

WHAT'S THE VALUE OF LIFE?

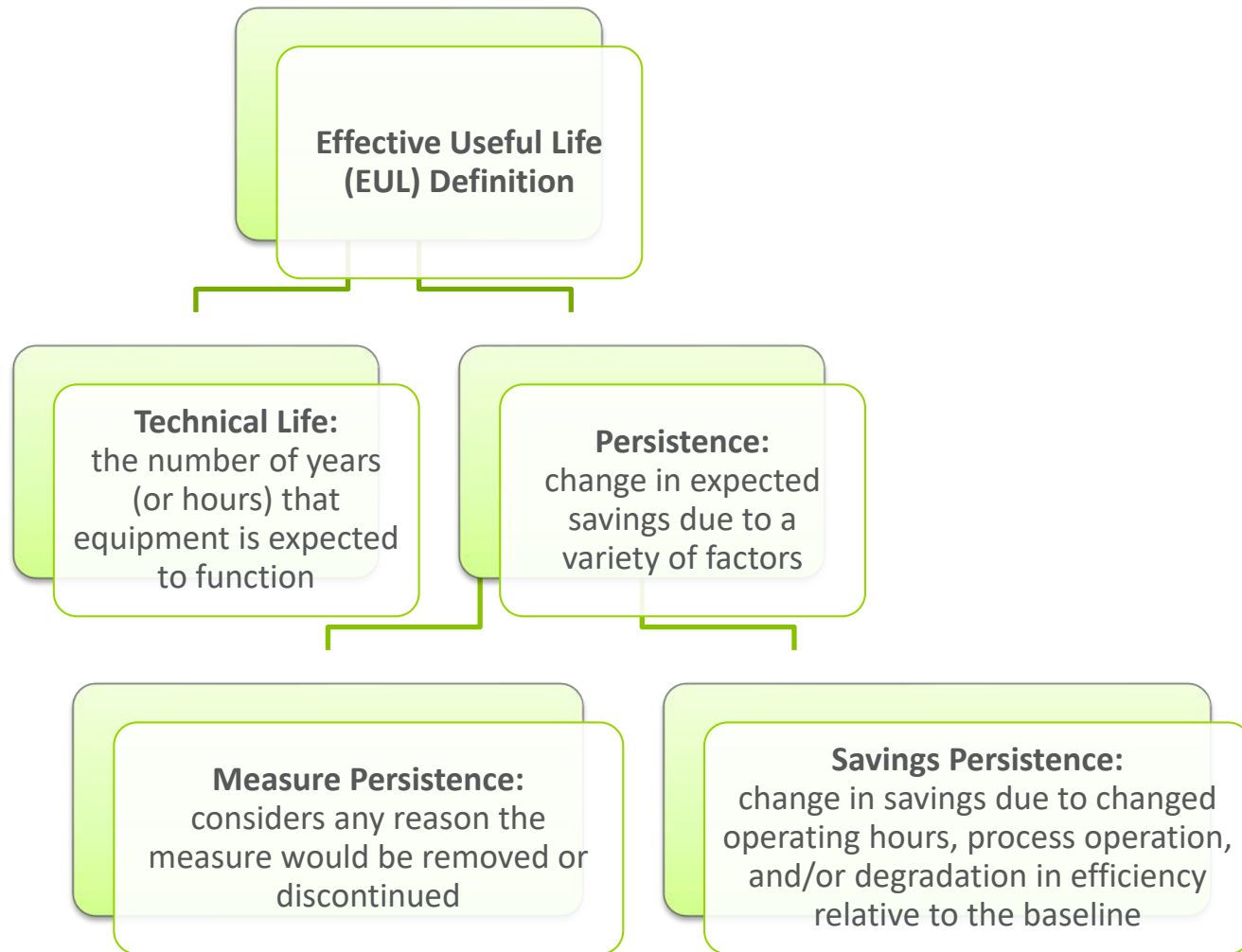
AUGUST 15, 2018

KAREN MAOZ
ROBERT NEUMANN

NAVIGANT CONSULTING, INC.

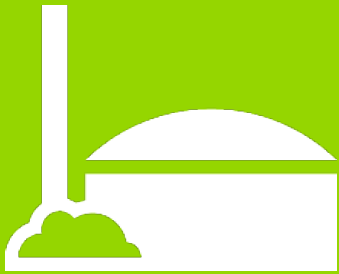
NAVIGANT

EFFECTIVE USEFUL LIFE DEFINITION



WHY ARE WE QUANTIFYING EULS?

