TITLE 24, PART 6 | 2025 CODE CYCLE

Revise Automatic Daylighting Controls Exceptions

Codes and Standards Enhancement (CASE) Proposal
Nonresidential Daylighting

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February 24, 2023

CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Agenda

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Market Overview and Analysis	*2 min*
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Cost and Energy Methodology	*7 min*
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Discussion & Next Steps	*15 min*

Background

- Code Change Proposal
- 2022 Code Requirements
- Context and History

Proposed Code Change

Description of change:

- Reduce the total installed general lighting wattage for requiring automatic daylighting controls from 120 watts to 75 watts.

Draft code language for this measure is available in Handouts.

Current Code Requirements

Existing Requirements in Title 24, Part 6

- Section 130.1(d) exempts rooms from requiring automatic daylighting controls if:
  - The combined general lighting wattage in the skylit and primary sidelit zones is less than 120 watts.
  - The general lighting wattage in the secondary sidelit zones is less than 120 watts.

Existing Model Code Requirements

- ASHRAE 90.1-2019 Addendum O revised the wattage for exempting automatic daylighting controls to 75 watts.

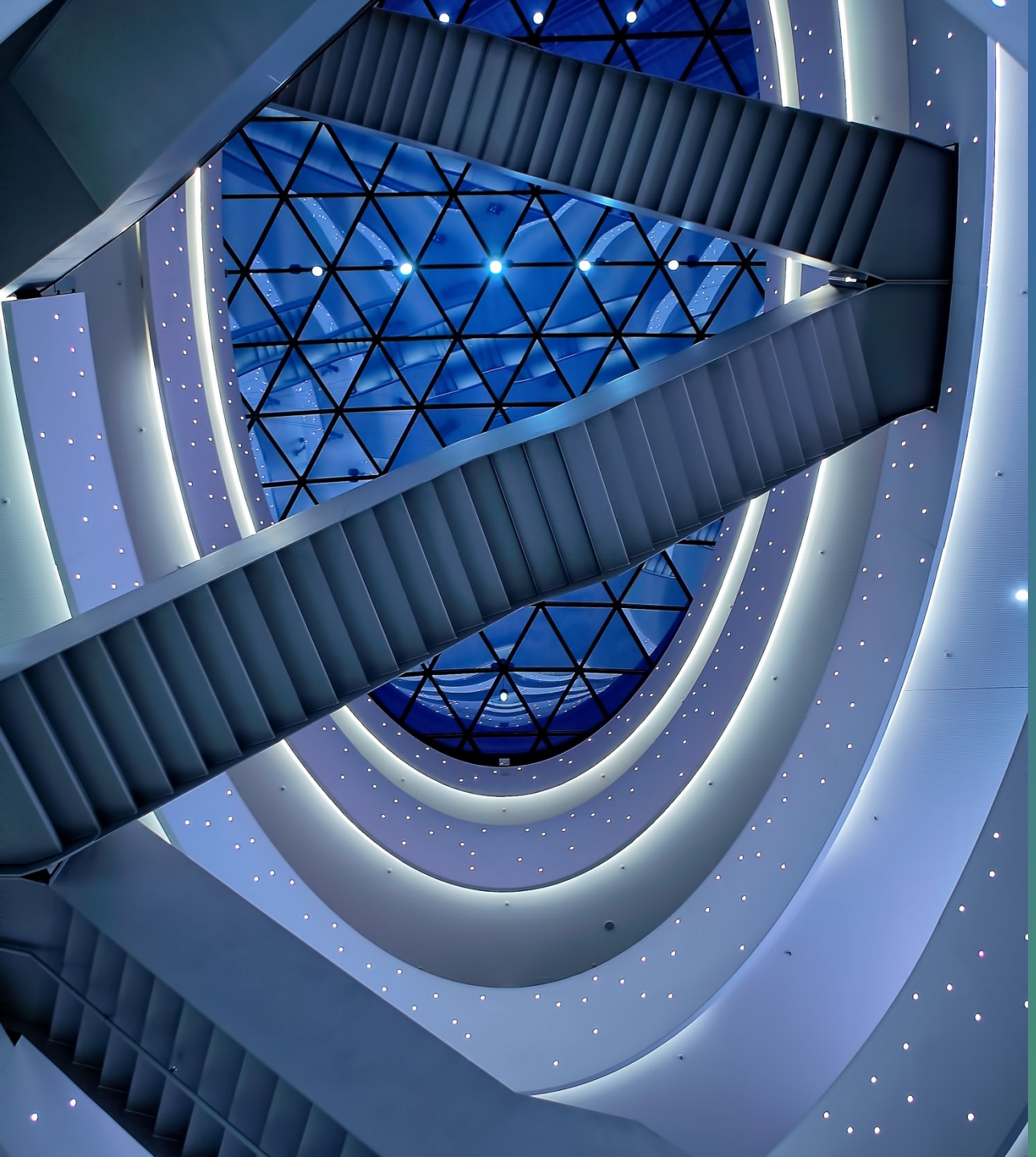
Context and History

The 120-watt threshold for automatic daylighting controls has remained unchanged for multiple code cycles. Meanwhile, **luminous efficacy** of light sources has significantly increased.

- Title 24, Part 6 indoor lighting power densities are now based on LED efficacy.
- 120-watt threshold represents higher lighting power for LEDs compared to legacy technology.

LEDs have lowered dimming control costs:

- Dimming is a standard feature for general lighting luminaires with negligible added costs.
- Dimming to 10% is a standard feature.



Market Overview

- Current Market Conditions
- Market Trends
- Potential Market Barriers and Solutions

Market Overview and Analysis

Current Market of Automatic Daylighting Controls

- Control strategy familiar to all market actors
- Standard capability in lighting control systems

Market Trends

- Most LED luminaires are dimmable and can readily support automatic daylighting controls regardless of space size
