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DE-OHIO EXHIBIT _____

BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

In The Matter of the Application of Duke Energy Ohio for Approval of an Electric Security Plan	)))	Case No. 08-920-EL-SSO
In the Matter of the Application of Duke Energy Ohio for Approval to Amend Accounting Methods	)))	Case No. 08-921-EL-AAM
In the Matter of the Application of Duke Energy Ohio for Approval of a Certificate of Public Convenience and Necessity to Establish an Unavoidable Capacity Charge	)))))	Case No. 08-922-EL-UNC
In the Matter of the Application of Duke Energy Ohio for Approval to Amend its Tariffs	)))	Case No. 08-923-EL-ATA

DIRECT TESTIMONY OF

RICHARD G. STEVIE, Ph.D.

ON BEHALF OF

DUKE ENERGY OHIO

July 31, 2008

233407

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I. INTRODUCTION AND PURPOSE

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Richard G. Stevie. My business address is 139 E. Fourth Street, Cincinnati, Ohio.

Q: PLEASE STATE YOUR OCCUPATION.

A: I am Managing Director of Customer Market Analytics for Duke Energy Business Services, Inc. (DEBS), a wholly-owned service company subsidiary of Duke Energy Corporation (Duke Energy). DEBS provides various administrative services to Duke Energy Ohio, Inc. ("DE-Ohio") and other Duke Energy affiliates, including Duke Energy Indiana, Inc., Duke Energy Carolinas, LLC and Duke Energy Kentucky, Inc.

Q. PLEASE BRIEFLY DESCRIBE YOUR DUTIES AND RESPONSIBILITIES AS MANAGING DIRECTOR OF THE CUSTOMER MARKET ANALYTICS DEPARTMENT.

A. I have responsibility for several functional areas including load forecasting, load research, demand side management (DSM) analysis, market research, load management analytics, and product development analytics. The Customer Market Analytics Department is responsible for providing functional analytical support to DE-Ohio as well as the other Duke Energy affiliates previously mentioned.

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

A. I received a Bachelor's degree in Economics from Thomas More College in May 1971. In June 1973, I was awarded a Master of Arts degree in Economics from the University of Cincinnati. In August 1977, I received a Ph.D. in Economics from the University of Cincinnati.

My past employers include the Cincinnati Water Works where I was involved in developing a new rate schedule and forecasting revenues, the United States Environmental Protection Agency's Water Supply Research Division where I was involved in the research and development of a water utility simulation model and analysis of the economic impact of new drinking water standards, and the Economic Research Division of the Public Staff of the North Carolina Utilities Commission where I presented testimony in numerous utility rate cases involving natural gas, electric, telephone, and water and sewer utilities on several issues including rate of return, capital structure, and rate design. In addition, I was involved in the Public Staff's research effort and presentation of testimony regarding electric utility load forecasting. This included the development of electric load forecasts for the major electric utilities in North Carolina. I was also involved in research concerning cost curve estimation for electricity generation, rate setting and separation procedures in the telephone industry, and the implications of financial theory for capital structures, bond ratings, and dividend policy. In July 1981, I became the Director of the Economic Research Division of the Public Staff with the responsibility for the development and presentation of all testimony of the Division.

In November 1982, I joined the Load Forecast Section of The Cincinnati Gas & Electric Company (CG&E). My primary responsibility involved directing the development of CG&E's Electric and Gas Load Forecasts. I also participated in the economic evaluation of alternate load management plans and was involved in the development of CG&E's Integrated Resource Plan (IRP), which integrated the load forecast with generation options and demand-side options.

With the reorganization after the merger of CG&E and PSI Resources, Inc. in late 1994, I became Manager of Retail Market Analysis in the Corporate Planning Department of Cinergy Services, Inc. and subsequently General Manager of Market Analysis with responsibility for the load forecasting, load research, DSM impact evaluation, and market research functions of the combined Cinergy company. After the merger of Cinergy Corp. and Duke Energy in 2006, I became the General Manager of the Market Analysis Department with responsibility for several areas, including load forecasting, load research, market research, DSM strategy and analysis, load management development, and business development analytics. Since then, I have become the Managing Director of the Customer Market Analytics Department.

In addition, since 1990 I have chaired the Economic Advisory Committee for the Greater Cincinnati Chamber of Commerce. I have been a part-time faculty member of Thomas More College located in Northern Kentucky and the University of Cincinnati teaching undergraduate courses in economics. In addition, I am an outside adviser to the Applied Economics Research Institute in the Department of Economics at the University of Cincinnati as well as a member of an advisory committee to the Economics Department at Northern Kentucky University.

Q. ARE YOU A MEMBER OF ANY PROFESSIONAL ORGANIZATIONS?

A. Yes. I am a member of the American Economic Association, the National Association of Business Economists, and the Association of Energy Services Professionals.

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

A. My testimony explains: (1) the long term load forecast for DE-Ohio; (2) the evaluation process of DE-Ohio's energy efficiency program portfolio; (3) the DSMore model that DE-Ohio uses to evaluate energy efficiency programs; (4) the assumptions underlying the modeling; (5) the cost-effectiveness tests utilized; and (6) the results of these cost-effectiveness analyses. I then discuss DE-Ohio's proposed method of evaluating, measuring, and verifying the impacts achieved from its energy efficiency programs and a related issue on market transformation. My testimony also provides estimates of the broader economic benefits from the installation of smart metering systems. These are often referred to as the macroeconomic benefits or multiplier effects that arise from investments. My testimony will provide background on the method used to estimate the broader economic benefits and then apply the method to DE-Ohio's proposed investments in smart meter installations. Finally, I will also testify about an electronic bulletin board that will enhance supplier and customer participation in the competitive retail electric service market.

