

LED TAG - Wall Packs

Outdoor Wall Mounted Area Luminaires



LED TAG Work Group Members

- Jon Linn, NEEP DLC - Convener
- Eric Strandberg, LDL - Presenter
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- Jennifer Williamson, BPA (Emerging Tech)

LED Wall Pack Presentation

- Current product mix
- Category Definition
- Wattage bins, typical retrofits
- Installations to Date
- What's being Replaced
- Advantages and Concerns
- Manufacturers and Products
- Comparing Specs
- DLC List of products
- Design Considerations
- DLC active Utility Members
- Scoring Meeting Criteria

BPA's Current Program

F		LED		
<p><i>Includes fixtures that have been approved by BPA. NOTE: Most applicable products on the Energy Star, Lighting Design Lab and Designlights Consortium approved product lists meet BPA standards, [LM-79 and / or LM-80 documentation should be available upon request]</i></p> <p><i>NOTE: Links to ES, LDL and DLC can be found on the "Shared Notes and Links" page.</i></p> <p><i>NOTE: For Screw-in "A", Reflector, and/or Decorative Type Lamps use Measure N2 selection.</i></p>				
I, CFL	New Fixture, Retrofit	F1	Upgrade Incandescent/CFL exit sign to LED	\$50
T12, I, MV, MH, HPS & LPS	New Fixture, Retrofit	F2	Upgrade Recessed fixtures (includes LR-6-type kit or equivalent), New LED Track-heads 1 per head, (Hard Wire Design) Loading Dock Lights, (Wing Arm Design, 1 per head)	\$30
CFL, T12, I, MV, MH, HPS & LPS		F21	LED Outdoor (New fixtures only AND must be \leq 50% of existing fixture wattage) Wall Packs, Sconces, Parking Lot, or Bollards *** Excludes Street, Industrial and Flood Fixtures ***	\$50
T12 and T8		F4	Linear LED Applications; Refrigerated Case Lighting - 1 to 6 watts per linear foot of LED (new fixture) Outdoor / Indoor Signage, Accent and/or Cove Lighting - 1 to 6 watts per linear foot of LED (In many cases Sign Lighting upgrades will need to be submitted as Non-standard measures)	\$15

	Loading Dock Lights, (wing Arm Design, 1 per head)
F21	LED Outdoor (New fixtures only AND must be \leq 50% of existing fixture wattage) <u>Wall Packs, Sconces, Parking Lot, or Bollards</u> <u>*** Excludes Street, Industrial and Flood Fixtures ***</u>
	Linear LED Applications:

Wall Packs and Areas Near Buildings

Current Program Offer

- New Fixture
- Wattage reduction at least 50%
- Wall packs, sconces
- Not street, industrial, and flood fixtures
- Incentive \$50 per fixture
- Lighting Facts, DLC, LDL



Current Product Mix

Traditional “Wall Pack”

- Not DLC
- Too much up light



Sconce, Decorative or wall pack?

- Res. Or Comm.?
- 2,400+ lumens
- Not DLC or E*



Unique to wall

- Dark sky



Like “Pole mounted”, but, on a wall bracket

- ”Shoebox” or Street light.
- Dark Sky



Category Name:

Outdoor Wall Mounted Area Luminaires

- Eliminating the terms “wall pack” and sconce from language will aid in clarity and prevent confusion. Though recognizable to most, it is a bit misleading due to the fact that many “traditional” looking wall packs and sconces will not pass DLC specifications (or some others), mainly due to the Zonal Lumen Requirements (up light).
- This may hamper their inclusion in some incentive programs

Baseline Wattage, Incentive Rate

Fixture Lamp Watts	Fixture Wattage Reduction Savings	
	BPA >50%	Standard Practice
50 - 100	30.5 - 58	35 - 90
100 - 175	58 - 105	76 - 170
250	147.5	205
400	230	300

kWh Savings	
BPA >50%	Standard Practice
131 - 249	151 - 387
249 - 452	327 - 731
634	882
989	1290

Existing BPA Incentive	Incentive Rate/kWh					
	\$0.15		\$0.20		\$0.25	
	BPA >50%	Standard Practice	BPA >50%	Standard Practice	BPA >50%	Standard Practice
\$50	\$20 - \$37	\$23 - \$58	\$26 - \$50	\$30 - \$77	\$33 - \$62	\$38 - \$97
\$50	\$37 - \$68	\$49 - \$110	\$50 - \$90	\$65 - \$146	\$62 - \$113	\$82 - \$183
\$50	\$95	\$132	\$127	\$176	\$159	\$220
\$50	\$148	\$194	\$198	\$258	\$247	\$323

