Ohio | Public Utilities Commission

Application to Commit Energy Efficiency/Peak Demand Reduction Programs (Mercantile Customers Only)

Case No.: 10-1632**-EL-EEC**

Rule 4901:1-39-05(F), Ohio Administrative Code (O.A.C.), permits a mercantile customer to file, either individually or jointly with an electric utility, an application to commit the customer's existing demand reduction, demand response, and energy efficiency programs for integration with the electric utility's programs. The following application form is to be used by mercantile customers, either individually or jointly with their electric utility, to apply for commitment of such programs implemented during the prior three calendar years.

Completed applications requesting the cash rebate reasonable arrangement option (Option 1) in lieu of an exemption from the rider will be automatically approved on the sixty-first calendar day after filing, unless the Commission, or an attorney examiner, suspends or denies the application prior to that time. Completed applications requesting the exemption from the electric utilities' energy efficiency rider option (Option 2) will not qualify for the 60-day automatic approval.

Complete a separate application for each customer program. Projects undertaken by a customer as a single program at a single location or at various locations within the same service territory should be submitted together as a single program filing, when possible. Check all boxes that are applicable to your program. For each box checked, be sure to complete all subparts of the question, and provide all requested additional information. Submittal of incomplete applications may result in a suspension of the automatic approval process or denial of the application.

If you consider some of the items requested in the application to be confidential or trade secret information, please file a copy of the application under seal, along with a motion for protective order pertaining to the material you believe to be confidential. Please also file a copy of the application in the public docket, with the information you believe to be confidential redacted.

Section 1: Company Information

Name: CITY OF NEWARK

Principal address: 40 W. Main St., Newark, Oh 43055

Address of facility for which this energy efficiency program applies: 1140 Hollander St, Newark, Oh 43055-6043

Name and telephone number for responses to questions:

Carl Hurst, City Of Newark, (740) 670-7783

Electricity use by our company (at least one must apply to your company—check the box or boxes that apply):

- ☐ We use more than seven hundred thousand kilowatt hours per year at our facility. (Please attach documentation.)

  See Confidential and Proprietary Attachment 4 – Calculation of Rider Exemption and UCT which provides the facility consumption for the last three years, benchmark kWh, and the last 12 months usage.

- ☒ We are part of a national account involving multiple facilities in one or more states. (Please attach documentation.) When checked, see Attachment 6 – Supporting Documentation for a listing of the customer's name and service addresses of other accounts in the AEP Ohio service territory.

Section 2: Application Information

A) We are filing this application (choose which applies):

- ☐ Individually, on our own.
- ☒ Jointly with our electric utility.

B) Our electric utility is: Ohio Power Company

The application to participate in the electric utility energy efficiency program is "Confidential and Proprietary Attachment 3 – Self Direct Program Project Completed Application."

C) We are offering to commit (choose which applies):

- ☐ Energy savings from our energy efficiency program. (Complete Sections 3, 5, 6, and 7.)
- ☐ Demand reduction from our demand response/demand reduction program. (Complete Sections 4, 5, 6, and 7.)
- ☒ Both the energy savings and the demand reduction from our energy efficiency program. (Complete all sections of the Application.)

Section 3: Energy Efficiency Programs

A) Our energy efficiency program involves (choose whichever applies):

☒ Early replacement of fully functioning equipment with new equipment. (Provide the date on which you replaced your fully functioning equipment, 12/30/2007 and the date on which you would have replaced your equipment if you had not replaced it early. Please include a brief explanation for how you determined this future replacement date (or, if not known, please explain why this is not known)).

The remaining life of the equipment varies and is not known with certainty. The future replacement date is unknown and has historically been at the end of equipment life. Replacement was completed early to achieve energy savings and to reduce future maintenance costs.

☐ Installation of new equipment to replace equipment that needed to be replaced. We installed our new equipment on the following date(s):

☐ Installation of new equipment for new construction or facility expansion. We installed our new equipment on the following date(s):

B) Energy savings achieved/to be achieved by your energy efficiency program:

a) If you checked the box indicating that your project involves the early replacement of fully functioning equipment replaced with new equipment, then calculate the annual savings [(kWh used by the original equipment) – (kWh used by new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

Unit Quantity (watts) = Existing (watts x units) – Installed (watts x units)

kWh Reduction (Annual Savings) = Unit Quantity x (Deemed kWh/Unit)

Annual savings: 18,800 kWh

See <u>Confidential and Proprietary Attachment 5 – Self Direct Program Project Calculation</u> for annual energy savings calculations and <u>Attachment 8 – Prescriptive Protocols</u> for the work papers that provide all methodologies, protocols, and practices used in this application for prescriptive measures, as needed.

b) If you checked the box indicating that you installed new equipment to replace equipment that needed to be replaced, then calculate the annual savings [(kWh used by less efficient new equipment) – (kWh used by the higher efficiency new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

Annual savings: kWh

Please describe the less efficient new equipment that you rejected in favor of the more efficient new equipment.

c) If you checked the box indicating that your project involves equipment for new construction or facility expansion, then calculate the annual savings [(kWh used by less efficient new equipment) – (kWh used by higher efficiency new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

Annual savings: kWh

Please describe the less efficient new equipment that you rejected in favor of the more efficient new equipment.

Section 4: Demand Reduction/Demand Response Programs

A) Our program involves (choose which applies):

☒ Coincident peak-demand savings from our energy efficiency program.

☐ Actual peak-demand reduction. (Attach a description and documentation of the peak-demand reduction.)

☐ Potential peak-demand reduction (choose which applies):

- Choose one or more of the following that applies:

  ☐ Our peak-demand reduction program meets the requirements to be counted as a capacity resource under a tariff of a regional transmission organization (RTO) approved by the Federal Energy Regulatory Commission.

  ☐ Our peak-demand reduction program meets the requirements to be counted as a capacity resource under a program that is equivalent to an RTO program, which has been approved by the Public Utilities Commission of Ohio.

B) What is the date your peak demand reduction program was initiated?

The coincident peak-demand savings are permanent installations that reduce demand through energy efficiency and were installed on the date specified in Section 3 A above.

C) What is the peak demand reduction achieved or capable of being achieved (show calculations through which this was determined):

Unit Quantity (watts) = Existing (watts x units) – Installed (watts x units)

KW Demand Reduction = Unit Quantity (watts) x (Deemed KW/Unit (watts))

3.6 kW

See Confidential and Proprietary Attachment 5 – Self Direct Program Project Calculation for peak demand reduction calculation, and Attachment 8 – Prescriptive Protocols for the work papers that provide all methodologies, protocols, and practices used in this application for prescriptive measures, as needed.

Section 5: Request for Cash Rebate Reasonable Arrangement (Option 1) or Exemption from Rider (Option 2)

Under this section, check the box that applies and fill in all blanks relating to that choice.

Note: If Option 2 is selected, the application will not qualify for the 60-day automatic approval. All applications, however, will be considered on a timely basis by the Commission.

A) We are applying for:

☒ Option 1: A cash rebate reasonable arrangement.

OR

☐ Option 2: An exemption from the cost recovery mechanism implemented by the electric utility.

B) The value of the option that we are seeking is:

Option 1: A cash rebate reasonable arrangement, which is the lesser of (show both amounts):

☐ A cash rebate, based on avoided generation cost, of $______________. (Attach documentation showing the methodology used to determine the cash rebate value and calculations showing how this payment amount was determined.)

OR

☒ A cash rebate valued at no more than 50% of the total project cost, which is equal to $ 1,557.75. (Attach documentation and calculations showing how this payment amount was determined.)

See Confidential and Proprietary Attachment 5 – Self Direct Program Project Calculation for incentive calculations for this mercantile program.

Option 2: An exemption from payment of the electric utility's energy efficiency/peak demand reduction rider.

☐ An exemption from payment of the electric utility's energy efficiency/peak demand reduction rider for ____ months (not to exceed 24 months). (Attach calculations showing how this time period was determined.)

OR

☐ Ongoing exemption from payment of the electric utility's energy efficiency/peak demand reduction rider for an initial period of 24 months because this program is part of an ongoing efficiency program that is practiced by our organization. (Attach documentation that establishes your organization's ongoing efficiency program. In order to continue the exemption beyond the initial 24 month period your organization will need to provide a future application establishing additional energy savings and the continuance of the organization's energy efficiency program.)

Section 6: Cost Effectiveness

The program is cost effective because it has a benefit/cost ratio greater than 1 using the (choose which applies):

☐ Total Resource Cost (TRC) Test. The calculated TRC value is: ______ (Continue to Subsection 1, then skip Subsection 2)

☒ Utility Cost Test (UCT) . The calculated UCT value is: 5.0 (Skip to Subsection 2.)

<u>Subsection 1: TRC Test Used (please fill in all blanks).</u>

The TRC value of the program is calculated by dividing the value of our avoided supply costs (capacity and energy) by the sum of our program costs and our electric utility's administrative costs to implement the program.

Our avoided supply costs were _______.

Our program costs were _______.

The utility's administrative costs were _______.

<u>Subsection 2: UCT Used (please fill in all blanks).</u>

We calculated the UCT value of our program by dividing the value of our avoided supply costs (capacity and energy) by the costs to our electric utility (including administrative costs and incentives paid or rider exemption costs) to obtain our commitment.

Our avoided supply costs were $ 2,108.70

The utility's administrative costs were $ 112.80

The utility's incentive costs/rebate costs were $ 1,557.75.

Section 7: Additional Information

Please attach the following supporting documentation to this application:

- Narrative description of your program including, but not limited to, make, model, and year of any installed and replaced equipment.

  See Attachment 1 - Self Direct Project Overview and Commitment for a description of the project. See Attachment 6 – Supporting Documentation, for the specifications of the replacement equipment Attachment 8 – Prescriptive Protocols for the work papers that provide all methodologies, protocols, and practices used in this application for prescriptive measures, as needed. Due to the length of time since the equipment replacement, the make, model and year of the replaced equipment is not available.

- A copy of the formal declaration or agreement that commits your program to the electric utility, including:

  1) any confidentiality requirements associated with the agreement;

     See Attachment 2 – Self Direct Program Project Blank Application including Rules and Requirements. All confidentially requirements are pursuant to the Retrospective Projects/Rules and Requirements that are part of the signed application which is provided as Confidential and Proprietary Attachment 3 – Self Direct Program Project Completed Application.)

  2) a description of any consequences of noncompliance with the terms of the commitment;

     See Attachment 2 – Self Direct Program Project Blank Application including Rules and Requirements. All consequences of noncompliance are pursuant to the Retrospective Projects/Rules and Requirements that are part of the signed application which is provided as Confidential and Proprietary Attachment 3 – Self Direct Program Project Completed Application.

  3) a description of coordination requirements between you and the electric utility with regard to peak demand reduction;

     None required because the resources committed are permanent installations that reduce demand through increased efficiency during the Company's peak summer demand period generally defined as May through September and do not require specific coordination and communication to provide demand reduction capabilities to the Company.

4) permission by you to the electric utility and Commission staff and consultants to measure and verify energy savings and/or peak-demand reductions resulting from your program; and,

   See Attachment 2 – Self Direct Program Blank Application including Rules and Requirements granting such permission pursuant to the Retrospective Projects/Rules and Requirements that are part of the signed application which is provided as Confidential and Proprietary Attachment 3 – Self Direct Program Project Completed Application.

5) a commitment by you to provide an annual report on your energy savings and electric utility peak-demand reductions achieved.

   See Attachment 1 - Self Direct Project Overview and Commitment for the commitment to comply with any information and compliance reporting requirements imposed by rule or as part of the approval of this arrangement by the Public Utilities Commission of Ohio.

- A description of all methodologies, protocols, and practices used or proposed to be used in measuring and verifying program results. Additionally, identify and explain all deviations from any program measurement and verification guidelines that may be published by the Commission.

  The Company applies the same methodologies, protocols, and practices to Self Direct Program retrospective projects that are screened and submitted for approval as it does to prospective projects submitted through its Prescriptive and Custom Programs. The Commission has not published a technical reference manual for use by the Company so deviations can not be identified. The project submitted is a prescriptive project and energy savings are determined as described in Confidential and Proprietary Attachment 5 - Self Direct Program Project Calculation, and Attachment 8 – Prescriptive Protocols for the work papers that provide all methodologies, protocols, and practices used in this application for prescriptive measures, as needed.

Ohio | Public Utilities Commission

Application to Commit Energy Efficiency/Peak Demand Reduction Programs (Mercantile Customers Only)

Case No.: 10-1632-EL-EEC

State of OHIO :

WILLIAM RINGROSE, Affiant, being duly sworn according to law, deposes and says that:

1. I am the duly authorized representative of:

   KEMA Services, Inc agent of Ohio Power

2. I have personally examined all the information contained in the foregoing application, including any exhibits and attachments. Based upon my examination and inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete.

3. I am aware of fines and penalties which may be imposed under Ohio Revised Code Sections 2921.11, 2921.31, 4903.02, 4903.03, and 4903.99 for submitting false information.

