The Keystone of Energy Efficiency

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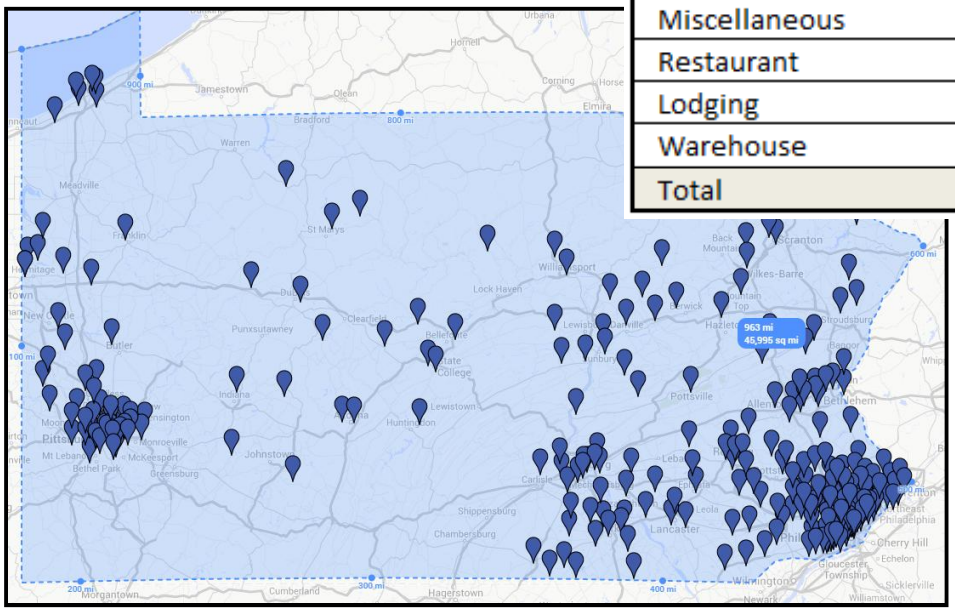
Impetus for Light Metering Study

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

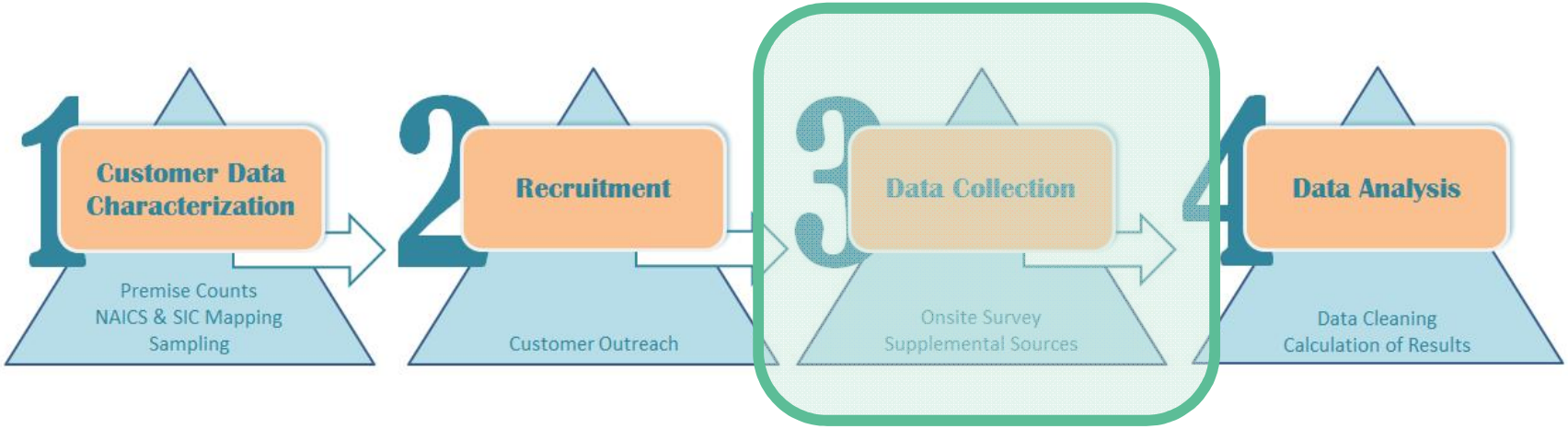
Building Type	Sites	Loggers
Retail	69	312
Office	65	302
Education	61	309
Institutional/Public Service	61	306
Health	53	257
Grocery	47	229
Miscellaneous	37	159
Restaurant	35	155
Lodging	35	166
Warehouse	32	152
Total	495	2,347