Q. PLEASE DESCRIBE THE ATTACHMENTS TO YOUR TESTIMONY.

A. Attachment RGS-1 provides the load forecast for DE-Ohio. Attachment RGS-2 provides information on the required level of energy efficiency required to meet the mandate set forth in R.C. Section 4928.66(A)(1)(a) (the "EE Mandate"), which is a cumulative 22% energy savings by 2025 based on the total, annual average, and normalized kilowatt-hour sales of the electric distribution company. Attachment RGS-3 provides the multipliers that represent the impacts on final-demand output. Finally, Attachment RGS-4 reflects the four selected multipliers applicable to the installation of a smart meter system which we refer to as SmartGrid.

II. DE-OHIO'S LOAD FORECAST

Q. DID YOU PARTICIPATE IN THE PREPARATION OF DE-OHIO'S LOAD FORECAST?

A. While I did not participate directly in the development of the forecast, the people who report to me did prepare the forecast. I have reviewed the projections and found them to be reasonable and appropriate for preparing the resource plan of DE-Ohio.

Q. HOW IS DUKE ENERGY OHIO'S LOAD FORECAST DEVELOPED?

A. The Load Forecast is developed in three steps: first, a service area economic forecast is obtained; next, an energy forecast is prepared; and finally, using the energy forecast, summer and winter peak demand forecasts are developed.

The forecast methodology is essentially the same as that presented in past Electric Long-Term Forecast Reports (LTFR) filed with PUCO, as well as the one filed as recently as April 15, 2008.

Q. PLEASE DESCRIBE HOW THE SERVICE AREA ECONOMIC FORECAST IS OBTAINED.

The economic forecast for the greater Cincinnati and northern Kentucky region is obtained from Moody's Economy.com, a nationally recognized economic forecasting firm. Based upon its forecast of the national economy, Moody's Economy.com prepares a forecast of key economic concepts specific to the greater Cincinnati area. This forecast provides detailed projections of employment, income, wages, industrial production, inflation, prices, and population. The information serves as input into the energy forecast models.

Q. HOW IS THE ENERGY FORECAST DEVELOPED?

A. The energy forecast projects the service area load required to serve Duke Energy Ohio's retail customer classes - residential, commercial, industrial, government or other public authority ("OPA"), and street lighting. The projected energy requirements for Duke Energy Ohio's retail electric customers are determined through econometric analysis. Econometric models are a means of representing economic behavior through the use of statistical methods, such as regression analysis.

Q. WHAT ARE THE PRIMARY FACTORS AFFECTING ENERGY USAGE?

A. Some of the major factors are the number of residential customers, weather, and economic activity measures such as employment, industrial production, income and price. For the residential sector, the key factors are real per capita income, real energy price, weather, appliance saturations, and appliance efficiencies. For the commercial and governmental sectors, the key factors include the weather, employment, and real energy prices. In the industrial sector, the key factors include industrial production, real energy prices, and the weather. Finally, for the street lighting sector, the key factors include the number of residential customers and the saturation of efficient lighting.

Generally, energy use increases with higher industrial and commercial activity along with the increased saturation of residential appliances, including space heating and cooling equipment. As energy prices increase, energy usage tends to decrease due to customers' conservation activities.

Q. ARE THESE FACTORS RECOGNIZED IN THE EQUATIONS USED TO PROJECT THE ENERGY REQUIREMENTS OF DUKE ENERGY OHIO'S RETAIL CUSTOMERS?

A. Yes, they are. By including these variables in the forecasting process, we can project future energy consumption based on forecasts of these economic and weather factors.

Q. HOW IS THE FORECAST OF ENERGY REQUIREMENTS FOR DUKE ENERGY OHIO'S RETAIL CUSTOMERS PREPARED?

A. The DE-Ohio forecast of energy requirements is included within the overall forecast of energy requirements for the greater Cincinnati and northern Kentucky region. The DE-Ohio sales forecast is developed by allocating percentages of the total regional forecast for each customer group. These percentages provide DE-Ohio forecasts for sales to the residential, commercial, industrial, government or OPA, and street lighting sectors. Forecasts are also prepared for three minor categories: interdepartmental use (Gas Department), Company use (Duke Energy Ohio), and losses. In a similar fashion, the DE-Ohio peak load forecast is developed by allocating a share from the regional total. Historical percentages and judgment are used to develop the allocations of sales and peak demands.

Q. PLEASE EXPLAIN HOW THE PEAK FORECASTS ARE DEVELOPED.

A. DE-Ohio projects both a winter and a summer peak for the total region using econometric equations where peak demand is a function of economic growth, as measured by energy sales, and several key weather factors. As previously discussed, the DE-Ohio peak load forecast is developed by allocating a share from the regional total.

For the summer peak, the weather factors are temperature and humidity around the time of the peak, the morning low temperature, and the high temperature for the day before the peak. For the winter peak, the weather factors are the temperature and wind speed around the time of the peak, and the low temperature from the evening before when the peak occurs in the morning. If the winter peak occurs in the evening, the morning low temperature for the day is used instead of the evening low from the day before.

Q. IS DE-OHIO'S LOAD FORECASTING METHODOLOGY SIMILAR TO THAT EMPLOYED PRIOR TO THE CREATION OF DUKE ENERGY IN 2006?

A. Yes, the econometric forecasting methodology used to create the Load Forecast is basically the same as that used by DE-Ohio prior to the merger. As previously mentioned, the forecast is the same as that filed with the Commission in the 2008 Long-Term Forecast Report.

Q. ARE YOU FAMILIAR WITH OTHER ELECTRIC UTILITIES' LONG-TERM LOAD FORECASTS?

A. Yes, I am.

Q. ARE THE FACTORS THAT ARE USED BY DE-OHIO IN FORMULATING ITS LOAD FORECASTS SIMILAR TO THE FACTORS USED BY OTHER UTILITIES IN THEIR LOAD FORECASTS?

A. Yes. While other utilities might use a variety of load forecasting approaches, such as econometric, end-use, trend analysis, or time series analysis, nearly all of the utilities I am familiar with use the same factors considered by DE-Ohio, to varying degrees. These commonly used factors include: population, weather data, income forecasts, industrial production measures, employment, and price information. In addition, price forecasts for alternate fuels including natural gas and fuel oil are used as well.

