Lighting the Way Equitably with Ameren Illinois' Luminaire Level Lighting Controls Market Transformation Initiative

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ABSTRACT

Ameren Illinois' Luminaire Level Lighting Controls (LLLC) Market Transformation Initiative (MTI) seeks to remove market barriers – lack of value proposition, limited distributor and installer skillsets, and high initial cost – to bring about lasting change in the lighting market, where LLLC systems are recommended and installed in the commercial sector. In the second year of pilot implementation, Ameren Illinois saw a 2100% increase in the number of projects—from 12 in 2022 to 261 in 2023. The successful participation in 2023 was a combined result of expansion of traditional incentive channels, market-specific trainings targeting trade allies serving rural and disadvantaged communities, and consistent messaging of the value of LLLC during Ameren Illinois events. This paper shares Ameren Illinois' impactful implementation of program activities.

Background

Ameren Illinois has been actively running a Market Transformation (MT) pilot program to accelerate the adoption of Luminaire Level Lighting Control (LLLC) systems since 2022. Ameren Illinois opted for an MT—rather than a resource acquisition— approach to better address the market barriers that have significantly inhibited the pace and scale of LLLC uptake since the technology became available for purchase over a decade ago.[1] While Ameren Illinois recognized that taking an MT approach would entail additional upfront investment, the company also recognized the approach could foster broad, market-level savings well into the future.

LLLCs are a subset of networked lighting controls (NLCs): technologies that integrate daylight harvesting, occupancy sensing, and dimming within a wirelessly controlled LED fixture. LLLCs are distinct from other types of NLCs in that they have a sensor embedded in each fixture that can operate independently or be connected to operate within a larger network. LLLCs therefore offer enhanced flexibility and control in new construction, major renovation, and retrofit settings across building types. LLLCs can provide substantial energy savings at a lower cost than a full lighting redesign. In a recent study, researchers replaced baseline fluorescent lighting one-for-one with LLLCs and found 50-74% annual energy savings due to the controls alone (i.e., excluding savings attributable to the LED upgrade). In contrast, a full lighting redesign yielded 67% annual energy savings solely from the controls, but at two to three times the cost of the LLLC retrofit (UO 2020).

Operating within the state of Illinois, the planning, implementation, and evaluation of Ameren Illinois' LLLC MTI is guided by "Attachment C: Framework for Counting Market

[1] Adoption of LLLCs—and networked lighting controls more generally--has remained stubbornly low: in 2021, networked lighting controls overall comprised less than 1% of all luminaires in the United States (Wolgamott and Kisch 2021).

Transformation Savings in Illinois" in the Illinois Technical Resource Manual (Attachment C). Attachment C describes an MTI as a theory-driven initiative that undertakes a variety of strategic activities to reduce market barriers with the goal of creating lasting change in a clearly defined target market. Attachment C states that Program Administrator (PA) must document the MTI's goal(s), strategic activities, and intended market changes induced by those activities, in a logic model. (IL SAG 2024)

In addition to the logic model, Attachment C instructs Illinois PAs to develop an Energy Savings Framework (ESF) and an Evaluation Plan for each of their MTIs. Taken together, these three documents provide stakeholders—PAs, program implementers, program evaluators, Illinois MT Working Group members,[2] and others—with a common understanding of the target market's starting point, how the MTI aims to alter that market, and how the evaluator will assess the MTI's progress over time. The documents assist the stakeholders in working collaboratively from an MTI's inception until its end. This paper describes:

- The LLLC MTI program theory that the cross-functional team—Ameren Illinois (the PA), Resource Innovations (RI, PA support contractor), and Opinion Dynamics (evaluator)—collaboratively developed in accordance with the Attachment C framework.
- The pilot's strategic activities centered around distributor and installer training to remove market barriers and to enhance engagement across Ameren Illinois' small/medium cities and rural communities. This section also describes supportive collateral materials and incentives documents, and the early effects the pilot activities are having on LLLC and NLC projects in Ameren Illinois' area.
- Ameren Illinois' planned next steps for continuing to grow adoption of LLLCs in its service area in 2024 and beyond.

LLLC MTI Program Theory

Target Market

The LLLC MTI is designed to target key market actors—manufacturers, distributors, installers/general contractors, and end use customers—to bring about lasting change in the commercial lighting market. Figure 1 illustrates how the market actors interact with one another.

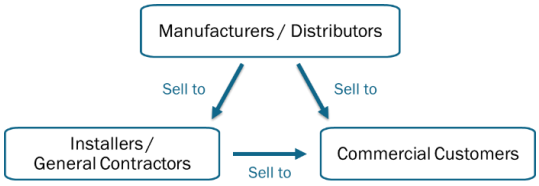

Figure 1. LLLC Target Market[3]

[2] The MT Working Group is a subset of the Illinois Energy Efficiency Stakeholder Advisory Group, commonly referred to as the IL SAG.

[3] Manufacturers develop and manufacture LLLC products; distributors stock these products for retail to installers. Installers are organizations that perform installation components of a construction or retrofit project. General Contractors are organizations that manage construction and retrofit projects; may do installation work and/or subcontract to installer organizations. Commercial customers represent all building types in the commercial sector.

Currently available LLLC retrofit kits can render LLLCs cost-effective in both existing and new construction spaces, especially in areas with higher lighting power densities. LLLC savings are contingent on site-specific characteristics, occupancy patterns, and user behavior. To date, Ameren Illinois customers have installed LLLCs in manufacturing, medical, office, religious, retail/service, school/college, and warehouse facilities.

