[ELPC and OEC Exhibit 1]

BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of	**)**		
Ohio Edison Company, The Cleveland	**)**		
Electric Illuminating Company, and the	**)**	**Case Nos.**	**12-2190-EL-POR**
Toledo Edison Company for Approval of	**)**		**12-2191-EL-POR**
Their Energy Efficiency and Peak	**)**		**12-2192-EL-POR**
Demand Reduction Program Portfolio	**)**		
Plans for 2013 through 2015	**)**		

DIRECT TESTIMONY OF

GEOFFREY C. CRANDALL

ON BEHALF OF
THE OHIO ENVIRONMENTAL COUNCIL AND
THE ENVIRONMENTAL LAW AND POLICY CENTER

October 5, 2012

INTRODUCTION AND BACKGROUND

Q. What is your name and business address?

A. My name is Geoffrey C. Crandall. My business address is MSB Energy Associates, Inc., 1800 Parmenter Street Suite 204, Middleton, Wisconsin 53562.

Q. On whose behalf are you testifying today?

A. I am testifying on behalf of the Ohio Environmental Council and the Environmental Law and Policy Center.

Q. Please describe your background and experience in the field of gas and electric utility regulation.

A. I am a principal and the Vice President of MSB Energy Associates, Inc. I have over 35 years of experience in utility regulatory issues, including energy efficiency, conservation and load management resources program design and implementation, resource planning, restructuring, mergers, fuel and purchase power, gas planning and cost recovery, and related issues. I have provided expert testimony before more than a dozen public utility regulatory bodies throughout the United States. I have provided expert testimony before the United States Congress on several occasions.

My experience includes over 15 years of service on the Staff of the Michigan Public Service Commission (MPSC). In my tenure at the MPSC, I served as an analyst in the Electric Division (Rates and Tariff section) involving rate cases as well as fuel and purchase power cases. I also served as the Technical Assistant to the Chief of Staff and Supervisor of the Energy Conservation Section involving residential and commercial energy efficiency programs. I also served as the Division Director of the Industrial,

Commercial and Institutional Division. In that capacity, I was Director of the Division and had responsibility for energy efficiency and conservation program design, funding and implementation of Michigan utility and DOE-funded programs and initiatives involving industrial, commercial and institutional gas and electric customers throughout Michigan.

In 1990, I was hired by MSB Energy Associates, Inc. and have served clients throughout the United States on numerous projects related to energy efficiency and load management program development, system planning, fuel and purchase power, gas cost recovery assessments, electric restructuring, customer impact analyses and other issues. My curriculum vitae is attached as Exhibit GCC-1.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to address the reasonableness of the proposed FirstEnergy Corp's (FirstEnergy) Energy Efficiency and Peak Demand Reduction Program Portfolio Plan (EE&PDR) for 2013 through 2015 that was submitted jointly by Ohio Edison Company, The Cleveland Electric Illuminating Company and the Toledo Edison Company on July 31, 2012 to the Public Utilities Commission of Ohio (Commission or PUCO). I will refer to these three companies collectively as "FirstEnergy." In my testimony I describe my assessment of the proposed EE&PDR plan overall and make suggestions regarding modifications and improvements.

Q. Please summarize your conclusions.

A. The Commission should require the Companies to modify their proposed programs and to eliminate several marginal measures from the programs, including EISA compliant incandescent bulbs and standard T-8 bulbs and fixtures.

1. The Commission should require the Companies to modify their non-commercial and industrial energy efficiency incentive program to address the concerns of the trade allies, increase LED incentives and reduce processing time.
2. The Commission should not authorize the proposed conservation voltage reduction pilot program.
3. The Commission should direct the Companies to significantly improve the collaborative working group process.
4. The Commission should direct the Companies to develop and offer a data center energy efficiency program.
5. The Companies should revise their existing street lighting, parking lot and area lighting tariffs to include LED lighting technologies.

OVERALL ASSESSMENT OF THE PROPOSED EE & PDR PLAN

Q. What materials have you reviewed to develop your opinions on the proposed EE&PDR Plans?

A. I have reviewed the application, testimony, exhibits, and responses to discovery questions in conjunction with this filing. I have also reviewed the applicable provisions from the Ohio Revised Code and Ohio Administrative Code.

Q. Could you please describe FirstEnergy's plan for meeting the requirements of Ohio Revised Code Section 4928.66.

A. The Companies' have proposed EE&PDR plans that are projected to have benefits in excess of costs (using the TRC test). The plan consists of approximately fifteen programs. The proposed Plans include programs for customers in the residential, low-income residential, small commercial, small industrial, large commercial, large industrial and governmental customer sectors. Proposed implementation strategies address major energy consuming devices in homes, businesses, government and industry. The proposed programs include a wide array of energy efficiency and demand response technologies, including the removal and recycling of underutilized appliances and room air conditioners, as well as encouraging more efficient appliances, lighting, heating and cooling equipment.

Q. What is your overall opinion of the EE&PDR plan submitted?

A. I believe the proposed programs have improved compared to the original proposed plans. However, I believe there is still room for improvement, and these plans need to be modified and improved. My concerns and recommendations are as follows:

NEED FOR ENERGY AWARENESS AND CONSUMER EDUCATIONAL EMPHASIS

Q. Do you have suggestions and comments regarding the proposed consumer awareness and energy use education efforts described in the proposed plans?

A. Yes. There is a need to embrace a continual, long-term effort to build customer awareness of energy efficiency. The proposed plans identify various marketing strategies and approaches that will be used for individual programs. However, what is missing is

an overarching customer and energy education awareness element of the plan. The Companies need to strive to make customers aware of efficient heating, cooling, and lighting alternatives as well as the implications of selecting various appliances, entertainment systems, TV's and plug loads.

Q. Do the plans as submitted fail to address these consumer awareness and customer education issues?

A. The Companies' proposed plans include program-specific marketing ideas and strategies. A continual and concerted effort should be in place to heighten consumer awareness through the use of public service announcements, bill inserts on energy awareness overall, Company speaker bureaus, website resources to inform customers, and portable energy displays, kiosks and other strategies to be utilized at public events. An important part of the overall energy efficiency program implementation strategy is for the Companies to regularly and consistently disseminate information to inform customers of the actions they can take as well as the services and incentives that are available to reduce the wasteful use of energy.

DATA CENTER ENERGY EFFICIENCY PROGRAM

Q. Based on your review of FirstEnergy's proposed plans do you believe any important programs or technologies were omitted?

A. Yes. The Companies did not propose a comprehensive Data Center energy efficiency program.

Q. What is the basis for your concerns about FirstEnergy's not including a data center energy efficiency program?

A. As a result of significant societal changes in how information is transferred and exchanged in this country (i.e. less reliance on paper-based information), energy usage by data centers has increased dramatically. In response to this increase the 109th Congress passed Public Law 109-431. (GCC- 2). Congress required that the Environmental Protection Agency conduct a study of energy consumption of computer data centers owned by both the government and private enterprise. In addition to assessing cost savings and growth trends associated with data centers, the study reviewed the existing incentives offered for data center energy efficiency services and products. Congress also required that specific recommendations be formulated regarding potential incentives, and voluntary programs to encourage adoption of energy efficient data centers and computing.

Q. How does this relate to Ohio?

A. With the proliferation of and access to cell phones, personal computers, PDA's, tablets, etc. many customers in Ohio are becoming less dependent on paper-based information and more dependent on digital information. As a result, the Companies' customers in Ohio are relying more and more on digital information management and data centers. Data centers have become essential to the basic operation of businesses and many organizations. Data centers are relied on heavily in nearly every sector of the economy including universities, businesses, government operations, media, financial services, security, etc.

In a report to Congress,[1] the U.S. Department of Energy (DOE) reported that the energy

[1] " Report to Congress on Server and Data Center Energy Efficiency Public law 109-431, August 2, 2007"

used by the nation's servers and data centers is significant and that the energy use of the nation's servers more than doubled between 2000 and 2006. DOE indicated that energy use for servers was forecasted to double again between 2006 and 2011. For the year 2011, DOE expected consumption of more than 100 billion kWh/year, costing approximately $7.4 billion annually in electricity costs. The DOE indicated that data center space can consume up to 100 to 200 times as much electricity as standard office spaces. With such large power consumption, these customers are prime targets for energy efficiency design measures that could reduce electricity use and save money. This is a high-growth sector driven by increased reliance on cell phones, digital data and enhanced communications systems. Data center growth in the government sector results from:

1. publishing government information by use of the internet,
2. government regulations requiring digital records retention,
3. enhanced disaster recovery requirements,
4. emergency, health and safety services,
5. information security and national security,
6. e-filing of taxes and USPS on-line tracking, and
7. high-performance scientific computing.

The Companies have not proposed a high priority, dedicated data center program in their proposed plans. These energy intensive data centers and server operations are prime opportunities for energy efficiency.

Q. Did the Companies' Market Potential Study include an assessment of end use consumption by customers who operate data centers?

A. Yes. In the Cleveland Electric Illuminating Company Application, Appendix D, page 104 of the "Market Potential Study," Figure 8-7 (FirstEnergy Ohio Commercial Energy Consumption by End Use), (GCC- 3), the Company offers a chart that indicates consumption by end use. End use breakouts are shown as 4% space heating, 5% computers, 13% cooling, 11% ventilation and 39% for lighting. Data centers use electricity directly for the operation of servers, lighting, ventilation, and cooling to operate sensitive electronic equipment within a specific temperature range and humidity level required for reliable operation. The Companies market potential study did not specifically disaggregate the existing or projected energy use or savings potential for data centers in the Companies' service territory. However, in the Cleveland Electric Illuminating Company Application, Appendix D, page 93 of the "Market Potential Study," Figure 8-4, "Commercial Technical Potential by End-use," page 93, the table indicates the following technical potential disaggregated by end use: 32% for computers, 49% for ventilation, 45.6% for cooling and 29.2% for lighting. Given this information and the DOE analyses, it appears that a significant technical potential exists for the energy intensive data centers operated by some of the Companies' customers.

Q . What are you suggesting the Companies do regarding data center energy efficiency opportunities?

A. I realize that developing a comprehensive data center energy efficiency plan will take time and effort. However, I believe since these programs will cover the 2013-2015 period, such a program should be developed and offered by the Companies during this program cycle. Given the high-growth nature of this customer segment I believe a comprehensive data center program should be developed and offered to customers in the

near future. I have also provided an example of a comprehensive data energy center program (see Exhibit (GCC-4)) that is being operated by an investor owned utility in Colorado as well as the Midwest. The Commission should direct FirstEnergy to work with the collaborative to develop a program in the next six months with a target date of starting a program by December 1, 2013.

