NEEP HVAC Load Shape

NEEP End Use Load Data Projects

AESP Brown Bag
September 8, 2011

Jarred Metoyer

Study Overview

- Develop a sample frame and design based on recent (past three years) program participation data from all NEEP sponsors.
- Twelve sponsors provided data and sampling considerations of region and unit size were selected as primary design parameters with other parameters like building type and economizer considered, but not uniform in the population developed.
- Installation of true-power end-use meters collecting 1-minute data for commercial ACs across the Northeast
- Develop unit-level regression equations using GIS-identified closest available weather station data for period of monitoring (summer 2010)

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Study Overview

- Models run with 8760 “typical year” (TMY3) weather data
- Unit level results extrapolated using load research software to develop population results and estimates of precision of hourly load ratios
- Spreadsheet tool developed to allow users to enter connected load or load reductions to develop coincident peak demand savings under ISO defined peaks as well as user specified time periods and temperature thresholds.

Project Approach

HVAC and Lighting Projects

- The sample design should utilize the findings of Phase I Loadshape study by mining those data
- Data collection and analysis should fill gaps and create a complete picture of the C&I Load Shape

HVAC Specific

- Budget driver is the number of sample points for primary data collection
- Decisions must be made promptly to capture the appropriate range of weather conditions

Development of HVAC Sampling Assumptions

- Impacts of large C&I HVAC measures for NSTAR and National Grid via 8,760 load shapes of savings. Current evaluations for Connecticut Light and Power, United Illuminating, and Western Massachusetts Electric also employ this underlying 8,760 method.

- KEMA mined these data and develop error ratio parameters that are directly applicable to this C&I Unitary HVAC Load Shape Project sample design. In this manner, the error ratio assumptions will be well grounded in actual regional measurement.

Error Ratio

- Error ratio is analogous to a coefficient of variation and represents a measure of the variability in the relationship between the measured *y* variable and the known *x* variable.
- In this case, KEMA interprets the key analytical pursuit as the average coincident peak demand impact reflected in the load shape(s) according to ISO/PJM definitions at 80/10 confidence/precision.
- Example: The error ratio associated with the demand reduction for the forward capacity market ("FCM") ISO-NE peak hours was estimated to be 0.78.

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Selected HVAC Error Ratios

- After much review, we propose to provide some degree of protection in the sample design by using reasonably conservative error ratios in the preliminary plan
  - **1.0 for small units** and
  - **0.6 for large units**
- Climate zone is a very important driver and needs to dominate the sample design
- Historical distribution of units may not necessarily be a good predictor of future resource
- The project team will be able to use “other” available data to supplement the sample

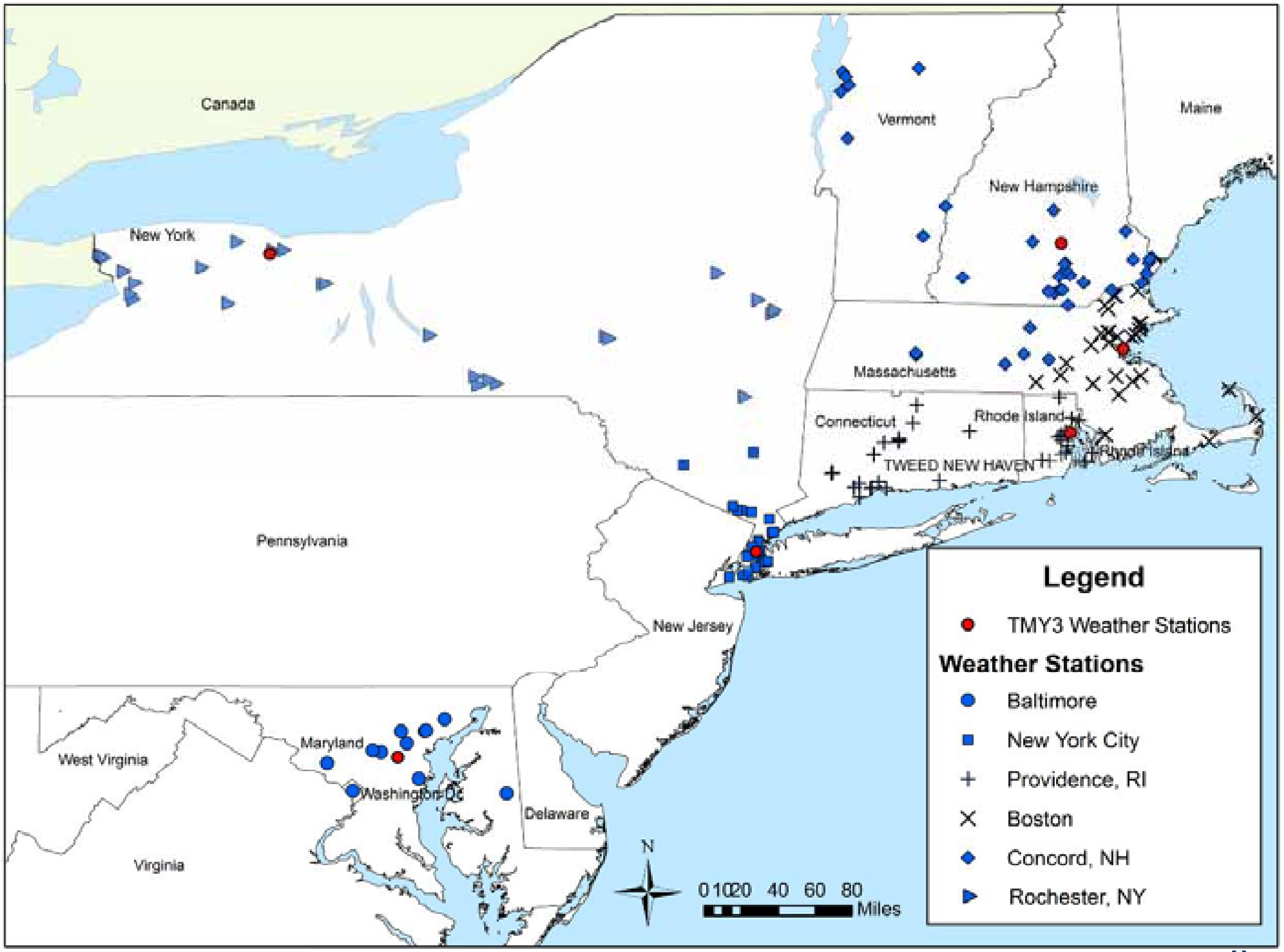
Anticipated Relative Precision – Climate and Unit Size

NEEP HVAC Sample Coverage						
(Climate and Unit Size Dimensionality)						
		Population		Sample Size		Expected
Class	Sector	Units	Percent	Units	Percent	Precision
Climate	Unit Size					
Mid Atlantic	Small	158	2%	45	10%	±29.7%
Mid Atlantic	Large	82	1%	30	7%	±15.5%
NE-East Mass	Small	294	4%	45	10%	±26.1%
NE-East Mass	Large	128	2%	30	7%	±15.8%
NE-North	Small	1,225	17%	45	10%	±30.1%
NE-North	Large	355	5%	30	7%	±18.0%
NE-South Coastal	Small	470	6%	45	10%	±28.4%
NE-South Coastal	Large	151	2%	30	7%	±16.0%
NY-Inland	Small	2,537	35%	45	10%	±25.5%
NY-Inland	Large	672	9%	30	7%	±19.3%
NY-Urban/Coastal	Small	917	13%	45	10%	±28.6%
NY-Urban/Coastal	Large	256	4%	30	7%	±17.3%
Totals		7,245	100%	450	100%	±8.7%

Region	Total	Large	Small
Mid Atlantic	37	15	22
NE-East Mass	75	30	45
NE-North	75	30	45
NE-South Coastal	77	31	46
NY-Inland	76	33	43
NY-Urban/Coastal	69	24	45

- Several alternative allocation strategies were considered
- The 45/30 split for most climate zones provides some protection against the more aggressive error ratio assumed for large units

Weather station and Site locations



Unit level modeling - weather

- All unit level models had both temp/RH and ISO-NE THI models
- Complete weather data from NOAA stations for 2010 are used to calibrate the metered data period, all stations were processed for temp/RH and ISO-NE defined THI
- Unit level regression based on temperature-humidity index (THI) and over 300 dummy variables for daytype, hour, and 2nd and 3rd consective hot day hours. Weather input was actual weather for the closest weather station for the metered period

$$L_{dh} = \alpha + \beta_{Ch} THI_{dh} + \beta_{w(d)} w(d) + \beta_{g(h)} g(h) + \beta_{2h} H_{2d} + \beta_{3h} H_{3d} + \varepsilon_{dh}$$

