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Luminaire Level Lighting Controls: 2025 Review of Key Assumptions

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Executive Summary

The Luminaire Level Lighting Control (LLLC) program at the Northwest Energy Efficiency Alliance (NEEA) is working to make LLLC systems standard practice in commercial buildings across the Northwest[1]. NEEA contracted with Cadmus to review its approach to estimating the percentage of luminaire level lighting controls (LLLC) out of all commercial lighting fixtures sold in the Northwest. Cadmus addressed one primary research objective (RO) in its review:

> Review the LLLC program's estimates of market share represented by their aggregated and anonymized manufacturer sales and utility incentive data and, if necessary, make recommendations for updating calculations of this key assumption.

NEEA provided Cadmus with a memo titled "NEEA's Method of Estimating Annual LLLC Sales in the Northwest", the associated 2025 LLLC Sales Estimation excel file which describes NEEA's market estimate approach, and the LLLC 2020-2025 anonymized and aggregated sales data.

Cadmus conducted secondary research to identify updated lighting market characterizations and new population datasets to reassess the ceiling estimate for LLLC market penetration in the Northwest, originally established in a prior study (Carey and Kan, 2023). Additionally, Cadmus analyzed changes in the volume of LLLC incentives from participating utilities over time to understand how this data may influence NEEA's LLLC market share estimates and conducted secondary research exploring how DesignLights Consortium (DLC) qualifications, a non-profit organization that promotes energy efficiency in lighting, could influence market share estimations.

Conclusion 1: Cadmus found that NEEA's LLLC market share assumptions are supported by qualitative and quantitative data. This finding is supported through secondary research and an analysis of utility incentive data that confirms the appropriateness of the original forecast.

Recommendation 1: No changes are recommended to NEEA's LLLC market share estimate and approach at this time. NEEA should consider updating the market share estimation approach if: 1) new commercial lighting market characterizations become available, 2) new Northwest population data show notable increases or decreases that would affect top-down market share estimates, or 3) a significant building energy code change causes shifts in the market.

[1] In this report, the 'Northwest' refers to Idaho, Montana, Oregon, and Washington.

NEEA's Approach to Estimating LLLC Market Share

The Luminaire Level Lighting Control (LLLC) program at the Northwest Energy Efficiency Alliance (NEEA) is working to make LLLC systems standard practice in commercial buildings across the Northwest[2]. NEEA estimates LLLC market share using manufacturer sales data, the volume of LLLC incentives from participating utilities, and subject matter expert (SME) knowledge. Aggregated and anonymized manufacturers' sales data is purchased from a third-party vendor. NEEA then uses SME knowledge about manufacturers' product listings and market presence to create a conservative estimate of the overall percentage of commercial sales that the participating manufacturers' data is likely to represent. Sales are then extrapolated to generate an estimate of LLLC sales in the Northwest region when all lighting manufacturers (and their commercial products) are taken into account.

Eight participating manufacturers provided commercial lighting sales data to NEEA's third-party vendor from 2023 to 2025, while seven provided data for 2021 and 2022. Program SMEs estimate that seven of them fall within the top 20 LLLC manufacturers responsible for the most number of sales, as of 2025. This sales data is provided by manufacturers in aggregate form only without visibility into sales by individual manufacturer. Each row of data includes the time, location, quantity, fixture category, fixture wattage, fixture lumens, and customer class of each LLLC sold in the region.

NEEA also collects utility incentive data on lighting controls from its funding utilities. Through this process, many utilities in the region have indicated difficulty separating LLLC installation and associated control-specific savings from total lighting savings, though there is evidence of improvement from 2024 forward, as the deviation between utility claimed savings and NEEA adjusted savings has been reduced. This issue is particularly acute in new construction applications, as measure-level savings are not always reported. NEEA has addressed this concern by comparing the utility-reported kWh savings per luminaire with the sales average and adjusting the utility reported kWh savings accordingly. If the utility-reported kWh savings per luminaire is identified as being unusually high by NEEA, NEEA assumes that these savings include other lighting measures and adjusts the claim by applying the sales-average kWh savings per luminaire to the claimed units instead.

[2] In this report, the 'Northwest' refers to Idaho, Montana, Oregon, and Washington.

