



Energy Reporting Update

Levin Nock

July 13, 2022



Webinar logistics

- Everyone is muted
- The webinar is being recorded.
- Presentation Video and PDF soon at designlights.org/webinars
- Please enter questions in the questions pane (not the chat).
 - Some answers via text during the presentation
 - Q&A at the end

Webinar Team



Levin Nock



Heather Jones



Jason Jeunette



Agenda

- Introduction
- DLC Energy Reporting Requirements and Recommendations
 - Past
 - Present
 - Recent developments: new standards and working group proposals
 - Future
- Questions and Answers

Levin Nock, PhD



- Senior Technical Manager, DLC Networked Lighting Controls
- 2011 – 2016 BPA Energy Efficiency Emerging Technologies
- Market Research and Product R&D
- Cornell and Duke Universities

Contradance

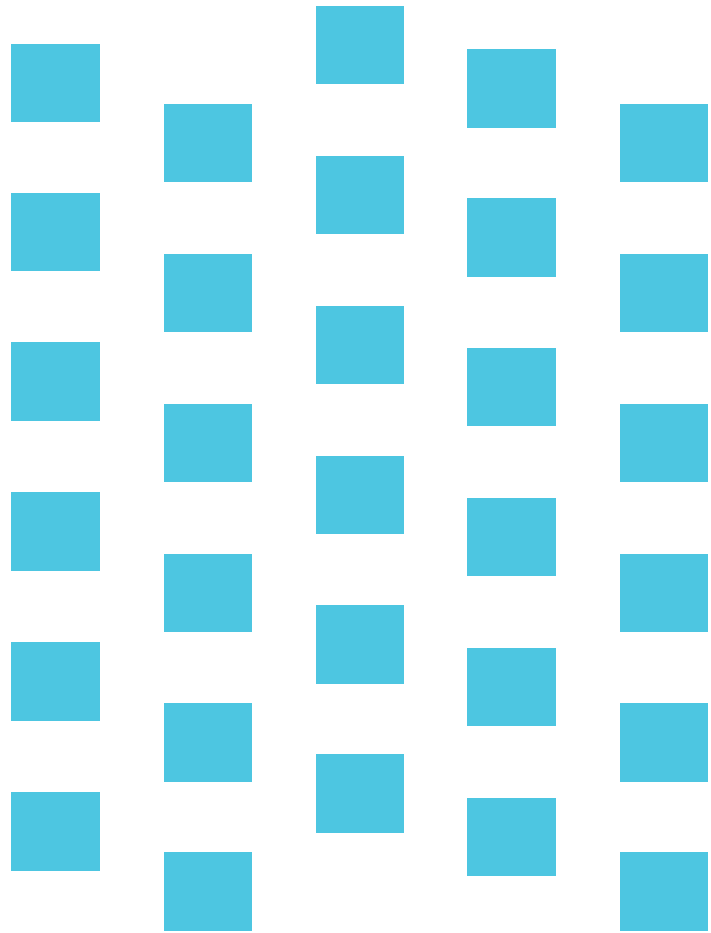


Commons.Wikimedia.org

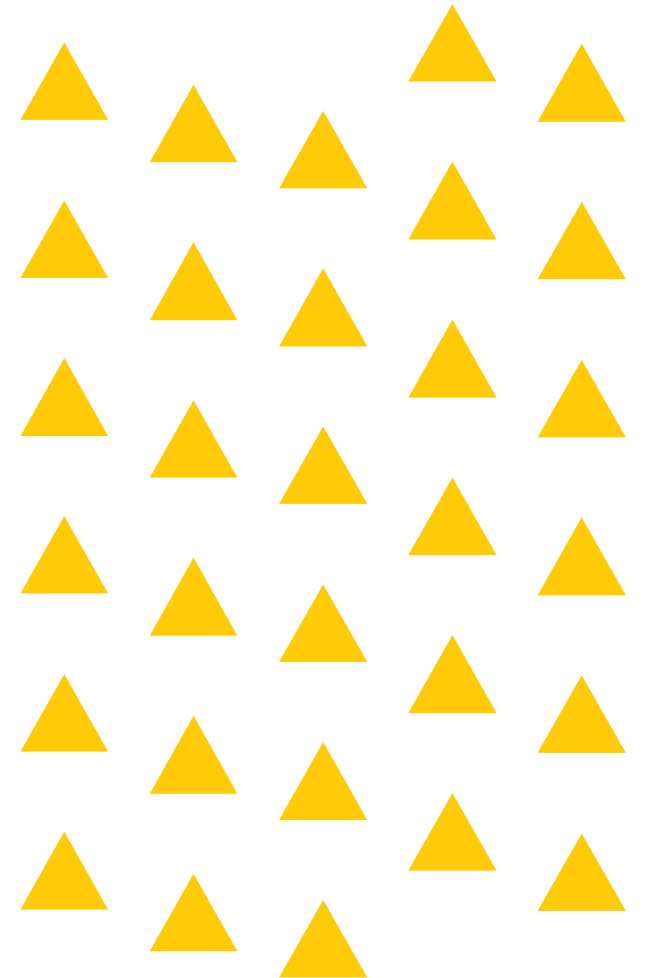


Openclipart.org

DLC Member Efficiency Programs (Utilities)



DLC Industry Partners (NLC Manufacturers)



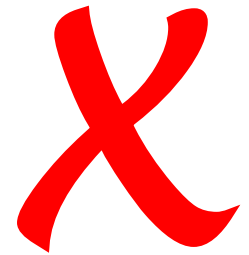
What the DLC does

- Is a nonprofit
- Maintains lists of qualified products
- Lists are used by efficiency programs to administer rebates and incentives
- Creates policies
- Refers to standards



and does not do

- Is not a certification body
- Does not create standards
- Does not test products
- Does not offer any rebates or incentives directly



Terminology



“DLC”

vs.