LED STREET LIGHTING

Q. In your review of the Companies service offerings and programs, are there other relevant energy efficiency technologies or actions that were not but should have been included in the proposed plans?

A. Yes. The companies are not proposing to use high efficiency solid state lighting referred to as light emitting diodes (LED), technology in their street lighting and area lighting tariff services.

Q . Could you explain the energy efficiency technology opportunities in relation to street and area lighting?

A. According to DOE, LED technology is becoming very cost competitive with standard lighting applications for outdoor use. Currently, high pressure sodium and mercury vapor lighting systems are a commonly used technology used for outdoor lighting in roadways, parking lots, streets, and pedestrian areas. Recent advances in LED technology have provided new opportunities for outdoor area lighting with distinct advantages over mercury vapor or high pressure sodium. The advantages include better control of the light, less energy use, and much longer life with better lumen maintenance. In addition, LED lights do not contain lead or mercury, do not present disposal hazards, light up

instantly without re-strike delay, and reduce light trespass, sky glow and glare. The Companies' eligible street lighting services include the use of less efficient high pressure sodium, mercury vapor and incandescent lighting technology in conjunction with its street lighting and related tariffs e.g., The Cleveland Electric Illuminating Company Tariff P.U.C.O. No. 13,"Street Lighting Service-Rate "STL") Company Owned.

I have provided several examples of utilities that include efficient LED lighting technologies in their street lighting services and tariff's. Pacific Gas & Electric provides incentives for its customers on their LS-2 fixed pricing schedule. (See Exhibit GCC- 5). Customers who replace or upgrade their existing street lights with PG&E approved LED street lighting are eligible for lower pricing and product rebates. LED options replace standard street lighting ranging from 70 to 400 watts fixtures. PG&E also offers a comprehensive "Turnkey Replacement Service" to provide services to customers who are interested in using LED street lighting. Efficiency Vermont and Vermont Utilities provides support to encourage customers to install LED street lighting and LED outdoor lighting. (See GCC-6). In Michigan, the Wisconsin Electric Company provides LED lighting in conjunction with its street lighting services and tariff. (See Exhibit GCC-7). In Iowa, the Interstate Power and Light Company provides 80 watt LED bulbs in conjunction with its Tariff No. 1 street lighting services. (See Exhibit GCC-8). In New York, Central Hudson Gas and Electric Corporation is another example of a utility that revised its tariff to include LED lighting in its street lighting tariff No. (GCC-9).

Q. Are you requesting that the Companies include LED Lighting in its street lighting Services and tariffs?

A. Yes. The Companies should promote energy efficiency wherever reasonable (without a DSM budget and handled within the tariff). A tariff modification to include more efficient LED technologies should be pursued by the companies. A number of utilities in this country offer highly efficient LED lighting technology in conjunction with their street lighting services and tariffs. This is an efficiency opportunity that could be captured by the Companies in Ohio, in the normal course of doing business.

IMPROVE SEVERAL ASPECTS OF THE PROPOSED PROGRAMS

Q. Do you have any specific suggestions for improvement regarding the proposed measures or other aspects of the proposed programs?

A. I am concerned about the proposed inclusion of several measures in the Companies' plan. The company is proposing to offer rebates on standard T-8 lamps and fixtures and Energy Independence and Security Act (EISA) compliant incandescent lighting. If approved, this would represent a lost opportunity. Since standard T-8 technology is expected to replace the outdated T-12 lamps and fixtures, a rebate should not be available for the standard efficiency T-8 technology, but instead should be applied to the high performance T-8 and T-5 technologies. In my experience working in the Illinois Collaborative for the past several years, I am aware that the Commonwealth Edison lighting program promotes energy efficiency improvement by requiring T-8 lamps to (typically) be either high performance or reduced wattage in order to qualify for their incentives. In terms of providing rebates on bulbs, FirstEnergy's focus should be on

encouraging customer to purchase the most efficient bulbs available. While EISA compliant incandescent bulbs are expected to be readily available during the 2013-2015 timeframe these bulbs are far less efficient than the CFLs and LED bulbs available on the market. While customers may choose those bulbs, providing rebates would encourage them to make the less efficient choice. Thus, the Commission should not allow FirstEnergy to discount EISA compliant incandescent bulbs.

Q. Do you have suggestions regarding the implementation of commercial and industrial energy efficiency programs or trade ally relationships?

A. In reviewing the evaluation report done on the commercial and industrial energy efficiency incentive programs as well as my personal participation in collaborative meetings, I note that there are opportunities to improve FirstEnergy's implementation of Commercial and Industrial Energy Efficiency Incentive Programs. Trade ally satisfaction levels were reported to be 5% in the category of "very satisfied," 26% "satisfied," 28% "dissatisfied," and 23% "very dissatisfied" with the program. Key suggestions and problems reported included recommendations to increase incentives for LED lighting, the reduction of incentive levels for projects, and the excessive time needed to process applications for customers to receive incentive payments. Additionally, in the evaluation report completed on this program (Appendix G), customers, trade allies, and Company staff have raised concerns about the length of time needed to receive incentive checks. This lag time (up to 90 days) is a problem and is of particular concern.

FirstEnergy needs to improve its efficiency in managing the commercial and industrial energy efficiency incentives program, enhance its relationship and improve coordination

efforts with customers and trade allies in order to improve the implementation of this program. Extended backlogs, slow processing time and insufficient LED lighting incentive levels are problems that will annoy customers and trade allies and will impede the program effectiveness. Given the importance of this program, I recommend that the Commission order the Companies to address this problem and then file a report with the Commission outlining the steps FirstEnergy is taking.

Q. Do you have an opinion regarding the energy efficiency kits that have been proposed in the plan?

A. Yes. I believe the energy kits for the schools should be authorized. These kits are likely to provide benefits due to the active participation by teachers and students and the high installation rates that are expected to result. However, I do not believe the Commission should authorize the standard or the all electric kits for small commercial, industrial and residential customers. FirstEnergy has not sufficiently justified the magnitude of kits it is proposing in terms of benefits/costs compared to other programs. The problem is that there are lingering questions regarding the installation rate for the measures included in the kits, and FirstEnergy has not addressed these questions in this filing. If the kits are authorized and provided to customers as proposed, and if the evaluation results indicate low installation rates, this would be questionable use of ratepayer funds.

Q. Do you have an opinion regarding the proposed elimination of the existing Pro-Rata treatment for recording energy savings?

A. Yes. I recommend that the Commission should not authorize FirstEnergy's proposed change to this methodology. The Commission was correct to have found this methodology reasonable. To do otherwise would allow an energy efficiency measure

that is installed in December to be given credit as if it had been installed in January of the reporting year, which would allow FirstEnergy to count savings from a very short time period as though they took place for twelve months. An annualized approach to reporting savings would be a potential disincentive for a utility to diligently implement an energy efficiency program and would allow for inflated and inaccurate energy savings reports. Should shared savings be authorized in Ohio, use of an annualized reporting methodology would further compound the problem by potentially paying a reward/performance premium for fictitious savings. While I understand the concern that it is sometime difficult to determine exactly when a measure begins to produce actual savings, assuming that savings have been going on all year is not a reasonable solution to the problem. I believe the Commission should retain the requirement for tracking and reporting savings on a pro-rata basis.

FIRSTENERGY COLLABORATIVE PROCESS

Q. Do you believe that a stakeholder input/collaborative process as it is now being managed is reasonable and effective?

A. No. A FirstEnergy collaborative working group should be an ongoing activity in Ohio with regularly scheduled meetings and active participation by interested parties. A forum for the two-way exchange of ideas would assist and inform FirstEnergy program implementers in the development, modification, and refinement of programs.

Q. How do you believe the stakeholder collaborative process should operate?

A. Having been involved in a number of collaborative working groups, I have found that ongoing stakeholder involvement is very helpful in the design, implementation,

monitoring, evaluation, modification, or elimination of ineffective programs. Stakeholder participants should include interested parties who are willing to take the time and effort to participate in the stakeholder process. In order for the process to be workable and useful, those who are on the collaborative work group need to; 1) Demonstrate a commitment to the working group process by reviewing the pre-meeting materials; 2) invest the time and effort and attend the meetings; and 3) provide input and actively participate at the meetings.

Q. What are your recommendations for the FirstEnergy collaborative during the 2013-2015 timeframe?

A. I believe that the stakeholder group should have regularly scheduled meetings every quarter. This group's objective should be to explore improvements to the ongoing programs, offer ideas to enhance trade alley relationships and customer participation, and act as a sounding board to assist with implementation strategies. At least one week in advance, the collaborative group should be provided with meeting agendas and relevant materials that are to be covered during the meetings. That will afford the participants the opportunity to review the pre-meeting materials and be prepared to participate and contribute during the meetings.

PROPOSED CONSERVATION VOLTAGE REDUCTION PROGRAM

Q. Do you have concerns about the proposed conservation voltage reduction program?

A. Yes. FirstEnergy has indicated that in conjunction with Docket No. 12-814-EL-UNC it is proposing to study the energy efficiency impacts of a voltage reduction experiment. It proposes to analyze intentional voltage adjustments and the impacts on distribution

circuits. However, nothing in FirstEnergy's testimony indicates that anything it is doing is being done to increase efficiency in a manner that would indicate the Companies should take credit for the work as an energy efficiency measure in this plan period. Customers would be completely unaware of these activities, and it is my understanding that customers will not be asked to take any actions or modify their energy use patterns in any way. FirstEnergy has indicated that it is required to comply with the Ohio Administrative Code which establishes standards for system voltage, frequency, etc. This proposed voltage adjustment activity is related to the basic, regulated distribution system function and as such should not be funded in conjunction with the EE & PDR programs.

Q. Do you have concerns regarding the implications of such a voltage reduction pilot on customers?

A. Yes. FirstEnergy is proposing to target both residential and non residential customers with this voltage reduction experiment, which does not require the customers to know of the experiment or to change their energy use in any manner. It is likely that FirstEnergy would be hopeful that its customers were oblivious to this activity, since this activity would be occurring on the company's side of the meter within FirstEnergy's distribution system. This is a distribution system infrastructure improvement activity and as such would be a normal on-going business responsibility of this electric distribution utility.