Logic Model

Figure 2 shows the LLLC MTI's logic model: that is, it depicts the program's theory of change.[4] The first row of the logic model identifies the market barriers that have been inhibiting LLLC adoption in Ameren Illinois' service area and that Ameren Illinois' limited program resources are most likely to be able to reduce or eliminate:

- **Lack of value proposition:** based on interviews with Ameren Illinois distributors and installers, Ameren Illinois determined that many distributors and installers are not aware of or familiar with the energy savings and non-energy benefits of LLLCs (e.g., enhanced occupant comfort, improved lighting). These actors are therefore ill-equipped to offer LLLCs as an option and to convey the benefits of LLLCs to customers. End-use customers are also largely unfamiliar with LLLCs and their benefits and therefore unlikely to consider and purchase them.
- **High upfront costs:** LLLCs cost roughly 50% more than traditional luminaires on a per-fixture basis. (Kisch 2021)
- **Lack of skilled distributors and installers:** Ameren Illinois also learned through interviews with distributors and installers that few in the area understand LLLC systems' functions and features.

The next row of the logic model shows the pilot's strategic activities that are designed to overcome the three barriers, thereby accelerating LLLC adoption over the short, medium, and long terms.

- **Developing educational and sales materials** to assist distributors and installers in learning about the energy- and non-energy benefits of LLLCs, gaining comfort discussing these topics, and gaining comfort promoting LLLCs to customers.
- **Offering incentives** for qualified LLLCs, at least during initial program implementation, to bring down the higher first cost of LLLCs and jump-start market adoption.
- **Conducting distributor and installer trainings and providing sales collateral support** for distributors and installers on procuring, bidding, selling, and installing LLLCs. As the program matures and seeks deeper and more accelerated market change, Ameren Illinois plans to continually refine the types, approaches, and specialization of the training and collateral materials.

The third row of the logic model shows the direct "products" (outputs) that will result from the program activities. The lower portion of the logic model describes the market changes (outcomes) that the team expects to see over the short, medium, and long terms as a result of

[4] This logic model reflects updates and simplifications the team made over the past two years to an earlier version presented by Siong and Pittman (2022).

program activities. These start with increases in target market awareness and familiarity with LLLCs and continue with increases in distributor and installer LLLC recommendations to customers, increases in installations, more DLC-qualified LLLCs, and ultimately a transformed commercial lighting controls market. The team also assembled a market progress indicator (MPI) table that shows the metrics, data sources, and specific goals associated with each outcome; this paper covers MPIs in the Evaluation Plan section below.

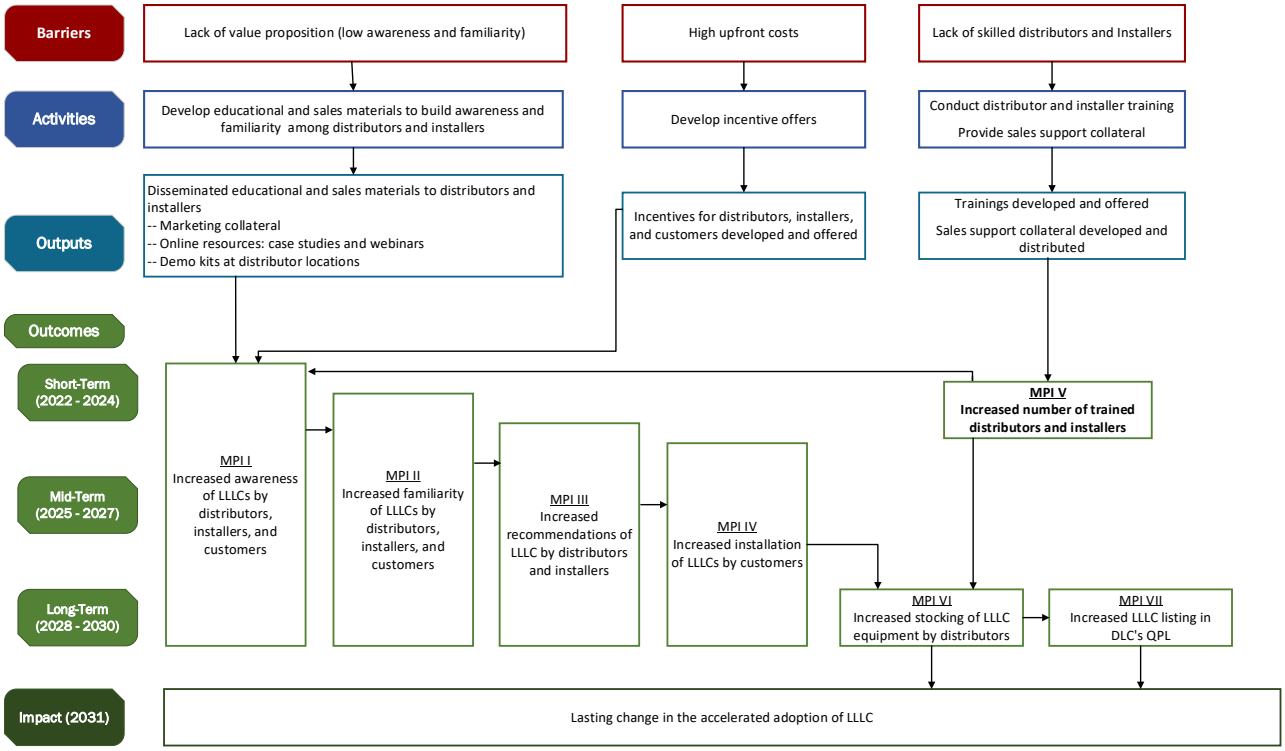

Figure 2. LLLC Logic Model

Ameren Illinois views logic models as living documents and plans to review and update the LLLC MTI logic model periodically as the program evolves and the team gathers new information about the commercial lighting and lighting control market in Ameren Illinois' service area through MTI evaluations.