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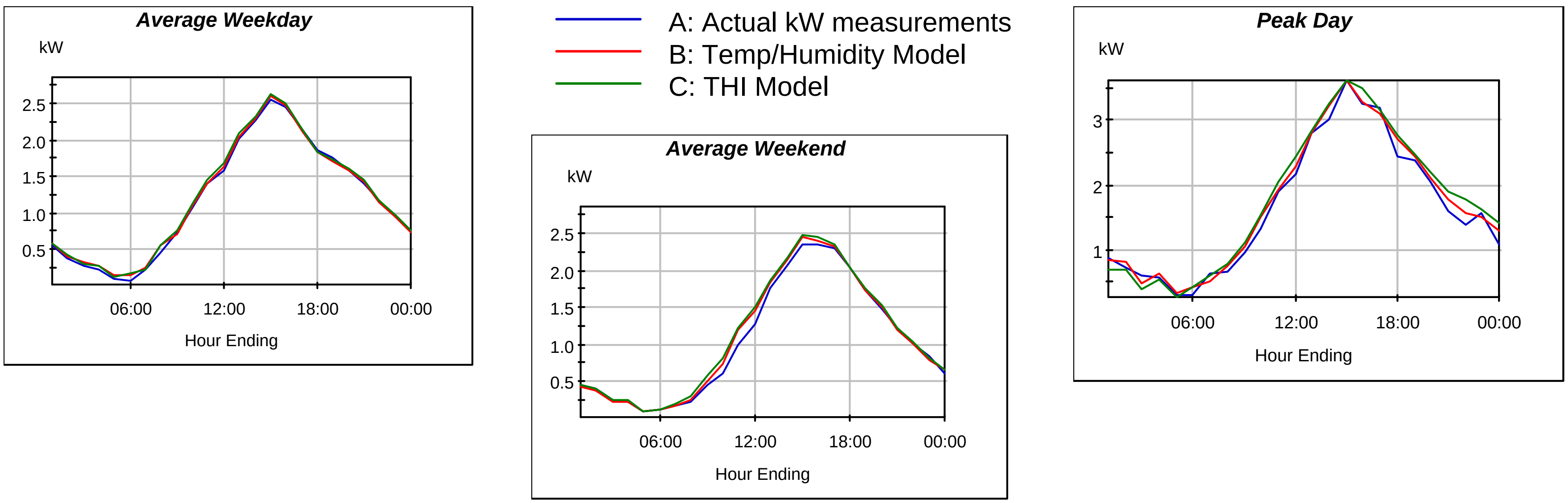
Unit level modeling

- Review fit for weekdays, weekend days and peaks



	Total Usage			Peak Demand		
Variable	Base	Comparison	Base - Comp.	Base	Comparison	Base - Comp.
Temp/RH	1,034.30	1,054.62	-20.32	3.62	3.62	0
THI	1,034.30	1,074.36	-40.06	3.62	3.62	0

	Load Factor			Difference Stats		
Variable	Base	Comparison	Base - Comp.	MBE	RMSE	CV
Temp/RH	31.33%	31.94%	-0.62%	-0.02	0.23	0.2
THI	31.33%	32.54%	-1.21%	-0.04	0.27	0.24

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Extrapolation

- Sample design was based on region and tonnage categories and these will govern the extrapolation
- Each hourly kW/ton value in the 8760 multiplied by the sampling “case weight”
- Each definition of peak kW/ton multiplied by the case weight
- Total NEEP, size category level, region level, and region+size level extrapolations to those populations
- Other analyses will not become part of tool: building type, economizer
  - Tool can display the mix of chosen estimate

Results

- The primary results were annual hourly load shapes with 8,760 values of the average coincident load ratio of measured to connected load for each of 12 combinations of region and unit size. The precision of each hourly load ratio was calculated as well as the precision of the average annual usage estimate.
- The resulting load shapes were used to calculate annual equivalent full load cooling hours and seasonal coincidence factors that will help document bids into the capacity markets.

Results

- ISO-NE On-Peak Period: Defined as 1 PM to 5 PM on weekday non-holidays during June, July, and August.
- PJM On-Peak Period: Defined as 2 PM to 6 PM on weekday non-holidays during June, July, and August.
- ISO-NE FCM Seasonal Peak: Defined as all non-holiday weekday hours in June, July and August during which the ISO New England Real-Time System Hourly Load is greater than 90% of the most recent “50/50” System Peak Load Forecast for the summer season.

Results

Total	Annual Load Factor (EFLH/8760)			EFLH = Effective Full Load Cooling Hours		
Region	**Estimated Ratio**	**RP @ 80%CI**	**RP @ 90%CI**	**Annual Estimate**	**RP @ 80%CI**	**RP @ 90%CI**
Mid-Atlantic	0.1707	±9.78%	±12.55%	1,495	±9.78%	±12.55%
NE-East Mass	0.1339	±10.12%	±12.99%	1,173	±10.12%	±12.99%
NE-North	0.0862	±13.14%	±16.87%	755	±13.14%	±16.87%
NE-South Coastal	0.0976	±11.44%	±14.69%	855	±11.44%	±14.69%
NY- Inland	0.1087	±13.58%	±17.43%	952	±13.58%	±17.43%
NY- Urban/Coastal	0.1704	±10.69%	±13.72%	1,492	±10.69%	±13.72%

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Results

	Total	Coincidence Factor			Maximum Load Ratio		
	Region	Hourly Average	RP @ 80%CI	RP @ 90%CI	Hourly Maximum	RP @ 80%CI	RP @ 90%CI
ISO-NE On-Peak (1-5PM, WDNH, Jun-Aug)	Mid-Atlantic	0.4892	±7.09%	±9.10%	0.718	±7.83%	±10.05%
	NE-East Mass	0.4488	±8.40%	±10.78%	0.699	±8.43%	±10.82%
	NE-North	0.3421	±11.98%	±15.38%	0.469	±12.23%	±15.69%
	NE-South Coastal	0.3397	±10.39%	±13.33%	0.526	±9.59%	±12.30%
	NY- Inland	0.3815	±12.59%	±16.15%	0.477	±13.01%	±16.69%
	NY- Urban/Coastal	0.5529	±8.24%	±10.58%	0.822	±5.80%	±7.44%
PJM On-Peak (2-6PM, WDNH, Jun-Aug)	Mid-Atlantic	0.4833	±7.32%	±9.40%	0.718	±7.83%	±10.05%
	NE-East Mass	0.4443	±8.56%	±10.99%	0.699	±8.43%	±10.82%
	NE-North	0.3343	±12.16%	±15.61%	0.469	±12.23%	±15.69%
	NE-South Coastal	0.3341	±10.49%	±13.46%	0.526	±9.59%	±12.30%
	NY- Inland	0.3836	±12.62%	±16.20%	0.477	±13.01%	±16.69%
	NY- Urban/Coastal	0.5665	±7.83%	±10.05%	0.822	±5.80%	±7.44%
ISO-NE FCM Seasonal Peak	Mid-Atlantic						
	NE-East Mass	0.4863	±8.39%	±10.77%	0.699	±8.43%	±10.82%
	NE-North	0.4241	±12.23%	±15.70%	0.469	±12.23%	±15.69%
	NE-South Coastal	0.4369	±9.54%	±12.24%	0.526	±9.59%	±12.30%
	NY- Inland						
	NY- Urban/Coastal						

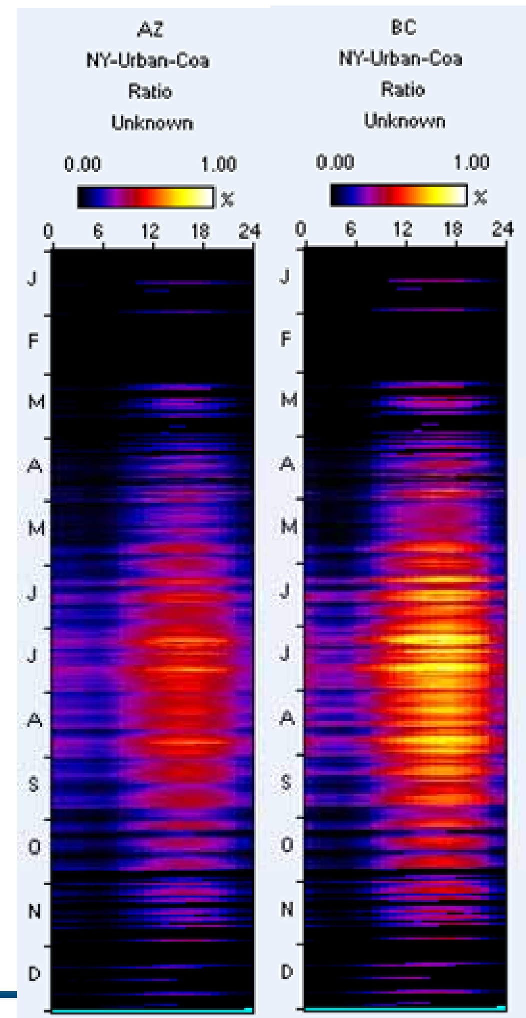
Results

- **Regional Weather-Normalized Load Shapes**

  <11.4 Ton Profile on Left

  >=11.5 Ton Profile on Right)

- Example NY-Urban Region
- Full 8760
  - Hour on X-axis (0 to 24)
  - Month on Y-axis (Jan to Dec)
  - Color intensity hourly load ratio



Load Shape Spreadsheet Tool

– Results were used to develop a load shape savings tool that is intended to meet a variety of information needs of program administrators, planners, and air regulators

– The spreadsheet tool allows users to select specific regions, peak demand definitions, and installed load reductions to apply the load shapes and report energy and demand estimates and the precision of those estimates. A report was also produced and the report and spreadsheet tool are publically available at **www.neep.org/emv-forum**.

Further questions or comments on HVAC load shape study?

