

Emergent Issues in Lighting



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Lighting Center UC Davis- *advance the application of energy efficient lighting*

1. Research and Development
2. Lighting Demonstrations
3. Education and training
4. *Building Codes and policy*



Adaptive-sensor based lighting



Technology Considerations



Adaptive LED luminaires equipped with motion sensors provide efficient, long-lasting under-canopy lighting



Adaptive LED wall packs reduce energy use over 50% compared to HPS or metal halide wall packs



Adaptive induction luminaires are available with integrated occupancy sensors and controls-ready ballasts



Network control systems can incorporate multiple types of outdoor luminaires into one system for easy monitoring and management

Adaptive Lighting Initiative

one of our largest lighting success stories

- **Inclusion in Title 24 2014**
- **Utility partners**
- ASHRAE
- Broad application at UC/CSU
- Primary path for ARRA ETAP/
CEC funding
- NEMA support



• text

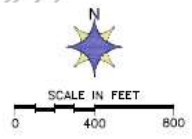
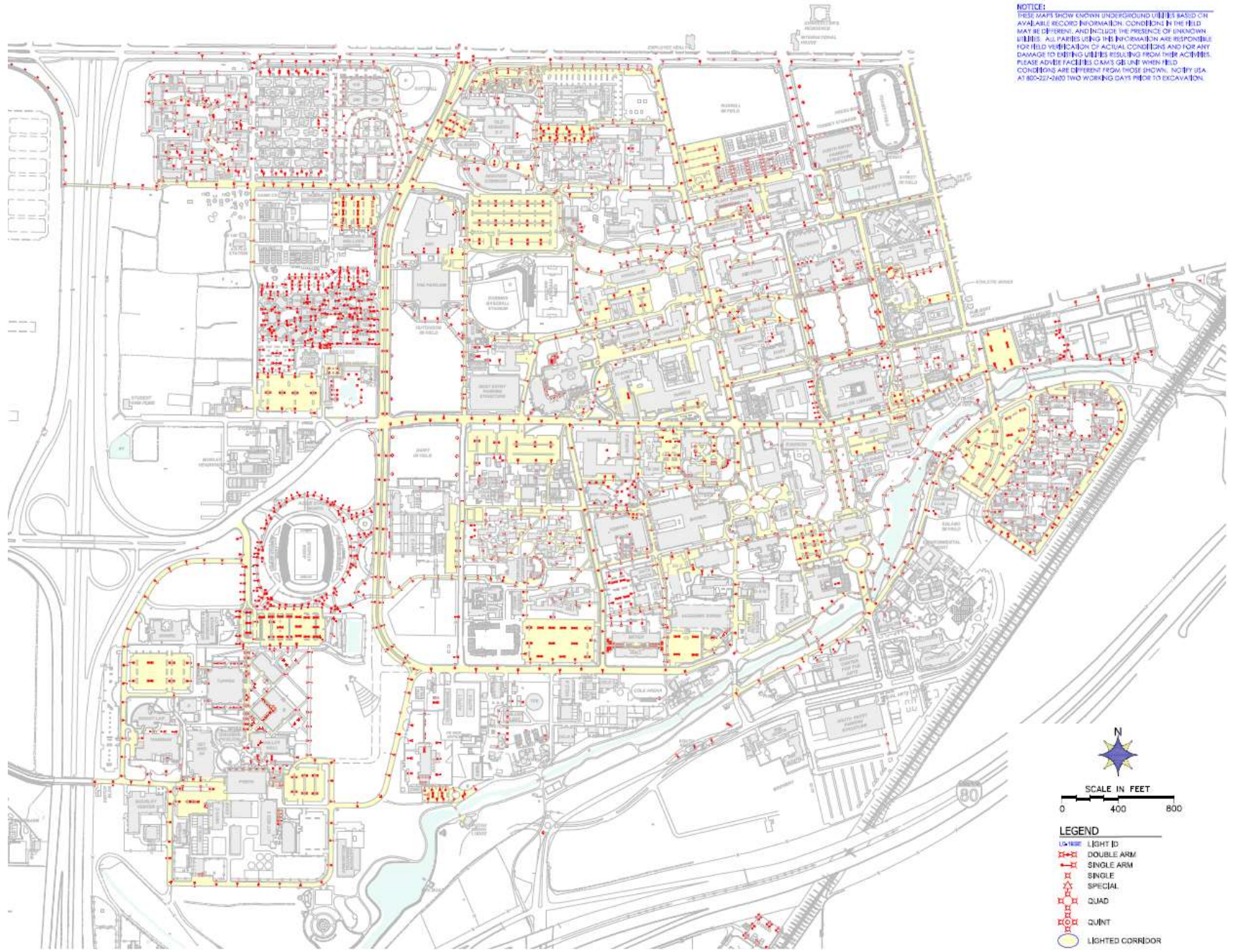




