Memorandum

To:	Dave Walker, Michigan Public Service Commission
From:	Joe Forcillo, Consumers Energy; Jason Kupser, DTE Energy; Scott Dimetrosky, Apex Analytics; Amy Ellsworth, Cadmus
Subject:	Explanation and Recommended Revision to LED Measure Life for 2021 MEMD
Date:	August 10, 2020

This memo proposes that the Estimated Useful Life (EUL) for LED bulbs be revised in the 2021 MEMD based on a number of significant recent developments affecting measure life. The following are the details supporting this new recommendation.

Background

In September of 2019, the Cadmus team, on behalf of DTE Energy and Consumers Energy, submitted a prior memo with a recommendation regarding the Useful Life (EUL) for LED bulbs in the 2020 Michigan Energy Measures Database (MEMD).[1] That memo recommended a lifetime of four years for standard lamps and five years for specialty lamps. Those recommendations were approved and reflected in the 2020 MEMD.[2]

That memo recognized the regulatory uncertainty around lighting and the need to regularly revisit the recommendations, noting:

"Given the considerable uncertainty around the changing standards, the Cadmus team further recommends that the measure life for LED bulbs should be revisited regularly, on a schedule of approximately every two years, to assess whether additional changes to the measure life are warranted...considering any changes to the EISA backstop rule, definitions of general service lamps, and the outcome of any litigation in the update."

The Cadmus team believes that there are four significant factors that warrant revising the EUL at this time:

1. **Full recension of the DOE EISA backstop legislation**. In December of 2019 DOE issued a Final Determination in which they formalized full recension of the 2007

[1] "Explanation and Recommended Revision to LED Measure Life for 2020 MEMD", Memorandum from Consumers Energy, DTE Energy, Apex Analytics, ad Cadmus to the Michigan Public Service Commission, September 30, 2019.

[2] See the Michigan Energy Efficiency Measures Database (MEMD) at https://www.michigan.gov/mpsc/0,9535,7-395-93309_94801_94808_94811---,00.html

Energy Independence and Security Act (EISA) backstop requirement, which would have established a 45 lumen/watt (i.e., a CFL or equivalent efficiency) baseline beginning in 2020.[3] The ruling also removed a number of exemptions to EISA, including three-way and rough service lamps, opening up loopholes that allow for manufacturers and retailers to sell incandescent lamps for both standard (i.e., A-line) and specialty styles.[4]

2. **The increased adoption of a modeling approach for residential lighting lifetime adjustment**. The September 2019 memo recommended a "sunset date" approach for adjusting the EUL of residential lamps. In this method, a negotiated sunset year was selected, after which no savings are claimed. However, over the last six months a number of states, including Illinois and Wisconsin, have moved towards using an alternative approach that models the likelihood a socket filled with a program LED would have an LED installed in the future. This method is a more rigorous, quantitative approach that utilizes historical sales and predicted future sales to derive the EUL (i.e., less arbitrary than selecting a single year through the sunset date approach).
3. **The COVID pandemic**: The 2020 COVID pandemic has put tremendous strain on the economy, leading consumers to select the least cost lighting product available. There are also indications that the pandemic has shifted retail lighting sales away from big box stores to grocery and drug stores – retailers that have historically sold far fewer LEDs than the big box stores – plus led to import challenges with LEDs. While the length of the pandemic is impossible to predict, these effects are likely to extend into 2021, thus lengthening the time period in which a socket filled with a program lamp would continue to have an inefficient baseline (i.e., extending the time period for the savings claim).
4. **The importance of lighting in meeting energy efficiency goals**. The COVID pandemic has also put increased pressure on the Michigan utilities' energy efficiency portfolios and created new challenges with meeting aggressive savings goals. Residential lighting continues to be an important measure in the portfolios, and prematurely truncating the measure life has significant impacts on both savings and cost-effectiveness that could affect the ability of the utilities to meet their goals.