“NLC”

**DesignLights
Consortium®**

**Networked Lighting
Controls**

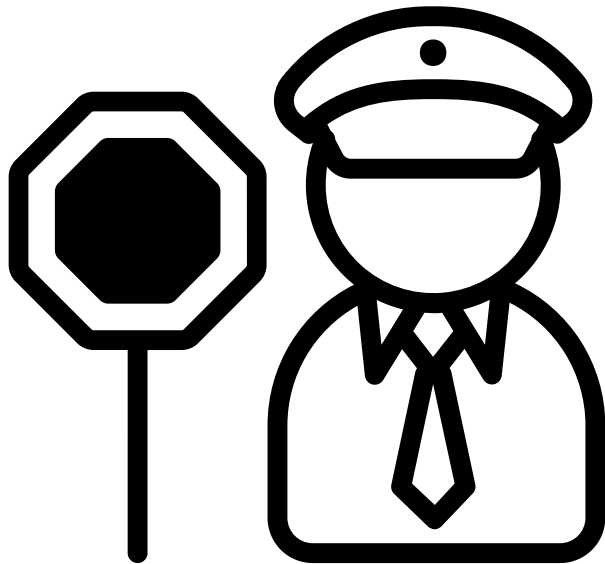


Each Capability is

“Required”

or

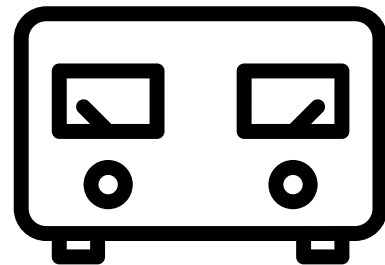
“Reported”



“Energy Monitoring” and “Energy Reporting” are closely related.

Embedded energy measurement tools enable features:

- Realtime energy dashboard
- Predictive maintenance
- Reports of historical data
- Etc.

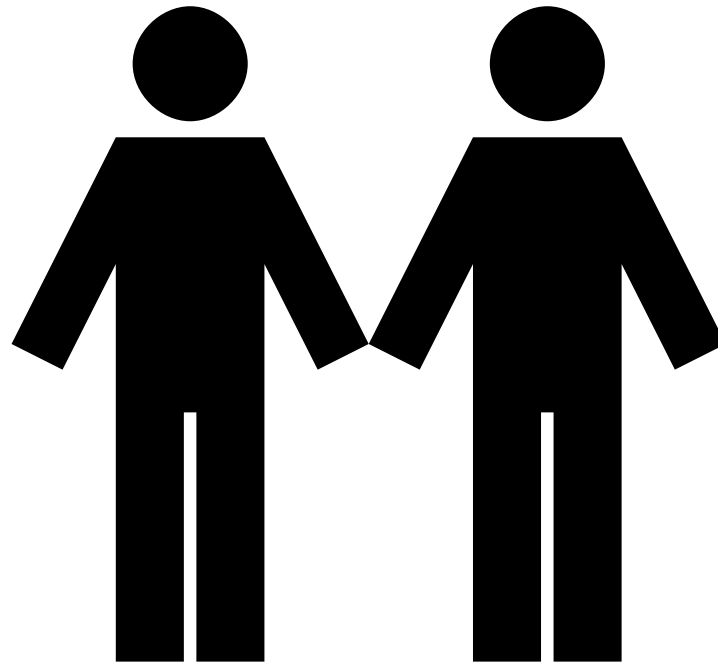


Computer files of historical energy data created using embedded

- Measurement tools
- Data processing
- Memory
- File export



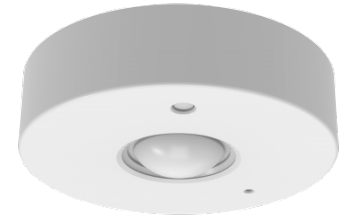
**At the DLC,
“Energy Monitoring” and “Energy Reporting”
refer to roughly the same topic.**



The DLC's Requirements for Networked Lighting Controls (NLC)



- Networking of Luminaires and Devices
- Occupancy Sensing
- Daylight Harvesting
- High-End Trim
- Zoning
- Individual Luminaire Addressability
- Continuous Dimming
- **Energy Monitoring (except room-level)**
- Cybersecurity

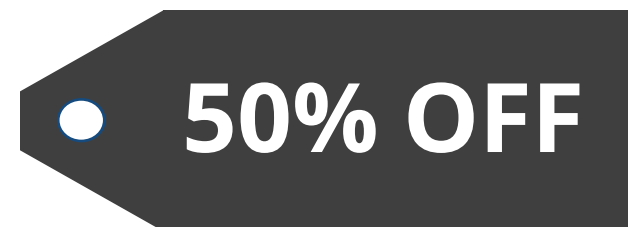
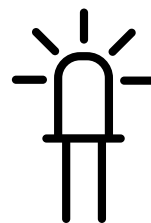




