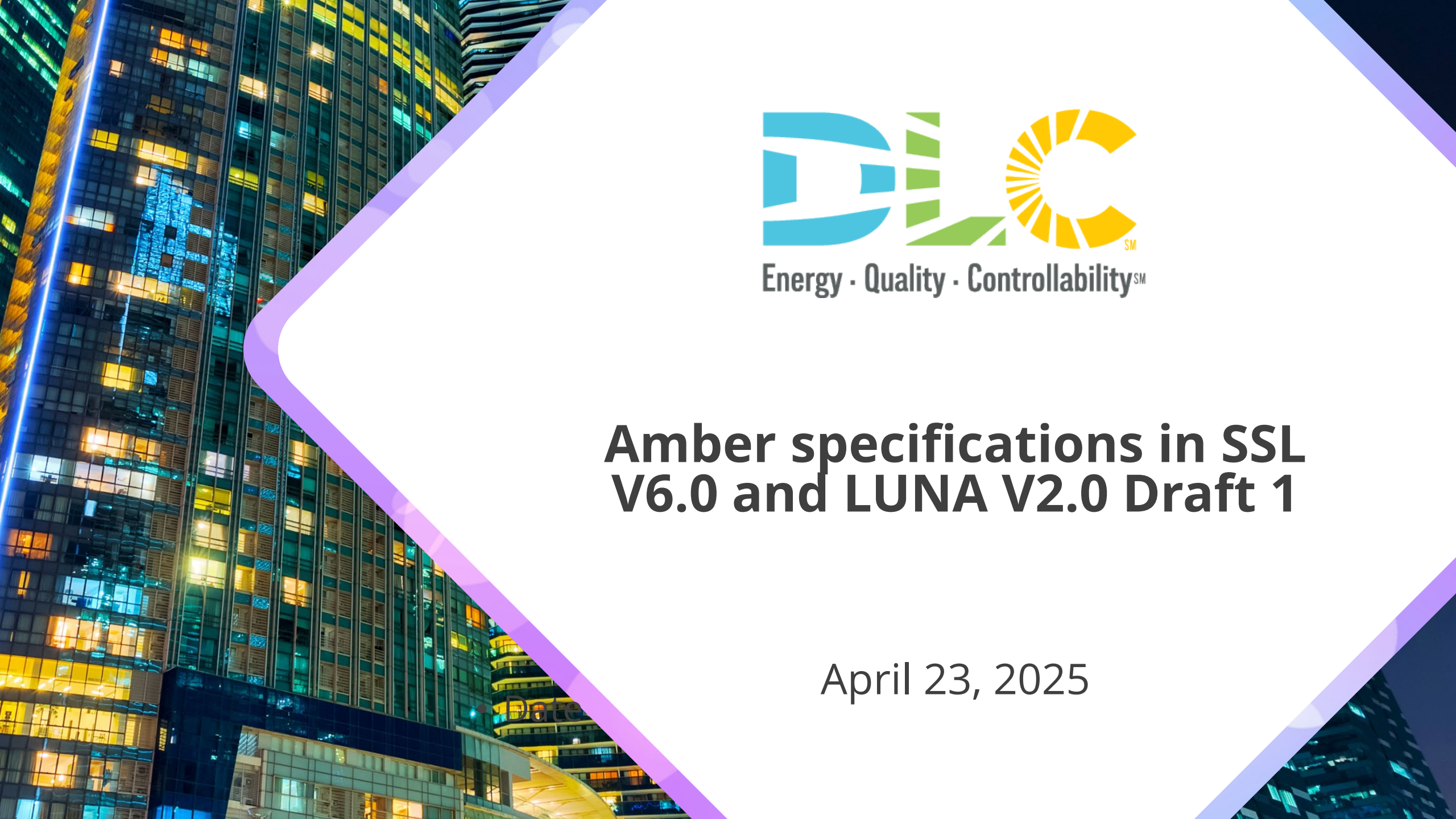


Energy · Quality · Controllability℠

Amber specifications in SSL V6.0 and LUNA V2.0 Draft 1

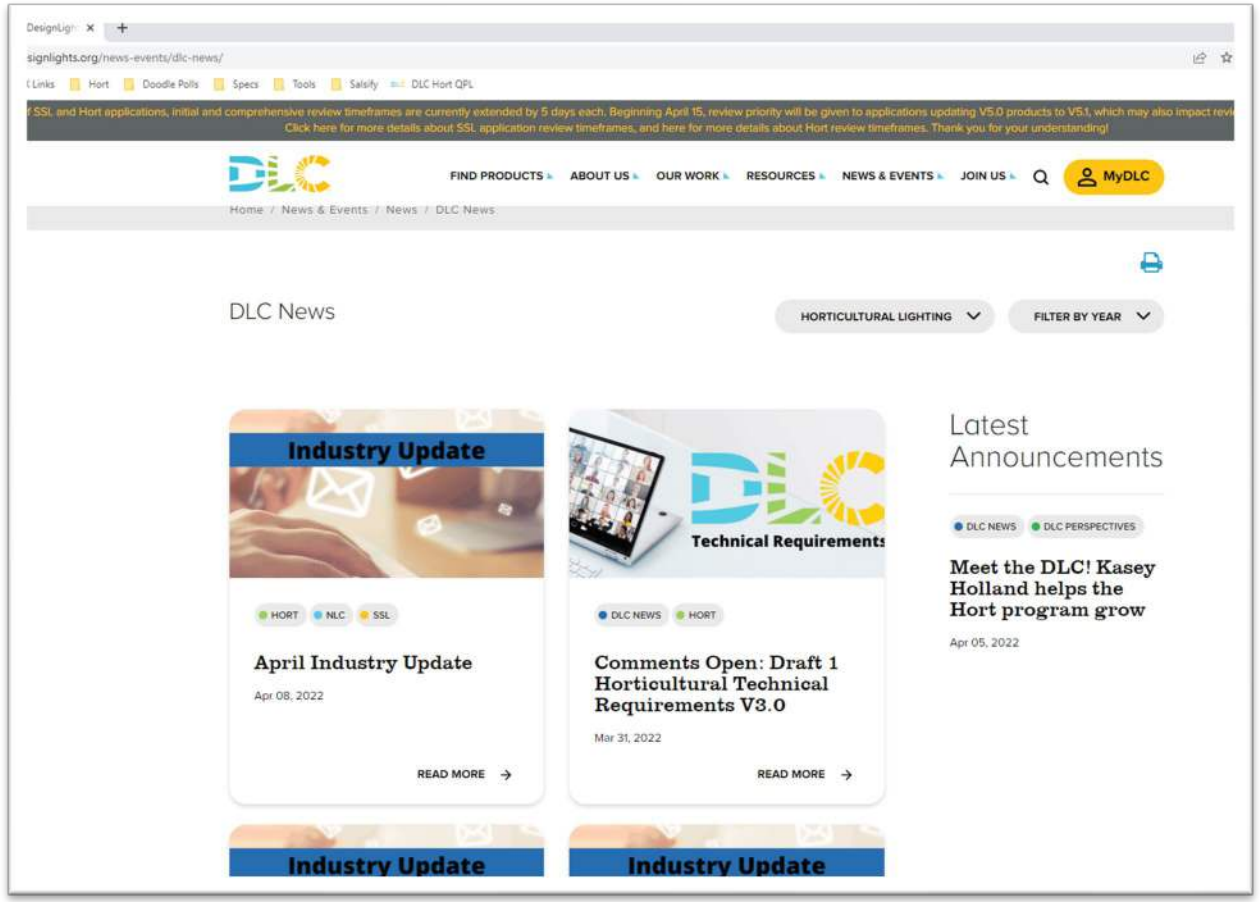
April 23, 2025

Date

Welcome!

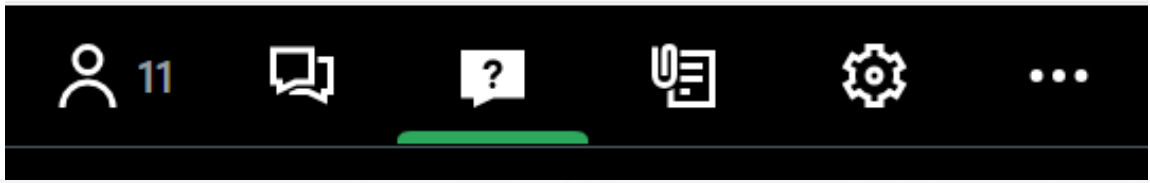
- **Slides and recorded webinar will be posted** on the *DLC News & Events* page at https://designlights.org shortly after today's presentation

- All attendees are automatically muted



Webinar orientation

- **Questions will be held until the end during a live Q&A**
  - **Use the Question pane (not Chat) to submit for Q&A**



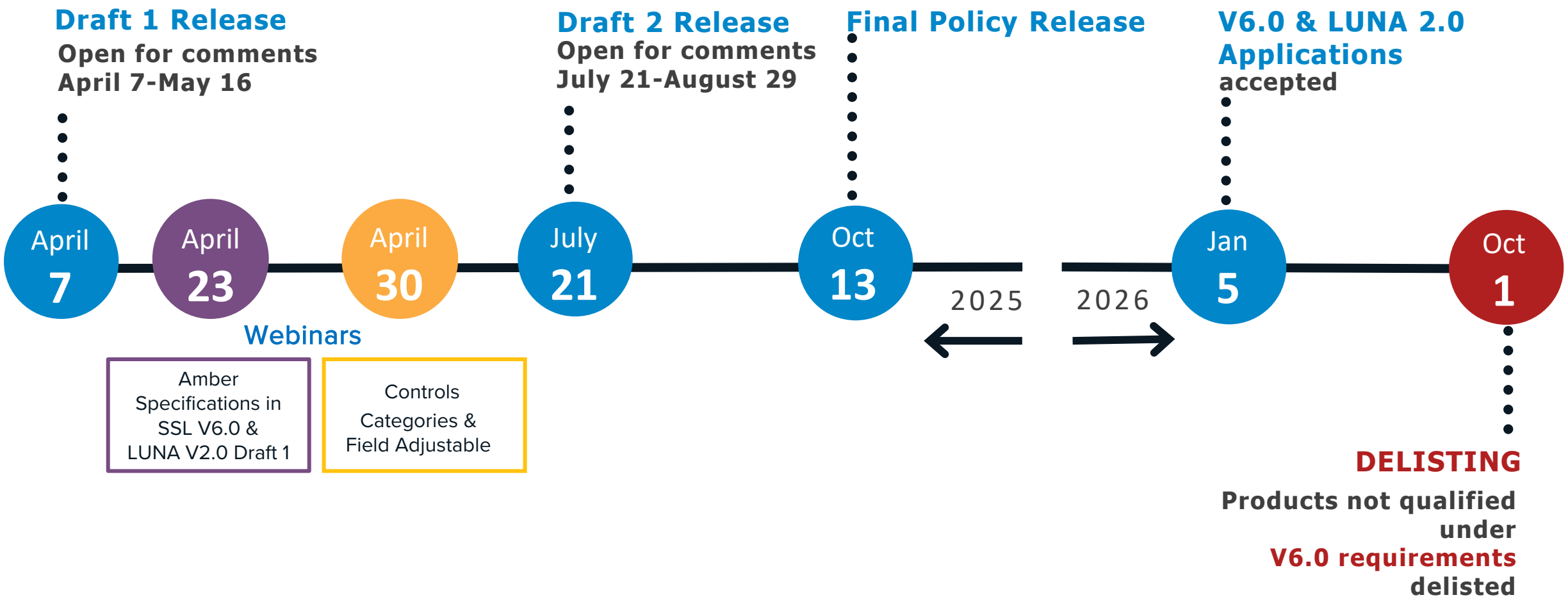
Energy · Quality · Controllability

The DesignLights Consortium is an independent, nonprofit organization providing decision makers with data and resources on quality lighting, controls, and integrated building systems to reduce energy, carbon, and light pollution.

Thank you for being part of our consortium

DLC Stakeholder Input Process

SSL V6.0 & LUNA V2.0 – Release timeline



Agenda

- Non-white light (NWL) products in Draft 1
  - Why is this needed?
  - Standards landscape
  - Amber technology types
  - Product types
  - Tradeoffs
    - Metrics and thresholds
  - Key questions
- LUNA V2.0
  - Rationale and changes
  - Turtle lighting products
  - Key questions

Why would DLC qualify NWL/Amber LED products?