William Ringrose QC MANAGER
Signature of Affiant & Title

Sworn and subscribed before me this 30th day of November, 2010 Month/Year

Angie Doan
Signature of official administering oath

Angie Doan, Outreach Manager
Print Name and Title

My commission expires on 01-03-11

NOTARIAL SEAL STATE OF OHIO
ANGIE DOAN
Notary Public, State of Ohio
My Commission Expires 01-03-11

AEP OHIO
A unit of American Electric Power

Self Direct Project Overview & Commitment

The Public Utility Commission of Ohio (PUCO) will soon review your application for participation in AEP Ohio's Energy Efficiency/Peak Demand Response program. Based on your submitted project, please select by initialing one of the two options below, sign and fax to 877-607-0740.

Customer Name	**CITY OF NEWARK**		
Project Number	**AEP-10-01090**		
Customer Premise Address	**1140 HOLLANDER ST, NEWARK, OH 43055-6043**		
Customer Mailing Address	**40 W. Main St., Newark, OH 43055**		
Date Received	**12/8/2009**		
Project Installation Date	**12/30/2007**		
Annual kWh Reduction	**18,800**		
Total Project Cost	**$9,900.69**		
Unadjusted Energy Efficiency Credit (EEC) Calculation	**$2,077.00**		
Simple Payback (yrs)	**6.0**		
Utility Cost Test (UCT)	**5.0**		
			Please Choose One Option Below and Initial
Option 1 - Self Direct EEC: 75%	**$1,557.75**	✓	**Initial:** DK
Option 2 - EE/PDR Rider Exemption	**109 Months (After PUCO Approval)**	☐	**Initial:**

Note: *This is a one time selection. By selecting Option 1, the customer will receive payment in the amount stated above. Selection of Option 2: EE/PDR rider exemption, will result in the customer not being eligible to participate in any other energy efficiency programs offered by AEP Ohio during the period of exemption. In addition, the term of Option 2: EE/PDR rider exemption is subject to ongoing review for compliance and could be changed by the PUCO.*

If Option 1 has been selected, will the Energy Efficiency Funds selected help you move forward with other energy efficiency projects? ✓ YES ✓ NO

Project Overview:

The Self Direct (Prescriptive) project that the above has completed and applied is as follows.

Retrofit (290) F34T12 lamps and ballasts with F28T8 lamps and ballasts
Retrofit (1) incandescent lamp with screw-base CFL
Retrofit (4) F34T12 Utube lamps and ballasts with F28T8 Utube lamps and ballasts
Retrofit (1) incandescent exit sign with LED exit sign

The documentation that was included with the application proved that the energy measures applied for were purchased and installed.

By signing this document, the Mercantile customer affirms its intention to commit and integrate the above listed energy efficiency resources into the utility's peak demand reduction, demand response, and energy efficiency programs. By signing, the Mercantile customer also agrees to serve as a joint applicant in any filings necessary to secure approval of this arrangement by the Public Utilities Commission of Ohio, and comply with any information and compliance reporting requirements imposed by rule or as part of that approval.

Ohio Power Company	**CITY OF NEWARK**
By: Jon F. Williams	By: Daniel Coffman
Title: Manager	Title: Service Director
Date: 10/25/10	Date: 10/22/10

AEP OHIO
A unit of American Electric Power

Self-Direct Program
Project Application

Application Instructions

- Complete the application form for each installation account number.
- Complete the Self-Direct Program spreadsheet, which is in Excel format, fully describing each measure replaced and installed along with project costs, existing and new equipment inventories/operation descriptions, baseline and new usage measurements or detailed calculations, total energy and demand savings, and other specified information. It shall be the customer's responsibility to provide all necessary documentation, calculations, and energy impact and summer peak demand saving verification in order to justify the project for incentives.
- Complete the Self-Direct Program project description and include all required documentation including detailed customer-approved invoices, proof of purchase, receipts, technical specifications, studies/proposals, etc.
- NOTE: Sending inadequate invoice documentation, incomplete/incorrect forms, or backup information, including detailed energy and summer peak demand calculations, will delay review of the application. Contact AEP Ohio if you require additional assistance in completing the application.
- Submit all information to AEP Ohio. All completed submissions become the property of AEP Ohio. Make a copy of all documents for your records.

FORM SUBMITTAL: Please note all Rules and Requirements.
Return the signed, completed form and all required detailed documentation to:

Mail: AEP Ohio
6031 East Main Street, Suite 190
Columbus, OH 43213
Fax: 877-607-0740
Email: gridsmartohio@kema.com
Questions: Call 877-607-0739

Visit **gridsmartohio.com** for more information on the Self-Direct Program and other energy efficiency incentive programs offered by AEP Ohio.

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A unit of American Electric Power

Self-Direct Program
Project Application

Project ID provided by AEP Ohio
PROJECT ID: ____________

THIS INCENTIVE APPLICATION FORM IS VALID THROUGH DECEMBER 31, 2009.

☐ **Pre-approval Application** ☐ **Final Application**

SECTION 1: SELF-DIRECT CUSTOMER INFORMATION

Company Name		Contract Date of Acceptance
Mailing Address		
City	State	Zip Code
Contact Name (print)	Phone	Fax
Contact E-mail*		

Building Type: ☐ Office ☐ School/College ☐ Retail/Service ☐ Restaurant ☐ Hotel/Motel ☐ Medical ☐ Grocery ☐ Warehouse ☐ Light industry ☐ Heavy Industry ☐ Government/Municipal ☐ Other____________

By signing here, I acknowledge the information on this application is accurate and complete. I confirm I have read, agree with and understand the Rules and Requirements of this application and I have the authority to execute on behalf of my company / corporation.

Customer Signature ________________________________ **Date** ____________

* By providing your e-mail address, you are granting AEP Ohio permission to send further e-mails regarding our programs and services

SECTION 2: COMPLETION AND PAYMENT INFORMATION

Attention to	Total Incentive Amount Requested $	
Taxpayer ID # of Recipient (if not a Corporation or Tax Exempt)	Total Project Cost $	Total Incremental Cost $
☐ Corporation (Inc, LLC, PC, etc.) ☐ Tax Exempt ☐ Other (Individual, Partnership – may receive 1099)	Total Annual kWh Claimed	kW Demand Reduction Claimed

SECTION 3: JOB SITE INFORMATION (where equipment was installed)

Job Site Name			Project Contact Name
Job Site Address (physical location)			Project Contact Telephone
City	State	Zip Code	Project Contact Email
Job Site AEP Ohio Account Number (primary account)		Job Site Premise Number	

SECTION 4: CONTRACTOR INFORMATION (equipment or service provider/ installer)

Contractor Name			
Contractor Street Address	City	State	Zip Code
Contractor Contact Name	Contact Telephone	Contact Email	

SECTION 5: CUSTOMER ELECTION (CHOOSE ONE OPTION AND COMPLETE ASSOCIATED INFORMATION)

Option #1	☐ Incentive Payment	Incentive Calculation: $ ____________
Option #2	☐ Exemption From EE/PDR Rider	# of Months Exempted: ____ months (calculation provided by AEP Ohio)

Self-Direct Program

Retrospective Projects / Rules and Requirements

Columbus Southern Power Company and Ohio Power Company are collectively known as AEP Ohio ("AEP Ohio"). AEP Ohio provides energy-efficiency incentives for the purchase and installation of qualifying cost-effective equipment in the customer's facility (the customer's "Commitment of Resources") under the Rules and Requirements provided in this incentive application and subject to regulatory approvals.

Customer Qualifications

The Self-Direct Program (the "Program") applies to customers served at AEP Ohio's retail electric rates who meet the minimum energy usage requirements of 700,000 kWh per year or who are part of a national account involving multiple facilities in one or more states. This application defines the Date of Acceptance.

Terms and Conditions

- THIS INCENTIVE APPLICATION FORM IS VALID FOR SUBMITTAL BY SELF-DIRECT CUSTOMERS UNTIL DECEMBER 31, 2009. AEP Ohio incentive programs may be changed or cancelled at any time without notice. The Customer and its contractor are solely responsible for contacting AEP Ohio to ask whether or not the program is still in effect and to verify program parameters.
- Customer agrees to commit all energy and demand resources identified in this application to AEP Ohio's energy and demand target / benchmarks as identified in Senate Bill 221.
- Incentive payments are available while program funding lasts.
- To ensure maximum program participation, AEP Ohio reserves the right to limit funding on a per project basis.
- Pre-approval by AEP Ohio is required.
- Incentive items must be installed on the AEP Ohio electric account listed on the application.
- The incentive payment shall be:
  - 75% of the calculated incentive under the Business Lighting or Custom Program, whichever is applicable to this project.
- In lieu of a one-time incentive payment, the customer may elect to seek an exemption from the Energy Efficiency / Peak Demand Reduction (EE/PDR) Rider for the associated electric account(s) for a defined period of time as stated on this Application. For this exemption, and as defined in the table below, the incentive payment amount is compared to the estimated net present value (NPV) of the customer's estimated EE/PDR rider obligation, as calculated by AEP Ohio. If exemption is elected, the customer is not eligible for other programs offered by AEP Ohio during the period of exemption. Unless additional resources are committed, the customer will, after the specified number of months on this Application, be subject to the EE/PDR Rider.
- If an incentive is elected, the customer remains in the EE/PDR rider for the period of time that an exemption would have been in effect and may also participate in other AEP Ohio programs.
- All equipment must be new; used or rebuilt equipment is **not** eligible for an incentive.
- Eligible measures must produce **verifiable** and **persistent** energy and/or demand reduction, for a period of no less than five (5) years from the date of installation, through an increase in efficiency or through the use of load-shifting technologies. Measurement and verification may be required.
- Ineligible measures:
  1. Rely solely on changes in customer behavior and require no capital investment, or merely terminate existing processes, facilities and/or operations.
  2. Are required by state or federal law, building or other codes, or are standard industry practices.
  3. Involve fuel switching, plug loads, or generate electricity.
  4. Are easily reverted / removed or are installed entirely for reasons other than improving energy efficiency.
  5. Include other conditions to be determined by AEP Ohio.
- Projects submitted for retrospective claims must be installed and operating between January 1, 2006 and the Date of Acceptance into the Self-Direct Program. Incentive levels, as shown in the table below, are based on the calendar year of installation / operation. Customer shall provide proof of equipment installation / operation start-up.
- All applications are subject to AEP Ohio, its contractor(s) / agent(s), and the Public Utility Commission of Ohio (PUCO) review and approval prior to any incentives paid or exemption from the EE/PDR Rider under this program.
- Customer is allowed and encouraged to consider using all or a portion of the incentive payment, as received from AEP Ohio under this program, to help fund other customer-initiated energy efficiency and demand reduction projects in the future. Future projects can also qualify for incentives under the Business Lighting or Custom program.
- A signed final application with documentation verifying installation of the project including, but not limited to, equipment, invoices, approvals, and other related information must be submitted to AEP Ohio prior to application approval.
- The summer peak period is defined as weekday peak-demand hours (7:00 AM to 9:00 PM, May through September).
- Customers are encouraged to submit projects that warrant special treatment (i.e., non-typical projects) to be considered on a case-by-case basis by AEP Ohio.
- AEP Ohio reserves the right to randomly inspect customer facility(ies) for installation of materials listed on this incentive application and will need access to survey the installed project. Customer understands and agrees that Program installations may also be subject to inspections by the PUCO or their designee, and photographs of installation may be required. All documentation and verification is subject to strict confidentiality.
- If the inspection finds that customer did not comply with program rules and requirements, any incentive received under this Program must be returned to AEP Ohio including interest. Exemption from the rider will be voided as well. In addition, AEP Ohio reserves the right to withhold payment or exemption for projects that do not meet reasonable industry standards as determined by AEP Ohio.
- AEP Ohio reserves the right to refuse payment and participation if the customer or contractor violates program rules and procedures. AEP Ohio is not liable for incentives promised to customers as a result of program misrepresentation.
- The customer understands and agrees that all other terms and conditions, as specified in the application, including all attachments and exhibits attached to this application, which will serve as a contract for the customer's commitment of energy and demand resources to AEP Ohio, shall apply.
- AEP Ohio reserves the right to request additional backup information, supporting detail, calculations, manufacturer specification sheets or any other information prior to any incentive payment.
- Equipment could have been installed in retrofit, replacement, or new construction applications and must meet reasonable industry standards. All equipment / measures must meet minimum cost effectiveness requirements as defined or determined by AEP Ohio. Customer must also provide evidence of measure life.
- AEP Ohio will issue any approved incentives in the form of checks.
- Customer can not apply for incentives for future projects and elect after the fact to apply for exemption under this program.
- All documentation and verification is subject to strict confidentiality.
- All completed submissions become the property of AEP Ohio.

Disclaimers

AEP Ohio:

- Does not endorse any particular manufacturer, product or system design by offering these incentives.
- Will not be responsible for any tax liability imposed on the customer as a result of the payment of incentives. AEP Ohio will report incentives greater than $as income on IRS form 1099. Such incentives shall be taxable unless Customer 600 meets acceptable tax exemption criteria. Customers are encouraged to consult with their tax advisors about the taxability of any incentive payments.
- Does not expressly or implicitly warrant the performance of installed equipment (contact your contractor for detailed equipment warranties).
- Is not responsible for the proper disposal/recycling of any waste generated as a result of this project.
- Is not liable for any damage caused by the operation or malfunction of the installed equipment.
- Does not guarantee that a specific level of energy or cost savings will result from the implementation of energy conservation measures or the use of products funded under this program.

