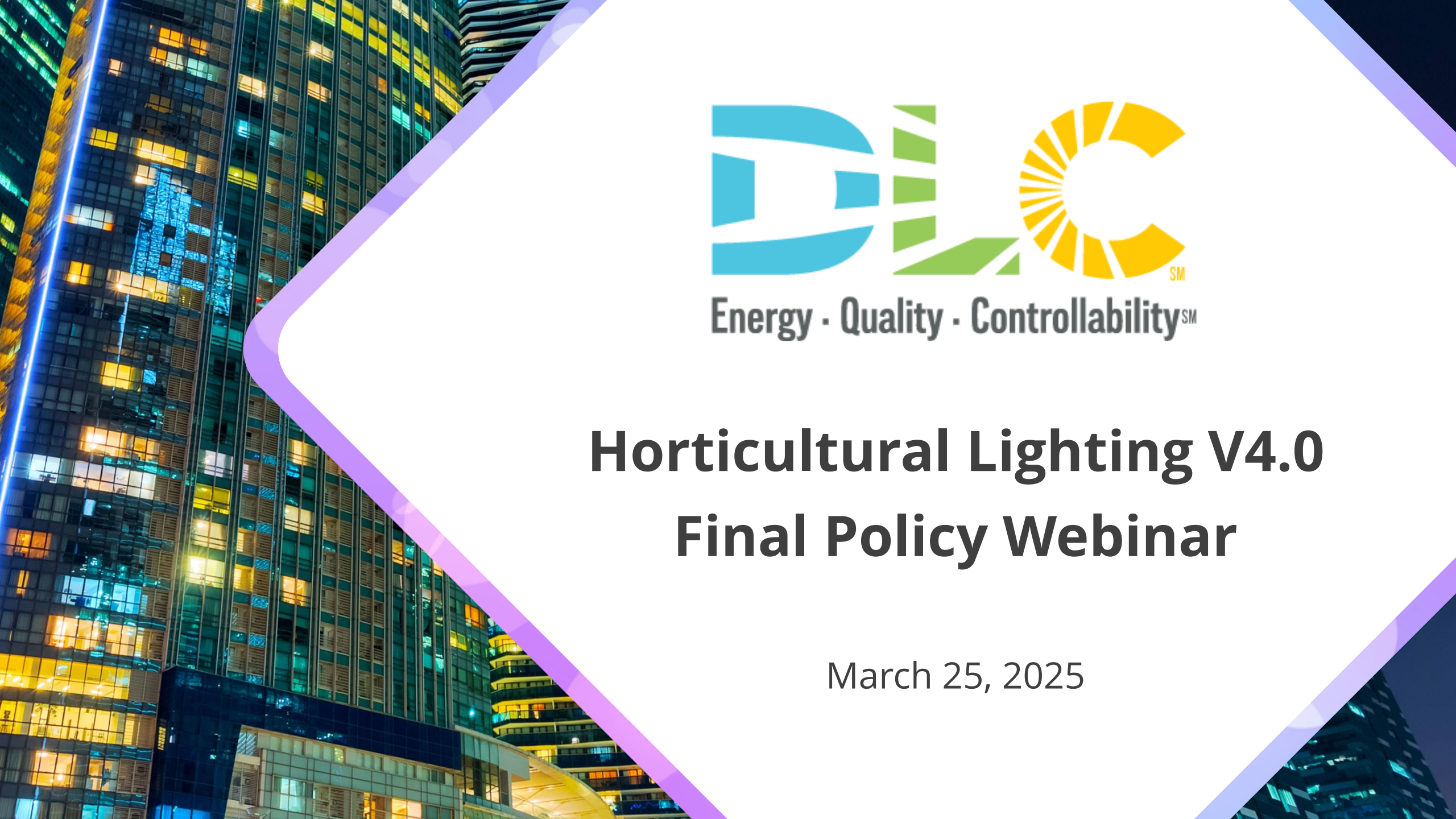


Energy · Quality · Controllability℠

Horticultural Lighting V4.0 Final Policy Webinar

March 25, 2025

Agenda

- Introduction
- Webinar Logistics
- V4.0 Overview and Timeline
- V4.0 Requirements
- V4.0 Fees
- Hort Operations V4.0
- Q&A

Introductions

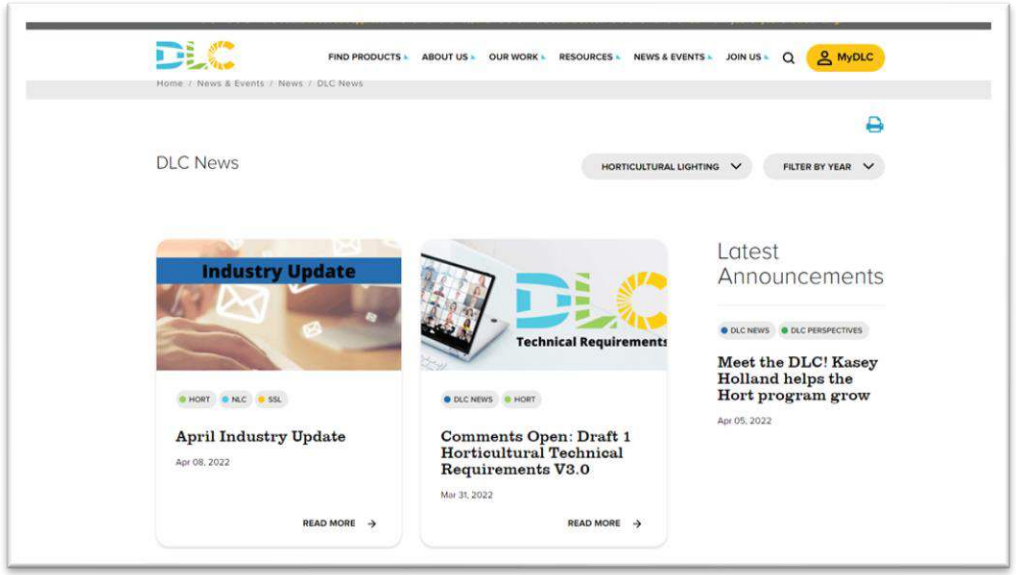
Presenters & Q&A Support

Kasey Holland
Technical Manager (Hort & SSL)