Recent Study History

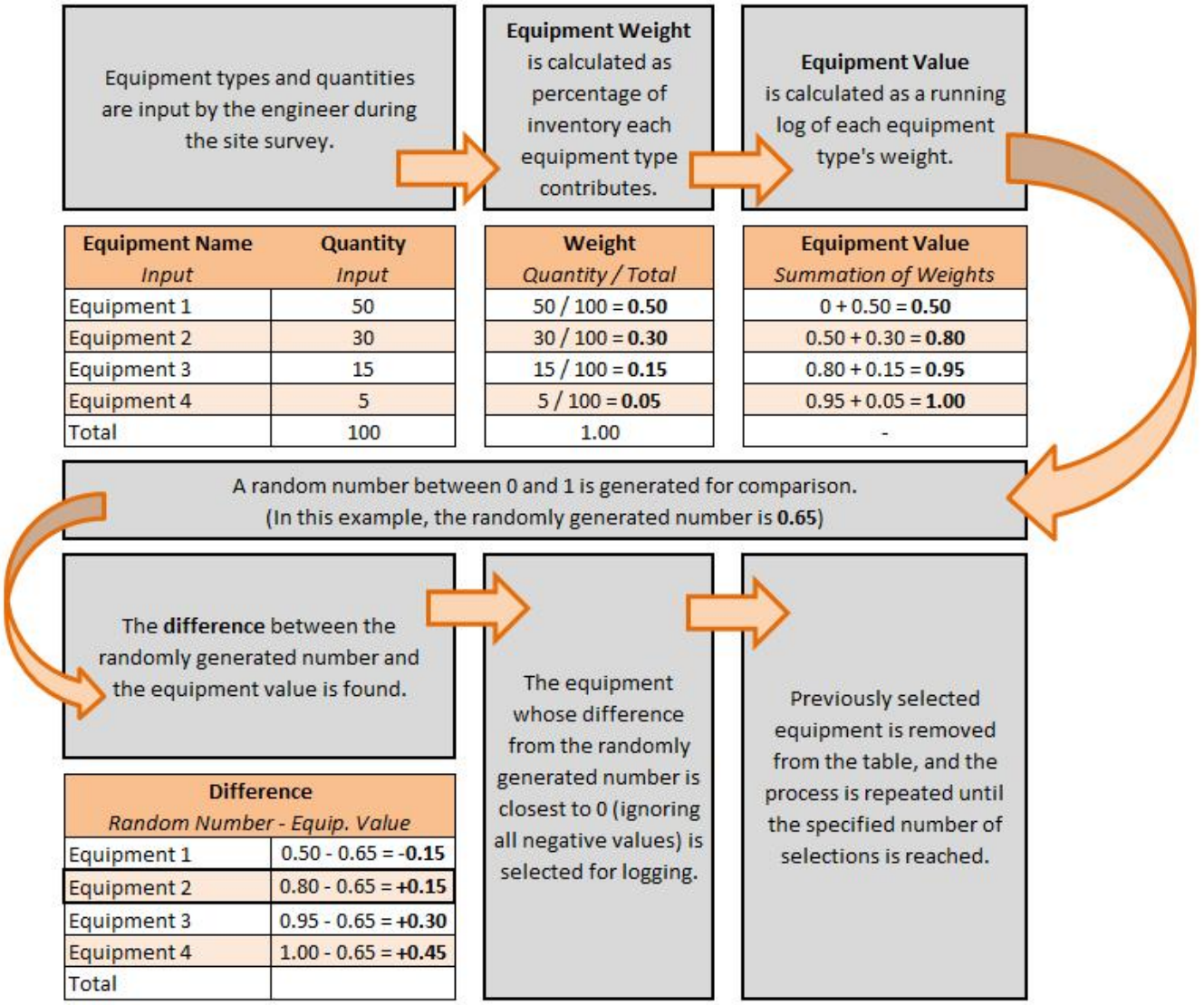
- Reported Sources of Bias
  - Accuracy and calibration of tools
  - Measurement error
  - Sensor placement bias
  - Sample selection bias