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AESP Brown Bag

C&I Measure Life Study Commissioned by NEEP

Sponsored by EM&V forum members from ME, NH, VT, MA, RI, CT and NY

September 8, 2011

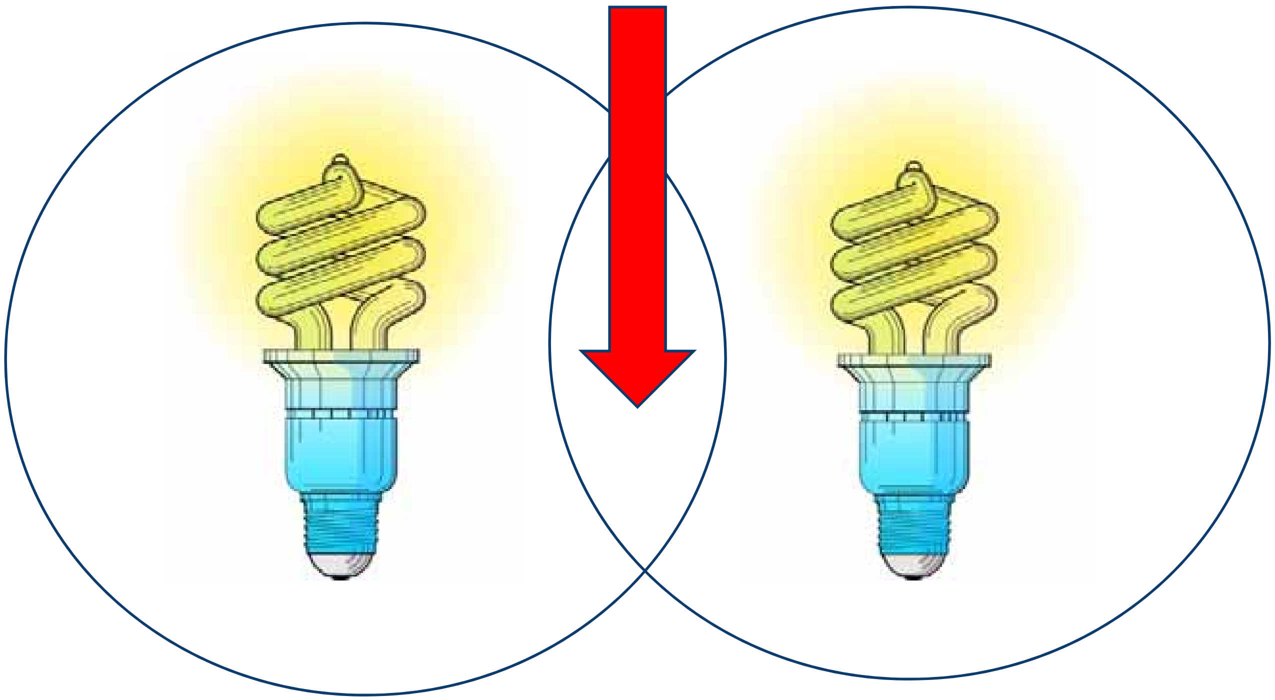
Experience you can trust.

Project Overview

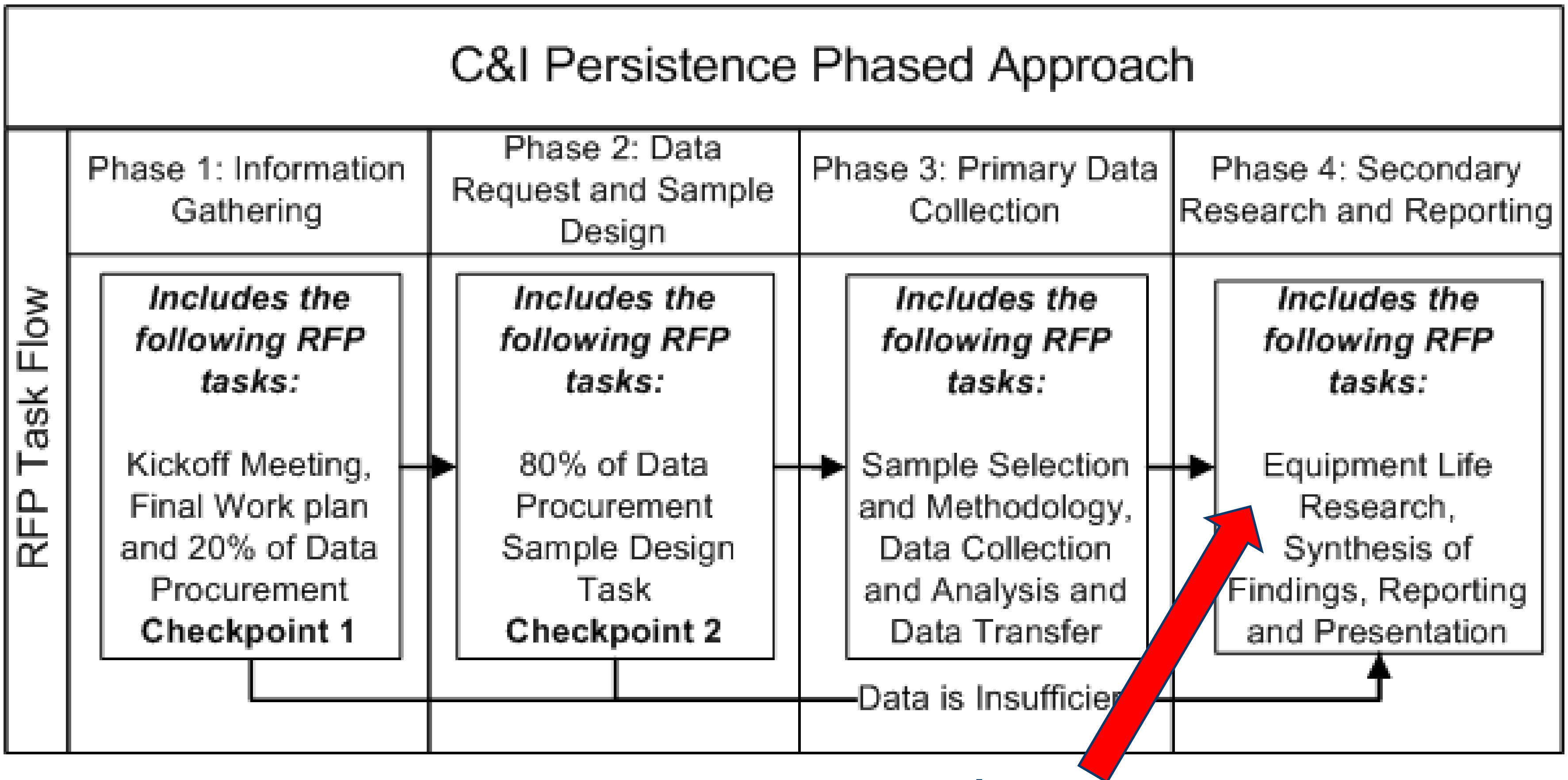
- Issue: Lighting Effective Useful Life (EUL) assumptions currently based on manufacturer ratings, and are key part of lifetime savings estimates.
- Key Objective: Commission a study to determine new EULs, ideally with primary data collection.
- Region is Unique: There are few other regions in the county with the historical data available to consider a study of this type.

My Perspective

This Study



Project Status



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Final Sample

- Challenge of acquiring detailed files led to early conclusion of data effort.
- Some projects covered more measures than initially expected.

Year Category	Projects	T8	HID	CFLF	CFLB
Sample Design					
1 (1999-2002)	112	87	45	23	21
2 (2003-2006)	91	71	21	23	22
3 (2007-2009)	49	40	14	12	15
Sample Design Totals	252	198	80	58	58
Final Sample					
1 (1999-2002)	108	92	49	35	28
2 (2003-2006)	73	66	22	34	28
3 (2007-2009)	43	34	12	12	15
Final Sample Totals	224	192	83	81	71

Data gathered was sufficient for analysis

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On-site Activities

- Ballast checks (did around 1,000 total)
- Observations and counting of lighting
- “Detective work” and inquiring with contacts about removal events, when they happened and what caused it.
- Censoring when exact date of event was not known.
- Some sampling at large facilities. Analysis only includes those areas targeted for observation.

Data Collection followed rigorous protocol

CFL Bulb and Fixture Pre-Modeling Results

- CFL Bulbs

Year Category	# of Sites	TS Quantity	OS Installed Quantity	% Installed	Avg. Annual Hrs of Use	OS Quantity that Failed	% that Failed	OS Quantity Removed Before Failure	% Removed Before Failure	OS Quantity Don't Know/ Unsure	% Don't Know/ Unsure
1 (1999-2002)	28	3,420	1,093	32.0%	1,993	916	26.8%	507	14.8%	904	26.4%
2 (2003-2006)	28	9,508	2,508	26.4%	3,614	4,390	46.2%	2,159	22.7%	452	4.8%
3 (2007-2009)	15	1,577	1,148	72.8%	3,356	234	14.8%	27	1.7%	168	10.7%
Total	**71**	**14,505**	**4,749**	**32.7%**	**3,179**	**5,540**	**38.2%**	**2,693**	**18.6%**	**1,524**	**10.5%**

- CFL Fixtures

Year Category	# of Sites	TS Quantity	OS Installed Quantity	% Installed	Avg. Annual Hrs of Use	OS Quantity that Failed	% that Failed	OS Quantity Removed Before Failure	% Removed Before Failure	OS Quantity Don't Know/ Unsure	% Don't Know/ Unsure
1 (1999-2002)	35	2,289	638	27.9%	3,359	132	5.8%	1,296	56.6%	223	9.7%
2 (2003-2006)	34	1,892	1,162	61.4%	4,788	11	0.6%	180	9.5%	539	28.5%
3 (2007-2009)	12	891	356	40.0%	6,369	0	0.0%	478	53.6%	57	6.4%
Total	**81**	**5,072**	**2,156**	**42.5%**	**4,626**	**143**	**2.8%**	**1,954**	**38.5%**	**819**	**16.1%**