Commercial/industrial value

Reduce sky glow

Environmentally sensitive needs

Standards: Updated ANSI C78.377-2024 contains 1800 K and 2000 K bins

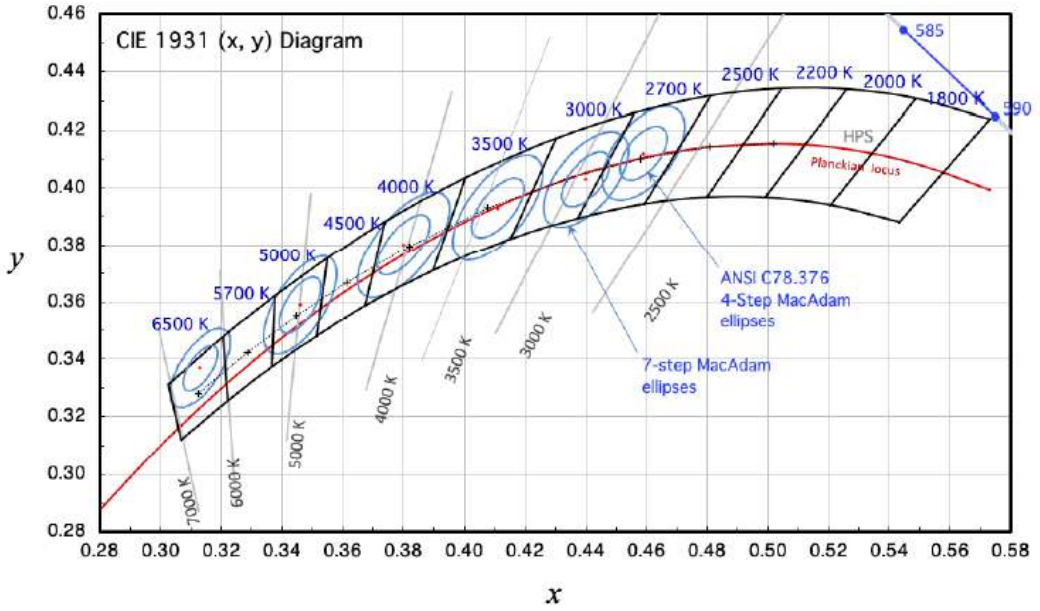
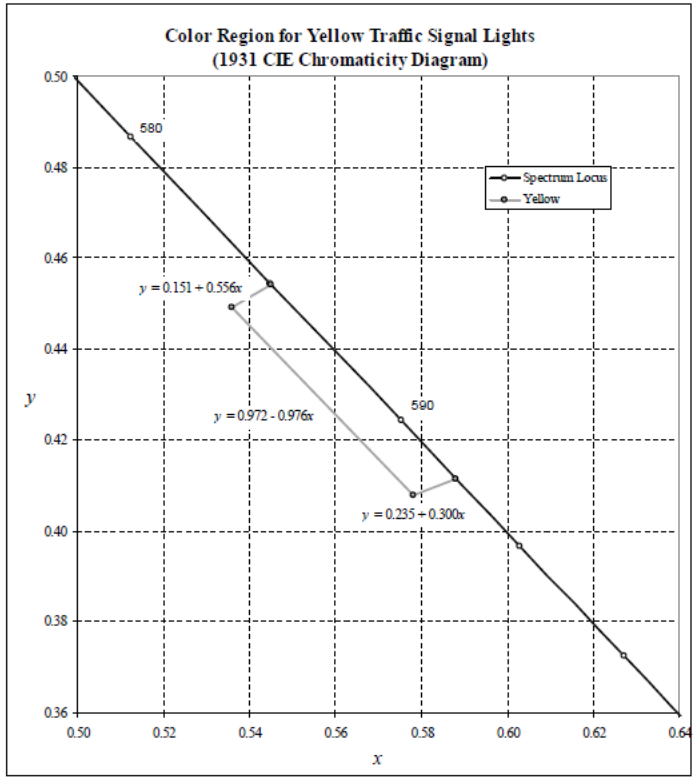


Figure A1 from ANSI C78.377-2024

Standards
Traffic light and vehicle lighting standards

Figure 1 (cont'd)



ST-052-E (2005)
Vehicle Traffic Control Signal Heads:
Light Emitting Diode (LED) Circular Signal Supplement

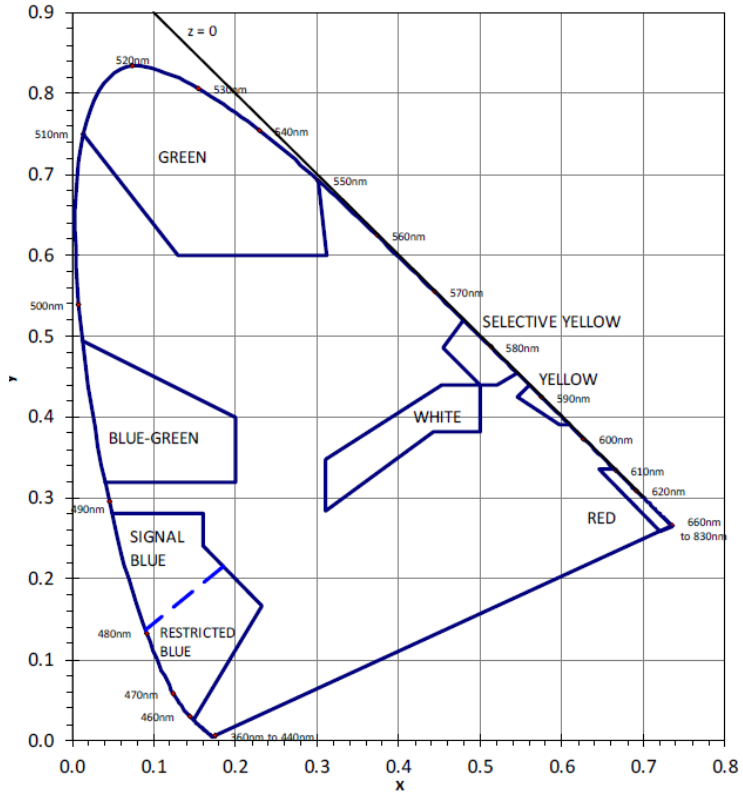


Figure 1 - CIE 1931 chromaticity diagram

SAE J578 (2020)
Chromaticity Requirements for Ground Vehicle
Lamps and Lighting Equipment

DLC definitions for Amber LED technologies

de-Amber

- Chromaticity **outside of** C78.377-2024 quadrangles.
- **Narrowband** SPD with a **dominant wavelength** between 590 – 610 nm and a FWHM (full width at half maximum) of 20 nm or less.
- Zero radiation below 560 nm.