LLLC MTI Energy Savings Framework

Following Attachment C guidance, Ameren Illinois developed a service-area-level ESF for the LLLC MTI. The ESF includes two components: a natural market baseline (NMB) that forecasts market adoption of LLLCs in the absence of any market intervention by Ameren Illinois, and a forecast of the energy savings Ameren Illinois expects will be attributable to the LLLC MTI.

Natural Market Baseline Market Share

RI and Ameren Illinois leveraged the theoretical NMB curve and component list shown in Figure 3 to develop an NMB specific to LLLCs in Ameren Illinois' service territory. Opinion

Dynamics contributed valuable feedback throughout the NMB development process, resulting in all members of the cross-functional team agreeing on the final NMB forecast.

The y-axis of the NMB curve is the percentage of total commercial-sector luminaires sold that include LLLCs in time *t*, as defined by the following equation. It shows the percentage of sales *in any given year*; it does not depict cumulative equipment saturation.

$$\frac{\%\ all\ luminaires\ sold\ with\ LLLCs(t)}{\%\ all\ luminaires\ sold(t)}$$

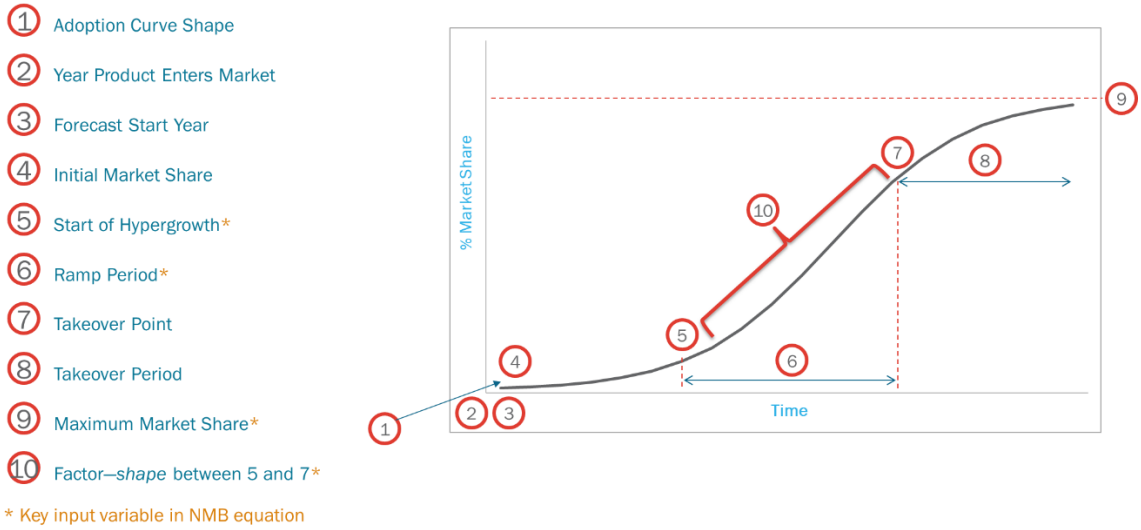

Figure 3. Theoretical Natural Market Baseline

While all the NMB components shown in **Error! Reference source not found.**3 contribute to an understanding of LLLCs' projected market adoption, the key input variables are used directly in calculation of the NMB curve. The curve calculation is defined as:

$$Market\ Penetration(t) = \frac{Maximum\ Market\ Share}{1 + Factor\ \wedge \left(\frac{Start\ of\ Hypergrowth + \left(\frac{RampPeriod}{2}\right) - Current\ Year(t)}{Ramp\ Period}\right)}$$

The first of the key variables is the **Start of Hypergrowth**, the year in which LLLC market share begins to accelerate--the first inflection year on the NMB curve in Figure 3. Research shows that LLLC adoption is most likely in areas where: 1) energy code explicitly identifies LLLCs as a compliance path, and 2) utility incentives are available. (Cadmus 2021) Illinois communities use the International Energy Conservation Code (IECC) to specify energy-efficiency codes and standards. IECC is updated every three years, though most Illinois communities have historically not adopted the latest IECC until several years after a new code has taken effect. Most Illinois communities, including those in Ameren Illinois' service area currently use 2018 IECC, although a 2021 version is now available. LLLCs are, or are expected to be, explicitly included in some forthcoming IECC versions, but not others.

The team concluded that hypergrowth is likely to start in 2030. This conclusion is supported by research that found the many commercial lighting systems that were recently retrofitted with LEDs are unlikely to be retrofitted again with LLLCs for several years or more

since LEDs have long lives. (DNV 2021) The conclusion is also corroborated by Northwest Energy Efficiency Alliance's (NEEA) LLLC adoption curve which shows hypergrowth starting approximately 13 years after the introduction of LLLCs to the market. (RIA 2016) Since the team estimated that LLLCs became commercially available in Ameren Illinois' region in 2016, hypergrowth would be expected to begin around 2030.

