaluation Framework, and the Model Energy Efficiency Program Impact Evaluation Guide prepared as part of the National Action Plan for Energy Efficiency. Petitioner's Exhibit B-1 provides an initial design for the EM&V analysis for the proposed energy efficiency programs.

Q11. ARE YOU FAMILIAR WITH THE COMMISSION'S RULES ON ENERGY EFFICIENCY OR DSM PROGRAM EVALUATION?

A11. Yes, it is my understanding that the Commission has established requirements that certain specific information be included in process and impact evaluation plans. The rules are as follows:

> 170 IAC 4-8-4 Demand-side management program evaluation
> Sec. 4. (a) When seeking commission approval for cost recovery, DSM incentives, or lost revenue, a utility shall develop a process and load impact evaluation plan to assess implementation and quantify the impact on energy and demand of the demand-side resource. The evaluation plan must include the following:
> (1) The type and timing of the measurement activity used to evaluate a demand-side resource.
> (2) The process where the result is used to modify the impact estimate for future planning and design of the demand-side program.

(3) The procedure employed regarding the following aspects of the evaluation of each program:

(A) Establish a protocol to collect basic data on load impact, participation level, utility cost, participant cost, and total cost. Data must be gathered to determine the load shape impact, net program savings, useful life of the measure, and persistence of savings, including utility actions to optimize market penetration of the program and minimize free-riders.

(B) Compare demand patterns of similar participant and non-participant groups, through the use of customer bill analysis, engineering estimates, end-use meter data, or other methods to identify the gross and net impacts of program participation on customers' usage and demand patterns.

(4) A method to measure rebound or the income effect for a program or a sector where the effect may be significant.

(b) A utility shall submit to the commission, annually, a document containing information, data, and results from the utility's process and load impact evaluation studies.

Q12. HOW WILL THE COMPANY'S EM&V PROPOSED PLANS SATISFY THE COMMISSION'S RULES?

A12. The processes outlined in my testimony and in Petitioner's Exhibit B-1 provide specific detail on how the Company's proposed EM&V plans satisfy the Commission's rules. To be more complete, I want to cite examples relative to each portion of the rules.

With respect to "(1) The type and timing of the measurement activity used to evaluate a demand-side resource," Petitioner's Exhibit B-2 provides the expected timing of the process and impact evaluation studies for each program. However, this schedule is intended to be indicative of when the Company expects to deliver the final evaluations. In reality, the Company will strive to balance costs, measurements and timing in the most effective and efficient manner possible, given program participation rates for various programs. Popular programs may require early attention, to ensure that resources are deployed in a cost-effective manner.

With respect to "(2) The process where the result is used to modify the impact estimate for future planning and design of the demand-side program," I have defined the process for utilizing the results of the EM&V analyses in this testimony.

Petitioner's Exhibit B-1 provides procedures for each program to address the Commission's following rule:

> "(3) The procedure employed regarding the following aspects of the evaluation of each program:
>
> (A) Establish a protocol to collect basic data on load impact, participation level, utility cost, participant cost, and total cost. Data are gathered to determine the load shape impact, net program savings, useful life of the measure, and persistence of savings, including utility actions to optimize market penetration of the program and minimize free-riders.
>
> (B) Compare demand patterns of similar participant and non-participant groups, through the use of customer bill analysis, engineering estimates, end-use meter data, or other methods to identify the gross and net impacts of program participation on customers' usage and demand patterns."

In addition, earlier in my testimony I presented procedures on how information on Verification, Customer Satisfaction Surveys, and System Performance information will be collected. Again, these planned EM&V impact and process evaluation plans, and associated protocols, are subject to revisions and enhancements as the Company gains more experience with program participation rates, required precision, and desired timing. Furthermore, the Company will draw upon any lessons learned from relevant Indiana EM&V and evaluation experts.