Fixture Lamp Watts	Materials Cost	Contractors Installed Cost
50 - 100	\$ 150 - \$ 200	\$ 225 - \$ 300
100 - 175	\$ 200 - \$ 250	\$ 270 - \$ 320
250	\$ 250 - \$ 350	\$ 370 - \$ 420
400	\$ 300 - \$ 500	\$ 435 - \$ 635

(Some) Installations to Date

ETO Wall Fixture Projects for 2012

List from April:

- 32watt LED retrofit kit by Energy Focus = 3 separate projects, total of 67 fixtures
- 26watt Lith OLW14 = 1 project, 4 fixtures
- 35watt Lith OLAW23 = 1 project, 9 fixtures
- 72watt Philips/Widelite = 1 project, 5 fixtures
- 30watt Lumark XTOR= 1 project, 6 fixtures
- 20watt Lumark XTRO = 1 project, 6 fixtures
- 57watt Rab = 1 project, 4 fixtures
- 74watt Lith CSXW = 1 project, 20 fixtures

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Working with Energy Trust of Oregon
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What's Being Replaced

Existing Situations	Halogen, CFL, HID(HPS,MH,MV)	Retrofit LED
Fixture configuration	Wall mounted fixtures	Yes
Fixture Type	Lensed, Cutoff type	Yes
Product	Varied range of cost and performance	Yes
Height	6' to +30'	Yes
Watt	13CFL to 400HID to 1000 Hal	10 to 100
Mfr	Broad range	Yes
Cost	\$50 CFL to \$550 PSMH	\$120 to \$550
Hours	All night to intermittent	Same
Life	10K to 30K	50,000+
Initial light output	800 lu to 30K lu	550 lu to 7,600
Rated light output	-30%	-30%
Fixture efficiency	50% – 75%	“100”%
Lumens per watt	50+ CFL to 85+ PSMH (lamp)	55 to 70
Labor to replace	Low	Low
Controls	Usually just on/off photo	Many options
Annual cost to operate	varied	

LED Wall Packs - Advantages

Good LED Attributes

- **Energy Efficient-** Many of these system can save a lot of energy compared to incumbent products.
- **Optical control-** Because they are point sources (array of pt source) can design the optics to maximize that. Can create different and unique and better distribution patterns (as opposed to other lighting types that only use lens to direct)
- **Light Quality-** Whiter light source compared to alternatives (especially HPS), in this application (broad spectrum, render colors better, greens and blues won't look like gray, more equal intensities across spectrum)
- **Instant on-** Can deliver full output on command. (unlike HID and CFL) and no strike or re-strike concerns. This may lead to more energy efficient behavior patterns in users.
- **Controllable-** (not damaged by frequent off/on or dimming) - fully dimmable source (step "bi-level" or continuous) life longer if run at lower power. 10% possible. MH electronic ballast can dim to 55-60% (but not on traditional magnetic ballast)
- **Long life-** (less labor) - compare to group relamping schedule.
- **Rugged Source-** The solid state "lamp" make them ideal for applications where the fixture could be vibrated or impacted.
- **Small size-** Smaller luminaire sizes can make for easier installations and less interference with other architectural elements

LED Wall Packs - Concerns

Concerns

- **Cost-** High first cost compared with incumbent technologies
- **Long term performance-** Most products are “new and improved” very little knowledge about system performance.
- **Maintenance of system components**
 - Photocell - gets cleaned with HPS replacement, but LED fixtures might require separate trip.
 - Lens and debris removal might be required for LED. Unknown. If bucket truck to clean fixtures every 3 years - but how many really do get cleaned?
 - Thermal management cleaning. Heat sinks, air ports, active cooling components.
 - Driver, wiring, adhesives etc.
- **Product quality-** As with all new technologies, there is a range of standards. It is difficult to evaluate and compare one brand to another.
- **Directional-** can be problem (glare, uniformity)
- **Many you can't relamp** - no way to add new light bars, or array to led fixture. When they finally dim down (no catastrophic failure) have to go out and replace entire fixture. Most of B/C don't take that into account.
- **Complex System-** Incumbent technologies have relatively simple and robust components.
- **No Standardized Components-** Most components (lamps, heat sinks, drivers, etc) are somewhat propriety and unique.