OPTION #1 - ONE-TIME INCENTIVE PAYMENT	
Incentive Levels (for retrospective projects completed since January 1, 2006)	75% of the calculated incentive payment under the current Business Lighting or Custom Programs, whichever is applicable.
Min / Max payback w/o incentive applied	1 year Min / 7 Year Max

OPTION #2 - EXEMPTION FROM EE / PDR RIDER
Exemption from the EE/PDR rider is determined by comparing the value of the one-time incentive payment with the estimated net present value (NPV) of the EE/PDR rider payments, as calculated by AEP Ohio, for the customer's associated electric account. This NPV is defined as the customer's financial contribution to AEP Ohio's efforts to reach EE/PDR targets. Exemption term will be rounded to the nearest month.

Self-Direct Program

Retrospective Project Description: Project ______ of ______

Project Descriptive Name	Project In-service Date
Affected Electric Account Number(s)	

Claimed Project Baseline (AEP Ohio will make the final determination of applicable baseline):

____ Retrofit (the project was an elective retrofit and the equipment was still operable)

____ Replacement (the project was a replacement of equipment at or near the end of its useful life)

____ New (the project was an addition of new equipment in an existing facility or new construction)

Describe the project including detail of energy savings equipment. Attach additional sheets if needed.

Describe the removed equipment and operating strategy. Attach additional sheets if needed.

Describe the installed equipment and operating strategy. Attach additional sheets if needed.

Describe your calculation method for energy savings. Attach additional sheets if needed.

In addition to electrical energy and/or demand reduction, other benefits of proposed project include:

___Conserves other utilities (gas, water, etc.)

___Improves process flow

___Improves product quality

___Increases production capacity

___Meets environmental regulations

___Reduces labor

___Saves energy

___Uses fewer raw materials

___Other ____

Project Technical Specifications

(This sheet provides an example of required data collection. The Self-Direct spreadsheet provides additional guidance and streamlines the process for collecting, documenting and reporting this information to AEP Ohio, and it follows the format of this sheet. Please provide as much detail as possible on the Self-Direct spreadsheet to expedite review and processing of the requested incentive).

Please complete the Self-Direct spreadsheet for each measure installed and provide supporting documentation including engineering or equipment supplier studies, customer-approved invoices, purchase orders, detailed calculations of baseline and energy and peak summer demand savings. A detailed proposal and complete package will expedite review of application. This information is required by AEP Ohio and/or its consultants for project analysis.

	EQUIPMENT REMOVED OR LOWER EFFICIENCY OPTION	INSTALLED EQUIPMENT OR HIGHER EFFICIENCY OPTION
Equipment type		
Manufacturer of equipment		
Model number(s)		
Date of Removal / In-Service Date		
Age of equipment at removal		
Estimated remaining useful life at time of removal or installation		
Efficiency rating		
Nameplate data: kW, tons, HP, watts, etc.		
Quantity		
Annual operating hours		
Annual energy savings (kWh)		
Summer peak reduction (kW)*		
Annual electric bill savings ($)		
COST BREAKOUT		
Equipment		
Engineering		
Installation		
Other (explain)		
TOTAL PROJECT COST		
Incremental Cost = Installed Option Total Cost – Removed Equipment or Lower Efficiency Option Total Cost		

* **Determination of peak demand reduction (kW) from non-HVAC equipment:** For non-HVAC measures, calculate the average kW reduction over the period from 7 a.m. to 9 p.m., weekdays, from May 1 through September 30. The preferred calculation method will estimate hourly kW demands over the peak demand period, and average the results. However, if measures do not vary significantly during those hours, a less rigorous estimation process may be applied if approved in advance by the program.

* **Determination of peak demand reduction (kW) within HVAC systems:** Calculate the maximum HVAC peak demand reduction that occurs between 7 a.m. to 9 p.m. on a weekday from May 1 through September 30.

Account Name	Service Address	City	State
City Of Newark	40 W Main St	Newark	OH
City Of Newark	10 W Locust St Rear	Newark	OH
City Of Newark	101 Ecology Row	Newark	OH
City Of Newark	1140 Hollander St	Newark	OH
City Of Newark	119 Dewey Ave	Newark	OH
City Of Newark	1195 E Main St	Newark	OH
City Of Newark	1195 E Main St	Newark	OH
City Of Newark	1195 E Main St	Newark	OH
City Of Newark	12 S Park Pl	Newark	OH
City Of Newark	1200 Hillview Cir E	Newark	OH
City Of Newark	1225 E Main St	Newark	OH
City Of Newark	125 N 6th St	Newark	OH
City Of Newark	1275 E Main St	Newark	OH
City Of Newark	128 E Main St	Newark	OH
City Of Newark	1280 E Main St	Newark	OH
City Of Newark	1321 Granville Rd	Newark	OH
City Of Newark	1325 N 21st St	Newark	OH
City Of Newark	1354 Pembroke Ct	Newark	OH
City Of Newark	N 13th St	Newark	OH
City Of Newark	1458 Krebs Dr	Newark	OH
City Of Newark	1482 Mount Vernon Rd	Newark	OH
City Of Newark	1493 W Main St	Newark	OH
City Of Newark	15 S 21st St	Newark	OH
City Of Newark	1500 Mount Vernon Rd	Newark	OH
City Of Newark	152 Fleek Ave	Newark	OH
City Of Newark	1633 W Main St	Newark	OH
City Of Newark	165 W Main St	Newark	OH
City Of Newark	1663 E Main St	Newark	OH
City Of Newark	1663 E Main St	Newark	OH
City Of Newark	169 Hudson Ave	Newark	OH
City Of Newark	170 Everett Ave	Newark	OH
City Of Newark	1721 Londondale Pkwy	Newark	OH
City Of Newark	2 N 1st St	Newark	OH
City Of Newark	2 N Park Pl	Newark	OH
City Of Newark	210 2nd St Ne	Newark	OH
City Of Newark	2100 Cherry Valley Rd	Newark	OH
City Of Newark	22 S 1st St	Newark	OH
City Of Newark	220 2nd St Ne	Newark	OH
City Of Newark	2249 Cherry Valley Rd Se	Newark	OH
City Of Newark	225 Hudson Ave	Newark	OH
City Of Newark	232 Mount Vernon Rd	Newark	OH
City Of Newark	25 S 6th St	Newark	OH
City Of Newark	25 Price Rd	Newark	OH
City Of Newark	275 N Cedar St	Newark	OH
City Of Newark	275 N Cedar St Rear	Newark	OH
City Of Newark	28 N Park Pl	Newark	OH
City Of Newark	300 Thornwood Dr	Newark	OH
City Of Newark	33 W Main St Rear	Newark	OH
City Of Newark	34 5th St Se	Newark	OH
City Of Newark	35 S Park Pl	Newark	OH
City Of Newark	365 Ohio St	Newark	OH
City Of Newark	37 N Buena Vista St	Newark	OH
City Of Newark	S 3rd St	Newark	OH
City Of Newark	45 E Shields St	Newark	OH
City Of Newark	462 2nd St Ne	Newark	OH
City Of Newark	469 E Main St	Newark	OH
City Of Newark	49 E Church St	Newark	OH
City Of Newark	495 Sisal St	Newark	OH
City Of Newark	5 W Stevens St	Newark	OH
City Of Newark	508 Goosepond Rd	Newark	OH
City Of Newark	60 N 3rd St	Newark	OH
City Of Newark	650 W Church St	Newark	OH
City Of Newark	66 N 4th St	Newark	OH

City Of Newark	69 W National Dr Rear	Newark	OH
City Of Newark	69 W National Dr	Newark	OH
City Of Newark	75 S 4th St	Newark	OH
City Of Newark	79 Obannon Ave	Newark	OH
City Of Newark	842 Larkspur Dr	Newark	OH
City Of Newark	845 Wells Ave Hse Park	Newark	OH
City Of Newark	846 Cleveland Ave Rear	Newark	OH
City Of Newark	911 Roosevelt Ct	Newark	OH
City Of Newark	Arlington Ave	Newark	OH
City Of Newark	Bryn Mawr Dr	Newark	OH
City Of Newark	W Church St	Newark	OH
City Of Newark	Country Club Dr	Newark	OH
City Of Newark	Country Club Dr	Newark	OH
City Of Newark	Dayton Rd Ne	Newark	OH
City Of Newark	Deo Dr	Newark	OH
City Of Newark	Deo Dr	Newark	OH
City Of Newark	E Main St	Newark	OH
City Of Newark	E Main St	Newark	OH
City Of Newark	E Main St	Newark	OH
City Of Newark	331 W National Dr Unit Tfl	Newark	OH
City Of Newark	Empire Dr	Newark	OH
City Of Newark	Everett Ave	Newark	OH
City Of Newark	Garfield Ave	Newark	OH
City Of Newark	Granville St	Newark	OH
City Of Newark	Granville St	Newark	OH
City Of Newark	Granville St	Newark	OH
City Of Newark	Green Wave Dr	Newark	OH
City Of Newark	Highland Blvd	Newark	OH
City Of Newark	1248 Horns Hill Rd	Newark	OH
City Of Newark	1248 Horns Hill Rd	Newark	OH
City Of Newark	1248 Horns Hill Rd	Newark	OH
City Of Newark	Howell Ct	Newark	OH
City Of Newark	Hudson Ave	Newark	OH
City Of Newark	Hudson Ave	Newark	OH
City Of Newark	Hudson Ave	Newark	OH
City Of Newark	Mckinley Ave	Newark	OH
City Of Newark	Meadowbrook Dr	Newark	OH
City Of Newark	Moull St	Newark	OH
City Of Newark	Mount Vernon Rd	Newark	OH
City Of Newark	Mount Vernon Rd	Newark	OH
City Of Newark	Mount Vernon Rd	Newark	OH
City Of Newark	Mount Vernon Rd	Newark	OH
City Of Newark	Mount Vernon Rd	Newark	OH
City Of Newark	N 11th St	Newark	OH
City Of Newark	N 21st St	Newark	OH
City Of Newark	N 21st St	Newark	OH
City Of Newark	N 21st St	Newark	OH
City Of Newark	N 21st St	Newark	OH
City Of Newark	N 21st St	Newark	OH
City Of Newark	N 21st St	Newark	OH
City Of Newark	N 23rd St	Newark	OH
City Of Newark	N 24th St	Newark	OH
City Of Newark	2nd St Ne	Newark	OH
City Of Newark	1195 W Main St	Newark	OH
City Of Newark	N 5th St	Newark	OH
City Of Newark	N 6th St	Newark	OH
City Of Newark	N Buena Vista St	Newark	OH
City Of Newark	N Buena Vista St	Newark	OH
City Of Newark	Ohio St	Newark	OH
City Of Newark	W Main St	Newark	OH
City Of Newark	Rocky Ridge Rd	Newark	OH
City Of Newark	Rocky Ridge Rd	Newark	OH
City Of Newark	S 21st St	Newark	OH
City Of Newark	2nd St Ne	Newark	OH

City Of Newark	2nd St Ne	Newark	OH
City Of Newark	2nd St Ne	Newark	OH
City Of Newark	2nd St Ne	Newark	OH
City Of Newark	S Buena Vista St	Newark	OH
City Of Newark	State Route 16	Newark	OH
City Of Newark	State Route 16	Newark	OH
City Of Newark	Swansea Rd	Newark	OH
City Of Newark	Tamarack Rd	Newark	OH
City Of Newark	W Church St	Newark	OH
City Of Newark	W Church St	Newark	OH
City Of Newark	W Church St	Newark	OH
City Of Newark	W Main St	Newark	OH
City Of Newark	W Main St	Newark	OH
City Of Newark	W Shields St	Newark	OH
City Of Newark	672 Westwood Dr Frnt Liftpum	Newark	OH
City Of Newark	2105 Cherry Valley Rd Se Unit Sign	Newark	OH
City Of Newark	39 S 4th St	Newark	OH
City Of Newark	170 Everett Ave	Newark	OH
City Of Newark	174 Mount Vernon Rd Frnt Trf Lt	Newark	OH
City Of Newark	769 Mount Vernon Rd	Newark	OH
City Of Newark	1370 W Main St	Newark	OH
City Of Newark	2410 River Rd	Granville	OH
City Of Newark	2572 Upland View Ct Unit Ss-Li	Newark	OH
City Of Newark	1371 W Main St	Newark	OH
City Of Newark	417 W Main St	Newark	OH
City Of Newark	447 W Main St	Newark	OH
City Of Newark	389 W Main St	Newark	OH
City Of Newark	499 W Main St Unit Signal	Newark	OH
City Of Newark	2101 Cherry Valley Rd Se	Newark	OH
City Of Newark	W Main St	Newark	OH
City Of Newark	1236 W Church St	Newark	OH
City Of Newark	371 Mount Vernon Rd	Newark	OH
City Of Newark	21 S Park Pl	Newark	OH
City Of Newark	25 S Park Pl	Newark	OH
City Of Newark	549 E Main St	Newark	OH
City Of Newark	E Locust St	Newark	OH
City Of Newark	87 2nd St Ne	Newark	OH
City Of Newark	82 S 3rd St	Newark	OH
City Of Newark	80 S 4th St	Newark	OH
City Of Newark	107 S 6th St	Newark	OH
City Of Newark	86 5th St Se	Newark	OH
City Of Newark	Union St	Newark	OH
City Of Newark	Myrtle Ave	Newark	OH
City Of Newark	275 N Cedar St	Newark	OH
City Of Newark	170 Everett Ave	Newark	OH
City Of Newark	155 E Main St	Newark	OH
City Of Newark	151 W National Dr	Newark	OH
City Of Newark	420 Granville St	Newark	OH
City Of Newark	10 W Locust St Stop	Newark	OH
City Of Newark	1549 Crystal Ct Rear Lift	Newark	OH
City Of Newark Division Of Fire	1800 W Main St	Newark	OH
City Of Newark Parks & Rec	1953 Horns Hill Rd	Newark	OH
City Of Newark Parks Dept	22 N 2nd St	Newark	OH
City Of Newark Service Department	1175 Hollander St	Newark	OH
City Of Newark Traffic Control	1197 E Main St	Newark	OH
City Of Newark Water Treatment Plan	1500 Horns Hill Rd	Newark	OH
City Of Newark Water Treatment Plan	1200 Horns Hill Rd	Newark	OH