Unique Nexant Methodology

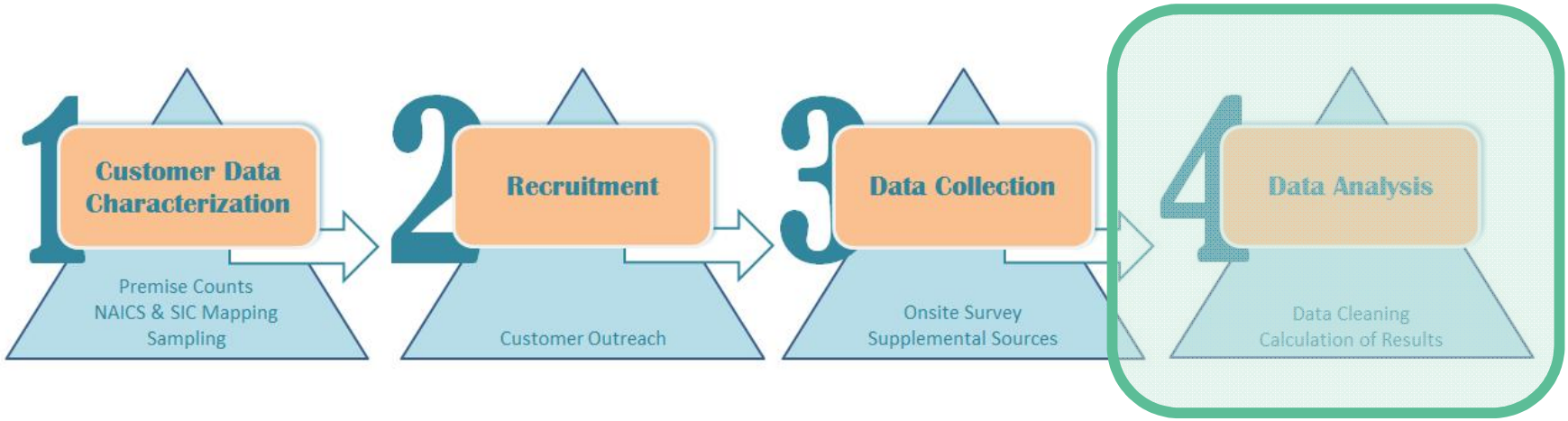


- Nexant's iEnergy® Onsite Application and random fixture selection algorithm to reduce sensor placement bias
- Use of three distinct light logger types to reduce bias associated with accuracy and calibration of tools

Selection Algorithm



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	5%	0%	...	2%	17%	29%	0%	7%
Other	36%	0%	...	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		Annualized HOU		Weight*HOU
Dining Area	0.49	x	2,304	=	1,129
Kitchen/Food Preparation	0.25	x	3,058	=	765
Restrooms	0.09	x	4,353	=	392
Storage	0.10	x	713	=	71
Other	0.05	x	6,596	=	330
Hallways	0.01	x	2,452	=	25
Total	**1.00**				**2,711**

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.

	2016		2014		△	
Building Type	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%