DOCKETED	
Docket Number:	19-BSTD-03
Project Title:	2022 Energy Code Pre-Rulemaking
TN #:	234645
Document Title:	Presentation - 2022 Pre-Rulemaking for Building Energy Efficiency Standards
Description:	September 9 - 2022 Pre-Rulemaking for Building Energy Efficiency Standards workshop presentation for CASE Nonresidential Grid Integration and CEA Controlled Receptacles proposals
Filer:	Haile Bucaneg
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	9/9/2020 2:25:07 PM
Docketed Date:	9/9/2020

2022 Pre-Rulemaking for Building Energy Efficiency Standards

Payam Bozorgchami, P.E.

September 9, 2020

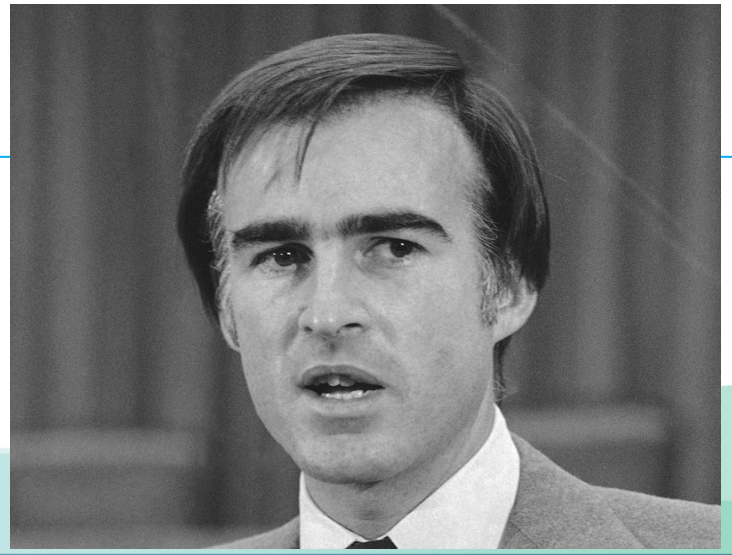
Start Time: 9:00 AM

What We Will Cover Today

- Some Basic, Background
- How Title 24, Part 6 is Developed
- **Haile Bucaneg**
  - Nonresidential Grid Integration
    - Heat Pump Water Heaters
    - Thermal Energy Storage
    - Demand Responsive Lighting Control
    - Demand Responsive Controls Requirements
- **Thao Chau**
  - Proposal from CEA on Controlled Receptacles
    - Mandatory Measures
    - Demand Response
    - Nonresidential Grid Optimization

Authority & Process

- **Public Resources Code (PRC 25402):** Reduction of wasteful, uneconomic, inefficient, or unnecessary consumption of energy
  - (a)(1) Prescribe, by regulation, lighting, insulation, climate control system, and other building design and construction standards that increase the efficiency in the use of energy and water…
  - Warren Alquist Act Signed into law in 1974 by Governor Ronald Reagan and launched by Governor Jerry Brown in 1975 which mandates updates Building Efficiency Standards and requires the building departments to enforce them through the permit process.

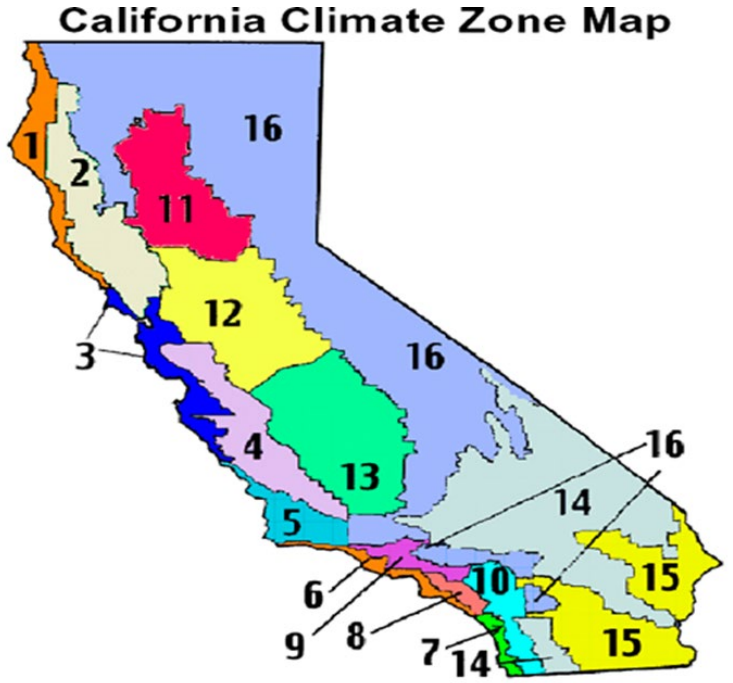


Goals of the California Energy Code

1. Increase building energy efficiency cost-effectively
2. Contribute to the state's GHG reduction goals
3. Enable pathways for all-electric buildings
4. Reduce residential building impacts on the electricity grid
5. Promote demand flexibility and self-utilization of PV generation
6. Provide tools for local government reach codes