The next key variable related to NMB is the **Ramp Period**: the number of years between the Start of Hypergrowth and the Takeover Point, where we define the Takeover Point when market adoption begins to decelerate, i.e., the second inflection year on the NMB curve.

Because the projected Ramp Period for a new technology is highly speculative, researchers often estimate ramp periods based on the observed ramp periods of other products with similar characteristics and market barriers that have been commercially available for some time. Earlier research into LLLC adoption by Research Into Action (RIA) estimated an LLLC Ramp Period of 14 years. (RIA 2016) RIA based their analyses on an adoption curve for DALI lighting systems with photocells and occupancy sensors, a technology similar to LLLCs. The Ameren Illinois team examined other established technologies that could potentially serve as proxies for LLLCs, but none matched the technological and market characteristics of LLLCs as well as DALI lighting systems. The team concluded that a 14-year ramp period is appropriate for the LLLC NMB.

Maximum Market Share is the next key NMB variable. Maximum Market Share is the largest annual percentage of all commercial luminaire sales in Ameren Illinois' service territory that the team expects LLLC systems will achieve with the LLLC MTI. The team's derivation used the following steps:

1. LLLCs are an option only where LED lamps are installed (whether or not the LLLCs are installed at the same time as LEDs or as a fixture retrofit). The US Department of Energy (DOE) estimates that over half of the installed stock of commercial lighting installed is LEDs, and DOE forecasts that the saturation of LEDs in commercial buildings will continue to grow rapidly over the next 10 to 15 years so that the saturation will exceed 90% by 2035.[5] (DOE 2019) Since nearly all of the commercial lamps in Ameren Illinois' service area will turn over in the next 15 years[6] and the vast majority of new and replacement lamps will be LEDs, that means close to all commercial lighting—98%—will be eligible for LLLCs in 2038 (15 years from the date of the analysis) and beyond.
2. An estimated 75% of commercial customers may consider and install some type of NLCs.[7]
3. Annual non-residential lighting sales data from Pacific Northwest distributors for 2013 and 2014, when NEEA had just begun supporting LLLCs, shows that LLLCs represented 58% of all NLC sales in the region. (BPA 2022) Since the intention of Ameren Illinois' NMB analysis was to estimate LLLC sales *in the absence* of any programmatic interventions, we rounded the figure downward from 58% to 50%.
4. Multiplying the factors from (1), (2), and (3) together yields an estimated Maximum Market Share of 36.8%. Through extensive cross-functional team discussions that covered all of the data described above as well as the team's collective industry

[5] Projections are based on Table 4.1 in DOE 2019.
[6] According to IL SAG, the deemed measure life of commercial lighting measures caps out at 15 years. (IL SAG 2023)
[7] The cross-functional team used its industry knowledge to extrapolate this value from data presented in DNV 2021.

experience, the team concluded that we should round the Maximum Market Share up to 40% to avoid conveying a sense of false precision.

The final variable in the NMB equation is the **Factor** which defines the shape of the NMB curve between the start and end of hypergrowth. The Factor is calculated with the following equation:

$$Factor = \frac{(Percent\ of\ Maximum\ Market\ Share\ at\ the\ time\ Hypergrowth\ ends)}{(Percent\ of\ Maximum\ Market\ Share\ at\ the\ time\ Hypergrowth\ begins)}$$

Since the team did not have any product-specific information about the expected market share of LLLCs at the start and end of hypergrowth, the team adopted the common estimation that hypergrowth begins when the market share is 10% of the Maximum Market Share, and hypergrowth ends (i.e., the Takeover Point occurs) when the market share is 90% of the Maximum Market Share. Using these values in the above equation yields $\frac{90^2}{10^2} = 81$.

Table 1 summarizes the key variables the cross-functional team used to define the LLLC NMB curve, and Figure 4 shows the final NMB curve.

Table 1. Input values for key LLLC NMB variables

Key variable	**Value used in the LLLC NMB curve**
Start of hypergrowth	2030
Ramp period	14 years
Maximum market share	40%
Factor	81

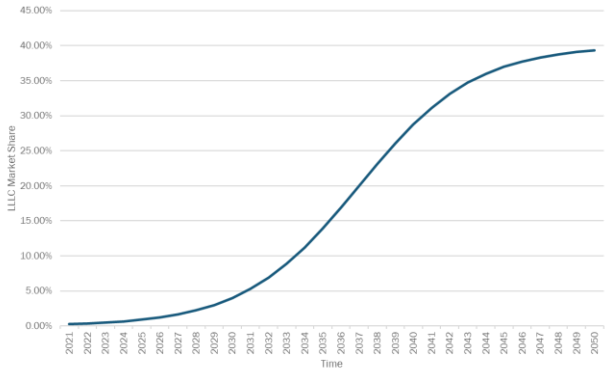

Figure 4. LLLC NMB Curve

Natural Market Baseline Savings Forecast

NMB energy savings are the product of the number of NMB LLLCs forecasted to be sold each year (time t) and the average unit energy savings (UES) per LLLC:

$$LLLC\ NMB\ energy\ savings(t) = number\ NMB\ LLLCs\ sold(t) * UES(per\ LLLC)$$

Solving first for the number of LLLCs attributable to the NMB in each year, the team used the following equation:

$$Number\ of\ NMB\ LLLCs\ sold(t) = NMB\ Market\ Share\ \%(t) * Total\ luminaire\ sales(t)$$

The team's approach to estimating the total number of luminaires sold to Ameren Illinois' business sector each year is depicted in Figure 5. Note that the second column of Table 2 shows the NMB market share in each year (consistent with the values graphed in Figure 4).