- Connected lighting controls have reduced the complexity of implementing automatic daylighting controls

POLL QUESTION NEXT SLIDE

Are you aware of market barriers we should consider?

Technical Considerations

- Technical Considerations
- Potential Barriers and Solutions

Technical Considerations

Technical Considerations

- Multiple options for implementing automatic daylighting controls in smaller spaces
  - Standalone daylight sensor
  - Daylight sensors as part of a room-based or building-wide networked lighting control system
  - Luminaire-level lighting controls that include a daylight sensor
- Both wired and wireless control solutions are available.

POLL QUESTION NEXT SLIDE

Do you see any technical barriers we should consider?

Energy and Cost Impacts Per Square Foot

Methodology and Assumptions

- Energy Savings Methodology and Results
- Cost Impacts Methodology and Results
  - Incremental costs
  - Energy cost savings

Methodology for Energy Impacts Analysis

Based on a representative prototypical space:

- Square footage and configuration most likely impacted by the proposed code change
- Use ray tracing to determine the amount of daylight entering the space on an hourly basis
  - Estimate the frequency and depth of electric light dimming to maintain design light levels
  - Analyzing CZ1 - CZ16 and 4 orientations for primary and secondary sidelit daylit zones
- Compare energy usage between spaces with and without automatic daylighting controls

Ray Tracing Prototype	
Dimensions	16’ x 18’ (288 sqft)
Ceiling height	9’
Reflectances (ceiling, walls, floor)	80/50/20
Window size	3 side-by-side windows each 3’-6” wide by 5’-6” tall
Sill height	2’-6”
Window head height	8’
Lighting power allowance	0.6 W/sqft

Assumptions for Standard and Proposed Designs

Standard Design

- Compliant with 2022 code
- Daylighting controls in all zones except:
  - Combined general lighting in skylit and primary sidelit zones is less than **120** watts per room
  - Combined general lighting in secondary sidelit zones is less than **120** watts per room

Proposed Design

- Dimming to 10% for all sources
- Daylighting controls in all zones except:
  - Combined general lighting in skylit and primary sidelit zones is less than **75** watts per room
  - Combined general lighting in secondary sidelit zones is less than **75** watts per room

Which Space Types Could Be Affected?

