

**DOCKET**

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# 2008 Title 24 Nonresidential CASE Proposals

Presented by  
PG&E, SCG and SDG&E  
Codes & Standards Programs  
May 18, 2006



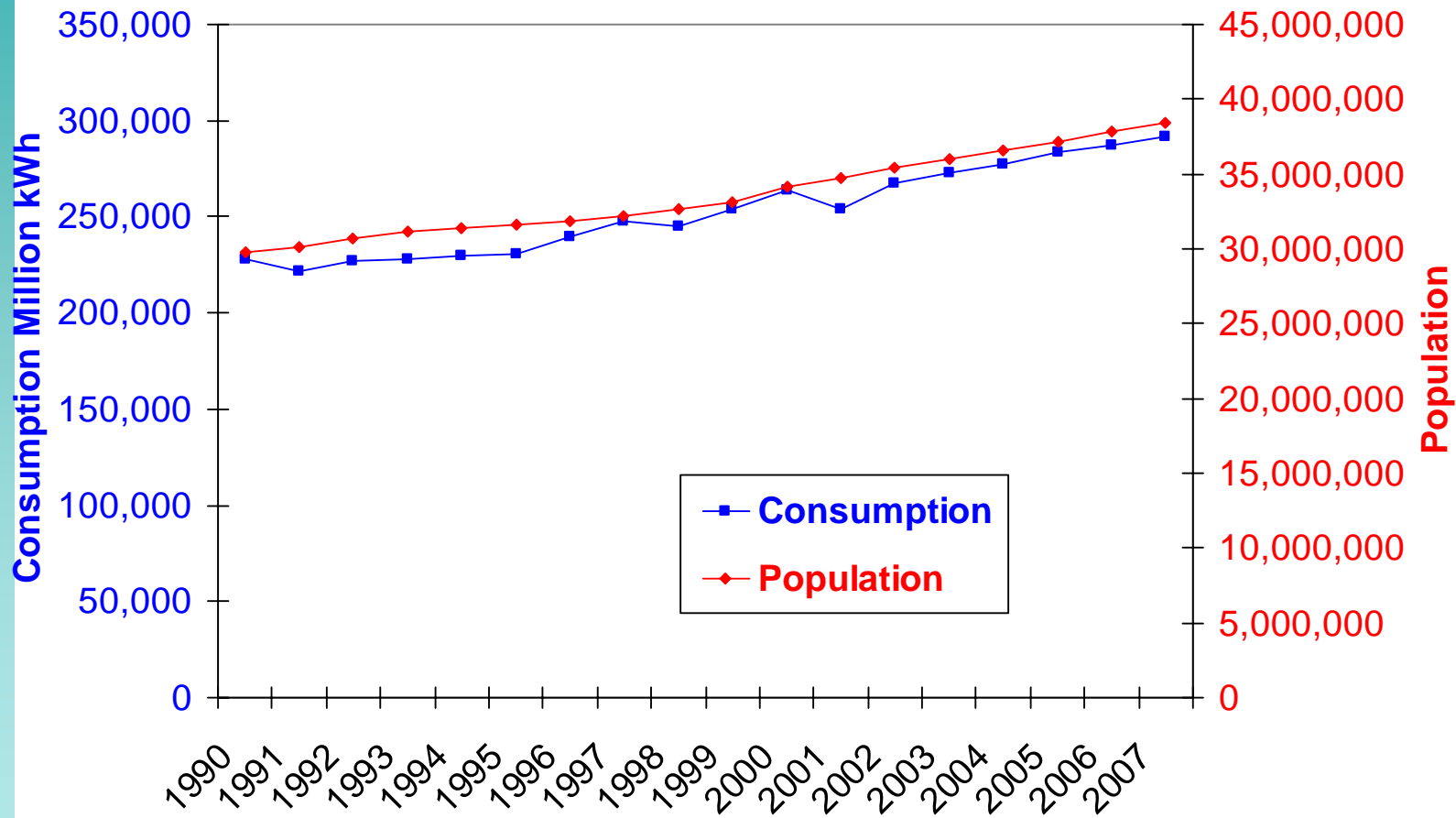
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Codes & Standards Enhancement Project



# California Growth



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# More Background

- Serious constraints on adding generation and transmission capacity
- Energy efficiency less expensive than adding capacity
- State policy: improve and maintain efficiency before adding more electrical capacity