Modeling Approach

As noted above, Illinois stakeholders recently developed a modeling approach (an alternative to the "sunset date" approach) that accounts for the increasing probability, over

[3] https://www.federalregister.gov/documents/2019/12/27/2019-27515/energy-conservation-program-energy-conservation-standards-for-general-service-incandescent-lamps

[4] Note that while there are a number of lawsuits underway now against the DOE – including a lawsuit that Michigan is participating in – these lawsuits are likely to be prolonged, plus it's unlikely that any decision ruling against the DOE would have an immediate impact on the market (i.e., it would allow for a few years for the manufacturers and retailers to prepare for the new standard).

time, that a socket filled by a program lamp would have had an LED installed. The pending update of the Illinois Technical Reference Manual (Version 9)[5] uses an Effective Useful Life (EUL) methodology that relies on two sources of industry accepted data:

1) 2018 and 2019 market shares for LED, CLF, Halogen, and Incandescent bulbs for standard (A-lines) and specialty (candelabra and globes combined, and reflectors) as estimated by CREED LightTracker.[6]
2) U.S. DOE saturation forecasts by bulb type, converted into average annual growth rates.[7]

With these two information sources, the Illinois Technical Advisory Group[8] tentatively agreed upon a stipulated growth forecast for LED and non-LED market shares that generally follows the DOE growth forecasts while incorporating historical growth from 2018 and 2019.

The Cadmus team proposes a similar approach for Michigan, noting that:

- The use of non-program states to calculate the historical sales trajectory is appropriate because the trajectory should not be impacted by changes in program magnitude from one year to the next (i.e., program effects could impact the slope of the sales trajectory, and using non-program states removes any potential program impacts).
- The delta watts reflect values from the MEMD.
- The discount rates, as noted below, are adjusted to reflect values for Consumers Energy and DTE.

Applying the Modeling Approach

The assumed growth forecasts are detailed on the yellow worksheets titled A-Line Forecast, Specialty Forecast, and Reflector Forecast in the companion workbook to this memo (MI EUL Lighting Adjustment_080520.xlsx), and shown in Attachment A.

The green tabs in the associated workbook apply the growth forecasts to calculate EUL by lamp type, with a summary of the output shown in Attachment B. The worksheet calculates

[5] https://www.ilsag.info/technical-reference-manual/il-trm-version-9/

[6] The Consortium for Retail Energy Efficiency Data (CREED) serves as a consortium of program administrators, retailers, and manufacturers working together to collect the necessary data to better plan and evaluate energy efficiency programs. LightTracker is the first initiative of CREED, focusing on acquiring full-category lighting data, including incandescent, halogen, CFL, and LED bulb types, for all distribution channels and for the entire U.S. See www.creedlighttracker.com.

[7] https://www.energy.gov/eere/ssl/ssl-forecast-report

[8] Note the IL TRM and lighting Technical Advisory Group were led by the Vermont Energy Investment Corporation (VEIC). The Group met approximately eight times during a six month period, concluding in May 2020.

the rate of change of market shares of non-LEDs starting with the year after lamps are purchased (rows 11 and 12, cumulative and year on year, respectively). For the first year, gross delta watts are based on gross savings calculated between LEDs and the baseline lamp. After the first year, the baseline wattage and therefore delta watts, decreases, because over time, a portion of non-free riders would have purchased LEDs on their own. For example, as shown in the A-line EUL worksheet, cell E12, an estimated 10% of the 2020 halogen or incandescent purchasers would have purchased an LED through possible reintroduction of EISA standards that accelerate market adoption. Therefore, baseline and delta watts decrease by 10%. In 2022, the model assumes an additional 8% of the original halogen or incandescent purchasers would purchase LEDs, and so on. The result is an eroding stream of savings over an assumed 10-year LED life.[9]

The stream of savings can then be applied using one of the three following options:

1. By using the actual stream of savings, with differing savings each year. This is the most detailed in terms of claiming savings each year but would likely introduce a challenge in terms of data tracking declining savings year after year.
2. Using a midlife adjustment (dual baseline) approach in which there is a higher stream of savings for the first five years, followed by a lower savings stream for the second five-year period.
3. A truncated measure life approach, calculated by dividing the net-present-value (NPV) of the stream of savings by the first-year savings, thus providing the same lifetime savings.