Aaron Feldman
Associate Director of Operations

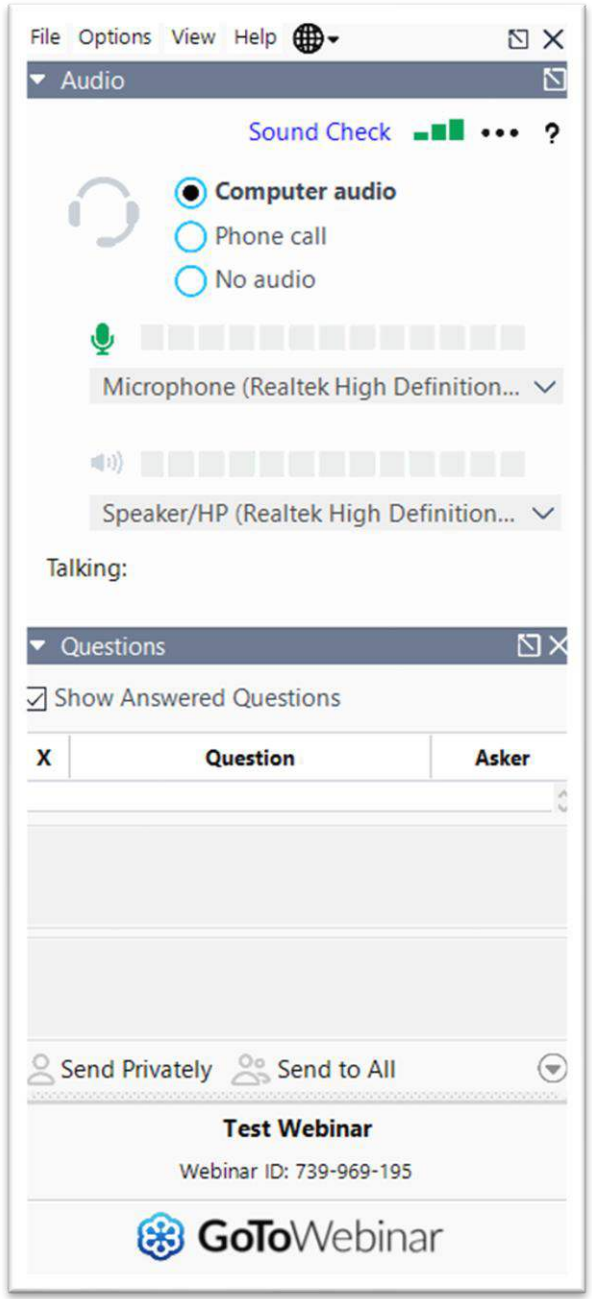
Webinar Logistics

- **Slides and recorded webinar will be posted** on the *DLC News & Events* page at www.designlights.org shortly after today's presentation
- All attendees are automatically muted
  - If you experience technical issues, please use the Chat feature to let us know



Questions and Answers

- We will leave **15 minutes** after the presentation to answer questions. Please enter your Questions pane in GoToWebinar.
  - DLC technical and applications teams will answer questions as they come in via the Questions pane
  - Some questions will be answered aloud (anonymously) at the end during the Q&A session



V4.0 Overview and Timeline

Hort Technical Requirements Goals

Accelerate adoption of energy efficient lighting in CEA

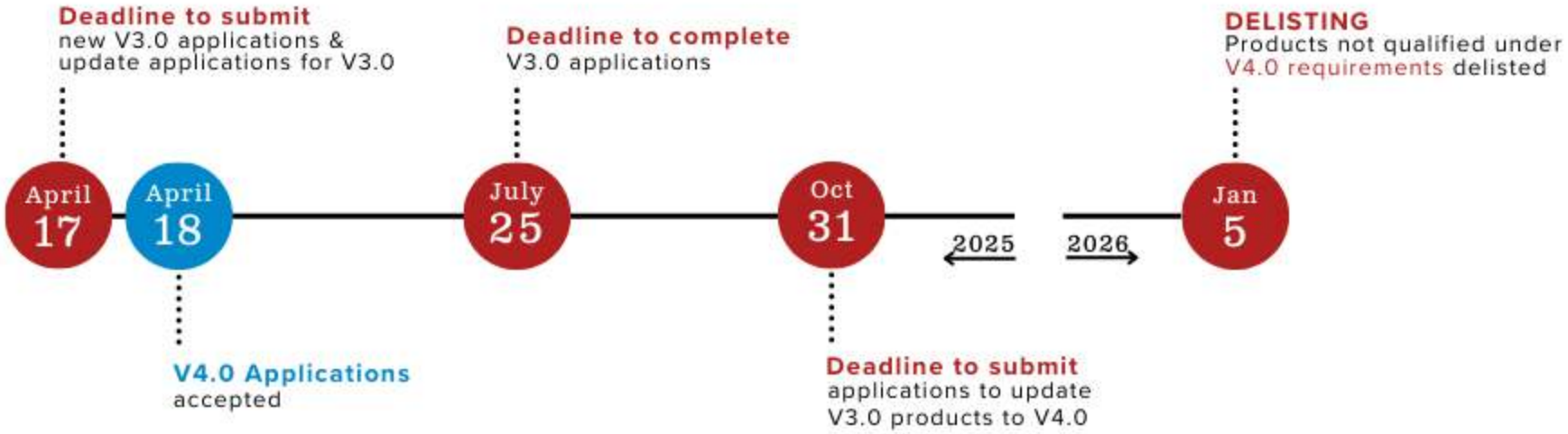
Support efficiency programs and aid end users using the QPL to identify and select products that are eligible for rebates

