Energy · Quality · Controllability℠

NLC Technical Requirements
Version NLC5, Draft 2

April 27, 2020

Date

Team

Stuart Berjansky
Technical Director

Levin Nock
Senior Technical Manager

Bagwat Mohan
Senior Technical Operations Analyst

Webinar Logistics

- Slides and recorded webinar will be posted to www.designlights.org after presentation
- All attendees on mute; Please use GoToWebinar Interface (Question pane) to submit questions as we go
- DLC will answer simpler questions at the end, as time permits; and follow-up directly with attendees with any unanswered questions
- If you experience any technical issues, use Chat feature to let us know

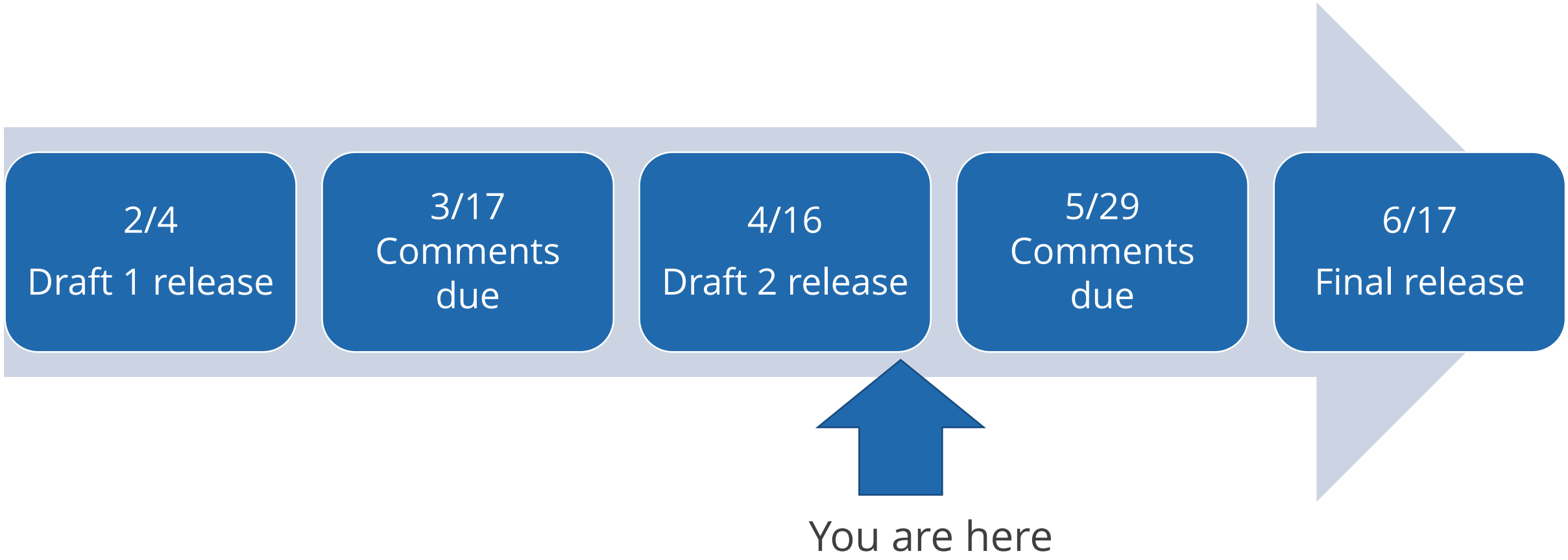
Agenda

- Introduction
- Interoperability
- Cybersecurity
- Misc.

NLC Technical Requirement Evolution

June release	Version	Main Topics
2016	1	Initial release for interior applications
2017	2	Add exterior applications
2018	3	Add DC/PoE; and multi-year plans for energy monitoring and cybersecurity
2019	4	Require energy monitoring, and define cybersecurity
2020	5	Introduce interoperability which includes energy monitoring; and require cybersecurity

Current Timeline for NLC-5



Comment Forms

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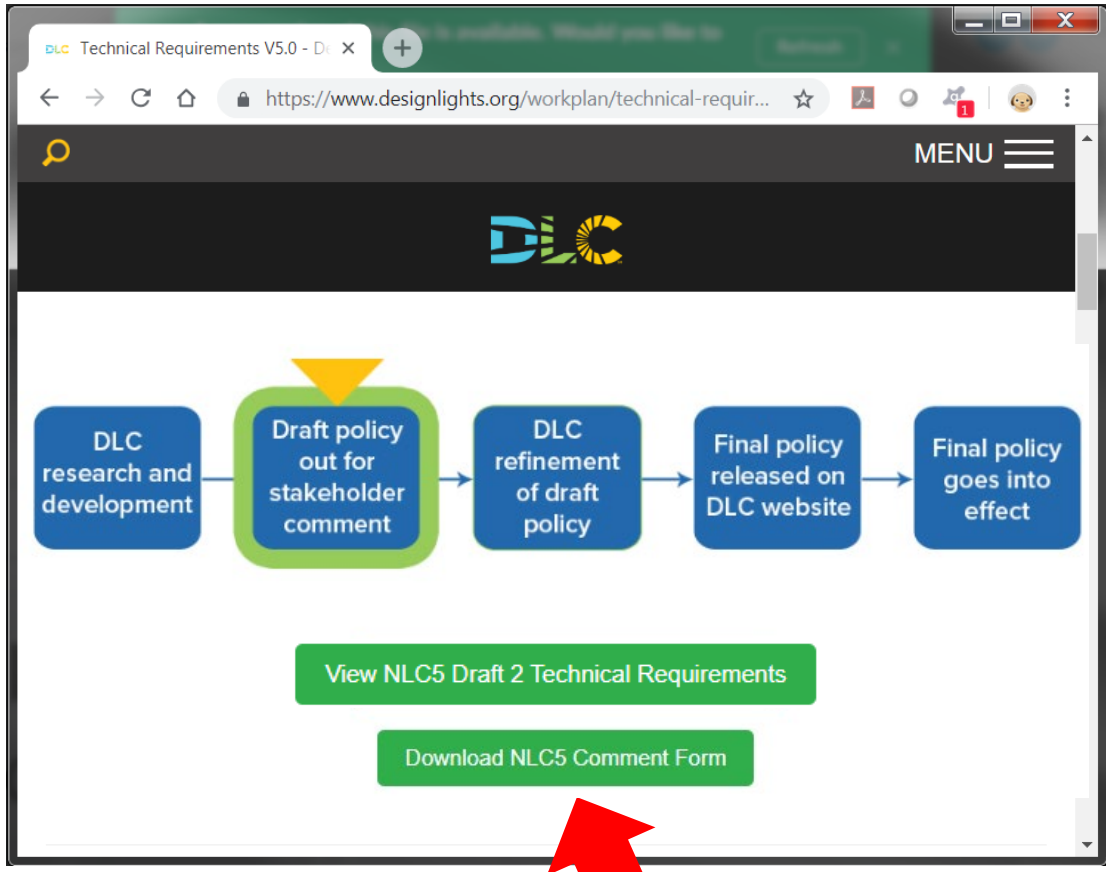