Q. DOES DE-OHIO'S ENERGY AND PEAK LOAD FORECAST ALREADY INCLUDE THE IMPACT OF HISTORICAL DEMAND SIDE MANAGEMENT PROGRAMS?

A. Yes, the impacts of the historical demand side management (DSM) programs that have been implemented in the DE-Ohio service area are already reflected in these forecasts. The historical data used to develop the 2008 Load Forecast incorporate the impact of those existing programs.

Q. ARE THERE OTHER PEAK LOAD REDUCTIONS THAT ARE NOT INCLUDED IN DE-OHIO'S LOAD FORECAST?

A. Yes. The peak load reductions attributable to the Power Manager and PowerShare® CallOption program are not reflected in DE-Ohio's load forecast. In addition, the incremental load reductions expected from energy efficiency conservation programs have also not been reflected in the forecast.

Q. ARE THERE ANY ADJUSTMENTS MADE TO THE FORECASTS DERIVED FROM THE ECONOMETRIC MODELS?

A. Yes, the forecast includes a specific adjustment to account for the impacts of the new federal energy efficiency legislation, the Energy Independence and Security Act of 2007 ("EISA"), dealing with lighting standards that goes into effect 2012. Attachment RGS-1 provides the load forecast for DE-Ohio after incorporating the impacts from the EISA legislation.

Q. DOES THE RECENT PASSAGE OF AMENDED SUBSTITUTE SENATE BILL 221 AFFECT DE-OHIO'S LOAD FORECAST?

A. Yes. The energy efficiency mandates of Amended Substitute Senate Bill 221 (SB 221) could have a significant impact on the load forecast. Based on the percentages as stated in the legislation and a three year rolling average of DE-Ohio energy and peak loads, DE-Ohio has estimated the required annual reductions in load that must occur each year. Attachment RGS-2 provides these estimates. The calculations include a credit for energy efficiency and demand response impacts already achieved by DE-Ohio since 1998. It must be emphasized that while these load reductions represent the levels required to meet the conditions in the legislation, they may not be cost-effective or achievable. DE-Ohio has commissioned a market potential study to ascertain the level that can be achieved. Unfortunately, this study is still in process. Results will be incorporated in future filings.

III. DE-OHIO'S ENERGY EFFICIENCY PROGRAMS

Q. HOW WERE DUKE ENERGY OHIO'S ENERGY EFFICIENCY PROGRAMS DEVELOPED?

A: As explained in the testimony of Company Witness Schultz, DE-Ohio has been working to re-design its portfolio of programs in collaboration with interested stakeholders (the "Collaborative") over the past several years. The energy efficiency[1] programs and measures considered by DE-Ohio included (i) programs already offered and tested by DE-Ohio's affiliated utility operating companies, (ii) any new programs suggested by the Collaborative over the years, and (iii) existing programs offered by DE-Ohio. DE-Ohio is in the process of analyzing each potential program. DE-Ohio will apply multiple cost-effectiveness tests to determine a final set of energy efficiency programs. The programs being filed for inclusion in DE-Ohio's Energy Efficiency Plan and Rider DR-SAW are the existing portfolio of programs and the PowerShare program described in DE-Ohio witness Schultz's testimony in this docket.

Q. HAS DE-OHIO COMPLETED A MARKET POTENTIAL STUDY ON ENERGY EFFICIENCY PROGRAM POTENTIAL?

A. As mentioned above, DE-Ohio has not yet completed a market potential study. DE-Ohio has commissioned a market potential study, but the results of this study are not yet available. Once that study is complete, the results will be compared

[1] The term "energy efficiency," as used in this testimony, includes both energy efficiency/conservation and demand response measures.

with the programs previously developed through the Collaborative process and additional program offerings may be filed for approval with the Commission, as appropriate.

Q. WHAT IS THE PURPOSE OF A MARKET POTENTIAL STUDY?

A. The purpose of a market potential study is to provide estimates of the market potential for energy efficiency for DE-Ohio's customers. The study provides estimates of the technical, economic, and market potentials for energy efficiency. The technical potential is defined as the amount of energy efficiency that could be obtained if all energy efficiency measures were adopted without regard to costs. This level of savings represents the upper limit of energy efficiency opportunity.

The economic potential is defined as the total energy savings available at a specified long-term avoided cost of energy. Measures with levelized costs that are lower than the avoided cost of energy are included in estimates of economic potential. The market potential is defined as the total energy savings available from all programs recommended in the market potential study, considering cost-effectiveness and adoption rates.

IV. <u>THE DSMore MODEL</u>

Q. WHAT IS THE DSMore MODEL?

A. DSMore is a financial analysis tool designed to evaluate the costs, benefits, and risks of energy efficiency programs and measures. DSMore estimates the value of an energy efficiency measure at an hourly level across distributions of weather and/or energy costs or prices. By examining energy efficiency performance and cost effectiveness over a wide variety of weather and cost conditions, DE-Ohio is in a better position to measure the risks and benefits of employing energy efficiency measures versus traditional generation capacity additions, and further, to ensure that demand-side resources are compared to supply-side resources on a level playing field.

The analysis of energy efficiency cost-effectiveness has traditionally focused primarily 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).

The test results are also provided for a range of weather conditions, including normal weather, and under various cost and market price conditions. Because DSMore is designed to be able to analyze extreme conditions, one can obtain a distribution of cost-effectiveness outcomes or expectations. Avoided costs for energy efficiency tend to increase with increasing market prices and/or more extreme weather conditions due to the covariance between load and costs/prices. Understanding the manner in which energy efficiency cost effectiveness varies under these conditions allows a more precise valuation of energy efficiency programs 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 cost and rate information of the utility. These inputs enable one to then analyze the cost-effectiveness of the measure or program.

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

A. 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.

Q. WHAT UTILITY INFORMATION IS INPUT INTO THE MODEL?

A. 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;
- Avoided costs of energy, capacity, transmission & distribution; and
- Cost escalators.