NORTH FIRE STATION

COUNT OF ACTUAL NUMBER OF FIXTURES RETROFITTED

31 – 4' 4lamp fluorescent
83 – 4' 2lamp fluorescent
2 – 4' 2lamp Utube fluorescent
1 – compact fluorescent
1 – LED exit signs

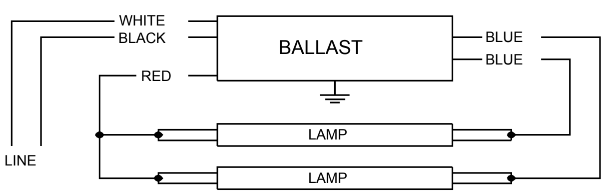
PHILIPS
ADVANCE

REL-2P32-HL-SC	
Brand Name	STANDARD ELEC
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	120
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
F17T8	2	17	0/-18	0.36	43	1.26	20	0.96	1.7	2.93
F25T8	1	25	0/-18	0.32	38	1.43	20	0.95	1.7	3.76
F25T8	2	25	0/-18	0.51	61	1.24	20	0.98	1.7	2.03
F32T8	1	32	0/-18	0.40	47	1.41	20	0.98	1.7	3.00
* F32T8	2	32	0/-18	0.65	77	1.20	15	0.98	1.7	1.56
F32T8/ES (30W)	1	30	60/16	0.38	45	1.41	20	0.98	1.7	3.13
F32T8/ES (30W)	2	30	60/16	0.60	72	1.20	20	0.98	1.7	1.67
F40T8	1	40	32/00	0.49	58	1.38	20	0.98	1.7	2.38

Wiring Diagram



Diag. 64

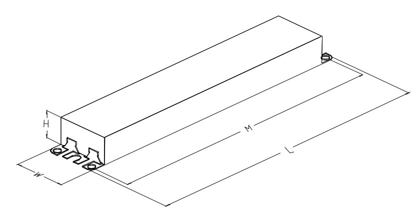
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	25.0	
White	25.0	
Blue	31.0	
Red	37.0	
Yellow		
Gray		
Violet		

	in.	cm.
Yellow/Blue		
Blue/White		
Brown		
Orange		
Orange/Black		
Black/White		
Red/White		

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
9.50 "	1.7 "	1.18 "	8.90 "
9 1/2	1 7/10	1 9/50	8 9/10
24.1 cm	4.3 cm	3 cm	22.6 cm

Revised 02/27/2003

Data is based upon tests performed by Philips Lighting Electronics N.A. in a controlled environment and is representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.

PHILIPS LIGHTING ELECTRONICS N.A.
10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
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Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

PHILIPS ADVANCE

REL-2P32-HL-SC	
Brand Name	STANDARD ELEC
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	120
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Notes:

Section I - Physical Characteristics
1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.
1.2 Ballast shall be provided with integral leads color-coded per ANSI C82.11.

Section II - Performance Requirements
2.1 Ballast shall be ___________ (Instant or Rapid) Start.
2.2 Ballast shall provide Independent Lamp Operation (ILO) for Instant Start ballasts allowing remaining lamp(s) to maintain full light output when one or more lamps fail.
2.3 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.
2.4 Ballast shall operate from 60 Hz input source of 120V, 277V or 347V as applicable with sustained variations of +/- 10% (voltage and frequency).
2.5 Ballast shall be high frequency electronic type and operate lamps at a frequency between 20 kHz and 30 kHz or above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.
2.6 Ballast shall have a Power Factor greater than 0.98 for primary lamp.
2.7 Ballast shall have a minimum ballast factor for primary lamp application as follows: 0.75 for Low Watt, 0.85 for Normal Light Output and 1.20 for High Light.
2.8 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less.
2.9 Ballast input current shall have Total Harmonic Distortion (THD) of less than 20% for Standard models and THD of less than 10% for Centium models when operated at nominal line voltage with primary lamp.
2.10 Ballast shall have a Class A sound rating for all 4-foot lamps and smaller.
2.11 Ballast shall have a minimum starting temperature of _______ [-18C (0F) for standard T8 lamps, 10C (50F) for T8/HO, standard T12, Slimline T12 and Long Twin Tube lamps, 0C (32F) for Slimline T8, -29C (-20F) for T12/HO lamps,] for primary lamp application. Ballast shall have a minimum starting temperature of 60F (16C) for energy-saving lamps.
2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions.

Section III - Regulatory Requirements
3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).
3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.
3.3 Ballast shall comply with ANSI C62.41 Category A for Transient protection.
3.4 Ballast shall comply with ANSI C82.11 where applicable.
3.5 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).
3.6 Ballast shall comply with NEMA 410 for in-rush current limits.

Section IV - Other
4.1 Ballast shall be manufactured in a factory certified to ISO 9001 Quality System Standards.
4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70C.
4.3 Manufacturer shall have a twenty-year history of producing electronic ballasts for the North American market.

Note: Energy saving T8 lamps (25W, 28W or 30W) may experience lamp striations if operated on ballasts not rated for their use.

Revised 02/27/2003

PHILIPS LIGHTING ELECTRONICS N.A.
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Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

SECTION I – Fixed Light Output Electronic (Fluorescent)

Ballast Specification for Electronic Fluorescent

Optanium®

Section I - Physical Characteristics

1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.

1.2 Ballast shall be provided with integral leads color coded per ANSI C82.11.

Section II - Performance Requirements

2.1 Ballast shall be ________ (Instant or Programmed) Start.

2.2 Ballast shall provide Independent Lamp Operation (ILO) for Instant Start ballats allowing remaining lamp(s) to maintain full light output when one or more lamps fail.

2.3 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.

2.4 Ballast shall operate from 60 Hz input source of 120V, 277V or 347V as applicable with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast. IntelliVolt models shall operate from 50/60 Hz input source of 120V through 277V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.

2.5 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.

2.6 Ballast shall have a Power Factor greater than 0.98 for primary lamp.

2.7 Ballast shall have a minimum ballast factor for primary lamp application as follows: 0.75 for Low Watt, 0.85 for Normal Light Output, and 1.20 for High Light.

2.8 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.

2.9 Ballast input current shall have Total Harmonic Distortion (THD) of less than 10% when operated at nominal line voltage with primary lamp.

2.10 Ballast shall have a Class A sound rating.

2.11 Ballast shall have a minimum starting temperature of -18C (0F) for standard T8 lamps and 16C (60F) for energy-saving T8 lamps.

2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

Section III - Regulatory Requirements

3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).

3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.

3.3 Ballast shall comply with ANSI C62.41 Category A for Transient protection.

3.4 Ballast shall comply with ANSI C82.11 where applicable.

3.5 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.

4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70C.

4.3 Manufacturer shall have a fifteen year history of producing electronic ballasts for the North American market.

4.4 Ballast shall be Advance Transformer part # ____________ or approved equal.

Attachment 6 Supporting Documentation
Project # AEP-10-1090

WORLDWIDE PARTNER

GE Lighting

SITE SEARCH › HOME › PRODUCTS › EDUCATION / RESOURCES › LIGHTING APPLICATIONS

Where to Buy | FAQs | Contact Us | EliteNet

Products > Linear Fluorescent > Straight Linear > T8 > 00257

00257 – F28T8SP41UMX/ECO

GE Ecolux® UltraMax™ Starcoat® T8

This product is no longer manufactured. Remaining stock is on Firesale.

• Passes TCLP, which can lower disposal costs.

ecomagination

High Color Rendering
Reduced Wattage
Energy Savings

GENERAL CHARACTERISTICS

Lamp type	Linear Fluorescent - Straight Linear
Bulb	T8
Base	Medium Bi-Pin (G13)
Wattage	28
Voltage	115
Rated Life	18000 hrs
Rated Life (instant start) @ Time	18000 h @ 3 h 24000 h @ 12 h
Bulb Material	Soda lime
Starting Temperature (MIN)	15 °C (59 °F)
LEED-EB MR Credit	85 picograms Hg per mean lumen hour
Additional Info	TCLP compliant

Bulb Base

View Larger

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	2750
Mean Lumens	2585
Nominal Initial Lumens per Watt	98
Color Temperature	4100 K
Color Rendering Index (CRI)	82
S/P Ratio (Scotopic/Photopic Ratio)	1.8

ELECTRICAL CHARACTERISTICS

Open Circuit Voltage (instant start) Min @ Temperature	525 V @ 15 °C
Cathode Resistance Ratio -	4.25

ADDITIONAL RESOURCES

Catalogs
Testimonials
Brochures
Product Brochures
- ULTRA Linear Fluorescent
- Ecolux
- Ecolux (Environmental)

Application/Segment Brochures
- Retail Lighting
- Office Lighting
- Healthcare Lighting
- Contractor Lighting
- Property Management

Sell Sheets
- GE ULTRA F28 Linear Fluorescent System

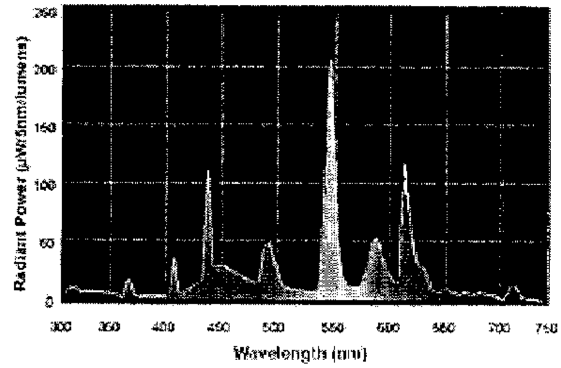
MSDS (Material Safety Data Sheets)
Disposal Policies & Recycling Information

GRAPHS & CHARTS

Spectral Power Distribution

Attachment 6 Supporting Documentation
Project # AEP-10-1090

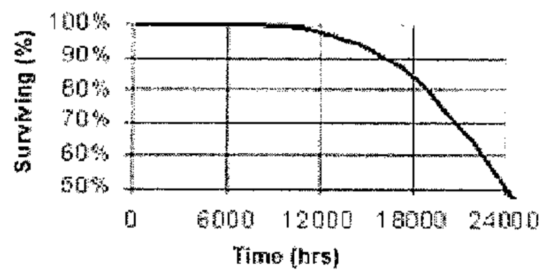
Rh/Rc (MIN)	
Cathode Resistance Ratio - Rh/Rc (MAX)	6.5
Current Crest Factor (MAX)	1.7



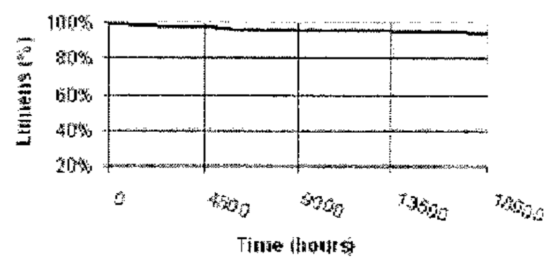
DIMENSIONS

Maximum Overall Length (MOL)	47.7800 in (1213.6 mm)
Minimum Overall Length	47.7800 in (1213.6 mm)
Nominal Length	48.000 in (1219.2 mm)
Bulb Diameter (DIA)	1.000 in (25.4 mm)
Bulb Diameter (DIA) (MIN)	0.940 in (23.8 mm)
Bulb Diameter (DIA) (MAX)	1.100 in (27.9 mm)
Max Base Face to Base Face (A)	47.220 in (1199.3 mm)
Face to End of Opposing Pin (B) (MIN)	47.400 in (1203.9 mm)
Face to End of Opposing Pin (B) (MAX)	47.500 in (1206.5 mm)
End of Base Pin to End of Opposite Pin End (C)	47.670 in (1210.8 mm)

Lamp Mortality



Lumen Maintenance



PRODUCT INFORMATION

Product Code	00257
Description	F28T8SP41UMX/ECO
Standard Package	Case
Standard Package GTIN	00064894002571
Standard Package Quantity	36
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	36
UPC	043168002578

COMPATIBLE GE BALLASTS

Product Code	Description	# of Bulbs	Power Factor	Ballast Factor
23680	GE-132-120-N	1	0.99	0.84
23681	GE-132-277-N	1	0.97	0.84
24162	GE-132-277-N-84T	1	0.97	0.84
72258	GE132MAX-L/ULTRA	1	0.93	0.78
72259	GE132MAX-N/ULTRA	1	0.99	0.88
72269	GE-132-MV-N	1	0.99	0.88
72270	GE-132-MV-N-42T	1	0.99	0.88
75954	GE132-MVPS-H	1	0.99	1.18
75952	GE132-MVPS-L	1	0.99	0.71
75953	GE132-MVPS-N	1	0.99	0.87
75379	GE132MVPS-N-V03	1	0.98	0.88

AEP GridSMART

KEMA Operations Manual

Supplement – Summary of Deemed Savings for Incentives Year 2009

KEMA

Summary of Common Deemed Savings Measures

The below table contains prescriptive measures in a convenient format for viewing the default deemed savings.