NLC5 Comment Form	
Document:	Networked Lighting Control (NLC) System Technical Requirements
Version:	Draft 2 of NLC5
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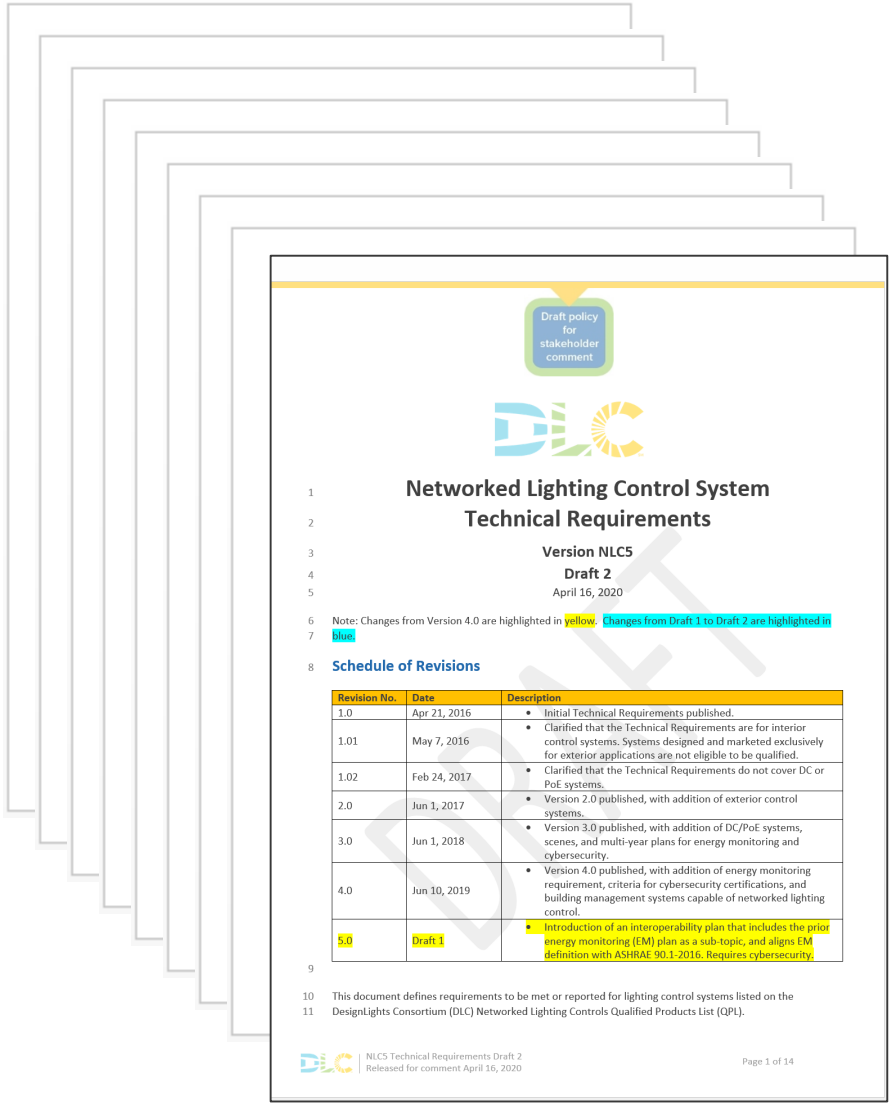
NLC Technical Requirement Overview

Draft 1 changes from Version 4.0 are highlighted in yellow. Changes from Draft 1 to Draft 2 are highlighted in blue.



Draft policy for stakeholder comment

Networked Lighting Control System Technical Requirements

Version NLC5
Draft 2
April 16, 2020

Note: Changes from Version 4.0 are highlighted in yellow. Changes from Draft 1 to Draft 2 are highlighted in blue.

Schedule of Revisions

Revision No.	Date	Description
1.0	Apr 21, 2016	• Initial Technical Requirements published.
1.01	May 7, 2016	• Clarified that the Technical Requirements are for interior control systems. Systems designed and marketed exclusively for exterior applications are not eligible to be qualified.
1.02	Feb 24, 2017	• Clarified that the Technical Requirements do not cover DC or PoE systems.
2.0	Jun 1, 2017	• Version 2.0 published, with addition of exterior control systems.
3.0	Jun 1, 2018	• Version 3.0 published, with addition of DC/PoE systems, scenes, and multi-year plans for energy monitoring and cybersecurity.
4.0	Jun 10, 2019	• Version 4.0 published, with addition of energy monitoring requirement, criteria for cybersecurity certifications, and building management systems capable of networked lighting control.
5.0	Draft 1	• Introduction of an interoperability plan that includes the prior energy monitoring (EM) plan as a sub-topic, and aligns EM definition with ASHRAE 90.1-2016. Requires cybersecurity.

