



LUMINAIRE LEVEL LIGHTING CONTROLS (LLLC) UPDATE

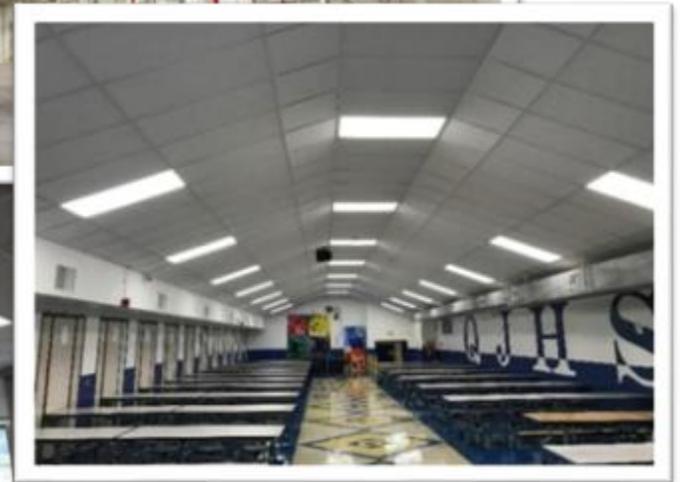
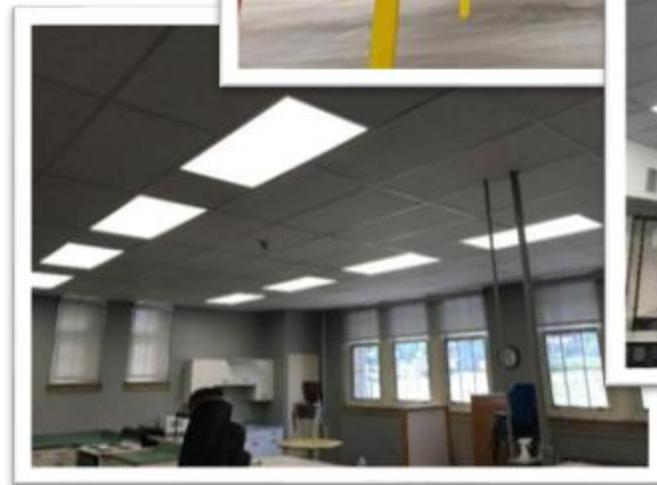
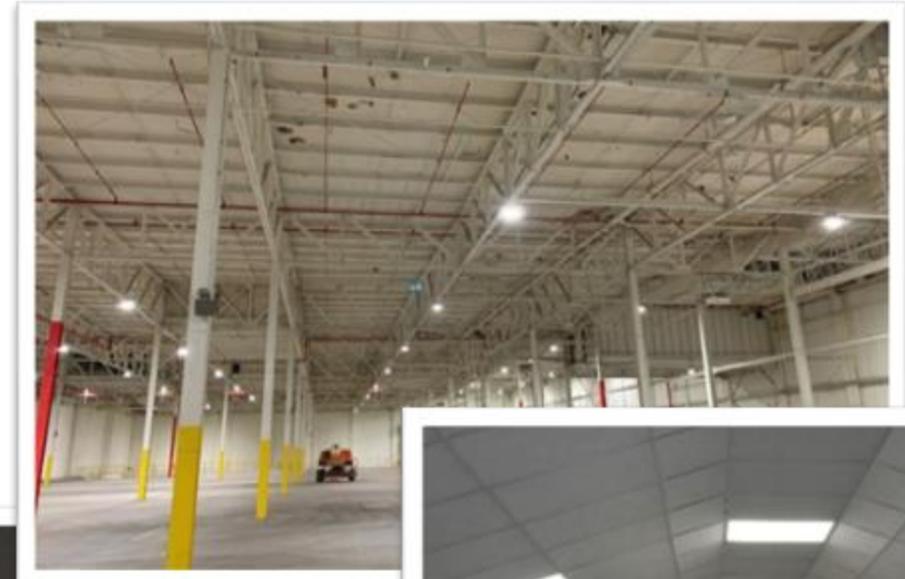
SAG MARKET TRANSFORMATION WORKING GROUP