Measure	Unit	Incentive Per Unit	kW Per Unit	Total kWh Per Unit	Years Life
Screw in CFL 5-15 Watts	Lamp	$2.00	0.029	155	2
Screw in CFL 16-26 Watts	Lamp	$2.00	0.054	290	2
Screw in CFL 27 Watts or higher	Lamp	$3.00	0.069	368	2
Hardwired CFL 29W or Less	Fixture	$30.00	0.052	276	12
Hardwired 30W or Greater	Fixture	$60.00	0.103	544	12
T12 to T8 Conversion (with electronic ballast): 2-foot & 3-foot T12 to T8	Lamp	$6.00	0.012	60.5	11
T12 to T8 Conversion (with electronic ballast): 4-foot T12 U Tube to T8 U Tube	Lamp	$5.00	0.009	46.7	11
T12 to T8 Conversion (with electronic ballast): 4-foot T12 to HP or RW T8	Lamp	$7.00	0.012	62	11
T12 to T8 Conversion (with electronic ballast): 8-foot T12 to Reduced Wattage T8	Lamp	$7.00	0.016	78.7	11
Standard T8 to Reduced Wattage T8 (Lamp Only): 4-foot T8 to RW T8 (lamp only)	Lamp	$1.00	0.005	28.8	3
Standard T8 to Reduced Wattage T8 (Lamp Only): 8-foot T8 to RW T8 (lamp only)	Lamp	$1.00	0.005	24.6	3
Delamping (Combined with T8 ballast retrofit): 2-foot & 3 -foot delamping	Lamps Removed	$5.00	0.022	119.3	11
Delamping (Combined with T8 ballast retrofit): 4-foot delamping	Lamps Removed	$7.50	0.032	172.3	11
Delamping (Combined with T8 ballast retrofit): 8-foot delamping	Lamps Removed	$12.50	0.062	333.7	11
LED Exit Signs	Fixture	$25.00	0.042	343.4	16
Cold Cathode Lamps	Lamp	$5.00	0.020	108	5
Lighting Occupancy Sensors	Controlled kW	$90.00	0.300	1385	8
New T8/T5 Fixture	kW Reduction	$350.00	0.916	4914	11
Lighting Density	kW Reduction	$400.00	0.916	4914	11
LED Traffic Signals	Lamp	$15.00	0.085	275	6
LED Pedestrian Signals	Lamp	$15.00	0.044	150	8

AEP GridSMART

KEMA Operations Manual

Appendix A – AEP Ohio Prescriptive Lighting Protocols

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Lighting

Most lighting measures presented in these work papers use the same methodology. The following provides the assumptions and methods used for calculating energy savings.

Baseline and retrofit equipment assumptions, i.e. wattages, are specific to the measure. Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed.

Savings are calculated by appyling operating hours and other parameters that define the energy savings. These workpapers base the energy savings methodology on the California 2005 DEER Study[1] assumptions. The DEER database is a tool that was jointly developed by the California Public Utilities Commission (CPUC) and the California Energy Commission with support and input from the Investor-Owned Utilities and other interested stakeholders. DEER provides operating hours, interative effects and coincidence factors by building type; however, savings for AEP Ohio Program will not be dependent on building type. Savings presented here are calculated using averages of DEER building type values.

Lighting factors used in savings calculations are listed in the table below. This document explains how these values and the resulting savings were derived.

Table 1: Average Lighting Factors

CFL Annual Operating Hours	Other Lighting Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
4,321	4,389	1.19	0.77	1.12

Annual energy savings and the peak coincident demand savings were calculated using the equations below:

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are based on the difference between baseline and efficient equipment connected wattage and annual operating hours, according to the following formula:

[1] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

kWh Reduction = (kW of existing equipment - kW of replacement equipment) * (Annual operating hours)*(Energy Interactive Effects)

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Interactive factors account for savings that the measures achieve through avoided air conditioning load because of reduced internal heat gains from energy-efficient lighting. The interactive effects do not apply to exterior lighting.

The annual operating hours, the coincidence factors, and the interactive effect factors are all derived from DEER figures.

The following table lists building types set by DEER. A straight average across DEER building types would heavily weight sectors that happen to have multiple DEER categories. For instance, DEER has four sectors in education and only two in medical. A straight average of operating hours would have weighted the education sector twice as heavily as the medical sector where in reality the two are similar in electric demand.[2] Instead, our average values are that of sector groupings as stated in the table below.

[2] AEP Ohio 2009 to 2028 Energy Efficiency, Peak Demand Reduction Potential Study, Volume 2. Page 48. Summit Blue Consulting, Inc. August 13, 2009.

Table 2: DEER Building Types

DEER	Average Grouping
Education – Primary School	K-12 School
Education – Secondary School	
Education – Community College	College/University
Education – University	
Grocery	Grocery
Health/Medical – Hospital	Medical
Health/Medical – Nursing Home	
Lodging – Hotel	Hotel/Motel
Lodging – Motel	
Lodging – Guest Room	
Manufacturing – Light Industrial	Light Industry
Office – Large	Office
Office – Small	
Restaurant – Sit-Down	Restaurant
Restaurant – Fast-Food	
Retail – 3-Story Large	Retail/Service
Retail – Single-Story Large	
Retail – Small	
Storage – Conditioned	Warehouse
Storage – Unconditioned	
Warehouse – Refrigerated	

The following tables list DEER values. Compact fluorescent lamps (CFLs), LED lighting (unless otherwise noted), and integrated ballast ceramic metal halides have CFL lighting operating hours. Other lighting categories have different operating hours as shown below.

Table 3: Interactive Effects by Building Type from DEER

DEER Market Sector	Demand Interactive Effects	Energy Interactive Effects
Education – Primary School	1.23	1.15
Education – Secondary School	1.23	1.15
Education – Community College	1.22	1.15
Education – University	1.22	1.15
Grocery	1.25	1.13
Medical – Hospital	1.26	1.18
Medical – Clinic	1.26	1.18
Lodging Hotel	1.14	1.14
Lodging Motel	1.14	1.14
Lodging – Guest Rooms	1.14	1.14
Manufacturing – Light Industrial	1.08	1.04
Office – Large	1.25	1.17
Office – Small	1.25	1.17
Restaurant – Sit-Down	1.26	1.15
Restaurant – Fast-Food	1.26	1.15
Retail – 3-Story Large	1.19	1.11
Retail – Single-Story Large	1.19	1.11
Retail – Small	1.19	1.11
Storage Conditioned	1.09	1.06
Storage Unconditioned	1.09	1.06
Warehouse	1.09	1.06

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Table 4: Coincident Diversity Factors from DEER

DEER Market Sector	Coincident Diversity Factors
Education – Primary School	0.42
Education – Secondary School	0.42
Education – Community College	0.68
Education – University	0.68
Grocery	0.81
Medical – Hospital	0.74
Medical – Clinic	0.74
Lodging Hotel	0.67
Lodging Motel	0.67
Lodging – Guest Rooms	0.67
Manufacturing – Light Industrial	0.99
Office – Large	0.81
Office – Small	0.81
Restaurant – Sit-Down	0.68
Restaurant – Fast-Food	0.68
Retail – 3-Story Large	0.88
Retail – Single-Story Large	0.88
Retail – Small	0.88
Storage Conditioned	0.84
Storage Unconditioned	0.84
Warehouse	0.84

Table 5: Annual Operating Hours from DEER

DEER Market Sector	CFL Annual Operating Hours	Other Lighting Annual Operating Hours
Education – Primary School	1,440	1,440
Education – Secondary School	2,305	2,305
Education – Community College	3,792	3,792
Education – University	3,073	3,073
Grocery	5,824	5,824
Medical – Hospital	8,736	8,736
Medical – Clinic*	4,212	4,212
Lodging Hotel	8,736	8,736
Lodging Motel	8,736	8,736
Lodging – Guest Rooms	1,145	NA
Manufacturing – Light Industrial*	4,290	4,290
Office – Large	2,739	2,808
Office – Small	2,492	2,808
Restaurant – Sit-Down	3,444	4,368
Restaurant – Fast-Food	6,188	6,188
Retail – 3-Story Large	4,259	4,259
Retail – Single-Story Large	4,368	4,368
Retail – Small	3,724	4,004
Storage Conditioned*	2,860	4,859
Storage Unconditioned*	2,860	4,859
Warehouse*	2,600	4,859

* Not from DEER

Industrial-operating hours are assumed based on the following sources:

- DEER estimates hours to be 2,860.
- Efficiency Vermont Technical Reference User Manual's (No. 2004-29) estimates 5,913 hours.
- The 2004-2005 PG&E work papers assumed 6,650 hours for process industrial and 4,400 for assembly industrial.

DEER's estimated hours are far lower than figures other sources have provided and so we have increased the DEER values by 50% or to 4,290 hours. This value is reasonable and on the conservative side of the averages. We will use this conservative value until more data is available for AEP Ohio or other MidWestern utility territory.

Similarly, we believe that the DEER storage and warehouse operating hours are low as well. Using data from other programs in the region, KEMA has seen average operating hours that are significantly higher and is using a higher value of 4,859 as a better estimate of deemed operating hours for this region.

DEER has set Medical-Hospital operating hours at 8,736. We have lowered this value for the purposes of calculating our average by using operating hours that are 50% above that of offices or 4,212 hours (Medical-Clinic operating hours). This reduction accounts for areas in medical facilities that behave more like offices and do not operate around the clock. The value used in our calculations is the average of the DEER Hospital and the revised clinic operating hours.

Hotel/Motel operating hours are the average of guest room hours and either hotel or motel operating hours since a facility can only be one or the other.

Incremental costs are taken from a number of sources. The AEP Ohio 2009-2028 Energy Efficiency/Peak Demand Reduction Potential Study conducted in August of 2009 provides costs for some measures. Since this study was prepared specifically for AEP, the utility's costs are used whenever applicable. Because some measures listed in the study do not match with that of the program, costs are derived from other sources as well including DEER, KEMA, and the Commonwealth Edison Company's 2008-10 Energy Efficiency and Demand Response Plan prepared by ICF International. The ICF document is referenced as the ICF Portfolio Plan.

Compact Fluorescent Lamps, Screw-In	
Measure Description	ENERGY STAR-rated CFLs with lamp/ballast efficacy of ≥ 40 lumens per Watt. Measure applies only if incandescent or HID lamps are being replaced.
Units	Per lamp
Base Case Description	Incandescent or HID lamps.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: AEP Ohio Potential Study
Effective Useful Life	Source: DEER 2.5 years

This incentive applies to screw-in lamps and applies only if an incandescent or high-intensity discharge (HID) lamp is being replaced. All screw-in CFLs must be ENERGY STAR® rated. The lamp/ballast combination must have an efficacy ≥40 lumens per Watt (LPW). For screw-in CFLs, electronic ballasts are required for lamps ≥18 Watts.

Measure Savings

Baseline and retrofit equipment assumptions are presented in the next table. Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed. The table shows the wattages used for the savings calculations.

KEMA

Table 6: Baseline and Retrofit Wattages

Measure	Base Wattage (Watts)	Retrofit Wattage (Watts)	kW Reductions (kW)
15 W or less	75	15	0.060
15 W or less	60	15	0.045
15 W or less	60	14	0.046
15 W or less	50	14	0.036
15 W or less	65	13	0.052
15 W or less	60	13	0.047
15 W or less	40	13	0.027
15 W or less	40	11	0.029
15 W or less	40	10	0.030
15 W or less	35	7	0.028
15 W or less	30	7	0.023
15 W or less	25	7	0.018
15 W or less	30	9	0.021
15 W or less	25	9	0.016
15 W or less	25	5	0.020
15 W or less	20	5	0.015
16W-25W	100	25	0.075
16W-25W	75	25	0.05
16W-25W	100	23	0.077
16W-25W	100	20	0.08
16W-25W	75	20	0.055
16W-25W	75	19	0.056
16W-25W	75	18	0.057
16W-25W	60	18	0.042
16W-25W	60	16	0.044
26W and Greater	150	40	0.11
26W and Greater	150	36	0.114
26W and Greater	100	30	0.07
26W and Greater	100	28	0.072
26W and Greater	100	26	0.074
26W and Greater	75	26	0.049

Table 7: Wattage Reduction

Wattage Category	Average Wattage Reduction
≤15	32
16 to 26	60
>26	76

The following tables provide the measure savings using the above wattage reduction assumptions.