Note that all three of these approaches provide identical NPV of lifetime savings (using a real discount rate of 4.1%[10]); the only difference is in how they are tracked.

Applying Net-to-Gross (NTG)

The decreasing stream of savings is calculated for gross savings. To apply NTG, the first-year savings are adjusted for the NTG ratio, and then the remaining savings are run through the model. This is because the adjusted measure lifetime only applies for non-freeriders (i.e., only those purchasers that would have purchased an incandescent or halogen, and thus were influenced by the program).

[9] Illinois caps LED savings streams at 10 years.

[10] We computed the real discount rate of 4.1% by adjusting the weighted average cost of capital for DTE and Consumers energy by the inflation rate of 2.9% and then averaging the result, as shown in the associated spreadsheet for each bulb type in cells P1:S4 .

Recommendation

The Cadmus team recommends using the above described approach to estimate lighting EULs based on predicted LED market shares over time as the preferred method to consider uncertainty associated with EISA reintroduction. We also recommend applying the reporting option of an effective truncated life (option 3 above), which is consistent with all other measures in the MEMD in that it reflects a single stream of savings over the lifetime of the measure. A summary of the recommended values is presented below in Table 1.

As in the prior memo, the Cadmus teams recommends that the measure life for LED bulbs continue to be revisited regularly and updated as needed based on the outcome of ongoing litigation against the DOE or other factors as warranted.

Table 1. Recommended Adjusted EUL, by Style

Style	EUL
Standard (A-line)	5.6
Specialty (Globes and Candelabras)	6.3
Specialty (Reflectors)	7.6

Attachment A
Baseline (Non-Program) Market Share Forecasts by Technology and Year

Standard (A-line)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
LED	**48%**	**52%**	56%	61%	64%	67%	70%	74%	77%	81%	85%	88%	90%
CFL	**2%**	**3%**	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%
Halogen	**43%**	**40%**	38%	34%	31%	28%	27%	24%	20%	16%	12%	10%	8%
Incandescent	**7%**	**5%**	5%	5%	4%	4%	3%	3%	3%	2%	2%	2%	2%

Specialty (Globes and Candelabras)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
LED	**24%**	**45%**	54%	58%	63%	66%	67%	69%	70%	71%	71%	72%	73%
CFL	**0%**	**0%**	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Halogen	**2%**	**2%**	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	0%
Incandescent	**74%**	**53%**	44%	40%	36%	33%	31%	30%	29%	28%	27%	27%	0%

Specialty (Reflectors)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
LED	**73%**	**83%**	85%	86%	87%	88%	89%	90%	90%	91%	91%	92%	92%
CFL	**0%**	**0%**	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Halogen	**17%**	**14%**	12%	12%	12%	12%	11%	10%	10%	9%	9%	8%	8%
Incandescent	**10%**	**3%**	3%	2%	1%	0%	0%	0%	0%	0%	0%	0%	0%

Attachment B
Savings Streams for Adjusted EUL

Standard (A-line)

Option for Savings	NPV	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Annual Decline	158.7	28.5	25.5	23.5	21.4	19.8	17.5	15.0	12.5	9.7	8.0
Midlife Adjustment	158.7	28.5	28.5	28.5	28.5	28.5	7.1	7.1	7.1	7.1	7.1
Adjusted EUL (Years)	5.6										

Specialty (Globes and Candelabras)

Option for Savings	NPV	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Annual Decline	149.0	23.7	21.5	19.1	17.5	16.8	16.1	15.4	15.0	14.7	14.3
Midlife Adjustment	149.0	23.7	23.7	23.7	23.7	23.7	10.4	10.4	10.4	10.4	10.4
Adjusted EUL (Years)	6.3										

Specialty (Reflectors)

Option for Savings	NPV	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Annual Decline	409.6	54.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0
Midlife Adjustment	409.6	54.0	54.0	54.0	54.0	54.0	42.3	42.3	42.3	42.3	42.3
Adjusted EUL (Years)	7.6										