Process Used to Updated Energy Codes

CEC staff, with input from utility partners and industry stakeholders, develop the triennial standards update



Opportunities for participation

- Utility-Sponsored Stakeholder Meetings
- CEC-Sponsored Workshops

Standards must be cost-effective

- Life-Cycle Costing Methodology
- Time Dependent Valuation (TDV)

2022 Standards Process

2022 STANDARDS UPDATE SCHEDULE	
DATE	**MILESTONES**
November 2018 - November 2019	Updated Weather Files
November 2018-December 2019	Metric Development
November 2018-July 2019	Measures Identified and approval
August 2019 to October 2020	Stakeholder meeting/workshop & final staff workshop
August 2020-October 2020	CASE Reports submitted to the CEC
February 2021	45-day Language Hearings
July 2021	Adoption of 2022 Standards at a Business Meeting
July 2021 to November 2021	Staff work on Software, Compliance Manuals, Electronic Documents Available to Industry
December of 2021	Approval of the Manuals
January 2022	Software, Compliance Manuals, Electronic Documents Available to Industry
January 1, 2023	Effective Date

Tentative Pre-Rulemaking Schedule

- **September 1**
  - Energy Savings and Process Improvements for Alterations and Additions
    - Roof deck insulation for low-slope roofs
    - Prescriptive attic insulation for alterations
    - Prescriptive duct sealing
    - Electric resistance water heating
    - Electric resistance space heating
    - 40-ft trigger for prescriptive duct requirements
    - Cool roof for steep-slope roofs
    - Cool roof for low-slope roof
- **September 9**
  - Nonresidential Grid Integration
  - Controlled Receptacle, CEA Proposal
- **September 10**
  - Verification Testing
- **Date TBD**
  - Indoor Air Quality Roundtable discussion with the outside world
- **September 22**
  - ~~Nonresidential Indoor Lighting~~
  - Outdoor lighting
  - Daylighting
- **September 23**
  - Computer Room Efficiencies
  - Pipe Sizing and Leak Testing for Compressed Air Systems
  - Refrigeration System Operation

Tentative Pre-Rulemaking Schedule (Cont.)

- **September 29**
  - Air Distribution
  - Nonresidential HVAC Controls
- **September 30 (TBD for Verification Testing)**
  - Controlled Environmental Horticulture
- **October 1**
  - Multifamily Domestic Hot Water
  - Multifamily Restructuring
- **October 6 and November 17**
  - Solar Photo Voltaic and Electrification
  - Multifamily All Electric
- **October 7**
  - Nonresidential Indoor Lighting
- **October 13**
  - Nonresidential High Performance Envelope
- **October 15 Place holder (May get pushed backed based on the Roundtable results from the (Date TBD)**
  - Indoor Air Quality Roundtable discussion with the outside world

Key Web-Link

2022 Title 24 Utility-Sponsored Stakeholder
http://title24stakeholders.com/

Building Energy Efficiency Program
http://www.energy.ca.gov/title24/

Comments to be submitted to:
https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=19-BSTD-03

NOTE: For this workshop comments To Be Submitted By September 24, 2020

Standards Contact Information – Energy Commission

Mazi Shirakh, PE
ZNE Technical Lead & Advisor to the 2022 Building Standard Staff.
Mazi.Shirakh@energy.ca.gov
916-654-3839

Payam Bozorgchami, PE
Project Manager, 2022 Building Standards
Payam.Bozorgchami@energy.ca.gov
916-654-4618

Larry Froess, PE
CBECC Software Lead
Larry.Froess@energy.ca.gov
916-654-4525

Peter Strait
Supervisor, Building Standards Development
Peter.Strait@energy.ca.gov
916-654-2817

Haile Bucaneg
Senior Mechanical Engineer
Haile.Bucaneg@energy.ca.gov
916-651-8858

Todd Ferris
Supervisor, Software Tools Development
Todd.Ferris@energy.ca.gov
916-654-4072

Comments For Todays Workshop

Due Date September 24, 2020 By 5:00 PM

Comments to be submitted to:
https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=19-BSTD-03

Questions?