Spaces likely to be affected:

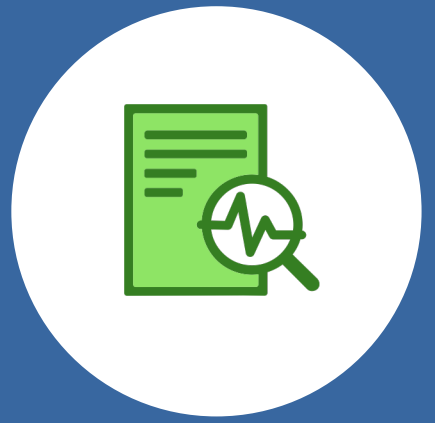
- Large private office > 250 sf
- Small classrooms, sidelit width 12 to 20 ft
- Corridors between 175 and 300 sf
- Lounges and conference rooms
- Small lobbies
- Small open offices < 25 ft daylit zone width
- Exercise rooms
- Small banks and other small to medium sized service

Spaces unlikely to be affected:

- Small offices daylit zone width < 15 ft
- Standard size classroom, 20-30 ft sidelit
- Warehouses
- Toplit retail
- Open offices
- Atria, Concourses

Incremental Cost Information

- Equipment costs are collected by obtaining quotes from manufacturer's sales representative agencies based on representative projects.
  - State and local sales taxes are applied to the material costs.
  - Representative projects include new constructions/additions and alterations
- Incremental labor costs are collected through market actor outreach, including
  - Specifier hours
  - Installation hours
  - Startup and commissioning efforts
- No additional costs for Acceptance Test Technicians due to sampling requirements and alterations options



Poll

What other important cost information should we consider?

Statewide Energy Impacts

Methodology and Assumptions

- Statewide Energy Impacts Methodology

Statewide Energy Impacts Methodology and Assumptions

The Statewide CASE Team estimates annual statewide impacts by multiplying **A x B x C**:

A. per square foot energy impacts (discussed in previous section)

B. number of square feet of new construction/additions/alterations of each applicable building type
   - Assumption: impacts all new construction
   - Assumption: existing buildings retrofitted once every 15 years

C. portion of affected square feet in each climate zone

Example:

Per Unit Impacts

Savings type	Savings per sq ft
Electricity	[X] kWh
Peak demand	[X] Watts
Natural gas	[X] Therms
GHG emissions	[X] Tons CO_2e

×

Affected New Construction

Climate Zone	Large Office sq ft	Assembly sq ft
1	100	20
2	1,000	1,500
…		
16	5,000	3,000

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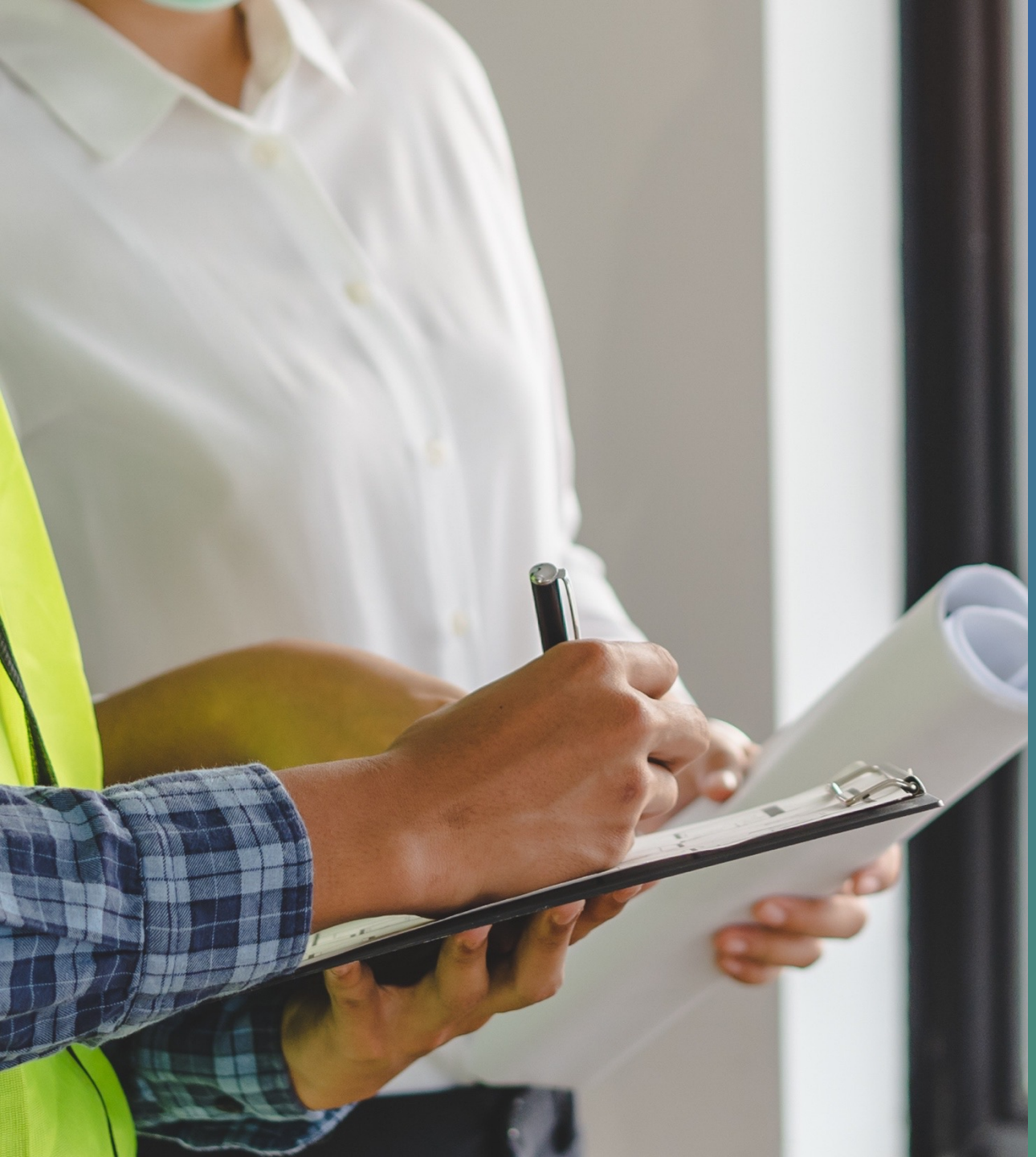
Statewide Energy Impacts