I'm also concerned that this proposed pilot raises concerns regarding the potential damages to residential or non-residential equipment. For example, it is possible that voltage reductions could harm equipment such as process systems, air conditioners,

motors, lighting systems (reduced lumens) or cause motors to overheat causing, electrical system interruptions and outages, loss of production, etc. If the Commission authorizes this pilot, the Companies should inform customers of the changes to the system. That way should equipment be damaged as a result of the pilot, customers would be able to make a claim and be compensated for their losses.

Q. Do you believe the CVR pilot should be authorized as part of the EE & PDR plan?

A. No.

SUMMARY

Q. Could you please summarize your conclusions & recommendations regarding FirstEnergy's proposed EE&PDR plan?

A. Yes. They are as follows:

- The Commission should require the Companies to modify its proposed programs and to eliminate several marginal measures from its program, including EISA compliant incandescent bulbs and standard T-8 bulbs and fixtures as is currently proposed.
- The Commission should require that the Companies modify their non-commercial and industrial energy efficiency incentive program to address the concerns of the trade allies, increase LED incentives and reduce processing time.
- The Commission should not authorize the proposed conservation voltage reduction pilot program.

- The Commission should direct the Companies to significantly improve the collaborative working group process.
- The Commission should direct the Companies to develop and offer a data center energy efficiency program.
- The Commission should direct the Companies to revise their existing street lighting, parking lot and area lighting tariffs to include LED lighting technologies.

Q. Does this complete your testimony?

A. Yes

CERTIFICATE OF SERVICE

I hereby certify that a true copy of the foregoing *Direct Testimony of Geoffrey C. Crandall*, submitted on behalf of the Environmental Law & Policy Center and Ohio Environmental Council, was served by electronic mail upon the following Parties of Record this 5th day of October, 2012.

/s/ Justin Vickers
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Geoffrey C. Crandall

Vice President and Principal

EDUCATION

B.S. in Business and Pre-Law, Western Michigan University, 1974.

Mr. Crandall has also completed courses at Michigan State University Graduate School, the University of Wisconsin-Madison and Wayne State University, in areas of federal taxation, accounting, management and the economics of utility regulation. Mr. Crandall also completed the examination for the National Conference of States on Building Codes and Standards Energy Auditor.

EXPERIENCE

Mr. Crandall joined MSB in January 1990. He specializes in residential and low-income issues, the impact of energy efficiency and utility restructuring on customers. Mr. Crandall has addressed issues related to energy efficiency and residential customers and utility restructuring in California, New York, Colorado, Iowa, and Michigan. He has analyzed and/or designed energy efficiency programs for residential customers in Michigan, Georgia, Wisconsin, Arizona, and New Orleans, and has conducted workshops on low-income restructuring and energy efficiency issues in over 20 states, including Washington, Hawaii, Nevada, Kansas, Michigan, Rhode Island, California, Virginia, and New Orleans. In the energy efficiency area, Mr. Crandall has analyzed and proposed modifications to utility demand-side programs in the states of Arizona, Georgia, Hawaii, Illinois, Maine, Michigan, Minnesota, North Carolina, Ohio, Pennsylvania, Utah, Washington State, California, Iowa, Montana, Colorado, Missouri, Virginia, Wisconsin, and Washington D.C.

Prior to joining MSB, Mr. Crandall was employed by the Michigan Public Service Commission from 1974 through 1989, where he served as the Director of the Demand-Side Management Division. He was responsible for the development, implementation and monitoring of government- and utility-sponsored demand-side management, energy-efficiency and conservation policies and programs. These activities involved customers in the residential, commercial, industrial and institutional sectors. He was responsible for both pilot and full-scale programs, and conducted demand-side program design and implementation. Mr. Crandall is familiar with marketing strategies, segmentation and market-penetration analyses, as well as the implementation of successful demand-side programs.

Mr. Crandall has dealt with a wide variety of regulatory issues beyond energy conservation, including utility diversification, non-traditional regulatory concepts, incentive regulation, utility billing practices, utility power plant maintenance and management of plant outages.

Mr. Crandall served as Chair of the NARUC Energy Conservation Staff Subcommittee from 1986-1989. He has lectured and made presentations to many groups on demand-side programs and least-cost planning, including two NARUC-sponsored least-cost planning conferences; the 1990 NARUC Regional Workshops on Least-Cost Utility Planning in Newport, Rhode Island and Little Rock, Arkansas; the Wisconsin Public Service Commission's Integrated Resource Planning Workshop; the 1988, 1989, and 1990 Michigan State University Graduate School of Public Utilities and the U.S. Department of Energy.

Mr. Crandall has testified before the: United States Congress, Michigan Legislature, Michigan Public Service Commission, North Carolina Utilities Commission, Public Service Commission of the District of Columbia, Illinois Commerce Commission, Maine Public Utilities Commission, Massachusetts Department of Public Utilities, Public Service Commission of Hawaii, Minnesota Public Service Commission, Iowa Public Service Commission, Georgia Public Service Commission, Public Utility Commission of Ohio, Virginia Public Service Commission, Wisconsin Public Service Commission, and the City Council of the City of New Orleans, Louisiana.

Mr. Crandall has written several articles published in the Public Utilities Fortnightly and Electricity Journal, Natural Gas Magazine, and a number of proceedings for the Biennial Regulatory Information Conference and the American Council for an Energy-Efficient Economy.

TESTIMONY

Case No. U-5531, (8/77), Consumers' Power Company electric rate increase application. Mr. Crandall served as the Staff Witness and recommended that the Applicant initiate the Residential Electric Customers' Information program.

Case No. U-6743, (3/81), Michigan Consolidated Gas Company. Mr. Crandall served as the Staff policy witness and recommended that the Commission approve a surcharge to cover all reasonable and prudent costs associated with Applicant's implementation of the Michigan Residential Conservation Services Program.

Case No. U-6819, (6/81), Michigan Power Company-Gas. Mr. Crandall served as the Staff policy witness and described the basis for the program and the expected level of activity, recommending that the Commission approve a surcharge to cover all reasonable and prudent costs associated with Applicant's implementation of the Michigan Residential Conservation Service Program.

Case No. U-6787, (6/81), Michigan Gas Utilities Company. Served as the Staff policy witness and described the basis for the program and the expected level of activity, recommending that the Commission approve a surcharge to cover all reasonable and prudent costs associated with the implementation of the Michigan Residential Conservation Service Program.

Case No. U-6820, (6/81), Michigan Power Company-Electric. Served as the Staff policy witness and reviewed the Applicant's request to operate the Michigan Residential Conservation Service Program. Although not mandated by federal law, Applicant chose to operate the program in conjunction with its other services offered to residential gas customers. Recommended the establishment of a surcharge to cover all reasonable and prudent costs associated with the operation of that program.

Case No. U-5451-R, (10/82), Michigan Consolidated Gas Company. Served as the Staff policy witness and described the Staff's position regarding Applicant's proposed adjustment of surcharge level. Recommended that the eligibility criteria for customers be adjusted to more accurately reflect proper fuel consumption and to include customers who would be likely to realize a seven-year return on their investment by installing flue-modification devices in conjunction with Applicant's financing program.

Case No. U-6743-R, (10/82), Michigan Consolidated Gas Company. Served as the Staff policy witness regarding the Applicant's proposed expenses and revenues, as well as the reasonableness of activity and expense levels in the company's projected period.

Case No. U-7341, (12/84), Detroit Edison Company, Request for Authority for Certain Non-Utility Business Activities. Represented the Staff's position during settlement discussions and sponsored the settlement agreement.

Case No. U-6787-R, (3/84), Michigan Gas Utilities Company. Served as the Staff witness regarding the Applicant's proposed expenses and revenues. This also included a review of the company's future expenses associated with the Energy Assurance Program, the Specialized Unemployed Energy Analyses, and the Michigan Business Energy Efficiency Program expenses.

Case No. U-8528, (3/87), Commission's Own Motion on the Costs, Benefits, Goals and Objectives of Michigan's Utility Conservation Programs. Represented the Staff on the costs and savings of conservation programs and the other benefits of existing programs, and described alternative actions available to the Commission relative to future energy-conservation programs and services and other conservation policy matters.

Case No. U-8871, et al., (4/88), Midland Cogeneration Venture Limited Partnership. For approval of capacity charges contained in a power-purchase agreement with Consumers' Power Company. Served as the Staff witness on Michigan conservation potential and reasonably achievable programs that could be operated by Consumers' Power Company, and testified to the potential impact of these conservation programs on the Company's request for use of its converted nuclear plant cogeneration project. Also recommended levels of demand-side management potential for the commercial, industrial and institutional sectors in Consumers' Power service territory.

Case No. U-9172, (1/89), Consumers' Power Company, Power-Supply Cost-Recovery Plan and Authorization of Monthly Power-Supply Cost-Recovery Factors for 1989. Served as Staff witness on the conservation potential and reasonably achievable programs that could be operated by Consumers' Power Company. Testified to the potential impact of these conservation programs

on the Company's fuel and purchase practices, its five-year forecast and the fuel factor. Recommended levels of demand-side management potential for the commercial, industrial and institutional sectors in Consumers' Power service territory as an offset to its more-expensive outside and internally generated power. Suggested that CPCO vigorously pursue conservation, demand-side management research, and planning and program implementation.

Case No. U-9263, (4/89), Consumers' Power Company Request to Amend its Gas Rate Schedule to Modify its Rule on Central Metering. Served as a Staff witness on the conservation effect of converting from individual metered apartments to a master meter. Suggested that the Commission continue its moratorium on the master meters, due to the adverse energy-conservation and efficiency impact.

Case No. E-100, (1/90), North Carolina Public Service Commission proceeding on review of the Duke Power Company's least-cost utility plan. Testified on behalf of the North Carolina Consumers' Council regarding utility energy-efficiency and demand-side management programs and the concept of profitability and implementation of demand-side management programs.

Case No. 889, (1/90), Public Service Commission of the District of Columbia. Testified on behalf of the Government of the District of Columbia in the Potomac Electric Power Company's application for an increase in its retail rates (general rate case). Sponsored testimony regarding the design and implementation and overall appropriateness of PEPCO's existing and proposed energy-efficiency and conservation programs.

Case No. 889, (4/90), Public Service Commission of the District of Columbia. Provided supplemental direct testimony and testified on behalf of the Government of the District of Columbia in the Potomac Electric Power Company's application for an increase in its retail rates (general rate case). Offered supplemental testimony regarding a more detailed review of PEPCO's existing pilot and full-scale energy-efficiency and conservation programs. Offered suggestions and recommendations for a future direction for PEPCO to pursue in order to implement more cost-effective and higher-impact energy-efficiency and conservation programs.