LED Exit Sign and HID Pre-Modeling Results

- LED Exit Signs

Year Category	# of Sites	TS Quantity	OS Installed Quantity	% Installed	Avg. Annual Hrs of Use	OS Quantity that Failed	% that Failed	OS Quantity Removed Before Failure	% Removed Before Failure	OS Quantity Don't Know/ Unsure	% Don't Know/ Unsure
1 (1999-2002)	56	1,142	941	82.4%	8,760	0	0.0%	152	13.3%	49	4.3%
2 (2003-2006)	32	679	621	91.5%	8,760	0	0.0%	56	8.2%	2	0.3%
3 (2007-2009)	14	219	189	86.3%	8,760	0	0.0%	0	0.0%	30	13.7%
Total	**102**	**2,040**	**1,751**	**85.8%**	**8,760**	**0**	**0.0%**	**208**	**10.2%**	**81**	**4.0%**

- HIDs

Year Category	# of Sites	TS Quantity	OS Installed Quantity	% Installed	Avg. Annual Hrs of Use	OS Quantity that Failed	% that Failed	OS Quantity Removed Before Failure	% Removed Before Failure	OS Quantity Don't Know/ Unsure	% Don't Know/ Unsure
1 (1999-2002)	49	2,439	1,304	53.5%	5,979	162	6.6%	919	37.7%	54	2.2%
2 (2003-2006)	22	2,481	420	16.9%	4,358	20	0.8%	1,987	80.1%	54	2.2%
3 (2007-2009)	12	4,026	3,733	92.7%	4,736	0	0.0%	219	5.4%	74	1.8%
Total	**83**	**8,946**	**5,457**	**61.0%**	**5,004**	**182**	**2.0%**	**3,125**	**34.9%**	**182**	**2.0%**

T8 Pre-Modeling Results

- T8s

Year Category	# of Sites	TS Quantity	OS Installed Quantity	% Installed	Avg. Annual Hrs of Use	OS Quantity that Failed	% that Failed	OS Quantity Removed Before Failure	% Removed Before Failure	OS Quantity Don't Know/ Unsure	% Don't Know/ Unsure
1 (1999-2002)	92	36,011	28,142	78.1%	4,502	1,385	3.8%	4,227	11.7%	2,258	6.3%
2 (2003-2006)	66	41,144	30,784	74.8%	4,286	460	1.1%	8,179	19.9%	1,721	4.2%
3 (2007-2009)	34	14,049	12,147	86.5%	3,640	87	0.6%	475	3.4%	1,341	9.5%
Total	**192**	**91,204**	**71,072**	**77.9%**	**4,261**	**1,931**	**2.1%**	**12,881**	**14.1%**	**5,320**	**5.8%**

Model Results: Two Approaches

- **Kaplan-Meier**
  - Simple yet robust estimator, handles right-censoring
  - Can only be used with at least 50% non-retention
- **Parametric Survival Analysis**
  - More powerful than Kaplan-Meier
  - Can handle left-, right-, and interval-censoring
  - Can be used with less than 50% non-retention
  - It assumes the data follows a certain distribution:
    - Weibull, Gamma, Log-Normal, or Log-Logistic

Weibull is de facto model for survival analyses of this nature

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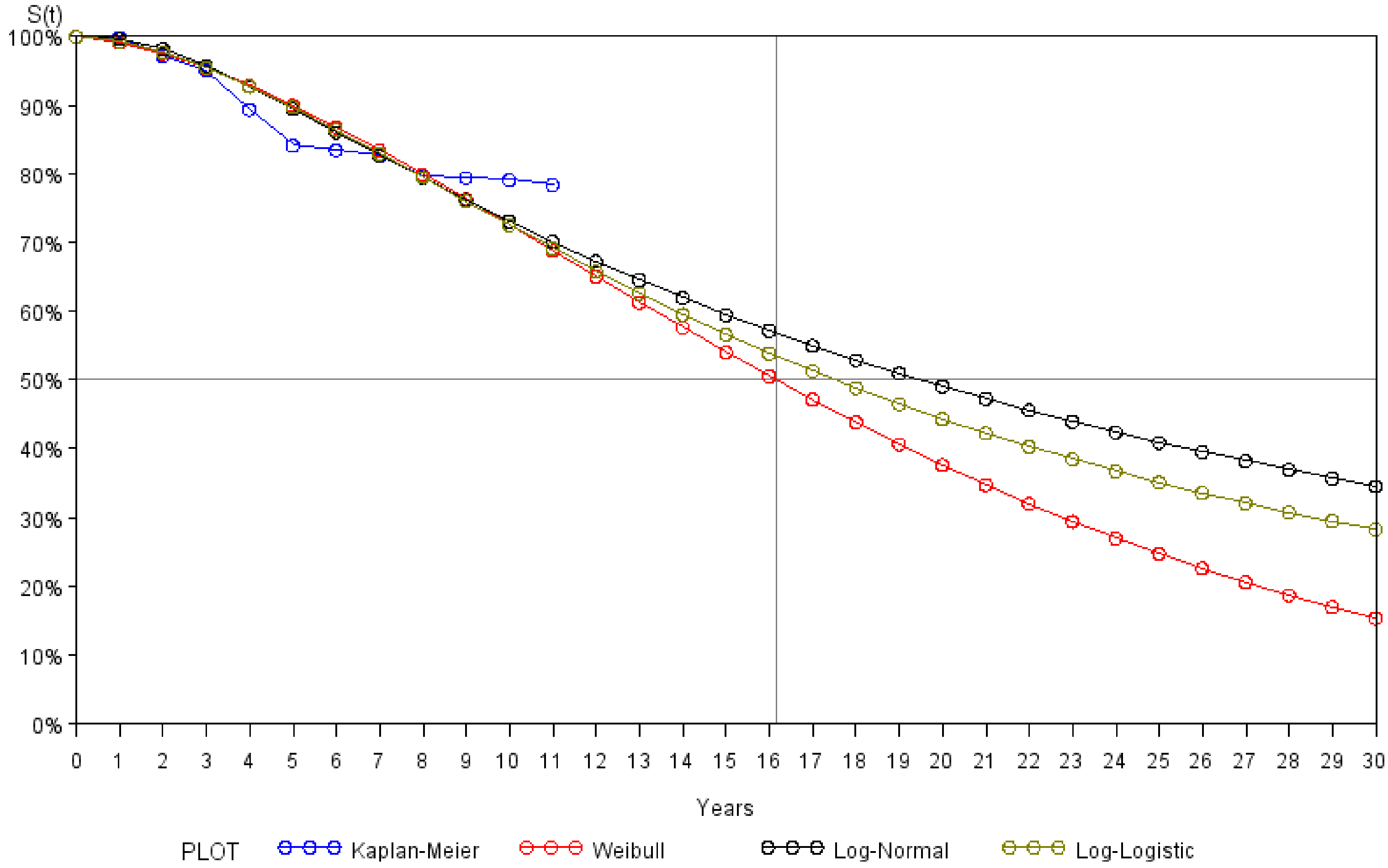
Plots of Results

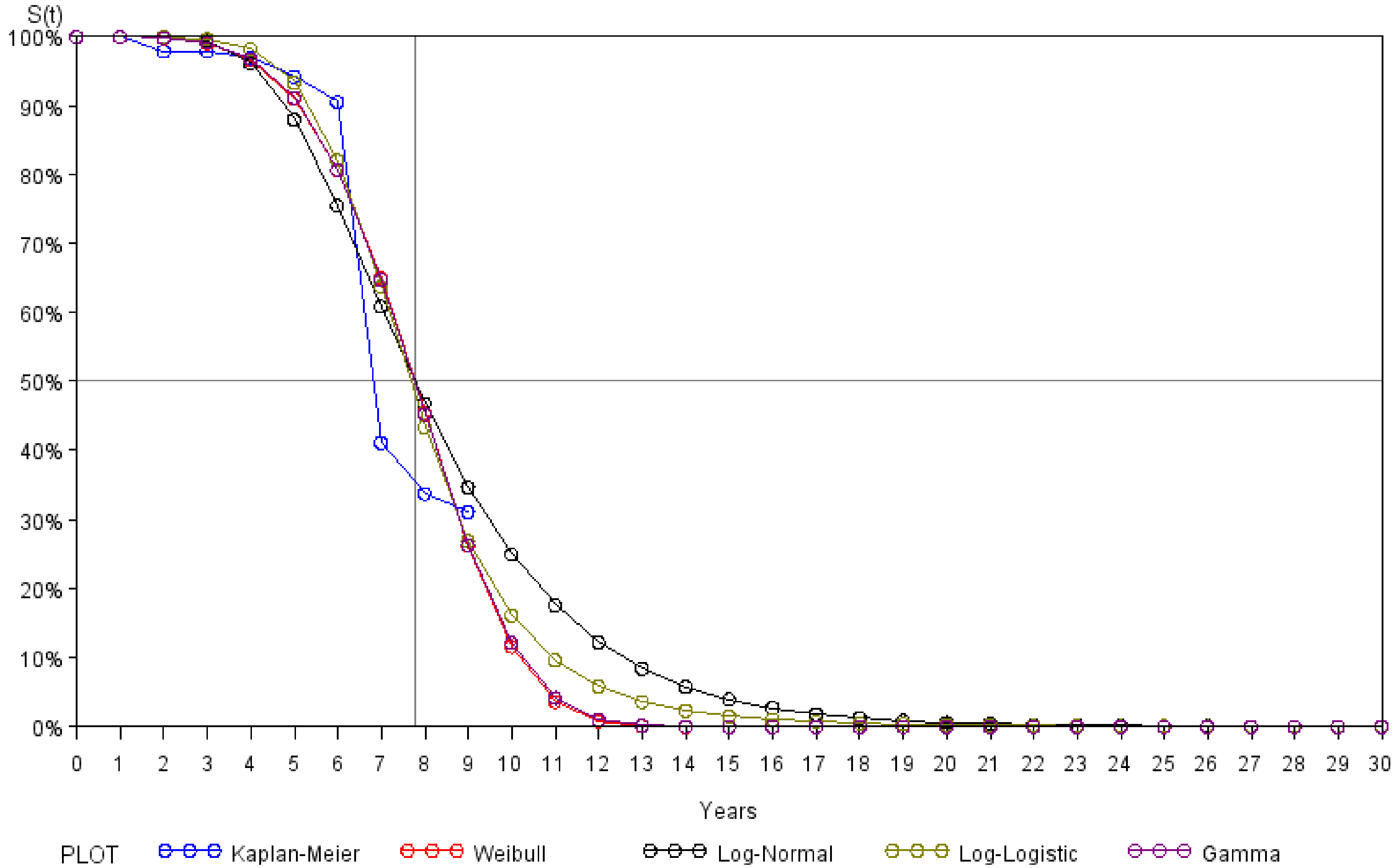
- The following plots show results from Kaplan-Meier and the parametric models
- The **y-axis** = probability of survival, **x-axis** =years
- EUL is the time at which half of the units are expected to survive**.** A **vertical line** indicates the EUL for the Weibull model