To derive the total business sector square feet for each year of the forecast, the team started with Ameren Illinois' most recent potential study (AEG 2020), which provided the total commercial square footage in Ameren Illinois' service area in 2020. From there, the team projected annual business sector square feet for 2022 to 2030 based on historic 40-year trends reported by EIA (2018).

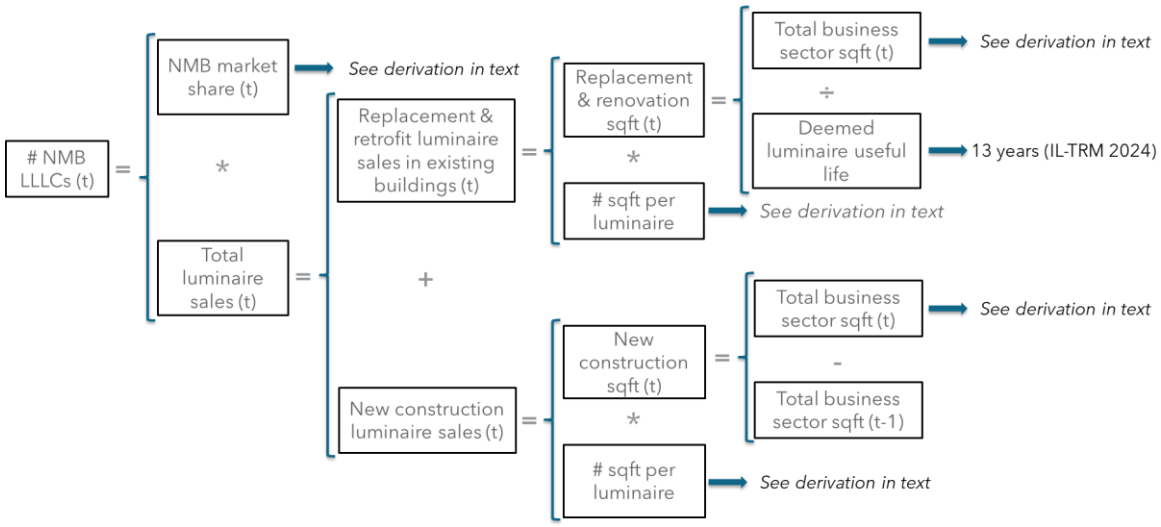

Figure 5. Derivation of the number of NMB LLLCs sold to Ameren Illinois' business sector in time "t"

The team consulted with Steve Mesh, Principal at Lighting Education and Design, to derive the average number square feet per luminaire, recognizing that the value would be the same regardless of whether or not a luminaire is equipped with an LLLC. Mr. Mesh created sample lighting designs for multiple building types, and developed small (10,000 sqft), medium (20,000 sqft), and large (30,000 sqft) designs for each building type. When the square-feet-per-fixture differed between sizes of a single building type, the team averaged the values across that building type. Table 2 shows the derivation of the weighted average square footage per luminaire value for all buildings in Ameren Illinois' business sector.

Table 2. Weighted square footage per luminaire

Building Type	Sqft/fixture	Building Prevalence	Weighted Sqft/fixture
Education	113	12%	13.6
Office	83	15%	12.5
Retail	120	15%	18.0
Warehouse	185	31%	57.4
Health	73	7%	5.1
Unknown	150	20%	30.0
			136

Solving next for the LLLC UES, the team turned to the IL TRM, which provides the following general equation that defines NLC energy savings:

$$\Delta kWh = kW_{Controlled} * Hours * (ESF_{EE} - ESF_{Base}) * WHF_e$$

The equation does not, however, include energy savings for specific use cases for Ameren Illinois' service area. Thus, RI developed a rigorous methodology to develop an average UES for LLLCs specific to Ameren Illinois. The approach entailed deriving average values for "kW controlled," "waste heat factor," and "hours" variables by using each variable's TRM-prescribed commercial lighting values by building type and weighting them based on the prevalence of those building types in Ameren Illinois' service area. The baseline and EE energy savings factors are directly prescribed in the IL TRM. Step-by-step calculations are provided in a presentation Ameren Illinois made to the Illinois MT Working Group (Ameren Illinois 2023). The resulting average annual energy savings per LLLC for Ameren Illinois' service area is:

$$\Delta kWh = 0.06406 * 4970 * 0.61 * 1.07 = 207.8\, kWh$$

Table 3 shows the inputs and final values for the NMB savings forecast.

Table 3. Forecasted NMB savings estimates

Year	NMB market share	Total luminaire sales (# of units)	NMB LLLC sales (# of units)	UES (kWh)	NMB savings (kWh)
2022	0.36%	718,991	2,588	207.8	537,786
2023	0.49%	725,175	3,553	207.8	738,313
2024	0.66%	731,411	4,827	207.8	1,003,051
2025	0.90%	737,701	6,639	207.8	1,379,584
2026	1.23%	744,046	9,152	207.8	1,901,786
2027	1.66%	750,444	12,457	207.8	2,588,564
2028	2.24%	756,898	16,955	207.8	3,523,249
2029	3.00%	763,408	22,902	207.8	4,759,036
2030	4.00%	769,973	30,799	207.8	6,400,032

LLLC MTI Savings Forecast

The LLLC MTI savings forecast, like the NMB savings forecast, is a foundational component of all MTIs in the state of Illinois. The same cross-functional team that worked on the NMB also worked collaboratively on the LLLC MTI savings forecast to ensure that all parties understand, agree on, and support the approach, assumptions, and results.

