



# 2008 Title 24 PG&E Nonresidential CASE Reports Update

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# 2008 T-24 CASE Reports

- **Codes And Standards Enhancements**
- **Technical and feasibility information on energy savings proposals to support an informed CEC decision**
  - *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



# 2008 T-24 Nonresidential CASE Reports

- Insulation Levels
- TDV Lighting Controls
- Cool roofs
- Demand Response
- Outdoor Lighting
- Skylighting
- Indoor Lighting
- Sign Lighting
- Overall Envelope
- Indoor Lighting
- Outdoor Signs
- Sidelighting
- Refrigerated Warehouses
- Scavenger Fans
- DDC to Zone



# Issues Common to All Measures

- **Cost of electricity and natural gas**
  - Separate time dependent factors for demand response (DR) developed by PIER/SCE PCT
- **Quantities of building sf, outdoor lighting and signs**
- **Emissions factors for electricity and natural gas**
  - From CEC declaration of environmental impact for 2005 standards



# New Construction Activity by CTZ sqft X 1,000 (4 year average)

CTZ	AMUSEMENT	ASSEMBLY	EDUCATION	GOVT	HOTEL	MEDICAL	OFFICE	RETAIL	SCHOOL	SERVICE	STORAGE	OTHER	Total 1,000's sf
1	22	2	5	13	25	20	79	40	50	9	28	24	318
2	93	19	23	84	177	119	419	241	242	53	259	204	1,934
3	849	103	149	184	997	334	4,999	1,868	1,111	3,077	1,030	453	15,155
4	358	77	279	46	380	452	3,365	1,075	1,162	2,656	496	499	10,843
5	145	31	0	20	154	75	356	244	251	245	432	167	2,121
6	405	165	68	151	566	599	1,697	1,820	912	1,746	2,400	349	10,878
7	160	49	71	32	530	167	1,114	738	524	938	642	85	5,049
8	581	250	114	215	806	959	2,498	2,714	1,443	3,010	3,761	458	16,808
9	309	105	107	165	251	780	1,438	1,781	923	1,833	2,495	428	10,615
10	591	192	103	280	645	351	1,815	2,906	1,961	1,203	8,640	501	19,188
11	224	149	5	55	144	216	874	1,140	383	207	454	297	4,149
12	577	356	37	204	799	562	4,133	3,808	2,496	2,442	4,166	1,205	20,786
13	475	130	46	331	72	566	436	1,161	656	327	1,658	447	6,305
14	537	191	167	415	617	913	2,298	2,915	1,899	2,825	7,103	638	20,518
15	272	99	85	110	625	247	1,416	1,365	951	1,122	2,825	303	9,419
16	179	71	19	230	112	168	442	594	369	273	1,117	168	3,741
<b>Totals</b>	<b>5,776</b>	<b>1,990</b>	<b>1,277</b>	<b>2,535</b>	<b>6,901</b>	<b>6,527</b>	<b>27,380</b>	<b>24,410</b>	<b>15,334</b>	<b>21,965</b>	<b>37,504</b>	<b>6,227</b>	<b>157,827</b>



# Calculating Emission Reductions from Energy Savings

Emissions factors	NOx	CO	CO2	PM10
Natural Gas, California (lbs/MMBtu)	0.094	0.03	115	0.01
Electricity, Western States (lbs/MWh)	0.383	0.23	1200	0.06

[http://www.energy.ca.gov/reports/2003-09-12\\_400-03-018.PDF](http://www.energy.ca.gov/reports/2003-09-12_400-03-018.PDF)

Values provided by the CEC System Assessment and Facilities Siting Division.



# Outdoor Lighting

- Revisit parking lot and walkway LPA's as well as security lighting LPA's
- Basis of models is IESNA outdoor lighting standards
- LPA's will be based upon pulse start MH  
or for parking lots... HPS
- Remove or reduce loopholes
- This work is co funded by Sempra



# Indoor Lighting

- **Revisit retail lighting as area category method**
  - Study removal of tailored lighting method
  - Consider “use it or lose it” allowances in area category method for display lighting, high RCR spaces
  - Study removing exemptions (refrigerated case lighting)
- **Add multi-scene requirements or PAF**
  - Normal retail, 1 or 2 levels of load curtailment, stocking/cleaning, off (emergency/security)
- **This work is co funded by Sempra**



# Sign Lighting

- **Create taxonomy for sign families**
  - How / Where illuminated
  - Static vs moving displays
  - Cover as many types as possible
- **Specific requirements by sign type**
  - Power density for all types of signs
  - Alternative to LPD - power regulation efficiency requirements for all sources
  - Controls off during the day or dimmed at night
- **Look at ease of compliance issues**
- **Working with SCE**



# Skylighting

- **Reduce prescriptive skylighting criteria**
  - < 15 ft ceiling height not likely cost-effective
  - Minimum area reduced from 25,000 sf to 10,000 sf – likely cost-effective
- **Require photocontrols**
  - Based upon experience with controls in the standard
  - Add adjustable deadband to photocontrol requirements
- **Photocontrol PAF calculation**
  - Daylight availability based in ACM software
  - Simpler prescriptive calculation
- **Improve daylit area definition for partitions**



# Sidelighting & Photocontrols

- **Redefine sidelit space for standard**
  - Geometrical basis – larger windows lead to larger daylit depth
- **New model for photocontrol PAF**
  - Effective aperture not based on WWR
  - ACM hourly savings model based on daylight availability – TDV compatible
- **Study prescriptive requirement in large sidelit areas**



# Refrigerated Warehouses

- **New section for warehouses**
  - Exempt process uses
  - Scope is **cold storage**
  
- **Studying shell U-factor requirements**
  
- **Studying refrigeration system requirements**
  - sizing, efficiency and controls
    - Condenser
    - Compressor
    - Evaporator
  - maximum U-factors for refrigerant piping and storage



# Scavenger Fan

- **Maintains negative pressure in common exhaust plenum**
- **Currently, ACM models this as inducing large infiltration rates**
- **Investigate the actual impact of fans on building ventilation**
- **Improve ACM procedures for scavenger fan modeling and energy use estimation**



# DDC to Zone

- Requirement for EMCS
  - Looking at Benefit to Cost by CTZ
  - Consider size threshold for requirement
- DDC (Direct Digital Controls) to zone
  - Zone temperature, VAV box position known
  - ECMS able to reset setpoints or pressure
- Energy savings - VAV pressure reset
- Demand response- global temp reset



# Revise Overall Envelope Method

- Hand calc method to perform trade-offs between envelope components
- Recalculate coefficients based on TDV
  - extra value for demand savings
  - West facing windows more important
  - TDV trade-offs between heating (U-factor) and cooling (SHGC)
- Coefficients developed from layers model of angular solar transmittance



# Demand response added to CASE studies

- Refine specification of “automatic load controls” receiving PAF credit
- Consider wider range of demand responsive indoor lighting controls
  - Switching circuits
  - Dimming circuits
  - Addressable ballasts
- Consider demand responsive control of signs lit during the day



# Additions to CASE studies

- Add DR implications and code where applicable to all measures
- Propose language for:
  - Standards
  - ACM
  - Nonresidential Compliance Manual including worked examples
  - Compliance forms



# Next steps on CASE studies

- review and alter work plans
- approve work on draft reports