Case No. ICC Docket 90-004 and 90-0041, (6/90), Illinois Commerce Commission proceeding to adopt an electric-energy plan for Central Illinois Light Company (CILCO). Testified on behalf of the State of Illinois, Office of Public Counsel and the Small-Business Utility Advocate. Reviewed the CILCO electric least-cost plan filing and the conservation and load-management programs proposed in its filing. Sponsored testimony regarding my analysis of the proposed programs, and offered alternative programs for the Company's and the Commission's consideration.

Case No. D.P.U. 90-55, (6/90), Commonwealth of Massachusetts Department of Public Utilities. Testified on behalf of the Commonwealth of Massachusetts, Division of Energy Resources. Reviewed and analyzed Boston Gas' proposed energy-conservation programs that were submitted for pre-approval in its main rate case. In addition, suggested that it might consider implementation of other natural-gas energy- efficiency programs, and not award an economic incentive for energy-efficiency and conservation programs until minimum program-implementation standards are satisfied.

Case No. U-9346, (6/90), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency Association. Reviewed and analyzed the Consumers' Power Company rate-case filing related to energy-efficiency and demand-side management programs. Proposed alternative energy-efficiency programs and recommended program budgets and a cost-recovery mechanism.

Case No. 89-193; 89-194; 89-195; and 90-001, (6/90), Maine Public Utilities Commission. Testified on behalf of the Maine Public Advocate's Office. Reviewed the appropriateness of Bangor Hydro-Electric Company's existing energy-efficiency and demand-side management programs in the context of BHE's main rate case and request for approval to construct the Basin Mills Hydro-Electric dam. Reviewed the overall resource plan and suggested alternative programs to strengthen the energy-efficiency and demand-side management resource efforts.

Case No. 6617, (4/91), Hawaii Public Utility Commission. Testified on behalf of the Hawaii Division of Consumer Advocacy. Described what demand-side management resources are, why they should be included in the integrated resource planning process, and proposed the implementation of several pilot projects in Hawaii along with guidelines for the pilot programs.

Case No. E002/GR-91-001, (5/91), Minnesota Public Utilities Commission. Testified on behalf of Minnesotans for an Energy Efficient Economy. Assessed the DSM programs being operated or proposed by Northern States Power Company and made recommendations as to ways in which NSP could improve its DSM efforts.

Case No. 905, (6/91), Public Service Commission of the District of Columbia. Testified on behalf of the District of Columbia Energy Office. Responded to the energy-efficiency and load management aspects of Potomac Electric Company's filing and made several recommendations for DC-PSC action.

Case No. 6690-UR-106, (9/91), Public Service Commission of Wisconsin. Testified on behalf of The Citizens' Utility Board of Wisconsin. Assessed the DSM programs being operated or proposed by the Wisconsin Public Service Corporation, made recommendations as to the WPSCO energy efficiency programs, and suggested ways the company could improve its DSM efforts.

Case No. E002/CN-91-19, (12/91), Minnesota Public Utilities Commission. Testified on behalf of Minnesota Department of Public Service. Assessed the DSM potential and programs being operated or proposed by Northern States Power Company and made recommendations as to the potential for energy efficiency in the NSP service territory and ways in which NSP could improve its DSM efforts.

Case No. 912, (4/92), Public Service Commission of the District of Columbia. Testified on behalf of the Government of the District of Columbia in the Potomac Electric Power Company's application for an increase in its retail rates for the sale of electric energy. Testified regarding the reasonableness of DSM and EUM policy changes, the cost allocation of the DSM and EUM expenses, an examination of the prudence of management regarding the energy-efficiency

programs, and an examination of the appropriateness of the costs associated with energy-efficiency programs.

Case No. PUE 910050, (5/92), Virginia State Corporation Commission. Testified on behalf of the Citizens for the Preservation of Craig County regarding the need for the Wyoming-Cloverdale 765 kV transmission line. Specifically, addressed the adequacy of the DSM planning of Appalachian Power Company and Virginia Power/North Carolina Power. Made recommendations as to APCO and VEPCO's energy efficiency programs, and suggested ways the company could improve its DSM efforts.

Case No. EEP-91-8, (5/92), Iowa Utilities Board. Testified on behalf of the Izaak Walton League concerning the adequacy of Iowa Public Service Company's Energy Efficiency Plan. Reviewed the plan and suggested modifications to it.

Case No. 4131-U and 4134-U, (5/92), Georgia Public Service Commission. Testified on behalf of the Georgia Public Service Commission staff regarding the demand-side management portions of Georgia Power Company's and Savannah Electric and Power Company's Integrated Resource Plans. Testimony demonstrated that it is reasonable for the Commission to expect that the utilities can successfully secure substantial amounts of demand-side management resources by working effectively with customers.

Case No. 917, (8/92), Public Service Commission of the District of Columbia. Testified on behalf of the District of Columbia Energy Office in hearings on Potomac Electric Power Company's Integrated Resource Planning process. Addressed a number of program-specific issues related to PEPCO's demand-side management efforts.

Case No. 4132-U, 4133-U, 4135-U, 4136-U, (10/92), Georgia Public Service Commission. Testified on behalf of the Staff Adversary IRP Team of the Georgia PSC. Provided a critique of Georgia Power Company's and Savannah Electric and Power Company's proposed residential and small commercial DSM programs.

Case No. 4135-U, (3/93), Georgia Public Service Commission. Testified on behalf of the Staff Adversary IRP Team of the Georgia PSC. Provided a critique of Savannah Electric and Power Company's proposed Commercial and Industrial DSM programs.

Case No. R-0000-93-052, (12/93), Arizona Corporation Commission. Testified on behalf of the Arizona Community Action Association. Critiqued and made recommendations regarding the integrated resource plans and demand-side management programs of Arizona Public Service Company and Tucson Electric Power Company.

Case No. 934, (4/94), Public Service Commission of the District of Columbia. Filed testimony on behalf of the District of Columbia Energy Office in hearings concerning the Washington Gas Light Company (WGL) general rate case application to increase existing rates and charges for gas service. Testimony involved critiquing and reviewing WGL's least cost planning efforts and integration of DSM, marketing and gas supply efforts.

Case No. U-10640, (10/94), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency Association concerning the need to integrate DSM and load promotion analysis into MichCon's GCR planning process.

Case No. 05-EP-7, (3/95), Wisconsin Public Service Commission. Testified on behalf of the Citizens' Utility Board on level of utility DSM and program designs and strategies.

Case No. 05-EP-7, (3/95), Wisconsin Public Service Commission. Testified on behalf of the Wisconsin Community Action Program Association on low-income customers and utility DSM programs.

Case No. TVA 2020-IRP, (9/95), Tennessee Valley Authority. Testified on behalf of the Tennessee Valley Energy Reform Coalition. Assessed, critiqued and made recommendations regarding the integrated resource plans and demand-side management programs proposed by the Tennessee Valley Authority.

Case No. R-96-1, (10/95), Alaska Public Utilities Commission. Testified on behalf of the Alaska Weatherization Directors Association regarding the proposed standards and guidelines for integrated resource planning and energy efficiency initiatives under consideration in Alaska.

Case No. D95.9.128, (2/96), Montana Public Service Commission. Testified on behalf of the District XI Human Resources Council concerning the low-income energy efficiency programs offered by the Montana Power Company.

Case No. DPSC Docket No. 95-172, (5/96), Delaware Public Service Commission. Prepared draft testimony on behalf of the Low-Income Energy Consumer Interest Group regarding Delmarva Power & Light Company's application to revise its demand-side programs. The case was settled, with LIECIG obtaining funding for low-income energy efficiency programs, prior to testimony.

Case No. U-11076, (8/96), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Michigan Jobs Commission's recommendations regarding electric and gas reform. Discussed the implications of utility restructuring and the needs of residential and low-income households, and proposed regulatory and industry solutions.

Case No. 96-E-0897, (3/97), New York Public Service Commission. Prepared draft testimony for New York's Association for Energy Affordability regarding the impact of proposed utility restructuring plans on low-income customers. The case was settled in Spring 1997.

Case No. R-00973954, (7/97), Pennsylvania Public Utilities Commission. Testified on behalf of the Commission on Economic Opportunity regarding the economics of demand-side measures and programs proposed for implementation by Pennsylvania Power & Light Company.

Case No. 98-07-037, (7/98), California Public Utilities Commission. Testified on the California Alternative Rates for Energy and the Low Income Energy Efficiency programs regarding the

implementation and adoption of revisions to these programs necessitated by the AB 1890 and the Low Income Governing Board.

Case No. U-12613, (3/01), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Wisconsin Public Service Corporation application to implement PA 141 the electricity deregulation law. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management.

Case No. U-12649, (3/01), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Wisconsin Electric Power Company and the Edison Sault Electric Company application to implement PA 141 Michigan's electricity deregulation law. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management.

Case No. U-12651, (3/01), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Northern States Power Company – Wisconsin application to implement PA 141 the electricity deregulation law. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management.

Case No. U-12652. (3/01), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Indiana Michigan Power Company d/b/a American Electric Power application to implement PA 141 the electricity deregulation law. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management.

Case No. U-12725, (4/01), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Wisconsin Electric Power Company and the Edison Sault Electric Company application to increase its residential rates. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management and recommended a significant increase in these activities.

Case No. U-13060, (12/01), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Michigan Consolidated Gas Company application for Approval of their Gas Cost Recovery Plan and Five-Year gas Forecast. I reviewed the filing and recommended the Commission reject the proposed GCR factor and suggested continuation of the existing GCR factor or adopt an adjusted MCAAA sponsored GCR factor. I also suggested a set-aside allocation be designated for low-income customers to ensure access to alternative gas providers under the applicant's customer choice program.

Case No. 6690-UR-114, (9/02), Wisconsin Public Service Commission. Testified on behalf of the Citizens Utility Board regarding the Wisconsin Public Service Corporation application to increase its electric and natural gas rates. I reviewed the portions of the filing related to their low-income assistance/weatherization and the proposed executive compensation incentive plan.

Case No. U-14401, (04/05), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Michigan Consolidated Gas Company application for Approval of their Gas Cost Recovery Plan and Five-Year gas Forecast. I reviewed the filing and recommended the Commission reject the proposed plan and suggested initiation of strategies that would lower the need to acquire expensive and unnecessary gas supplies.