Estimated EUL for T8s



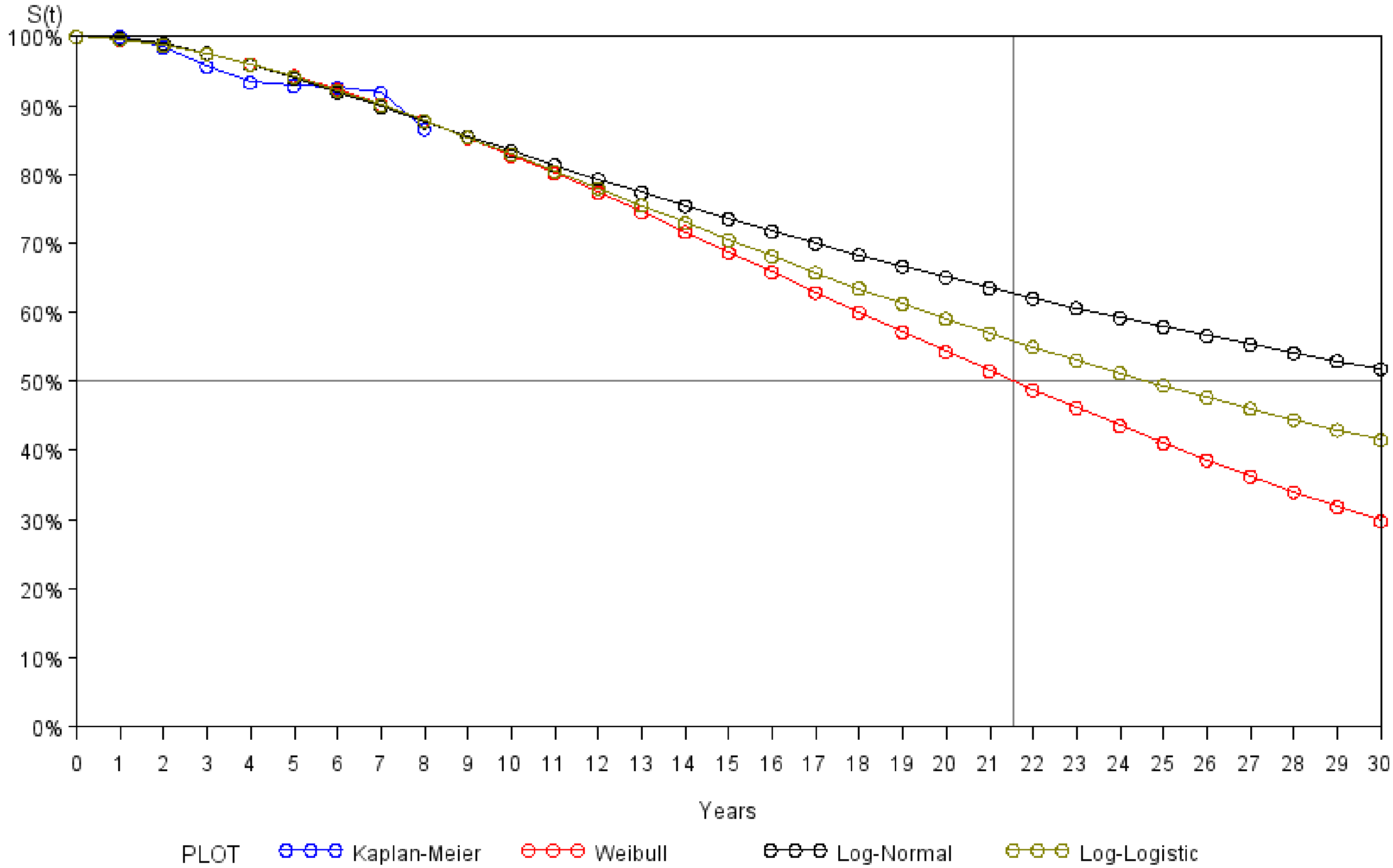
EUL=16.2 years.

Estimated EUL for HIDs



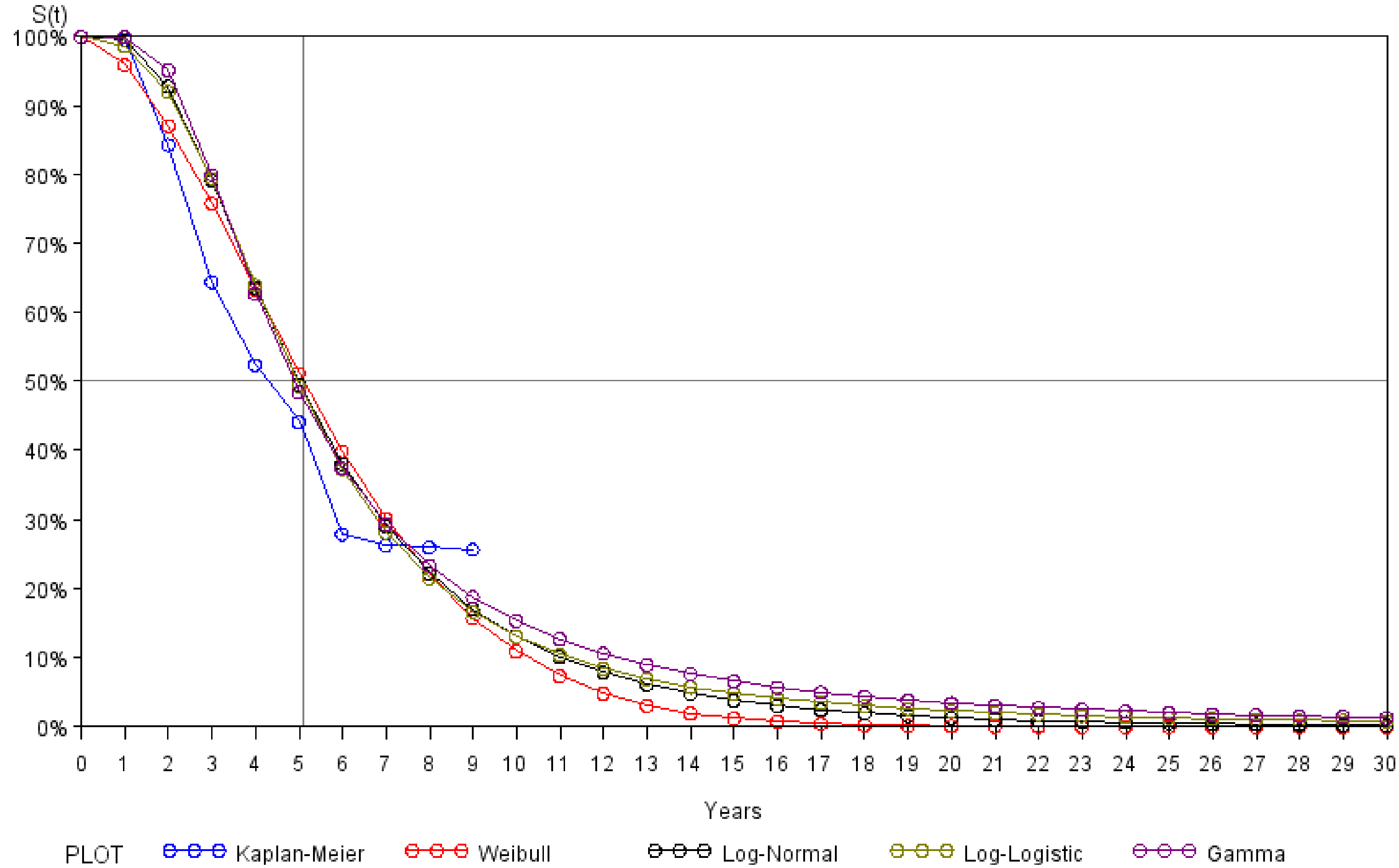
EUL=17.8 years.

