



# The Proposed California Quality LED Lamp Specification

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# Background

- CFL sales and market saturation appear to have leveled off at around 30% of medium screw-based sockets.
- Evaluation efforts were superficial and focused mostly on purchasing decisions not on long-term consumer satisfaction.
- Research and expert opinion suggest that the color quality and lamp life of CFLs are major shortcomings.
- Lack of a high performance standard for CFLs meant that the utilities purchased the lowest-priced product. “Super CFL” effort did not reach the market.



# Lessons from CFL Programs

## DOE Study “CFL Lighting: Lessons Learned on the Way to Market”

- Much consumer research is needed to determine what the consumer does and does not know before the initial product launch so that the launch is done right the first time.
- Delay launch rather than introduce inferior product; first impressions are long-lasting.
- Performance claims must be accurate. Don’t launch a product until performance issues are ironed out.
- Shift consumer focus from product price to product value.
- Manufacturers and energy-efficiency groups should coordinate to establish minimum performance requirements.



# Scope of the CA Quality Spec

- Voluntary specification
- CEC will not certify products
- For line-voltage replacement LED lamps
  - E11-E26, GU-24 and maybe GU-10
- Efficacy requirements the same as Energy Star
- Quality requirements go beyond Energy Star
  - Dimming
  - Beam shape
  - Color quality (CCT binning, color rendering index (CRI) and R9)
  - Lamp life
- Utility programs will rebate only compliant LED lamps



# Scope: Lamp Bases and Lamp Shapes

Table shows which beam shapes are allowed for each combination of base and shape

		Lamp shape					
		A,G, B, BA,C,CA,F	R,BR,	MR	PAR20, PAR30,	PAR38	JC Bi-pin, wedge
Lamp base	E12, E17, E26, GU-24 (120V)	Omni-directional	Floodlamp	X	Spotlight	Spotlight or Floodlamp	X
	GU-10 (120V)	X	X	Spotlight	Spotlight	X	X
	GX5.3 (12V)	X	X	Spotlight	X	X	X
	G8, G9 (120V)	X	X	Spotlight	X	X	Omni-directional



# Energy Star Plus: Dimming

- Dimming will be required in Title 24 2013 for both new construction and retrofit projects
  - Certain exclusions apply
- Dimming must be free of flicker and noise down to 10% output
- Manufacturers must list three compatible dimmers on lamp packaging
- There is currently no standard for “free of flicker and noise”, but PNNL among others are working on this
- There is currently no standard for efficiency at dimmed levels, but LBNL has released a draft specification