Case No. U-14401-R, (10/05), Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Michigan Consolidated Gas Company application re-opener Approval of their Gas Cost Recovery Plan and Five-Year gas Forecast. I reviewed the filing and recommended the Commission reject the proposed plan and suggested initiation of strategies that would lower the need to acquire expensive and unnecessary gas supplies.

Case No. U-14701, (02/06), Michigan Public Service Commission. Testified on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding the Consumers Energy Company application for Approval of a Power Supply Cost Recovery Plan and for Authorization of Monthly Power Supply Cost Recovery Factors for Calendar Year 2006. I reviewed the filing including the application, testimony, exhibits, discovery responses and submitted testimony recommending that the Commission not approve the five-year PSCR plan as filed due to the impacts related to the Palisades sale and the absence of alternative resources in the projected five-year resource portfolio.

Case No. U-14702, (02/06), Michigan Public Service Commission. Testified on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding The Detroit Edison Company application for authority to implement a Power Supply Cost Recovery Plan in its rate schedules for 2006-metered jurisdictional sales of electricity. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission not approve the proposed five-year PSCR plan as filed due because it was deficient in its selection of alternative resources in the projected five-year resource portfolio.

Case No. U-14992, (12/06), Michigan Public Service Commission. Testified on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding The Consumers Energy Company application for approval of the proposed Power Purchase Agreement in connection with the sale of the Palisades Nuclear Power Plant and other assets. The purpose of my testimony was to address the overall soundness of this application and proposal. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission not approve the proposed purchase power agreement and transfer the ownership of the nuclear plant and other assets.

Case No. 06-0800, (3/07), Illinois Commerce Commission. Provided testimony on behalf of the Illinois Citizens Utility Board regarding the Illinois electricity resource auction process. I assessed the existing resource/power supply auction based bidding process and recommended modifications and improvements to the Illinois resource acquisition mechanism.

Case No. 24505-U, (5/07), Georgia Public Service Commission. Testified on behalf of the Georgia Public Service Commission Advocacy staff regarding the demand-side management portions of Georgia Power Company's Integrated Resource Plans. Testimony demonstrated that it is reasonable for the Commission to approve the five proposed DSM programs and expect that Georgia Power can successfully secure considerably more demand-side management resources by working effectively with its customers.

Case No. U-14992, (11/07), Michigan Public Service Commission. Testified on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding The Consumers Energy Company rate application for approval of a rate increase and the recovery of energy efficiency programs and certain costs in connection with the sale of the Palisades Nuclear Power Plant and other assets. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission not approve the recovery of transaction costs involving the transfer the ownership of the nuclear plant and other assets and on various aspects of its proposed energy efficiency programs and proposed incentives.

Case No. 07-0540, (12/07), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the Commonwealth Edison Company application for approval of its proposed Energy Efficiency and Demand Response Plan. I assessed the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed plan filing.

Case No. 07-0539, (12/07), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the Central Illinois Light Company d/b/a and Ameren CIPS CENTRAL ILLINOIS PUBLIC SERVICE COMPANY and Ameren CIPS ILLINOIS POWER COMPANY d/b/a Ameren IP application for approval of its proposed Energy Efficiency and Demand Response Plan. I assessed the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed plan filing.

Case No. U-15415, (2/08), Michigan Public Service Commission. Testified on behalf of the American Association of Retired People regarding The Consumers Power Company application for approval for authority to implement a Purchase Power recovery plan, 5-year forecast, and monthly PSCR factors for the 12-month period calendar year 2008. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission adopt a more effective and less expensive resource acquisition procedure to help keep the cost of energy down in Michigan.

Case No. U-15417, (4/08), Michigan Public Service Commission. Provided testimony on behalf of the American Association of Retired People regarding The Detroit Edison Company for Authority to Implement a Power Supply Cost Recovery Plan in its Rate Schedule for 2008 Metered Jurisdictional Sales of Electricity. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission adopt a more effective and less expensive resource acquisition procedure to help keep the cost of energy down in Michigan.

Case No. U-15244, (7/08), Michigan Public Service Commission. Provided testimony on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding The Detroit Edison Company request for Authority to increase rates, amend its rate schedules and rules governing the distribution and supply of electric energy, and for miscellaneous accounting authority. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission direct DECO to make modifications to its Integrate Resource Planning analysis.

Case No. EEP-08-2, (7-08), Iowa Public Utilities Board. Provided testimony on behalf of the environmental interveners regarding the request of the Mid American Energy Company for approval of an Energy Efficiency Plan. I made an assessment of the proposed energy efficiency and demand response plan and recommended modifications and improvements to the implementation strategy and proposed programs.

Case No. EEP-08-1, (8-08), Iowa Public Utilities Board. Provided testimony on behalf of the environmental interveners regarding the Interstate Power and Light Company request for approval of an Energy Efficiency Plan. I made an assessment of the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed programs and implementation strategy.

Case No. 137-CE-147, (2-09), Public Service Commission of Wisconsin. Provided testimony on behalf of PRESERVE OUR RURAL LANDS regarding the Application of American Transmission Company, as an Electric Public Utility, to Construct a new 345 kV Line from the Rockdale Substation to the West Middleton Substation, Dane County, Wisconsin. I suggested modifications of the proposal and rejection of the approval of the line.

Case No. M2009-2093218, (8-09), Pennsylvania Public Utility Commission. Provided testimony on behalf of The Office Of Consumer Advocate regarding the West Penn Power Company d/b/a Allegheny Power Energy Efficiency and Conservation Plan request for plan approval. I analyzed the proposed plan and made an assessment of the proposed energy efficiency and demand response and cost recovery plan. I suggested modifications and improvements to the proposed programs as well as the proposed implementation strategy.

Case No. 09-1947-EL-POR, 09-1948-EL-POR, 09-1949-EL-POR, 09-1942-EL-EEC, 09-1943-EL-EEC, 09-1944-EL-EEC, POR, 09-580-EL-EEC, 09-580-EL-EEC, 09-580-EL-EEC, Public Utilities Commission of Ohio. Provided testimony on behalf of The Office Of The Environmental Law and Policy Center regarding the Ohio Edison Company, The Cleveland Electric Illuminating Company and the Toledo Edison Company for approval of their energy efficiency and peak demand reduction program portfolio and associated cost recovery mechanism and approval of their initial benchmark reports and in the matter of the energy efficiency and peak demand reduction programs. I reviewed, analyzed and assessed the appropriateness of the proposed plans, benchmark reports and proposed peak reduction program portfolio. I suggested modifications and improvements to the proposed programs. I also made recommendations regarding the proposed implementation strategy as well as accounting and program cost tracking.

Case No. U-16412, (10/10), Michigan Public Service Commission. Provided testimony on behalf of the Natural Resources Defense Council, Michigan Environmental Council and The Environmental Law and Policy Center regarding the Consumers Energy Company request to amend its natural gas & energy efficiency Energy Optimization Plan. I reviewed the application, testimony, exhibits, discovery responses and submitted testimony that recommended modifications to the proposed Energy Optimization Plan.

Case No. 10-0570, (11/10), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the Commonwealth Edison Company application for approval of its proposed Energy Efficiency and Demand Response Plan. Assessed the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed plan filing.

Case No. 10-0568, (11/10), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the Central Illinois Light Company d/b/a and Ameren CIPS CENTRAL ILLINOIS PUBLIC SERVICE COMPANY and Ameren CIPS ILLINOIS POWER COMPANY d/b/a Ameren IP application for approval of its proposed Energy Efficiency and Demand Response Plan. Assessed the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed plan filing.

Case No. 10-0564, (11/10), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the People's Gas Light and Coke Company and North Shore Gas Company request for approval of its proposed Energy Efficiency Plan. Assessed the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed plan filing.

Case No. 10-0567, (11/10), Illinois Commerce Commission. Provided testimony on behalf of the Environmental Law and Policy Center regarding the Northern Illinois Gas Company application for approval of its proposed Energy Efficiency Plan and approval of Rider 30, Energy Efficiency Plan Cost recovery and related changes to Nicor tariffs. Assessed the proposed energy efficiency and demand response plan and recommended modifications and improvements to the proposed plan filing.

Case No. M-2010-2210316, (3/11), Pennsylvania Public Utility Commission. I provided testimony on behalf of The Office Of Consumer Advocate regarding the UGI Utilities, Inc. Electric Division (UGI-Electric) request for Efficiency and Conservation Plan approval. I analyzed the proposed plan and made an assessment of the proposed energy efficiency and demand response and cost recovery plan. I suggested modifications and improvements to the proposed programs and implementation strategy.

Case No. 11-07026 and 11-07027, (11/11), Nevada Public Utilities Commission. I provided testimony on behalf of the Bureau of Consumer Protection regarding both the Sierra Pacific Power Company and Nevada Power Company 2011 Annual Demand Side Management Update reports. I reviewed the filings and made recommendations regarding various aspects of demand response resources and demand side management portfolios.

In addition, I have served the following public sector clients since 1990.

Client	**Nature of Service**
Alaska Housing Finance Corporation	Analysis of energy efficiency, system planning and applicability of Energy Policy Act standards to Alaska resource selection process.
California Low Income Governing Board	In conjunction with AB 1890 the state's restructuring statute provided analyses of options to deliver energy efficiency and assistance programs to low-income households in a restructured utility environment. Assisted the CPUC and Low Income Governing Board in developing low-income energy assistance and energy efficiency programs, implementation methods and procedures under interim utility administration.
Conservation Law Foundation of New England	Provided technical support to the collaborative working groups with Boston Edison, United Illuminating, Eastern Utilities Association, and Nantucket Electric regarding system planning approaches, energy efficiency programs and resource screening.
District of Columbia Public Service Commission	Testimony regarding demand-side management, least cost planning principles.
Germantown Settlement, Philadelphia	Analysis and technical support regarding business structure and market to aggregate load and/or provide energy efficiency and energy assistance services to low-income households.
City of New Orleans	Developed least cost planning rules, guided a public working group to develop demand-side programs, and developed a low income, senior citizens energy efficiency program.
Oak Ridge National Laboratory	Prepared an economic analysis of the customer impact from various electricity restructuring configurations for the State of Ohio
Ohio Office of Consumer Council	Analyzed two utilities' long-range plans and energy efficiency resource options. Analyzed the Dominion East Gas Company application to be relieved of the merchant function.
Ontario Energy Board	Developed demand-side management programs and evaluated

	need for natural gas integrated resource planning rules.
U.S. Environmental Protection Agency	Developed handbook, "Energy Efficiency and Renewable Energy: Opportunities from Title IV of the Clean Air Act", which focuses on how energy efficiency and renewables relate to acid rain compliance strategies.
U.S. Environmental Protection Agency and U.S. Department of Energy	Analyzed and compared utility supply- and demand-side resource selection for Clean Air Act compliance on the Pennsylvania-New Jersey-Maryland (PJM) interconnection.
Washington State Weatherization Directors	Natural Gas energy conservation program design involving Cascade Natural Gas Company

Public Law 109–431
109th Congress

An Act

Dec. 20, 2006
[H.R. 5646]

To study and promote the use of energy efficient computer servers in the United States.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. STUDY.