Q. WHAT PROCESS DOES DE-OHIO FOLLOW TO EVALUATE THE PROGRAMS OR MEASURES?

A. To begin, an analyst or program manager develops the inputs for the program or measure using information on expected program costs, load impacts, customer incentives necessary to drive customers' participation, free rider expectations, and expected number of participants. This information is used in initial runs of the model to determine cost-effectiveness and whether adjustments need to be made to a program or measure in order for it to pass the participant test, the first critical test.

Then, 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.

This is the typical process DE-Ohio employs to evaluate programs and measures.

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

A. Program managers and analysts develop the 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, as well as from external experts in the industry. Over time, as impact and process evaluations are performed on Ohio program results, information and input specifically related to Ohio customers will begin to emerge and be used within future cost effectiveness analyses.

Q. WHAT IS THE SOURCE FOR THE UTILITY INPUTS TO THE MODEL?

A. The discount rate is obtained from DE-Ohio's most recent cost of capital analysis, losses are based upon past experience of DE-Ohio, rate structures are based on the current Company's tariffs, avoided transmission and distribution costs are obtained from DE-Ohio's most recent analysis of incremental transmission and distribution capital spending, relative to load growth forecasts, and avoided energy and capacity costs are based upon market prices, which are the subject of Witness Judah Rose in this proceeding. In the long-run, avoided capacity costs should trend toward the cost of new capacity. Estimates of the long-term capacity costs are the subject of a recent request for proposal (RFP) issued by DE-Ohio which is included in this application at part C. At this time, the results of the RFP are not available. DE-Ohio intends to use that information, once available, in conjunction with the market estimates from its consultant, ICF, to develop a long-run projected avoided capacity cost.

Program specific inputs include items such as program costs, measure life, free ridership, incremental customer costs, energy savings, demand savings, and marketing or distribution costs.

The ultimate test of energy efficiency cost-effectiveness lies in integrated resource plan (IRP) model run comparisons with and without the energy efficiency programs inserted as resource options. An up-front energy efficiency screening process is still necessary, though, because IRP production costing models are unable to accommodate the hundreds of analyses required for measure-specific energy efficiency resource options within its optimization modeling framework. So, pre-screening and bundling of energy efficiency options that are found to be cost-effective is a more efficient and effective approach.

For the generation analysis in this filing, DE-Ohio has assumed the energy efficiency mandate level of energy savings within the IRP. Comparing the energy costs from an IRP with the energy efficiency impacts to one without the energy efficiency impacts provides the best overall estimate of the avoided energy costs that also embodies any base load and intermediate avoided capacity costs not captured in the peaker capacity cost. This approach and analysis will be conducted annually, to ensure that the estimation and valuation of avoided energy costs is consistent with DE-Ohio's alternative supply side resources, and with forward expectations of avoided energy costs.

V. COST-EFFECTIVENESS TESTS

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

A. Once programs and measures have been analyzed using DSMore, 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. DE-Ohio also uses the Utility Cost Test ("UCT"), the Total Resource Cost Test ("TRC"), and the Ratepayer Impact Test ("RIM") Test for screening 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 capital cost as well as increased annual operating cost, if applicable.

- The UCT compares utility benefits (avoided costs) to incurred utility costs to implement the program, 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.

- 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.

Q. WHAT WERE THE RESULTS OF THE PROGRAM ANALYSIS?

A. The test results for the programs listed in DE-Ohio witness Schultz's testimony were previously provided to the Commission in DE-Ohio's 2006 Application for Recovery of Costs, Lost Margin, and Performance Incentive Associated with the Implementation of Electric Residential Demand Side Management Programs in Case No. 06-91-EL-UNC. Test results for DE-Ohio's new portfolio of programs are not available at this time, but will be completed after the information on avoided capacity costs has been fully developed.

VI. <u>MEASUREMENT AND VERIFICATION</u>

Q. WHY IS EVALUATION, MEASUREMENT AND VERFICATION A CRITICAL COMPONENT OF DE-OHIO ENERGY EFFICIENCY PLAN?

A. DE-Ohio believes that successful, reliable and cost-effective energy efficiency programs require valid evaluation, measurement and verification (EM&V) activities to: (1) assure that measures are installed and tracked properly; (2)

verify or revise energy impacts; (3) monitor and ensure customer satisfaction; and (4) establish independent third-party evaluations and reviews to confirm energy impacts and to improve program delivery, efficiency and effectiveness.

DE-Ohio has historically conducted such studies on its programs and will continue to do so for any new programs.

Q. WHAT IS MEASUREMENT AND VERIFICATION?

A. Measurement and verification (M&V) of energy efficiency programs and measures is an umbrella term (sometimes referred to as EM&V). There are five types of evaluation, in general. First, there is cost effectiveness evaluation, which I discussed above. Second, impact evaluation strives to estimate the actual energy and demand load reductions realized from a program. Third, measurement 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, verification 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 can be realized. Finally, process evaluation refers to a set of review and auditing methods that ascertain program effectiveness, efficiency, customer satisfaction, vendor satisfaction and other factors that contribute to program success.

Q. HOW DOES DE-OHIO PLAN TO MEASURE, MONITOR AND VERIFY THE PROGRAMS?

A. In general, the following approach will be used for monitoring and verification of programs:

Paper and Electronic Verification

- Paper or electronic verification will be completed on all applications for energy efficiency incentives by customers. 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. Customers and/or contractors will be contacted for clarification and completion of the application if they fail to provide necessary information. Incentives will only be processed once verification is complete and information is entered into the electronic tracking systems. Verification information and all customer applications for incentives will be maintained by DE-Ohio.

Field Verification and Monitoring

- In most cases, will occur on customer premises using randomly selected samples of approximately 5% of installations. On-site visits will verify the installation of the claimed equipment in the proper application, confirm appropriate contractor or vendor processes and performance, and bring to light potential discrepancies or process improvements for the programs. Sample size will be larger for very large projects with significant incentives or energy impacts at risk. The size of such samples will be commensurate with the increased load savings as determined by DE-Ohio. 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, and potentially uncover latent problems or issues with the measure/installation.

System Performance Tests

- System performance tests 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.