Protect the integrity and value of the QPL for all stakeholders

Hort Version 4.0

- Version 4.0 is a major revision that includes a few key updates
  - Increases the Efficacy Threshold (PPE)
  - Removal of All Lamp Categories
  - Clarifications/Enhancements to existing technical requirements
    - Spectrally Tunable
    - Dynamically Configurable vs DC-Powered
    - LM-80 applicability and more

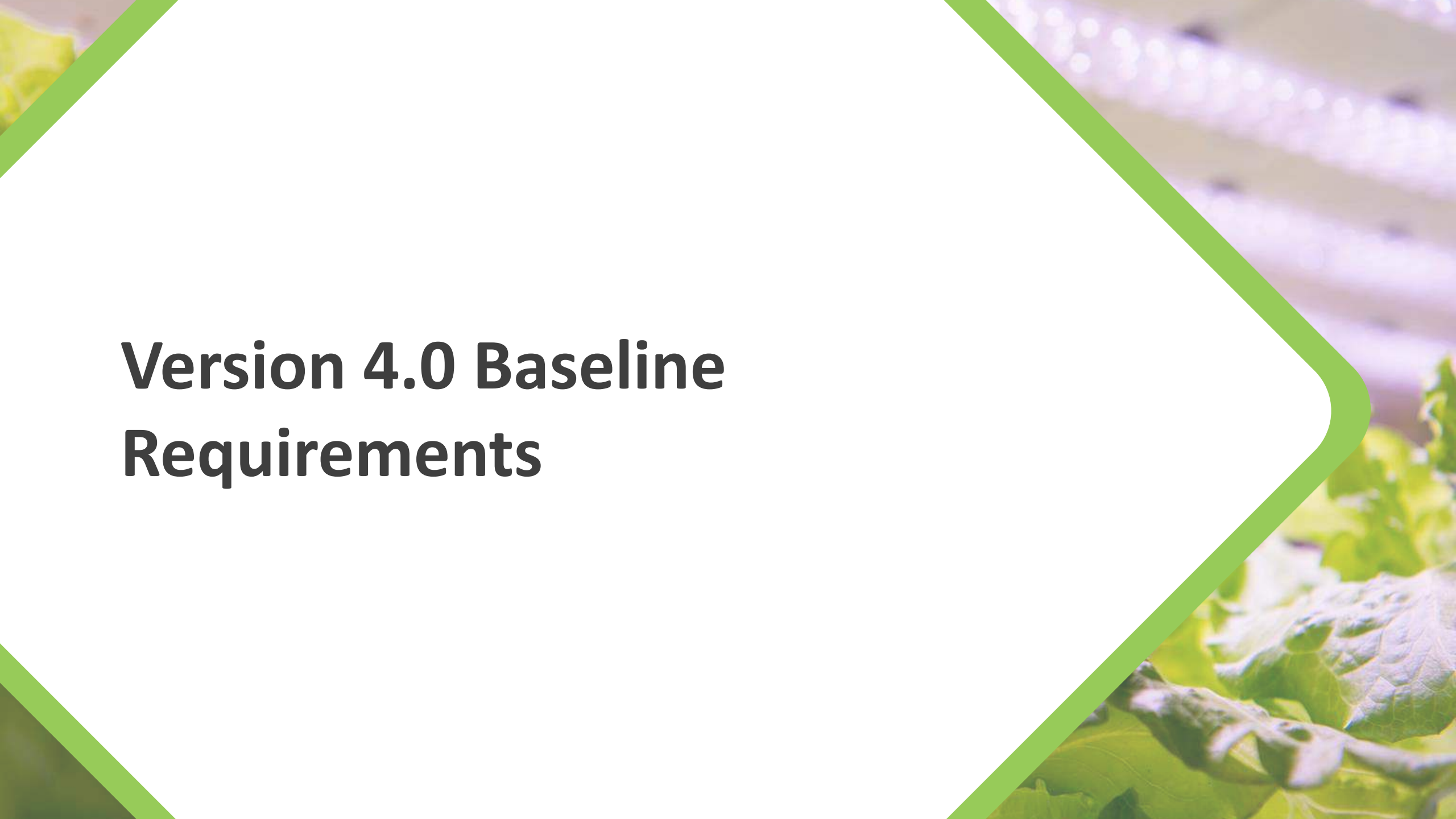
Hort Version 4 Timeline



Version 4.0 Details

- PPE Increase to delist the bottom 15%
- Color Tuning clarifications
- Flexible pathways for Dynamically Configurable products
- Removal of Lamp pathways

Version 4.0 Baseline Requirements



Standard Requirements

V4.0 requirements for Hort QPL listed products include

- Safety Certification
- *Warranty*
- Long-term Performance
- Power Quality
- **Efficacy**