Table 8: Measure Savings for 15 W or less

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
4,321	1.19	0.77	1.12	0.029	155

Table 9: Measure Savings for 16 – 26 W

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
4,321	1.19	0.77	1.12	0.054	290

Table 10: Measure Savings for > 26 W

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
4,321	1.19	0.77	1.12	0.069	368

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below.

Noncoincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are based on the difference between baseline and efficient equipment connected wattage and annual operating hours, according to the following formula:

KEMA

kWh Reduction = (kW of existing equipment - kW of replacement equipment) * (Annual operating hours)*(Energy Interactive Effects)

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = noncoincident kW savings * Coincidence Factor * Demand interactive effect

Interactive factors account for savings that the measures achieve through avoided air conditioning load because of reduced internal heat gains from energy-efficient lighting.

The annual operating hours, the coincidence factors, and the interactive effect factors are all derived from DEER figures.[3]

Measure Life and Incremental Measure Cost

The following table provides the measure life and incremental measure cost (IMC) documented for this measure as well as the source of the data.

Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option. For lighting measures, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 11: Measure Life and Incremental Measure Cost

Wattage Category		Value	Source
All	Measure Life	2.5	DEER 2005
≤15W	Incremental Measure Cost	$4.13	AEP Ohio Potential Study
16W-26W	Incremental Measure Cost	$4.13	AEP Ohio Potential Study
> 26W	Incremental Measure Cost	$4.13	AEP Ohio Potential Study

[3] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Compact Fluorescent Fixtures, Hardwired	
Measure Description	New fixtures or modular retrofits with hardwired electronic ballasts qualify. The CFL ballast must be programmed start or programmed rapid start with a PF ≥90 and THD ≤20%.
Units	Per fixture
Base Case Description	Incandescent or HID lamps.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: KEMA
Effective Useful Life	Source: DEER 12 years

Hardwired CFL incentives apply only to complete new fixtures or modular (pin-based) retrofits with hardwired electronic ballasts. The CFL ballast must be programmed 'start' or programmed 'rapid start' with a PF ≥90 and THD ≤20 percent.

Measure Savings
Baseline and retrofit equipment assumptions are presented in the table below. Most lighting retrofits assume early replacement of existing technologies where the baseline represents the equipment removed. The following table shows the wattages used for the savings calculations.

KEMA

Table 12: Baseline and Retrofit Wattages

Measure	Base Wattage	Retrofit Wattage	kW Reduction
29W or Less	100	28	0.072
29W or Less	125	27	0.098
29W or Less	110	27	0.083
29W or Less	100	26	0.074
29W or Less	75	26	0.049
29W or Less	100	25	0.075
29W or Less	75	25	0.05
29W or Less	100	23	0.077
29W or Less	75	20	0.055
29W or Less	75	19	0.056
29W or Less	75	18	0.057
29W or Less	60	18	0.042
29W or Less	60	16	0.044
29W or Less	60	15	0.045
29W or Less	60	14	0.046
29W or Less	60	13	0.047
29W or Less	40	13	0.027
29W or Less	40	9	0.031
30W or Greater	120	30	0.09
30W or Greater	120	40	0.08
30W or Greater	200	55	0.145
30W or Greater	200	65	0.135

Table 13: Wattage Reduction

Wattage Category	Average Wattage Reduction
≤29	57
≥30W	113

The following tables provide the measure savings using the above wattage reduction assumptions.

Table 14: Measure Savings for 29W or less

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
4,321	1.19	0.77	1.12	0.052	276

KEMA

Table 15: Measure Savings for ≥30W

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
4,321	1.19	0.77	1.12	0.103	544

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operation hours, the coincidence factors, and the interactive effect factors were all derived from the DEER database.[4] DEER values by building type were averaged for the AEP Ohio Program.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Measure Life and Incremental Measure Cost

The table below provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option. For lighting measures, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

[4] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 16: Measure Life and Incremental Measure Cost

Wattage Category		Value	Source
All	Measure Life	12	DEER
≤29	Incremental Measure Cost	$95	KEMA
≥30W	Incremental Measure Cost	$132	KEMA

Permanent Lamp Removal	
Measure Description	Incentives are paid for the permanent removal of existing 8', 4', 3' and 2' fluorescent lamps. Unused lamps, lamp holders, and ballasts must be permanently removed from the fixture. This measure is applicable when retrofitting from T12 lamps to T8 lamps or simply removing lamps from a T8 fixture. Removing lamps from a T12 fixture that is not being retrofitted with T8 lamps are not eligible for this incentive.
Units	Per lamp
Base Case Description	Various configurations of fluorescent fixtures before removal of lamps.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: ICF Portfolio Plan
Effective Useful Life	Source: DEER 11 years

Incentives are paid for the permanent removal of existing fluorescent lamps resulting in a net reduction of the number of foot-lamps. Customers are responsible for determining whether or not to use reflectors in combination with lamp removal in order to maintain adequate lighting levels. Unused lamps, lamp holders, and ballasts must be permanently removed from the fixture. This measure is applicable when retrofitting from T12 lamps to T8 lamps or simply removing lamps from a T8 fixture. Removing lamps from a T12 fixture that is not being retrofitted with T8 lamps is not eligible for this incentive. A Pre-approval Application is required for lamp removal projects in order for KEMA to have the option of conducting a pre-retrofit inspection.

Measure Savings

Non-coincident demand savings are summarized by the following table:

Table 17: Wattage Reduction

Wattage Category	Average Wattage Reduction
8 Foot Lamp Removal	68
4 Foot Lamp Removal	35
2 Foot or 3 Foot Lamp Removal	24

Table 18: Measure Savings for 8-Foot Lamp Removal

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	8-foot Lamp Peak Savings (kW)	8-foot Savings (kWh)
4,389	1.19	0.77	1.12	0.062	333.7

Table 19: Measure Savings for 4-Foot Lamp Removal

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	4-foot Lamp Peak Savings (kW)	4-foot Savings (kWh)
4,389	1.19	0.77	1.12	0.032	172.3

Table 20: Measure Savings for 2-Foot or 3-Foot Lamp Removal

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	2-foot or 3-foot Lamp Peak Savings (kW)	2-foot or 3-foot Savings (kWh)
4,389	1.19	0.77	1.12	0.022	119.3

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operating hours, the coincidence factors, and the interactive effect factors were all derived from the DEER database.[5] However, DEER values by building type were averaged for the AEP Ohio Program.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

[5] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline assumptions are presented in the next table. Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed. The table shows the wattages used for the savings calculations. Weighted average savings values are used when determining deemed savings for each 8 foot or 4 foot lamp permanently removed.

Table 21: Wattages for Eight-foot Lamps

Baseline	Base Wattage	Lamp Removed Wattage	Weight Percentages
Two 8' T12 (60W/75W)	140	70	85%
Two 8' T8 (59W)	111	56	15%
Total Weighted Average		68	

Table 22: Wattages for Four-foot Lamps

Baseline	Base Wattage	Lamp Removed Wattage	Weight Percentages
Two 4' T8 (32W)	65	36	3%
Two 4' T12 (34W/40W)	72	36	8%
Three 4' T8 (32W)	92	31	7%
Three 4' T12 (34W/40W)	115	38	22%
Four 4' T8 (32W)	118	30	15%
Four 4' T12 (34W/40W)	144	36	45%
Total Weighted Average		**35**	

Table 23: Wattages for Two and Three-foot Lamps

Baseline	Base Wattage	Lamp Removed Wattage	Weight Percentages
Two 3' T12 (30W)	76	38	15%
Two 3' T8 (34W/40W)	48	24	15%
Two 2' T8 (17W)	31	15	30%
Two 2' T12 (20W)	56	28	30%
Three 2' T8 (17W)	46	16	2.5%
Three 2' T12 (20W)	62	21	2.5%
Four 2' T8 (17W)	60	15	2.5%
Four 2' T12 (20W)	112	28	2.5%
Total Weighted Average		24	

Measure Life and Incremental Measure Cost

The following table provides the measure life and incremental measure cost (IMC) documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. For lighting measures, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 24: Measure Life and Incremental Measure Cost

Measure Category		Value	Source
All	Measure Life	11	DEER
8-Foot Lamp Removal	Incremental Measure Cost	$25.91	ICF Portfolio Plan
4-Foot Lamp Removal	Incremental Measure Cost	$25.70	ICF Portfolio Plan
2-Foot or 3-Foot Removal	Incremental Measure Cost	$25.70	KEMA

High Performance and Reduced Wattage 4-foot T8 Lamps and Ballast	
Measure Description	This measure consists of replacing existing T12 4' lamps and magnetic ballasts with high performance 32W T8 lamps or reduced wattage 28W or 25W lamps and electronic ballasts. Both the lamp and ballast must meet the Consortium for Energy Efficiency (CEE) high performance or reduced wattage T8 specification (www.cee1.org) summarized below.
Units	Per lamp
Base Case Description	T12 lamp and magnetic ballasts
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: AEP Ohio Potential Study
Effective Useful Life	Source: DEER 11 years

This measure consists of replacing existing T12 lamps and magnetic ballasts with high-performance T8 lamps or reduced wattage (28 or 25W) T8 lamps and electronic ballasts. This measure is based on the Consortium for Energy Efficiency (CEE) high-performance T8 or reduced wattage specification (www.cee1.org) and is summarized below. A list of qualified lamps and ballasts can be found at: http://www.cee1.org. Both the lamp and ballast must meet the specification to qualify for an incentive. The incentive is calculated based on the number of lamps installed. A manufacturer's specification sheet must accompany the application.

For reduced wattage 4-foot T8 lamps, the nominal wattage must be 28 W (≥2,585 Lumens) or 25 W (≥2,400 Lumens) to qualify. The mean system efficacy must be ≥ 90 MLPW, CRI ≥80, and lumen maintenance at 94 percent. Other requirements can be found on the CEE website using the links above.

The table below provides the specification for high performance systems.

Table 25: High-Performance T8 Specifications

Performance Characteristics for Systems				
Mean system efficacy	≥ 90 Mean Lumens per Watt (MLPW) for Instant Start Ballasts			
	≥ 88 MLPW for Programmed Rapid Start Ballasts			
Performance Characteristics for Lamps				
Color Rendering Index (CRI)	≥ 80			
Minimum initial lamp lumens	≥ 3100 Lumens[6]			
Lamp life	≥ 24,000 hours			
Lumen maintenance or minimum mean lumens	≥ 90% or ≥ 2,900 Mean Lumens			
Performance Characteristics for Ballasts				
Ballast Efficacy Factor (BEF) BEF = (BF x 100) / Ballast Input Watts	**Instant-Start Ballast (BEF)**			
	Lamps	Low BF ≤ 0.85	Norm 0.85 < BF ≤ 1.0	High BF ≥ 1.01
	1	> 3.08	> 3.11	NA
	2	> 1.60	> 1.58	>1.55
	3	≥ 1.04	≥ 1.05	≥ 1.04
	4	≥ 0.79	≥ 0.80	≥ 0.77
	Programmed Rapid Start Ballast (BEF)			
	1	≥ 2.84	≥ 2.84	NA
	2	≥ 1.48	≥ 1.47	≥ 1.51
	3	≥ 0.97	≥ 1.00	≥ 1.00
	4	≥ 0.76	≥ 0.75	≥ 0.75
Ballast Frequency	20 to 33 kHz or ≥ 40 kHz			
Power Factor	≥ 0.90			
Total Harmonic Distortion	≤ 20%			

Measure Savings
Savings are summarized by the following table:

Table 26: Measure Savings for High-Performance or Reduced Wattage 4-foot Lamp and Ballast (per lamp)

Coincident Demand Savings (kW)	Energy Savings (kWh)
0.012	62.0

[6] For lamps with temperature ≥4500K, 2,950 minimum initial lamp lumens are specified.

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operating hours, the coincidence factors, and the interactive effect factors were all derived from the DEER database and shown in the following table. However, DEER values by building type were averaged for the AEP Ohio Program.

Table 27: Factors used for Calculating Lighting Savings

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
4,389	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are presented in the table below.