Similar to the approach the team took to estimating the number of LLLCs attributable to the baseline, the team forecasted the number of LLLCs attributable to the LLLC MTI by multiplying the total number of luminaires sold in each year by the projected market "uplift" attributable to Ameren Illinois' MTI activities, as shown in the following equation:

$$Number\ of\ MT\ LLLCs(t) = MT\ Uplift\ \%(t) * Total\ luminaire\ sales(t)$$

The team estimated LLLC MTI "market uplift" using a combination of findings from Ameren Illinois' 2023 LLLC baseline survey (Opinion Dynamics 2023), lighting distributor and installer representation at and feedback from LLLC 2022 and 2023 training events, diffusion theory, and other industry sources. The MT market uplift calculations relied on the following three variables:

1. Percent of distributors and installers who are familiar with LLLCs
2. Of those familiar with LLLCs, percent of distributors and installers who reported recommending LLLCs to customers (i.e., as a result of Ameren Illinois-sponsored LLLC training and other Ameren Illinois LLLC MTI outreach and educational activities)
3. Percent of customers who reported a willingness to buy/install LLLCs

The team found that just over 4% of distributors and installers are familiar with LLLCs. Recognizing that Ameren Illinois anticipates continuing its in-person and online trade ally training, developing and disseminating additional program collateral, and enhancing engagement with distributors and manufacturers in coming years, the cross-functional team concurred that the percentage of area distributors and installers familiar with LLLCs will increase over time. From a series of discussions about the expected scope and reach of planned MTI activities, the team agreed to increase the initial trade ally awareness estimate by 2.5% - 5.0% per year, with an estimated 12% of regional trade allies being very familiar with LLLCs by 2030.

Analysis of Ameren Illinois' 2022 post-LLLC trade ally training survey found that training attendees recommended LLLCs to customers 21% more often than they did before the training. The team applied this value to 2022.[8] In other MT research, NEEA estimated that training resulted in (trained) trade allies recommending an efficient technology 40% more often after five years of market intervention than they had prior to the intervention. (NMR Group 2019). The team used this value and assumed that 40% of lighting trade allies will be recommending LLLCs by 2027 (five years after Ameren Illinois began trade ally trainings). For the years between 2022 and 2027 the team approximated the percentage of (trained) trade allies who will recommend LLLCs by trending the 2022 to 2027 values; for 2028 to 2030, the team used the Excel forecasting function to estimate the appropriate percentage of trade allies, ending with just over 51% of (trained) trade allies in 2030.

Finally, the team applied diffusion theory to estimate the percentage of customers (of those who will learn about them through trained trade allies and other means) who will be willing to adopt LLLCs in each year. As depicted in Figure 6, diffusion theory deems 2.5% of the market as "innovators" who are the earliest adopters of new technologies. The team estimates 2.5% of customers were willing to install LLLCs in 2022. Diffusion theory deems another 13.5% of the market as "early adopters" of new technologies. Since the NMB analysis concluded that LLLCs will begin to experience hypergrowth starting in 2030, the team expects 16% of customers (=2.5% + 13.5%) to be willing to install LLLCs by 2030. The analysts used a straight-line approach to estimate the percentage of customers willing to install LLLCs in the years between 2022 and 2030.

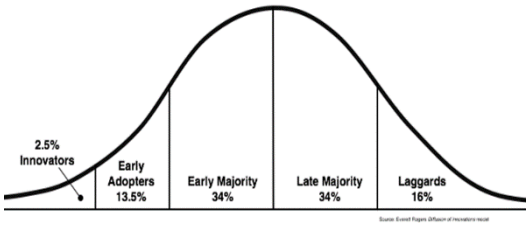

Figure 6. Diffusion theory technology adopter categories

[8] The number of respondents to the 2022 post-training survey was extremely small and not statistically significant. The team will update this value and the subsequent analysis once additional data become available.

Table 4 shows the forecasted MT market uplift based on these estimates along with the associated number of LLLCs sold as a result of the MTI, and the MT savings for 2022 to 2030. Figure 7 graphically depicts the number of LLLCs forecasted to be sold as a result of the program, and Figure 8 graphically depicts the energy savings forecasted to be attributable to the MTI.

Table 4. Forecasted LLLC MTI savings estimates

Year	% LLLC MTI market uplift (above NMB)	Total luminaire sales (# of units)	LLLCs attributable to the MTI (# of units)	UES (kWh)	Savings attributable to the MTI (kWh)
2022	0.09%	718,991	629	207.8	130,731
2023	0.17%	725,175	1,212	207.8	251,777
2024	0.27%	731,411	1,989	207.8	413,235
2025	0.53%	737,701	3,941	207.8	819,031
2026	0.81%	744,046	6,033	207.8	1,253,669
2027	1.24%	750,444	9,301	207.8	1,932,850
2028	1.92%	756,898	14,549	207.8	3,023,241
2029	3.43%	763,408	26,154	207.8	5,434,751
2030	6.03%	769,973	46,411	207.8	9,644,212

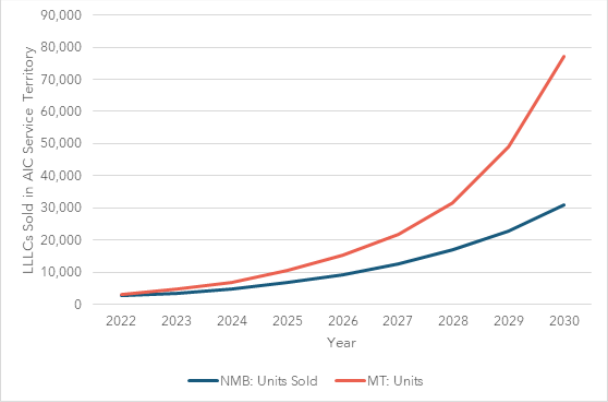

Figure 7. LLLC MTI forecast: number of units

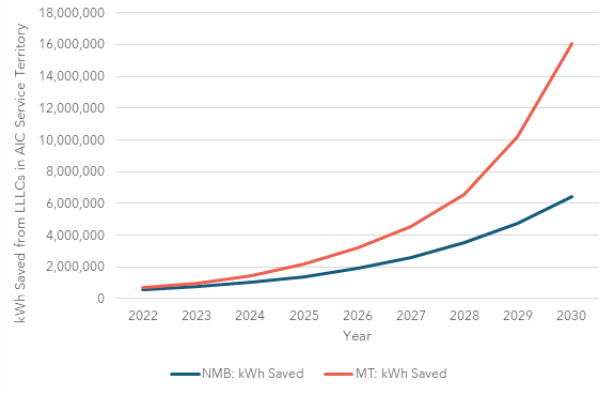

Figure 8. LLLC MTI forecast: kWh saved

Evaluation Plan

Attachment C identifies evaluation plans as the third critical component of MTI documentation. The LLLC MTI's evaluation plan, developed by Opinion Dynamics with collaborative involvement from the rest of the cross-functional team, includes both process and impact components each year. The evaluations are intended to:

- Describe the pilot's implementation, explore areas for pilot improvement, increase effectiveness and ease of implementation.
- Measure the effects the in-person and online LLLC trainings have on distributors and installers, including whether trained distributors and installers increasingly recommend LLLCs to their clients as a result of the trainings.

- Assess annual and year-over-year levels of awareness and understanding of LLLCs among distributors and installers.
- Measure shifts in LLLC market share over the evaluation period
- Estimate energy savings attributable to the LLLC MTI.

Specific tasks planned for evaluation over the 2024-2026 timeframe include:

- **Comprehensive review of all program materials**: logic model, MPIs, market plans, materials provided to distributors and installers, and mass marketing materials.
- **Pre-and post-training surveys/interviews with distributors and installers**: to provide a baseline assessment of distributors' and installers' understanding of LLLCs.
- **Market-level surveys with market actors:** to estimate awareness of and familiarity with LLLC technology and non-energy benefits in order to estimate LLLC savings potential.
- **MPI assessments:** to provide directional evidence of LLLC MTI attribution for changes in LLLC adoption and compare to targets.
- **Commercial lighting market monitoring:** to stay up to date on LLLC technology advancements, codes and standards, and inform attribution discussions.
- **Revisiting of the NMB:** to reassess the initial NMB using an expert judgement (Delphi) panel to provide input on key NMB inputs that drive the NMB market adoption curve.
- **NLC and LLLC sales data analysis:** secondary data to calculate the total market units of LLLCs in Illinois each year.
- **Estimation of MT savings attributable to the LLLC MTI**: use lighting sales data, survey findings, and secondary research, to estimate savings.

MT savings are calculated by taking the total market savings of LLLCs in Illinois and subtracting the savings from the NMB estimate. To avoid double counting with the RA program, the evaluation team will then subtract all non-MT verified savings within the same market from the MT savings. Because MTI's typically take time to generate meaningful savings, Ameren Illinois anticipates relatively small savings in the early stages of the pilot.

In the Field: Implementing the LLLC MTI Pilot

Ameren Illinois began implementing several strategic activities in 2022 that, taken together, address all three market barriers identified in the LLLC MTI logic model. Ameren Illinois is intentionally executing these informational/educational-focused activities simultaneously to maximize the MTI's effect on the commercial lighting market. The activities, which contain consistent and powerful messaging about the LLLC value proposition include: conducting online training sessions for Ameren Illinois' Energy Advisors (EAs); conducting in-person training events and holding webinars for distributors, installers, and EAs; developing and disseminating LLLC collateral materials to trained distributors, installers, and EAs, and providing LLLC incentives to jump-start adoption.

The cross-functional team scheduled in-person training events at a geographically diverse set of sites across Ameren Illinois' service territory to encourage attendance by distributors and installers who serve small/medium city and rural customers throughout the area. The team also engaged diverse, women- and minority-owned business to provide services for the events, such as catering and printing materials, whenever possible.

Online Training for Ameren Illinois Energy Advisors

To ensure that key Ameren Illinois personnel are sufficiently familiar with LLLC to support distributors and installers, Ameren Illinois' EAs and other relevant employees attended a two-hour online LLLC training conducted by industry expert Steve Mesh.

In-Person Trainings

The LLLC MTI team organized and conducted six in-person training events in 2022 in three separate locations within Ameren Illinois service area, and another six in-person training events in 2023 in six separate locations. The team carefully selected rural training sites, including three distributor facilities, to ensure attendees include those who serve contractors and consumers in rural, disadvantaged communities. Of the roughly 2,300 distributors and installers invited to the in-person trainings, approximately 4% attended an event.