This document defines requirements to be met or reported for lighting control systems listed on the DesignLights Consortium (DLC) Networked Lighting Controls Qualified Products List (QPL).

NLC5 Focus Areas

Interoperability

- The capability of lighting and/or building systems or components to exchange actionable information
- Unlocks new energy savings by connecting different systems
- Includes External Systems Integration, LS/DR, Energy Monitoring

Cybersecurity

- The practice of defending networked systems and data from malicious attacks
- Critical for customer trust and adoption

NLC Coming of Age

Interoperability

How to make friends and play well with others

Cybersecurity

Don’t talk to strangers

Lighting Controls

Search Results:

50

Results Per Page: 50

Search by model, brand name, or manufacturer

Customize Columns + Display As Tiles Sort By +

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FILTER RESULTS

Clear All Filters

- **Manufacturer** +
- **Technical Requirements Version Number** +
- **Ease of Implementation** +
- **System Scope and Application** +
- **Advanced Capabilities** +
- **User Interface** +
- **Integral Controls such as LLLC** +
- **Wired or Wireless Communication** +

Company	System	Product Scope	LLLC (Control + 2 Sensors)	
Acuity Brands	Xpoint	Interior	true	Show
Acuity Brands	Atrius Dimming	Interior	false	Show
Acuity Brands	nLight Air	Exterior	true	Show
Acuity Brands	nLight Air	Interior	true	Show
Acuity Brands	nLight	Interior	true	Show
Acuity Brands	nLight	Interior	true	Show
Amatis Controls	Amatis Controls	Interior	false	Show
Autani, LLC	Energy Center	Interior	true	Show
Autani, LLC	Energy Center	Exterior	false	Show
Avi-on Labs, Inc.	Avi-on Lighting Control Platform	Interior	false	Show
Cree Lighting	SmartCast	Interior	true	Show

Table 1: "Required" and "Reported" Capabilities for Interior Lighting Systems

'Required' Interior System Capabilities	'Reported' Interior System Capabilities
Networking of Luminaires and Devices	Control Persistence
Occupancy Sensing	Scheduling
Daylight Harvesting/Photocell Control	Device Monitoring/Remote Diagnostics
High-End Trim	Type of User Interface
Zoning	Luminaire Level Lighting Control (LLLC, integrated)
Individual Addressability	Personal Control
Continuous Dimming	Load Shedding/Demand Response
Energy Monitoring	Plug Load Control
Cybersecurity	External Systems Integration
	Emergency Lighting
	Color Changing/Tuning
	Ease of Implementation
	Scene Control
	Interoperability

Table 2: "Required" and "Reported" Capabilities for Exterior Lighting Systems

'Required' Exterior System Capabilities	'Reported' Exterior System Capabilities
Networking of Luminaires and Devices	Control Persistence
Occupancy Sensing AND/OR Traffic Sensing	Device Monitoring/Remote Diagnostics
Daylight Harvesting/Photocell Control	Type of User Interface
High-End Trim	Luminaire Level Lighting Control (LLLC, integrated)
Zoning	Load Shedding/Demand Response
Individual Addressability	External Systems Integration
Continuous Dimming	Emergency Lighting
Scheduling	Color Changing/Tuning
Energy Monitoring	Ease of Implementation
Cybersecurity	Scene Control
	Interoperability

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Table 3: Definitions of Capabilities and Requirements

Row	Capability	Definition
1	Networking of Luminaires and Devices	The capability of individual luminaires/lamps and control devices to exchange digital data with other luminaires/lamps and control devices on the system. This capability is required at the room, space, or area level, but not at the whole building level or beyond (e.g. non-lighting systems, or the internet).
2	Occupancy Sensing	The capability to affect the operation of lighting equipment based upon detecting the presence or absence of people in a space or exterior environment. Exterior systems must include either occupancy sensing or traffic sensing. They may include both, but that is not required.
•••		
24	Interoperability	The capability of a system or component to communicate data to/from another system or component in a published, repeatable and non-proprietary way, such as a published API. Data sent from an NLC is documented such that others can receive, interpret, and use the data accurately and reliably. This also includes the network protocol requirements, messaging, and related functionality. This capability consists of aspects of other NLC capabilities: currently External Systems Integration, Load Shedding/Demand Response, and Energy Monitoring. Additional capabilities may be included under this umbrella in the future.