KEMA

Table 28: Baseline and Retrofit Wattages for High-Performance or Reduced Wattage Fixture Retrofits

	T8, 4-foot Configuration	Base Fixture Wattage	Retrofit Lamp Wattage	Retrofit Fixture Wattage	Demand Savings per fixture (kW)	Demand Savings per lamp (kW)	Weight Percentages
High	4-lamp	144	32	108	0.036	0.009	9%
	3-lamp	103	32	83	0.02	0.007	4%
	2-lamp	72	32	54	0.018	0.009	8%
	1-lamp	43	32	28	0.015	0.015	4%
Med	4-lamp	144	28	96	0.048	0.012	15%
	3-lamp	103	28	72	0.031	0.010	10%
	2-lamp	72	28	48	0.024	0.012	15%
	1-lamp	43	28	25	0.018	0.018	10%
Low	4-lamp	144	25	85	0.059	0.015	9%
	3-lamp	103	25	66	0.037	0.012	4%
	2-lamp	72	25	44	0.028	0.014	8%
	1-lamp	43	25	22	0.021	0.021	4%
	Weighted Average					0.0126	

Measure Life and Incremental Measure Cost

The table below provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option. In this case, the IMC is equal to the full measure cost since cost of the less efficient option is 0.

Table 29: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Lamp and Ballast	11	DEER
Incremental Measure Cost	4 Foot Lamp and Ballast	$13.14	AEP Ohio Potential Study

KEMA

Reduced Wattage 4-foot Lamp Only	
Measure Description	This measure consists of replacing existing standard T8 4' lamps and electronic ballasts with reduced wattage T8 lamps. The lamp must meet the Consortium for Energy Efficiency (CEE) reduced wattage T8 specification (www.cee1.org). The nominal wattage for 4 foot lamps must be 28W (≥2585 Lumens) or 25W (≥2400 Lumens) to qualify. The mean system efficacy must be ≥ 90 MLPW, CRI ≥ 80, and lumen maintenance at 94%. A manufacturer's specification sheet must accompany the application.
Units	Per lamp
Base Case Description	Standard T8 fixtures.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: ICF Portfolio Plan
Effective Useful Life	Source: KEMA 3 years

Incentives are available when replacing standard 32-Watt T8 lamps with reduced-wattage T8 lamps when an electronic ballast is already present. The lamps must be reduced wattage in accordance with the Consortium for Energy Efficiency (CEE) specification (www.cee1.org). Qualified products can be found at http://www.cee1.org. The nominal wattage must be 28 W (≥2,585 Lumens) or 25 W (≥2,400 Lumens) to qualify. The mean system efficacy must be ≥ 90 MLPW, CRI ≥80, and lumen maintenance at 94 percent. A manufacturer's specification sheet must accompany the application.

Measure Savings
Savings are summarized by the following table:

Table 30: Measure Savings for Reduced-Wattage 4-foot Lamp Only

Coincident Demand Savings (kW)	Energy Savings (kWh)
0.005	28.8

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operating hours, the coincidence factors, and the interactive effect factors were all derived from the DEER database and shown in the next table. However, DEER values by building type were averaged for the AEP Ohio Program.

Table 31: Factors used for Calculating Lighting Savings

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
4,389	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are presented in the next table.

Table 32: Baseline and Retrofit Wattages for 4-foot T8 Lamp Only

T8 Configuration	Base Lamp Wattage	Base Fixture Wattage	Retrofit Lamp Wattage	Retrofit Fixture Wattage	Demand Savings per fixture (kW)	Demand Savings per lamp (kW)	Weight Percentages
4 ft, 4-lamp	32	112	28	96	0.016	0.004	18%
4 ft, 3-lamp	32	85	28	72	0.013	0.004	13%
4 ft, 2-lamp	32	58	28	48	0.01	0.005	15%
4 ft ,1-lamp	32	32	28	25	0.007	0.007	5%
4 ft, 4-lamp	32	112	25	85	0.027	0.007	18%
4 ft, 3-lamp	32	85	25	66	0.019	0.006	13%
4 ft, 2-lamp	32	58	25	44	0.014	0.007	15%
4 ft ,1-lamp	32	32	25	22	0.01	0.010	5%
Weighted Average						0.006	

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option. In this case, the IMC is equal to the full measure cost for lamp and ballast retrofit and incremental for lamp only. The lamp and ballast retrofit is a change in technology.

Table 33: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Lamp Only	3	KEMA
Incremental Measure Cost	4 Foot Lamp Only	$2.10	ICF Portfolio Plan

Reduced Wattage 8-foot	
Measure Description	This measure consists of replacing existing T12 8' lamps and magnetic ballasts with reduced wattage T8 lamps and electronic ballasts. Both the lamp and ballast must meet the Consortium for Energy Efficiency (CEE) high performance or reduced wattage T8 specification (www.cee1.org). Eight foot lamps must have a minimum MLPW of 90 and must have a nominal wattage of less than 57W. A manufacturer's specification sheet must accompany the application. High wattage T8 (59W) can be replaced with reduced wattage lamps without replacing the ballast. The lamps must also meet CEE standards for reduced wattage.
Units	Per lamp
Base Case Description	T12 lamp and magnetic ballasts or high watt T8 fixtures (for reduced wattage lamp only replacements).
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: DEER and ICF Portfolio Plan
Effective Useful Life	Source: KEMA and DEER

This measure consists of replacing existing T12 lamps and magnetic ballasts with reduced wattage lamp and electronic ballast systems. The lamps and ballasts must meet the Consortium for Energy Efficiency (CEE) specification (www.cee1.org). Qualified lamps and ballast products can be found at http://www.cee1.org. Incentives are also available when replacing 59-Watt T8 lamps with reduced-wattage T8 lamps when an electronic ballast is already present. Eight-foot lamps must have a minimum MLPW of 90 and must have a nominal wattage of less than 57 W. A manufacturer's specification sheet must accompany the application.

Measure Savings
Savings are summarized by the following table:

Table 34: Measure Savings for Reduced-Wattage 8-foot Lamp and Ballast

Coincident Demand Savings (kW)	Energy Savings (kWh)
0.016	78.7

Table 35: Measure Savings for Reduced-Wattage 8-foot Lamp Only

Coincident Demand Savings (kW)	Energy Savings (kWh)
0.005	24.6

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operating hours, the coincidence factors, and the interactive effect factors were all derived from the DEER database and shown in the table below. DEER values by building type were averaged for the AEP Ohio Program.

Table 36: Factors used for Calculating Lighting Savings

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
4,389	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are presented in the next table.

Table 37: Baseline and Retrofit Wattages for 8-foot

	Configuration	Base Lamp Wattage	Base Fixture Wattage	Retrofit Lamp Wattage	Retrofit Fixture Wattage	Demand Savings per fixture (kW)	Demand Savings per lamp (kW)	Weight Percentages
Lamp and Ballast	8ft, 2 lamp	60	132	57	102	0.030	0.015	50%
	8ft, 1-lamp	60	77	57	60	0.017	0.017	50%
	Weighted Average						0.016	
Lamp Only	8ft, 2 lamp	59	106	57	102	0.004	0.002	50%
	8ft, 1-lamp	59	68	57	60	0.008	0.008	50%
	Weighted Average						0.005	

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is the cost difference between the energy-efficient equipment and the less efficient option. In this case, the IMC is equal to the full measure cost for lamp and ballast retrofit and incremental for lamp only. The lamp and ballast retrofit is a change in technology.

Table 38: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Lamp and Ballast	11	DEER
Measure Life	Lamp Only	3	KEMA
Incremental Measure Cost	8 Foot Lamp and Ballast	$36.91	DEER
Incremental Measure Cost	8 Foot Lamp Only	$5.50	ICF Portfolio Plan

2-foot & 3-foot T8 Lamps and Ballast	
Measure Description	This measure consists of replacing existing T12 2-foot and 3-foot lamps and magnetic ballasts with 17W, 2-foot, and 25W, 3-foot, T8 lamps and electronic ballasts.
Units	Per lamp
Base Case Description	T12 lamps and magnetic ballast
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: PG&E 2006 Work papers
Effective Useful Life	Source: DEER 11 years

This measure consists of replacing existing T12 lamps and magnetic ballasts with T8 lamps and electronic ballasts. The lamp must have a color rendering index (CRI) ≥ 80 and the ballast must have a total harmonic distortion (THD) ≤ 32% at full light output and power factor (PF) ≥ 0.90. Ballasts must also be warranted against defects for 5 years. The incentive is calculated based on the number of lamps installed. A manufacturer's specification sheet must accompany the application.

Measure Savings
The coincident kW and kWh savings are provided in the following table:

Table 39: Measure Savings for 2-foot and 3-foot Lamp and Ballast (per lamp)

2-foot Lamp fixtures		3-foot Lamp fixtures	
Coincident Demand Savings (kW)	Energy Savings (kWh)	Coincident Demand Savings (kW)	Energy Savings (kWh)
0.010	51.6	0.013	69.5

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operating hours, the coincidence factors, and the interactive effect factors were all derived from the DEER database and shown in the following table.

Table 40: Factors used for Calculating Lighting Savings

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
4,389	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are presented in the tables below. The fixture wattages were collected from PG&E's Non-residential Retrofit Program standard fixture wattage table.

Table 41: Baseline and Retrofit Wattages for 2-foot lamps

T8 Configuration	Base Lamp Wattage	Base Fixture Wattage	Retrofit Lamp Wattage	Retrofit Fixture Wattage	Demand Savings per fixture (kW)	Demand Savings per lamp (kW)	Weight Percentages
2 ft, 4-lamp	20	112	17	61	0.051	0.013	2.5%
2 ft, 3-lamp	20	84	17	47	0.037	0.012	2.5%
2 ft, 2-lamp	20	56	17	33	0.023	0.012	65%
2 ft ,1-lamp	20	28	17	20	0.008	0.008	30%
Weighted Average						0.011	

Table 42: Baseline and Retrofit Wattages for 3-foot lamps

T8 Configuration	Base Lamp Wattage	Base Fixture Wattage	Retrofit Lamp Wattage	Retrofit Fixture Wattage	Demand Savings per fixture (kW)	Demand Savings per lamp (kW)	Weight Percentages
3 ft, 4-lamp	30	152	25	87	0.065	0.0163	2.5%
3 ft, 3-lamp	30	114	25	67	0.047	0.0157	2.5%
3 ft, 2-lamp	30	76	25	46	0.030	0.0150	65%
3 ft ,1-lamp	30	38	25	26	0.012	0.0120	30%
Weighted Average						0.014	

Measure Life and Incremental Measure Cost

The table below provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case, the IMC is equal to the full measure cost since cost of the less efficient option is $0.

Table 43: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Lamp and Ballast	11	DEER
Measure Life	Lamp Only	3	KEMA
Incremental Measure Cost	2 Foot Lamp and Ballast	$10.50	PG&E 2006 Work Paper
Incremental Measure Cost	3 Foot Lamp and Ballast	$21	PG&E 2006 Work Paper

U-Tube T8 Lamps and Ballast	
Measure Description	This measure consists of replacing existing T12 U-tube lamps and magnetic ballasts with T8 U-tube lamps and electronic ballasts.
Units	Per lamp
Base Case Description	U-tube T12 lamps and magnetic ballast
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: AEP Ohio Potential Study
Effective Useful Life	Source: DEER 11 years

This measure consists of replacing existing U-tube T12 lamps and magnetic ballasts with U-tube T8 lamps and electronic ballasts. The lamp must have a color rendering index (CRI) ≥ 80 and the ballast must have a total harmonic distortion (THD) ≤ 20% at full light output and power factor (PF) ≥ 90. Ballasts must also be warranted against defect for 5 years. The incentive is calculated based on the number of lamps installed. A manufacturer's specification sheet must accompany the application.

Measure Savings
The coincident kW and kWh savings are in the following table.

Table 44: Measure Savings for U-tube Lamp and Ballast (per lamp)

Coincident Demand Savings (kW)	Energy Savings (kWh)
0.009	46.7

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operating hours, the coincidence factors, and the interactive effect factors were all derived from the DEER database and shown in the following table.[7]

[7] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 45: Factors used for Calculating Lighting Savings

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
4,389	1.19	0.77	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are presented in the following table. The wattages were collected from PG&E's Non-residential retrofit standard wattages table.

Table 46: Baseline and Retrofit Wattages for U-tube lamps

T8 Configuration	Base Lamp Wattage	Base Fixture Wattage	Retrofit Lamp Wattage	Retrofit Fixture Wattage	Demand Savings per fixture (kW)	Demand Savings per lamp (kW)	Weight Percentages
U-tube, 2 lamp	35	72	32	59	0.013	0.007	50%
U-tube, 1 lamp	35	43	32	31	0.012	0.012	50%
Weighted Average						0.010	

Measure Life and Incremental Measure Cost

The table below provides the measure life and IMC documented for this measure as well as the source of the data. Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case, the IMC is equal to the full measure cost since cost of the less efficient option is $0. For U-tubes, it is assumed that the cost is the same as a high performance 4-foot T8 lamp (DEER measure ID D03-852).

Table 47: Measure Life and Incremental Measure Cost

	Measure Category	Value	Source
Measure Life	Lamp and Ballast	11	DEER
Measure Life	Lamp Only	3	KEMA
Incremental Measure Cost	U-Tube Lamp and Ballast	$13.14	AEP Potential Study

Cold Cathode	
Measure Description	All cold cathode fluorescent lamps (CCFLs) must replace incandescent lamps of at least 10 W and not greater than 40 W. Cold cathode lamps may be medium (Edison) or candelabra base. Product must be rated for at least 18,000 average life hours.
Units	Per lamp
Base Case Description	Incandescent
Measure Savings	Source: KEMA, SCE
Measure Incremental Cost	Source: PG&E
Effective Useful Life	Source: SCE 5 years

All cold cathode fluorescent lamps (CCFLs) must replace incandescent lamps of at least 10 W and not greater than 40 W. Cold cathode lamps may be medium (Edison) or candelabra base. The product must be rated for at least 18,000 average life hours.