Deadline.

Not later than 180 days after the date of enactment of this Act, the Administrator of the Environmental Protection Agency, through the Energy Star program, shall transmit to the Congress the results of a study analyzing the rapid growth and energy consumption of computer data centers by the Federal Government and private enterprise. The study shall include—

(1) an overview of the growth trends associated with data centers and the utilization of servers in the Federal Government and private sector;

(2) analysis of the industry migration to the use of energy efficient microchips and servers designed to provide energy efficient computing and reduce the costs associated with constructing, operating, and maintaining large and medium scale data centers;

(3) analysis of the potential cost savings to the Federal Government, large institutional data center operators, private enterprise, and consumers available through the adoption of energy efficient data centers and servers;

(4) analysis of the potential cost savings and benefits to the energy supply chain through the adoption of energy efficient data centers and servers, including reduced demand, enhanced capacity, and reduced strain on existing grid infrastructure, and consideration of secondary benefits, including potential impact of related advantages associated with substantial domestic energy savings;

(5) analysis of the potential impacts of energy efficiency on product performance, including computing functionality, reliability, speed, and features, and overall cost;

(6) analysis of the potential cost savings and benefits to the energy supply chain through the use of stationary fuel cells for backup power and distributed generation;

(7) an overview of current government incentives offered for energy efficient products and services and consideration of similar incentives to encourage the adoption of energy efficient data centers and servers;

(8) recommendations regarding potential incentives and voluntary programs that could be used to advance the adoption of energy efficient data centers and computing; and

(9) a meaningful opportunity for interested stakeholders, including affected industry stakeholders and energy efficiency advocates, to provide comments, data, and other information on the scope, contents, and conclusions of the study.

SEC. 2. SENSE OF CONGRESS.

It is the sense of Congress that it is in the best interest of the United States for purchasers of computer servers to give high priority to energy efficiency as a factor in determining best value and performance for purchases of computer servers.

Approved December 20, 2006.

LEGISLATIVE HISTORY—H.R. 5646:

HOUSE REPORTS: No. 109–538 (Comm. on Energy and Commerce).
CONGRESSIONAL RECORD, Vol. 152 (2006):
July 11, 12, considered and passed House.
Dec. 7, considered and passed Senate.

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Appendix D

MARKET POTENTIAL STUDY

Energy Savings and Demand Reduction for Ohio Edison, Toledo Edison, and The Illuminating Company

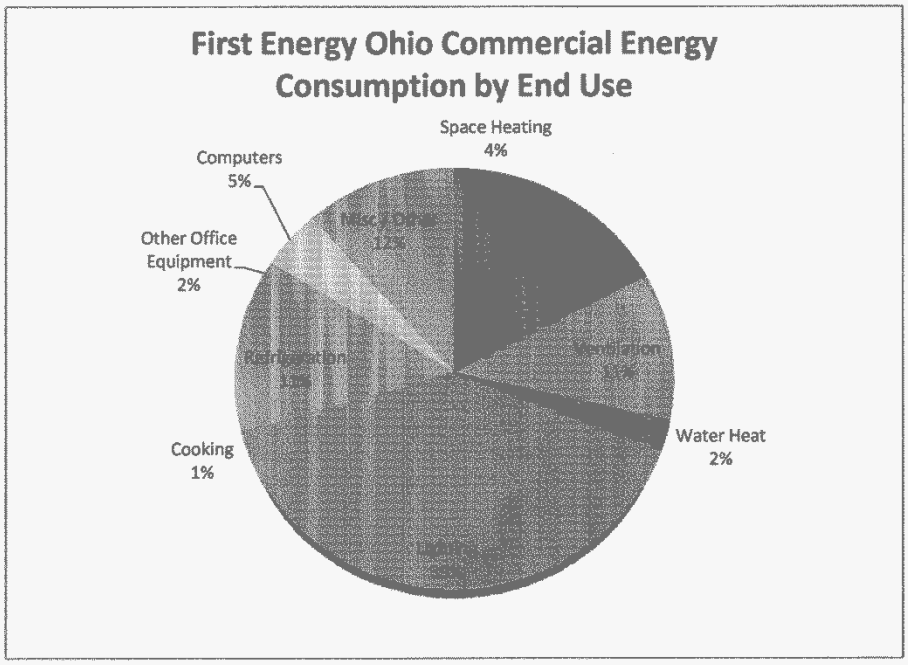
PREPARED FOR

FirstEnergy Corp.

22 JUNE 2012

The following chart shows our estimates of commercial energy usage by end use. This analysis was used in top-down analysis of technical market potential. A detailed table of commercial end use energy consumption can be found in Appendix A.

Figure 8-7 FirstEnergy Ohio Commercial Energy Consumption by End Use



Some measures, such as lighting, required a calculation of current inventory. Some items have no relationship to the number of customers, and therefore the number of these items must be calculated. To calculate the number of four-foot light bulbs in the Companies' territories, a proxy was needed. B&V used an Energy Information Administration Energy Consumption Series: Lighting in Commercial Buildings Study. The study identifies the proper number of lumens needed to light commercial space. This, along with the number of square feet of commercial space identified by the study, B&V was able to calculate the required number of four-foot bulbs. Next, a count of T8 and T12 bulbs from the industrial survey was used to estimate the number of T12 bulbs. This became the basis for the number of bulbs that could be replaced in the Economic Potential study. This number also became the benchmark used to identify the number of bulbs per year that could be replaced in the Market Potential Study.

Table 8-4 Commercial Technical Potential by End-Use

END USE	MAXIMUM SAVINGS (%)	CURRENT MARKET STATE (%)	TECHNICAL POTENTIAL (%)	TECHNICAL POTENTIAL (MWH)	% OF OH COMMERCIAL SALES
Space Heating	46.6%	17.4%	38.5%	264,996	1.7%
Cooling	53.9%	15.4%	45.6%	985,524	5.9%
Ventilation	59.5%	17.7%	49.0%	852,911	5.5%
Water Heat	29.5%	15.9%	24.8%	95,519	0.6%
Lighting	39.7%	26.3%	29.2%	1,758,911	11.4%
Cooking	66.7%	13.4%	57.6%	52,125	0.3%
Refrigeration	25.0%	40.7%	14.8%	263,473	1.7%
Computers	36.8%	11.3%	32.6%	229,336	1.5%
Misc / Other	33.0%	6.8%	30.8%	634,508	4.1%
Total	--	--	32.8%	5,047,503	32.8%

The study indicates large opportunities in lighting and HVAC (space cooling and ventilation) programs. Together, these two end-uses have a technical potential amounting to 23% of present sales.

Xcel Energy®

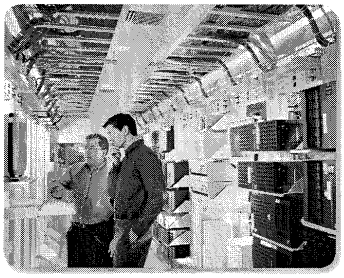
INFORMATION SHEET
COLORADO | MINNESOTA

Data Center Efficiency

BUILDING A GREEN DATA CENTER

Running a data center requires a tremendous amount of energy, and usage is on the rise. In fact, the EPA expects energy use to double every 5 years. For every dollar spent on IT energy usage, companies spend another on related systems energy usage. (Source: IBM, US EPA CSC Data Center Seminar, December 2007). If your business is running a data center, this presents a substantial opportunity to align business and environmental interests by making energy efficiency a priority in their technology management strategy.

The good news for all businesses is that adopting energy-saving, environmentally friendly data center practices can be both financially attractive and easy to implement. Xcel Energy is offering attractive cash rebates to offset the cost of putting your business on the green path to improving its energy efficiency.



Examples of Energy-Efficient Improvements

Companies are facing huge growth rates in data storage, resulting in a 20–30% increase in energy consumption each year, according to the Environmental Protection Agency (EPA). All this means that energy efficiency is more important than ever.

While the news may seem daunting, there are many things you can do to reduce the energy consumption of your data center – and Xcel Energy can help with the following:

- **High-Efficiency Servers** – Experts estimate that new servers are 25% more efficiency than standard servers, and ENERGY STAR® rated servers can be even more efficient.
- **Server Virtualization/Consolidation** – Historically, software programs have been dedicated on a one-to-one relationship with servers. Virtualization software eliminates the need for dedicated servers. Consolidating allows servers to operate at a much higher load factor. Virtualization and consolidation can increase server load factors from a typical 10% to 50–70% without suffering any loss in reliability and may result in up to an 80% reduction in energy use.
- **Airflow Improvements** – Involve efficiently managing the proper amount of air needed to cool the servers in a data center. Strategies include: optimizing air inlet and return, minimizing the mixing of hot and cold air, and directing air only to where it is needed. All will improve the efficiency of air flow, which has a significant impact on the amount of fan energy needed to direct cooled air to the to the appropriate equipment.
- **Electrical Equipment** – Savings are available from higher efficiency batteries, transformers and inverters; high efficiency power supplies in the IT cabinets and high efficiency storage devices.

ACHIEVE BUSINESS SUSTAINABILITY

The Data Center Efficiency program is designed to help Xcel Energy customers address energy conservation opportunities in both new and existing data centers.

Data Center Efficiency improvements deliver energy savings and help you:

- Improve ROI of data management
- Manage increasing energy costs
- Improve reliability of data center performance

- **High-Efficiency Cooling Equipment** – Besides high efficiency chillers and roof top units, technology can raise the supply air temp to the racks by improving distribution of the air. This allows greater use of air side and water side economizers, which reduce the need for central plant cooling.
- **Humidification** – Best practices for data center operation have relaxed humidity controls to a range of 25–60%. Also, more efficient methods of humidifying include evaporative and ultrasonic mechanisms.
- **Power Systems** – There are opportunities to save—from transformer to UPS (uninterruptible power supply) to high-efficiency power supply —in some cases up to 15% more efficient than similar systems that are five or more years old.
- **High-Efficiency Lighting Equipment** – Although generally a small portion of the total energy usage in the data center (around five percent), there is opportunity to install higher-efficiency lighting when retrofitting existing or designing new data centers.