The Importance of NLC and Energy Reporting

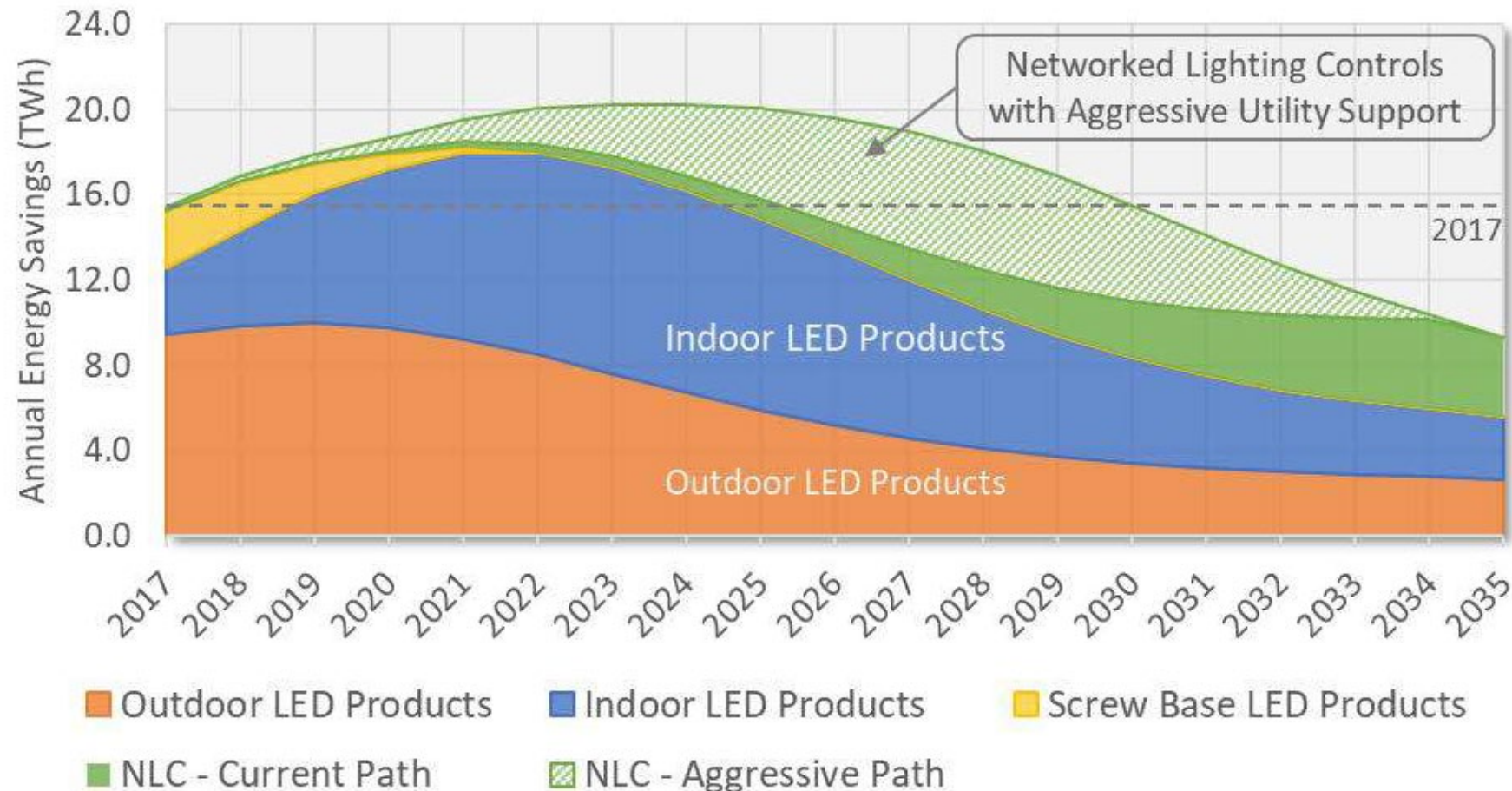
Why are Networked Lighting Controls important to Efficiency Programs?

- LED lighting is the new normal
- NLC saves ~half of the remaining lighting load
- NLC foundation for comprehensive whole-building and IoT



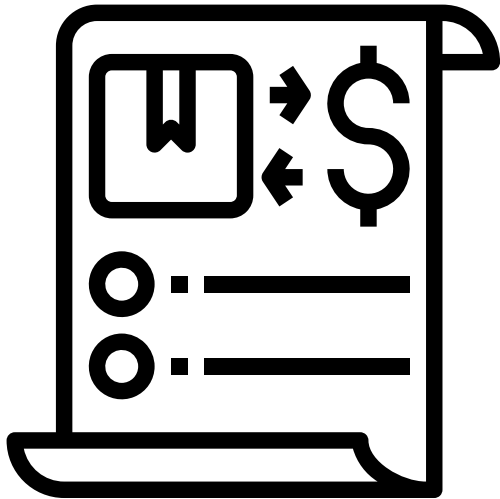
Why are Networked Lighting Controls important to Efficiency Programs?

U.S. Non-Residential Annual Energy Savings Potential
Based on DOE Stock Estimates and Forecasted Adoption & Efficacy

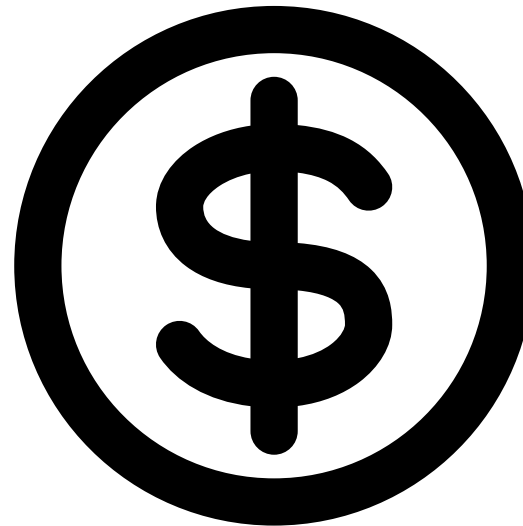


Why are Energy Reports important to Efficiency Programs for NLC?