pc-Amber

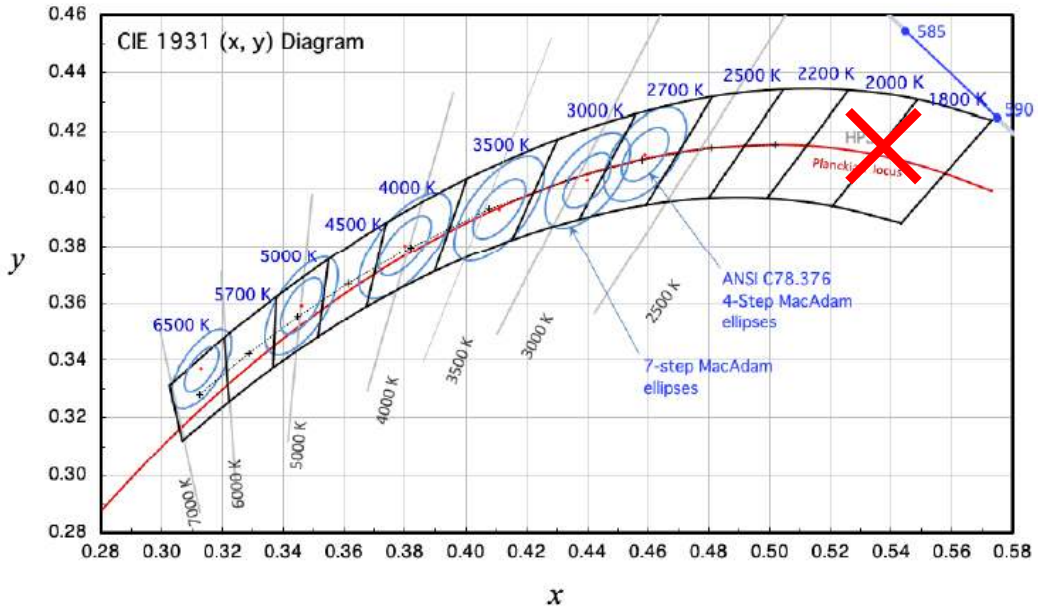
- Chromaticity **outside of** C78.377-2024 chromaticity quadrangles.
- **Broadband** SPD with a **dominant wavelength** between 590 – 600 nm, a FWHM of no more than 80 nm, and a secondary peak of short wavelength radiant power in the blue range.
  - No more than 1% optical radiation below 500 nm.

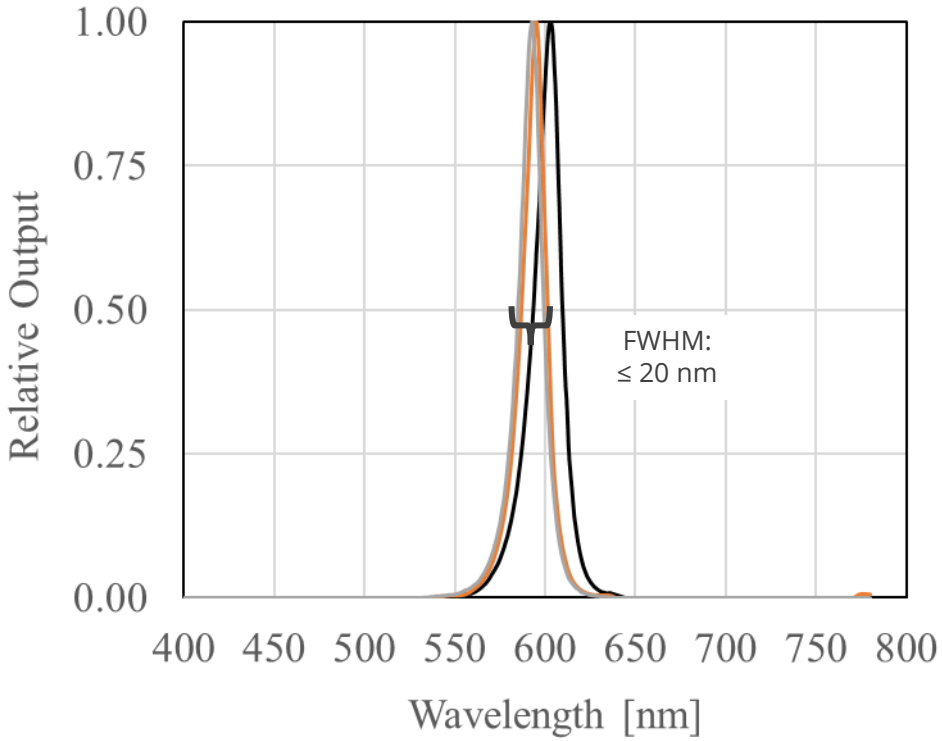
Filtered-Amber

- White LED (2200 K– 5000 K) with **amber filtered lens or optic** that reduces the short wavelength radiation to meet Hawaii and Maui County Code criteria
- No chromaticity requirements except:
- <=2% blue and “traffic color compliant”:
  - Percent (%) blue is defined as the sum of the optical radiation between 400 - 500 nm divided by the sum of the optical radiation between 400 – 700 nm.
  - Traffic color compliant is defined as chromaticity **outside of** ITE Yellow (Amber) (per SAE J578 APR2020).