Research Objective and Methods

Cadmus addressed one primary research objective (RO) in its review:

> Review the LLLC program's estimates of market share represented by their aggregated and anonymized manufacturer sales and utility incentive data and, if necessary, make recommendations for updating calculations of this key assumption.

To address this research objective, Cadmus performed three analyses. The first was an updated review of a top-down market share estimate created by Cadmus in 2022[3]. Cadmus conducted secondary research for recent commercial lighting market characterizations and updated population estimates for the Northwest, before re-applying the top-down analysis (detailed in the body of the report). The second analysis reviewed NEEA documentation of reported utility savings per LLLC luminaire over time. The third analysis was a comparison of manufacturers that currently have LLLC products listed on the qualified-products list maintained by the DesignLights Consortium (DLC) with those represented by NEEA's LLLC sales data and those likely to represent the top twenty manufacturers by LLLC sales, as listed by subject matter experts in the NEEA LLLC program.

[3] 2022 Review of Key Assumptions for Luminaire Level Lighting Controls

Results: RO1. Market Share Estimate Review

Top-Down Market Share Estimate Approach Still Applies

Cadmus reviewed the "2022 Review of Key Assumptions for Luminaire Level Lighting Controls"[4] to assess whether the previously submitted market share estimate approach still applies in 2025. In the 2022 study, Cadmus independently estimated the market share for networked lighting controls (NLC) using a top-down approach, because LLLC systems are a subset of NLC technology. Starting with Navigant's 2019[5] forecast of the installed commercial stock of LED connected luminaires, Cadmus scaled the results down using the Northwest population as a percentage of the U.S. population (4.48% per the April 1, 2020 U.S. Census data). Then, assuming that the change in commercial lighting stock represents all new lighting system sales, Cadmus estimated the annual market share by dividing this change by the number of years between datapoints. Table 2 below shows the calculation inputs from the Navigant forecast for installed commercial stock, which is multiplied by 4.48% to determine potential Northwest installed commercial stock.

Table 2. Calculation of NLC Market Share

Calculation	2017	2020	2025	2030
Installed Commercial Stock (millions)	2	8	44	125
Northwest Stock (thousands)	90	358	1,971	5,599
Annual Increase (thousands)	N/A	90	322	726

This estimate assumes that the adoption rates in the Northwest will match the Navigant (2019) forecast for the entire U.S. and that the change in installed commercial stock represents all new system sales (including LLLC). NLC annual market share is expected to increase from approximately 90,000 LED luminaires per year in 2020 to 322,000 systems per year in 2025 and 726,000 systems per year in 2035. Considering that LLLC systems are a small subset of NLC, NEEA's extrapolated value of a little over 92,000 units in 2024 is consistent with this analysis.

Since the publication of the 2019 Navigant Study, which informed NEEA's market share assumptions, no primary research specific to LLLC in the U.S. or the Northwest has been released. Cadmus reviewed population statistics per state from the 2024 American Community Survey[6] and found that the Northwest population constitutes 4.5% of the U.S. population, as compared to 4.48% from the 2020 U.S. Census.