Claim savings



Set incentives



Forecast savings

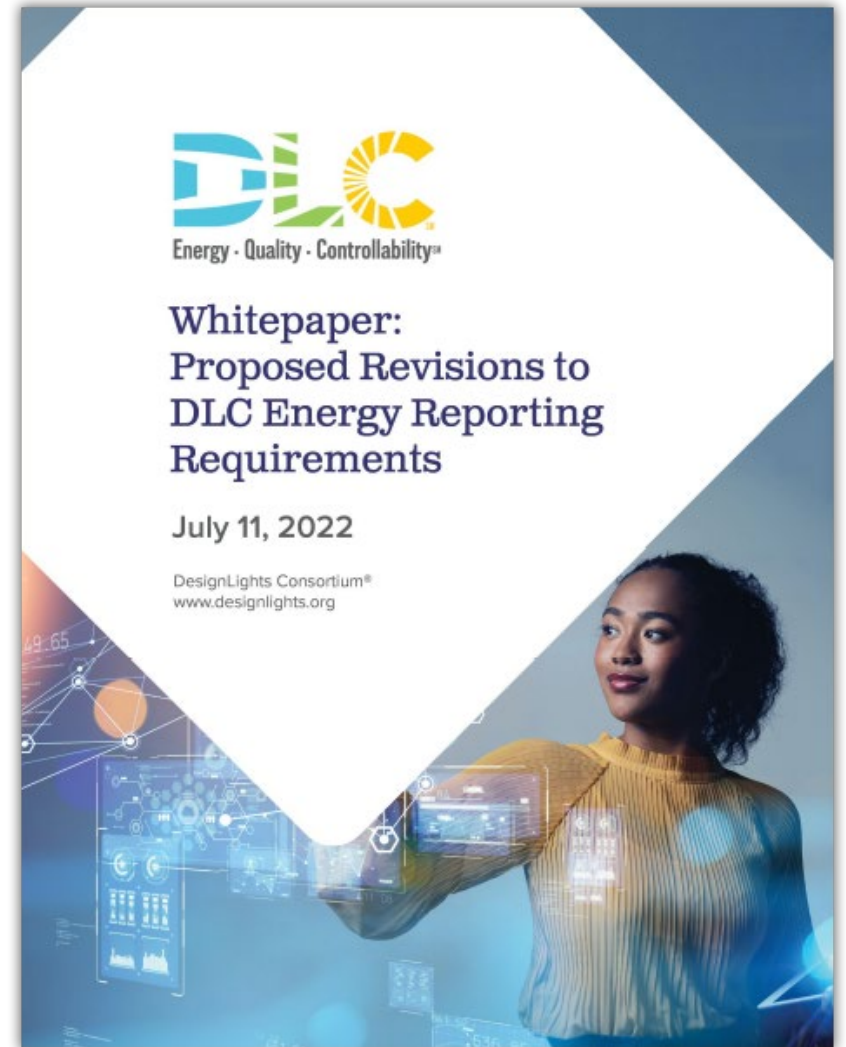


Past and Present



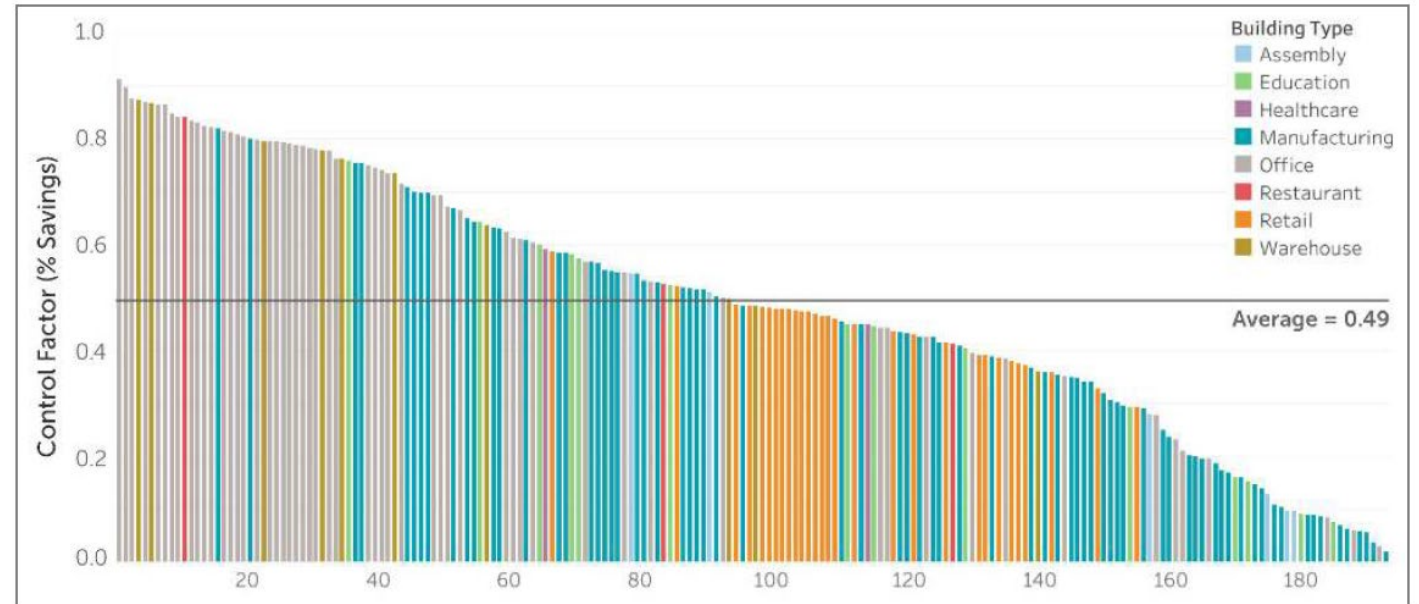
Whitepaper: Proposed Revisions to DLC Energy Reporting Requirements

- 12 pages
- <https://www.designlights.org/resources/reports/whitepaper-proposed-revisions-to-dlc-energy-reporting-requirements>



NLC Energy Savings Research

Figure 1. Distribution of NLC savings across all buildings analyzed (n=194).



- 2020: Energy Savings from Networked Lighting Control (NLC) Systems with and without LLLC
 - <https://www.designlights.org/resources/reports/report-energy-savings-from-networked-lighting-control-nlc-systems-with-and-without-lllc/>
 - Sponsors: DLC, NEEA
- 2017: Energy Savings from Networked Lighting Control (NLC) Systems
 - <https://www.designlights.org/resources/reports/report-energy-savings-from-networked-lighting-control-nlc-systems/>
 - Sponsors: BPA, DLC, Efficiency Maine, Hydro Quebec, Natural Resources Canada, NEEA

Energy Monitoring Multi-Year Plan

2016 – 2018, V1 - V3

- Energy Monitoring was **Reported**

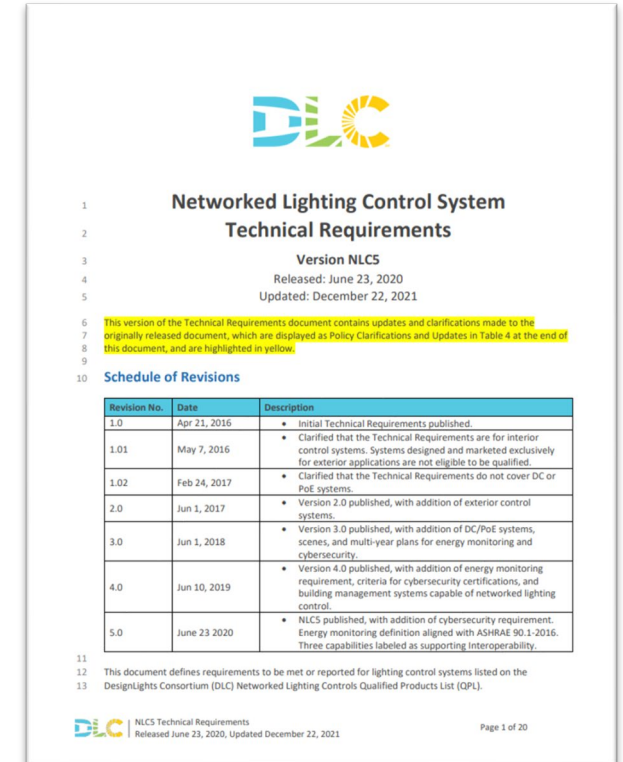
June 2019 V4

- Energy Monitoring Capability was **Required**
 - Exception for room-based systems
 - 1-year grace period
- Energy report .CSV and/or API