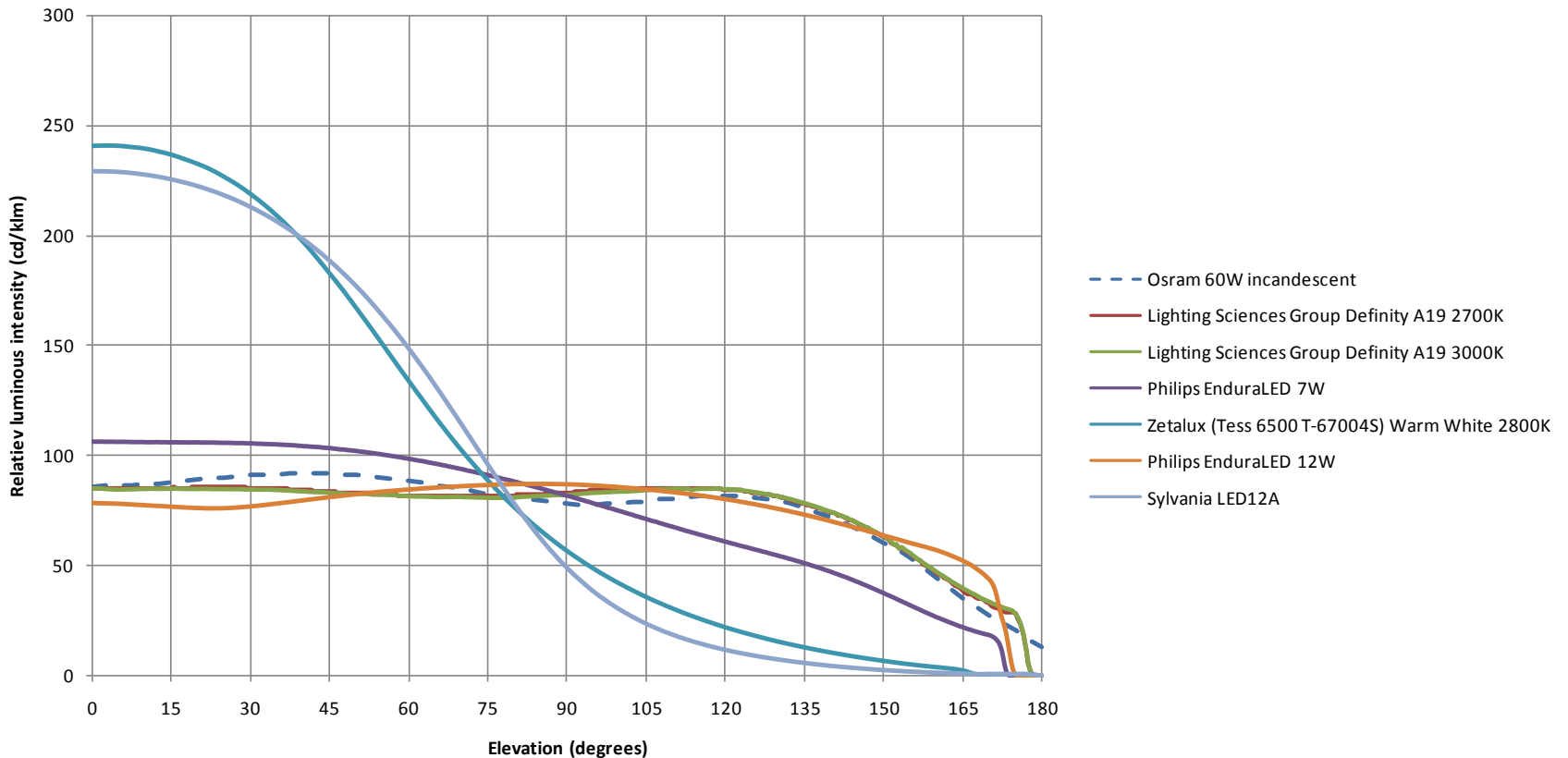
# Energy Star Plus: Beam Shape

- Many early LED replacement lamps were “snow cones” due to heat sinking requirements
- Snow cones do not resemble either A-lamps or directional lamps in terms of beam shape
- Energy Star allows snow cones as “semi-directional” lamps
- CA Quality Specification allows only:
  - Omnidirectional (same definition as in ENERGY STAR)
  - Floodlamp (not defined in ENERGY STAR)
  - Spotlights (same definition as in ENERGY STAR)