Estimated EUL for LED Exits



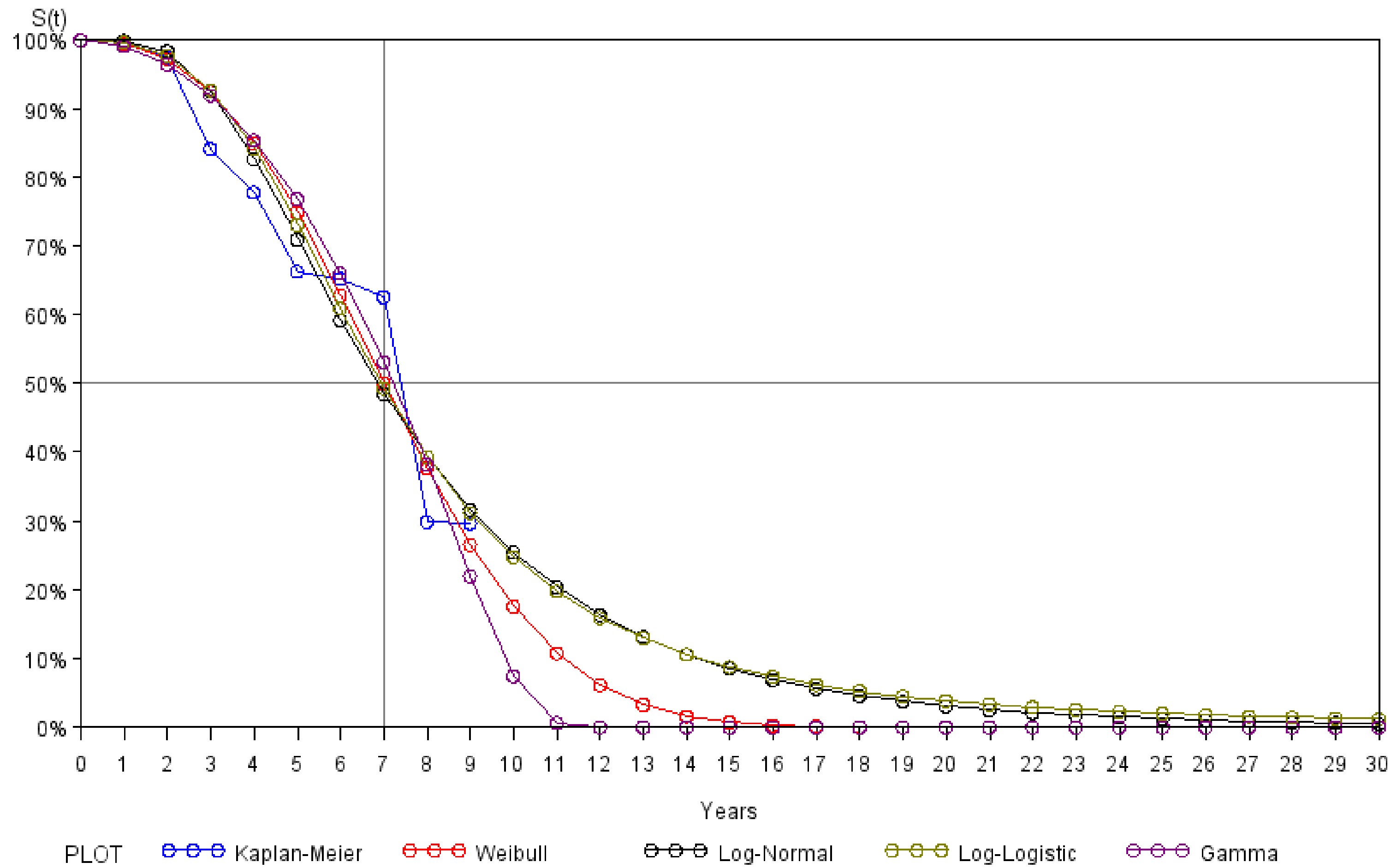
EUL=21.6 years.

Estimated EUL for CFL Bulbs



EUL=5.1 years.

Estimated EUL for CFL Fixtures



EUL=7.0 years.

Overall Parametric Results

- These results use the Weibull distribution
- Weibull is the standard in survival analysis

Technology	Estimated EUL	80% CI Lower	80% CI Upper
T8s	16.2	11.7	22.3
HIDs	7.8	6.4	9.4
LED Exits	21.6	12.7	36.7
CFL Bulbs	5.1	4.3	6.1
CFL Fixtures	7.0	6.1	8.1

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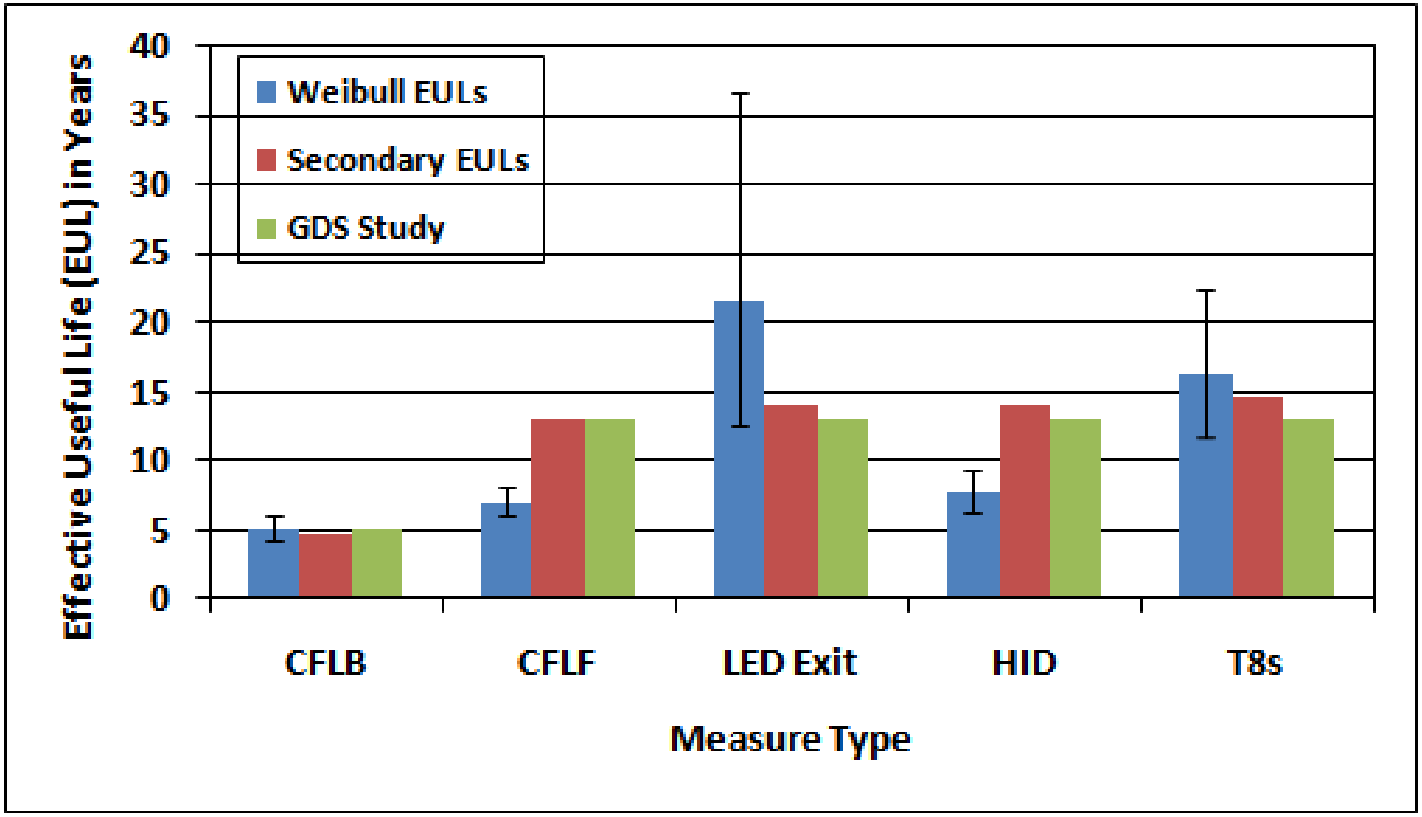
Weibull, Secondary, and GDS EULs

- Whiskers show upper and lower bounds at 80% CI.



Comparison to Secondary Research

- CFL bulbs and T8s are very similar to secondary research. Weibull T8 result is 1.5 years longer than secondary research average. CFL bulb is half a year longer.
- Weibull CFL fixture and HID estimates are approximately 6 years shorter than secondary research estimates.
- Weibull LED Exit estimates are 8 years longer than secondary research estimates.

Questions

Thank you for your attention.

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Incremental Costs: Honing in on Common Measures

Mike Sherman - Navigant Consulting, Inc., presenting

*AESP Brown Bag - **Saving Money and Getting Results***

Boston ,Massachusetts

September 8, 2011

DISPUTES & INVESTIGATIONS • ECONOMICS • FINANCIAL ADVISORY • MANAGEMENT CONSULTING

Project Context: Evaluation, Measurement and Verification Forum

» Forum founded and facilitated by the Northeast Energy Efficiency Partnership in 2009.