Climate Zone	Elec Savings (GWh)	…	GHG savings (MT CO_2e)
1	20		1,500
2	50		3,000
…			
16	100		2,000



Compliance and Enforcement

- Design
- Permit Application
- Construction
- Inspection
- Revisions to Compliance Software

Compliance and Verification Process

1. **Design Phase**
   Identify automatic daylighting controls on the plan documents for daylit zones where the connected lighting load is greater than 75 watts

2. **Permit Application Phase**
   Check and confirm automatic daylighting controls are identified on the plans and NRCC forms for daylit zones with a connected lighting load greater than 75 watts

3. **Construction Phase**
   Procure, install, wire, and commission photocontrols in daylit zones with a connected lighting load greater than 75 watts

4. **Inspection Phase**
   - Perform automatic daylighting controls acceptance testing in daylit zones with a connected lighting load greater than 75 watts
   - Verify automatic daylighting controls are identified for daylit zones with a connected lighting load greater than 75 watts in approved drawings and documents

Compliance and Verification

- The general workflow and the compliance and verification process remain unchanged
- The number of photocontrols increases
  - Automatic daylighting controls are identified for more spaces on the plan documents
  - Increase in time and effort required for installation and commissioning
  - Acceptance Test Technicians may need to perform automatic daylighting controls Functional Testing on higher number of photocontrols
    - Acceptance Test Technicians only test 1 photocontrol per group

EnergyCodeAce.com provides no-cost tools, training, and resources on code compliance