Adaptive Networked Exterior LED Lighting at UC Davis: Savings, Security and Control



NOTICE:
 THESE MAPS SHOW KNOWN UNDERGROUND UTILITIES BASED ON AVAILABLE RECORD INFORMATION. CONDITIONS IN THE FIELD MAY BE DIFFERENT, AND INCLUDE THE PRESENCE OF UNKNOWN UTILITIES. ALL PARTIES USING THE INFORMATION ARE RESPONSIBLE FOR FIELD VERIFICATION OF ACTUAL CONDITIONS AND FOR ANY DAMAGE TO EXISTING UTILITIES RESULTING FROM THEIR ACTIVITIES. PLEASE ADVISE FACILITIES DEPARTMENT WHEN FIELD CONDITIONS ARE DIFFERENT FROM THOSE SHOWN. NOTIFY USA AT 800-221-2400 TWO WORKING DAYS PRIOR TO EXCAVATION.



- LEGEND**
-  LIGHT CORRIDOR
 -  DOUBLE ARM
 -  SINGLE ARM
 -  SINGLE
 -  SPECIAL
 -  QUAD
 -  QUINT
 -  LIGHTED CORRIDOR

**Field test results: PIR sensor detected
100% of roadway occupants**







Activation to 100%

Detection 100%



Draft—2016 Title 24 Residential Lighting



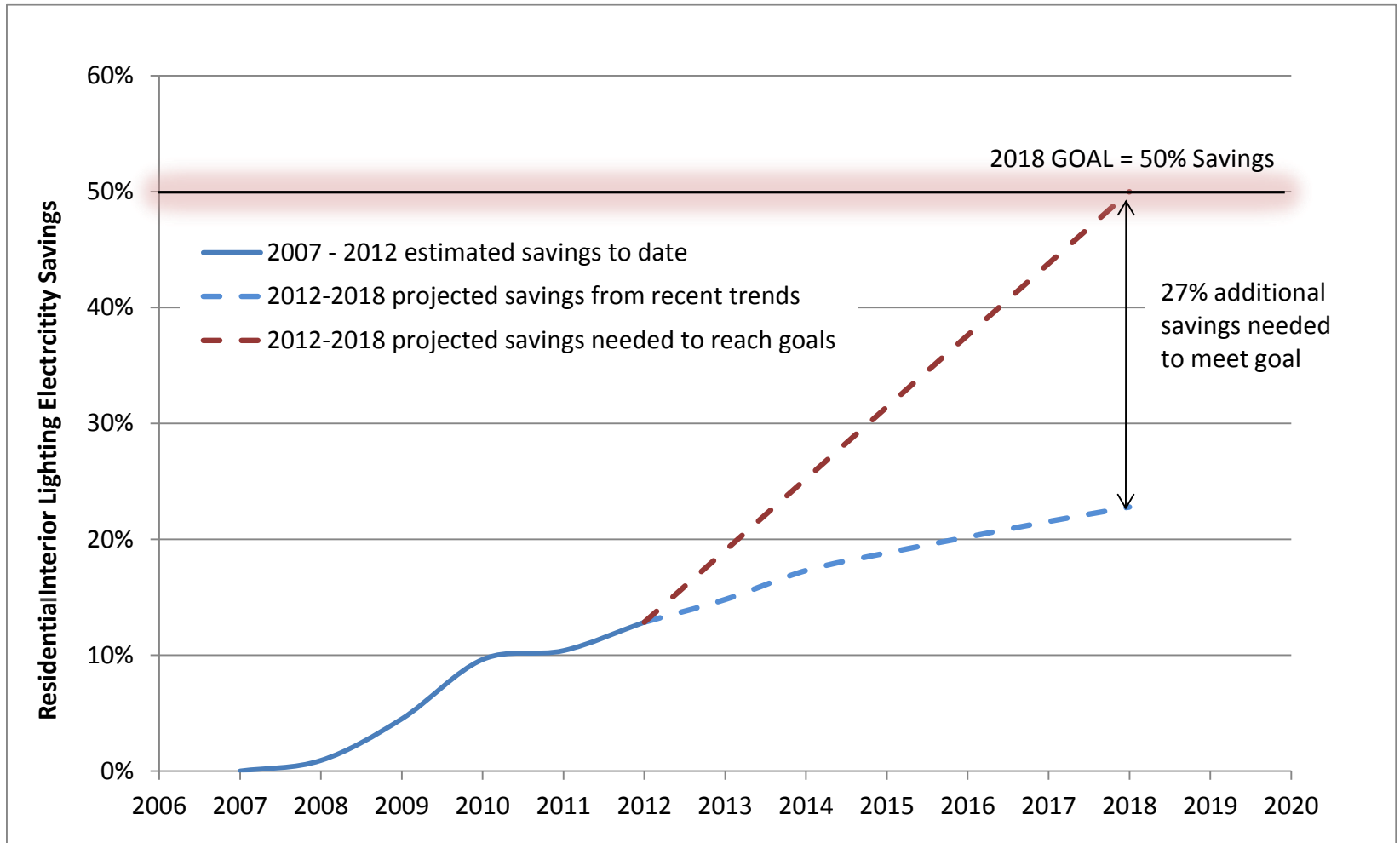
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Electricity Savings Estimates Residential Interior Lighting