Photosynthetic Photon Efficacy[1,2] (K_P or PPE) (µmol x J^{-1})	≥2.5 µmol x J^{-1}	Required/ Threshold	(ANSI/IES LM-79) 400-700 nm range

Parameter/Attribute/Metric	Requirement	Requirement Type	Method of Measurement/Evaluation
Photon Flux Maintenance, Photosynthetic (PFM_P)	Q_{90} ≥36,000 hours	Required/ Threshold	(ANSI/IES LM-80 / IES TM-21 or IES LM-84 / IES TM-28) 400-700nm range, fixture technical specification sheet, and *In-Situ Temperature Measurement Test* (ISTMT)
Photon Flux Maintenance, Far-Red (PFM_{FR})	Report time to Q_{90}	Reported	(ANSI/IES LM-80 / IES TM-21 or IES LM-84 / IES TM-28) 700-800nm range
Driver Lifetime	≥50,000 hours	Required/ Threshold	Driver technical specification sheet, fixture technical specification sheet, and *In-Situ Temperature Measurement Test* (ISTMT)
Fan Lifetime	≥50,000 hours	Required/ Threshold	Fan technical specification sheet, fixture technical specification sheet
Warranty	Fixtures: ≥5 years ~~Lamps: ≥3 years~~	Required/ Threshold	Legal warranty terms & conditions
Power Factor (PF)	≥0.9	Required/ Threshold	Benchtop electrical testing or ANSI/IES LM-79
Total Harmonic Distortion, Current (THDi)	≤20%	Required/ Threshold	Benchtop electrical testing or ANSI/IES LM-79
Safety Certification	Horticultural Lighting designation by OSHA NRTL or SCC-recognized body	Required/ Threshold	ANSI/UL 8800 (ANSI/CAN/UL 8800)

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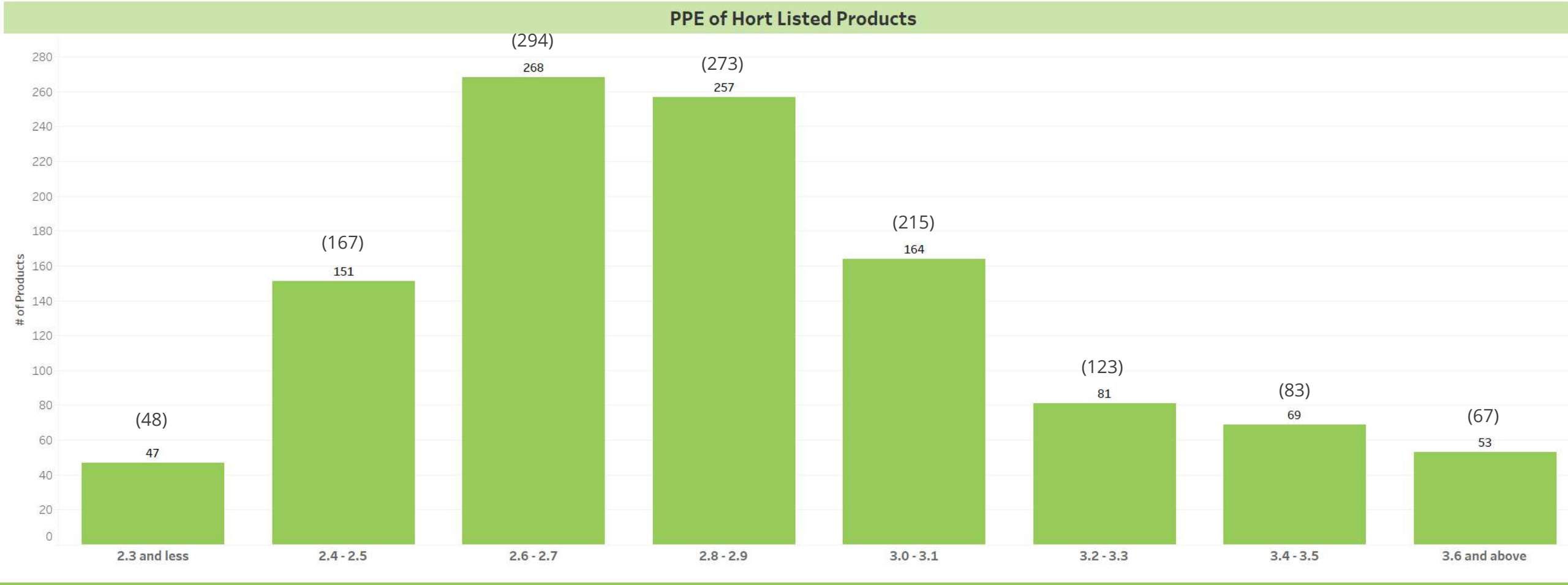
Version 4.0's efficacy increase

To accelerate EE in CEA, the DLC's Hort Program follows a **Major Revision every 2 years** to drive energy efficient lighting in CEA by increasing PPE **to delist the bottom 15% of listed products**

Version 3.0 Efficacy:
2.3 µmol/J

Version 4.0 Efficacy:
2.5 µmol/J

Version 4.0's efficacy increase



The PPE increase corresponds to the bottom 15% of listed products

Removal of Lamp Eligibility

Removal of Lamp Eligibility

V2.1 introduced pathways to qualify two types of horticultural lamps:

LED replacements for linear fluorescent lamps and LED replacements for mogul-based HID lamps