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Interoperability

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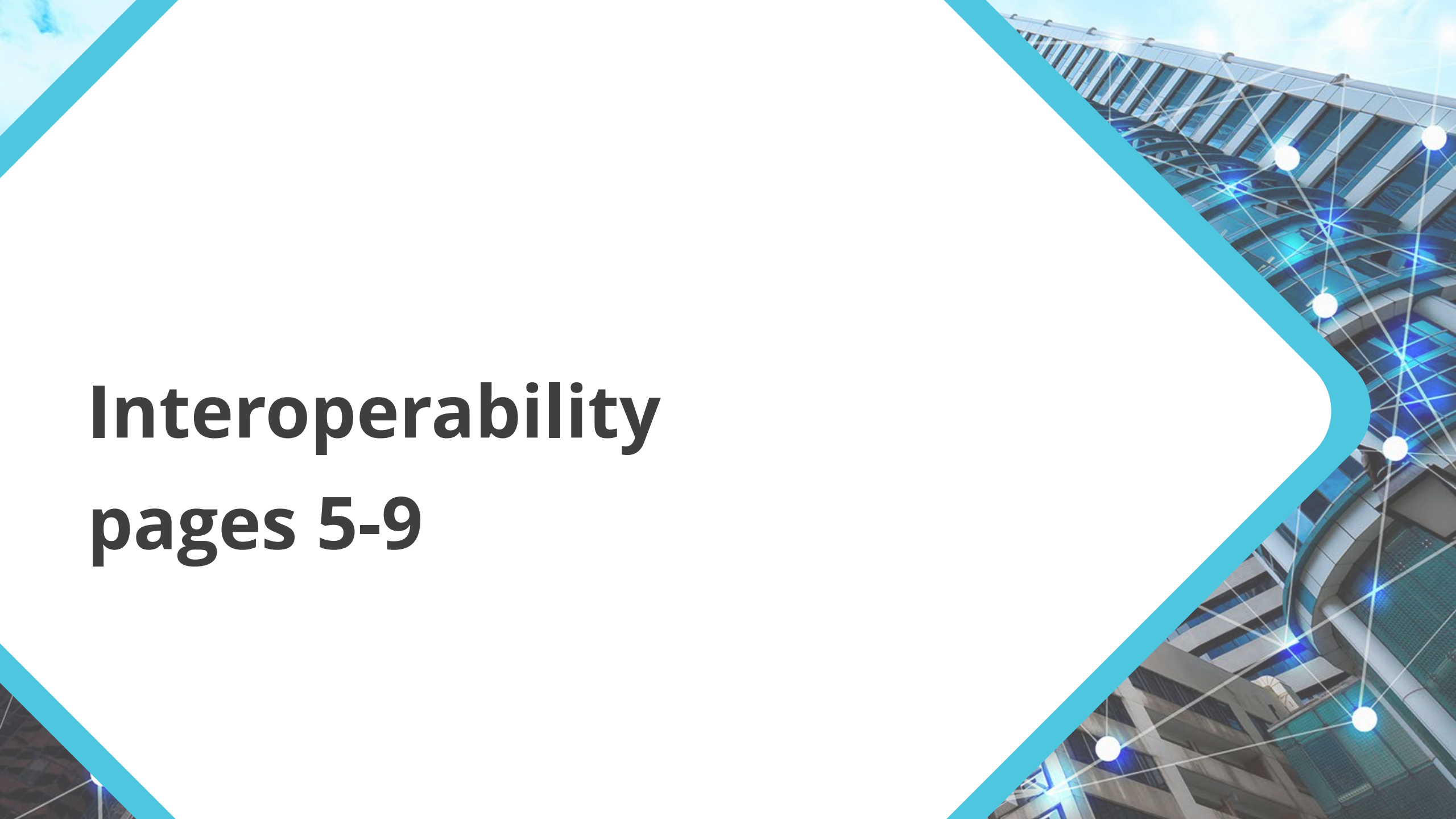


Interoperability

- Interoperability is defined as the ability of two or more systems or system components to exchange actionable information
- SEPA (Smart Electric Power Alliance)

Interoperability Objectives

- Unlock energy savings opportunities
- Broader customer acceptance
- Stronger value proposition

Interoperability, First 3 Use Cases

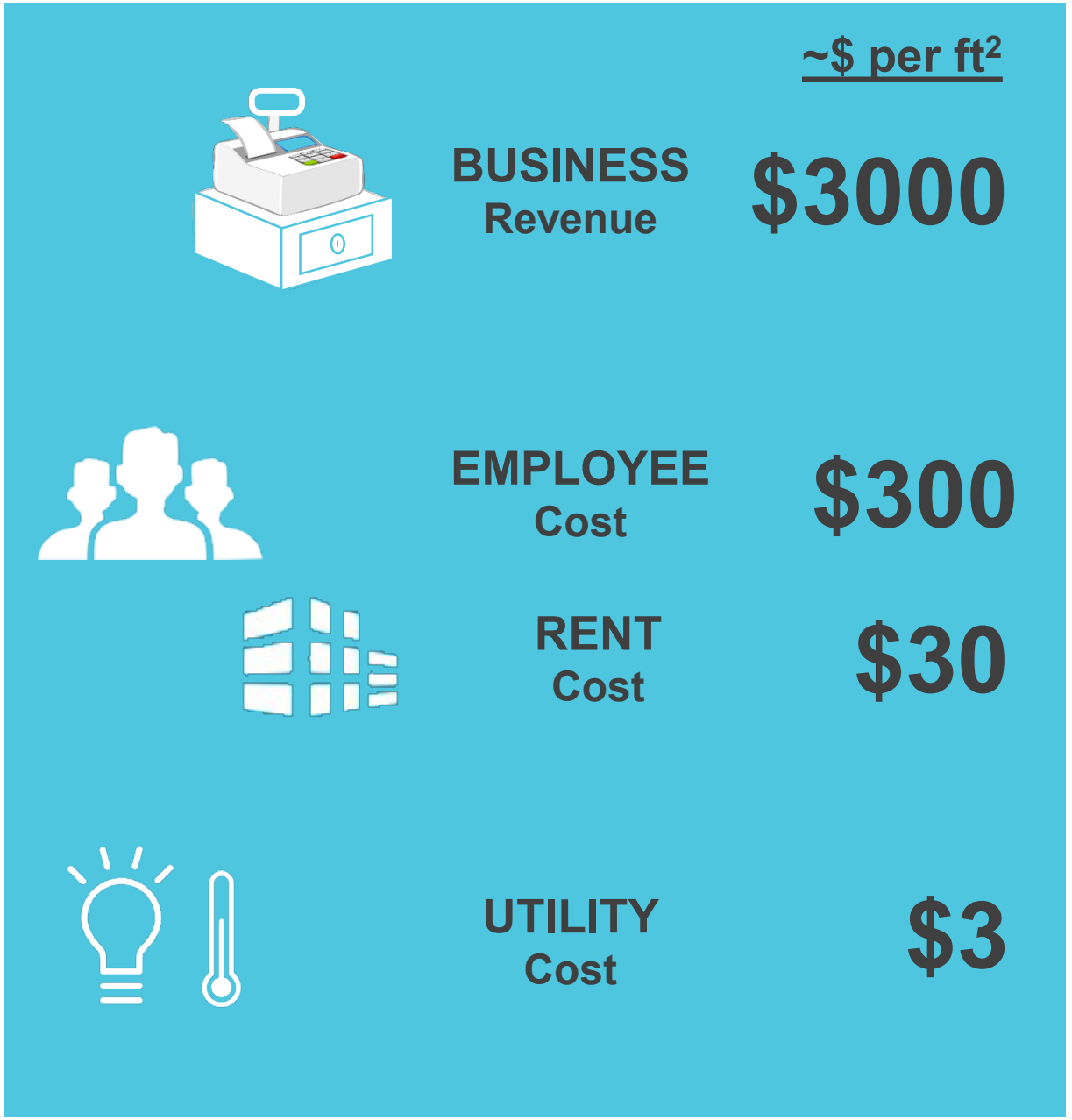
- External Systems Integration (e.g. HVAC)