Source: CLTC calculations

An aerial photograph of a residential development featuring numerous houses with dark roofs and light-colored walls, arranged in a curved street pattern. A semi-transparent white rectangular box is overlaid on the center of the image, containing text. The background shows a mix of green trees and grassy areas.

**~75% energy used for lighting is from
low-efficacy fixtures (~45% savings potential)**

Road to Huffman

Only practical method is to quickly transform
market place to LED



A man with a beard, wearing a light blue shirt, is inspecting a row of LED lamps hanging from a metal track in a factory. He is holding a small object, possibly a component or a tool, near one of the lamps. The lamps are arranged in a line, and the background shows a complex industrial structure with various metal beams and components. The lighting is bright, highlighting the man's face and the details of the lamps.

California Quality LED Lamp Specification

Voluntary California Quality LED Lamp Specification

- CRI \geq 90
- R9 $>$ 50
- CCT 2700K or 3000K
- 4-step MacAdam ellipse
- Dimming
- Flicker reduction
- 5-year warranty



Title 24 2016 Working Proposal

1. All high-efficacy lighting
2. All recessed downlights must be high efficacy
3. Recognizing all luminaires—**other than recessed**—with medium-base sockets **as high efficacy** if at the time of inspection the sockets are **populated with California Quality LED sources**

High Efficacy High color (dedicated and screw based)



Downlights— High-efficacy trim kits or dedicated LED



A collection of various LED lamps is shown. In the foreground, several white cylindrical lamps with prominent heat sinks are visible. Behind them, there are numerous spherical lamps, some in yellow and some in white. The lamps are arranged on a metallic surface, possibly a tray or a workbench. The text "Allow high-quality LED lamps for all other fixtures" is overlaid in a semi-transparent white box across the middle of the image.