V4 removes the eligibility pathways for all types of horticultural lamps

Dynamically Configurable Pathways

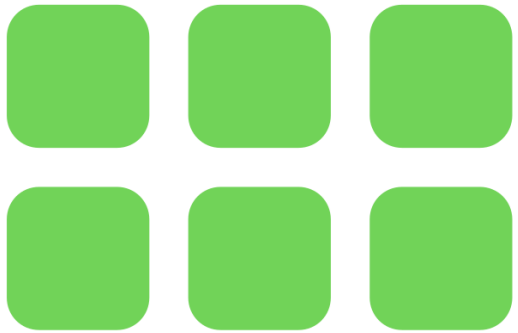
Dynamically Configurable Listing Pathways

V2.1 introduced pathways to list DC-powered products and dynamically configurable lighting products based on the underlying DC-power modules (light bars)

V4 relaxes requirements on dynamically configurable lighting products being developed and sold as a single AC-powered fixture to allow qualification as AC-powered or DC-powered

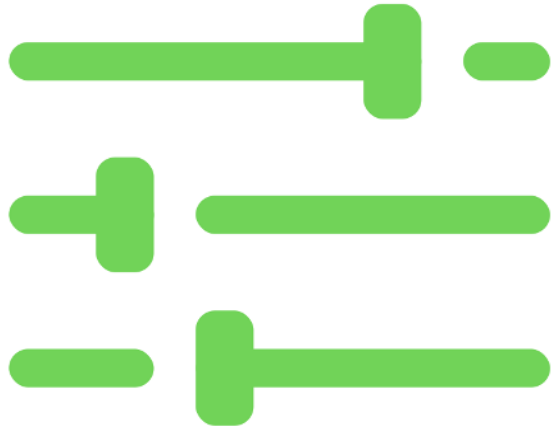
Spectral Tuning Clarifications

Spectral Tuning Clarification



Predefined Spectra

Tuning within a set of predefined spectral options



Customizable Spectra

Precise and dynamic control over the spectral output

These changes will improve application efficiency and do not require any new testing on spectrally tunable products compared to V3.0

Additional Clarification/Enhancements

Add'l Clarification/Enhancements

- Introduces a +/- 15 nm limit between two distinct colors for LM-80 applicability claims
  - "distinct colors" as defined by the LED manufacturer.
  - Does not restrict LM-80 applicability claims based on manufacturing tolerances or binning options
- Supports latest revisions to industry standards
  - e.g. ANSI/IES LM-79-21 or ANSI/IES TM-33-23
- Corrected language for THD_i

V4.0 Recap

Hort Version 4.0 Recap

- Version 4.0 is a major revision that includes a few key updates
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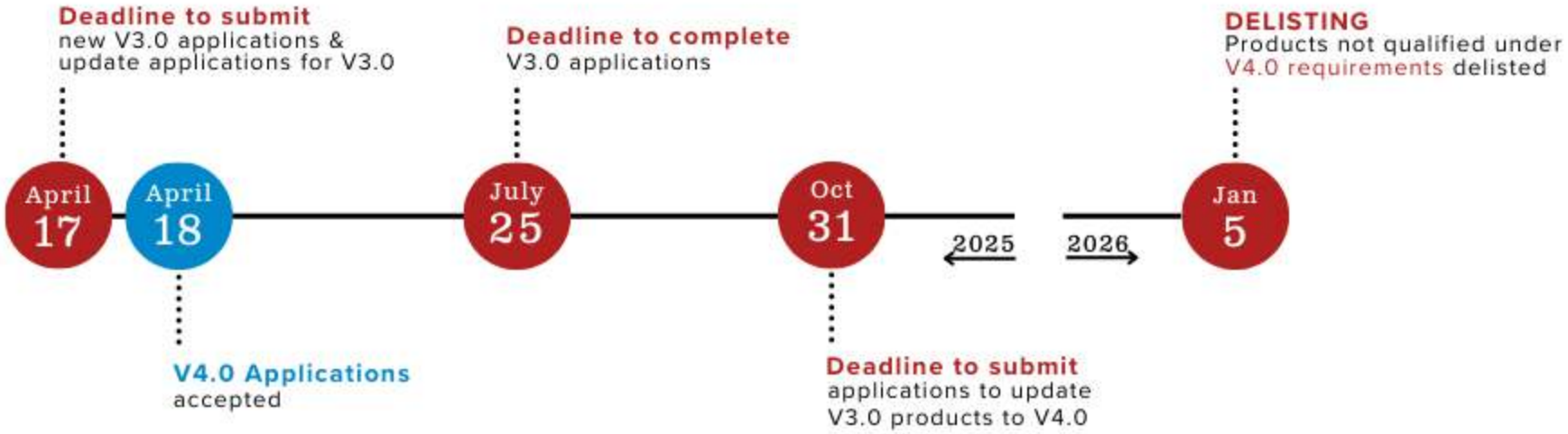
Hort Version 4 Timeline



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V4.0 Fees

V4.0 Fees

Update Application (including Private Label updates)	Through April 17, 2025	Effective April 18, 2025
Performance-affecting updates (per parent product)	$750	$850
– Additional* LED type	$115	$150
– Additional* driver	$105	$105
– Internal fan	$45	$45
– Spectral tuning (per channel) per worst-case efficacy parent product	$125	$150
– Active cooling per application	$175	$175
Performance-affecting updates (per child product)	$35	$35
Additional child product added to family	$35	$35
Non-performance-affecting updates (per family)	$500	$500
TM-33 document review	$100	$100
Nomenclature updates	No fee	No fee