- Load Shedding/Demand Response (LS/DR)

- Energy Monitoring (EM)

Interoperability will unlock value

- Way Finding
- Customer Loyalty Apps
- Product Placement Optimization
  - Asset Tracking
  - Conference Room Scheduling
  - Space Optimization
    - Occupancy-based HVAC
    - Load Shed for Utility Incentives
    - Energy Reports for Utility Incentives



Energy Monitoring Multi-Year Plan

June 2018 V3

- The Energy Monitoring type was **Reported**.

June 2019 V4

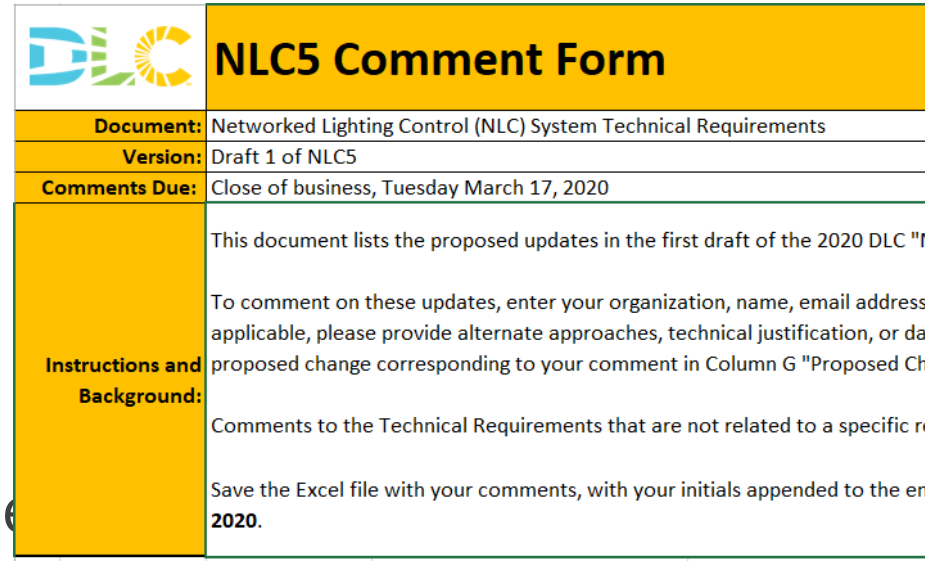
- Energy Monitoring Capability is **Required**
- Energy report .CSV and/or API
- Exception for room-based systems
- 1-year grace period

June 2020 V5

- Data requirements
  - 15-minute timestamped interval data
  - Record retention ≥ 2 years
- Guidance for contents, Tables EM-1, EM-2

Thanks for Comments on Draft 1

- Interoperability
  - BMS: NLC has no data about thermal zone
  - LS/DR: Clarify tables
  - EM:
    - Revise table of parameters
    - Align with ASHRAE 90.1 loosely
    - Accept status change reports
    - Add option for room-based systems



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Reporting guidelines for LS/DR (p.6) and EM (p.8)

Table LS/DR-1

Communication	Inquiry from the demand control originator	NLC response
1-way	Load reduction request (unspecified amount, starting now)	Execute
1-way or 2-way	Load reduction request for a specified amount starting at a specified time for a specified duration	1-way: Execute 2-way: Acknowledge & execute
1-way or 2-way	Cancellation of load reduction	1-way: Execute 2-way: Acknowledge & execute
2-way	Present load status?	Kilowatt (kW)
2-way	Data as interval or status change?	Flag
2-way	Reporting interval	Number of minutes
2-way	Recurring load status update at a specified interval or upon status change	Periodic kW report at a specified interval
2-way	Planned load reduction capacity for a specified future time (peak) and duration (accumulated) period	Kilowatt (kW) – peak Kilowatt-hour (kWh) – accumulation over period

181 **Table EM-1: Energy Data Reporting Guidelines for .CSV or API; Static Data**

Row	Topic	Data Element	Definition	Note
1.1	Headings	For each field	Each type of data element is identified by a heading.	Text such as "Manufacturer", "Product", etc.
1.2	System	NLC Manufacturer	The manufacturer of the NLC system	Text
1.3	System	NLC Product	The name of the NLC system	Text
1.4	Site	Building/Business Type [*Note A]	The main business function in the portion of the building where the NLC system is installed	From ASHRAE 90.1-2016 Table 9.5.1
1.5	Baseline for NLC	Maximum Rated Power with no control strategy enabled	The maximum possible power consumption of the lighting system without any control strategy in effect. If a luminaire retrofit has occurred, this value is equal to the maximum rated power of the new luminaire(s). The spatial granularity matches the energy measurements. For instance, if energy is reported at each luminaire, then the baseline power is reported at each luminaire.	Separate data for interior vs. exterior. Units = kiloWatts
1.6	Energy	Energy Reporting Interval [*Note B]	The frequency an energy measurement is reported (15 minutes or less)	Units = minutes
1.7	Energy	Data method	How is energy interval data calculated?	Text such as "15 minute average from 3 samples spaced 5 minutes apart"

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183 **Table EM-2: Energy Data Reporting Guidelines for .CSV or API; Dynamic Variables**