Nonresidential Grid Integration Proposals for 2022

Staff Pre-Rulemaking Workshop

Presenter: Haile Bucaneg, Senior Mechanical Engineer

Date: September 9, 2020

Proposal Summary

Staff received proposals pertaining to Nonresidential Grid Integration

- Compliance Options
  - Heat Pump Water Heaters
  - Thermal Energy Storage Systems
- 2022 Code Update
  - Demand Responsive Lighting Controls
  - Demand Responsive Controls Requirements

Compliance Option Submeasures

Heat Pump Water Heaters

- Nonresidential compliance options for heat pump water heaters.
- Advanced load up compliance credits.
- Grid connectivity compliance credits.

Thermal Energy Storage

- Chilled water thermal energy storage system currently available in CBECC-Com.
- Broaden thermal energy storage systems available in CBECC-Com.

2022 Code Update

Demand Responsive Lighting Controls

- Revise threshold for demand responsive lighting controls requirement.
- Clarify language identifying applicable lighting systems.
- Additional testing method for demand responsive lighting controls.

Demand Responsive Controls Requirements

- Revise language to broaden network technologies allowed for demand responsive controls.
- Cleanup existing requirements language.

2022 Code Update Sections Affected

Building Energy Efficiency Standards for Residential and Nonresidential Buildings:

- Section 110.12(a)
- Section 110.12(c)
- Section 140.6(a)2K
- Table 140.6-A Lighting Power Adjustment Factor (PAF)

Reference Appendices:

- NA 7.6.3

Demand Responsive Lighting Controls

Demand Responsive Lighting Controls

Existing demand responsive lighting controls threshold

- 10,000 square feet building area.
- Area with lighting power density 0.5 watts per square foot or less is not counted towards this threshold.

Demand Responsive Lighting Controls

Proposed demand responsive lighting controls threshold

- 4,000 watts total design lighting power.
- Based on general lighting of any enclosed area 100 square feet or larger with a lighting load that exceeds 0.5 watts per square foot.

