



Efficiency Vermont SSL Programs 2009

Gabe Arnold, PE, LC

ENERGY STAR Lighting Partners Meeting
San Antonio, TX
March 19th, 2009

2008 Year in Review

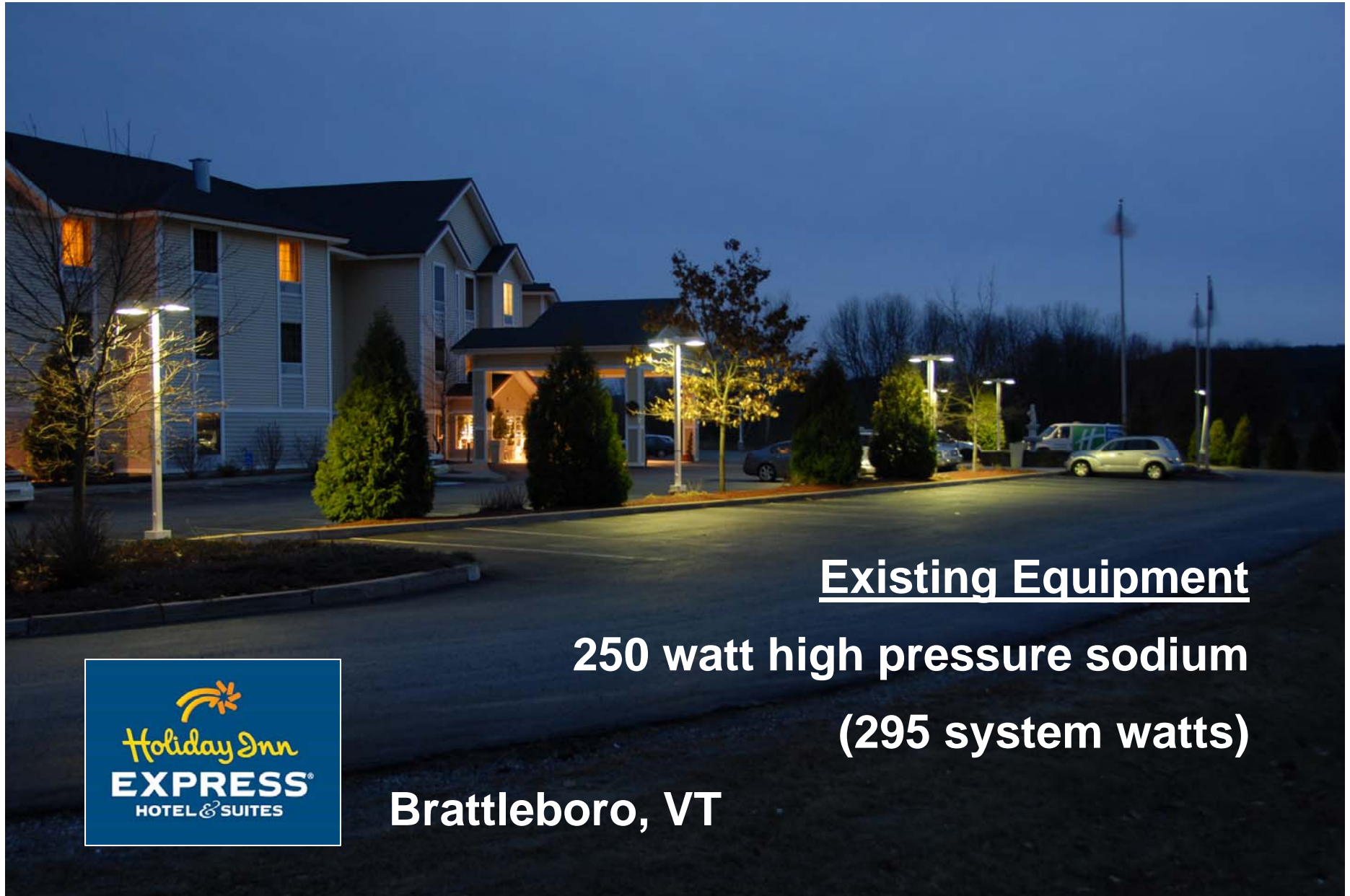
- LED Downlight Coupon offered since April 2008
- Required LM-79 testing to meet proposed ENERGY STAR V1.0 SSL Standards. (Cree LLS LR6 & Cooper Halo LED)
- 497 Total Products Rebated in 2008 through Coupon
 - 90 Unique Installations
 - 27 Commercial Installations, 59 Residential, 5 Unknown
- Does not include 600+ LED down lights rebated through Custom Business and Direct Install Program



2008 Year in Review – Pilot Projects

(20) Commercial Pilot Projects

- 7 Parking Lots (Both Cobrahead and Shoebox)
- 5 Gas Stations (Canopies and Pumps)
- 1 Parking Garage
- 1 Correctional Facility (Prison Yard Lighting)
- 1 Outdoor Clothing Outlet (PAR20 & PAR30 LED Track)
- 1 Jewelry Store (display case)
- 6 Convenience Stores (LED Refrigerated Case Lighting)



Existing Equipment

250 watt high pressure sodium
(295 system watts)