de-Amber LEDs

Figure A1 from ANSI C78.377-2024

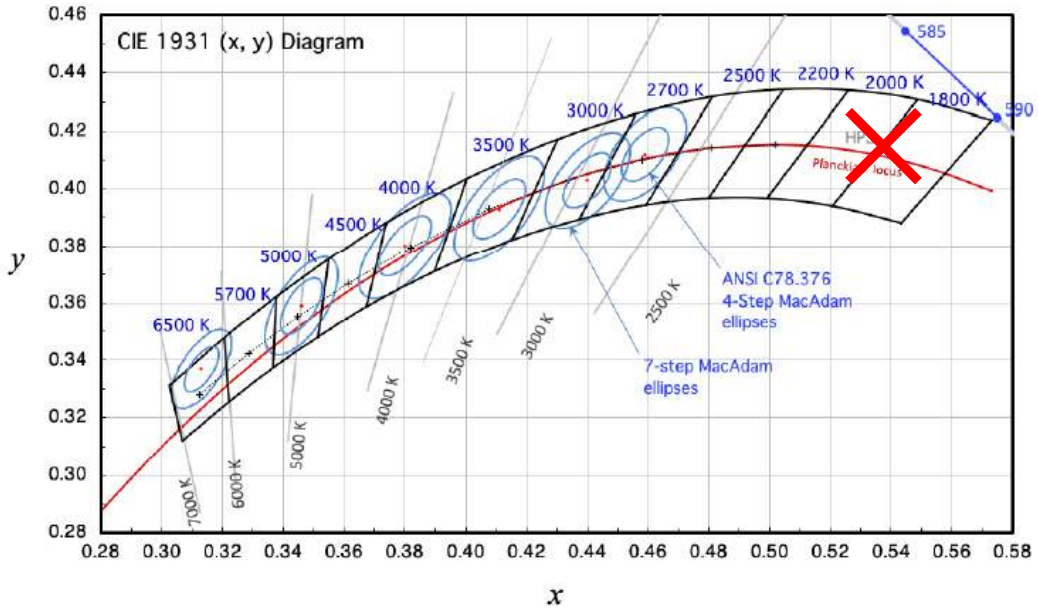


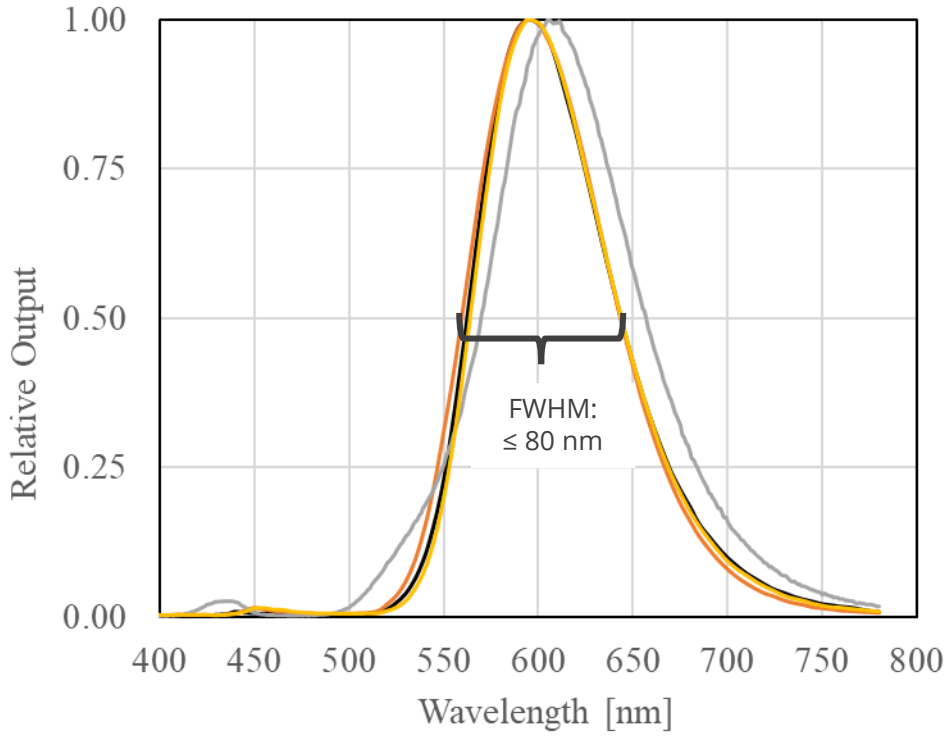


De-Amber LED SPDs

pc-Amber LEDs

Figure A1 from ANSI C78.377-2024



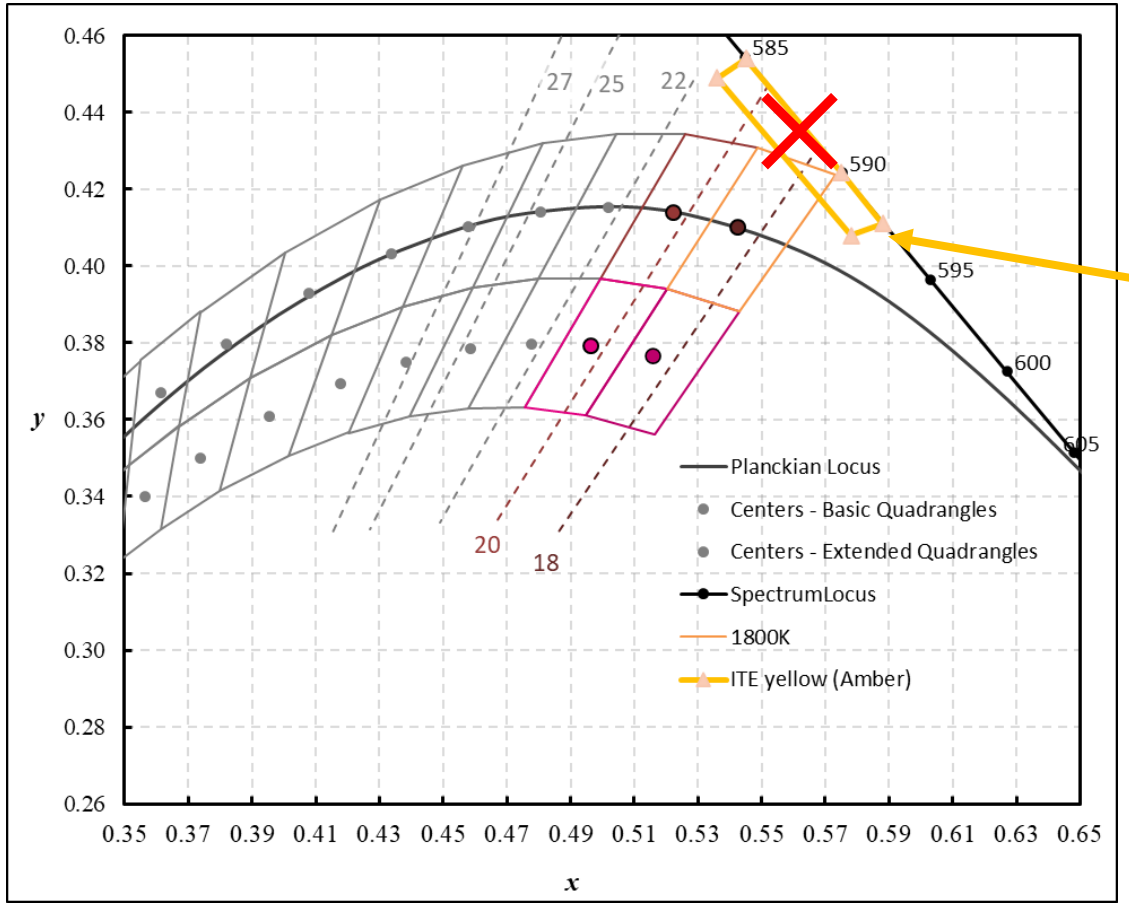


pc-Amber LED SPDs

Filtered-Amber LEDs (LUNA luminaires)