Current DLC Definition of Energy Monitoring Capability

- NLC5 Technical Requirements, pages 6 and 17
 - <https://www.designlights.org/our-work/networked-lighting-controls/technical-requirements/nlc5>
- From 2019 V4
 - Energy Monitoring Capability is **Required**
 - Exception for room-based systems
 - Energy report .CSV and/or API
- Updates 2020 V5
 - Data requirements
 - Loosely aligned with ASHRAE 90.1 section 8.4.3
 - 15-minute timestamped interval, or state changes
 - Record length 2 years
 - Recommended report contents, Tables EM-1, EM-2



Relevant Standards





ANSI/ASHRAE/IES 90.1

Energy Standard for Buildings Except Low-Rise Residential Buildings

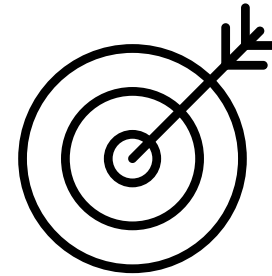
- 2016 and 2019
- Section 8.4.3 Power (not Section 9 Lighting)
- Building systems store a 3-year record of 15-minute interval data

Relevant Recent Standards

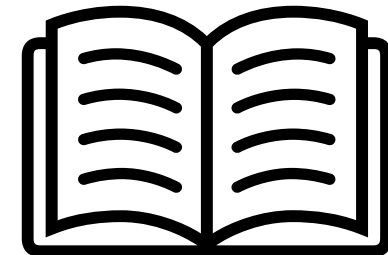
- ANSI C137.5-2021
 - Lighting Systems—Energy Reporting Requirements for Lighting Devices
- ANSI C137.6-2021
 - Lighting Systems--Data Tagging Vocabulary (Semantic Model Elements) for Interoperability