Brattleboro, VT

LED Solution

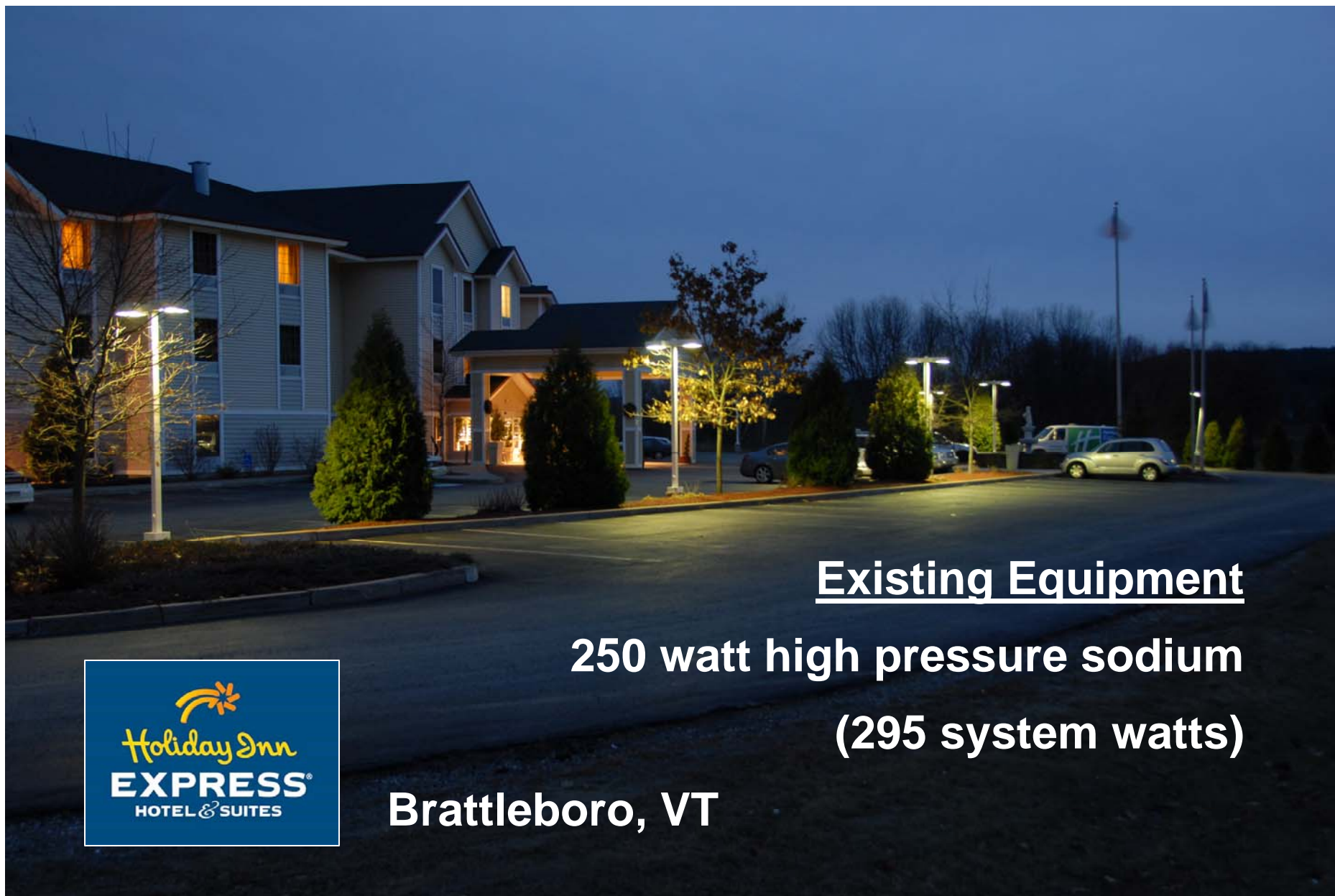
Beta LED EDGE Area Light

- 104 system watts (4-bar)
- 60 lumens per watt
- 75 CRI
- L₇₀ life 150,000 hours



Brattleboro, VT





Existing Equipment

250 watt high pressure sodium
(295 system watts)



Brattleboro, VT



Brattleboro, VT

Example Economics

Replace 250W HPS with Beta LED EDGE Area Light

- **Save 191 watts per fixture – 65%!**
- **Estimate installed cost \$885 per fixture**
- **\$100 Efficiency Vermont rebate**
- **5.9 year payback**
(includes maintenance savings, assumes 4380 hours and \$0.13/kWh)



River Bend Market - Townshend, VT



LYNDON
A vermont STATE COLLEGE

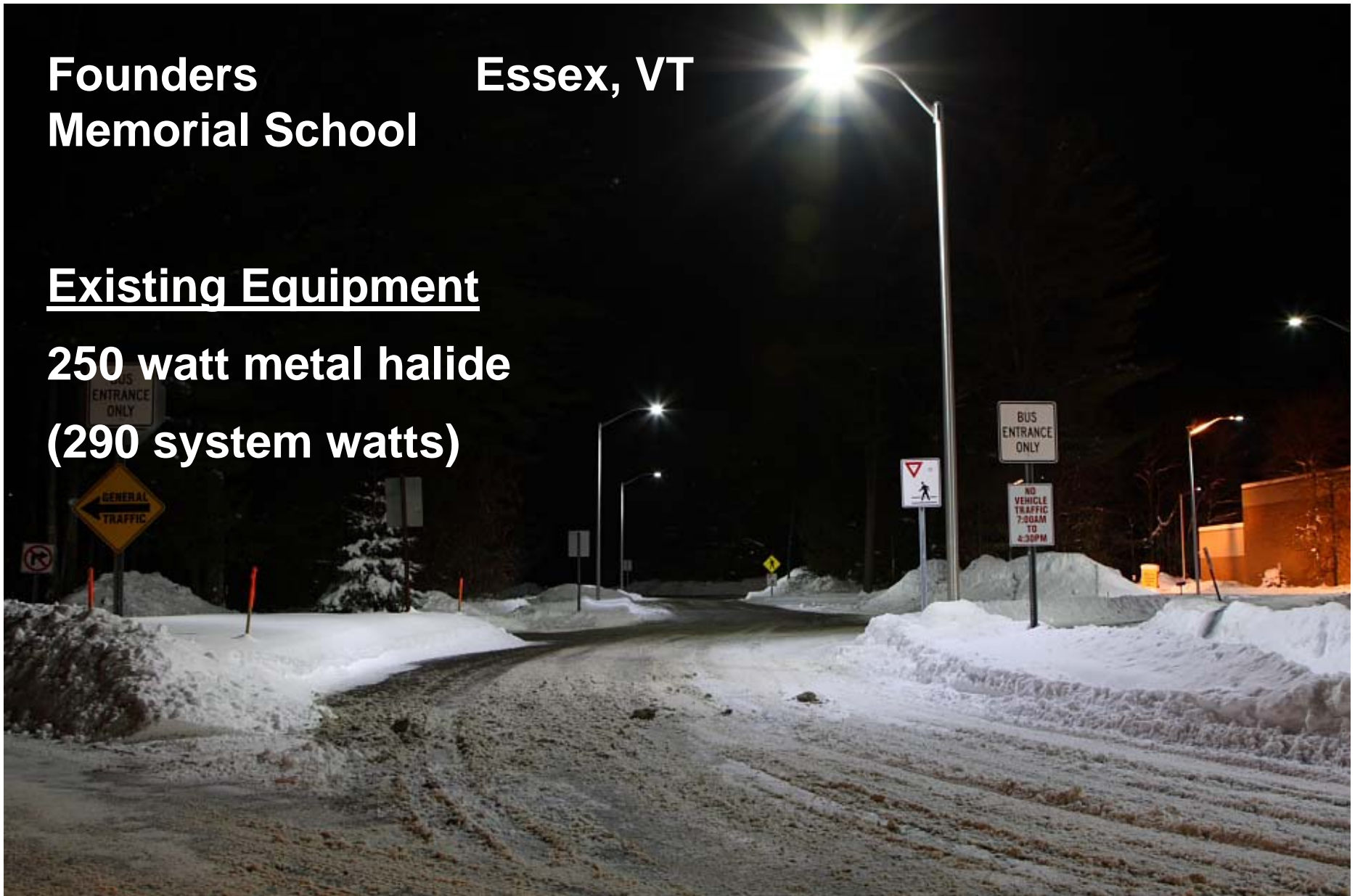
Lyndonville, VT

Founders Memorial School

Essex, VT

Existing Equipment

250 watt metal halide
(290 system watts)



Founders Memorial School

Essex, VT

LED Solution

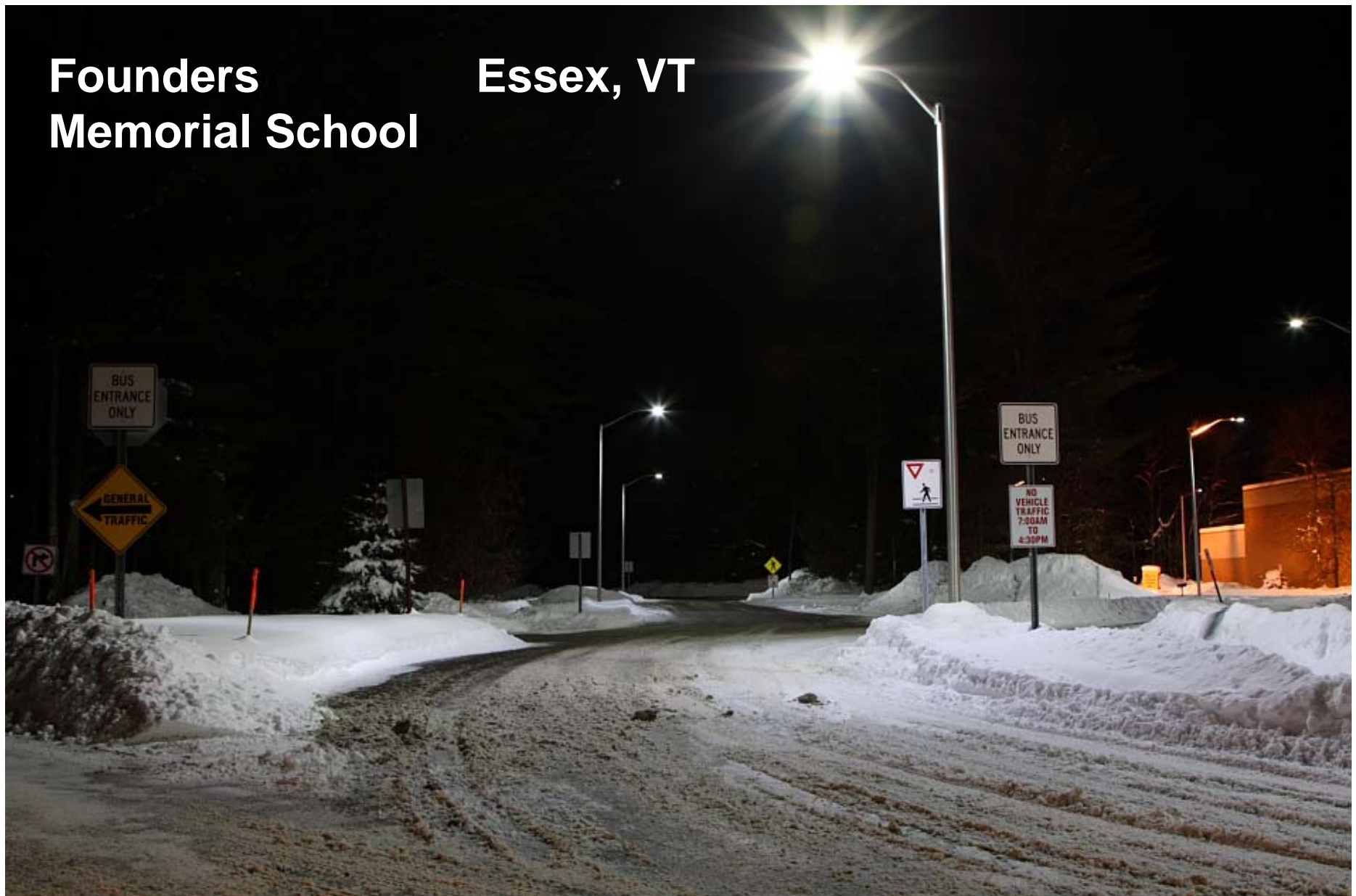
Beta LEDway Street Light

- 78 system watts
- 65 lumens per watt
- 75 CRI
- L₇₀ life 150,000 hours



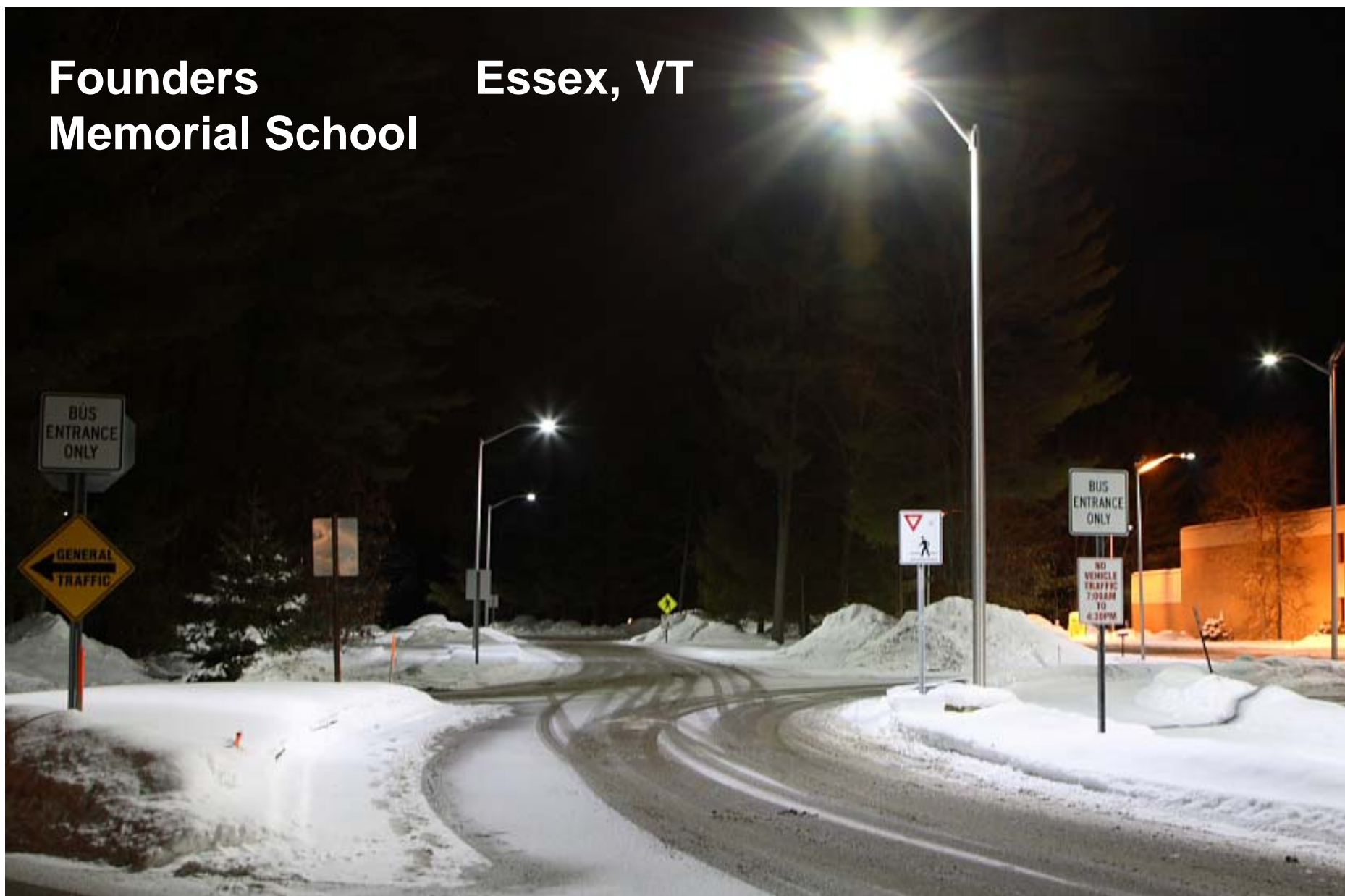
Founders Memorial School

Essex, VT



Founders Memorial School

Essex, VT



Example Economics

Replace 250W MH with Beta LEDway Street Light

- Save 217 watts per fixture – 74%!
- Estimate installed cost \$800 per fixture
- \$100 Efficiency Vermont rebate
- 4.7 year payback
(includes maintenance savings, assumes 4380 hours and \$0.13/kWh)



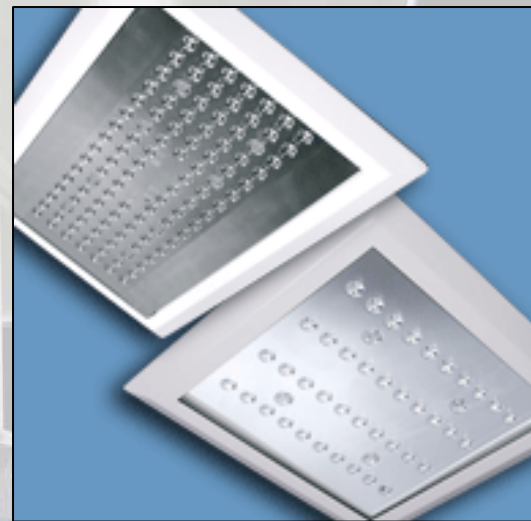
Short Stop Mobil - Derby, VT

Existing Equipment
400 watt metal halide
(455 system watts)

LED Solution

LSI Crossover Canopy Light

- 130 system watts (100 LED)
- 60 lumens per watt
- 75 CRI
- L₇₀ life 60,000 hours



Short Stop Mobil - Derby, VT



Short Stop Mobil - Derby, VT



Short Stop Mobil - Derby, VT

Example Economics

Replace 400W MH with LSI Crossover Canopy Light

- Save 325 watts per fixture – 71%!
- Estimate installed cost \$700 per fixture
- \$100 Efficiency Vermont rebate
- 2.9 year payback
(includes maintenance savings, assumes 4380 hours and \$0.13/kWh)



Derby, VT



Derby, VT



Existing Equipment
PAR30 & PAR38 lamps

Manchester, VT

LED Solution

Eco-Story PAR30 Lamp

- 8 watts
- 32 lumens per watt
- 83 CRI
- L₇₀ life TBD
(estimated 40,000 hours)



Manchester, VT



Manchester, VT





Manchester, VT



Example Economics

Replace 50W PAR30 with Eco-Story LED lamps

- Save 42 watts per fixture – 84%!
- Estimate cost \$65 per lamp
- Custom Efficiency Vermont rebate
- 2.3 year payback before incentive
(includes maintenance savings, assumes 3500 hours and \$0.13/kWh)



Denecker Chevrolet - Vergennes, VT

LED Solution

Cree LR6 LED Downlight

- 12 system watts
- 60 lumens per watt
- 92 CRI
- L₇₀ life 50,000 hours



Denecker Chevrolet - Vergennes, VT



Denecker Chevrolet - Vergennes, VT

Example Economics

Replace 65W BR30 with Cree LR6 downlight

- Save 53 watts per fixture – 82%!
- Estimate cost \$110 per fixture
- \$30 Efficiency Vermont rebate
- 2.3 year payback
(includes maintenance savings, assumes 3500 hours and \$0.13/kWh)



Essex, VT

2009 Program Plans

- Program Approach: Aggressive and Cautious
 - Aggressive support for good-performing products
 - Require ENERGY STAR and/or LM-79, LM-80, temperature testing
- New Commercial and Residential Rebates
- Marketing, Education & Awareness, Availability Promotions

Timing – Why get out early?

- Opportunity
 - Elevate Positioning of your organization in Marketplace
 - Build Credibility as a Trusted Resource
 - Help set the Standard
 - Avoid the Mistakes of the CFL
 - Build the infrastructure for future programs

2009 Program Plans – Residential

- Coupon currently available
- Look for more product coupons in 2009:
 - Undercabinet Kitchen
 - Task Lighting
 - Outdoor Porch Lights
 - Track/Rail Lights, plus more..

VERMONT LED DOWNLIGHT INSTANT COUPON

\$30 OFF (per item)
Efficiency Vermont Approved LED Downlight

REDEEMABLE IN STORE ONLY. For purchases made 4/1/08-12/31/08. Not to exceed purchase price. Limit up to 6 Efficiency Vermont approved LED downlights per residential electric utility customer in VT per calendar year or up to 25 Efficiency Vermont approved LED downlights per business electric utility customer in VT per calendar year. See back for details.

1. Fill out the information completely.
2. Redeem coupon at the register and save!

PRODUCTS TO BE INSTALLED IN MY: ☐ HOME ☐ BUSINESS
PLEASE PRINT CLEARLY

NAME ON YOUR VT HOME ELECTRIC BILL OR ON YOUR VT BUSINESS ELECTRIC BILL _____

PHYSICAL STREET ADDRESS (NO P.O. BOXES OR RURAL ROUTES) _____ VT _____ 05 _____

CITY/TOWN (MUST BE A VT ADDRESS) _____ ZIP CODE _____

DATE OF PURCHASE ____/____/____

DAYTIME PHONE - FOR VERIFICATION ONLY _____

Product Type (check one): <input type="checkbox"/> Interior <input type="checkbox"/> Exterior	Manufacturer	Model #	Actual Wattage Used (check one): <input type="checkbox"/> 17 watt or less	QTY	Individual Retail Price \$ _____

Note to Distributor: Currently approved product includes the LLF LR6 LED Downlight. This product has been third-party tested through the U.S. Department of Energy CALIPER program using IESNA LM-79 and LM-80 testing methods. Other LED downlight products may be eligible with submittal of 3rd party test data using IESNA LM-79, LM-80, etc., and pre-approval from Efficiency Vermont.

Offer valid for all residential and business electric utility customers in Vermont. See reverse side for details.

For Retailer Use Only: Total # of Products _____ Total Value of Coupon \$ _____

RRT50w-0308

Residential Product Qualification

- ENERGY STAR and Listing on Efficiency Vermont LED Eligible Products List Required



2009 Commercial Rebates

- New 2009 LED Commercial Rebate Form

LED SCREW-IN LAMPS

Efficiency Vermont is excited about the development of screw-based LED PAR20, PAR30, PAR38, and MR-16 lamps. At this time, however, we are not offering rebates for these products.

The industry currently lacks a standard for predicting the useful life of screw-in LED products. Testing by the U.S. Department of Energy has shown widespread variation in products, with many products not meeting the ratings listed by the manufacturer.

Rebates may become available once an industry standard is established. Please contact Efficiency Vermont for additional information.

NEW!



LED SCREW-IN LAMPS

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Non-LED Lighting

- Please see the 2009 Commercial Lighting Rebate Application for rebates on non-LED lighting products.
- Custom rebates may be available for other energy-efficient lighting technologies. Contact Efficiency Vermont for details.

WORK WITH EFFICIENCY VERMONT

There may be other opportunities to save money and energy, such as with HVAC, motors, and refrigeration. Please contact Efficiency Vermont's Rebate Coordinator at 888-921-5990, ext. 1003 or info@efficiencyvermont.com.

2009 REBATE APPLICATION

Commercial LED Lighting Equipment

USE THIS FORM ONLY IF...

- You are requesting rebates for new construction or replacement projects totaling less than 10,000 square feet.
- You have fewer than 100 rebate-eligible items to submit.

NOTE: REBATES EXCEEDING \$2,500 REQUIRE PRE-APPROVAL BY EFFICIENCY VERMONT OR BURLINGTON ELECTRIC DEPARTMENT PRIOR TO PURCHASE. Call the Efficiency Vermont Rebate Coordinator at 888-921-5990, ext. 1003 for instructions.

Efficiency Vermont now supports the installation of energy-efficient light-emitting diode (LED) lighting through financial rebates. To receive your rebates, follow these simple steps:

1. Determine your project's eligibility.

- Review the product specifications on pages 2 & 3.
- Confirm that your equipment is listed on Efficiency Vermont's "LED Eligible Products List."

2. Complete this application.

- Fill out the worksheet on page 4.
- Calculate your total rebate and enter the amount in the space provided.
- Read and sign the "Terms & Conditions" on page 5.
- Please check to make sure you've provided all information requested. Incomplete information will delay the processing of your application.

3. Return your completed application with your proof(s) of purchase.

- Enclose the sales receipt(s) or invoice(s) itemizing your new equipment. The proof of purchase must indicate the date and place of purchase, as well as the size, type, manufacturer, and model or part number of the equipment.
- *All electric utility customers except those in Burlington:* Send this completed application with your receipt(s) to Efficiency Vermont, Rebate Coordinator, 255 S. Champlain St., Burlington, VT 05401-4894.
- *Customers served by the Burlington Electric Department:* Send this completed application with your receipt(s) to Energy Services Area, Burlington Electric Department, 585 Pine St., Burlington, VT 05401. Please contact BED at 802-865-7342 prior to purchase for approval for all new construction projects.

Where applicable, all lighting installations are required to comply with the Vermont commercial energy code. For more information, see http://publicservice.vermont.gov/energy-efficiency/ee_commstandards.html.

Efficiency Vermont

888-921-5990 • www.efficiencyvermont.com

Printed on 100% recycled post-consumer waste content and process chlorine-free paper with soy-based inks. BX10a-0309

Efficiency Vermont

What are LEDs?

Light-emitting diode (LED) lighting is an exciting, rapidly evolving technology that produces light in a whole new way.

- LEDs are small light sources that become illuminated by the movement of electrons through a semiconductor material, more akin to computer chips than to light bulbs.
- The heat from an LED is conducted through the back of the fixture, rather than radiated in all directions as with other light sources. The proper dissipation of this heat is key to effective LED performance.
- LEDs are the only light source that are inherently directional and do not require a reflector to direct light, offering increased energy savings in directional applications.
- In select directional applications, LEDs can offer energy savings of more than 50% versus fluorescent or HID, and more than 75% savings versus incandescent lighting.

Not all LED lighting is created equal.

While LEDs are already beginning to surpass the quality and efficiency of existing lighting technologies, such as fluorescent and incandescent, LED performance varies widely.

- Testing by the U.S. Department of Energy has shown wide variability in performance of LED products, with some products not meeting the ratings listed by the manufacturer.
- Only well-designed LED products using the latest in LED technology, and applied in the right applications, will provide the energy, lighting quality, and long-life benefits of LEDs.
- Look for the ENERGY STAR label, awarded to select LED fixture types that meet strict efficiency, quality, and lifetime criteria.

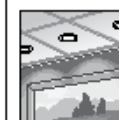
Efficiency Vermont's "LED Eligible Products List"

- Efficiency Vermont has worked with the U.S. Department of Energy and other utilities in the Northeast to develop performance standards for high-performing LED products. The products that meet these performance standards have passed a variety of tests to help ensure their performance and are listed on Efficiency Vermont's "LED Eligible Products List."
- The introductory "LED Eligible Products List" features a small number of approved products. This list will be updated frequently throughout 2009 as manufacturers release new products and obtain the testing required to meet Efficiency Vermont and ENERGY STAR performance standards.
- Only products listed on the "LED Eligible Products List" are eligible for rebates from Efficiency Vermont.

For a copy of the "LED Eligible Products List" or for additional information on LEDs, please call Efficiency Vermont toll-free at 888-921-5990 or visit www.efficiencyvermont.com/led.

LED PRODUCT INFORMATION

1 Recessed Downlight Fixtures



Install a new ENERGY STAR qualified LED recessed downlight fixture.

\$30 Rebate



- Product must be listed on Efficiency Vermont's "LED Eligible Products List."
- Product must carry the ENERGY STAR label.
- Minimum luminaire efficacy of 35 lumens per watt.
- Minimum light output of 345 lumens for downlights 4" or smaller.
- Minimum light output of 575 lumens for downlights 5" or larger.
- Minimum lumen maintenance of 94.1% at 6,000 hours per IES LM-80.

2 Surface/Pendant-Mounted Downlight Fixtures



Install a new ENERGY STAR qualified LED surface- or pendant-mounted downlight fixture.

\$30 Rebate



- Product must be listed on Efficiency Vermont's "LED Eligible Products List."
- Product must carry the ENERGY STAR label.
- Minimum luminaire efficacy of 35 lumens per watt.
- Minimum light output of 345 lumens for downlights 4" or smaller.
- Minimum light output of 575 lumens for downlights 5" or larger.
- Minimum lumen maintenance of 94.1% at 6,000 hours per IES LM-80.

3 Outdoor Pole/Arm-Mounted Parking or Roadway Fixtures



Install a new LED pole- or arm-mounted parking lot or roadway light fixture.

\$100 Rebate

- Product must be listed on Efficiency Vermont's "LED Eligible Products List."
- Minimum luminaire efficacy of 50 lumens per watt.
- Minimum light output of 2,300 lumens.
- Minimum lumen maintenance of 94.1% at 6,000 hours per IES LM-80.

4 Outdoor Pole/Arm-Mounted Decorative Parking or Roadway Fixtures



Install a new decorative type pole- or arm-mounted parking lot or roadway light fixture.

\$100 Rebate

- Product must be listed on Efficiency Vermont's "LED Eligible Products List."
- Products include acorn and post-top decorative type outdoor light fixtures.
- Minimum luminaire efficacy of 40 lumens per watt.
- Minimum light output of 2,300 lumens.
- Minimum lumen maintenance of 94.1% at 6,000 hours per IES LM-80.

PRODUCTS MUST BE LISTED ON EFFICIENCY VERMONT'S "LED ELIGIBLE PRODUCTS LIST" TO QUALIFY FOR REBATES.

5 Outdoor Wall-Mounted Area Fixtures (Wall Packs)



Install a new LED wall-pack type fixture.

\$100 Rebate

- Product must be listed on Efficiency Vermont's "LED Eligible Products List."
- Minimum luminaire efficacy of 40 lumens per watt.
- Minimum light output of 1,300 lumens.
- Minimum lumen maintenance of 94.1% at 6,000 hours per IES LM-80.

6 Circular or Square Parking Garage Fixtures



Install a new LED parking garage fixture.

\$100 Rebate

- Product must be listed on Efficiency Vermont's "LED Eligible Products List."
- Minimum luminaire efficacy of 56 lumens per watt.
- Minimum light output of 4,000 lumens.
- Minimum lumen maintenance of 94.1% at 6,000 hours per IES LM-80.

7 Bollard Fixtures



Install a new ENERGY STAR qualified LED bollard type fixture.

\$50 Rebate



- Product must be listed on Efficiency Vermont's "LED Eligible Products List."
- Product must carry the ENERGY STAR label.
- Minimum luminaire efficacy of 35 lumens per watt.
- Minimum lumen maintenance of 94.1% at 6,000 hours per IES LM-80.

8 Outdoor Step Light Fixtures



Install a new ENERGY STAR qualified outdoor step light fixture.

\$25 Rebate



- Product must be listed on Efficiency Vermont's "LED Eligible Products List."
- Product must carry the ENERGY STAR label.
- Minimum luminaire efficacy of 20 lumens per watt.
- Minimum light output of 50 lumens.
- Minimum lumen maintenance of 94.1% at 6,000 hours per IES LM-80.

9 Outdoor Pathway Light Fixtures



Install a new ENERGY STAR qualified outdoor pathway LED light fixture.

\$25 Rebate



- Product must be listed on Efficiency Vermont's "LED Eligible Products List."
- Product must carry the ENERGY STAR label.
- Minimum luminaire efficacy of 25 lumens per watt.
- Minimum light output of 100 lumens.
- Minimum lumen maintenance of 94.1% at 6,000 hours per IES LM-80.

10 Wall-Wash Light Fixtures



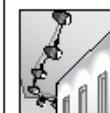
Install a new ENERGY STAR qualified LED wall-wash fixture.

\$30 Rebate



- Product must be listed on Efficiency Vermont's "LED Eligible Products List."
- Product must carry the ENERGY STAR label.
- Minimum luminaire efficacy of 40 lumens per watt.
- Minimum light output of 575 lumens.
- Minimum lumen maintenance of 94.1% at 6,000 hours per IES LM-80.

11 Track Lighting Fixtures

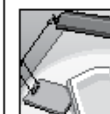


Install a new LED directional track lighting fixture.

\$30 Rebate

- Product must be listed on Efficiency Vermont's "LED Eligible Products List."
- Screw-in/screw-based products are not eligible.
- Minimum luminaire efficacy of 30 lumens per watt.
- Minimum light output of 250 lumens per head.
- Minimum lumen maintenance of 94.1% at 6,000 hours per IES LM-80.

12 Portable Desk/Task Light Fixtures



Install a new ENERGY STAR qualified LED portable desk or task light fixture.

\$25 Rebate



- Product must be listed on Efficiency Vermont's "LED Eligible Products List."
- Product must carry the ENERGY STAR label.
- Minimum luminaire efficacy of 29 lumens per watt.
- Minimum light output of 200 lumens per head.
- Minimum lumen maintenance of 94.1% at 6,000 hours per IES LM-80.

13 Undercabinet Shelf-Mounted Task Light Fixtures



Install a new ENERGY STAR qualified LED undercabinet task light fixture.

\$25/foot Rebate



- Product must be listed on Efficiency Vermont's "LED Eligible Products List."
- Product must carry the ENERGY STAR label.
- Minimum luminaire efficacy of 29 lumens per watt.
- Minimum light output of 125 lumens per foot.
- Minimum lumen maintenance of 94.1% at 6,000 hours per IES LM-80.

Custom incentives are available for energy-saving measures in addition to those listed on this form. Contact Efficiency Vermont to discuss your needs.

2009 REBATE APPLICATION • COMMERCIAL LED LIGHTING EQUIPMENT

COMPLETE PAGES 4 AND 5 OF THIS FORM & SUBMIT WITH YOUR PROOF(S) OF PURCHASE.
Products must be listed on Efficiency Vermont's "LED Eligible Products List" in order to qualify for rebates.

Product Category	Manufacturer Name	Model Number	Lumen Output (if available)	# of hours operated per week	Quantity	X Rebate	= Sub-Total
1						\$30	
Recessed Downlight Fixtures						\$30	
						\$30	
						\$30	
2						\$30	
Surface/Pendant-Mounted Downlight Fixtures						\$30	
						\$30	
						\$30	
3						\$100	
Outdoor Pole/Arm-Mounted Parking or Roadway Fixtures						\$100	
						\$100	
						\$100	
4						\$100	
Outdoor Pole/Arm-Mounted Decorative Parking or Roadway Fixtures						\$100	
						\$100	
						\$100	
5						\$100	
Outdoor Wall-Mounted Area Fixtures (Wall Packs)						\$100	
						\$100	
						\$100	
6						\$100	
Circular or Square Parking Garage Fixtures						\$100	
						\$100	
						\$100	
7						\$50	
Bollard Fixtures						\$50	
						\$50	
						\$50	
8						\$25	
Outdoor Step Light Fixtures						\$25	
						\$25	
						\$25	
9						\$25	
Outdoor Pathway Light Fixtures						\$25	
						\$25	
						\$25	
10						\$30	
Wall-Wash Light Fixtures						\$30	
						\$30	
						\$30	
11						\$30	
Track Lighting Fixtures						\$30	
						\$30	
						\$30	
12						\$25	
Portable Desk/Task Light Fixtures						\$25	
						\$25	
						\$25	
13						\$25/foot	
Undercabinet Shelf-Mounted Task Light Fixtures						\$25/foot	
						\$25/foot	
						\$25/foot	

TOTAL REBATE REQUESTED \$ _____

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Commercial Product Qualification

- Using a Regional Qualification Strategy
- ENERGY STAR required where an ENERGY STAR label exists
- If no ENERGY STAR label, product must meet NEEP DLC Performance Specs based on LM-79, LM-80, and temperature testing.






DesignLights™ Consortium
A NEEP Commercial Lighting Initiative



**Product Data Submission Requirements
For Northeast Region
Qualified SSL Products List**
Draft 14 March 6, 2009



DesignLights™ Consortium Sponsors

<p>Connecticut</p> <ul style="list-style-type: none"> • Connecticut Light and Power Company • United Illumination 	<p>Massachusetts</p> <ul style="list-style-type: none"> • Cape Light Contract • National Grid • NSTAR • Western Massachusetts Electric Company 	<p>Maine</p> <ul style="list-style-type: none"> • Efficiency Maine
<p>New Hampshire</p> <ul style="list-style-type: none"> • Public Service of New Hampshire 	<p>New Jersey</p> <ul style="list-style-type: none"> • New Jersey Clean Energy Program 	<p>New York</p> <ul style="list-style-type: none"> • Long Island Power Authority • NYSERDA
<p>Rhode Island</p> <ul style="list-style-type: none"> • National Grid 		<p>Vermont</p> <ul style="list-style-type: none"> • Efficiency Vermont

Luminaire Efficacy

- All SSL Programs & Energy Savings based on Luminaire Efficacy
 - Evaluated at Fixture Level instead of Source Level (lumens per watt)

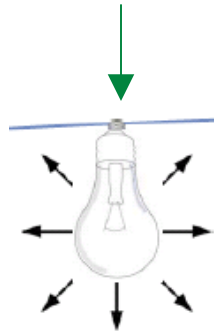
$$\begin{aligned} & \text{Lumens}_{eligible_product} * \left(\frac{1}{LPW_{base}} - \frac{1}{LPW_{eligible_product}} \right) \\ &= Watts_{base} - Watts_{eligible_product} \\ &= Watts_{saved} \end{aligned}$$

- *Is it time to stop ignoring fixture losses with other Residential Lighting Technologies?*

Source
Efficacy

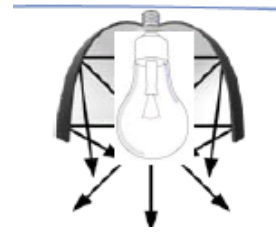
Luminaire
Efficacy

Incandescent



10 LPW

X



60% Fixture Efficiency

= 6 LPW

CFL



60 LPW

X



40% Fixture Efficiency

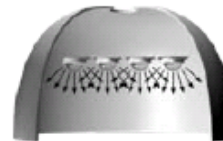
= 24 LPW

LED



80 LPW

X



90% Fixture Efficiency

95% Driver Efficiency

90% Thermal Efficiency

= 62 LPW

Addressing Availability

- Showroom and Distributor Promotions (still being planned)
 - 50% Cost Share for Qualifying Display LED Fixtures
 - Supplier must display XX Products or Product Types
 - Accessible Educational and Promotional Materials
- Retailers
 - Begin working with retail partners
 - Often requires a national or regional strategy to impact local availability

Marketing and Awareness

- Dedicated LED Web Page (in process)
 - www.encyvermont.com/led
- Media Placements w/ key messaging
 - The Media likes LEDs
 - Use Pilot and Example Projects to deliver key messaging
- LED Fact Sheet (in process)

Education

- Targeted Education statewide in 2009:
 - Contractors, Showrooms, Distributors
 - Design Professionals
- Future:
 - Retailers
 - End-Users

Thank You

Gabe Arnold

Efficiency Vermont

www.encyvermont.com/led