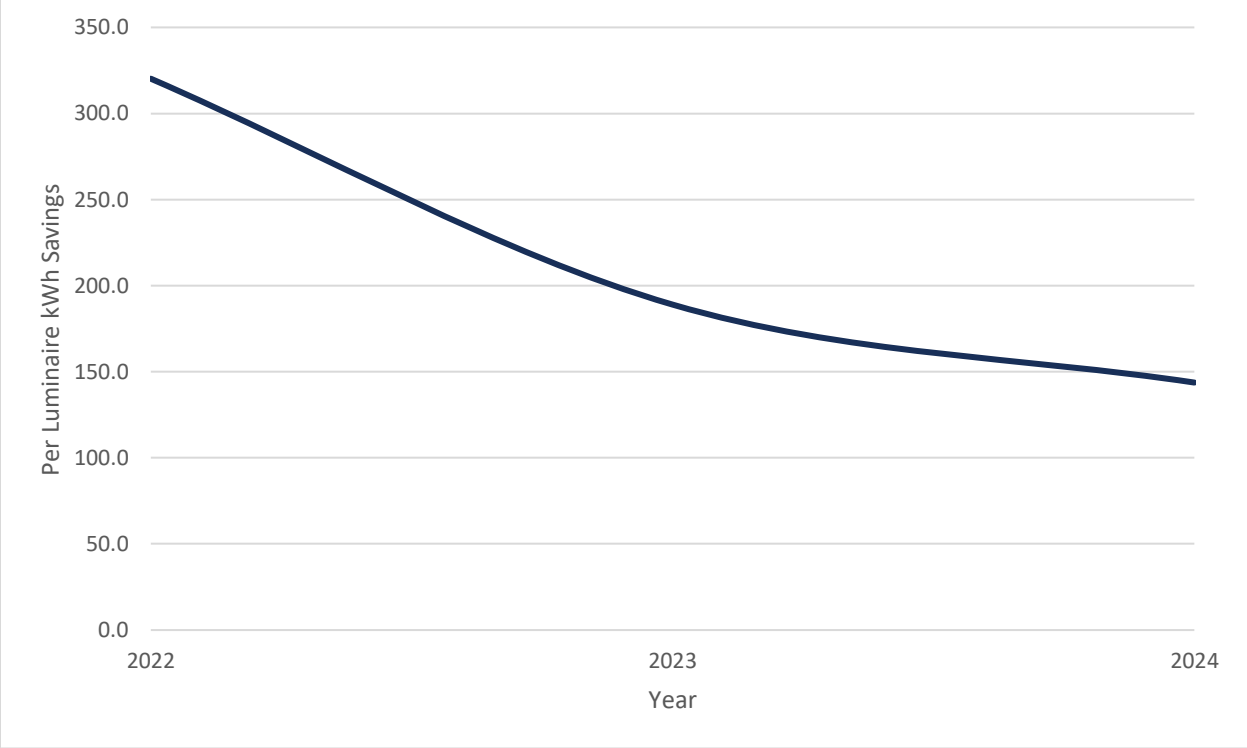
Per-Luminaite Utility Savings Reporting is Stabilizing over Time

When utilities began incentivizing LLLC projects, there were LLLC savings from larger commercial lighting retrofits and new construction project savings. Cadmus assessed year-over-year trends of the kWh

4 2022 Review of Key Assumptions for Luminaire Level Lighting Controls
5 2019 Energy Savings Forecast of Solid-State Lighting in General Illumination Applications
6 Census Bureau Tables

savings per product per state. As shown in Figure 1, utilities have refined their estimates of energy savings per luminaire, reducing savings claimed by half from over 300 kWh in 2022 to under 150 kWh in 2024. Most of this decrease happened between 2022 and 2023, while 2024 savings per luminaire were much closer to those reported in 2023. This indicates that utilities' reporting is becoming more stable over time and may reflect that they are better able to distinguish control savings associated with LLLC.

Figure 1. Utility Provided kWh Savings Per Luminaire in the Northwest



DLC Qualification Changes unlikely to Impact Market Share Estimate

The DesignLights Consortium (DLC) a is non-profit organization that maintains the Qualified Products List (QPL) for LLLC systems. In most cases, a commercial lighting project must use DLC-qualified products in order to qualify for utility incentives. Cadmus reviewed changes to the DLC QPL, regarding NEEA's subject matter experts' (SMEs') ranking of the top-twenty manufacturers thought to represent the most sales in the NW LLLC market, including manufacturers represented in NEEA sales data. All eight of the manufacturers represented in NEEA's sales data still maintained products on the QPL. One manufacturer currently estimated by the NEEA program team to be 19th in LLLC sales by volume in the Northwest in 2025, did fall off the DLC qualification lists, but as this manufacturer is a small player in the market, this change is unlikely to influence the market share estimation for LLLC.

Conclusion and Recommendation

Through this work, Cadmus came to the following conclusion and associated recommendation:

Conclusion 1: Cadmus found that NEEA's LLLC market share assumptions are supported by qualitative and quantitative data. Due to the relatively small impact that 0.02% population growth would have on the top-down estimate of LLLC market share, the refinement of utility reporting on LLLC luminaire savings over time, and the negligible changes in manufacturers important to estimating market share on the DLC QPL, Cadmus finds that NEEA's market share estimate falls within a conservative range and no change to NEEA's market share estimate approach is currently recommended.

Recommendation 1: No changes are recommended to NEEA's LLLC market share estimate and approach in 2025. NEEA should consider updating the market share estimate approach if: 1) new commercial lighting market characterizations become available, 2) new Northwest population data show notable increases or decreases that would affect top-down market share estimates, or 3) a significant building energy code change causes shifts in the market.