**Allow high-quality LED lamps
for all other fixtures**

The Honda house at UC Davis

a new paradigm for residential design

A model for promoting circadian health



Photo: Honda

Circadian design- changes in spectrum affect wellness

From the Latin

“**circa**” = approximately

“**dies**” = day



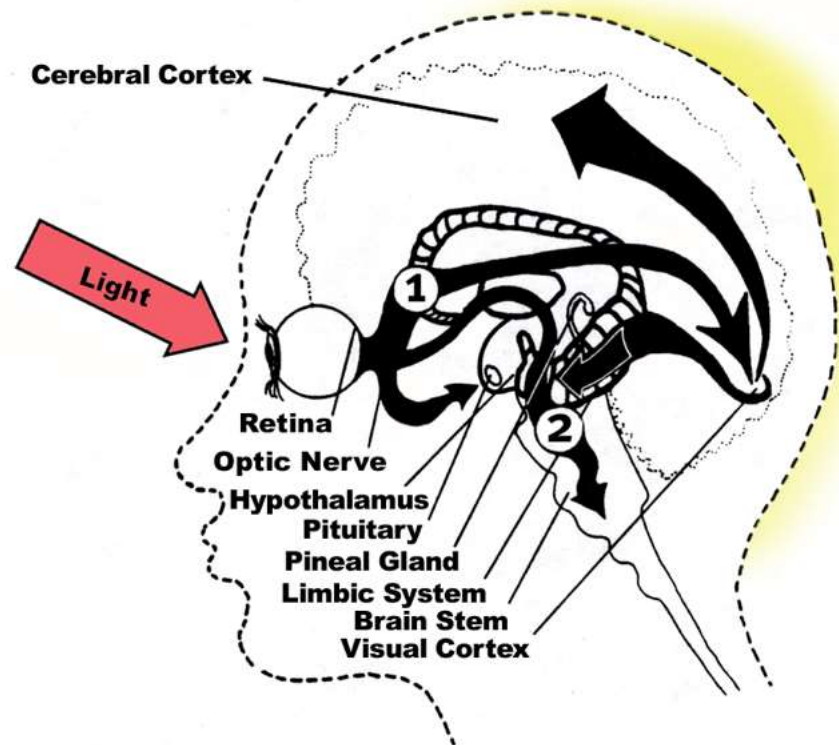
Visual & Circadian Pathways

1. Visual Pathway

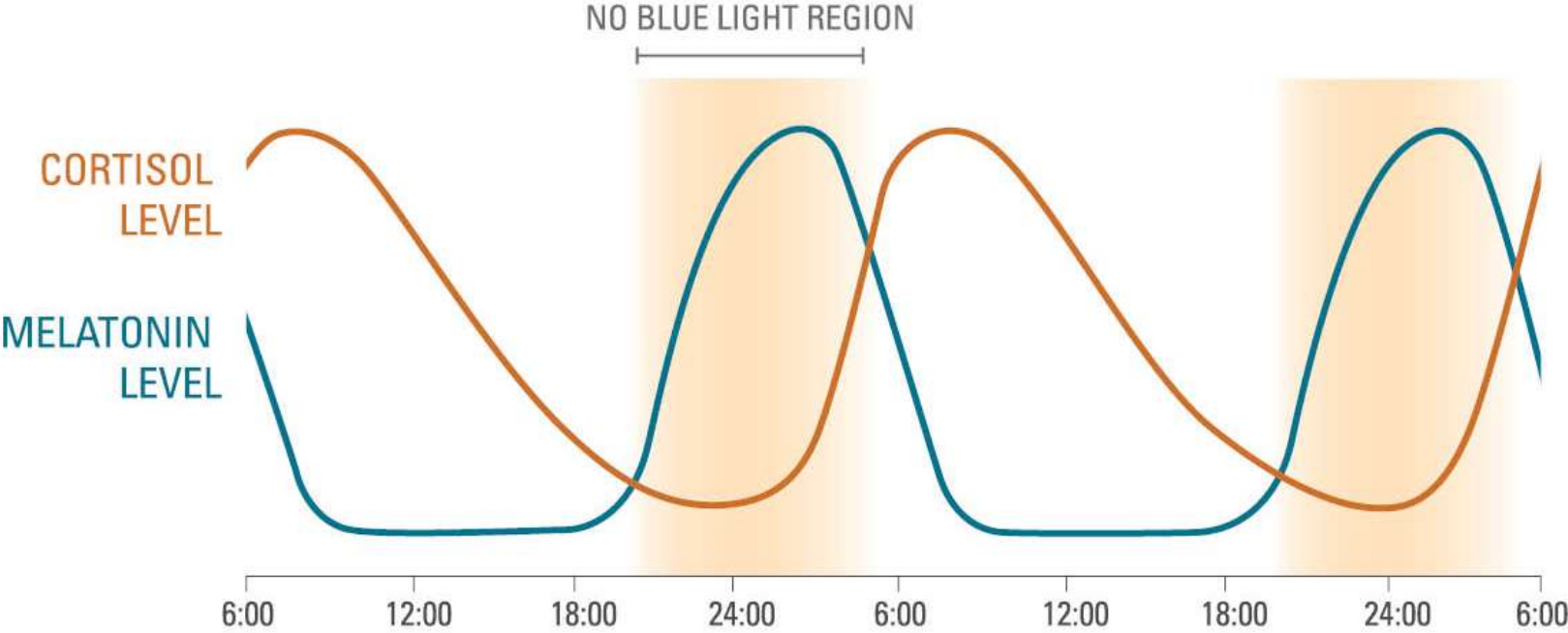
- Light stimulates the cerebral cortex for vision & perception