With respect to "(4) A method to measure rebound or the income effect for a program or a sector where the effect may be significant," this concept refers to changes in energy use that occurs specifically as a result of the cost savings

associated with participation in an energy efficiency program. The EM&V studies as discussed in Petitioner's Exhibit B-1 measure what is typically called "take-back", "snap-back", "rebound" or "income" effects when it is possible and reliable to measure this effect within a study period and approach.

For those program evaluations that use billing analysis and on-site metering, any "take-back" that occurs within the examination period are captured in the electric consumption metered data. This approach captures what is typically referred to as short-term take-back, because it captures the take-back that occurs soon after an energy efficient action is taken, typically a year or less following an action taken. Because utility bill analyses often examine electric consumption records before and after an action is taken, the short-term take-back is embedded in that data.

With respect to "(b) A utility shall submit to the commission, annually, a document containing information, data, and results from the utility's process and load impact evaluation studies," the Company fully anticipates providing copies of all EM&V studies and any associated information as necessary to the Commission for review. Additionally, the Company will work with its Oversight Board process, as in the past, providing draft EM&V studies and periodic updates on evaluation status and progress.

With these steps, I believe the Company can fully satisfy the Commission's rules on evaluation.

Q13. ARE YOU FAMILIAR WITH PREVIOUS COMMISSION ORDERS REGARDING DUKE ENERGY INDIANA'S EM&V?

A13. Yes, I have reviewed the testimony, exhibits and final orders in Cause Nos. 43955 and 43955 DSM1 ("DSM1").

Q14. WHAT IS THE CURRENT STATUS OF HOW DUKE ENERGY INDIANA APPLIES THE RESULTS OF ITS EM&V?

A14. In DSM-1, the Commission approved a settlement agreement between the Indiana Office of Utility Consumer Counselor and Duke Energy Indiana in which Duke Energy Indiana agreed to reconcile estimated lost revenues with actual lost revenue as verified by EM&V, applied retrospectively to the previously reconciled period for each program, and to calculate the shareholder incentive using prospective energy savings estimates and retrospective EM&V-reconciled participation numbers.

Q15. WHAT IS THE ESTIMATED COST AND TIMEFRAME FOR THE EVALUATION, MONITORING AND VERIFICATION FOR THE PROGRAMS?

A15. Duke Energy Indiana estimates that 5% of total program costs across the complete portfolio will be required over the portfolio approval period to adequately and efficiently perform evaluations, monitoring and verification. Historical industry experience suggests that evaluation costs are typically 3% to 8% of total program spending and the Company believes that 5% is reasonable and appropriate because the Company is committed to obtaining reliable and cost- effective estimates of the load impacts from the programs. The timeframe for EM&V is presented in Petitioner's Exhibit B-2.

III. APPLICATION OF EM&V IN RATEMAKING

Q16. HOW WILL THE EVALUATION, MEASUREMENT, AND VERIFICATION RESULTS BE UTILIZED IN DEVELOPING FORECASTS FOR THE PROPOSED RIDER?

A16. Before a program is implemented, a set of ex-ante impact assumptions are established along with the projected number of participants in the program. In the next section of this testimony, I provide a description for the source of the data for the program or measure. Upon the completion of a program impact evaluation, these estimates are revised based on the impact evaluation findings. As such, future forecasts will incorporate the most recent EM&V results. The estimated participant and load impact information is used to develop estimates of future lost revenues, future target achievement levels for development of estimated incentives, and in future cost-effectiveness evaluations.

Q17. HOW WILL THE EVALUATION, MEASUREMENT, AND VERIFICATION RESULTS BE UTILIZED IN DEVELOPING TRUE-UPS FOR THE PROPOSED RIDER?

A17. A completed impact evaluation report provides the Company with the actual participation and ex-post load impacts during the period of the evaluation study. The Company will use this actual participation information and ex-post load impacts as the basis for retrospective true-ups of estimated lost revenues for the proposed EE Rider. And, the Company will use this actual participation information as the basis

for retrospective true-ups to calculate the shareholder incentive, as described in the settlement agreement with the Indiana Office of Utility Consumer Counselor.