Unknowns

- **High color temperatures-** things tend to look bluish, more efficacious (some mfr trade off color for efficacy) adds to perception of glare (affects rods and cones differently in the eyes).
- Ongoing research of health effects of blue light at night.

Manufacturers and Products

	MFR	#		MFR	#		MFR	#
1	Cooper	20	13	Lighting Alt.	3	25	USLED	2
2	Acuity	10	14	Mercury Ltg	3	26	Visionaire	2
3	RC Lighting	6	15	Oxford Ltg	3	27	Xeralux	2
4	LSI Industries	5	16	Paraflex	3	28	Affineon	1
5	RAB Lighting	5	17	Philips Gardco	3	29	Beacon	1
6	Hubbell	4	18	Philips Wide-Lite	3	30	Dialight	1
7	MaxLite	4	19	SANSI	3	31	Hybra	1
8	Amsterdam	3	20	Boston E Lab	2	32	Philips Stonco	1
9	BetaLED	3	21	ElectraLED	2	33	Relume	1
10	Just Lighting	3	22	Finetchnix	2	34	S3J	1
11	LED-Era	3	23	GE	2	35	TCP	1
12	Leotek	3	24	IntenCity	2	Total		114

Comparing Specs. - **DRAFT**

	CRI	Efficacy	R9	Warranty	Safety	PF	Duv	Min Light Output	Zonal Lumen Req	L70 Lumen Maint	CCT
LDL Comm. (Outdoor wall-mounted area luminaire “wall packs”)	65	52 l/w	0+?	3 yrs	UL	.9+	Y	na	na	na	65K-
LDL Res. (Outdoor wall-mounted porch lights)	75	24 l/w	0+?	3 yrs	UL	.7+	Y	na	na	na	65K-
DLC (Outdoor Wall-mounted area luminaires)	50	60 l/w	na	5 yrs	UL	.9+	na	300 lum 40w inc~400 7w cfl~400	Y	50,000	57K-
Energy Star-NA				5 yrs							4K-

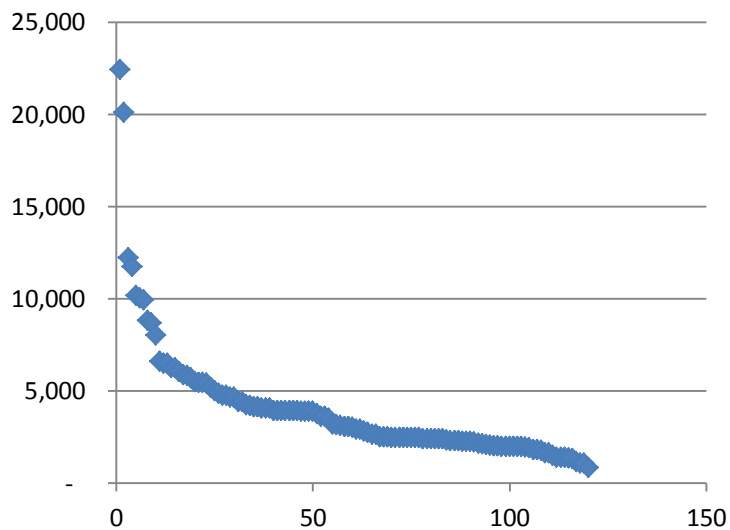
Concern with LDL Spec being less stringent than DLC?

DLC Qualified Products List

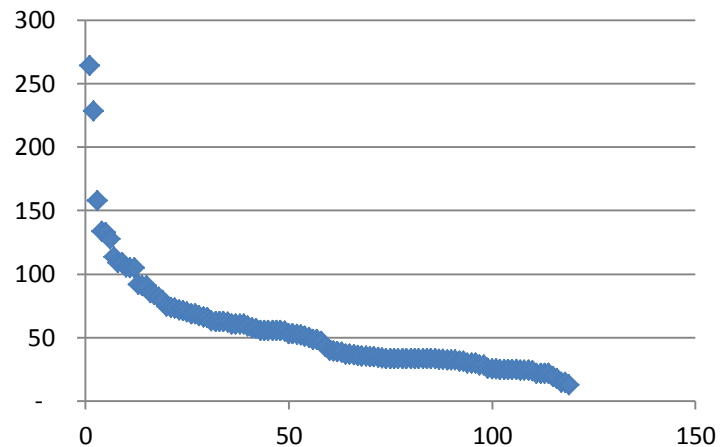
- Category: “Outdoor Wall-Mounted Area Luminaire”
- Range:
 - Watts
 - Wall pack 13 to 264
 - Efficacy:
 - 59 to 103
 - Lumens:
 - 820 to 22,436
 - Manufacturers
 - 36 Manufacturers, 43 Brands
 - Model numbers with specs listed (not including family products)
 - 122 model numbers (white “n/a” family)
 - Total SKUs in category on DLC list
 - 1819 total lines on DLC (white and gray)