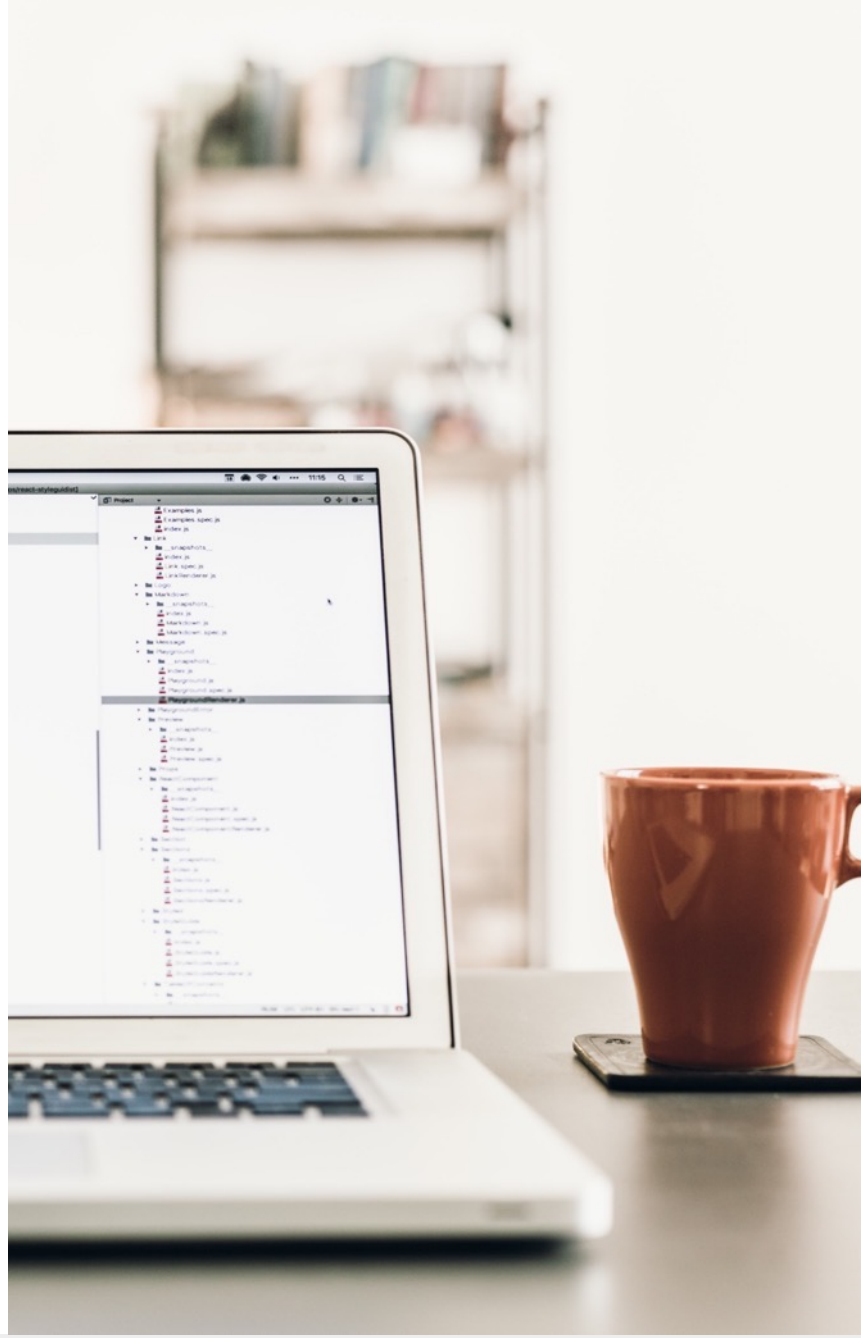
Market Actors

Market actors involved in implementing this measure include:

- **Lighting Designer / Daylight Consultant / Electrical Engineer / Energy Consultants / Architect / Interior Designer** – Identify spaces requiring automatic daylighting controls on the plan documents and prepare NRCC forms
- **Plans Examiner** – Check and confirm automatic daylighting controls are identified on the plan documents and NRCC forms
- **Electrical Contractor / Installer** – Procure, install, and wire photocontrols and other necessary hardware and accessories according to the design documents
- **Qualified Design Reviewer** – Ensure automatic daylighting controls are identified and consistent on the plan documents and NRCC forms
- **Commissioning Provider** – Commission the photocontrols as specified in the design documents
- **Acceptance Test Technician** – Conduct the automatic daylighting controls acceptance test
- **Inspector** – Verify automatic daylighting controls are included in the approved drawings and documents

Software Updates

- The proposed change will require a minor adjustment to the inputs for threshold for daylight dimming.
- No other changes are expected for the CBECC software or ACM Reference Manual.