If a problem is found with the installations or operations, the contractor and customer will be notified for correction. In addition, subsequent work or projects performed by that contractor will be monitored until DE-Ohio 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 DE-Ohio, that contractor, at DE-Ohio's discretion, may be eliminated from the program.

After the final set of programs has been fully developed, DE-Ohio will provide 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, 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.

Q. WHAT IS THE ESTIMATED COST AND TIME FRAME FOR THE EVALUATION, MONITORING AND VERIFICATION?

A. DE-Ohio estimates that 5% of total program costs will be required to adequately and efficiently perform evaluations, monitoring and verification. The industry standard for evaluation costs is typically 3% to 5% of total program spending. However, DE-Ohio is prepared to increase the level of spending as necessary to obtain reliable estimates of the load impacts from the programs.

Q. HOW WILL THE EVALUATION, MEASUREMENT, AND VERIFICATION RESULTS BE UTILIZED IN DE-OHIO'S RECONCILIATION AND TRUE-UP PROCESS FOR THE PROPOSED RIDER?

A. The EM&V process produces results on two main concepts: actual customer participation and actual load impacts. The reason these are important to the reconciliation and true-up process is that the original evaluation of program cost-effectiveness utilized projected numbers for participants in the programs and estimates of the load impacts. The EM&V process provides actual values to develop the estimates of the true-up.

It would be helpful if the timing on availability of the actual participation and load impacts coincided. Unfortunately, that is not the case. Information on actual participation and verification of installments are available more quickly because both can be collected as the program is rolling out. However, information on load impacts is more complex and tends to require rigorous impact evaluation studies, statistical billing analyses of pre- and post-usages, participant and non-participant surveys, and related activities that take time and care to complete in order to produce unbiased estimates of the load impacts. To do this, DE-Ohio must first wait several months to see how many participants there are in a particular measure in order to establish the sample size needed. Second, DE-Ohio must wait to collect post-installation load information, because a measure has to be installed for a reasonable period of time before DE-Ohio can estimate the level of load impact. During this process additional information will be collected on free-riders and free-drivers to adjust the level of the load impacts, where necessary.

The timing of the availability of participant and load impact results has implications for the reconciliation and true-up process. I expect that for the first true-up process, DE-Ohio will have actual participant information and possibly some load impact results, most likely for demand response programs (unless the timing of the true-up filing is during or immediately after the summer period). Load impact results for all programs will not be available until the completion of the second year of program implementation. At that point, a true-up of load impacts can be undertaken from the beginning of the program through the second year.

In general, DE-Ohio anticipates that the participant results will be reconciled each year and load impact results every other year. However, updates to the load impact results would only be reconciled back to the previous impact evaluation, not to the beginning of the program.

In working through the EM&V process, it is important to note that DE-Ohio has a strong incentive to have these studies completed in as timely a manner as possible. Besides being at risk for results under the save-a-watt approach, DE-Ohio needs to know quickly if these programs work in order to make sure the long-term generation plan is not affected. I will add that the complexity of the EM&V process is not the result of the structure of any specific regulatory recovery mechanism; rather, it is the nature of energy efficiency programs in general. Reliable measurement and verification of energy efficiency impacts requires time. To the extent that the Commission prefers stability and simplicity in the estimation and implementation of the rider for energy efficiency cost recovery, it is possible to stipulate the load impacts for the period of one year, or until such time as a complete impact evaluation has been conducted, at which time any required change in the impacts can be applied going forward, but not affect a retrospective true-up.

VII. MARKET TRANSFORMATION

Q. PLEASE DESCRIBE HOW THE EM&V ANALYSIS WILL REFLECT CHANGES IN THE MARKET AND PARTICIPANT BEHAVIOR OVER TIME.

A. Evaluation, measurement and verification will be conducted over time to verify the magnitude and persistence of the energy efficiency impacts achieved from both program participants, as well as from non-participants. Over time, DE-Ohio's energy efficiency programs can affect the nature of the energy efficiency market such that customer behavior, vendor behavior, and even manufacturer behavior is altered. Where significant momentum is generated with respect to the adoption of increased energy efficiency, it is possible to transform markets such that customers begin to demand more energy efficiency from their vendors, equipment providers, and manufacturers. This increased demand for energy efficiency can occur from "word of mouth" interactions as well as customer exposure to DE-Ohio's advertising and promotion of energy efficiency or the result of distribution channel partnerships between DE-Ohio and networked trade allies or manufacturers.

Importantly, partnership arrangements and distribution networks that DE-Ohio structures to deliver more efficient equipment have an impact both on customers that are aware of DE-Ohio's efforts as well as those that are not. In either case, energy efficiency is likely to be adopted, but the more that DE-Ohio is able to move these markets toward more efficient choices for customers, the more cost effective is DE-Ohio's realization of efficiency gains. In other words, factors such as these can drive more customers to implement energy efficiency measures without actually receiving the DE-Ohio's incentives offered. This results in a transformation of the market that would not have occurred without the actions or interventions in the market by DE-Ohio. This market mechanism is often referred to as free driver behaviors, or sometimes labeled as spillover effects, in contrast to the more familiar concept of free ridership.

Free riders are those customers who receive an incentive but would have purchased the energy efficiency equipment even without the incentive, whereas free drivers are those customers who purchase energy efficient equipment without an incentive as a result of market transformation. Both market phenomena matter in the prudent pursuit of demand-side resources and integrated resource planning. As such, DE-Ohio intends to measure both free rider and free driver impacts to more accurately gauge the overall cost-effectiveness of its energy efficiency efforts. For DE-Ohio's cost-effectiveness analyses discussed here, DE-Ohio intends to include the impacts of free riders, but not free drivers.

Q. HOW WILL THESE IMPACTS BE IDENTIFIED?

A. These market phenomena will be measured through the EM&V process. Free ridership will be measured through customer surveys, statistical billing analysis, pre- and post- measurement processes and related studies among program participants, whereas free driver impacts will be measured among non-participant customer populations and/or through analysis of manufacturing trends and vendor surveys, or other types of analyses that are able to discern the influence and contribution of these market effects on the adoption of energy efficiency measures and behaviors.