How to Evaluate Your Data Center

Whether you are building a new data center, or looking to make energy efficiency improvements to an existing data center, Xcel Energy can help. Our Data Center Efficiency program takes place in two steps: evaluation and implementation. The Data Center Efficiency service provider will conduct an assessment of your facility, identify potential energy savings and prepare a study report that:

- Helps you build a business case for project approval
- Details how to best run your data center at peak efficiency
- Identifies energy savings, cost estimates and rebate amounts for individual energy conservation opportunities

We offer study rebates up to 75 percent, not to exceed $25,000 and rebates up to $400 per kilowatt saved for preapproved projects. See your Xcel Energy account manager for details.

Project Option

Already have a project in mind without doing a study? Submit your project application for preapproval review today.

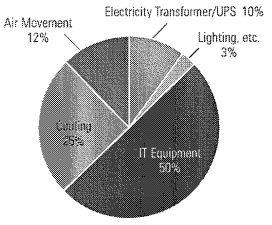
Call Now and Save

Contact your Xcel Energy account manager, or call our Business Solutions Center at **1-800-481-4700** for details

DATA CENTER LOADS

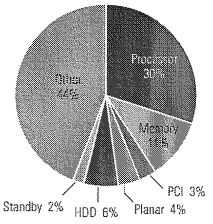
While servers and other IT equipment are the main power users, half the energy consumed is used to simply cool the equipment – which amounts to about 25% of a typical data center's energy consumption. Xcel Energy can help you find the right ways to reduce your consumption, and your energy bill.

Data Center Energy Usage



Source: *EYP Mission Critical Facilities Inc., New York*

IT Equipment Energy Usage



Source: IBM, US EPA CSC Data Center Seminar, December 2007

TAKE CONTROL OF YOUR ENERGY COSTS TODAY

Call your account manager or our **Business Solutions Center** at **1-800-481-4700** for more information or visit **xcelenergy.com/rebates**

LED Street Light Program
Fact Sheet

Turnkey Replacement Service

Your one-stop solution for LED upgrades

Pacific Gas and Electric Company's (PG&E) Light Emitting Diode (LED) Street Light program offers incentives to customers who own and maintain street lights in the PG&E service area on the LS-2 fixed pricing schedule. Through the program, customers who replace or upgrade their existing street lights with new PG&E-approved LED street lights are eligible for new lower pricing and product rebates.

Complementing the program, PG&E also offers a LED Street Light Turnkey Replacement Service. This provides a one-stop solution for customers who want to take advantage of the LED Street Light program and improve their energy efficiency, while minimizing cost and labor resource impacts. The service provides significant cost savings when compared with the project management expense associated with city personnel or city-acquired subcontracted labor.

Drawing on 100 years of experience in street light installation and maintenance, PG&E helps with project design, installation and billing updates, including:

- Volume purchasing power for LED lights
- Coordination of LED lighting selection
- LED fixture installation
- Rebate application completion and processing
- Billing record updates
- Geographic Information Systems (GIS) data
- Waste disposal and salvage of removed street light lamps and fixtures

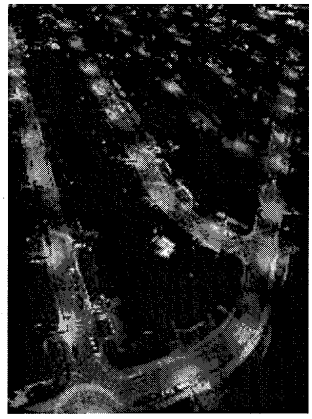
Reducing Energy Use and Cost

Street light replacement represents a significant savings opportunity for cities and counties. In some large cities, street lights may account for one-third of all municipal energy costs. In the PG&E service area, street lights consume about 860 gigawatt-hours of electricity every year, roughly equivalent to powering more than 126,500 homes for a year. Energy savings and return on investment of LED street lighting continues to improve as the technology progresses.

LED Lighting Advantages

In recent years, LED lighting has emerged as a valuable alternative to high pressure sodium (HPS) lights because it provides good lighting performance in terms of general light output, uniformity and correlated color temperature. The yellow-orange HPS street lights typically produce over-lit "hot spots" directly beneath them, while the LEDs maintain consistent luminance levels.

PG&E recently conducted a study in Oakland, Calif., where 15 HPS street lights were replaced with LED lights. A comparison of the two technologies found that the LED lights consumed 36 percent less power, while delivering better lighting quality than HPS luminaries.



In a PG&E pilot study in Oakland, California, HPS street lights were replaced with LED street lights. Following the study, a neighborhood survey found that 70% of respondents preferred the LED street lights, saying the new lights significantly improved pedestrians' ability to see and to recognize people at night while driving.

Turnkey Replacement Service Benefits

Purchasing

- Technical consultation to determine appropriate LED replacement and requirements
- Competitive LED fixture pricing using PG&E's volume purchasing power
- LED fixtures that meet PG&E's stringent standards and qualify for PG&E's LED Street Light rates and rebate program
- A product demonstration of LED lights before final lamp size selection

Installation

- Subcontracted labor and installation to qualified electric contractors
- Utilization of a competitive bid process
- Union and/or union-friendly contractors to assure prevailing wages
- Completion of work in 90-120 days (completion times may vary due to conditions such as heavy traffic or limited work hours permitted by a city)
- Each city will be responsible for securing required permits

Quality Control

- PG&E-trained subcontractors and PG&E inspector verification of all completed work
- One-year guarantee of PG&E workmanship
- Five-year manufacturers' warranty on LEDs
- One-year coverage for failed lamp removal and replacement installation

Disposal

- Assistance with street lamp and fixture disposal

Administration

- Solicitation of material and contractor bids
- Completion of all rebate applications and rate change forms
- Updates to the GIS system
- Data gathering and sample documents for American Recovery and Reinvestment Act (ARRA) reports

LED Street Light Rebates	
Fixture Replacement	Rebate
Replace 70 Watt fixture with new LED fixture	$50
Replace 100 Watt fixture with new LED fixture	$75
Replace150 Watt fixture with LED fixture	$100
Replace 200 Watt fixture with LED fixture	$125
Replace 250 Watt fixture with LED fixture	$150
Replace 310 Watt fixture with LED fixture	$175
Replace 400 Watt fixture with LED fixture	$200

Project Justification

- Help with justifying street light replacement to local governing bodies
- Projected savings calcuations related to energy consumption, maintenance, materials, and lowered greenhouse gas emissions

Complete Package Pricing

- Material, distributor, shipping, sales tax, installation, inspection, PG&E administration, and project management costs (several factors will influence final pricing)

Taking Action

For more information on how PG&E's LED Street Light Program Turnkey Replacement Service can streamline your street light replacement project, contact PG&E's **Business Customer Service Center** at **1-800-468-4743.**

July 2009 CNR-0609-0015

For My Business

Solutions For

Ways To Save & Rebates

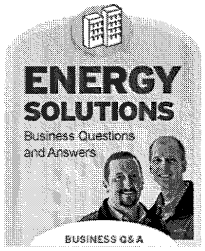
- Agricultural Lighting & Equipment
- Commercial Kitchens
- Commissioning Existing Buildings
- Compressed Air
- Data Centers & IT
- Heating, Ventilation & Air Conditioning (HVAC)
- Insulation & Air Sealing
- **Lighting Equipment, Controls & Design**
  - LED Lighting
  - Linear Fluorescent Lighting
  - Compact Fluorescent Lighting (CFLs)
  - Metal Halide Lighting
  - Lighting Control Equipment
  - Lighting Design
  - **Municipal Street Lighting**
- New Construction & Major Renovation
- Refrigeration & Controls
- Residential Rental Property Rebates
- Swimming Pools

Energy Solutions (Q&A)

Financing

Energy Leadership Challenge

Events



Municipal Street Lighting

Share | Like 0

General Info Find a Contractor or Supplier Get Started Today

Overview Publications & Resources

Improving efficiency in municipal street and public lighting.

Efficiency Vermont's Municipal Street Lighting program is designed to help Vermont municipalities upgrade their older, less efficient lighting technologies in street and public spaces with energy-efficient light emitting diode (LED) lighting.

Street lighting can account for one-quarter of a municipality's electrical bill. With LED lighting, municipalities can significantly reduce energy use, resulting in lower energy costs, and improve the nighttime environment in the community.

Now is an excellent time for municipalities to consider converting to LED street lighting and reap the following benefits:

- Reduced LED costs: LED street lighting technologies have vastly improved and have dropped significantly in cost.
- Financial incentives: Efficiency Vermont can offer financial incentives to help offset some of the costs associated with converting to LED lighting.
- LED tariffs: Many of Vermont's utilities now offer tariffs for LED street lighting that can result in financial savings to municipalities.

Efficiency Vermont encourages municipalities to evaluate their use of older, less efficient street and public space lighting, eliminate unnecessary lighting, and replace remaining lighting with LED lighting systems. Efficiency Vermont can provide guidance and technical assistance to help Vermont municipalities update their street lighting inventory, identify opportunities to eliminate unnecessary lighting, evaluate the relative costs and benefits of purchasing versus leasing lighting, and prepare a scope of work for converting fixtures to LEDs.

To help municipalities get started, Efficiency Vermont developed the step-by-step guide, Improving Efficiency in Municipal Street and Public Space Lighting (pdf 474 kb), and is planning workshops on how to implement a municipal street lighting project.

If your municipality is interested in lowering energy costs by converting to LED street lighting, or if you would like information on future workshops, contact Efficiency Vermont at info@efficiencyvermont.com or 888-921-5990.

Light Meter Loan Program

Municipalities and regional planning commissions can borrow high-quality light meters from Efficiency Vermont for 30 days. These meters help to measure lighting levels and ensure that current and planned lighting levels are appropriate for specific outdoor applications — a crucial step in identifying what street lights can be eliminated. If you are interested in borrowing a meter, contact Efficiency Vermont at info@efficiencyvermont.com or 888-921-5990.