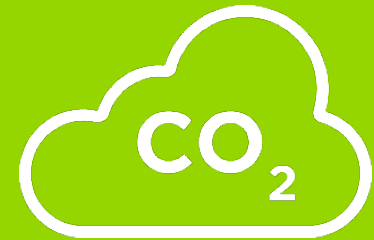
Value of Demand-Side Resources



Establishing Lifetime Savings Goals



Quantifying GHG Reductions



HISTORICAL RESEARCH

California Retention Studies (2006)

- Measure persistence (in place and operable)
- 8 + years after installation
- Updated numerous EULs

Wisconsin Measure Life Study (2009)

- Phone surveys, field work, and primarily secondary research
- Challenges and costs of performing primary research relative to quality of potential results
- limited project scope

NEEP Measure Life and Persistence Project (2011)

- On-site verification of C&I lighting
- Status of unit, quantify end of service, and reason for end of service
- Comparison to secondary source values

CUMULATIVE PERSISTING ANNUAL SAVINGS (CPAS)

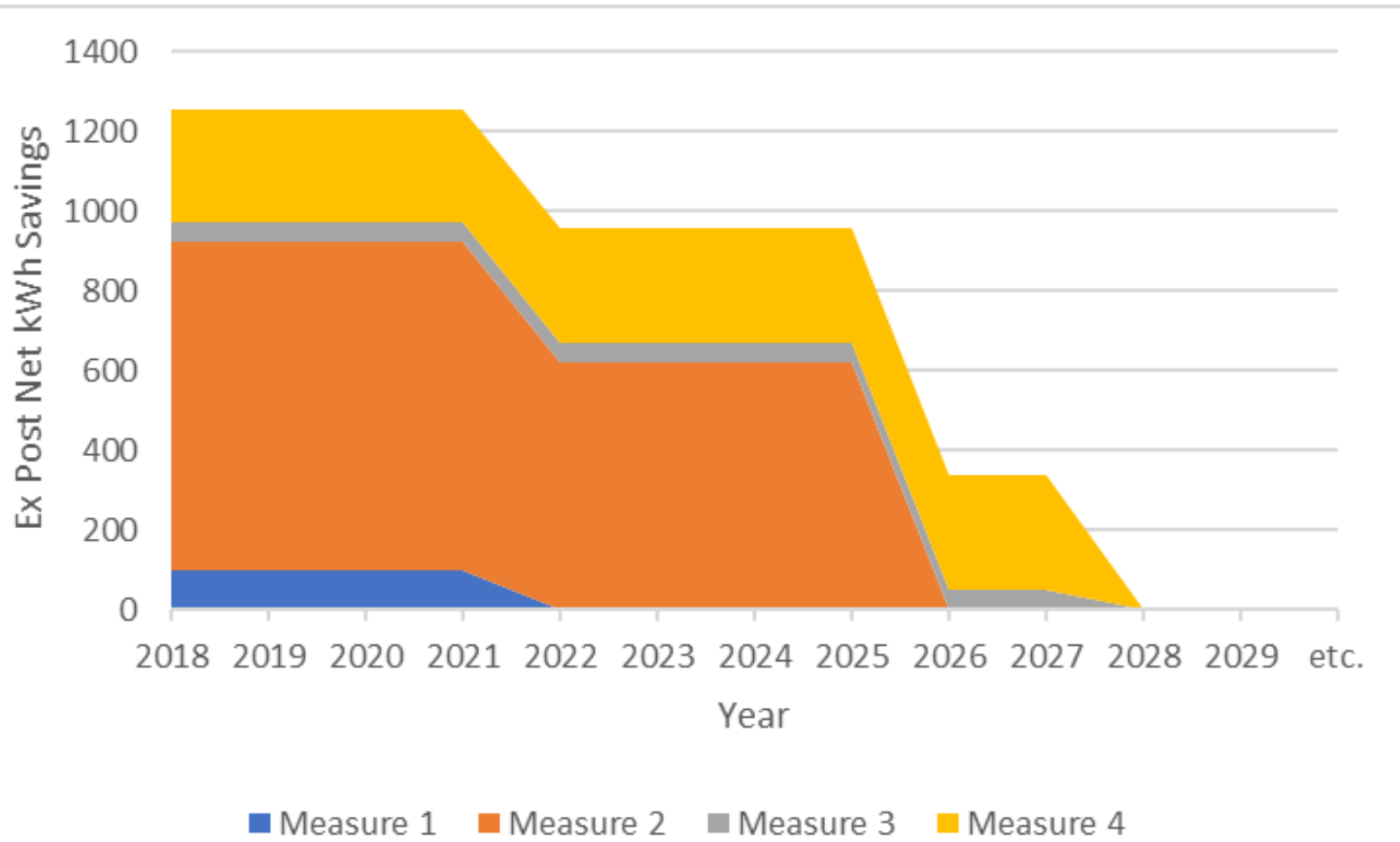
- Signed in 2016, CPAS is a new legislative accounting requirement for reporting program savings starting in 2018.
- Adoption of CPAS led ComEd to re-evaluate existing EUL data for their prescriptive and custom measures to ensure they are using the most accurate and up-to-date EUL estimates when reporting program savings.

The Illinois FEJA legislation:

“For purposes of this Section, “cumulative persisting annual savings” means the total electric energy savings in a given year from measures installed in that year or in previous years, but no earlier than January 1, 2012, that are still operational and providing savings in that year because the measures have not yet reached the end of their useful lives.”

- Source: p.183. <http://www.ilga.gov/legislation/99/SB/PDF/09900SB2814lv.pdf>.