Row	Topic	Data Element	Definition	Note
2.1	Headings	For each field	Each type of data element is identified by a heading.	Text such as "Unix Time", "Energy Data kWh", etc.
2.2	Energy	Timestamp	Date and time of each energy measurement	Unix time or RFC 3339 time
2.3	Energy	Energy Data	The actual energy readings that are recorded for each luminaire or group of luminaires	Units = kWh
2.6	Energy	Confidence Level	The percentage of all possible samples expected to include the true population parameter.	Units = %
2.7	Energy	Nominal Accuracy	% accuracy of the energy data [*Note C]	Text such as "+/-3% or 0.005 kWh, whichever is larger"
2.7	Energy	Record Duration	Months of 15 minute interval data	Units=months

Energy Monitoring definition updates in Table 3

11	Energy Monitoring	• The basic, required capability of energy monitoring is aligned with ASHRAE 90.1-2016 Section 8.4.3. as follows: o Energy use by interior lighting (if applicable), exterior lighting (if applicable) and receptacle circuits (if monitored by the NLC) can be monitored independently. o For buildings with tenants, the data for each tenant space can be reported to each tenant. o The lighting system energy use can be recorded at least once every 15 minutes and reported at least hourly, daily, monthly, and annually. o Energy use data can be transmitted to a building control system (if present) and graphically displayed. o Data can be stored for a minimum of 24 months. • Energy monitoring is not required for room-based systems. In order for room-based systems to claim the optional energy monitoring capability: o Energy data can be retrieved by a user in the room when required - hourly, daily, monthly or yearly. o Energy data can be retrieved in the form of CSV file or API. • In order for a system to qualify for this exemption, the DLC review process will confirm that the product claims only "Room or Zone" for interior scope as listed on the DLC QPL.

Cybersecurity pages 10-12

Cybersecurity Plan

June 2018 NLC-3

Cybersecurity activity is reported.

June 2019 NLC-4

Establish criteria to qualify a set of cybersecurity standards.

Only products that comply with a qualified standard may declare the **optional** cybersecurity capability.

June 2020 NLC-5

Cybersecurity is **Required**. Products must comply with at least one standard that meets the criteria defined in V4 (or reapply under V4 with the 1-year grace period).

June 2021 NLC-6

Cybersecurity is **Required**.

All products without cybersecurity are removed from the list by Oct 31, 2021.

DLC Cybersecurity Intent

What DLC wants to do:

- Ensure listed Manufacturers have done at least some diligence in addressing cybersecurity of their system
- Cite 3rd party standards
- Disclose those efforts for users of the QPL

What DLC wants to avoid:

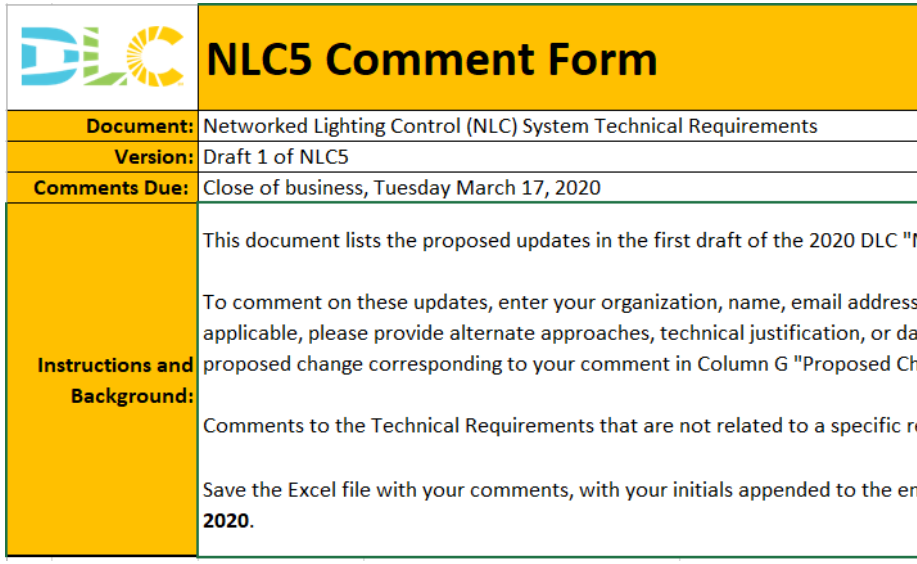
- Claiming assurance or responsibility or liability for cybersecurity performance of listed systems

Modifications from Cybersecurity Working Group

- Make space for services that are not-quite-standards
- Extend the grace period to new products, same as renewals
- Note: no exceptions for self-contained systems, because multiple standards already provide varying levels of rigor based on risk

Thanks for Comments on Draft 1

- Cybersecurity
  - Be very explicit about acceptable services
  - Clarify certification expiration
  - Expand recognized compliance pathways



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Cybersecurity

- Goal: accept proprietary standard certifications, while maintaining quality

V5 Cybersecurity Program Administration

- In order to claim the cybersecurity capability, a system must, at the time of qualification, either:
  a. Have a valid certification for one or more of the specified standards in Table CS-1, or
  b. Have a valid certification for one or more of the specified services in Table CS-2.
- The list of applicable standards in Table CS-1 and services in Table CS-2 will be reviewed for each incremental revision to the Technical Requirements, or annually, whichever comes sooner.
- Certification in any one of the four categories of Table CS-1 (Process, Components, System, Cloud Services) is sufficient.
- Table CS-3 describes how DLC reviewers will confirm compliance.
- The DLC will confirm cybersecurity certification will be valid for at least 12 months after the time of application submission. If the certification will expire within a year, the NLC manufacturer will need to submit a letter of intention of renewal with the application and will need to provide an updated certificate upon expiration, in compliance with Table CS-2 or CS-3.