Q18. HAS THE COMPANY PROVIDED ANY EM&V REPORTS TO DATE?

A18. Yes, EM&V reports have been completed for the following Core Plus programs and filed in Cause No. 42693 S1:

Power Manager
Personalized Energy Report
Home Energy Comparison Report
Appliance Recycling[1]
Residential Smart $aver HVAC
Agency Assistance Portal
Property Manager CFLs

Evaluation work is underway for the remaining Core Plus programs.

Q19. PLEASE PROVIDE AN UPDATE ON CORE PROGRAM EM&V RESULTS.

A19. The Independent Evaluation, Measurement and Verification Administrator to the statewide DSM programs is currently completing the evaluation of Core programs during program year 2 (2013). A summary report of findings is expected to be completed by June 1, 2014. Duke Energy Indiana participates in the DSMCC Subcommittee for EM&V and has reviewed the draft report for Core programs, and will continue to participate as the EM&V Administrator for Core Programs compiles the complete 3-year report of the Core programs.

IV. DSMORE

Q20. WHAT IS THE DSMore MODEL?

[1] The Appliance Recycling EM&V report filed in Cause Number 42693 S1 included process evaluation only. The finalized impact evaluation is pending.

A20. DSMore is a financial analysis tool designed to help energy efficiency and demand response program planners evaluate the costs, benefits, and risks of energy efficiency programs and measures. The Company utilizes DSMore to estimate the net present value of the benefits and costs associated with the implementation of an energy efficiency measure or program or a demand response program, which is also used to compute benefit-cost ratios, or tests. The resultant tests provide a summary of the measure's cost-effectiveness relative to the value of the benefits from projected load impacts.

DSMore has been used to assess the cost-effectiveness of the Core programs across the state of Indiana and for the Core Plus programs offered by Duke Energy.

DSMore can be utilized to estimate the value of an energy efficiency measure at an hourly level across a wide variety of weather and energy cost conditions. This enables the user to obtain a better understanding of the risks and benefits of employing energy efficiency measures. Understanding the manner in which energy efficiency cost effectiveness varies under alternate conditions allows a more precise valuation of energy efficiency and demand response programs.

Generally, the DSMore model requires the user to input specific information regarding the energy efficiency measure or program to be analyzed as well as the program cost, avoided costs, and rate information of the utility. These types of inputs are used in analyzing the cost effectiveness of the measure or program. The analysis of energy efficiency cost-effectiveness has traditionally focused on the calculation of specific metrics, often referred to as the California Standard tests: Utility Cost Test

("UCT"), Ratepayer Impact Measure ("RIM") Test, Total Resource Cost ("TRC") Test, Participant Test, and Societal Test. DSMore provides the results of those tests for any type of energy efficiency program (demand response and/or energy saving).

Q21. WHAT ENERGY EFFICIENCY PROGRAM OR MEASURE INFORMATION IS INPUT INTO THE MODEL?

A21. The information required on an energy efficiency program or measure includes, but is not limited to:

- Number of program participants, including free ridership or free drivers;
- Projected program costs, contractor costs and/or administration;
- Customer incentives, demand response credits or other incentives;
- Measure life, incremental customer costs and/or annual maintenance costs;
- Load impacts (kWh, kW and the hourly timing of reductions); and
- Hours of interruption, magnitude of load reductions or load floors.

Q22. WHAT UTILITY INFORMATION IS INPUT INTO THE MODEL?

A22. The utility information required for the model includes, but is not limited to:

- Discount rate;
- Loss ratio, either for annual average losses or peak losses;
- Rate structure, or tariff appropriate for a given customer class for a given jurisdiction;
- Avoided costs of energy, capacity, transmission & distribution; and
- Cost escalators.

Q23. HOW ARE PROGRAMS OR MEASURES MODELED?