VIII. METHOD FOR ESTIMATING ECONOMIC BENEFITS

Q. WHAT METHOD IS USED TO ESTIMATE THE ECONOMIC BENFITS FROM INVESTMENTS?

A. In general, investments made for a project have direct and indirect / induced types of impact. The direct impacts are measured by the installation phase of the project as well as on-going operational expenditures. The installation phase represents the capital equipment and the labor dollars to complete the construction phase of the project. Beyond the initial completion of the construction phase, there is the direct spending from on-going operations.

The indirect economic impacts arise in the form of increased income generated due to the increase in economic activity from the direct spending. In other words, the direct spending creates a "ripple" effect or induced impact above and beyond the direct spending. The total economic impact will be some multiple of the direct spending.

One way to look at this is if a business spends an additional dollar on a project, that dollar is spent, in part, again by the person or business that received it. This process repeats itself again and again until the cycle of spending is exhausted. The total economic impact can sometimes be many multiples of the initial dollars spent.

The general method for conducting this analysis involves the use of Input-Output multipliers to estimate the total economic impact of increases in final demand for goods and services. Input-Output analysis was developed by Wassily Leontief in the late 1930's and early 1940's as a way to model the interrelationships among the components of the economy. Through an Input-Output matrix, one can gain an understanding of the impact of a change in the level of activity in one industry on other supporting industries. Input-Output model coefficients provide the estimates of the impacts from these interrelationships. The approach has been used since the 1970's by the Bureau of Economic Analysis, Department of Commerce, to provide a structure for conducting estimates of the economic benefits from projects.

Q. HOW IS THE INPUT-OUTPUT METHOD APPLIED TO ESTIMATE ECONOMIC IMPACTS?

A. The Bureau of Economic Analysis (BEA) has developed a set of regional multipliers known as RIMS II (Regional Input-Output Modeling System). The BEA has created multipliers for the impact on final-demand output, final-demand earnings, final-demand value-added, direct-effect earnings, and direct-effect employment. The estimates of multipliers can be obtained for the nation as a whole as well as for specific regions. The BEA has developed a set of multipliers for the Greater Cincinnati region. DE-Ohio has obtained the set of multipliers in order to estimate the broader economic impacts from the smart meter project. Attachment RGS-3 provides the multipliers that represent the impacts on Final-demand Output. The values represent the total dollar change in output that occurs across all industries for each dollar of output delivered to final demand by the row industry. These multipliers can be used with the projected level of direct spending to estimate the total economic impact.

From the multipliers in Attachment RGS-3, I selected four that are applicable to the installation of a smart meter system. These are Utilities, Computer and Electronic Product Manufacturing, Electrical Equipment and Appliance Manufacturing, and Information and Data Processing Services. The four selected multipliers are provided on Attachment RGS-4 along with the projected amounts of direct investments assigned to each of the four categories. The associated levels of on-going spending are also provided.

The present value total direct investment of the project is [redacted]. Using the multipliers, this translates to a total economic impact of [redacted] million or an incremental benefit of [redacted]. For on-going operations, the present value total direct spending of the project is [redacted]. Using the multipliers, this translates to a total economic impact of [redacted] or an incremental benefit of $ 141 million.

From a total perspective, the present value total expenditure of the project is [redacted]. Using the multipliers, this translates to a total economic impact of [redacted] or an incremental benefit of [redacted].

Q. HOW REALISTIC ARE THESE VALUES OF INCREMENTAL BENEFIT?

A. In general, this translates into a multiplier that is close to 2 times. For manufacturing projects, I usually expect a higher multiplier. The level found here is not unexpected. However, if one wanted to take a more conservative view, one could examine the incremental value estimated using the lowest non-residential multiplier which is approximately 1.36. Using that multiplier, I find a minimum estimate of incremental economic benefit of [redacted] (0.36 times [redacted]).

Q. PLEASE SUMMARIZE THE FINDINGS FROM YOUR ANALYSIS?

A. From the application of the Input-Output multipliers to the projected spending on the smart meter system, I estimate that the incremental economic benefits from the project are [redacted]. I also find that under a very conservative approach, the value is [redacted].

IX. <u>ELECTRONIC BULLETIN BOARD</u>

Q. PLEASE EXPLAIN WHY DE-OHIO IS PROPOSING AN ELECTRONIC BULLETIN BOARD IN CONNECTION WITH ITS APPLICATION FOR AN ELECTRIC SECURITY PLAN.

A. DE-Ohio seeks to provide competitive options and alternatives to its customers, such that customers can better manage their energy costs. Toward that end, DE-Ohio believes it is important to provide open access and information to pricing alternatives and energy cost information via an online electronic bulletin board (EBB). The EBB will be designed to provide competitive energy pricing alternatives to customers by publishing market based energy prices for customers. The EBB website will also be made available, at a marketer's discretion, for the posting of competitive marketer prices, should a marketer opt to make their competitive prices available to customers, as well. The online open access environment is intended to provide more information and choices to customers, to better help them manage their energy costs.

Q. PLEASE IDENTIFY THE VARIOUS CUSTOMER GROUPS THAT MAY PARTICIPATE IN THE ELECTRONIC BULLETIN BOARD PROCESS.

A. Customer groups will be established based on load profile analysis, where customers with similar monthly and hourly usage patterns will be grouped together. Alternatively, individual customers larger than 100KW, with interval hourly meters, may request in writing that their accounts be specified individually such that competitive marketer offers can be specifically made available for their inspection, and possible selection, thereby increasing the relevancy of the EBB to as many customers as possible, and insuring that competitive markets are nurtured and supported through this transition period.

Q. ARE THERE ANY LIMITATIONS RELATIVE TO THE ELECTRONIC BULLETIN BOARD?

A. Yes.

Q. PLEASE EXPLAIN THOSE LIMITATIONS.

A. A customer that switches to the EBB price must stay at the EBB price or take service from a competitive retail electric service provider.

Q. WHAT IS THE RATIONALE FOR THIS LIMITATION?

A. DE-Ohio faces significant risk in meeting its obligation to serve where large groups of customers migrate to and from provider of last resort (POLR) service. Generally, energy markets are volatile; energy prices can rise and fall quickly. Unchecked, the movement of customers back and forth from standard ESP service to market based pricing, and back again, can potentially cause the need for increased reserve margins and costs to cover the risks posed by significant customer migrations to and from POLR service. Alternatively, this single, simple restriction placed on the flow back and forth to and from ESP and competitive markets (i) minimizes the potential increased reserve margin costs in POLR type service, (ii) allows customers the choice to remain with the ESP service, or participate in open markets at any time, and (iii) only places one restriction on customers that they not return to ESP, once they opt to participate in competitive markets.

Q: WERE THE ATTACHMENTS TO YOUR TESTIMONY PREPARED BY YOU OR AT YOUR DIRECTION?

A: Yes.

X. CONCLUSION

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.

Duke Energy Ohio - Forecast
No Legislative Impacts

	Residential	Commercial	Industrial	Other Public Authority	Street Light	Company Use	Inter Department	Total Deliveries	Losses	Sendout	Summer Peak
2008	7,433,641	6,325,748	5,737,161	1,559,954	104,387	20,736	7,615	21,189,241	1,506,887	22,696,128	4,446
2009	7,539,132	6,407,887	5,731,627	1,565,881	104,403	20,946	7,692	21,377,568	1,520,270	22,897,838	4,489
2010	7,652,536	6,500,776	5,785,450	1,578,219	104,504	21,154	7,770	21,650,409	1,539,662	23,190,071	4,548
2011	7,813,496	6,614,964	5,890,396	1,605,561	104,679	21,366	7,849	22,058,311	1,568,632	23,626,943	4,637
2012	7,762,236	6,688,762	6,004,816	1,439,244	104,858	21,580	7,926	22,029,422	1,566,594	23,596,016	4,674
2013	7,663,616	6,750,160	6,094,089	1,252,141	105,022	21,795	8,002	21,894,825	1,557,078	23,451,903	4,687
2014	7,553,777	6,807,021	6,164,575	1,061,868	105,238	22,014	8,084	21,722,577	1,544,881	23,267,458	4,694
2015	7,585,379	6,903,260	6,223,799	1,027,672	105,465	22,233	8,166	21,875,974	1,555,844	23,431,818	4,737
2016	7,612,253	6,999,439	6,284,714	990,930	105,702	22,454	8,247	22,023,739	1,566,411	23,590,150	4,797
2017	7,626,388	7,095,710	6,346,085	953,150	105,906	22,679	8,331	22,158,249	1,576,051	23,734,300	4,817
2018	7,638,818	7,191,616	6,407,945	914,914	106,117	22,904	8,412	22,290,726	1,585,549	23,876,275	4,855
2019	7,648,083	7,286,519	6,469,481	876,118	106,361	23,135	8,499	22,418,196	1,594,691	24,012,887	4,892
2020	7,650,584	7,381,713	6,529,617	838,439	106,623	23,365	8,582	22,536,923	1,603,219	24,140,142	4,928
2021	7,685,781	7,482,769	6,591,584	830,400	106,928	23,599	8,669	22,729,730	1,617,017	24,346,747	4,994
2022	7,717,896	7,582,588	6,658,042	825,030	107,267	23,836	8,755	22,923,414	1,630,882	24,554,296	5,036
2023	7,747,255	7,681,058	6,724,776	820,087	107,641	24,074	8,842	23,113,733	1,644,512	24,758,245	5,053
2024	7,775,080	7,777,763	6,792,939	815,035	108,069	24,316	8,928	23,302,130	1,658,002	24,960,132	5,095
2025	7,801,661	7,871,378	6,861,149	810,401	108,519	24,558	9,019	23,486,685	1,671,214	25,157,899	5,135
2026	7,826,950	7,960,128	6,926,129	805,443	109,006	24,802	9,110	23,663,568	1,683,881	25,347,449	5,173
2027	7,851,938	8,045,091	6,997,063	800,576	109,535	25,053	9,199	23,838,455	1,696,399	25,534,854	5,236
2028	7,877,286	8,131,013	7,066,683	795,936	110,067	25,307	9,289	24,015,581	1,709,051	25,724,632	5,250

Duke Energy Ohio - Energy Efficiency Forecast
Impacts Required to Meet the Requirements of House Bill 221

	Energy Percent Reductions Required		Energy Calculated Reductions Required*		Energy Accumulated Reduction	Energy Calculated Reductions Net of Credit	
	Incremental	Cumulative	Incremental	Cumulative	Credit - 1998 thru 2008	Incremental	Cumulative
2009	0.30%	0.30%	68,127	68,127	115,642	-	-
2010	0.50%	0.80%	113,396	181,523		65,881	65,881
2011	0.70%	1.50%	159,371	340,894		159,371	225,252
2012	0.80%	2.30%	183,248	524,142		183,249	408,501
2013	0.90%	3.20%	208,271	732,413		208,271	616,772
2014	1.00%	4.20%	233,010	965,423		233,010	849,782
2015	1.00%	5.20%	233,321	1,198,744		233,322	1,083,104
2016	1.00%	6.20%	231,965	1,430,709		231,964	1,315,068
2017	1.00%	7.20%	230,587	1,661,296		230,588	1,545,656
2018	1.00%	8.20%	229,629	1,890,925		229,628	1,775,284
2019	2.00%	10.20%	458,515	2,349,440		458,515	2,233,799
2020	2.00%	12.20%	457,656	2,807,096		457,655	2,691,454
2021	2.00%	14.20%	455,137	3,262,233		455,138	3,146,592
2022	2.00%	16.20%	450,988	3,713,221		450,988	3,597,580
2023	2.00%	18.20%	445,527	4,158,748		445,527	4,043,107
2024	2.00%	20.20%	440,354	4,599,102		440,354	4,483,461
2025	2.00%	22.20%	435,533	5,034,635		435,533	4,918,994