Less than 2% blue

&



Product types (luminaires)

- See Table 11 (pages 37-38)

Table 11: Eligibility by CCT Range and Amber LED Technology for Luminaires and Retrofit Kits

Category	General Application	Primary Use Designation (PUD)	Eligible CCT Range and Amber LED Technologies for DLC Standard Qualification*
Indoor Luminaires	All	All	1800 K – 6500 K de-Amber pc-Amber
Outdoor Luminaires and Outdoor Solar Powered Luminaires	Low Output Mid Output High Output Very High Output	Outdoor Pole/Arm-Mounted Area and Roadway Luminaires	1800 K – 5000 K de-Amber pc-Amber filtered-Amber
		Outdoor Pole/Arm-Mounted Decorative Luminaires	1800 K – 5000 K de-Amber pc-Amber filtered-Amber
		Outdoor Zero-Uplight Wall-Mounted Area Luminaires	1800 K – 5000 K de-Amber pc-Amber filtered-Amber
		Outdoor Uplight-Emitting Wall-Mounted Area Luminaires	2200 K – 5000 K
		Bollards	1800 K – 5000 K de-Amber pc-Amber filtered-Amber
		Parking Garage Luminaires	2200 K – 5000 K
		Fuel Pump Canopy Luminaires	1800 K – 5700 K de-Amber pc-Amber filtered-Amber
		Architectural Flood and Spot Luminaires	2200 K – 5000 K
		Stairwell and Passageway	2200 K – 5000 K
		Sports Flood	2200 K – 5700 K
		Hazardous Environment Area and Roadway Luminaires	1800 K – 5000 K de-Amber pc-Amber filtered-Amber
		Turtle Lighting Zero-Uplight Pole/Arm-Mounted Area and Roadway Luminaires	de-Amber
		Turtle Lighting Zero-Uplight Wall-Mounted Area Luminaires	de-Amber
		Turtle Lighting Zero-Uplight Bollards	de-Amber

Product types (lamps)

- See Table 12 (page 39)

Table 12: Eligibility by CCT Range and Amber LED Technology for Lamps

Category	General Application	Eligible CCT Range and Amber LED Technologies for DLC Standard Qualification*
Linear Replacement Lamps	All	1800 K – 6500 K de-Amber pc-Amber
Mogul Screw-Base (E39/E40) Replacements for HID Lamps	Outdoor: Low Output	1800 K – 5000 K de-Amber pc-Amber
	Outdoor: Mid Output	1800 K – 5000 K de-Amber pc-Amber
	Outdoor: High Output	1800 K – 5000 K de-Amber pc-Amber
	Outdoor: Very High Output	1800 K – 5000 K de-Amber pc-Amber
	High-Bay	1800 K – 6500 K de-Amber pc-Amber
	Low-Bay	1800 K – 6500 K de-Amber pc-Amber
Four Pin-Base Replacement Lamps for CFLs	All	1800 K – 6500 K

* Outdoor NWL (pc-Amber, de-Amber and filtered-Amber, 1800 K, and 2000 K) products must meet both SSL V6.0 and LUNA V2.0 requirements to be listed.


energy efficiency
lighting quality
NWL
TRADE OFFS
light pollution mitigation

Efficacy tradeoffs

- Efficacies are increasing for all product types in V6.0, but low CCT allowances are increasing
- 1800 K and 2000 K products are not eligible for Premium in V6.0

Table 37: Allowances to Efficacy

Feature	General Application	Performance Metric	Allowance under V6.0
Low CCT	All	≤ 2700 K	-8%
		≤ 2200 K	-10%
		≤ 2000 K	-20%
		≤ 1800 K	-25%

Efficacy tradeoffs

- Lower efficacy thresholds for amber products
  - Thresholds represent median luminaire efficacy among commercial products
  - Not PUD specific in Draft 1
  - not eligible for Premium in V6.0

Table 7: Proposed Efficacy Requirements for all Amber LED Products

Amber LED Technology	DLC Standard Minimum Efficacy (lm/W)
de-Amber	30
pc-Amber	70
Filtered Amber	95

Lumen maintenance tradeoffs

- Proposed lower lumen maintenance thresholds for NWL products are lower
  - not eligible for Premium in V6.0

Table 28: Proposed Lumen Maintenance and Driver Lifetime Requirements for DLC Standard and DLC Premium

Metric	DLC Standard	DLC Premium
Lumen Maintenance	2200 K – 6500 K: L70 ≥ 50,000 hours De-Amber, pc-Amber, 1800 K-2000 K: L70 ≥ 36,000 hours	(In addition to L70 thresholds) 2200 K – 6500 K: L90 ≥ 36,000 hours de-Amber, pc-Amber, 1800 K-2000 K: not eligible for Premium
Driver Lifetime	≥ 50,000 hours	

Color rendering and color maintenance tradeoffs

- Proposed color rendering requirements for NWL products
  - No thresholds in V6.0
  - Have to report performance
- Proposed color maintenance reporting for NWL products
  - No thresholds in V6.0
  - Have to report performance

Key questions

Key Questions Regarding Quality of Light Proposals

1. The DLC is proposing to specify which outdoor products are required to be tested for Distribution Reports (i.e., products with CCTs at 3000 K and with the highest light output within a family). What feedback, if any, do you have about this proposal?
2. The DLC is proposing to deprecate the use of the term "cutoff" in its PUD nomenclature (PUD letters C & D) and use Zero-Uplight and Uplight-Emitting terms instead. What feedback, if any, do you have about this proposal?
3. The DLC is also proposing changing the zonal lumen requirements for PUD letters C & D to more effectively limit uplight and reduce wasted light and wasted energy. What feedback, if any, do you have about this proposal?
4. The DLC is proposing minimum light output requirements for three new Turtle Lighting PUDs. Are there any concerns with the proposed thresholds?
5. The DLC is proposing to no longer require UGR (tabular) thresholds for Linear Ambient, High-Bay and Low-Bay PUDs qualified to Premium. What, if any, concerns do you have about this proposal?
6. The DLC is proposing to require reporting of CS4 and CS7 color maintenance values per ANSI/IES TM-35-19 as a way to transition away from a custom color maintenance evaluation process previously developed by the DLC. What feedback, if any, do you have about this proposal?
7. Some product categories/types do not allow Amber or 1800 K/2000 K options. What is your feedback on this limitation?