Each event educated attendees on LLLC technology and on the energy and non-energy benefits of LLLCs, as well as addressing distributor and installer perspectives in the LLLC bidding, selling, procuring, and installation processes. During the trainings, attendees gained first-hand experience commissioning LLLCs with guidance from the trainer. At the conclusion, attendees could optionally stay longer to continue engaging with the trainer and with the attending EAs assigned to each distributor and installer territory. In addition, two manufacturer representatives displayed and demonstrated their products at the 2023 training events, affording attendees the opportunity to gain additional first-hand knowledge of LLLCs.

Webinars

To address distributor and installer's lack of awareness and familiarity with the LLLC value proposition, the Ameren Illinois team engaged industry expert Steve Mesh to conduct four 45-minute webinars. The first two webinars contained the same content and covered LLLC system features, functions, and benefits. The second two webinars instructed distributors and installers on how to research, select, price, and bid on LLLC systems. Attendees of all of the webinars received pre-recorded PowerPoint presentations from manufacturers on their LLLC systems. Approximately 2% of the 2,300 invitees attended one or more webinars.

Collateral Materials

The team developed two collateral pieces to support distributors and installers in selling LLLCs to their customers and disseminated them at the conclusion of each in-person training session. One piece focuses on assisting distributors and installers in estimating the layout, number, cost and expected incentives for LLLC systems for project bid purposes. The other piece focuses on the benefits of LLLCs in improving commercial buildings, such as reducing energy use, increasing occupant comfort, providing better lighting, and offering flexible control in spaces with multiple uses.

Incentive Offerings

Starting in 2021, Ameren Illinois began offering incentives for LLLCs through multiple channels within its traditional Energy-Efficiency Portfolio (EEP). Only LLLC products included on the Design Lights Consortium's (DLC) Qualified Products List (QPL) are eligible for

incentives. Ameren Illinois initially set the initial incentives relatively high in order to attract attention to the technology and encourage distributors, installers, and their customers to give LLLCs a try. By mid-2023, Ameren Illinois had encouraged sufficient interest in LLLCs that it had to introduce a cap to limit per-fixture incentives. Ameren Illinois anticipates further reductions in the incentive cap throughout the LLLC MTI as the team observes increases in LLLC adoption rates.

While they will decline over time, Ameren Illinois plans to continue offering some LLLC incentives as a means of motivating LLLC manufacturers to include the QPL-required functionality and features in their successive LLLC product lines.

Early Market Uptake Success

Ameren Illinois has been tracking the number of NLC/LLLC projects[9] in its jurisdiction since 2018: there was just a one project each in 2018 and 2019, none in 2020, and nine in 2021. After the LLLC pilot kicked off in 2022, Ameren Illinois recorded 12 projects; the number jumped to 261 projects in 2023. (Ameren Illinois 2024). The 2022 and 2023 projects correspond to 106,080 kWh savings in 2022 and 2,907,879 kWh savings in 2023—a 2600% year-over-year increase.[10]

As of 2023, Ameren Illinois has not applied the NLC/LLLC savings to its Illinois EEP. In accordance with Ameren Illinois' LLLC MTI Business Plan (Ameren Illinois 2023), which the company presented to the Illinois Stakeholder group at the end of 2023 and which allows for evaluation of the MTI's implementation in 2024, the company anticipates attributing NLC/LLLC MTI savings to the EEP starting in 2024.

Ameren Illinois views MT as an excellent means of effectively engaging with the market while attributing savings and future impacts to the utility EEP and driving awareness and participation in real time to RA initiatives.

Looking Ahead

Ameren Illinois is developing an effective and sustainable field engagement strategy that can be used to educate, train, and support distributors and installers in both the near and long term. During the pilot phase of the LLLC MTI, the team identified hands-on commissioning, distributor and manufacturer representative connections to installers, and as-needed technical support for installers as necessary field engagement strategies. These are the main engagement foci for the LLLC MTI in 2024. Ameren Illinois plans to test new tactics for efficacy in the field and for cost-effectiveness to meet the primary objectives of those top strategies.

In addition to fine tuning a sustainable field engagement strategy, Ameren Illinois is working with evaluator, distributor, and manufacturer partners to identify the best methods of accessing and evaluating overall territorial NLC and LLLC sales data. During the pilot phase of the LLLC MTI, the team had difficulty finding reliable and territory-specific sales data that could be used to measure changes to the LLLC market within Ameren Illinois' territory. A regional distributor stated that they could share overall sales data, but that they had no way of

[9] Through 2023, Ameren Illinois' tracking database did not include unique measure codes for LLLCs and other types of NLCs. Ameren Illinois anticipates assigning a separate measure code for LLLC going forward.

[10] Notably, Ameren Illinois has not engaged in any training or marketing activities featuring NLCs more broadly. While no evaluation findings are available to confirm this, Ameren Illinois expects the large increase in NLC/LLLC uptake from 2022 to 2023 is largely due to its LLLC MTI market interventions.

identifying which fixtures are paired with LLLCs at installation. The team is exploring the possibility of combining distributor data with original equipment manufacturer (OEM) data to make those volumes more discernable, but the range of OEMs and combinations of fixtures and sensors that comprise LLLCs renders that effort challenging. Ameren Illinois is continuing to work with local partners to solve this challenge and will also be looking to peer utilities and organizations for solutions to tracking and evaluating MT impacts.

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