» Promotes regional EM&V consistency through coordinated research and evaluation:
- Protocols.
- Savings assumptions.
- Related energy efficiency program concerns such as incremental costs.

Incremental Cost Study Drivers

» Increased sensitivity to measure costs in cost effectiveness tests as standards increase and incremental savings decrease.

» Pressure for documentation from Forward Capacity Markets and new and greatly expanded energy efficiency resource goals.

» Much existing cost data relies on updates of old studies.
  – Markets and pricing have changed
  – Technology changes
  – Installation standards

Goals: Update Key Measure Costs

- Determine full measure and incremental costs.
- Break out materials and labor.
- Assess the costs in markets in participating states:
  - New England
  - New York
  - MD
  - DE
  - DC
- Address premium pricing to the extent possible

ICS Design Factors

- Close focus on measures receiving incentives in current energy efficiency programs.
- Create cost curves, not static snapshots
- Transparent calculation methodology
  - Open workbook calculation
  - User friendly, customizable
- Close coordination with on the ground program implementation staff and measure experts.

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Secondary Research Study Evaluation of 18 Measures

Secondary Research Quantitative and Qualitative Factors Considered

Quantitative Factors	Qualitative Factors
Number of Sources	Subcommittee First Priority Measures
Data Vintage	Geographic Concerns - Mid-Atlantic, New England
Baseline Measure Cost Completeness	Residential v Commercial/Industrial
Efficient Measure Cost Completeness	Relative Cost- Effectiveness
Labor Breakouts Provided?	Widgets v. System Measures
Full Costs Provided?	Budget

Measures Selected for Primary Research

» Subcommittee made final selections, mainly based on study team recommendations.

Gas Measures	“Electric” Measures
Residential Gas Furnaces	Air Source Heat Pumps
Residential Gas Boilers	Residential CAC
Commercial Gas Boilers	Residential Insulation
On Demand Hot Water	Air Sealing
Indirect Hot Water	Unitary AC
Combination Heat/Hot Water	Commercial Light Sensors

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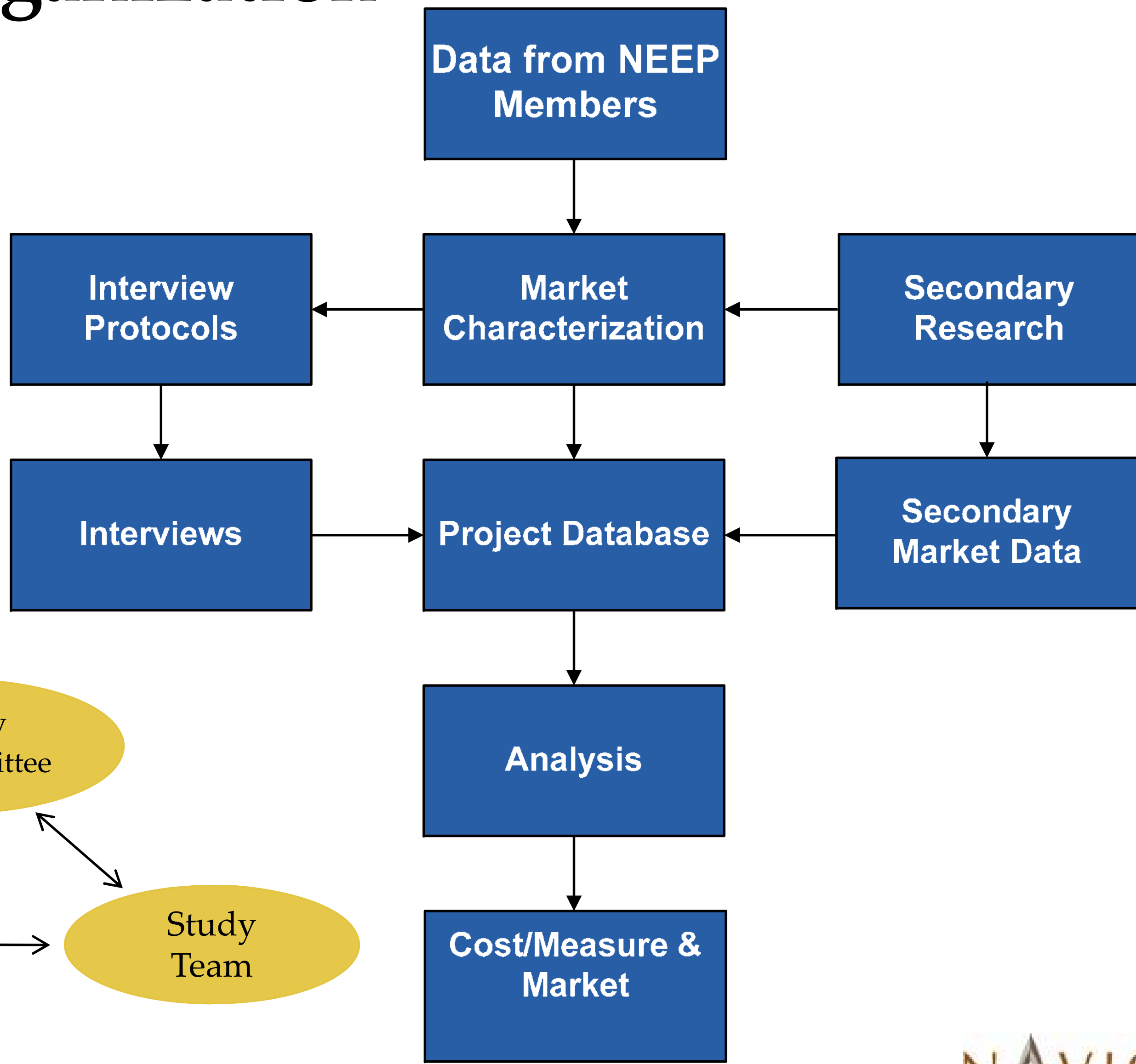
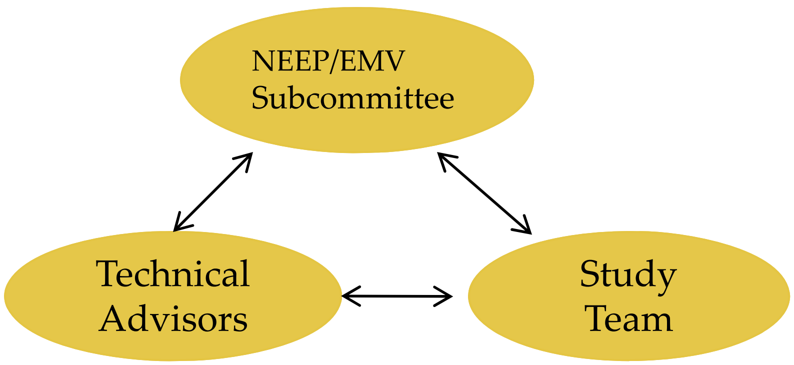
Study Organization





Markets

» Six markets identified in the study area using R.S. Means *Consumer Cost Indices.*

Market	Market Code	Cities/Areas	Adjustment Factor
Northern New England	1	ME, VT, NH	85.1
Central/Southern New England	2	MA (excluding Boston), RI, most CT	105.3
New England City	3	Boston, Providence	111.5
Metro New York	4	NYC, metro suburbs Southeast CT,	125.6
Upstate New York	5	Albany, Buffalo, Rochester etc.	98.9
Mid-Atlantic -	6	MD, DE, DC	91.5
Non Regional Specific	-	-	100

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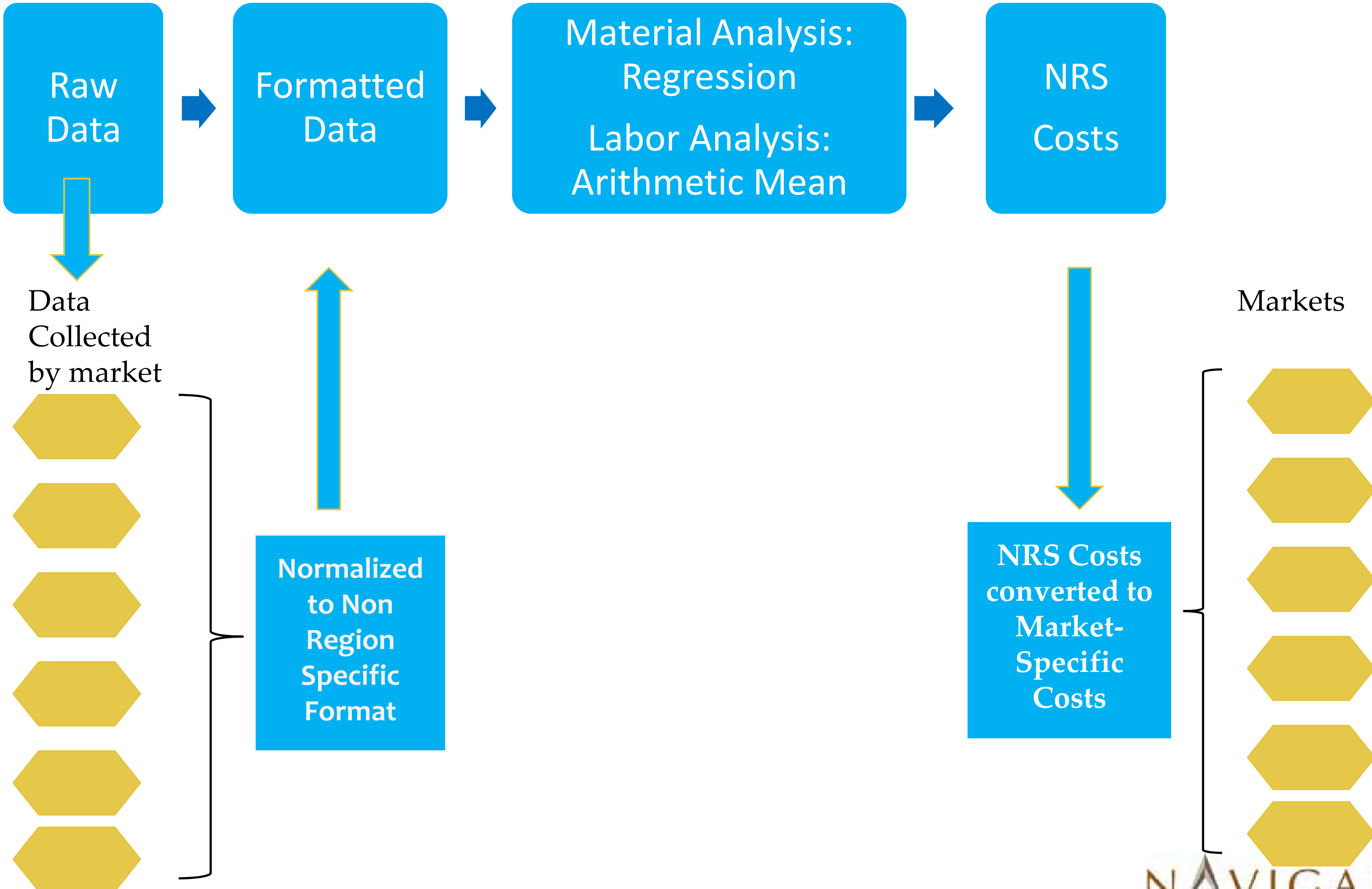
Data Collection