Wall Packs: Range of Products by Lm and W

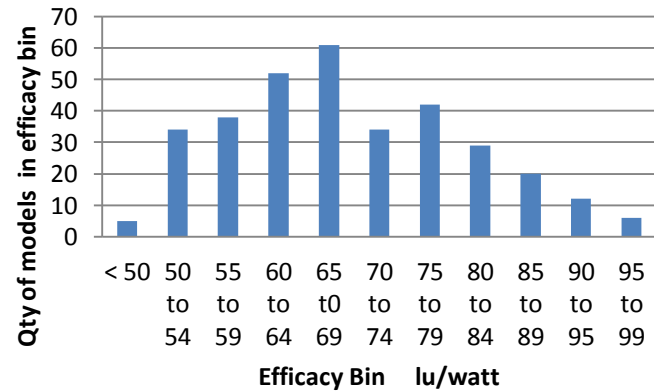
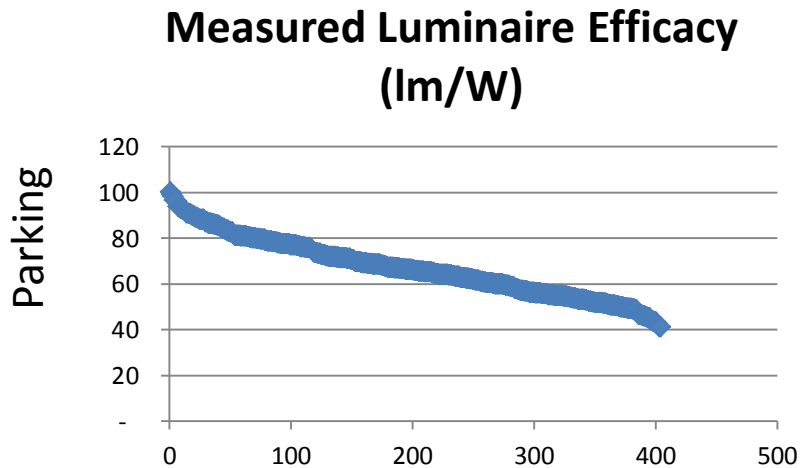
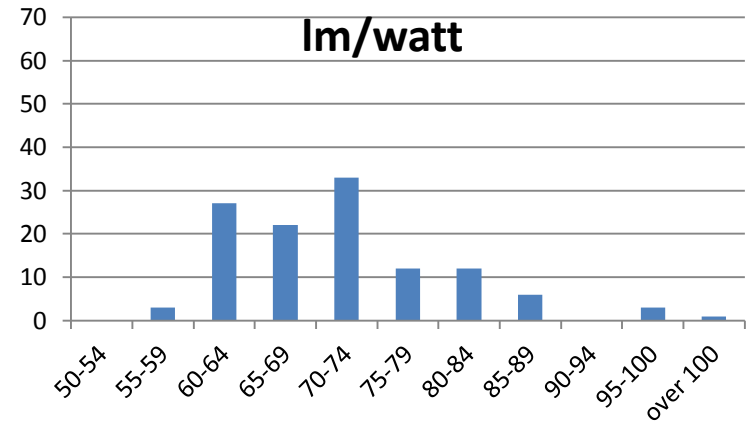
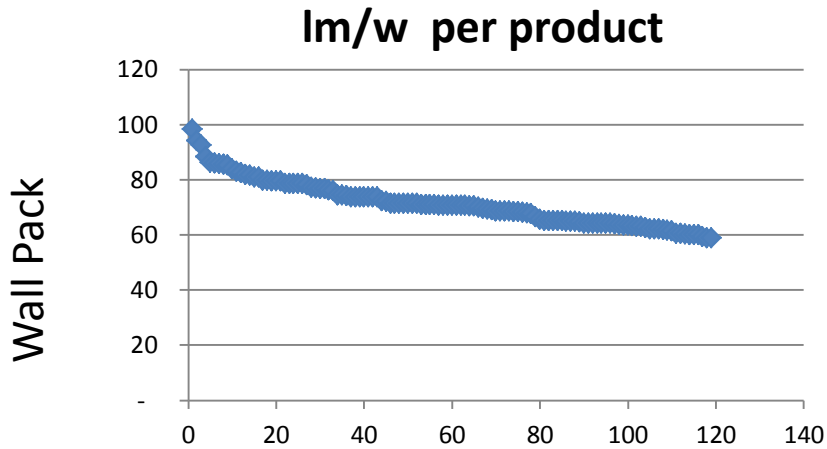
Measured Light Output (lm)