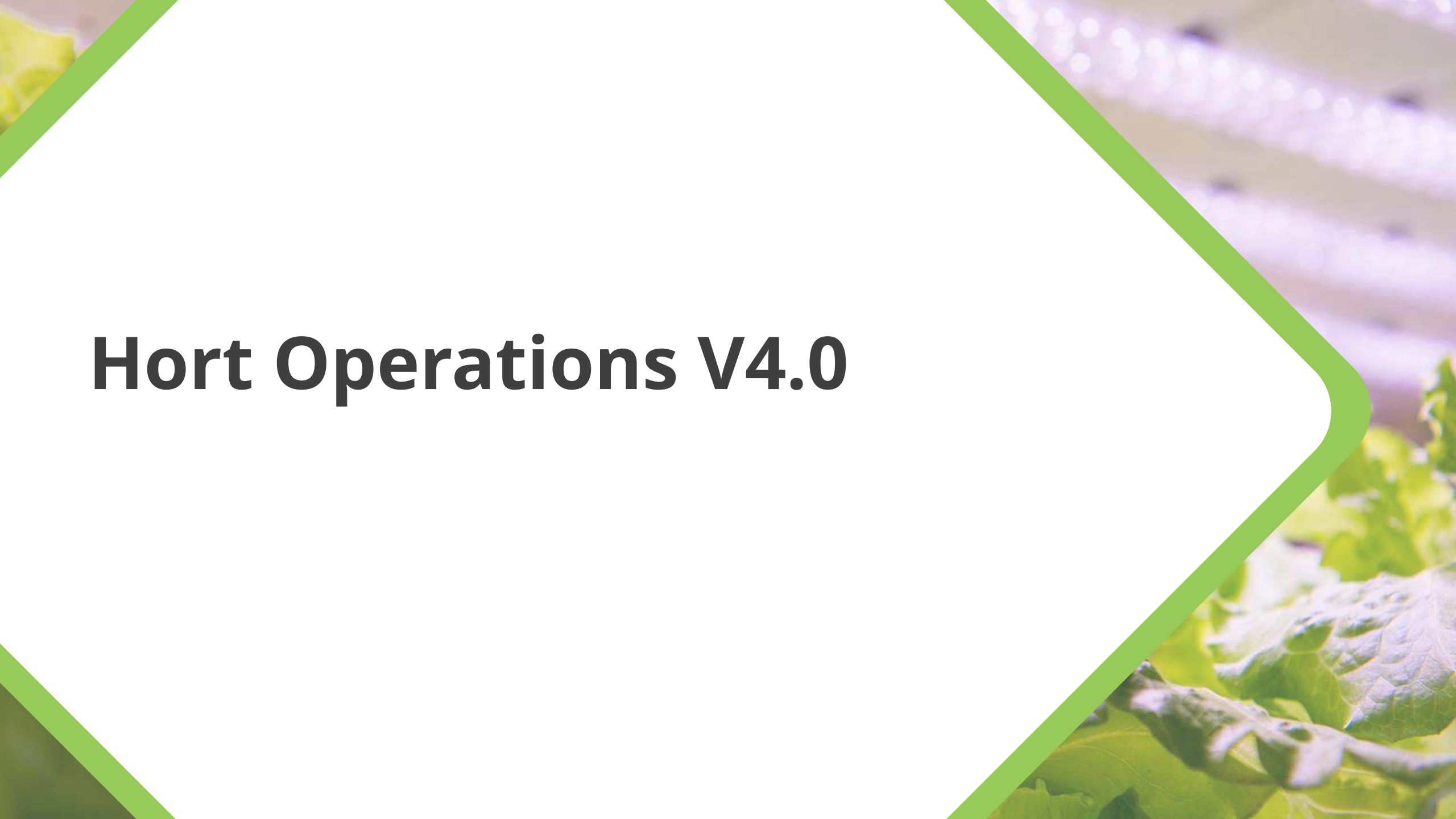
V4.0 Fees

Private Label Applications	Through April 17, 2025	Effective April 18, 2025
Application fee for each parent* within an application	$750	$850
Each additional family member (child product) in the Level 2 application	$35	$35

V4.0 Fees

Level 1 and Level 2 Applications	Through April 17, 2025	Effective April 18, 2025
Each parent product*	$1000	$1150
Additional* LED type included in fixture (Q_{90} verification)	$115	$150
Additional** driver available in fixture (lifetime and efficiency verification)	$105	$105
Internal fan included in fixture (lifetime verification)	$45	$45
Spectral tuning (per channel flux verification) per worst-case efficacy parent product	$125	$150
Active cooling (performance verification) per application	$175	$175
Each additional family member (child product) after the parent	$35	$35

Hort Operations V4.0

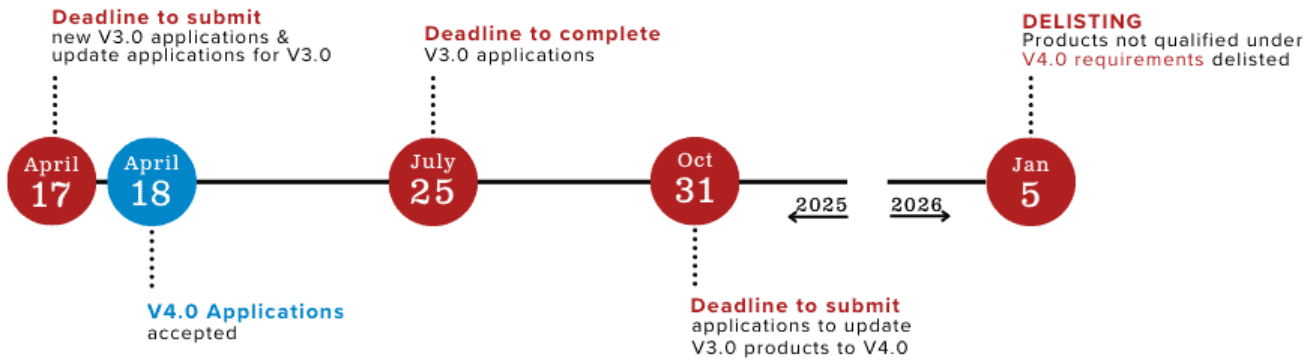


Hort Operations

- **Transition Process**
- **Submission Impacts**
  - Lamps
  - AC/DC definition change
  - LM-80 Applicability
  - Spectrally Tunable Products
- **Simplified upgrade path**
- **Expedite Opportunity**

