Technology View:

New CA Title 24 and SPEED Best Practice Technologies

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33rd Utility Energy Forum

Focus on 2020

May 17,2013

ciee california institute for energy and the environment
SPEED State Partnership for Energy Efficient Demonstrations
CLTC California Lighting Technology Center
WCEC Western Cooling Efficiency Center

California Institute for Energy and the Environment (CIEE)

An innovative University of California partnership of energy agencies, utilities, building industry, non-profits, and research entities designed to advance energy efficiency science and technology for the benefit of California and other energy consumers and the environment. CIEE is a branch of the University of California Energy Institute.



SPEED Market Impact

Develop

Market-Based Solutions

Partnering to innovate cutting-edge energy-efficient technologies

Demonstrate

Effectiveness & Viability

Validating performance & economics to educate and overcome barriers

Deploy

Into the Mainstream

Influencing market penetration to achieve deep energy efficiency potential

Product Improvements & Derivatives

2013 Title 24 changes the baseline from the 2008 baseline for 2014 IOU Incentives.

Examples of how the 2013 Title 24 Code will change the baseline for IOU incentives in 2014 and SPEED best practices for exceeding the 2013 Title 24

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SPEED State Partnership for Energy Efficient Demonstrations

CLTC
CALIFORNIA LIGHTING TECHNOLOGY CENTER

WCEC
WESTERN COOLING EFFICIENCY CENTER

What is changing in 2013 Title 24?

- **Exterior**
  - Sensors on all exterior luminaires mounted under 24’
- **Interior**
  - Sensors required in secondary spaces (which spaces)
  - Daylighting required in spaces (which spaces)
  - Dimmable ballasts required (which spaces?)
- **Compliance retrofit threshold reduced**
  - 10% of all luminaires or 40 ballasts

Good News - Bad News

1. The SPEED program demonstration work supported the 2013 Title 24 changes
2. IOU incentives require energy efficiency projects that exceed current Title 24 requirements
3. SPEED Technologies and other Best Practices still save up to 78% above the 2013 Title 24

Parking Garage Incentive Changes

Lighting Technology	% Energy Savings over 2013 T24	2008 Incentive	2013 Incentive	Incentive Lost
LED Parking Garage Luminaire	0%	$164	$0	$164
LED Parking Garage Luminaire (50% Low Mode)	0%	$222	$0	$222
LED Parking Garage Luminaire (20% Low Mode)	20%	$257	$35	$222


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Wallpack Incentive Changes

Lighting Technology	% Energy Savings over 2013 T24	2008 Incentive	2013 Incentive	Incentive Lost
LED Parking Garage Luminaire	0%	$82	$0	$82
LED Parking Garage Luminaire (50% Low Mode)	0%	$132	$0	$132
LED Parking Garage Luminaire (20% Low Mode)	44%	$161	$30	$131

Office Incentive Changes

Lighting Technology	% Energy Savings over 2013 T24	2008 Incentive	2013 Incentive	Incentive Lost
Ambient Troffer with Occupancy	0%	$15	$0	$15
Ambient Troffer with Occupancy and Daylighting	14%	$20	$5	$15
LED Ambient Troffer with Occupancy and Daylighting	78%	$41	$27	$15

Corridor Incentive Changes

Lighting Technology	% Energy Savings over 2013 T24	2008 Incentive	2013 Incentive	Incentive Lost
Ambient Troffer with Occupancy (50% Low)	0%	$47	$0	$47
Ambient Troffer with Occupancy (20% Low)	40%	$75	$28	$47
Ambient Troffer with Networked Controls (20% Low)	40%	$75	$28	$47
LED Ambient Troffer with Networked Controls (20% Low)	71%	$97	$50	$47

SPEED State Partnership for Energy Efficient Demonstrations

INTERIOR LIGHTING CASE STUDY

Post-retrofit corridor at CSU Long Beach with Adura controls.

ADAPTIVE CORRIDOR LIGHTING

Large-scale retrofits yield large-scale energy savings

CONTROL OPTIONS FOR ADAPTIVE CORRIDOR LIGHTING

Facility managers have a variety of choices when selecting light sources and controls, and cost-effective solutions are available to fit most campuses' needs. The incumbent example used for this business case study is the most common type of campus corridor fixture: a 2-lamp 2x4 T8 recessed fluorescent fixture. The four retrofit scenarios described here represent just some of the options commercially available today.

NOTE: To produce realistic calculations for the four scenarios presented here, the SPEED team selected specific, commercially available solutions. Scenario 1 implements a microwave occupancy sensor and bi-level ballast into each existing luminaire. Scenario 2 involves installing 0–10V dimming ballasts and a Lutron semi-wireless control system. Scenario 3 utilizes 0–10V dimming ballasts and an Enlighted wireless control system. Scenario 4 is based on Finelite's High-Performance Recessed (HPR) 2x4 LED fixture and the same Lutron control system used for scenario 3. Other manufacturers offer similar solutions.

SCENARIO 3 – NETWORKED
64% ENERGY SAVINGS

Networked lighting systems offer the most sophisticated level of lighting control. They require dimming ballasts, occupancy sensors and networked controls, a gateway, and a Web interface. The wireless gateway communicates with the other parts of the system and connects the system as a whole with the Internet, allowing control access from any location via the Web interface. Facility personnel can monitor energy use, adjust light levels and program fixtures based on occupancy, multiple predetermined schedules, predictive pathing, and demand response (DR) events. DR capability allows facilities to take advantage of utility incentives associated with DR program participation.

SCENARIO 4 – NETWORKED + LED
82% ENERGY SAVINGS

For maximum lighting efficiency, facilities can install LED fixtures with dimmable drivers along with the network control components described in Scenario 3. The networked control system also allows for dynamic adjustment of light levels based on occupancy.

REASON TO RETROFIT SOONER

Partnership incentives will decline sharply when Title 24 changes take effect.

SPEED/SCE ZNE Recreation Center Retrofit

UCSB ZNE Rec Center: Phase 1 – LED and Networked Controls Lighting Retrofit

- Pre Retrofit Lighting
  - 530,926 kWh
  - 4.09 W/Ft^2
- Post luminaire retrofit lighting
  - 193,434 kWh
  - 1.49 W/Ft^2
- 40% Savings from dimmable LED retrofits from controls
  - 116,060kWh
  - 0.89 W/Ft^2
- ***Estimated 85% Overall Lighting Savings***

Current SPEED Investigations

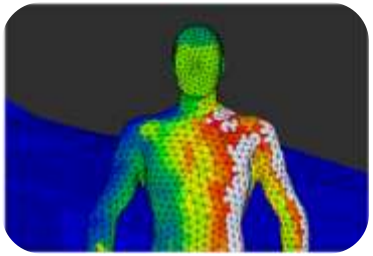
Advanced CV/VAV Controls

Occupancy Sensing Thermostats

LEED Platinum
UCD Gallagher Hall

NZE Project
UCSB Rec Center

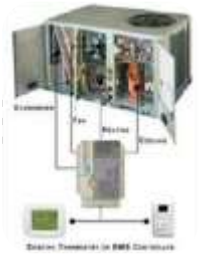
Duct Leakage Sealing



PEC Study
UC Berkeley

Current SPEED Investigations

Climate Optimized RTU



RTU Optimizer Controller

Kitchen Hood DCV

Laboratory Fume Hood DCV

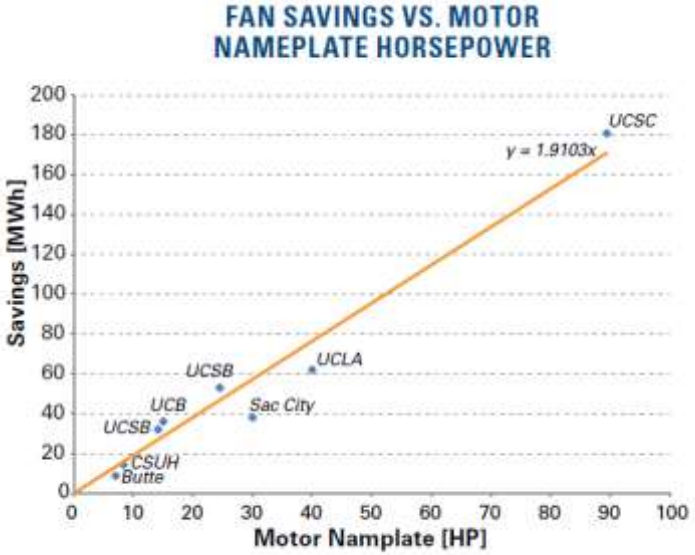
Evaporative Cooled Condenser

Laboratory ACH DCV

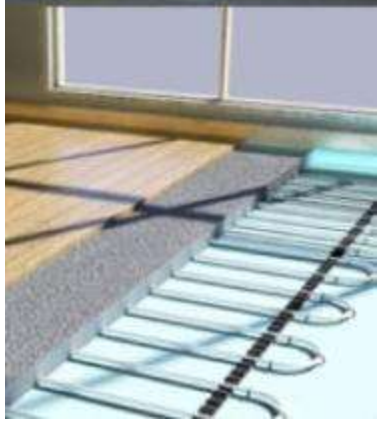
Shut-the-Sash Campaign

Demand Controlled Kitchen Ventilation

- VFD controlled fan motor responds to
  - Heat
  - Particulate
- Typical fan energy reduction of 40 – 70%
- Typical thermal energy reduction of 15 – 40%
- Typical simple paybacks 3 – 5 yrs

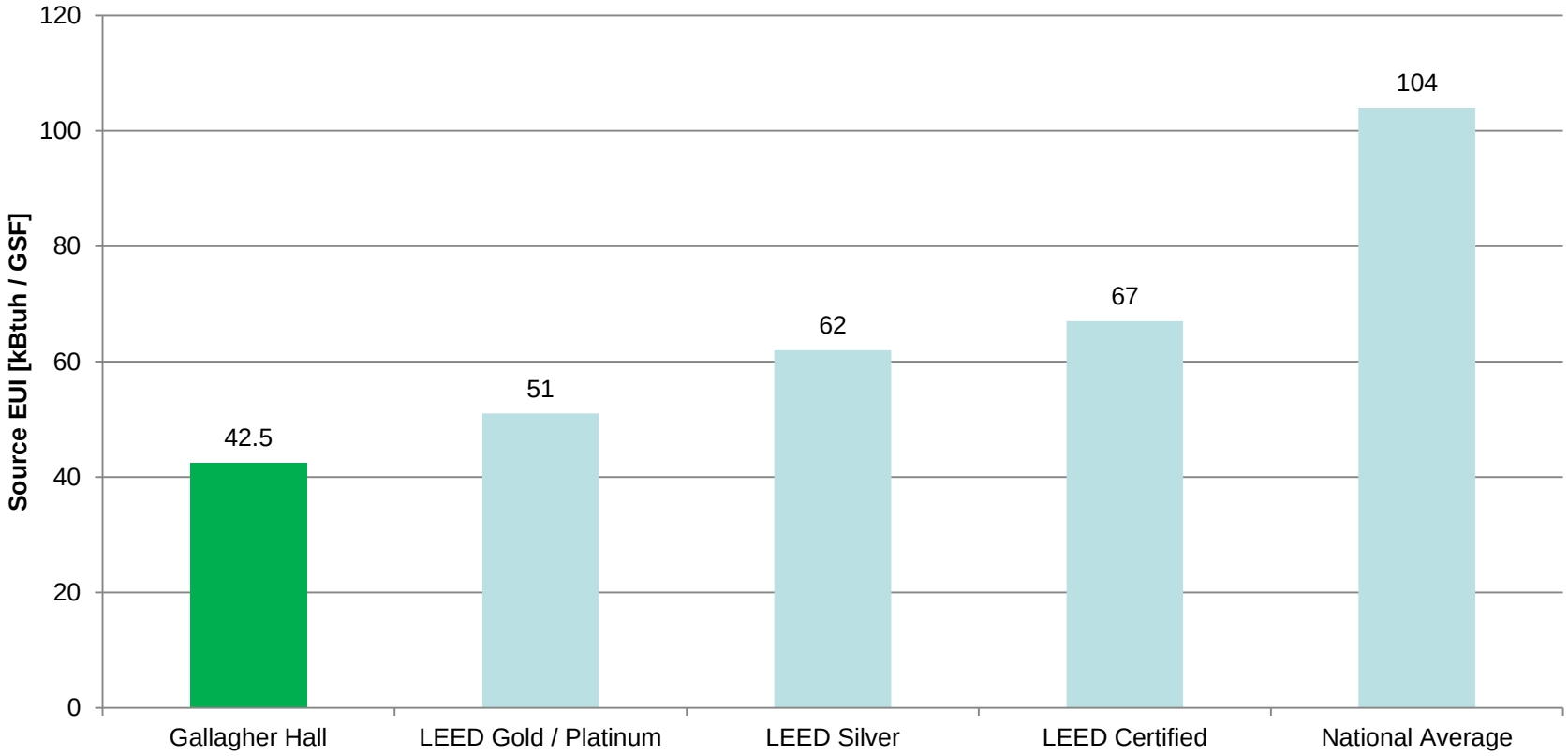


New Construction / Whole Building



Gallagher Hall – LEED Platinum

UC Davis Gallagher Hall – 2011 Actual



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2012 World Renewable Energy Forum

Direct Current to Direct Current – - A Bridge to Zero Net Energy?

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A Digital World Needs DC Power … so …. What's AC got to do with it?

PROBLEM: MISMATCHED AC & DC POWER REQUIREMENTS

ENERGY SOURCES – MIXED AC & DC

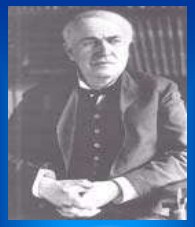
AC/DC Site Generation

DC Campus Fuel Cells

DC Photovoltaic

DC Wind Power

AC Line Power



ELECTRIC DEVICES – TYPICALLY DC

Electronic Lighting

HVAC Actuators

Sensor & Controls

AV/IT Devices

Security & Safety

RESULT: LOST OPPORTUNITY TO REDUCE ENERGY UP TO 30%

DC THE BRIDGE TO ZNE ?

According to:

SERA Architects (leaders of the Living Buildings Challenge), USGBC, NBI, Architecture 2030, studies from the CEC, and reports from the US DOE, LBNL…

Energy Efficiency can cost-effectively be increased by 50-80%

Of an average building's demand, on-site renewables can generate 10-30%

Thus, the remaining 10% will be a crucial gap to ZNE

DC CAN IMPROVE SYSTEM EFFICIENCY BY 10-35%

http://www.partnershipdemonstrations.org

- ***SPEED demonstrated solutions in energy efficiency toward ZNE "50%-90% solutions" — Best Practice technologies from RD&D supported by the CEC***

. *Thank You…… for Questions*:

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