Cybersecurity Tables, page 12

Table CS-1: Cybersecurity Standards Recognized by the DLC

Standard	Process	Components/ Embedded Devices	System	Cloud Services
ANSI/UL 2900-1	y	y		
IEC 62443	62443-4-1	62443-4-2	62443-3-3	
SOC 2	y		y	y
ISO 27001	y			
ISO 27017 (with 27001)				y
FedRAMP				y
CSA STAR				y

Table CS-2: Cybersecurity Services Recognized by the DLC

Service	Proof of Compliance
UL IoT Security Rating (UL 1376)	Copy of certificate or letter from UL
CSA Cybersecurity Verification Program (CVP) (CSA T200)	Copy of certificate or letter from CSA
Intertek Cyber Assured	Copy of certificate or letter from Intertek

Table CS-3: Proof of Cybersecurity Standard Compliance

Renewal is required at least every 3 years in order for a certificate to remain valid.

Standard	Proof of Compliance
ANSI/UL 2900-1	Certification claim listed on applicant's website, plus a letter or copy of certificate issued by an accredited certification body.
IEC 62443	ISASecure registry of a component, system, or CDO at https://www.isasecure.org/en-US/End-Users/ or Copy of IECEE certificate, or product listed at https://www.iecee.org/certification/certificates/ or Copy of certificate from other accredited agency, such as UL, VDE, DEKRA, etc.
SOC 2	Certification claim listed on applicant's website, plus a letter from 3rd party auditor.
ISO 27001	Copy of an accredited certification from a member of the ANSI-ASQ National Accreditation Board as listed at http://anabdirectory.remoteauditor.com/
ISO 27017 (with 27001)	Copy of an accredited certification from a member of the ANSI-ASQ National Accreditation Board as listed at http://anabdirectory.remoteauditor.com/
FedRAMP	"Authorized" at https://marketplace.fedramp.gov/#/products?status=Compliant;FedRAMP%20Ready&sort=productName
CSA STAR	"Certification" or "Attestation" at https://cloudsecurityalliance.org/star/registry/

Miscellaneous

Additional Requirements (in addition to Tables 1,2,3)

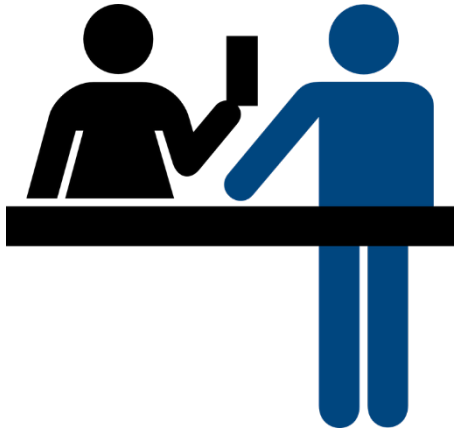
"Customer Available Information": In order for an applicant to claim a capability listed in Tables 1 and 2, the manufacturer's customer literature must specify that the system has the capability, with instructions for how to configure and/or use this feature.

• • •

The following capabilities from Table 1 and 2 are exempt from this requirement:

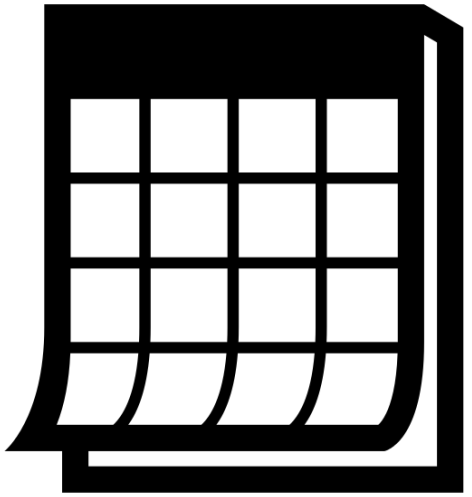
- Continuous Dimming
- Individual Addressability
- Luminaire Level Lighting Control (LLLC, integrated)
- Ease of Implementation
- Type of User Interface
- Cybersecurity
- Control Persistence
- ~~Interoperability: LS/DR~~
- ~~Interoperability: External Systems Integration~~

Commercial Availability



Commercial Availability and Verification: All systems must be fully commercially available in the U.S and/or Canada, able to be purchased, and with complete, final documentation and literature readily available on the manufacturer's website before they can be listed. The DLC requires that a qualified system has been installed and operated successfully in at least one actual field installation at a third party site (not occupied by the applicant or a lighting rep). The DLC will verify this through a case study and/or a customer reference. The facility can be of any size where all of the Required Capabilities are functional. Multiple sites may be used; for instance, occupancy sensing may be installed at one site and daylight harvest at another. If daylight harvest is not available at a customer's site, then it can be demonstrated in an installation at a building owned by the manufacturer, in a live webinar.

Grace Period



- Systems without cybersecurity will drop off the QPL in October 2021
- Until then, systems without cybersecurity can be listed under NLC4
  - For systems on the list that updated to NLC4 by April 15, 2020
  - Also for new systems not yet on the list

Grace Perio

Annual Revisions and Grace Period

The DLC revises the Networked Lighting Controls Technical Requirements annually, with final revisions completed in early June of each year. The DLC's goal is to display data that either meets the current specification or the previous year's specification, so that all of the QPL data is less than two years old.

Grace Period Policy: A listing grace period until April 15 of the following year (for example, April 15, 2021 for NLC5) will be provided for systems that have been qualified under a previous version of the Technical Requirements, but do not meet revised requirements. These systems can be relisted once under the previous version of the Technical Requirements. This will allow a period of 10.5 months to develop an updated or new system that can be submitted for evaluation according to the most current Technical Requirements.

For example, in June 2020, a system that is currently listed under NLC V4.0 (published in June 2019) has two options to remain listed in the future:

a. If the system qualifies for NLC5 (published in June 2020), then the data can be updated to NLC5 at any time until April 15, 2021.