MAY 22, 2023

AmerenIllinoisSavings.com

Agenda

- Program Theory Logic Model
 - Background
 - Target Market
 - Logic Model
- 2023 Market Engagement
 - Incentive Channels
 - Program Ally Training
 - Network Lighting Controls (NLC)/LLLC Informational Collateral
- Evaluation and Attribution
 - Evaluation Activities
 - Natural Market Baseline (NMB)



Background for LLLC as an MTI

Recognizing the huge savings potential, Ameren Illinois (AIC) launched the Luminaire Level Lighting Controls (LLLC) Market Transformation Initiative (MTI) pilot in 2021 to accelerate adoption of the technology within the service territory:

- A recent study by NEEA¹ showed significant 50 – 74% annual energy savings from 1:1 replacement of LLLCs compared to 59% savings of a full redesign, and at about one-third to half of the cost
- LLLC systems are a subset of Networked Lighting Controls (NLCs) and have been available for about a decade.
- LLLC systems have the unique characteristic of sensors embedded in every fixture, which enables usage flexibility across a variety of space types including warehouses, offices, hospitals and healthcare facilities, and schools
- LLLCs are easy to install, offer non-energy benefits and enable business owners to remotely address security and maintenance issues, as well as manage energy usage. Yet, LLLC adoption is low, with connected lighting comprising less than 1% of all luminaires in the US²

¹NEEA 2020. *Luminaire Level Lighting Controls Replacement vs Redesign Comparison Study*. <https://neea.org/resources/lllc-replacement-vs-redesign-comparison-study>

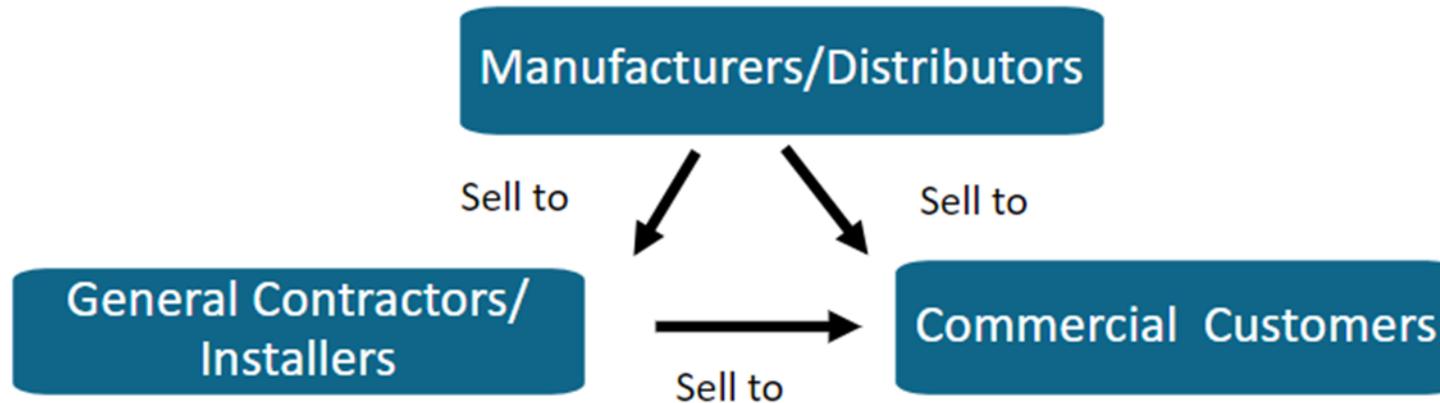
²Wolgamott, C., and T. Kisch. 2021. *Trends in Lighting Controls*. [Trends In Lighting Controls: Luminaire Level Lighting Controls \(facilityexecutive.com\)](https://www.facilityexecutive.com/resources/trends-in-lighting-controls)