A23. An analyst or program manager uses the program or measure and utility information in initial runs of the model to determine cost-effectiveness and if adjustments need to be made to a program or measure in order for it to pass the participant test, the first critical test.

The load impacts of the program or measure may be analyzed as a percent of savings reduction from the current level of use, as proportional to the load shape for the customer, or as an hourly reduction in kWh and/or kW. These approaches apply to energy saving programs and measures. For demand response programs, the analyst must provide information on the amount of the expected load reduction and the possible timing of the reduction.

Q24. WHAT IS THE SOURCE OF THE DATA FOR THE PROGRAM OR MEASURE?

A24. Program managers and analysts develop the initial inputs for each program or measure from industry information derived from sources such as Electric Power Research Institute ("EPRI"), Energy Star, E-Source, other utility program information and evaluations, Indiana and other contiguous states' Technical Reference Manuals ("TRM"), engineering building simulation models, as well as from external experts in the industry. Over time, as impact and process evaluations are performed on Indiana programs, information and input specifically related to Indiana customers is used for future cost-effectiveness analyses.

Some of the programs being proposed by the Company in this filing involve measures that are either not addressed by the Indiana TRM or are substantially

different from a measure in the Indiana TRM. The latter applies to the proposed Residential Smart $aver Lighting program CFL opt-in measure. The Indiana TRM includes the measure Residential ENERGY STAR Compact Fluorescent Lamp (CFL) (Time of Sale), where a CFL is purchased through a retail outlet, and the measure Residential Direct Install - ENERGY STAR Compact Fluorescent Lamp (CFL) (Early Replacement), where a CFL is installed by an auditor, contractor or member of utility staff, in a residential location. The Indiana TRM reference sections for each measure demonstrates that while the formulas to calculate the energy and demand savings are identical, there are several variables that can have different values for these two delivery channels. In the case of these two measures, the In Service Rate ("ISR") is different for the two delivery channels, which is not surprising considering one measure involves customer making a purchase in a store and the ISR increases as the customer purposefully installs the product and the other measure involves direct install, where the ISR reduces when the customer purposefully un-installs the product.

In addition to the ISR, the delivery channel and the customer targeting selected by the program can affect other variables in the energy savings calculation including the average hours of use per year and the waste heat factor to account for HVAC interactions.

The proposed Residential Smart $aver Lighting program CFL opt-in measure is delivered via a third delivery channel which is not included in the Indiana TRM. As such, the Indiana TRM measures were not used as the data source; instead, the

Company used the results of EM&V performed on the same program offered in Ohio and Kentucky by its affiliated utility companies.

V. RESULTS OF COST-EFFECTIVENESS TESTS

Q25. PLEASE DESCRIBE HOW ENERGY EFFICIENCY PROGRAMS AND MEASURES ARE ANALYZED.

A25. The net present value of the financial stream of costs versus benefits are assessed, *i.e.*, the costs to implement the measures are valued against the savings or avoided costs. The resultant benefit/cost ratios, or tests, provide a summary of the measure's cost-effectiveness relative to the benefits of its projected load impacts. As previously mentioned, the Participant Test is the first screen for a program or measure to make sure a program makes economic sense for the individual consumer. This is critical because participation by the customer in a particular EE program is voluntary and the customer is unlikely to participate unless it makes economic sense. Duke Energy Indiana also uses the UCT, the TRC, and the RIM Test for a comprehensive screening of energy efficiency measures.

- The Participant Test compares the benefits to the participant through bill savings and incentives from the utility, relative to the costs to the participant for implementing the energy efficiency measure. The costs can include incremental equipment and installation costs as well as increased annual operating cost, if applicable.
- The UCT compares utility benefits (avoided energy and capacity related costs) to utility costs incurred to implement the program such as marketing,

customer incentives, and measure offset costs, and does not consider other benefits such as participant savings or societal impacts. This test compares the cost (to the utility) to implement the measures with the savings or avoided costs (to the utility) resulting from the change in magnitude and/or the pattern of electricity consumption caused by implementation of the program. Avoided costs are considered in the evaluation of cost-effectiveness based on the projected cost of power, including the projected cost of the utility's environmental compliance for known regulatory requirements. The cost-effectiveness analyses also incorporate avoided transmission and distribution costs, and load (line) losses.