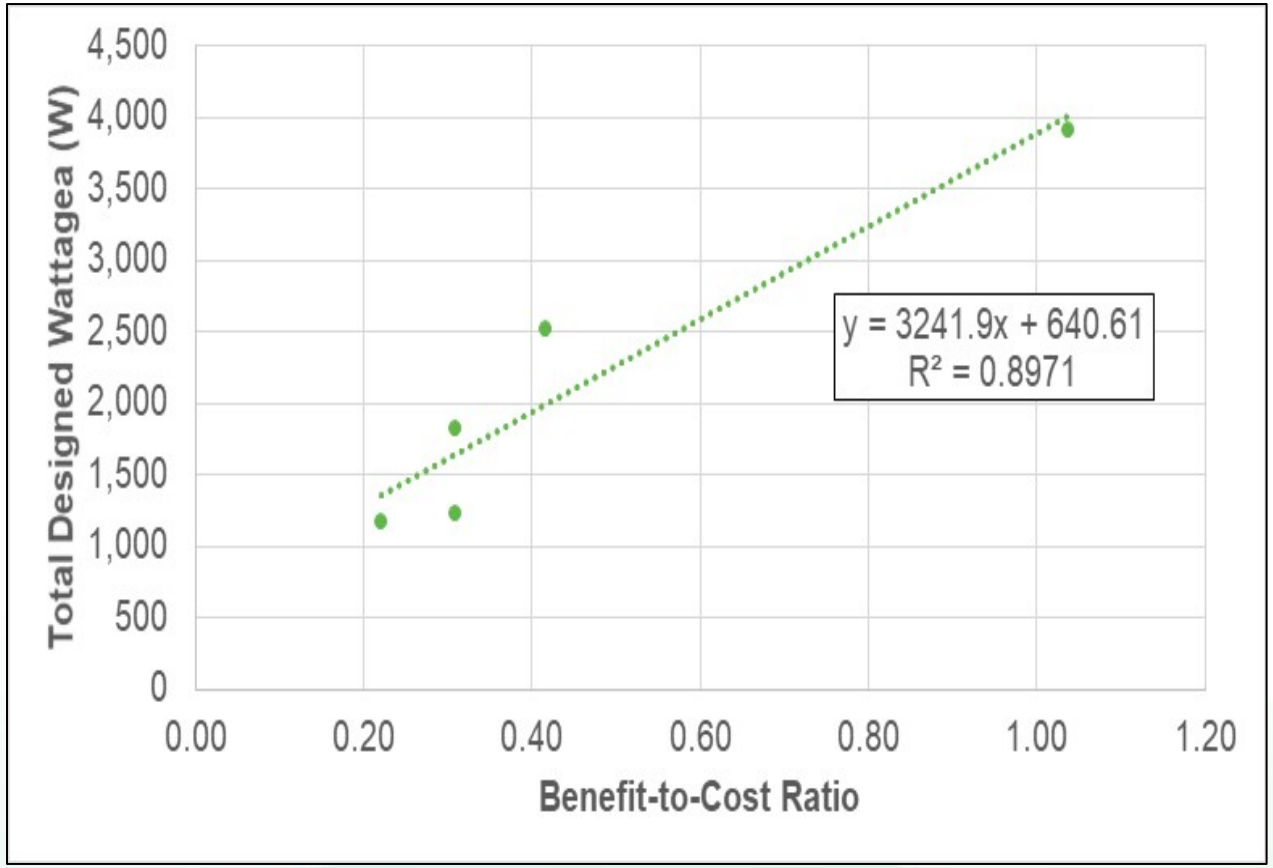
Demand Responsive Lighting Controls

Prototype Building	Installed Wattage (W)	Square Footage	New Con & Alteration Benefit-to-Cost Ratio
Small Office	1,822	4,392	0.31
Medium Office	15,547	42,574	1.52
Large Office	141,408	393,872	2.09
Strip Mall	11,892	14,682	1.71
Stand-alone Retail	13,055	19,920	1.60
Retail Large	125,210	203,726	1.46
Mixed Use Retail	3,901	6,118	1.04
Primary School	26,168	62,312	1.79
Secondary School	64,901	150,889	2.31
Warehouse (non-refrigerated)	1,162	3,852	0.22
Quick Service Restaurant	1,230	2,256	0.31
Small Hotel	2,516	5,832	0.42

Demand Responsive Lighting Controls

Installed Wattage vs Benefit-to-Cost Ratio

- Small Office
- Mixed Use Retail
- Warehouse (non-refrigerated)
- Quick Service Restaurant
- Small Hotel



Demand Responsive Lighting Controls

Applicable lighting systems in existing code

- General lighting in nonresidential buildings larger than 10,000 square feet.
- Existing code language includes exception for spaces with lighting power density of 0.5 watts per square foot or less.
  - These spaces do not contribute to existing 10,000 square feet threshold and are not required to install demand responsive controls.

Demand Responsive Lighting Controls

Applicable lighting systems in proposal

- Reference lighting systems subject to section 130.1(b).
  - General lighting of any enclosed area 100 square feet or larger with a connected lighting load that exceeds 0.5 watts per square foot.
  - Exceptions for areas enclosed by ceiling height partitions that have only one luminaire with no more than two lamps, restrooms, and healthcare facilities.

Demand Responsive Lighting Controls

Revisions to acceptance testing

- Existing requirement for combined illuminance from daylight and electric light of at least 50% of design illuminance.
  - Remove this testing requirement to provide clarity and allow for additional flexibility in lighting system design.

Demand Responsive Lighting Controls

Additional acceptance testing method

- New testing method based on electric current measurement of the full building lighting load.
  - Entire facility tested at once.
  - Facility lighting must be disaggregated from other end-use loads.
  - Does not require sampling.

Demand Responsive Lighting Controls

Incremental First Cost Network Lighting Controls with Native OpenADR

Category	Cost
Hardware Cost	$433
Installation Labor	$116
Acceptance Test	$274

- Connects to 5 controllers.
- Each controller can connect to 750 wireless devices.

Incremental First Cost Lighting System with Nonnative OpenADR

Category	Cost
Hardware Cost	$320
Installation Labor	$232
Acceptance Test	$274

- Connects to 254 devices.
- Costs used to represent a less restrictive case.

Demand Responsive Lighting Controls

Construction Type	Statewide Floor Space Impacted by Proposed Change in 2023 (million square feet)	First-Year[a] Electricity Savings (GWh)	First-Year Peak Electrical Demand Reduction (MW)	First - Year Natural Gas Savings (million therms)	15-Year Present Valued Energy Cost Savings (PV$ million in 2023)
New Construction	5.30	0.02	0.05	0.00	$0.93
Additions and Alterations	105.39	0.50	1.20	0.00	$19.47
TOTAL	110.69	0.53	1.25	0.00	$20.40

Demand Responsive Lighting Controls

Measure	Electricity Savings (GWh/yr)	Reduced GHG Emissions from Electricity Savings (Metric Tons CO2e)	Natural Gas Savings (million therms/yr)	Reduced GHG Emissions from Natural Gas Savings (Metric Tons CO2e)	Total Reduced CO_2e Emissions (Metric Tons CO2e)
Demand Responsive Lighting	0.528	126.86	0	0	126.86

Demand Responsive Lighting Controls

Technical Feasibility

- Multiple technologies available
  - Network lighting controls with native openADR VEN.
  - