



***Pacific Gas and  
Electric Company***

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# Hardwired Standby Loads CASE Study

## Lighting Controls

California Energy Commission  
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# Project Scope

- Evaluate Title 24 Code Change Recommendations to Address the Hardwired Standby Loads of Devices
- Examined Standby Loads of Lighting Controls for Both Non-Residential & High-Rise Residential Buildings
- Today's Scope Limited to Non-Residential Control Devices Not Lighting Systems:
  - Motion sensors
  - Occupancy sensors
  - Photo sensors



# Residential Hardwired Standby CASE Study

- Draft CASE study prepared for residential hardwired devices
- Evaluated 2 devices:
  - class 2 transformers (doorbell transformers)
  - ground fault circuit interrupters (GFCIs)
- Believe increased efficiency opportunities exist but recommend these be addressed under Title 20 appliance standards

# Overview & Methodology

- Overview: Evaluated standby loads of lighting control products and the potential for improving the efficiency of controls mandated in current Title 24 language.
- Methodology: Primary research and testing was required and included the following activities:
  - Manufacturer interviews
  - Contractor interviews
  - Standby load device testing (IEC 62301)
  - Industry publication review
  - Existing standards review
  - Statewide impact estimates
  - Cost-effectiveness scenario analysis
  - Code language review
  - Proposal development

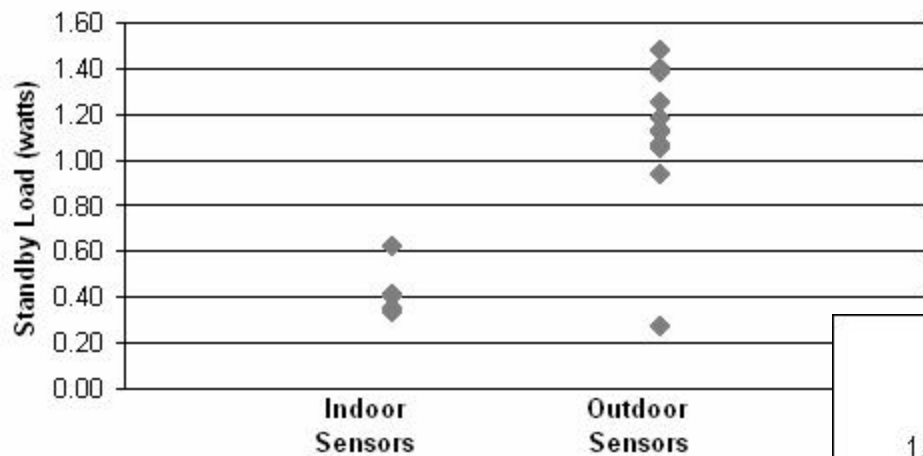
# Preliminary Testing Results

	Product Type	Location	Connection	Standy-By Power Consumption (W)	Retail Price (no installation)
1	Motion Sensor	Outdoor	120VAC, 60Hz	1.05	\$53.00
2	Motion Sensor	Outdoor	120 VAC	1.25	\$14.50
3	Motion Sensor	Outdoor	120 VAC	0.94	\$36.00
4	Motion Sensor	Outdoor	125	0.28	\$23.00
5	Occ Sensor	Indoor	120VAC, 60 Hz	0.63	\$35.00
6	Occ Sensor	Indoor	125VAC/CA Hz	0.34	\$22.99
7	Occ Sensor	Indoor	120 VAC	0.36	\$22.73
8	Occ Sensor	Indoor	120VAC	0.34	\$18.62
9	Occ Sensor	Indoor	120VAC	0.34	\$15.87
10	Occ Sensor	Indoor	125VAC/60 Hz	0.34	\$19.99
11	Occ Sensor	Indoor	125	0.41	\$20.00
12	Occ Sensor	Indoor	125	0.42	\$25.00
13	Photo Sensor	Outdoor	120VAC	1.38	\$12.98
14	Photo Sensor	Outdoor	120 VAC	1.40	\$12.98
15	Photo Sensor	Outdoor	120 VAC	1.48	\$9.98
16	Photo Sensor	Outdoor	120 VAC/ 15 A	1.18	\$9.98
17	Photo Sensor	Outdoor	120 VAC/ 15 A	1.38	\$9.98
18	Photo Sensor	Outdoor	120 VAC/ 15 A	1.07	\$6.98
19	Photo Sensor	Outdoor	120 VAC/ 15 A	1.13	\$7.98
20	Photo Sensor	Outdoor	120 VAC/ 15 A	1.12	\$9.99