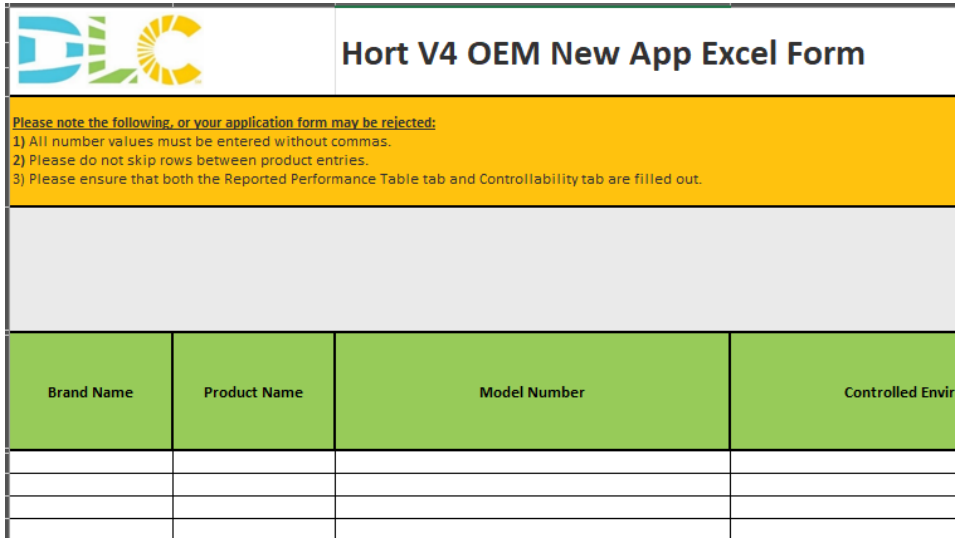
Transition Process

- All products listed on the QPL need to be submitted in update applications
  - Regardless of performance and if they meet the V4.0 PPE requirement
- 4/17 - Last Date to Submit V3.0 Applications
- 4/18 - Only V4.0 applications can be created/submitted
- 10/31 - V3.0 to V4.0 Update applications must be submitted
- 1/5/2026 - V3.0 products still on the QPL are delisted



Submission Impacts

- **Lamps**
  - App excel form
    - V3.0 forms will be backwards compatible
  - Questionnaire
    - Changes to remove lamp questions



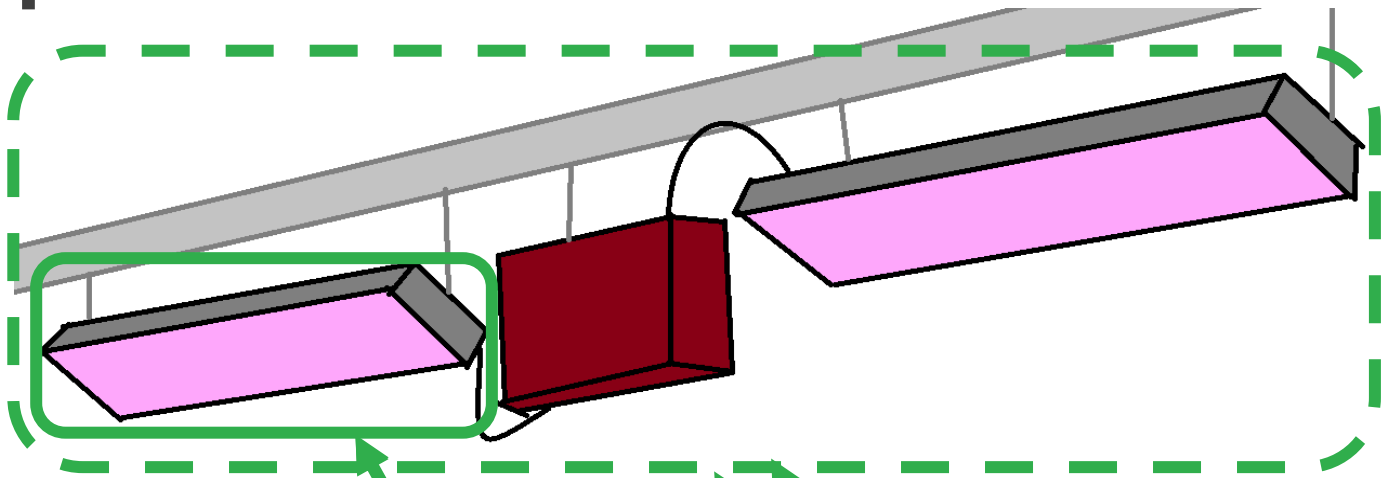
Hort V4 OEM New App Excel Form

Please note the following, or your application form may be rejected:
1) All number values must be entered without commas.
2) Please do not skip rows between product entries.
3) Please ensure that both the Reported Performance Table tab and Controllability tab are filled out.

Brand Name	Product Name	Model Number	Controlled Envir

AC/DC Submission Impact

- AC/DC Definition Change
  - V3.0 static set of components (e.g. LED Bars and driver) not rigidly connected **must submit through DC pathway**
  - V4.0 similar product types can be submitted **through AC or DC pathway**



V4.0 Can list as
- Model number rep dashed as AC **or**
- Model number rep solid as DC

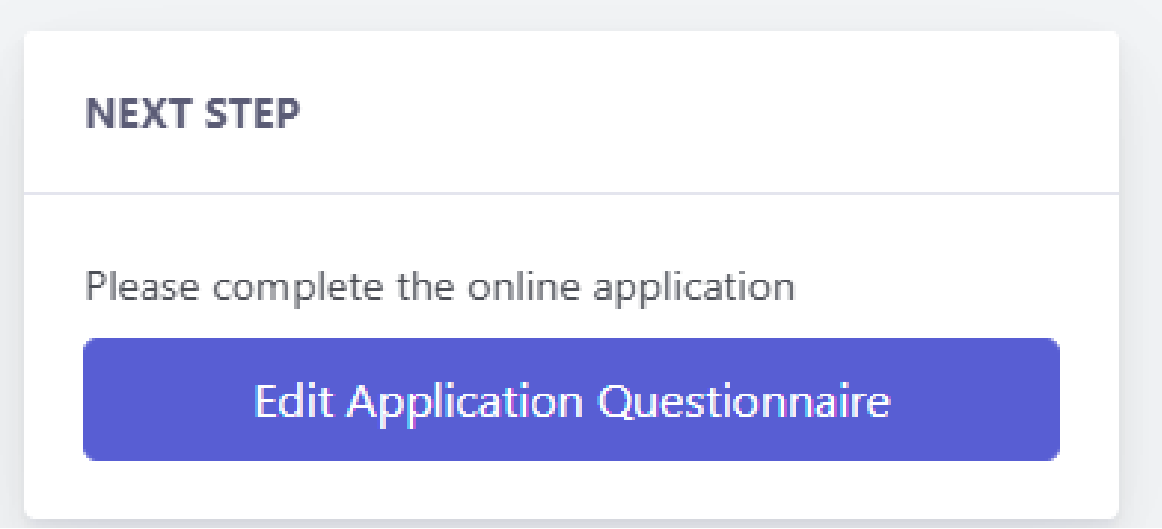
V4.0 Submission Impacts

- LM-80 Applicability
  - Actively participating in industry standards development
- Spectrally Tunable Products
  - No change to testing needs or thresholds
  - Updates to help clarify the different types of spectral tuning categories
    - Customizable
    - Predefined

Model Number	Spectral Setting 1			
	Spectral Setting 1	Reported Photosynthetic Photon Flux (µmol/s) (400-700nm) Setting 1	Reported Photon Flux Blue (µmol/s) (400-500nm) Setting 1	Reported Photon Flux Green (µmol/s) (500-600nm) Setting 1

Questionnaire Submission Impact

- AC/DC
  - Additional questions to clarify product type (e.g. available with power supply, power source test report)
- Spectrally Tunable
  - Additional question to clarify if customizable or predefined



Spectrally Tunable Example

		Current/LED			
Spectral Tuning Category	**Setting Displayed on QPL**	**White**	**Blue**	**Red**	**Far Red**
Customizable Spectra	**Max White**	Max	Min	Min	Min
	Max Blue	Min	Max	Min	Min
	Max Red	Min	Min	Max	Min
	Max Far Red	Min	Min	Min	Max
Pre-defined Spectra	**Roots**	#	#	#	#
	Veg/Greens	#	#	#	#
	Blooms	#	#	#	#

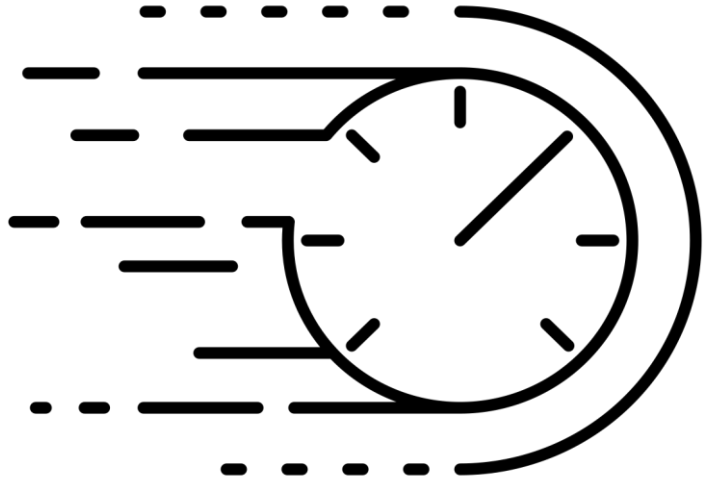
Spectral Tuning Category will depend on product design and capability

Simplified Upgrade Path

- Listed product families where all products meet the V4.0 efficacy requirements will have a simplified update application type
- Submitters will select the family or families they'd wish to qualify as V4.0 and confirm;
  - Products are still being sold in the marketplace
  - Products have not had any design, performance, or other changes that would require the submission of updated performance or test data
- Application review timeframe and fees apply for the simplified update application type as other update applications.

On-going Expedite Application Review Pilot

- Opportunity available to expedite applications
  - $1650 per expedited application
  - Halved reviewer response time
  - No change in requirements or review process only time allotted for reviewers to complete their part
  - Select to expedite at the time of application submission
-



Questions and Answers

Thank you for attending today's webinar on Hort V4.0!

Questions about applications and general inquiries should be sent to:
horticulture@designlights.org