2. Biological Pathway

- Light causes messages along a biological pathway (Hypothalamus, Pituitary, Pineal Gland) that are used to regulate the body's autonomic nervous and endocrine systems



Diurnal variations in hormones driven by Light



Circadian Sensitivity- mitigate blue pump light sources (CFL/T8/LED)

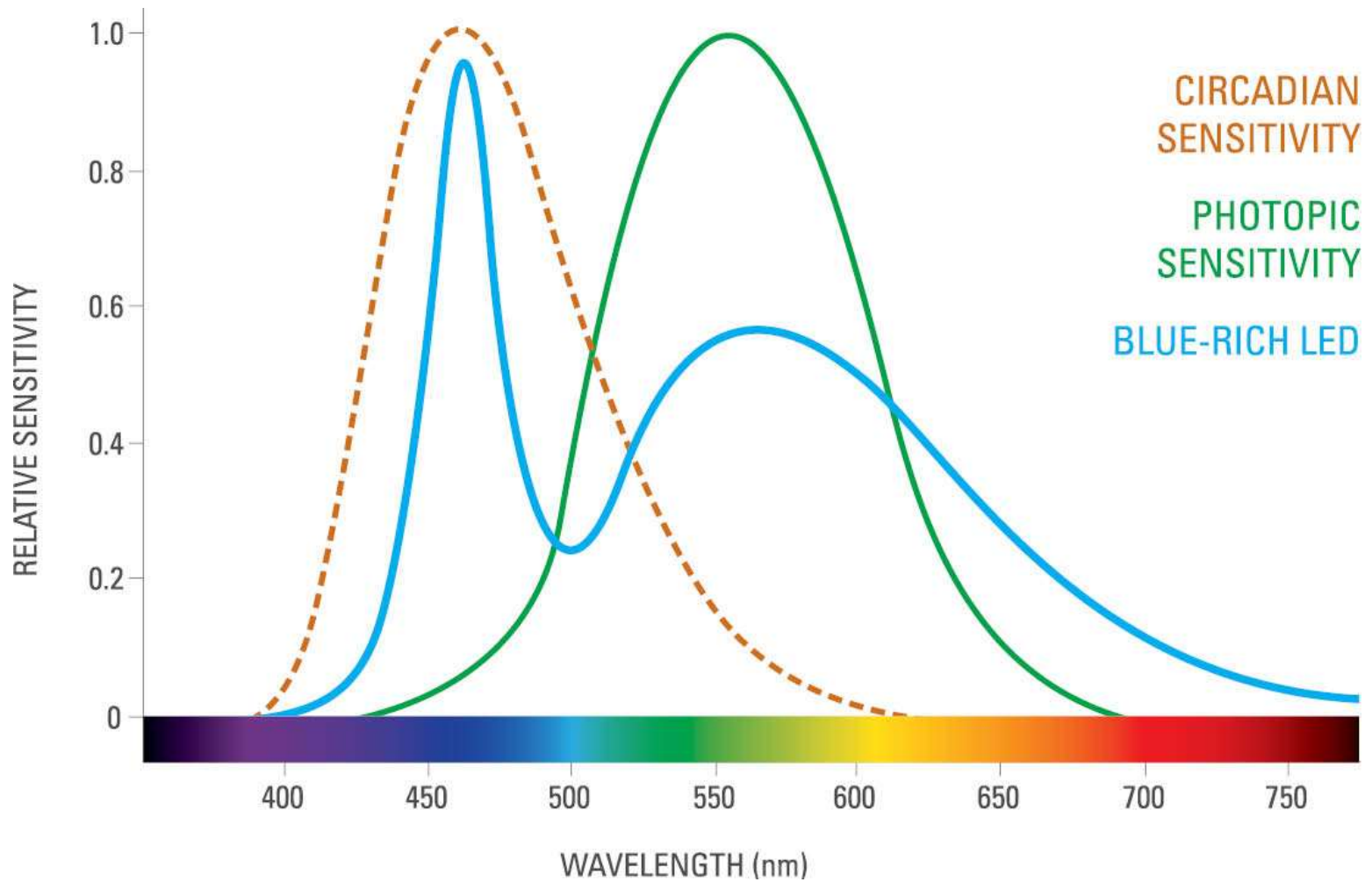




Photo: Honda





Maintain dark adaptation (no bleaching)







de young
Real Estate

de young
properties

Zero Net Energy Home

Designed to produce as much energy
as the home consumes each year.