* Uses three year moving average of Sendout

	Peak Percent Reductions Required		Peak Calculated Reductions Required*		Peak Accumulated Reduction	Peak Calculated Reductions Net of Credit	
	Incremental	Cumulative	Incremental	Cumulative	Credit - 1998 thru 2008	Incremental	Cumulative
2009	1.00%	1.00%	45	-	48	-	-
2010	0.75%	1.75%	78	30		30	30
2011	0.75%	2.50%	111	63		33	63
2012	0.75%	3.25%	145	97		34	97
2013	0.75%	4.00%	179	131		34	131
2014	0.75%	4.75%	214	166		35	166
2015	0.75%	5.50%	248	200		34	200
2016	0.75%	6.25%	282	234		34	234
2017	0.75%	7.00%	316	268		34	268
2018	0.75%	7.75%	350	302		34	302
2019	0.75%	8.50%	384	336		34	336
2020	0.75%	9.25%	418	370		34	370
2021	0.75%	10.00%	453	405		35	405
2022	0.75%	10.75%	487	439		34	439
2023	0.75%	11.50%	521	473		34	473
2024	0.75%	12.25%	556	508		35	508
2025	0.75%	13.00%	590	542		34	542

* Uses three year moving average of Peak

Bureau of Economic Analysis RIMS II Multipliers
Cincinnati Metropolitan Statistical Area

Attachment RGS 3

Industry Group	Final-demand Output (dollars)
1. Crop and animal production	1.7424
2. Forestry, fishing, and related activities	1.6211
3. Oil and gas extraction	1.0000
4. Mining, except oil and gas	1.8457
5. Support activities for mining	2.0167
6. Utilities*	1.3618
7. Construction	2.1636
8. Wood product manufacturing	1.8244
9. Nonmetallic mineral product manufacturing	2.0004
10. Primary metal manufacturing	1.8650
11. Fabricated metal product manufacturing	2.0455
12. Machinery manufacturing	2.1372
13. Computer and electronic product manufacturing	2.1250
14. Electrical equipment and appliance manufacturing	1.9888
15. Motor vehicle, body, trailer, and parts manufacturing	2.3026
16. Other transportation equipment manufacturing	1.8558
17. Furniture and related product manufacturing	2.0978
18. Miscellaneous manufacturing	2.1575
19. Food, beverage, and tobacco product manufacturing	2.1870
20. Textile and textile product mills	1.9107
21. Apparel, leather, and allied product manufacturing	2.0319
22. Paper manufacturing	2.1961
23. Printing and related support activities	2.2681
24. Petroleum and coal products manufacturing	1.7621
25. Chemical manufacturing	1.9155
26. Plastics and rubber products manufacturing	2.1769
27. Wholesale trade	1.8930
28. Retail trade	1.9925
29. Air transportation	1.8299
30. Rail transportation	1.8676
31. Water transportation	2.0857
32. Truck transportation	2.1608
33. Transit and ground passenger transportation*	2.1503
34. Pipeline transportation	1.6567
35. Other transportation and support activities*	1.9219
36. Warehousing and storage	1.9605
37. Publishing including software	2.0462
38. Motion picture and sound recording industries	1.8378
39. Broadcasting and telecommunications	1.9421
40. Information and data processing services	2.0121
41. Federal Reserve banks, credit intermediation and related servic	1.7872
42. Securities, commodity contracts, investments	2.1890
43. Insurance carriers and related activities	2.1716
44. Funds, trusts, and other financial vehicles	2.2393
45. Real estate	1.4594
46. Rental and leasing services and lessors of intangible assets	2.1571
47. Professional, scientific, and technical services	2.0770

48. Management of companies and enterprises	2.0958
49. Administrative and support services	2.0726
50. Waste management and remediation services	2.0315
51. Educational services	2.1465
52. Ambulatory health care services	2.0891
53. Hospitals and nursing and residential care facilities	2.1764
54. Social assistance	2.1150
55. Performing arts, museums, and related activities	2.0897
56. Amusements, gambling, and recreation	1.9719
57. Accommodation	1.9339
58. Food services and drinking places	2.0710
59. Other services*	2.1112
60. Households	1.3257

Economic Impact of Smart Meter Project

Impact of Direct Investment

	Input-Output Multipliers Final-demand Output (dollars)	Components	Project Cost 20 Year Present Value	Total Economic Value	Incremental Value
Computer and electronic product manufacturing	2.1250	Hardware	$ 9,043,988	$ 19,218,475	$ 10,174,487
Electrical equipment and appliance manufacturin	1.9888	Equipment (1)	$ 471,500,339	$ 937,719,875	$ 466,219,535
Information and data processing services	2.0121	Software and IT labor	$ 26,333,978	$ 52,986,597	$ 26,652,619
Total			$ 506,878,305	$ 1,009,924,946	$ 503,046,641

Impact of Operational Direct Spending

	Input-Output Multipliers Final-demand Output (dollars)	Components	Project Cost 20 Year Present Value	Total Economic Value	Incremental Value
Utilities	1.3618	Power usage	$ 6,802,523	$ 9,263,676	$ 2,461,153
Computer and electronic product manufacturing	2.1250	Hardware and support	$ 13,408,335	$ 28,492,711	$ 15,084,377
Electrical equipment and appliance manufacturin	1.9888	Service contracts and maintenance	$ 33,359,642	$ 66,345,656	$ 32,986,014
Information and data processing services	2.0121	Software maintenance	$ 93,219,645	$ 187,567,248	$ 94,347,603
			$ 146,790,145	$ 291,669,292	$ 144,879,146

Total Project Costs, Economic Value and Incremental Value

	Project Cost 20 Year Present Value	Total Economic Value	Incremental Value
Capital	$ 506,878,305	$ 1,009,924,946	$ 503,046,641
Operation and Maintenance	$ 146,790,145	$ 291,669,292	$ 144,879,146
Total	$ 653,668,450	$ 1,301,594,238	$ 647,925,788

(1) Meters, communication equipment, distribution automation equipment, and installation