- **Primary Data:** 181 Interviews of installers, distributors, allocated equally by measure and proportionally among the six market regions. Material and labor costs collected.
- **Secondary Data:** Existing studies, principally the California DEER database most recent update (2008).
- **Internet costs:** Used to supplement primary data. Standard markups and typical labor costs were estimated.

Data Analysis



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Example: Commercial Lighting Controls

Retrofit: Labor Costs Included

Control Type	Non-Regional Specific	Market 1 Northern New England	Market 2 Central/ Southern New England	Market 3 New England City	Market 4 NY Metro	Market 5 NY Upstate	Market 6 Mid-Atlantic
Fixed Photocontrol	$105	$89	$111	$117	$132	$104	$96
Turn-Lock Photocontrol	$160	$136	$168	$178	$201	$158	$146
Wired-in Photocontrol	$100	$85	$105	$111	$125	$98	$91
Screw-in Photocontrol	$108	$92	$114	$121	$136	$107	$99
Swivel Photocontrol	$114	$97	$120	$128	$144	$113	$105
Button Photocontrol	$103	$88	$109	$115	$130	$102	$95
Shorting Cap Photocontrol	$110	$93	$115	$122	$138	$108	$100
Electronic Timer	$390	$332	$411	$435	$490	$386	$357

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Example: Residential Boilers

Residential Boiler Incremental Cost Results ($/unit) – Non-Regional Specific

Size (k Btu/h)	85 AFUE		90 AFUE	
	Material Cost	**Total Installed Cost**	**Material Cost**	**Total Installed Cost**
50	$501	$501	$1,260	$2,142
75	$630	$630	$1,388	$2,271
105	$784	$784	$1,542	$2,425
125	$886	$886	$1,645	$2,528
150	$1,015	$1,015	$1,773	$2,656
175	$1,143	$1,143	$1,902	$2,785
200	$1,272	$1,272	$2,030	$2,913
225	$1,400	$1,400	$2,159	$3,041
250	$1,529	$1,529	$2,287	$3,170
300	$1,785	$1,785	$2,544	$3,427

Notes:

All costs are *incremental*; Baseline = 80% AFUE Boiler

Total Installed Cost = Material Cost + Labor Cost (Labor = $0 for 85 AFUE efficiency level; Labor = $893 for the 90 AFUE efficiency level)

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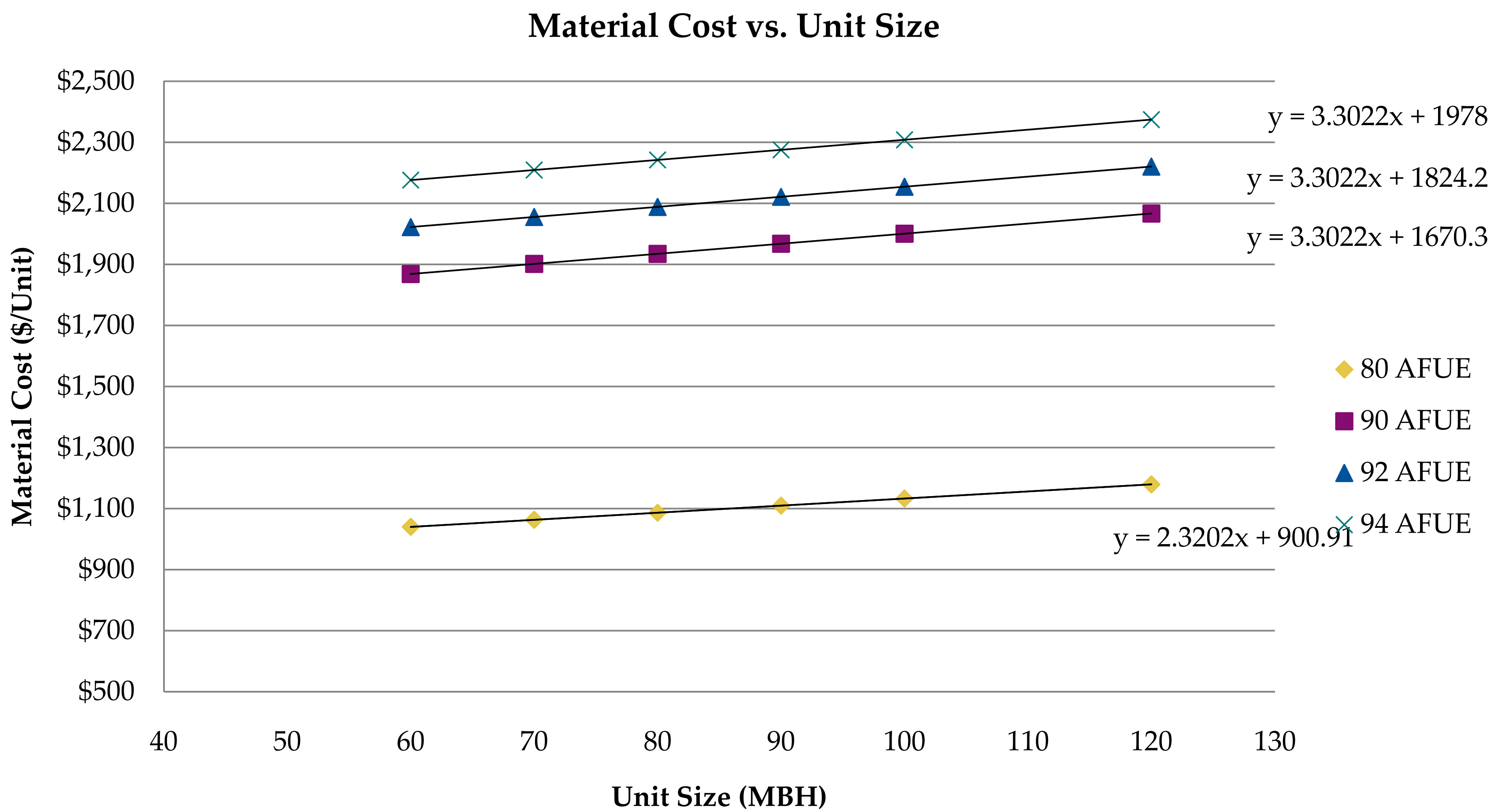
Cost Curve Example: Residential Furnaces

(With ECM Motors)



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Issues and Lessons Learned: Technical

» **Data:** Access to program data was spotty and detail varied. For some measures usable measure/ installer data was limited to a few program administrators.

» **Technical Advisor Group (TAG)** Program implementation staff and other measure experts invaluable for real world input on efficient equipment, protocols, reviewing results.

» **Costs**: Some reviewers thought costs high on some measures: Hot water heaters, Res AC, air sealing, but lacking contrary data.

- Bundling of premium features
- Not taking whole market into account
- Variances in the measures

Issues and Lessons Learned: Policy

» **High Stakes** – results can affect cost-effectiveness in some programs.

» **Costs:** Some costs perceived as high by reviewers but no hard data. DOE study used for setting national equipment/appliance standards confused some program administrators.

» **Premium Pricing:** efficient equipment bundled with premium features: increas cost without adding savings, e.g. SEER 15 Residential AC.
  – Can we unbundle the premium feature costs?
  – Are there "Vanilla" units that can be purchased?

Final Thoughts

- » Open analysis workbooks allow Program Administrators to tailor market cost factors, labor costs for local conditions.
- » Measure costs should be routinely updated in regular cycles.
- » Project Report will be available on EM&V Forum website in September:

www.neep.org/emv-forum

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Contact for Questions, Information

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QUESTIONS

To ask a question over the phone dial 800-243-6403 and enter passcode 949762#.

Press *1 to ask a question