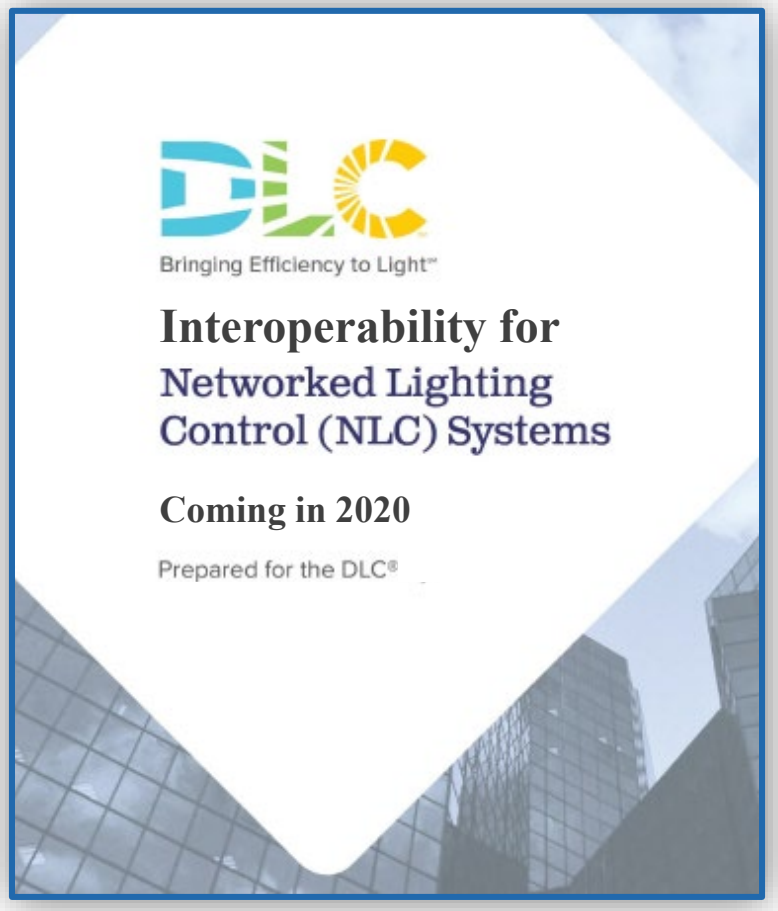
b. If the system does not qualify for NLC5, then the product can remain listed as NLC4 until October 31, 2021. After that, if the product and data have not been updated to either NLC5 (by April 2021) or NLC6 (by October 2021), then the product will be delisted.

Note that in order to use the grace period when a new set of Technical Requirements are published in June (for instance NLC5 in June 2020), a system would need to be listed under the previous version (in this example, NLC4).

For the new cybersecurity requirement introduced with NLC5, the same grace period will be extended to new products (products not previously listed on the DLC QPL). New products will use the NLC5 application form until April 15, 2021. Until April 15, 2021, if they meet all requirements except for the new cybersecurity requirement, then they will be qualified as NLC4.

Interoperability Research Sponsored by Natural Resources Canada

- Public Report supporting NLC interoperability
- Coming soon



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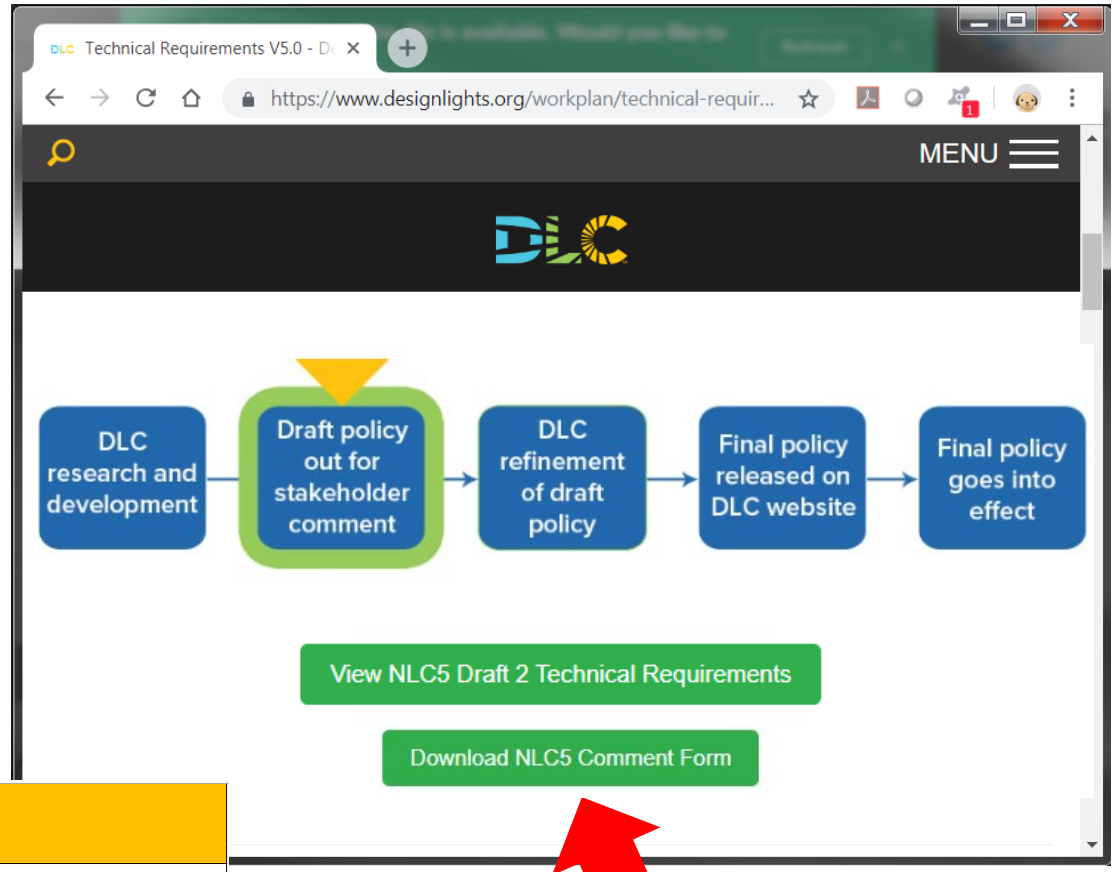

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