

The Keystone of Energy Efficiency



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Impetus for Light Metering Study

TRM	Sources
Delaware, 2012	EmPOWER Maryland Commercial Lighting Program Evaluations (2010)
Efficiency Maine, 2014	NEEP C&I Lighting Load Shape Project FINAL Report (2011)
Efficiency Vermont, 2011	NEEP C&I Lighting Load Shape Project FINAL Report (2011)
Efficiency Vermont, 2013	NEEP C&I Lighting Load Shape Project FINAL Report (2011)
Mass Save, 2012	NEEP C&I Lighting Load Shape Project FINAL Report (2011)
Mid-Atlantic, 2011	EmPOWER Maryland Commercial Lighting Program Evaluations (2010)
Mid-Atlantic, 2013	NEEP C&I Lighting Load Shape Project FINAL Report (2011) EmPOWER Maryland Commercial Lighting Program Evaluations (2010)
National Grid (MA), 2011	NEEP C&I Lighting Load Shape Project FINAL Report (2011) National Grid's 2007 Design 2000plus Lighting Subprogram (2009)
National Grid (RI), 2013	NEEP C&I Lighting Load Shape Project FINAL Report (2011) National Grid's 2007 Design 2000plus Lighting Subprogram (2009)
National Grid (RI), 2014	NEEP C&I Lighting Load Shape Project FINAL Report (2011)
New York, 2010	Uses flat CF value of 1 for interior lighting applications HOU from 2008 California DEER Update Study
New York, 2014	Uses flat CF value of 1 for interior lighting applications HOU from 2008 California DEER Update Study
Pennsylvania, 2013	Mid-Atlantic TRM (2011)
Pennsylvania, 2015	Mid-Atlantic TRM (2011)

Scope of Work

495 Sites

2,347 Loggers

Building Type	Sites	Loggers
Retail	69	312
Office	65	302
Education	61	309
Institutional/Public Service	61	306
Health	53	257
Grocery	47	229
Miscellaneous	37	159
Restaurant	35	155
Lodging	35	166
Warehouse	32	152
Total	495	2,347

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Recent Study History

- Reported Sources of Bias
 - □ Accuracy and calibration of tools
 - □ Measurement error
 - □ Sensor placement bias
 - □ Sample selection bias

Unique Nexant Methodology



- Nexant's iEnergy® Onsite Application and random fixture selection algorithm to reduce sensor placement bias
- Use of three distinct light logger types to reduce bias associated with accuracy and calibration of tools **IEPEC Long Beach 2015** 5

Selection Algorithm

Equipment type are input by the the site	s and quantities engineer during survey.		Equipment Weight is calculated as percentage of inventory each equipment type contributes.		Equipment Value is calculated as a running log of each equipment type's weight.	
Equipment Name	Quantity	1	Weight		Equipment Value	
Input	Input		Quantity / Total	6	Summation of Weights	1. K
Equipment 1	50		50 / 100 = 0.50		0 + 0.50 = 0.50	*
Equipment 2	30		30 / 100 = 0.30		0.50 + 0.30 = 0.80	8
Equipment 3	15		15 / 100 = 0.15		0.80 + 0.15 = 0.95	80.0
Equipment 4	5		5 / 100 = 0.05		0.95 + 0.05 = 1.00	1
The difference	(In this example, the	ne r	andomly generated nun	nbe	er is 0.65)	7
randomly genera	ted number and value is found.		The equipment whose difference from the randomly generated number is		Previously selected equipment is removed from the table, and the	
Random Numbe	ence r - Fauin Value		closest to 0 (ignoring		the specified number of	
Equipment 1	0.50 - 0.65 = -0.15		all negative values) is		selections is reached.	
Equipment 2	0.80 - 0.65 = +0.15		selected for logging.			
Equipment 3	0.95 - 0.65 = +0.30					
Equipment 4	1.00 - 0.65 = +0.45					
NAME OF TAXABLE PARTY OF TAXABLE PARTY		-				

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Data Processing



- Extensive data cleaning not explored in similar studies
 - Seasonal operation annualization
 - Deconstruction of lighting controls effects
- Unique load shape-based calculation of results

Load Shape-Based Calculations

- Unique load shapes created by building type for screw-in bulbs and general service lighting
- Space types weighted by lighting load contribution
- Similar methodology for CFs
- IFs based on eQUEST modeling

		Hour Ending Value										
Day Type:		10	11	12	13	14	15	16	17	18	19	
(1) Sunday		76%	86%	86%	86%	86%	86%	85%	40%	4%	< 1%	
(2) Monday		55%	72%	85%	100%	100%	100%	94%	56%	9%	< 1%	
(3) Tuesday		83%	92%	100%	100%	100%	100%	90%	78%	30%	14%	
(4) Wednesday		84%	84%	99%	100%	100%	100%	100%	73%	9%	< 1%	
(5) Thursday		94%	100%	100%	100%	100%	100%	91%	64%	21%	14%	
(6) Friday		100%	100%	100%	100%	96%	82%	76%	58%	4%	< 1%	
(7) Saturday		77%	86%	86%	86%	86%	86%	86%	76%	6%	< 1%	
(8) Holiday		< 1%	< 1%	<1%	< 1%	< 1%	< 1%	< 1%	< 1%	<1%	< 1%	
1 Table abridged	due to size											

Assessment ID:	100048	100130		100144	100145	100343	100371	Avg.
Total Connected Load (W):	2,175	9,044		18,540	3,682	3,600	1,211	-
Dining Area	47%	88%		49%	42%	62%	21%	47%
Kitchen/Food Preparation	0%	6%		20%	33%	6%	32%	24%
Restrooms	6%	6%		13%	3%	2%	48%	9%
Storage	<mark>5%</mark>	0%		2%	17%	29%	0%	7%
Other	36%	0%	1110	0%	0%	0%	0%	4%
Sales Floor	0%	0%		0%	0%	0%	0%	4%
Interior Office	6%	0%		2%	0%	0%	0%	3%

Space Type	Weight	A	nnualized HC)U V	Veight*HOU
Dining Area	0.49	х	2,304	=	1,129
Kitchen/Food Preparation	0.25	х	3,058	Ξ	765
Restrooms	0.09	х	4,353	=	392
Storage	0.10	X	713	=	71
Other	0.05	x	6,596	=	330
Hallways	0.01	х	2,452	=	25
Total	1.00				2,711

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Results

Nexant's unique sampling, data recording, and data processing methods allowed the team to create contemporary Pennsylvania-specific savings assumptions with increased efficiency and improved credibility.

Building Type	20	16	20	14	Δ	
	HOU	CF	HOU	CF	HOU	CF
Education	2,371	45%	2,190	56%	8%	-20%
Grocery	6,471	93%	4,660	87%	39%	7%
Health	2,943	52%	4,185	72%	-30%	-27%
Institutional/Public Service	1,419	23%	3,155	62%	-55%	-63%
Lodging	3,579	45%	4,399	50%	-19%	-9%
Miscellaneous	2,830	58%	4,056	62%	-30%	-6%
Office	2,294	48%	2,567	61%	-11%	-21%
Restaurant	4,747	77%	3,613	65%	31%	18%
Retail	2,915	66%	2,829	73%	3%	-10%
Warehouse	2,545	48%	2,868	58%	-11%	-17%