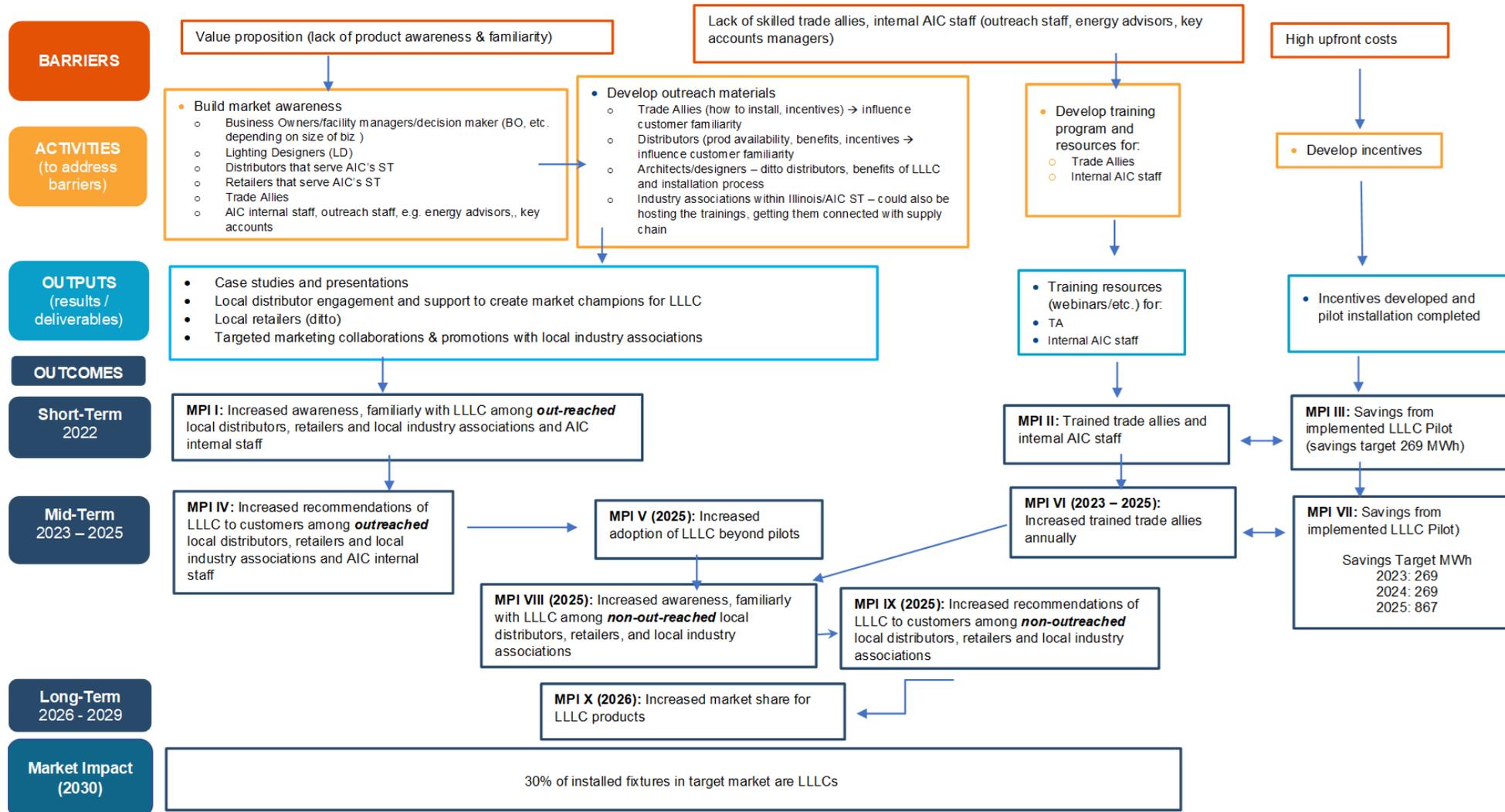
Target Market

- In alignment with the TRM definition of the target market:

‘an actual or nominal place where forces of demand and supply operate, and where buyers and sellers interact (directly or through intermediaries) to trade goods, services or contracts or instruments, for money or barter’
- AIC characterizes the LLLC MTI Target Market with this relationship diagram identifying Manufacturers, Distributors, General Contractors, Installers, and Commercial Customers as comprising the Target Market.