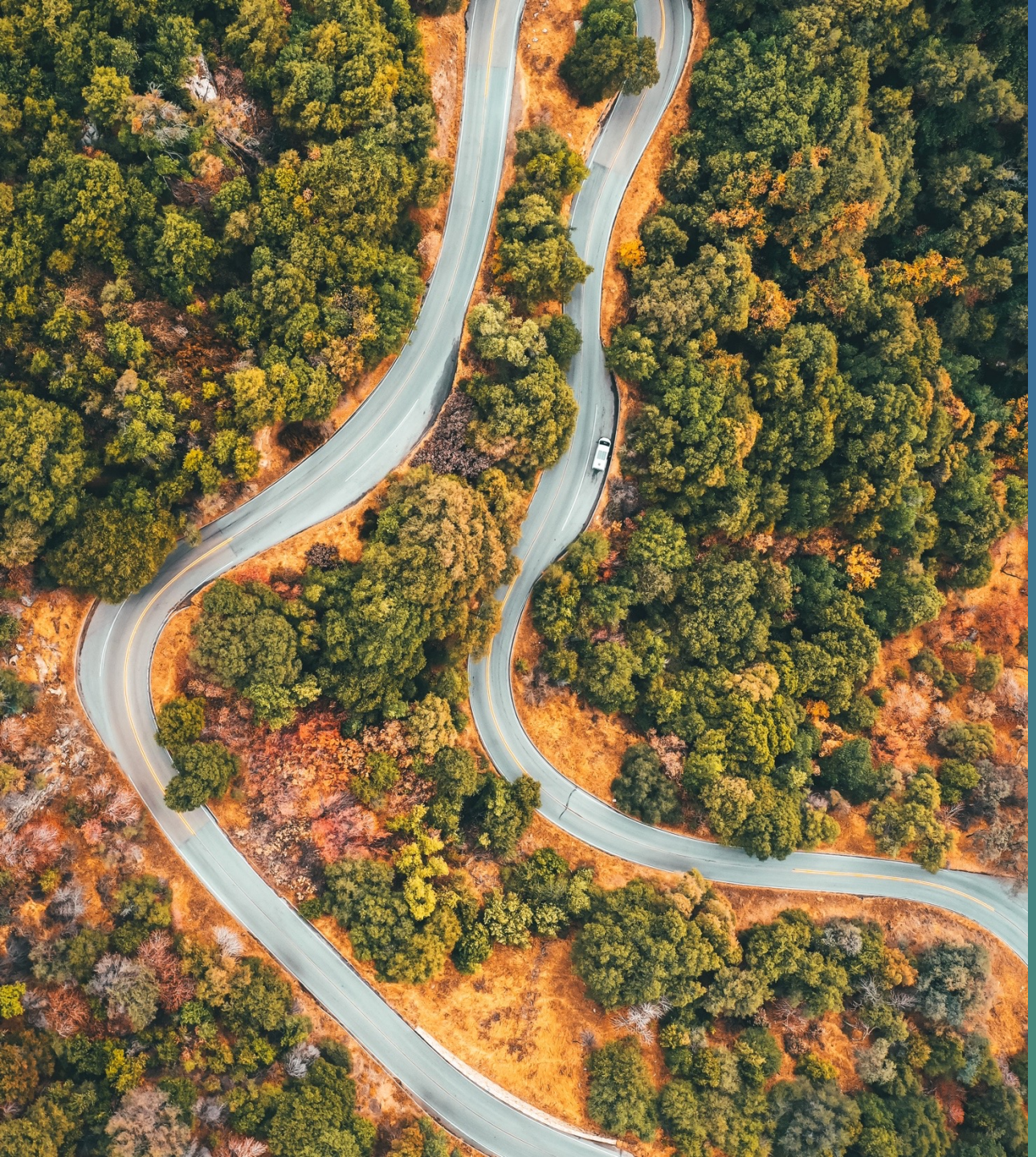


Review of Code Language Markup

- Draft Code Change Language

Draft Code Change Language

Draft code language available for review in Handouts and downloadable on Title24Stakeholders.com.



Discussion and Next Steps

We want to hear from you!

- POLL QUESTION NEXT SLIDE
  - Provide **any last comments or feedback** on this presentation now, verbally or in the GoTo Questions Pane

- More information on pre-rulemaking for the 2025 Energy Code at https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2025-building-energy-efficiency

Comments on this measure are due by March 10, 2023. Please send comments to info@title24stakeholders.com and copy CASE Authors (see contact info on following slide).

Thank You

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