Measured Wattage (W)



Comparison: Wall and Parking



Comparison: Area, Wall, Troffer



Product Category	Count of Model Number	Average of Measured Luminaire Efficacy (lm/W)	Count of Mfr
Linear Panels (1x4 Troffer)	17	98	5
Linear Panels (2x2 Troffer)	47	83	16
Linear Panels (2x4 Troffer)	16	100	4
Four-foot Linear Replacement Lamps	2	107	1
Outdoor Pole/Arm-mounted Area and Roadway Luminaires	254	73	51
Outdoor Pole/Arm-mounted Decorative Luminaires	93	57	16
Outdoor Wall-Mounted Area Luminaire	122	72	36
Retrofit Kits for Outdoor Pole/Arm-mounted Area and Roadway Luminaires	23	70	11
Retrofit Kits for Outdoor Pole/Arm-mounted Decorative Luminaires	12	62	6
Grand Total	586	72	93

Products Available: DLC

- Sample Manufacturer
- Model number variations - one basic product has 8 variations
 - Type: 2-5
 - Color: Bright White (BW) to Warm White (WW)
- In this case, 2 of 8 are DLC listed
- Each DLC product with data has 19 “family models” in gray in DLC list without data

ORDERING INFORMATION

LUMINAIRE/LED CONFIGURATION

FH-T2-99LED-WW	IES Type 2 distribution. 99 light emitting diode array (112 watts). Class 1, 120 thru 277 volt. Warm white (3500K).	
FH-T2-99LED-BW	IES Type 2 distribution. 99 light emitting diode array (112 watts). Class 1, 120 thru 277 volt. Bright white (5100K).	
FH-T3-99LED-WW	IES Type 3 distribution. 99 light emitting diode array (112 watts). Class 1, 120 thru 277 volt. Warm white (3500K).	
FH-T3-99LED-BW	IES Type 3 distribution. 99 light emitting diode array (112 watts). Class 1, 120 thru 277 volt. Bright white (5100K).	
FH-T4-99LED-WW	IES Type 4 distribution. 99 light emitting diode array (112 watts). Class 1, 120 thru 277 volt. Warm white (3500K).	
FH-T4-99LED-BW	IES Type 4 distribution. 99 light emitting diode array (112 watts). Class 1, 120 thru 277 volt. Bright white (5100K).	
FH-T5-99LED-WW	IES Type 5 distribution. 99 light emitting diode array (112 watts). Class 1, 120 thru 277 volt. Warm white (3500K).	
FH-T5-99LED-BW	IES Type 5 distribution. 99 light emitting diode array (112 watts). Class 1, 120 thru 277 volt. Bright white (5100K).	

DLC Items

Model Number	Measured Wattage (W)	Measured Luminaire Efficacy (lm/W)	Measured Light Output (lm)	Brand Name	Product Category
FH-T3-99LED-BW	109	47	5,067	Architectural Area Lighting	Outdoor Pole/Arm-mounted Decorative Luminaires
FH-T5-99LED-BW	114	44	5,042	Architectural Area Lighting	Outdoor Pole/Arm-mounted Decorative Luminaires

Design Considerations

- Design flexibility, fixture distribution, can be used to create contrast
- Products tend to be used at or near associated tasks (ie; doors, loading docks, alleys, etc)
- Max to Min levels not critical
- Ease of installation
- Low or no maintenance
- Visual perception (scotopic to photopic multiplier)
- Dark Sky compliant
- Minimal light trespass