Program Theory of Change: Logic Model (Version 1)



2023 LLLC Incentives

Participation Pathways:

- Standard Lighting
- Small Business Direct Install (SBDI)

Control Technologies Incentives:

- NLC Standard Lighting incentives:
 - \$0.50 per watt controlled – NLC
 - \$1.50 per watt controlled – LLLC
- SBDI:
 - NLC (includes LLLC) – \$1.25 per watt controlled

Small Business
As a small business, take advantage of incentives and discounts made just for you.
The costs to power, heat and cool your small business can account for a substantial portion of your operating budget. To save money and boost your bottom line, take advantage of various incentives, discounted products and efficiency programs.

Benefits of Energy Efficiency for Small Businesses

Profitability – Increase your profits by lowering your operating costs with energy saving products like LED light bulbs, advanced power strips and smart thermostats.
Comfort –

Networked Lighting Controls (NLC) Eligibility:

- New installations only; not to replace existing networked lighting controls
- Interior spaces only; exterior spaces may apply using the Custom application
- Total Watts Controlled is the wattage of all LED light fixtures connected to the NLC system
- System must enable three or more control strategies
- System must be listed on the DLC Networked Lighting Controls Qualified Products List: www.designlights.org/lighting-controls/

Description	System Type	Control Strategies (Minimum 3)	Total Watts Controlled (A)	Measure	Incentive per Unit (B)	Total Incentive (A) X (B)
Networked Lighting Controls (Interior Only)	Non-LLC installation (Single controller/sensor controls multiple luminaires)	<input type="checkbox"/> Occupancy/Vacancy <input type="checkbox"/> Daylighting <input type="checkbox"/> High-end trim <input type="checkbox"/> Dimming <input type="checkbox"/> Scheduling		BPL32	\$0.50/watt controlled	\$
	LLC installation (Each luminaire has its own controller/sensors; DLC listing indicates LLC)			BPL32	\$1.50/watt controlled	\$



2023 Program Ally Training

2022 trainees were surveyed before and after training and ODC provided insight for successes and opportunities for improvement

AIC has updated the Training based on feedback from ODC and attendees of the 2022 Training

AIC is offering 6 In-Person LLLC Trainings in 2023

- 6 different locations
- Planning to host trainings at Distributor facilities
- Single day training that focuses on
 - What is NLC/LLLC
 - How to Commission LLLC
 - How to Bid and Sell LLLC (New)
 - How to Procure LLLC Equipment (New)

Response	Pre-Training Survey	Post-Training Survey
Understand the differences between non-LLLC and LLLC lighting control systems.		
Mean	2.45	4.00*
Standard Deviation	1.21	0.63
Describe the pros and cons between non-LLLC and LLLC lighting control systems.		
Mean	2.27	4.27*
Standard Deviation	1.10	0.79
Identify new types of advanced lighting controls that can reduce complexity/cost of installation and setup.		
Mean	2.18	3.82*
Standard Deviation	0.98	0.60
Use a new publicly available tool to understand, evaluate, and compare available NLCs.		
Mean	2.18	3.82*
Standard Deviation	0.87	0.75
Install a wireless LLLC lighting control system.		
Mean	2.36	4.14*
Standard Deviation		
Mean		
Standard Deviation		

2nd page:

- Standalone vs. networked control options

Color temperature	nLight Interface	Control	Options
LP430 3000K, 60 CB	nLight Wired	nLight Wired	700 lumen battery pack (Noncompliant with CA T20)
LP435 3000K, 60 CB	nLight Wireless	None	1400 lumen battery pack (Noncompliant with CA T20)
LP440 4000K, 60 CB	nLight with 80% dimming	None	EM Self-Diagnostic battery pack, 10W Constant Power Certified CA Title 20 MARS05
LP450 5000K, 60 CB	nLight with 80% dimming	None	Bodyline Generator Transfer Device™
LP455 5000K, 60 CB	nLight with 80% dimming	None	CP
LP460 5000K, 60 CB	nLight with 80% dimming	None	Chicago plenum™
LP465 5000K, 60 CB	nLight with 80% dimming	None	PWS1836 6' pre-wire 3/8" diameter, 18 gauge, 1 circuit
LP470 5000K, 60 CB	nLight with 80% dimming	None	PWS1846 6' pre-wire 3/8" diameter, 18 gauge, 2 circuit
LP475 5000K, 60 CB	nLight with 80% dimming	None	PWS1846 PWSLX Two cables: one 6' pre-wire, 2 3/8" diameter, 18 gauge, 2 circuit; one 6' pre-wire, 3/8" diameter, 18 gauge
LP480 5000K, 60 CB	nLight with 80% dimming	None	PWS1846V 6' pre-wire, 3/8" diameter, 18 gauge, 1 circuit w/ low voltage wire



Focal Point provides flexibility in meeting the needs of each project by integrating with several building lighting control systems. A variety of sensors, drivers and other components can be specified that allow the luminaires to communicate with wired and wireless networks. All zoning can be digitally reconfigured through the application software. Daylight harvesting, occupancy sensing, integration with HVAC systems, and individual controls enable the monitoring and modulating of light levels and temperature in order to save energy, reduce costs and maximize occupant comfort. All Connected Solutions luminaires require a compatible building control system.

Connected Solution	Ordering Code	Model #	Protocol	Compatible Network	Occupancy & Daylight	Temperature Reporting	Communication to Luminaire	Drivers
legrand	DLM	LMP-C-01	DLM	DLM	Enabled	No	Wired	Advance by Signify
	LMPF	LMPF-401	DLM	DLM	Enabled	No	Wireless	Advance by Signify
	LMPFD	LMPF-401	DLM	Wireless	Enabled	No	Wireless	Optometric by eledLED (wired)
COOPER	WLXP	CEM-WXA	Wireless	Wireless	Enabled	No	Wireless	Advance by Signify
CRESTRON	LTI	Specified Driver	0-10V	Crestron, 2im Wireless & Spatialhub	Enabled	No	Wired	Advance by Signify
ENCELIUM	CLM	ZBHA-CLM-CIM-DAC	Zigbee	Enceium Light Management System	Enabled	No	Wireless	Optometric by eledLED
Enlighted	ENL	SU-8E-40T	Enlighted RF	Enlighted	Integrated	Yes	Wireless	Advance by Signify
OLUTRON	LH1	LDE1	EcoSystem	Quantum, Energi Star, Trak, Energi T1Pak	Enabled	No	Wired	Lutron HCLume
NX	NEE	NFPA-LV	NX	NX Distributed Intelligence	Enabled	No	Wired	Optometric by eledLED



2023 Educational Collateral

Creating additional Collateral and Supporting Resources for Distributors, General Contractors, Installers, and Customers

- Additional Case Studies of Local LLLC installations
- Educational flyers that outline NLC/LLLC characteristics and differences as well as energy savings and non-energy benefits
- Recordings of LLLC Educational Webinars
- Bidding Cost Sheets for LLLC Systems

The collage features several pieces of educational collateral from Ameren Illinois:

- Emergency Lighting and Luminaire Level Controls (LLLCs) Webinar:** A flyer with the Ameren Illinois Energy Efficiency Program logo, showing a person installing a luminaire. Text includes: "Join us for a webinar on Emergency Lighting and Luminaire Level Controls (LLLCs)", "Emergency lighting – more appropriately called networked emergency ballast – is essential for safety.", and "Visit AmerenIllinoisEnergy.com/Lighting or call 1.866.900.0747".
- Networked Lighting Controls:** A flyer with the Ameren Illinois Energy Efficiency Program logo, showing a modern interior with recessed lighting. Text includes: "Visit AmerenIllinoisEnergy.com/Lighting or call 1.866.900.0747".
- Wireless LLLC system:** A bidding sheet with a table and a floor plan diagram.