- The TRC test compares the total benefits to the utility and to participants relative to the costs to the utility to implement the program along with the costs to the participant. The benefits to the utility are the same as those computed under the UCT. The benefits to the participant are the same as those computed under the Participant Test, however, customer incentives are considered to be a pass-through benefit to customers. As such, customer incentives or rebates are not included in the TRC though some precedent exists in other jurisdictions to consider non-energy benefits in this test.
- The RIM Test, or non-participants test, indicates if rates increase or decrease over the long-run as a result of implementing the program.

The use of multiple tests can ensure the development of a reasonable set of energy efficiency programs, indicate the likelihood that customers will participate,

and also protect against cross-subsidization. It should also be noted that none of the tests described above include external benefits to participants and non-participants that can also offset the costs of the programs.

Q26. WHAT WERE THE RESULTS OF THE PROGRAM ANALYSIS?

A26. The Company analyzed and is proposing the following set of cost-effective programs:

Cost-Effectiveness Scores for Proposed Programs/Measures

	PCT (1)	TRC	UCT	RIM
Agency Assistance Portal	NA	6.03	2.24	0.65
Appliance Recycling	NA	3.21	2.48	0.85
Energy Efficiency Education Program for Schools	NA	1.72	1.37	0.72
Energy Management Information Services Pilot	1.56	1.24	2.94	1.10
Home Energy House Call	NA	1.33	1.26	0.71
My Home Energy Report	NA	1.28	1.28	0.60
Power Manager	NA	3.47	2.87	2.87
Residential Multi-Family Energy Efficiency	NA	3.69	2.65	0.79
Residential Neighborhood Program	NA	2.98	0.79	0.49
Residential Smart Saver®	12.80	3.01	1.94	0.67
Smart $aver Non-Residential Custom Rebate	2.26	1.19	2.45	0.81
Smart $aver Non-Residential Prescriptive - Energy Star Food Service	5.38	2.99	7.20	0.96
Smart $aver Non-Residential Prescriptive - HVAC	2.21	1.60	3.14	1.04
Smart $aver Non-Residential Prescriptive - Lighting	2.35	1.35	2.99	0.81
Smart $aver Non-Residential Prescriptive - Motors, Pumps & VFDs	4.92	2.62	3.81	0.87
Smart $aver Non-Residential Prescriptive - Non Res Information Technology	6.12	2.66	3.91	0.76
Smart $aver Non-Residential Prescriptive - Process Equipment	7.57	3.98	4.90	0.98

(1) The PCT score is NA when there are no participant costs.

VI. CONCLUSION

Q27. ARE THE PROGRAMS BEING OFFERED COST EFFECTIVE AND IN YOR DETERMINATION DOES THE COMPANY HAVE A REASONABLE PLAN FOR EM&V?

A27. Yes, the programs are cost effective and the EM&V plan is reasonable.

Q28. WERE EXHIBITS B-1 AND B-2 PREPARED BY YOU OR AT YOUR DIRECTION?

A28. Yes, they were.

Q29. DOES THIS CONCLUDE YOUR PREPARED TESTIMONY AT THIS TIME?

A29. Yes, it does.

VERIFICATION

I hereby verify under the penalties of perjury that the foregoing representations are true to the best of my knowledge, information and belief.