DLC Active Utility Members

AEP TC, TN, SEP	Efficiency Vermont	Northwest Energy	SMEC
Avista	El Paso Electric	NR Canada	SMUD
BC Hydro	Entergy TX	NYSERDA	Snohomish PUD
BGE	ETO	Oncor TX	Tacoma Power
BPA	EWEB	Pacific Power	TVA
Cape Light Compact	Hydro Quebec	PECO	TX NM Power Co
CenterPoint	JEA	PSE	UI
Clark County (NEEA)	LIPA	PSNH	Unitil F G&E
CL&P	MEEA	Salt River Project	WECC
Colvitz County (NEEA)	Missouri River	Santee Cooper	WI FOE
DC SEU	National Grid	SCE	WMECo
Efficiency Maine	NEEA	SDG&E	Xcel Southwestern
Efficiency Smart	NHEC	Seattle City Light	

State of the Market for Wall Packs

- Many new products introduced each year
- Costs coming down rapidly
 - First introduced x date at x cost
 - 2012 x cost
 - 50% price drop in one year
- There are a very large number of small “manufacturers” labeling and reselling poor marginally performing imported products
- Well designed they can maintain luminous flux for well past 50,000 hours; poorly designed they can drop to 10% of initial flux within 1,000 hours
- **Most major exterior manufacturers have high quality LED products integrated into their product mix**

Glossary

- Lamp
- Replacement lamp
- Integral luminaires (specifically designed for SSL)

Citations

- Lighting Analysts (<http://www.lightinganalysts.com>) and is one of the lighting calculation and rendering software applications used in the lighting industry.

Scoring Meeting Criteria

- **Energy Savings** - How significant and reliable are the energy savings per unit?
- **Non-Energy Benefits** - How great are the non-energy advantages for the end user for adopting this technology?
- **Technology Readiness** - How ready are the product(s) and providers to scale up for widespread use in the Pacific Northwest?
- **Ease of Adoption** - How easy is it for the end user to adopt the proposed technology?
- **Value** - Considering all costs and benefits, is this technology a good value for the owner?

Slides to be deleted (following this
one)

Strategy Advice

- If utilities do not get involved, customers may do it on their own, picking bad product and giving the industry a bad start

Qualifying Products Lists

- 18% (700) of lighting facts products are exterior
- DLC?
- Lighting Facts?
- LDL?

Existing Resources

Specific to Parking

- “CBEA Spec” - Retail Parking product performance specifications (DOE/ Commercial Building Energy Alliance)
- IES recommended illuminance levels for parking lots (IES RP-20)
- IES Street and Area Lighting conference (annual)

General LED Resources

- Gateway demos
- CALiPER Testing
- Computer simulation AGi-32
- Codes (ANSI/ASHRAE/IES Standard 90.1, International Energy Conservation Code, and California’s Title 24)
- IESNA DG-13-98, *Guide for the Selection of Photocontrols for Outdoor Lighting Applications.*
- Commercial Building Energy Alliances
 - Retailer Energy Alliance (REA) & Steering Committee

Organizations Involved

- Illuminating Engineering Society (IES)
- National Institute of Standards and Technology (NIST)
- National Electrical Manufacturers Association (NEMA)
- American National Standards Institute (ANSI)
- Institute of Electrical and Electronic Engineers (IEEE)
- Pacific Northwest National Laboratory (PNNL)
- Independent photometric testing laboratories
- Manufacturers,
- Research laboratories

Existing Research

- Standards activities (SSL Quality Advocates, SSL Manufacturer Initiative, SSL Manufacturing R&D Roadmap, GATEWAY demonstration projects, Next Generation Lighting Industry Alliance (NGLIA), Solid-State Lighting Product Quality Initiative, design competitions, and the Technical Information Network).
- Make manufacturers and users aware of ENERGY STAR luminaire requirements: Ballast or driver shall comply with ANSI/IEEE C62.411991, Class A operation. The line transient shall consist of seven strikes of a 100 kHz ring wave, 2.5 kV level, for both common mode and differential mode.
 - Controller, LED => Electrical Transients
 - Call attention to LED manufacturer application notes defining maximum
- Transient levels - PNNL

Ongoing Research

Specific to parking

- Next Generation Luminaire design competition for exterior

General LED

- SSL in America report