Item	Q	Unit Cost	Subtotal
Existing circuit breaker panel			
2x2 LLLC fixture (with wireless controller, integrated occupancy sensor and photoresistor)	150		
2x2 LLLC EM fixture (with wireless controller, integrated occupancy sensor and photoresistor)	13		
Wireless gateway	4		
Wireless wallbox switch/dimmer	8		
- Wireless LLLC system w/central server:** A bidding sheet with a table and a floor plan diagram showing a central server connected to multiple fixtures.

Item	Q	Unit Cost	Subtotal
Existing circuit breaker panel			
Server (in IT room)	1		
2x2 LLLC fixture	150		
2x2 LLLC EM fixture	13		
Wireless gateway	4		
Wireless wallbox switch/dimmer	8		
Home-run to panel			
Branch circuit			
Constant-charging circuit (unswitched)			
Cat 5 Ethernet cable	400'		



2023 LLLC MTI Evaluation Activities

Evaluator Activities for 2023

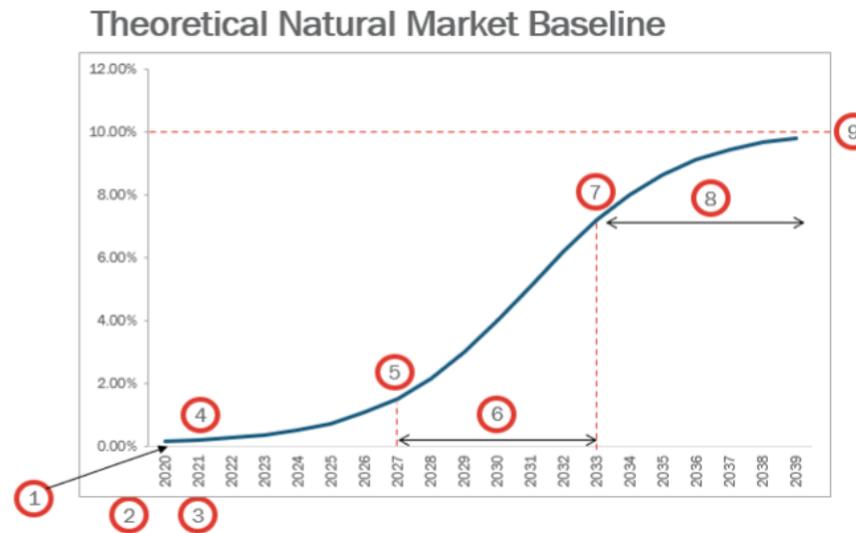
- Revision of Program Theory Logic Model
 - AIC is working to update the Logic Model and Market Progress Indicators
- ODC Fielding Target Market Baseline Surveys
 - Program Ally Distributors and Installers
 - Customers
- Program Ally Training Survey
 - ODC completed 6-month post-training surveys for 2022 trainees to provide long-term training impact and insight for LLLC MTI efforts
- 2022 LLLC Evaluation Memo
- Development of AIC LLLC Natural Market Baseline
 - ODC completed an Independent Review of the initial AIC LLLC NMB in May 2023



Natural Market Baseline (NMB)

AIC used the following NMB definition to support discussions of Literature and Market Data sources to develop the NMB for the LLLC MTI

- ① Adoption Curve Shape
- ② Year Product Enters Market
- ③ Forecast Start Year
- ④ Initial Market Share
- ⑤ Start of Hypergrowth
- ⑥ Ramp Period
- ⑦ Takeover Point
- ⑧ Takeover Period
- ⑨ Maximum Market Share



$$\text{Market Penetration (year)} = \text{Initial MarketShare} + \frac{(\text{Maximum Market Share} - \text{Initial Market Share})}{1 + \text{Factor}^{\left(\frac{\text{Start of Hypergrowth} + \frac{\text{Ramp Period}}{2} - \text{Year}}{\text{Ramp Period}}\right)}}$$





QUESTIONS?

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