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# CPUC Efficiency Goals 2006-2008

- Energy efficiency now treated as a generation resource

- Energy Goals:

2005	2006	2007	2008	
459	829	944	1,053	GWh

- IOUs get credit for codes work



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# PG&E 2008 T-24 CASE Reports

- Codes And Standards Enhancements
- Technical and feasibility information on energy savings proposals to support an informed CEC decision on 2008 Title 24
  - **Technical information** - how does it work, how much cost, how much energy and cost savings
  - **Feasibility** – market share, can market respond, interaction w/ codes & practices



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# PG&E Non-Res CASE Studies

- ★ ■ Outdoor Lighting
- ★ ■ Indoor Lighting
  - Sign Lighting
  - Toplighting
  - Sidelighting
  - Lighting Controls
  - Hardwired Standby Loads
- Refrigerated warehouses
- ★ ■ Envelope insulation
- Envelope trade-offs
- HVAC Controls
- Exhaust fans
- Demand response

Indoor and Outdoor Lighting CASE reports also sponsored by SCG and SDG&E



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# 2008 Title 24 Nonresidential CASE Outdoor Lighting Proposal

Clanton Engineering, Inc.

In support of

PG&E, SCG and SDG&E

Codes & Standards Programs



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# Overview of Proposal (LPD)

- Reduce some LPD's in Table 147-A "Lighting Power Allowances for General Site Illumination"
- Reduce some LPD's in Table 147-B "Lighting Power Allowances for Specific Applications"
- Add Initial Wattage Allowances (IWA) Table 147-A1 and 147-B1 for some applications to account for small or awkward geometry areas



# Overview of Proposal (Security)

- **Remove** security lighting multipliers (Table 147-D) when LPD's meet IESNA G-1
- **Clarify** security multiplier should apply to retail parking lots and not retail sales lots
- **Add** security lighting multipliers (Table 147-D) for LZ3 for parking lots and hardscape areas with special security requirements

# Other issues

- Move Outdoor Sales LPD to Table 147-B
- Add a dimming or nighttime lighting reduction requirement in Section 132(c) for lighting operating all day and night like garage entrances
- Change cutoff requirement from  $> 175\text{ W}$  to  $>150\text{W}$
- Update LPD's in Table 147-C
  - lighting to comply with local ordinance



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# Recommendations are based on:

- Selecting appropriate criteria
  - Based on IESNA recommended practices, design guides or general documents applicable to the application and lighting zone
- Revising lamp efficacy per 2008 Title 20 requirements
- Variety of lighting models (poles heights, spacing etc.) to convert criteria into LPDs

# Methodology (LPD's)

- Develop typical design scenarios with commonly used standard luminaires.
- Assure all design scenarios will meet appropriate IESNA recommended practices.
- Compare LPD's from *Table 147-A and Table 147-B* with LPDs for appropriate scenarios



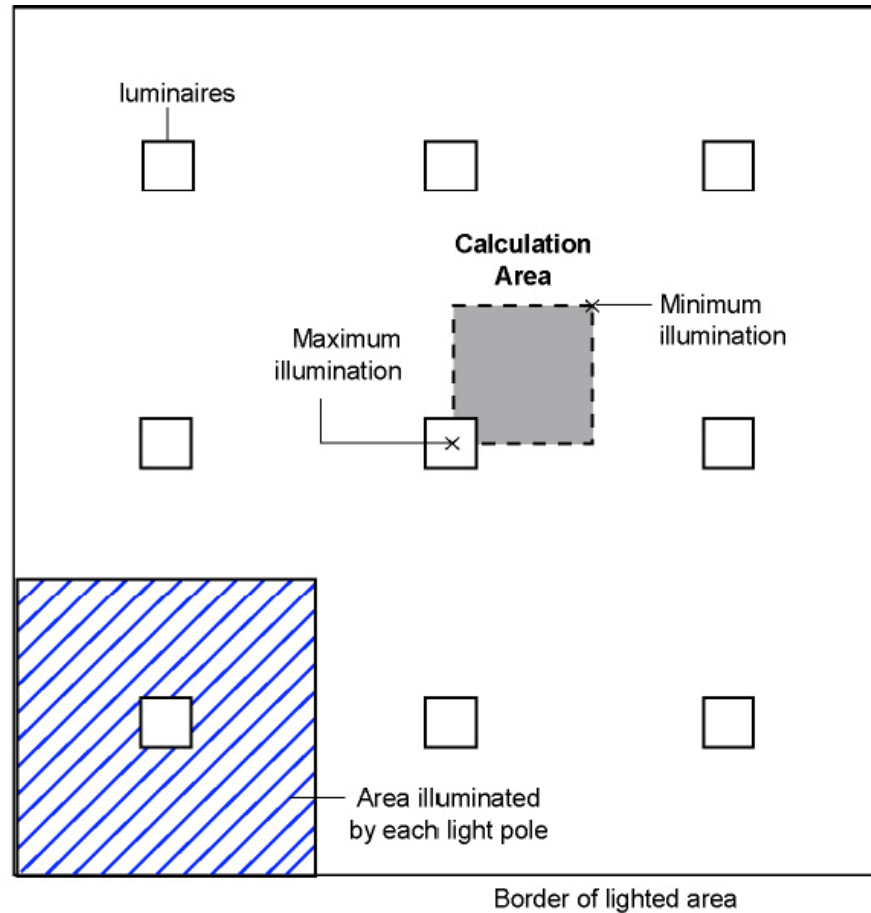
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# Methodology - Calculations