CPAS EXAMPLE



Navigant Consulting's Illinois FEJA CPAS Savings Example

EUL RESEARCH PROCESS – SIX STEP PROCESS

- Step 1:** Assess the knowledge base for current EUL estimates (complete).
- Step 2:** Develop current best estimates for all relevant EULs for CPAS calculations (complete).
- Step 3:** Assess the uncertainty in current estimates of measure EUL to see where evaluation and verification dollars should be invested.
- Step 4:** Build a structural model that incorporates key factors that influence EUL and persistence of savings by measure. Model to look at intervals of time to assess when to field studies and what should be addressed – e.g., what can you learn in year 5 of a measure with an 8 year EUL.
- Step 5:** Perform initial EUL verifications to assess importance of influential factors.
- Step 6:** Based on Step 5, develop larger field scale evaluations for measures and groups of measures where the small sample data shows that field data are inconsistent with the current EUL estimate.

METHODOLOGY FOR EUL ASSIGNMENT

Supporting Documents

Review documents used historically

Identify Quality Resources

Identify high quality sources to support or to update the EUL values

Strong Resources

Review high strength literature sources

Record EUL Values

Reference EUL values found in high strength sources unless only low strength sources are available

EUL Update

Recommend an update to the EUL value, if applicable

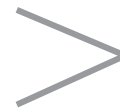
Rationale for Update

Provide rationale for recommending an update or keeping the existing EUL estimate

121 Measures Total



19 Decrease EUL
19 Increase EUL



**38 with Proposed
EUL Change**



32 Benefit From Additional Primary Research



20 Highly Sensitive to Persistence

EUL PERSISTENCE RESEARCH METHODOLOGY

**Initial Persistence
Factor
Assessment**

**Secondary
Persistence
Factor Research**

**Structural Model
Development**

DEVELOP STRUCTURAL MODEL BY MEASURE

- Build off findings from the initial screen to develop necessary research steps to inform the EUL structural model. This table illustrates a structural model for C&I lighting.
- It's important to gather data from program implementation tracking systems, i.e., building types for commercial measures and types of participants for residential measures.

Lighting Quantity	Year and Probability of Influence							
Factor	1	2	3	4	5	...	14	15
Building Type Dependent	Description: Office buildings may be further disaggregated between Class A - high end downtown commercial space versus Class C - located in economic depressed zone; Schools may only remodel when new bonds are approved.							
	Installation practices							
Schools	0%	0%	0%	0%	0%	0%	20%	40%
Office	5%	10%	15%	20%	25%	30%	40%	50%
	Occupancy changes							
Schools	0%	0%	0%	0%	0%	0%	20%	40%
Office	5%	10%	15%	20%	25%	30%	40%	50%
	Remodeling practices							
Schools	0%	0%	0%	0%	0%	0%	20%	40%
Office	5%	10%	15%	20%	25%	30%	40%	50%

Field work and surveys will assess the impact that persistence factors have on measure EUL at critical measure years

25%

CASE STUDY – BUILDING AUTOMATION SYSTEMS

Building Automation System (BAS) measure – a valuable technology for high impact savings in commercial buildings.

Source Quality

Based on DEER 2014 (California), which is aligned with primary literature review and meta-analysis.

Outdated EUL

2004 PG&E ninth year retention study included high-quality primary data sources. - EUL estimates are outdated.

Tech Change

Technology changed rapidly over the past 10 years including communication protocols and programming language can quickly become obsolete – older manufacturer support is lost for older BAS.

Large Range

ASHRAE* database provided a significantly higher EUL estimate for BAS ranging between 11-25 years

* American Society of Heating, Refrigerating and Air-Conditioning Engineers

CONTACTS

KAREN MAOZ

Associate Director

(312) 583.2176

Karen.Maoz@Navigant.com

ROB NEUMANN

Associate Director

(312) 583.2176

Rob.Neumann@Navigant.com

SECONDARY RESEARCH - QUALITY SOURCES

Classified each identified source according to their quality or “strength” into 5 levels. This classification system guided our assessment when making recommendations to determine the most appropriate EUL value for each measure.

Type	Strength	Description	Example
1	High	Primary research or vetted by third-party entities such as trade organizations, national labs, or government organizations	US DOE – Conservation Standards, LED reports for DOE, Appliance magazine, Measure Life and Persistence Project
2	Med–High	Meta-analyses conducted by third-party organizations, that include an evaluation of the studies comprising the dataset	California DEER, RTF reference workbook, GDS Report, Focus on Energy Report, ASHRAE database
3	Medium	Compilations conducted by third-party organizations. Original sources should be cited, and locatable where applicable	State TRMs, ENERGY STAR calculators
4	Med–Low	Primary research conducted by interested parties such as manufacturers, distributors, retailers or installers	Interviews
5	Low	Source where the basis of measure life is anecdotal, based on specs, warranty, etc.	Professional judgement

FACTORS AFFECTING MEASURE EUL

Delivery Method
Installation Practices
Sizing and rating
Maintenance
Climate Zone
Operating Hours
Operations / Practices
Occupancy changes
Remodeling

Source: NW Council's RTF definitions