# Energy Star Plus: Beam Shape

Relative Intensity of A Lamps

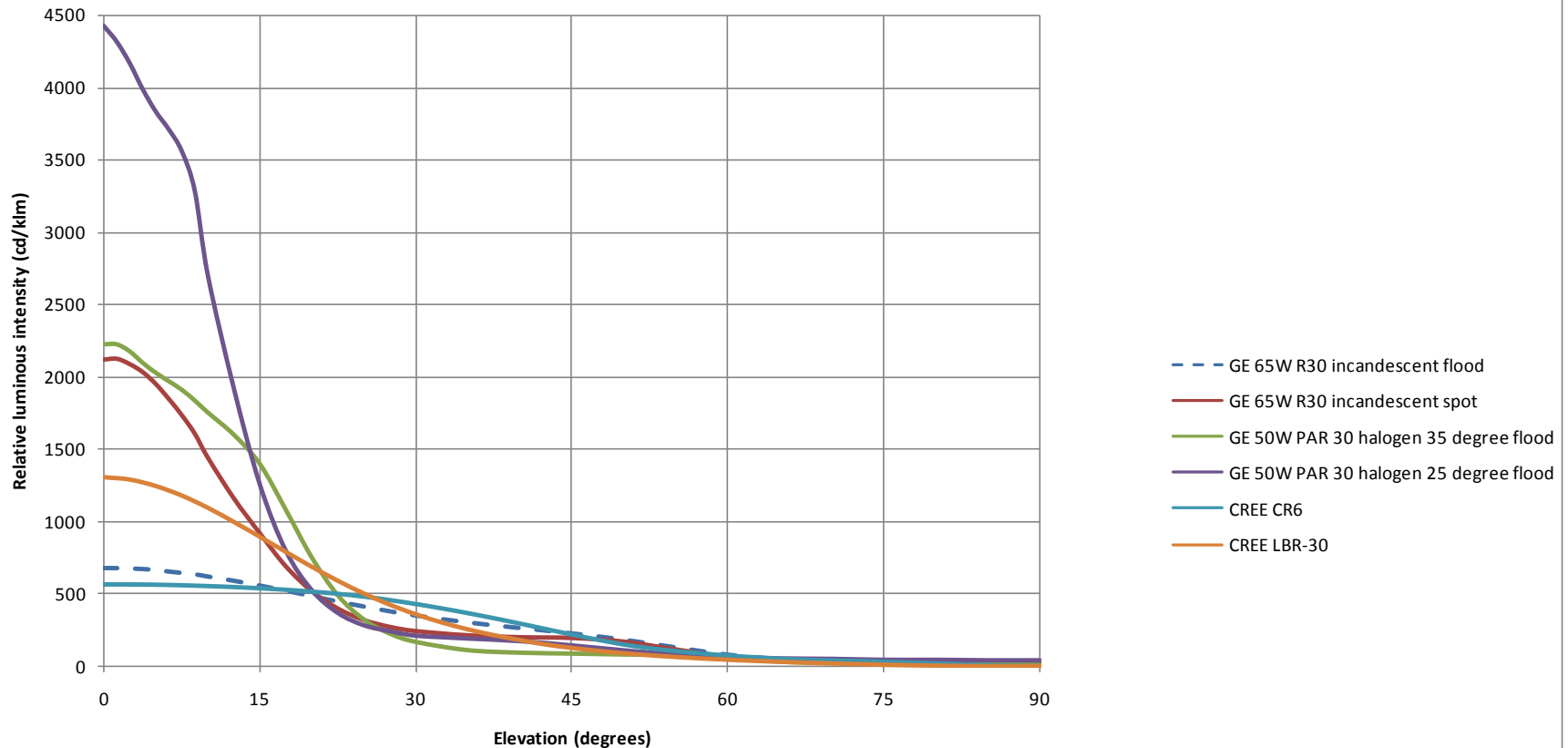






# Energy Star Plus: Beam Shape

Relative Intensity of R and PAR lamps





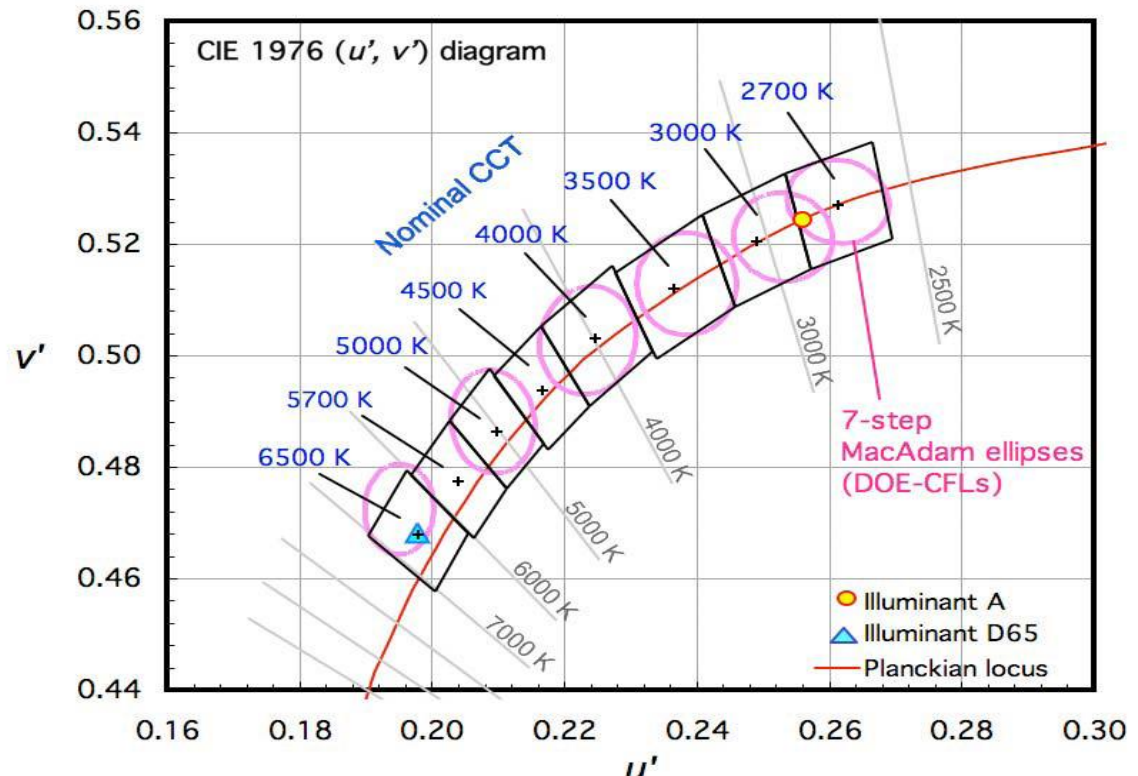
# Energy Star Plus: Color Quality

- ENERGY STAR draft 2 allows 80 CRI,  $R9 > 0$ , and allows any CCT within 7 steps of the Planckian Locus.
- Little or no available research on what is the “right” CRI or binning for residential lamps.
- The CA Quality Specification encourages consumers to replace incandescents which are 100 CRI on locus.
- CA Quality Specification requires 90 CRI,  $R9 > 0$ , within 3 steps of the locus.
- Consumer color quality research is being conducted by CLTC and CLASP funded by PG&E; results expected Summer 2013.



# Energy Star Plus: Color Quality

- Consumers are used to 2700K for non-halogen and 3000K for halogen incandescents.
- The CA Quality Specification gives consumers exactly those colors, within 3 steps.





## Energy Star Plus: Lamp Life

- LED replacement lamps are a new technology; their life in situ is not well understood
- ENERGY STAR sets out an elevated temperature test (55 degrees C ambient) but only requires this for directional and semidirectional lamps
- CA Quality Specification requires elevated life test for all lamps (any lamp may be enclosed)
- CA Quality Specification requires a 5-year warranty in res and/or non-res



# Utility Programs

- This specification is being developed in collaboration with the California Public Utilities Commission (CPUC).
- CPUC Decision 12-05-015 directs the California investor owned utilities (for their 2013-2014 energy efficiency portfolios) to only propose rebates for screw-based LEDs products that are consistent with the quality specification developed by the Energy Commission.
- See Section 10.4 of the CPUC decision, here: [http://docs.cpuc.ca.gov/PUBLISHED/FINAL\\_DECISION/166830.htm](http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/166830.htm).



# Stakeholder Involvement

- To be informed of future public processes for standards development, energy efficiency and other, sign up for the relevant Energy Commission list server:  
<http://www.energy.ca.gov/efficiency/listservers.html>
- For lighting-specific issues, also contact Owen.Howlett@energy.ca.gov