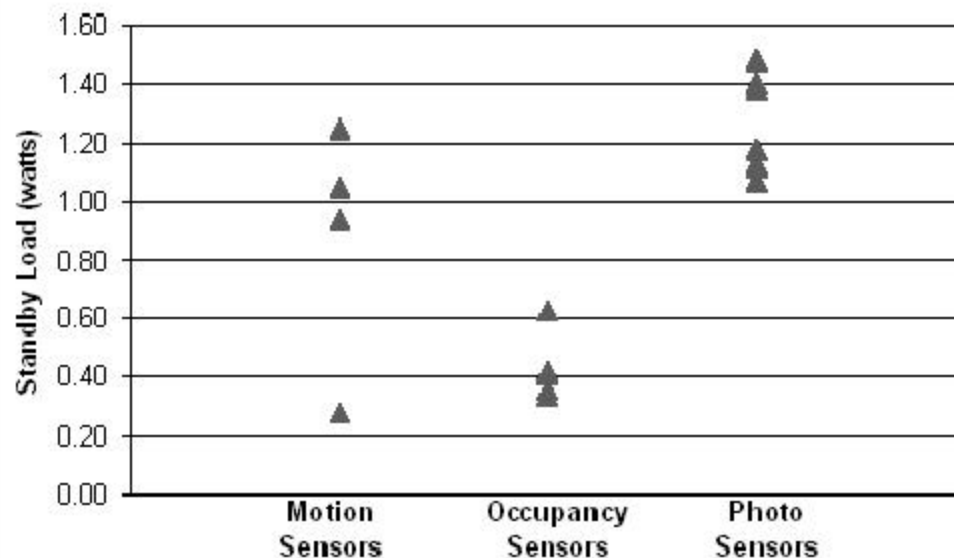


# Preliminary Testing Results Continued

Indoor versus Outdoor Sensor Standby Loads



Standby Loads by Sensor Type



# Industry Interview Results

- Overwhelming Response to: Do you measure standby loads of your controls?
  - *"I've never been asked that question before"*
- Of over 15 manufacturers evaluated, only 1 found that currently lists "power consumption" on specification sheets
  - *reported value was within 5% measured value*
- efficiency improvements for sensors could be achieved through more efficient power pack design
- Manufacturers have not developed products with standby load as a design criterion.
- If required, cost impacts associated with re-design of products could be significant

# Recommended Code Change Process

a two-phase process for implementing code changes to reduce hardwired standby loads:

- Phase 1: mandated “test and list” requirement for all lighting control devices to be established in the 2008 Title 24 standards.
- Phase 2: Two-years after the implementation of Phase 1, evaluate establishing minimum efficiency requirements by device type / technology.
  - Phase 2 code changes could occur under either a future Title 20 proceeding or the next Title 24 update



# Statewide Impact Analysis

Device	Type of Code Change	MWh Savings after 1 Year (average)	kW Savings after 1 Year (average)	Year 1 Million sq. ft. (Non-Residential)	CA High Rise Residential Buildings
Lighting Controls	Test & List	300	40	156	35,700
Lighting Controls	Minimum Efficiency	1,900	280	156	35,700

Population of new commercial controls is estimated using the following assumptions:

- Annual growth =156 million new sq ft of non-residential
- Lighting Density: 1.2 – 1.9 (ASHRAE Building Area Method)
- Control Density: 1 control/500 watts
- Yields approximately 1 control device per 700 sq.ft.

Population of new high rise residential controls is estimated using the following assumptions:

- 1 control per floor and an average of 10 floors per high rise building

# Cost -Effectiveness Analysis

## Lighting Controls: Phase One Test and List Proposal

*Using TDV Weighted Average Values*

**Range of Cost-effectiveness (negative values = cost effective)**

		<i>Cost Premium over Baseline</i>		
	<i>PV Savings</i>	Min	Average	Max
	Min	(\$9,541)	\$70,360	\$230,160
	Average	(\$367,306)	(\$287,405)	(\$127,605)
	Max	(\$814,512)	(\$734,612)	(\$574,811)

## Lighting Controls: Phase Two Minimum Efficiency Proposal

*Using TDV Weighted Average Values*

**Range of Cost-effectiveness (negative values = cost effective)**

		<i>Cost Premium over Baseline</i>		
	<i>PV Savings</i>	Min	Average	Max
	Min	(\$812,294)	\$1,100,543	\$3,013,380
	Average	(\$2,153,913)	(\$241,076)	\$1,671,761
	Max	(\$3,495,531)	(\$925,765)	\$330,143

- Scenario analysis indicates code changes could be cost-effective
- Phase One proposal assumes a small savings range resulting from lighting designer behavioral changes and other state initiatives (e.g. design for zero-energy new homes)

# Proposed New Title 24 Language (Phase One)

(k) **All Devices: Test and List.** The  
Manufacturer shall:

- Test the standby power requirements for each device per IEC 62301 testing protocol or other test approved by the Commission, and
- Provide a listing of the standby power requirements on the both the control and the external packaging.
- Clearly indicate area of product application: interior or exterior

# CASE Recommendations

- Include Phase One Test and List mandate for all lighting controls in 2008 Title 24 Update
- Analyze manufacturer data from Phase One and work with stakeholders to establish Phase Two mandated efficiency standards, as appropriate by device technology/technology
- Develop any Phase 2 code changes under either a future Title 20 proceeding or the next Title 24 update
- Investigate opportunities to reduce standby load in conjunction with overall lighting system efficiency rather than on a device-only basis