Measure Savings
Baseline and retrofit equipment assumptions are presented in table below. Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed. The table shows the wattages used for the savings calculations from SCE and KEMA research of cold cathode manufacturers.

Table 48: Baseline and Retrofit Wattages

Measures[8]	Base Wattage (Watts)	Retrofit Wattage (Watts)	Wattage Reduction (Watt)
Incandescent (15W) -> Cold Cathode FL (5W)	15	5	10
Incandescent (30W) -> Cold Cathode FL (5W)	30	5	25
Incandescent (40W) -> Cold Cathode FL (8W)	40	8	32
Average			22

The following table provides the measure savings using the above non-coincident savings.

[8] Southern California Edison Company, Cold Cathode Fluorescent Lamp Workpaper WPSCNRLG0063. 2007.

Table 49: Measure Savings

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak kW Savings	kWh Savings
4,321	1.19	0.77	1.12	0.020	108

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The annual operating hours, the coincidence factors, and the interactive effect factors were all derived from the DEER database.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy-efficient equipment and the less efficient option. In this case, the IMC is equal to the full measure cost since cost of the less efficient option is $0..

Table 50: Measure Life and Incremental Measure Cost[9]

	Value	Source
Measure Life	5	SCE WP
Incremental Measure Cost	$9.68	PG&E WP

[9] Southern California Edison Company, Cold Cathode Fluorescent Lamp Workpaper WPSCNRLG0063. 2007, Pacific Gas & Electric, Lighting WP.doc, 2006.

Exit Signs	
Measure Description	High-efficiency exit signs must replace or retrofit an existing incandescent exit sign. Electroluminescent, photoluminescent, T1 and light-emitting diode (LED) exit signs are eligible under this category. Non-electrified and remote exit signs are not eligible. All new exit signs or retrofit exit signs must be UL or ETL listed, have a minimum lifetime of 10 years, and have an input wattage ≤5 Watts or be ENERGY STAR qualified.
Units	Per Sign
Base Case Description	Incandescent Exit Signs
Measure Savings	Source: ENERGY STAR
Measure Incremental Cost	Source: AEP Ohio Potential Study
Effective Useful Life	Source: DEER 16 years

High-efficiency exit signs must replace or retrofit an existing incandescent exit sign. Electroluminescent, photoluminescent, T1 and light-emitting diode (LED) exit signs are eligible under this category. Non-electrified and remote exit signs are not eligible. All new exit signs or retrofit exit signs must be UL or ETL listed, have a minimum lifetime of 10 years, and have an input wattage ≤5 Watts or be ENERGY STAR qualified.

Measure Savings
Baseline and retrofit equipment assumptions are presented in the next table. Most lighting retrofits assume an early replacement of existing technologies where the baseline represents the equipment removed. The table shows the wattages used for the savings calculations.

Table 51: Baseline and Retrofit Wattages

Measure	Base Wattage	Retrofit Wattage	Wattage Reduction
Two Incandescent Bulbs (20W each) -> LED EXIT Sign (5W)	40	5	35

The measure savings use the above non-coincident savings.

Table 52: Exit Sign Savings

Peak kW Savings	kWh Savings
0.042	343.4

Measure Savings Analysis

Annual energy savings and the peak coincident demand savings were calculated using the equations below. The coincident diversity factor is 1.0 since the sign is on all the time. The operating hours are 8,760 hours per year.[10]

Table 53: Factors used for Calculating Savings

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects
8,760	1.19	1.00	1.12

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = non-coincident kW savings * Annual operating hours * Energy interactive effect

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect.

Measure Life and Incremental Measure Cost

The following table provides the measure life and incremental measure cost (IMC) documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. In this case, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

[10] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

KEMA

Table 54: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	16	DEER
Incremental Measure Cost	$82.54	AEP Ohio Potential Study

Occupancy Sensors	
Measure Description	Passive infrared, ultrasonic detectors and fixture-integrated sensors or sensors with a combination thereof are eligible. All sensors must be hard-wired and control interior lighting fixtures. The incentive is per Watt controlled.
Units	Per Connected Watt
Base Case Description	No Sensor
Measure Savings	Source: DEER
Measure Incremental Cost	Source: DEER
Effective Useful Life	Source: DEER 8 years

Passive infrared, ultrasonic detectors and fixture-integrated sensors or sensors with a combination thereof are eligible. All sensors must be hard-wired and control interior lighting fixtures. The incentive is per Watt controlled.

Measure Savings
The annual operation hours, the coincidence factors, and the interactive effect factors were all derived from the DEER database.

Table 55: Measure Savings for Occupancy Sensor per Connected Watt

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak Watt Savings	kWh Savings
4,389	1.19	0.77	1.12	0.0003	1.385

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below.

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = Connected wattage/1000 * Annual operating hours * Energy interactive effect*Occupancy Off Rate

Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

KEMA

Coincident kW savings = Connected wattage/1000 * Occupancy Off Rate * Coincidence Factor * Demand interactive effect

The baseline for this measure is fixtures that do not include any automatic controls, i.e., manual switches. Since the unit is defined as per connected Watt, the baseline demand is one watt. Demand savings depend on whether areas are high or low occupancy. DEER states that occupancy time off rates are at 20 percent for high-occupancy building types and 50 percent for low-occupancy building types.[11]. The table below shows the assumed range of occupancy off rates. Calculations here are performed with the 28% average sensor off rate.

Table 56: Occupancy Off Rate

Average Grouping	Occupancy Sensor Off Rate
Office	20%
School (K-12)	20%
College/University	20%
Retail/Service	20%
Restaurant	20%
Hotel/Motel	20%
Medical	20%
Grocery	20%
Warehouse	50%
Light Industry	50%
Heavy Industry	50%
Average	28%

Measure Life and Incremental Measure Cost

The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. For lighting measures, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

[11] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

Table 57: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	8	DEER
Incremental Measure Cost	$0.32	DEER

New T5/T8 Fluorescent Fixtures	
Measure Description	This measure consists of replacing one or more existing fixtures with new fixtures containing T8 or T5 lamps and electronic ballasts. The T8 or T5 lamps must have a color rendering index (CRI) ≥ 80. The electronic ballast must be high frequency (≥20 kHz), UL listed, and warranted against defects for 5 years. Ballasts must have a power factor (PF) ≥ 0.90. Ballasts for 4-foot lamps must have total harmonic distortion (THD) ≤20 percent at full light output. For 2- and 3-foot lamps, ballasts must have THD ≤32% at full light output.
Units	Per Watt reduced
Base Case Description	Typically high wattage HID fixtures
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: KEMA
Effective Useful Life	Source: DEER 11 years

This measure consists of replacing one or more existing fixtures with new fixtures containing T8 or T5 lamps and electronic ballasts. The T8 or T5 lamps must have a color rendering index (CRI) ≥ 80. The electronic ballast must be high frequency (≥20 kHz), UL listed, and warranted against defects for 5 years. Ballasts must have a power factor (PF) ≥ 0.90. Ballasts for 4-foot lamps must have total harmonic distortion (THD) ≤20 percent at full light output. For 2- and 3-foot lamps, ballasts must have THD ≤32 percent at full light output.

Measure Savings
The annual operating hours, the coincidence factors, and the interactive effect factors were all derived from the DEER database.[12]

Table 58: Measure Savings for New T8/T5 Fluorescent Fixtures per Watt Reduced

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak Watt Savings	kWh Savings
4,389	1.19	0.77	1.12	0.0009	4.9141

[12] 2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report - Residential and Commercial Non-Weather Sensitive Measures

KEMA

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = no-coincident kW savings * Annual operating hours * Energy interactive effect
Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are variable. Because we define this measure with the number of watts reduced, the non-coincident demand savings will be one watt by definition.

Measure Life and Incremental Measure Cost
The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. For lighting measures, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 59: Measure Life and Incremental Measure Cost

	Value	Source
Measure Life	11	DEER
Incremental Measure Cost[13]	$0.75	KEMA

LED Traffic Signals	
Measure Description	LED traffic signals meeting ENERGY STAR criteria, including arrow signals, that will replace existing incandescent traffic signals. Signals shall have a maximum wattage of 25. Signals must be installed and active. Lights must be hardwired, with the exception of pedestrian hand signals. Yellow lights are not eligible for rebates.
Units	Per Signal
Base Case Description	Incandescent fixtures
Measure Savings	Source: Michigan Statewide Energy Savings Database
Measure Incremental Cost	Source: Michigan Statewide Energy Savings Database
Effective Useful Life	Source: Michigan Statewide Energy Savings Database Traffic Signal: 6 Years Pedestrian Signal: 8 Years

LED traffic signals that meet ENERGY STAR criteria save 80-90 percent of the energy typically consumed by incandescent traffic signals and LED signals generally last 5-10 times longer. Since traffic signals operate 24 hours a day, 365 days a year, the opportunity for energy savings is significant, particularly in the peak demand. LED Traffic signals perform better than incandescent models and are a better value. They also have lower maintenance costs because they need to be replaced less frequently.

Measure Savings

The energy savings vary for red, green and yellow signals. Savings also vary for round lamps, arrows and pedestrian signals. Reviewing details on California, Wisconsin and Texan programs, the savings below are typical.

In general, savings are greater on car traffic signals and cost generally less than for pedestrian signals. These savings include diversity for each lamp type, and represent an average.

Table 60: Measure Savings Traffic and Pedestrian Signals

Signal Type	kW	kWh
Traffic	0.085	275
Pedestrian	0.044	150

KEMA

Measure Life and Incremental Measure Cost
The following table provides the measure life and IMC documented for this measure as well as the source of the data.

Incremental cost is cost difference between the energy efficient equipment and the less efficient option. For lighting measures, the IMC is equal to the full measure cost since the cost of the less efficient option, i.e., not conducting the retrofit, is $0.

Table 61: Measure Life and Incremental Measure Cost

	Signal Type	Value	Source
Measure Life	Traffic	6	KEMA
Incremental Measure Cost	Traffic	$90	KEMA
Measure Life	Pedestrian	8	KEMA
Incremental Measure Cost[14]	Pedestrian	$140	KEMA

Lighting Density	
Measure Description	Savings for new construction lighting projects will be calculated with lighting density.
Units	Per kW Reduced
Base Case Description	ASHRAE 90.1-2004 Lighting density.
Measure Savings	Source: KEMA
Measure Incremental Cost	Source: NA
Effective Useful Life	Source: DEER 11 Years

This measure applies only to new construction lighting projects and savings are calculated using the ASHRAE 90.1-2004 new construction lighting density as a baseline. The wattages are given on a per square foot basis and vary with business type.

The following table shows the ASHRAE criteria.

Table 62: ASHRAE Building Density Criteria

Building Type	Lighting Power Density (W/ft^2)	Building Type	Lighting Power Density (W/ft^2)
Automotive	0.9	Motion Picture Theatre	1.2
Convention Center	1.2	Multi-Family	0.7
Court House	1.2	Museum	1.1
Dining: Bar Lounge/Leisure	1.3	Office	1.0
Dining: Cafeteria/Fast Food	1.4	Parking Garage	0.3
Dining: Family	1.6	Penitentiary	1.0
Dormitory	1.0	Performing Arts Theatre	1.6
Exercise Center	1.0	Police/Fire Station	1.0
Gymnasium	1.1	Retail	1.5
Health Care	1.0	School/University	1.2
Hospital	1.2	Sports Arena	1.1

Hotel	1.0	Town Hall	1.1
Library	1.3	Transportation	1.0
Manufacturing Facility	1.3	Warehouse	0.8
Motel	1.0	Workshop.	1.4

Applications must calculate the kW reduction using the above numbers, taking into account the business type as well as the actual building square footage. On a per kW reduced basis, the following table shows the energy and coincident savings.

Table 63: Lighting Density Savings

Annual Operating Hours	Demand Interactive Effects	Coincident Diversity Factors	Energy Interactive Effects	Peak Watt Savings	kWh Savings
4,389	1.19	0.77	1.12	0.916	4,914

Measure Savings Analysis
Annual energy savings and the peak coincident demand savings were calculated using the equations below.

Non-coincident kW reduction = kW of existing equipment - kW of replacement equipment

Energy savings are calculated by applying the annual operating hours and the energy interactive effect, according to the following formula:

kWh Reduction = no-coincident kW savings * Annual operating hours * Energy interactive effect
Coincident demand savings are calculated by applying the coincidence factor and the demand interactive effect, according to the following formula:

Coincident kW savings = non-coincident kW savings * Coincidence Factor * Demand interactive effect

Baseline and retrofit equipment assumptions are variable. Because we define this measure as in the number of watts reduced, the non-coincident demand savings will be one kW by definition.

Measure Life
The following table provides the measure life documented for this measure as well as the source of the data.

KEMA

Table 64: Measure Life

	Value	Source
Measure Life	11	DEER