Accuracy

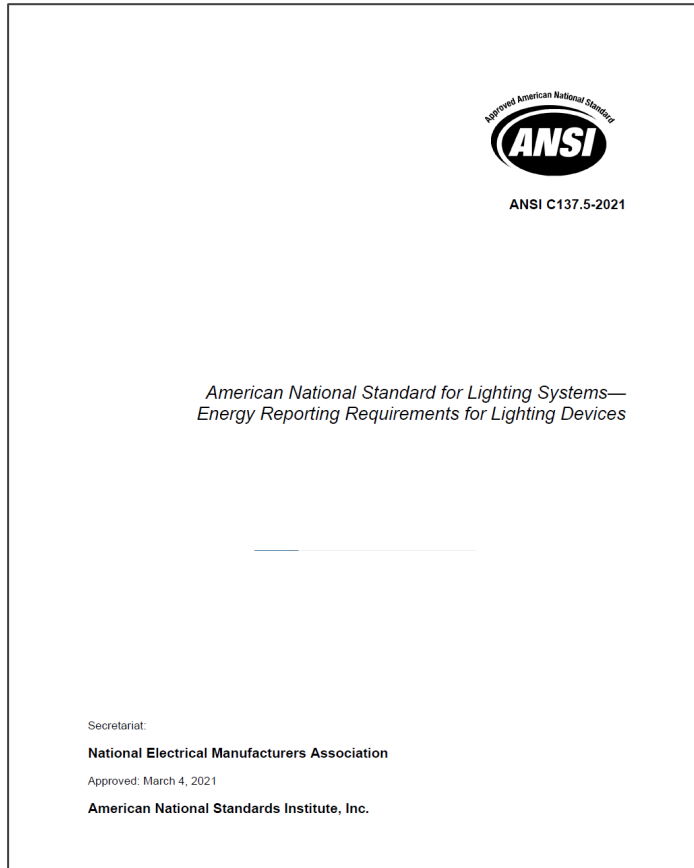


Vocabulary

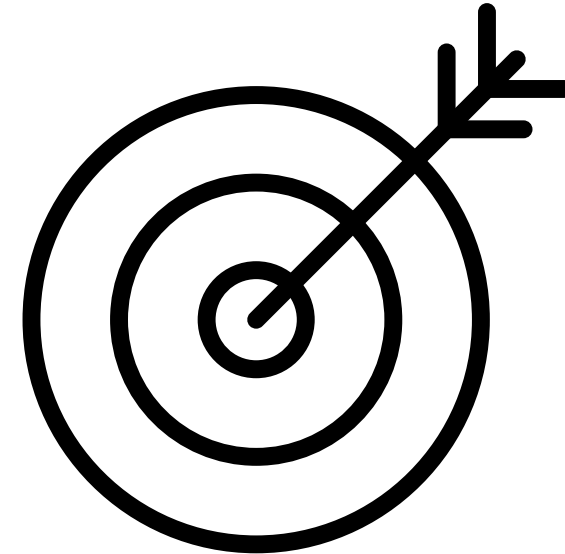


ANSI C137.5-2021

Lighting Systems—Energy Reporting Requirements for Lighting Devices

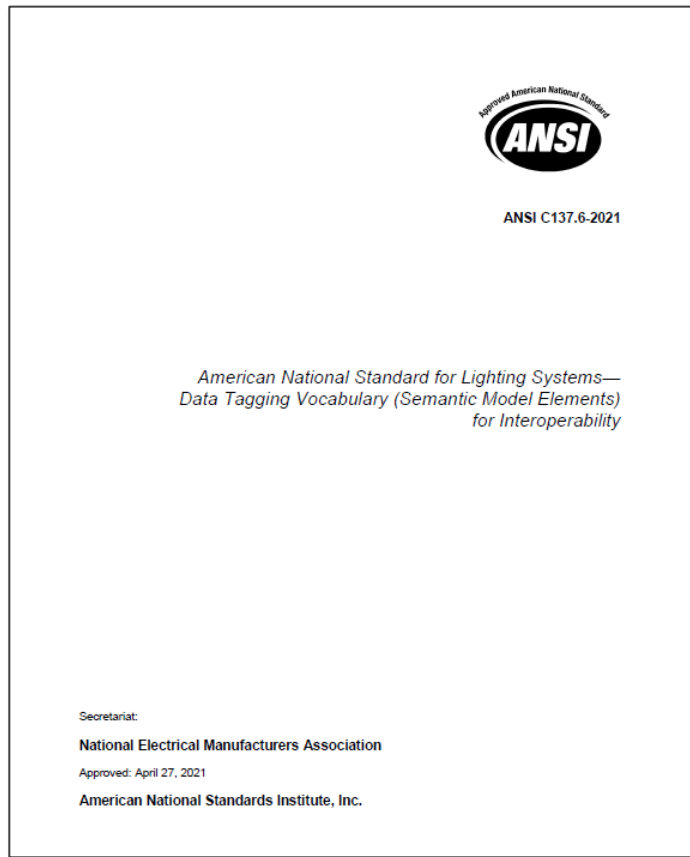


Accuracy

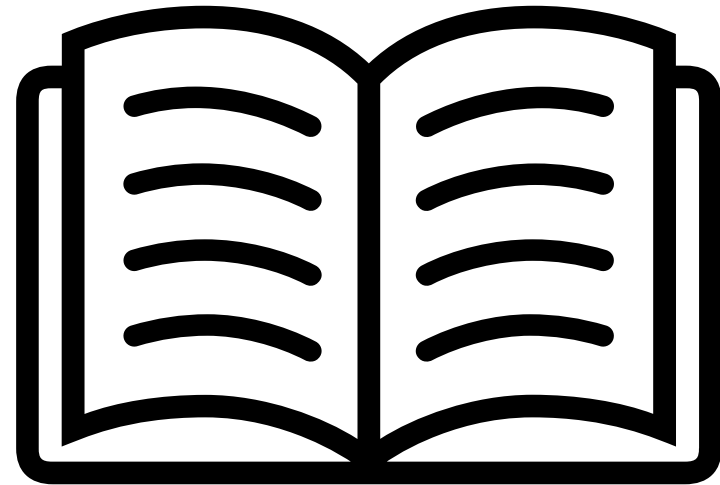


ANSI C137.6-2021

Lighting Systems—Data Tagging Vocabulary (Semantic Model Elements) for Interoperability



Vocabulary



ANSI C137.9-202X (in development)

Lighting Systems—Networked Lighting Control (NLC) - System Configuration Report



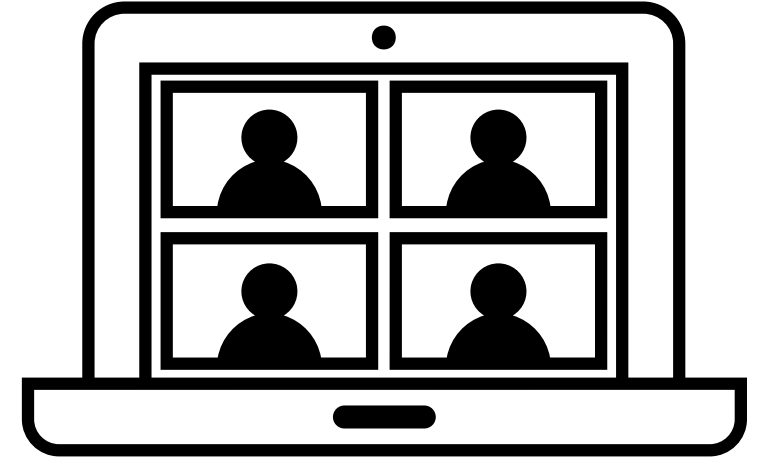
Configuration Report



Working Group



Working Group

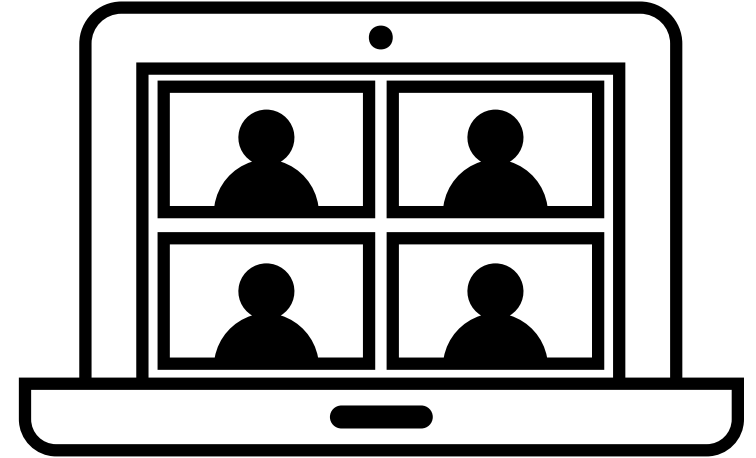


Utilities, Implementers, NLC Manufacturers, PNNL

Thanks!!

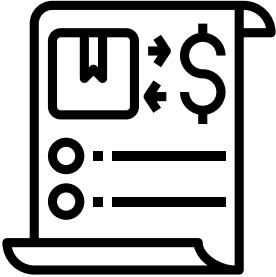
Working Group

- Efficiency program use cases
- How energy reports support the use cases
- Constraints on manufacturers
- Make and refine proposals to change the NLC5 TR



How Efficiency Programs Use Energy Reports

Claim savings



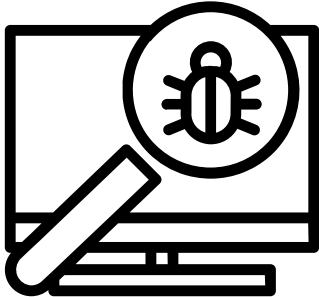
Set incentives



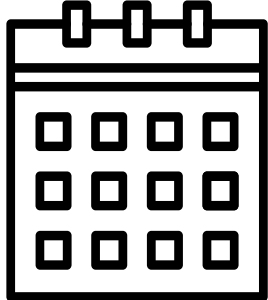
Forecast savings



Debug



First Year



How NLC Systems Produce Energy Reports

- Energy reporting is rarely installed, due to value engineering
- Limiting factors include
 - System memory capacity
 - Network throughput
 - Duration of record length and of accurate functionality

Proposals by Topic

1. Expand eligibility to accept 4 weeks of 15-minute data plus the first year of daily data
2. Recognize ANSI C137.5 and C137.6
3. Require interval data in .CSV or Excel files
4. Revise DLC recommendations for file contents

Proposals by NLC Technical Requirement contents: Revise two tables, and add a third

- New EM-0 High level data, to support efficiency programs
- EM-1 Static data table, revised
- EM-2 Dynamic data table, revised

Proposed New Table EM-0

Proposed Table EM-0: Efficiency Program Use Case Support Specification Table

Topic	Proposed Requirements
Standard for energy reporting	Conform to ANSI C137.5-2021
Reported energy metric	Period cumulative energy use (not savings)
Reported unit	Kilowatt-hours (kWh)
Spatial granularity	Zones: groups of NLC devices, larger than an individual luminaire and smaller than a whole building, from contiguous areas that make sense based on the function or location of the space.
Reporting format	CSV or Excel file
Record duration and data interval	2 years of 15-minute interval data (as currently required), OR 4 weeks of 15-minute interval data * and 12 months of daily interval data**
Reporting resolution	Minimum resolution of 1 kWh, AND sufficient fractional kWh resolution to match the accuracy level specified in ANSI C137.5-2021. In many zones, over a 15-minute interval, this will be in the ten-thousandths of a kWh (0.1 Wh).

* During the first year after original configuration, the preceding 4 weeks of 15-minute interval data can be reported at any time. For instance, after 4 weeks of a new academic term or new production cycle.

** During the first year after original configuration, daily interval data can be reported since original configuration.



Proposal from the Working Group: Revise two tables of Recommendations

- Add
 - Site name, Zone data: ID, energy use, luminaire quantity
- Omit or make optional
 - Non-essential parameters that support research
- Clarify definitions

Proposed Updates to Table EM-1: Recommended Energy Data Reporting Guidelines; Static Data

Proposed New Table EM-1

Recommended Header	Definition	Unit
Site/System Level Data		
Site name	A uniquely identifiable name of the site of the NLC installation	text
System rated power	Total connected lighting power of the system before controls	kW
Zone Level Data		
Zone ID	A uniquely identifiable name for each group of luminaires that are controlled together	text
Luminaire quantity	The number of luminaires or control devices within each non-overlapping zone	int
Rated power	Total rated power of the luminaires within each non-overlapping zone	kW
Configuration Data*		
High-end trim	The percentage of maximum output power programmed for the zone (e.g., 100% = no high-end trim)	%
Occupancy/vacancy sensing	Indicate whether occupancy/vacancy sensing is enabled for the zone	Y/N
Daylight harvesting	Indicate whether daylight harvesting is enabled for the zone	Y/N

* Luminaires typically belong to multiple, overlapping zones for various functions. A standard is needed to define a set of complete, non-overlapping zones and to define a configuration value(s) for each of these zones. Until such a standard is available, data will not be comparable across various NLC systems and the sum of energy usage from all zones might not equal the sum of energy usage from all luminaires.

Proposed Revised Table EM-2

Proposed Updates to Table EM-2: Recommended Energy Data Reporting Guidelines; Dynamic Variables

Recommended Header	Definition	Unit	Note
Timestamp	Date and time in UTC when energy consumption is reported based on the reporting duration and data interval	Excel Date & Time Value in UTC	Must support arithmetic and pivot table grouping in Excel
Zone ID	The uniquely identifiable name for the group of luminaires	text	Must match the names in the static data table
Active Energy	The integral of the instantaneous power over a time interval, cumulative since device initialization, non-resettable.	kWh	

Future



To be added soon to NLC5 TR: Alternate way to meet Energy Monitoring Requirement

- Current Capability: data available for 2 years

- Revised Capability

- Either

- Data available for 2 years



Same as before

- Or

- Previous 4 weeks of 15-minute interval data available during the first year since configuration, AND
 - Previous daily interval data (1 data point per day) available since original configuration, during the first year since configuration



**New from
WG**

To be evaluated in the DLC Policy Development Process: Everything else

- New Table EM-0: Efficiency Program Use Case Support Specification
- Revised Table EM-1 Static (Configuration) Data Table
- Revised Table EM-2 Dynamic Variables

The DLC Policy Development Process

The DLC team conducts a thorough data analysis to understand the problems we want to solve. Our expert team performs market research and interviews industry professionals to craft initiatives that serve our mission to promote energy efficient, high quality technology solutions.

We value our energy efficiency program members' expertise. That's why the DLC sends all proposals to our Member Technical Committee for feedback.

The DLC then drafts a policy based on our research and efficiency program member input.

In the comment period, we release the draft policy to all stakeholders and collect comments through guided comment forms. Depending on the complexity of the initiative, we often compose several drafts and open the policy up for several comment periods.

Our team makes revisions based on everyone's feedback and finalizes the draft to become official policy.

The DLC will advise on when the policy goes into effect, so all stakeholders have time to understand how the new requirements and policies will affect them.

RESEARCH

EE
MEMBER
INPUT

POLICY
DRAFTS

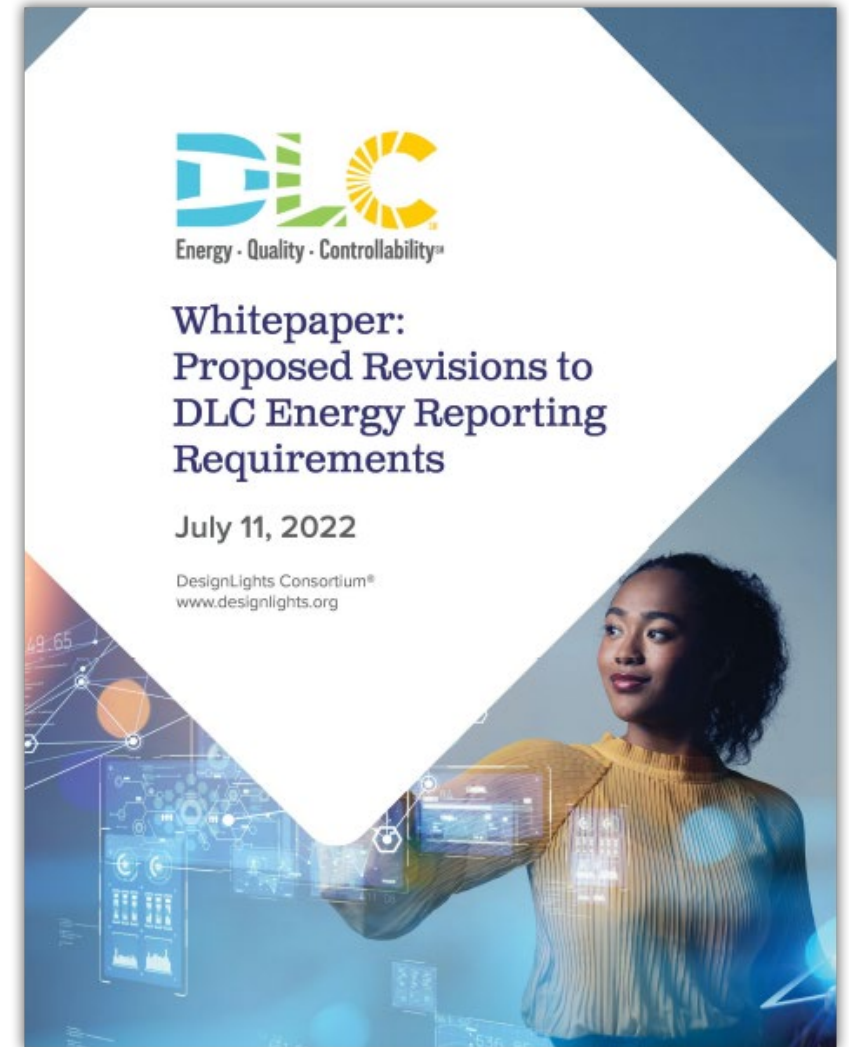
COMMENT
PERIOD(S)

FINAL
POLICY
RELEASE

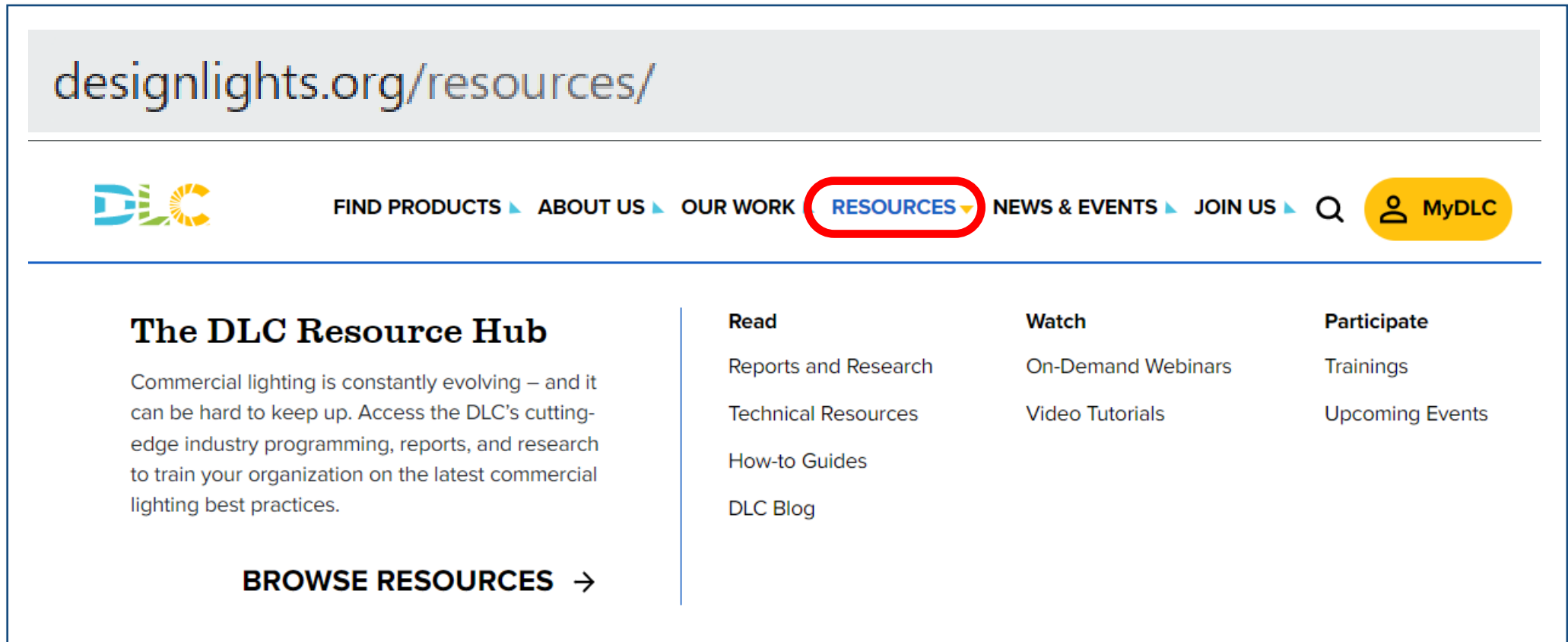
POLICY
EFFECTIVE

Whitepaper: Proposed Revisions to DLC Energy Reporting Requirements

- 12 pages
- <https://www.designlights.org/resources/reports/whitepaper-proposed-revisions-to-dlc-energy-reporting-requirements>



A recording of this webinar will be posted soon at <https://www.designlights.org/resources/>



The screenshot shows the website's navigation bar with the following items: FIND PRODUCTS, ABOUT US, OUR WORK, **RESOURCES** (highlighted with a red circle), NEWS & EVENTS, JOIN US, a search icon, and a MyDLC button. Below the navigation bar, the page is divided into three columns. The left column features the heading "The DLC Resource Hub" and a paragraph of text. The middle column is titled "Read" and lists "Reports and Research", "Technical Resources", "How-to Guides", and "DLC Blog". The right column is titled "Watch" and lists "On-Demand Webinars" and "Video Tutorials". A fourth column titled "Participate" lists "Trainings" and "Upcoming Events". At the bottom of the left column is a "BROWSE RESOURCES" button with a right-pointing arrow.

designlights.org/resources/

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The DLC Resource Hub

Commercial lighting is constantly evolving – and it can be hard to keep up. Access the DLC’s cutting-edge industry programming, reports, and research to train your organization on the latest commercial lighting best practices.

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How-to Guides		
DLC Blog		

Q&A



Each DLC Qualified NLC Product

offers all “Required” capabilities...

...not necessarily installed on every project.