Signed: Roshena M. Ham Dated: 5-29-14

Roshena M. Ham

Proposed Evaluation Approach for Duke Energy Indiana's Energy Efficiency and Demand Response Programs

Non-Residential Programs

Energy Management and Information Systems Pilot
Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

The impact analysis may employ an analysis of interval demand data, and an engineering analysis may be employed to estimate impacts when the interval metered data is not capable of documenting savings, or used to provide additional details on the areas of savings. In this case, selective on-site measurement and verification data collection will be performed at a sample of facilities. A statistically representative sample of participants will be selected for the engineering analysis. Program energy impacts will be reduced by the amount of impacts claimed through other Duke Energy programs.

The process evaluation will include participant interviews, vendor and trade ally interviews, and program manager interviews and provide information on customer behavior and satisfaction with the program. A statistically representative sample of participants will be selected for the analysis.

The Company intends to follow industry- accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with International Performance Measurement Verification Protocol (IPMVP) Options A, C or D depending on the measure.

Power Share (Demand Response)
Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

For the PowerShare® Mandatory and Voluntary programs the impact analysis will measure and evaluate the short-term changes in load due to the potential and actual interruption of activity or start of on-site generation. The evaluation research includes the collection and processing of interval consumption data, or generation output at an hourly or more frequent interval. Time-series based statistical regression analysis will be applied to hourly metered load to obtain the load reduction.

For the PowerShare® Generator program impact analysis, consumption data at an hourly or more frequent interval may be used. Metered data will be analyzed to determine the increased on-site generation output during the applicable event hours

The process evaluation plan will employ participant and non-participant surveys to ascertain customer satisfaction, vendor satisfaction, and related issues. A statistically representative sample of participants will be selected for the analysis.

The Company plans to follow industry-accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with International Performance Measurement Verification Protocol (IPMVP) Option C .

Smart $aver Non-Residential Custom Rebate

Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

The impact analysis for the Smart $aver Custom program will use a statistically representative sample of participating projects. A blend of selective monitoring and site visits will be performed at each of the selected sample set projects, with engineering-based estimation and may include participant billing analysis of a larger group.

The Process evaluation plan will include participant surveys to collect information needed to estimate net impacts and participants will be asked about equipment that was replaced, energy efficiency actions taken, prior intentions regarding these measures, changes in other major end uses that impact energy consumption, hours of facility operation, persistence and program satisfaction. A statistically representative sample of participants will be selected for the analysis.

The Company intends to follow industry- accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with International Performance Measurement Verification Protocol (IPMVP) Options A or C depending on the measure.

Smart $aver Non-Residential Prescriptive

Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

The impact analysis for the Smart $aver Prescriptive program will use a statistically representative samples of participants. A sample of facilities will receive a combination of selective monitoring and site visits to develop an engineering-based estimation. A participant billing analysis may be conducted with a larger group of participating customers.

The process evaluation will include participant surveys to collect information needed to estimate net impacts, as well as to asked about equipment that was replaced, energy efficiency actions taken, prior intentions regarding these measures, changes in other major end uses that impact energy consumption, hours of facility operation, persistence and program satisfaction. A statistically representative sample of participants will be selected for the analysis.

The Company plans to follow industry-accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with International Performance Measurement Verification Protocol (IPMVP) Options A or C depending on the measure.

Residential Programs

Agency Assistance Portal
Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

The impact analysis will consist of billing analysis and/or engineering estimates to determine the energy and demand savings. A statistically representative sample of participants will be selected for analysis.

The process evaluation will include a participant survey to collect information on energy efficiency actions taken as a result of the program, prior intentions, and changes in other major end uses, changes in household occupancy, persistence and program satisfaction. A statistically representative sample of participants will be selected for analysis.

The Company plans to follow industry-accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with International Performance Measurement Verification Protocol (IPMVP) Option C .

Appliance Recycling
Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

The impact analysis will use an engineering model to evaluate unit energy consumption of the program's refrigerators and freezers which aligns with industry best practices for estimating the energy consumption of appliance recycling programs. A statistically representative sample of participants will be selected for analysis.