FIND YOUR
REBATES
Municipal Street Lighting rebates include:

LED Outdoor Parking / Roadway Fixtures:
$80 - $250 each

SEE ALL REBATES

FIND YOUR
CONTRACTOR OR SUPPLIER

134 Total Results
Enter Your Zip Code

SEARCH

M.P.S.C. No. 3 – Electric
Wisconsin Electric Power Company
(Rate Case - ***Final*** U-16830)

Fourth Revised Sheet No. D-42.01
Replaces ***Third*** Revised Sheet No. D-42.01

LED STREET LIGHTING SERVICE RATE LED1

Availability:

To all municipal or governmental customers contracting for LED (light emitting diode) street lighting service by means of Company-owned and maintained lighting facilities subject to the availability of Company approved materials and completion of required engineering. This tariff is available ***until June 30, 2014***.

Rate:

Facilities Charge:

One time charge equal to the estimated installed cost of the lighting and related facilities, paid prior to installation of facilities, and monthly facilities charge of one half of one percent (0.5 %) of the estimated installed cost of all lighting and related facilities.

Energy Charge: $0.***09781*** per kWh

The kWh usage to be billed shall be calculated by multiplying the rated input wattage of the original fixture and related accessory equipment by 350 hours.

Subject to the surcharges and credits shown on Sheet Nos. D-3.00 to D-5.05.

Late Payment Charge: A 1.5% per month late payment charge will be applied to outstanding charges past due.

Conditions of Delivery:

1. Upon completion of a signed Agreement and payment, the Company will furnish, install, own and operate a complete LED lighting unit and will supply all electric energy and normal maintenance for the operation of the unit. A lighting unit may include an LED fixture, bracket, control, and monitoring device. This rate requires use of existing Company-owned wood poles and available 120-volt service. Where additional primary and/or secondary facilities are required, the Customer shall pay the full cost of installation.

2. The Company will initiate a first response to maintain lighting units within 72 hours of notification by the Customer. Conditions may require repeat visits to complete repairs. No credit will be allowed for periods during which luminaires are out of service, and no adjustments will be made to the Facilities Charge or energy consumption as a result of component or unit replacement. After a period of 10 years from installation, normal maintenance shall continue but replacement of the fixture or major fixture components are at Customer discretion and require reimbursement of expenses and a new or revised Agreement.

3. In the event of abnormal or excessive maintenance due to frequent vandalism or other causes not related to the quality of material or workmanship, the Customer shall reimburse the Company for all associated costs. The Company shall be responsible for tree trimming only within those work zones which are restricted to qualified utility workers.

4. Luminaires will automatically be switched on approximately 30 minutes after sunset and off 30 minutes before sunrise, providing dusk-to-dawn operation approximately 4,200 hours per year.

5. The Company will, at Customer's expense, modify, replace, relocate, change the position, or temporarily remove and reinstall any properly operating Company-owned poles or fixtures contracted for under this rate as requested in writing by the Customer or as required by a governing authority.

(Continued on Sheet No. D-42.02)

Issued ***June 27, 2012***
R.A. Draba
Vice-President,
Milwaukee, Wisconsin

Effective for service rendered on and after ***June 27, 2012***

Issued under authority of the Michigan Public Service Commission dated ***June 26, 2012*** in Case No. U-16830

LED STREET LIGHTING SERVICE RATE LED1

(Continued from Sheet No. D-42.01)

Conditions of Delivery (Cont'd):

6. *If the Customer, or a governing authority, terminates service or requests the permanent removal of any Company-owned LED lighting facilities within 10 years of installation, the Customer shall reimburse the Company for the lesser of the estimated labor charges for removal of the equipment, or the remaining balance of Facilities Charges to satisfy the 10 year period. Permanent removal of pole mounted lighting facilities more than 10 years after installation shall be at no cost to the Customer.*

7. *When necessary, the Customer shall grant or obtain permissions, easements, ordinance satisfaction, and/or permits to the Company to install/remove lighting facilities on public or private property without expense to the Company. The Customer is responsible for marking all privately owned underground facilities. If such facilities are not marked correctly and are subsequently damaged, the Customer is responsible for damages. All installations shall be in accordance with Company construction standards and any other codes the Company determines to be applicable.*

8. *Part-night, temporary or seasonal service is not available under this rate unless metered, and the Facilities Charge shall continue until unit is permanently disconnected by Company.*

9. *Subject to Company approval, the Company will allow municipal Customers to make attachments of temporary Christmas lighting and/or decorations on Company-owned light poles. The Customer must execute an annual agreement for such attachments and must meet all conditions thereof. Estimated energy consumption will be billed under the current Cg1 energy rate. Time and material charges for installation removal or associated maintenance may also apply.*

10. *Electric service will not be furnished hereunder for breakdown for standby purposes where another source of power is available to the Customer. Energy furnished under this rate shall not be used for purposes other than those specified hereunder and shall not be resold.*

11. *Customer shall indemnify and hold harmless the Company, from and against any and all liability for injuries or damages to persons or property arising or resulting from (a) any interruption or modification of service requested or caused by the Customer; or (b) any lighting, requested by Customer or third party, which does not conform to the Illuminating Engineering Society (IES) Recommended Practices.*

12. *The lighting agreement shall continue in force until terminated upon 30 days' prior written notice given by either of the parties to the other. The Company may remove any and/or all lighting facilities upon termination.*

Interstate Power and Light Company

ELECTRIC TARIFF

Filed with the I.U.B.

Fifth Revised Sheet No. 34
Canceling Fourth Revised Sheet No. 34

ORIGINAL TARIFF NO. 1

Street Lighting Service (All Pricing Zones)
Light Emitting Diode (LED) and Sodium Vapor Lighting N

Rate Codes: 190, 210, 640

Availability:
Available to municipalities, Iowa Department of Transportation, county governments, and other public bodies for the lighting of public highways, streets, alleys, and other thoroughfares. A proper written request from the municipality or government body is required prior to installation. Service hereunder is also subject to Company's Rules and Regulations.

Character of Service:
All-night lighting service of Customer specified streets and thoroughfares will be provided by an overhead high pressure sodium (HPS) vapor (or at IPL's option an LED fixture**) of appropriate luminaire at proper height on an existing wood distribution pole with one span of secondary voltage conductor of 400 feet or less. Service includes installation, operation and maintenance of refractors and controls, in addition to the supply of required electricity. Under conditions requiring permits, exceptional travel or extra maintenance personnel, maintenance will be rendered at direct cost plus applicable overheads. All new facilities will be owned and maintained by the company. All maintenance shall be done during regularly schedule working hours with a reasonable period of elapsed time allowed for such work. N

Net Monthly Rates:
The sum of A, B, C, D, E and F below, as applicable, plus the Energy Cost Adjustment, Energy Efficiency Cost Recovery, and Tax Adjustment Clauses.

A. Lamp and Fixtures on an existing standard wood distribution pole, with overhead wiring.

Price Code 640 – Northern and Southeastern zone
Price Code 210 – Southern zone
Price Code 190 – IPC zone

Lights:

Lamp Size LED** (Watts)	Lamp Size HPS (Watts)	Monthly kWhs (LED/HPS)	All Rates
80	100 & below*	28/45	$ 6.01
	150	67	$ 7.05
	250	104	$13.14
	400	160	$17.85
	1,000	370	$41.01

N

N

* HPS fixtures of less than 100 watts are frozen to existing fixtures at existing locations as of June 30, 2007.
** LED fixture installations are limited to those included in the IPL LED Lighting pilot. N

Date Issued: February 24, 2012
By: Erik C. Madsen – Director, Regulatory Affairs

Effective Date: March 29, 2012

STATE OF NEW YORK

Public Service Commission

Garry A. Brown, Chairman

Three Empire State Plaza, Albany, NY 12223
Further Details: James Denn
james_denn@dps.state.ny.us | 518.474.7080
http://www.dps.state.ny.us

10108/10-E-0420

RATES FOR NEW LIGHTING TECHNOLOGY APPROVED

— PSC Paves Central Hudson's Way to Install Municipal LED Street Lighting —

Albany, NY—11/18/10—The New York State Public Service Commission (Commission) today approved a new pricing option for Central Hudson Gas & Electric Corporation to enable municipalities to install energy efficient light emitting diodes (LED) street-lighting.

"A major operating cost municipalities face is the cost of operating and maintaining street lights," said Commission Chairman Garry Brown. "The key advantages of state-of-the-art LED street lights over traditional street lights are lower energy costs, improved night visibility, significantly longer life spans, reduced maintenance costs, and a much lower environmental impact. Installing more energy efficiency lighting devices is clearly the wave of the future."

On August 26, 2010, Central Hudson filed tariff revisions to add a new LED pricing option to its service classifications. Central Hudson wanted to do this because several municipalities in its service territory indicated plans to install LED lights made possible by the American Recovery Reinvestment Act of 2009 (ARRA) stimulus funding. The change approved by the Commission will enable the rates for new LED fixtures requested by municipalities in Central Hudson's service territory.

While some other utilities already have tariff rate designs that encourage the installation of LED street lighting in cities such as Rochester and New York City, this is a first for Central Hudson to directly offer tariffs to encourage municipalities to install LED street lighting. Similarly, Orange and Rockland Utilities, Inc. proposed company-owned LED fixtures in its street lighting tariffs in its ongoing rate case.

The annual kWh applicable to each new LED fixture will be calculated according to the company's current tariff provisions. The annual charges for each fixture will be calculated according to the methodology currently used by the company to develop rates for existing street light fixtures. Installation and/or attachment considerations will be addressed on a case-by-case basis.

LED streetlights strike the best balance between brightness, affordability, and energy and environmental conservation when their life span is considered. LEDs consist of clusters of tiny, high-intensity bulbs and are extolled for their power efficiency and clear luminosity. The most common type of street light is the high-pressure sodium (HPS) lamps found in most cities. While LEDs are more expensive than HPS lamps, they consume half the electricity, last up to five times longer, and produce more light.

The Commission's decision today, when issued, may be obtained by going to the Commission Documents section of the Commission's Web site at www.dps.state.ny.us and entering Case Number 10-E-0420 in the input box labeled "Search for Case/Matter Number." Many libraries offer free Internet access. Commission orders may also be obtained from the Commission's Files Office, 14th floor, Three Empire State Plaza, Albany, NY 12223 (518-474-2500).

-30-

Summary: Testimony of Geoffrey C. Crandall electronically filed by Mr. Justin M Vickers on behalf of Environmental Law & Policy Center and Ohio Environmental Council