LUNA V2.0 changes

LUNA V2.0:

Details in Table 32 and 34

Requirement

Expand product eligibility and simplify testing and controls requirements

Goals

Support adoption of high-quality, energy-efficient lighting that mitigates light pollution

DLC LUNA™

Expanding product eligibility in LUNA V2.0

Lamps

image courtesy of Current

Retrofit Kits

Selectable CCT

image courtesy of Current

LUNA V2.0 Lamp and retrofit kits

- New LUNA-eligible PUDs in Table 33 (page 107)
- Maximum U Rating
- Maximum light output

Primary Use Letter	Primary Use Designations (PUDs) Eligible for LUNA Qualification	Maximum U Rating Threshold	Maximum Light Output (lumens)
Y	Retrofit Kits for Outdoor Pole/Arm-Mounted Area and Roadway Luminaires	1	10,000
Z	Retrofit Kits for Outdoor Pole/Arm-Mounted Decorative Luminaires	2	10,000
AA	Retrofit Kits for Large Outdoor Pole/Arm Mounted Area and Roadway Luminaires	1	10,000
AB	Retrofit Kits for Zero-Uplight Outdoor Wall Mounted Area Luminaires	1	10,000
AD	Retrofit Kits for Fuel Pump Canopy Luminaires	2	10,000
AQ	Screw-Base Replacements for HID Lamps in Outdoor Pole/Arm-mounted Area and Roadway Luminaires	1 (in-luminaire)	10,000 (in luminaire)
AR	Screw-Base Replacements for HID Lamps in Outdoor Zero-Uplight Wall-mounted Area Luminaires	1 (in luminaire)	10,000 (in luminaire)
AU	Screw-Base Replacements for HID Lamps in Fuel Pump Canopy Luminaires	2 (in luminaire)	10,000 (in luminaire)
BG	Turtle Lighting Zero-Uplight Pole/Arm-Mounted Area and Roadway Luminaires	0	5000
BH	Turtle Lighting Zero-Uplight Wall-Mounted Area Luminaires	0	1500
BI	Turtle Lighting Zero-Uplight Bollards	0	1000

Turtle Lighting

Must meet LUNA V2.0 requirements

Turtle Lighting Criteria

- Maximum light output
- Zero uplight
- De-Amber LEDs
- Limit on high angle light

Turtle Lighting criteria

- Table 35 (page 114):

Primary Use Letter	Primary Use Designation	Maximum Light Output (lm)	Amber LED type	Maximum U Rating	Maximum G Rating
BG	Turtle Lighting Zero-Uplight Pole/Arm-Mounted Area and Roadway Luminaires	5000	de-Amber	U0	G1
BH	Turtle Lighting Zero-Uplight Wall-mounted Area Luminaires	1500	de-Amber	U0	G0
BI	Turtle Lighting Zero-Uplight Bollards	1000	de-Amber	U0	G0


LUNA Pre-submission Tool
Upload IES file or SPDX document
Click on the upload IES or SPDX button below to select one .ies file or .spdx document. After uploading, you will see the validation results on the next screen. If the file has validation errors, you will be informed of errors that need to be resolved prior to re-uploading the file. If the file has no errors, you will be able to view and download the generated .png image for use in the LUNA application.
UPLOAD IES OR SPDX
Calculate additional metrics for LUNA products:
• percent blue
• traffic color
compliance

Simplifying LUNA testing requirements

LUNA V1

LM-79 color testing:

Max and min CCT
at highest light output

LM-79 distribution testing:

Each unique optic:
Max CCT at highest light output

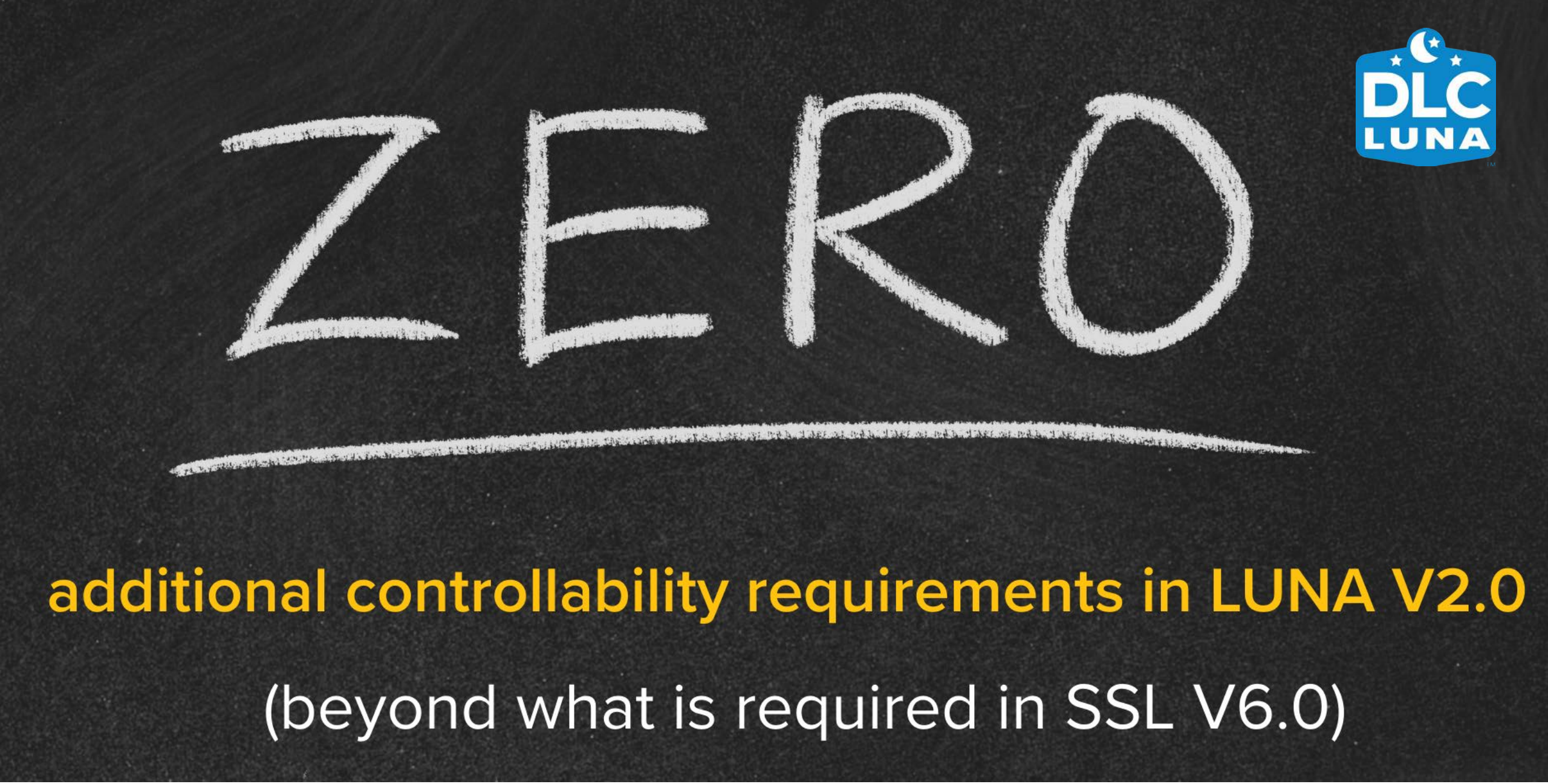
LUNA V2

LM-79 color testing:

Max & min CCT and Amber
at **any light output**

LM-79 distribution testing:

Each unique optic:
Max CCT and Amber at highest light output



additional controllability requirements in LUNA V2.0

(beyond what is required in SSL V6.0)

New metrics displayed on QPL

For all Amber LED products:

- Nomenclature (de-Amber, pc-Amber, Filtered-Amber)
- Dominant wavelength
- Chromaticity coordinates from LM-79 report listed as Test Data
- Nomenclature listed for child products

Additional metrics for LUNA-listed outdoor parent products (using the LUNA pre-submission tool)

- % blue
- traffic color compliance
- Hawaii code compliance

Key questions in LUNA V2.0 Draft 1

Key Questions on LUNA V2.0 Spectral Quality Requirements

1. Draft 1 proposes to limit the maximum CCT for outdoor lamps and retrofit kits to 2700 K (instead of 3000 K) for these products to qualify to LUNA. Is there any concern with this proposed requirement?
2. Is there a concern with allowing products with field adjustable CCTs above 3000 K (2700 K for lamps and retrofit kits) to be LUNA listed, as long as the product is shipped with the CCT set at a LUNA qualifying CCT level?
3. Recent research has demonstrated that S/P ratio is a better predictor of Sky Glow than CCT. Is there a benefit to the DLC showing product S/P ratios on the LUNA QPL? What feedback, if any, do you have regarding displaying S/P ratios on the LUNA QPL?

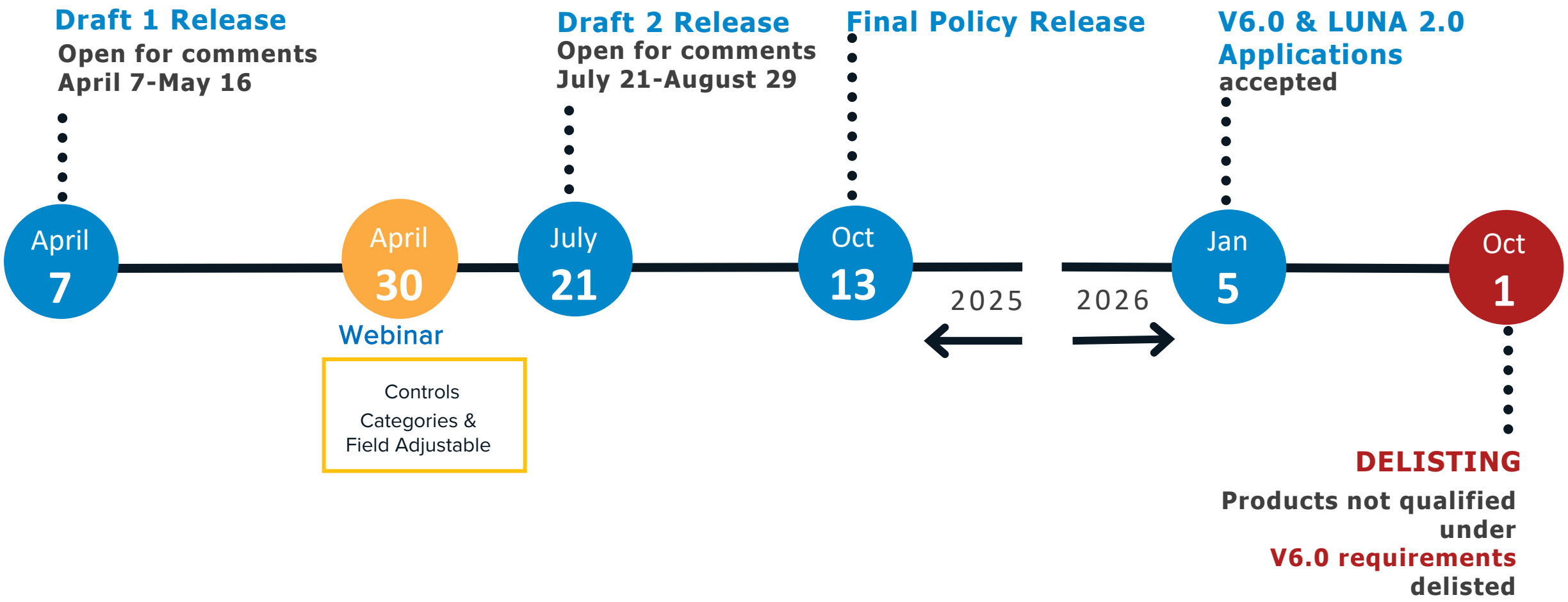
Key Questions for Proposed LUNA Turtle Lighting PUDs

1. What is your feedback on the proposed maximum light output requirements?
2. What is your feedback on the proposed use of G-Rating thresholds? Should the DLC specify a limit on high angle light instead (for example, by specifying % lumens in the FVH and BVH zones)?
3. Are there any missing Turtle Lighting PUDs that the DLC should consider adding?
4. What is your feedback on the DLC's proposal to disallow other direct emission long-wavelength LEDs (such as red-orange LEDs) to be included in Turtle Lighting products in LUNA V2.0?
5. Solar powered Turtle Lighting PUDs will be allowed in this proposal. What is your feedback on allowing solar powered Turtle Lighting PUDs?

Q&A

Wrap Up

SSL V6.0 & LUNA V2.0 – Release timeline



Thank you for attending the Amber specifications in SSL V6.0 & LUNA V2.0 webinar!


Make your comments count!