The process evaluation will consist of a review of the program operations and practices, including its management practices, marketing materials and operational activities as well as program management and implementer interviews and participant and non-participant surveys. A statistically representative sample of participants will be selected for analysis.

The Company plans to follow industry-accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with International Performance Measurement Verification Protocol (IPMVP) Option A as well as the current Uniform Method Project procedure for appliance recycling.

Energy Efficiency Education Program for Schools

Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

The impact analysis will consist of engineering estimates and/or billing analysis to determine the energy and demand savings. A statistically representative sample of participants will be selected for analysis.

The process evaluation will include program manager, implementer and teacher interviews to assess program operations, and student family surveys to assess program awareness, satisfaction, and compliance with installations and recommendations. For the theater component, the process evaluation will also consist of interviews with school administrators and a review of the theatrical presentation and program operations. A statistically representative sample of participants will be selected for the analysis.

The Company plans to follow industry-accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with International Performance Measurement Verification Protocol (IPMVP) Option C.

Home Energy House Call

Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

The impact analysis will consist of engineering estimates and/or billing analysis to determine the energy and demand savings.

The process evaluation will employ program manager and implementer interviews and participant surveys. Participant surveys will be used to assess levels of customer satisfaction with the audit and the auditor. The evaluation will document program operations and develop

recommendations for program improvements. A statistically representative sample of participants will be selected for the analysis.

The Company plans to follow industry-accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with International Performance Measurement Verification Protocol (IPMVP) Options A and C .

My Home Energy Report (MyHER)

Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

The impact evaluation will consist of a billing analysis to determine the energy reductions achieved by the program. If feasible, participants' consumption will be monitored over time so that consumption changes over an extended period of time can be assessed.

The process evaluation will include program manager and implementer interviews to assess program effectiveness. A participant survey will be used to collect information on energy efficiency actions taken as a result of the program, prior intentions, and changes in other major end uses, changes in household occupancy, persistence and program satisfaction. A statistically representative sample of participants will be selected for analysis.

The Company plans to follow industry-accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with International Performance Measurement Verification Protocol (IPMVP) Option C .

Power Manager (Demand Response)

Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

The impact analysis will develop AC duty cycle models for each AC unit in a sample of Power Manager (PM) participants in the Indiana System. This duty cycle model is then used to simulate the expected natural duty cycle for load control technologies under two different conditions: 1) during the PM event days, and 2) under peak normal weather conditions. The results of these simulations are used to produce estimates of the potential load reduction. These estimates are then de-rated by the results of various operability studies to give estimates of the realized and potential load reductions. In addition, an operability study will be done to determine the percentage of fully functioning Power Manager devices.

The process evaluation will include program manager interviews to assess program operations and participant interviews to assess program options, communications, satisfaction and

operational effectiveness. A statistically representative sample of participants will be selected for the analysis

The Company intends to follow industry-accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with IPMVP Option C.

Residential Multi-Family Energy Efficiency

Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

The impact analysis will consist of an engineering analysis, incorporating actions identified through the participant surveys, self-reported, and implementer data tracking records, and may involve on-site metering. A statistically representative sample of participants will be selected for analysis.

The process evaluation includes program manager, implementer interviews to assess program operations, and property manager and occupancy surveys to assess program awareness, satisfaction, and use/storage of measures. A statistically representative sample of participants will be selected for analysis.

The Company plans to follow industry-accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with International Performance Measurement Verification Protocol (IPMVP) Options A or C depending on the measures.

Residential Neighborhood Program

Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

The impact analysis will consist of engineering estimates and/or billing analysis to determine the energy and demand savings. A statistically representative sample of participants will be selected for analysis.

The process evaluation will include a participant survey to collect information on energy efficiency actions taken as a result of the program, prior intentions, and changes in other major end uses, changes in household occupancy, persistence and program satisfaction. A statistically representative sample of participants will be selected for analysis.

The Company plans to follow industry-accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with International Performance Measurement Verification Protocol (IPMVP) Options A and C .