- Layout typical grid or linear arrangement of luminaires as appropriate for calculation
- When reflectances are included in the calculations, use moderate case values
- Vary mounting height, lamp wattage and luminaire spacing while still meeting IESNA criteria
- Use a high efficacy lamp source similar to pulse start metal halide or fluorescent

# Simulation models (same as 2005)



# Methodology Lamps and LLF

- Use metal halide (60 lumens per watt or greater) for outdoor retail and canopies.
- Use compact fluorescent (60 lumens per watt or greater) for entries and facades.
- Use mean lamp lumens per manufacturer's lamp information.
- Use a luminaire dirt depreciation (LDD) factor of 0.7.

# LPD comparisons

- The lighting power density of a system that is providing the IESNA required minimum light levels and uniformity is compared to the proposed lighting power densities.
- The 2005 LPD's were compared to the selected IESNA guidelines.
- If the 2005 LPD's showed a substantially higher allowance than necessary to meet the IESNA recommended levels, the LPD's were adjusted.
- Shown in detailed spreadsheets in **Appendix C** of Outdoor Lighting CASE report



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# Initial wattage allowance development

- Initial wattage allowance – fixed wattage in addition to lighting power density times area
  - Accounts for areas that are unusual or difficult geometries or application aspect ratios
- IWA based on the wattage of an additional luminaire appropriate for each application
  - From 18W CFL for entrance canopy in LZ1, to 320W MH for parking lot in LZ4
- For many applications (such as parking lots) the IWA can be added once per site
- For all entrance canopies, the IWA is added once per entry
- Some applications do not have any IWA



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# Life Cycle Cost Analysis

- Compare the first cost and operating costs of proposed and base systems
- Meet or exceed the appropriate IESNA lighting criteria
- 2005 T-24 lighting power densities compared to proposed 2008 lower lighting power densities
- Cost of pulse start not included
  - Required by 2008 Title 20 for all new luminaires
- No first cost increment – immediate payback



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# Results (*Table 4: IESNA Design Criteria Basis per Lighting Zone for General Lighting Applications in 2008 Table 147-A*)

## IESNA Recommended Criteria per Lighting Zone

T-24 Lighting Application	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
Hardscape for automotive vehicular use, including parking lots, driveways, and site roads	RP-20-98 NO VERTICAL (.2 hfc min)	RP-20-98 Basic (.2 hfc min, .1 vfc)	RP-20-98 Enhanced (.5 hfc min, .25 vfc)	RP-20-98 Enhanced Security/Retail (1.0fc min, .25 vfc); G-1-03 Parking lots 3hfc ave

# Proposed changes to General Lighting Power Allowances – Table 147- A

*TABLE 147-A LIGHTING POWER ALLOWANCES FOR GENERAL SITE ILLUMINATION (W/FT<sup>2</sup> UNLESS OTHERWISE NOTED)*

Lighting Application	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
Hardscape for automotive vehicular use, including parking lots driveways and site roads	<del>0.05</del> <u>0.04</u>	<del>0.08</del> <u>0.05</u>	<del>0.15</del> <u>0.08</u>	<del>0.19</del> <u>0.10</u>
Hardscape for pedestrian use, including, plazas, sidewalks, walkways and bikeways	<del>0.06</del> <u>0.04</u>	<del>0.09</del> <u>0.06</u>	<del>0.17</del> <u>0.09</u>	0.21
Hardscape for driveways, site roads, sidewalks, walkways and bikeways (Method (ii))	1.0 w/lf	1.5 w/lf	4.0 w/lf	5.0 w/lf
Building Entrances (without canopy)	<del>0.35</del> <u>0.20</u>	<del>0.50</del> <u>0.35</u>	<del>.70</del> <u>0.55</u>	<del>1.00</del> <u>0.70</u>

# Initial Lighting Power Allowances

*TABLE 147-A1 INITIAL WATTAGE ALLOWANCE FOR GENERAL SITE ILLUMINATION (WATTS)*

Lighting Application	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
Hardscape for automotive vehicular use, including parking lots driveways and site roads	190	190	290	370
Hardscape for pedestrian use, including plazas, sidewalks, walkways and bikeways	90	130	190	290

# Proposed Changes to TABLE 147-B Lighting Power Allowances For Specific Applications

*TABLE 147-B LIGHTING POWER ALLOWANCES FOR SPECIFIC APPLICATIONS (W/ft<sup>2</sup> unless otherwise noted)*

Lighting Application	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
Building Facades	Not allowed	0.18	0.35	0.5
<u>Outdoor Sales Lot</u>	<del>0.35</del> <u>0.20</u>	<del>0.70</del> <u>0.60</u>	<del>1.25</del> <u>0.85</u>	<del>2.00</del> <u>1.40</u>
Outdoor Sales Frontage (Frontage in linear feet)	Not allowed	22.5 w/lf	<del>38.5</del> <u>36</u> w/lf	<del>55</del> <u>45</u> w/lf
Vehicle Service Station with or without Canopies	<del>0.70</del> <u>0.55</u>	<del>1.15</del> <u>1.05</u>	1.45	2.4

**Note: Outdoor Sales Lot moved from General Lighting (Table 147A) to Specific Applications (Table 147B)**



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# Initial Lighting Power Allowances

TABLE 147-B1 INITIAL WATTAGE ALLOWANCES FOR SPECIFIC APPLICATIONS (WATTS)

<u>Lighting Application</u>	<u>Lighting Zone 1</u>	<u>Lighting Zone 2</u>	<u>Lighting Zone 3</u>	<u>Lighting Zone 4</u>
<u>Building Facades</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>
<u>Outdoor Sales Lot</u>	<u>190</u>	<u>190</u>	<u>290</u>	<u>370</u>
<u>Outdoor Sales Frontage</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>
<u>Vehicle Service Station with or without Canopies</u>	<u>130</u>	<u>190</u>	<u>290</u>	<u>370</u>
<u>Vehicle Service Station Hardscape</u>	<u>190</u>	<u>190</u>	<u>290</u>	<u>370</u>
<u>All Other Sales Canopies</u>	<u>90</u>	<u>130</u>	<u>190</u>	<u>290</u>
<u>Non-sales canopies</u>	<u>20</u>	<u>40</u>	<u>70</u>	<u>90</u>
<u>Ornamental Lighting</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>
<u>Drive Up Windows</u>	<u>70</u>	<u>90</u>	<u>130</u>	<u>190</u>
<u>Guarded Facilities</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>
<u>Outdoor Dining</u>	<u>90</u>	<u>130</u>	<u>190</u>	<u>290</u>



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# Security Multipliers

TABLE 147-D MULTIPLIERS FOR SPECIAL SECURITY REQUIREMENTS

Function	Multiplier
Retail parking lots in lighting zones <del>1</del> , 2 and 3	1.25
Hardscape areas within 100 feet of the entrance of senior housing facilities in lighting zones 1, 2, and 3	1.25
Parking lots and walkways within 60 feet of entrances to <del>the building for</del> law enforcement, fire, ambulance and emergency vehicle facilities in lighting zones 1,2 and 3	2.00
Parking lots in lighting zone 3 with special security requirements	1.50
Hardscape areas in lighting zone 3 with special security requirements	2.00



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# Discussion

- Small or awkward sites configurations
- Appropriate IESNA application selections
- Appropriate definition of “areas deemed to have special security requirements”
  - Meet intent of IESNA G-1
  - Language to clearly define where security is an issue

# Acknowledgements

- Sponsored by California Ratepayers through Codes & Standards programs at:
  - Pacific Gas & Electric Company
    - Steve Blanc [SLB4@pge.com](mailto:SLB4@pge.com)
  - Southern California Gas Company & San Diego Gas & Electric Company
    - Jerine Ahmed [jahmed@semprautilities.com](mailto:jahmed@semprautilities.com)
  - Project management by Heschong Mahone Group
    - Jon McHugh [mchugh@h-m-g.com](mailto:mchugh@h-m-g.com)



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# Results (*Table 4: IESNA Design Criteria Basis per Lighting Zone for General Lighting Applications in 2008 Table 147-A*)

IESNA Recommended Criteria per Lighting Zone

T-24 Lighting Application	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
Hardscape for pedestrian use, including plazas, sidewalks, walkways, and bikeways	DG-5-94 Specialized Residential - Medium (.5 fc)	DG-5-94 Village Center Walkway - Mixed (1 fc)	DG-5-94 Suburban Shopping Street - Mixed (2 fc)	DG-5-94 City Center Shopping Street - Mixed (2.5 fc); G-1-03 Park trails and walkways  0.6 hfc ave

# Results (*Table 4: IESNA Design Criteria Basis per Lighting Zone for General Lighting Applications in 2008 Table 147-A*)

## IESNA Recommended Criteria per Lighting Zone

T-24 Lighting Application	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
Hardscape for driveways, side roads, sidewalks, walkways, and bikeways (Method II)	RP-8-00 Walkway/ Bikeway Mixed use - Pedestrian Low Conflict (.5 fc)	RP-8-00 Walkway/ Bikeway Mixed use - Pedestrian Medium Conflict (1 fc)	RP-8-00 Walkway/ Bikeway Mixed use - Pedestrian High Conflict (2 fc)	DG-5-94 City Center Shopping Street - Mixed (2.5 fc); G-1-03 Park Trails & Walkways 0.6 hfc ave

# Results (*Table 4: IESNA Design Criteria Basis per Lighting Zone for General Lighting Applications in 2008 Table 147-A*)

IESNA Recommended Criteria per Lighting Zone

T-24 Lighting Application	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
<b>Building Entrances (without canopy)</b>	DG-5-94 Village Center Walkways Mixed (1 fc)	RP-2-01 Seasonal Outdoor Merchandise Circulation Low (5 hfc)	RP-2-01 Seasonal Outdoor Merchandise Circulation Medium (7 hfc)	RP-2-01 Seasonal Outdoor Merchandise Circulation High (10 hfc)

# Results (*Table 5: IESNA Design Criteria Basis per Lighting Zone for Selected Specific Lighting Applications in 2008 Table 147-C*)

## IESNA Recommended Criteria per Lighting Zone

T-24 Specific Lighting Application	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
<b>Outdoor Sales Lot</b>	RP-33-99 Secondary Business District General Display (5 hfc, 10:1 max:min)	RP-2-01 Auto Retail Lot Low Level (20 hfc)	RP-2-01 Auto Retail Lot Medium Level (30 hfc)	RP-2-01 Auto Retail Lot High Level (50 hfc)

# Results (*Table 5: IESNA Design Criteria Basis per Lighting Zone for Selected Specific Lighting Applications in 2008 Table 147-C*)

## IESNA Recommended Criteria per Lighting Zone

T-24 Specific Lighting Application	Lighting Zone 1	Lighting Zone 2	Lighting Zone 3	Lighting Zone 4
Outdoor Sales Frontage (in linear feet)	NA	RP-2-01 Auto Dealership Feature Display (35 hfc)	RP-2-01 Auto Dealership Feature Display (50 hfc)	RP-2-01 Auto Dealership Feature Display (75 hfc)

# Results (*Table 5: IESNA Design Criteria Basis per Lighting Zone for Selected Specific Lighting Applications in 2008 Table 147-C*)

## IESNA Recommended Criteria per Lighting Zone

<b>T-24 Specific Lighting Application</b>	<b>Lighting Zone 1</b>	<b>Lighting Zone 2</b>	<b>Lighting Zone 3</b>	<b>Lighting Zone 4</b>
Vehicle Service Station with or without canopies	RP-33-99 Service Station Pump Island (10 hfc)	RP-2-01 Service Station Gas Islands (20 hfc)	RP-2-01 Service Station Gas Islands (30 hfc)	RP-2-01 Service Station Gas Islands (50 hfc)



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