Residential Smart $aver: HVAC

Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

The impact analysis will review deemed savings assumptions and verify equipment installations. Selective monitoring and site visits will be performed at a sample of participant homes with planned engineering-based estimation of energy and demand savings. A statistically representative sample of participants will be selected for the analysis.

The process evaluation will include participant and non-participant surveys, along with vendor satisfaction surveys or interviews, to estimate free ridership and uncover potential vendor issues that might impact customer satisfaction or program effectiveness. A statistically representative sample of participants will be selected for the analysis.

The Company intends to follow industry-accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with IPMVP Options C (retrofit) and D (new construction).

Residential Smart $aver: Lighting

Evaluation, measurement and verification actions will provide an independent, third-party report of energy savings attributable to the program including an impact analysis and process evaluation.

The impact analysis will use an engineering analysis to determine program savings. A statistically representative sample of participant will be selected for the analysis.

The process evaluation will include participant and non-participant surveys, along with vendor satisfaction surveys or interviews, to estimate free ridership and uncover potential vendor issues that might impact customer satisfaction or program effectiveness. A statistically representative sample of participants will be selected for the analysis.

The Company intends to follow industry-accepted methodologies for all measurement and verification activities. This evaluation plan is consistent with IPMVP Option C.

Planned[1] Evaluation, Measurement and Verification (EMV) Activities

Residential Program	Program/Measure	Previous Evaluation Report(s)	Q1 2015	Q2 2015	Q3 2015	Q4 2015	Q1 2016	Q2 2016	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q4 2017
Agency Assistance Portal		4/28/2014						M&V	M&V	Report				
Appliance Recycling	Refrigerator, Freezer	Q2 2014 Pending						M&V	M&V	Report				
Energy Efficiency Education Program for Schools	K12 Curriculum								M&V	M&V	Report			
Home Energy House Call	HEHC								M&V	M&V	Report			
My Home Energy Report	MyHER	11/21/2013				M&V	M&V	Report						
Low Income Neighborhoods									M&V	M&V	Report			
Power Manager		8/29/2013, Q3 2014 Pending		M&V	Report			M&V	Report			M&V	Report	
Residential Multi-Family Energy Efficiency	Lighting	4/28/2014										M&V	M&V	Report
Residential Smart Saver®	HVAC	Q3 2014 Pending							M&V	M&V	Report			
	Lighting								M&V	M&V	Report			

Non-Residential Program	Program/Measure	Previous Evaluation Report(s)	Q1 2015	Q2 2015	Q3 2015	Q4 2015	Q1 2016	Q2 2016	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q4 2017
Energy Management and Information Services Pilot						M&V	M&V	Report						
PowerShare		7/31/2013, Q3 2014 Pending		M&V	Report			M&V	Report			M&V	Report	
Smart $aver® Non-Res, Custom [2]				M&V	M&V	Report		M&V	M&V			M&V	M&V	*(2018 Report)*
Smart $aver® Non-Res, Prescriptive [2]	Lighting	Q3 2014 Pending			M&V	M&V			M&V	M&V	Report			
	Food Service		M&V	M&V			M&V	M&V			M&V	M&V	Report	
	HVAC		Report				M&V	M&V			M&V	M&V	Report	
	Information Technology		M&V	M&V			M&V	M&V			M&V	M&V	Report	
	Motors, Pumps, VFDs		M&V	M&V			M&V	M&V			M&V	M&V	Report	
	Process Equipment		Report				M&V	M&V			M&V	M&V	Report	

[1] Future Process and Impact Evaluation Report dates are projections only. Actual report dates will vary depending on program participation to provide a significant sample and the time needed to collect adequate data.
[2] Evaluation work for the following programs will be done in batches, with some data collected each year to contribute to the final analysis: Non-Res Smart $aver Custom and Prescriptive.

LEGEND	
M&V	Data collection (surveys, interviews, onsite visits, billing data) and analysis
Report	Evaluation Report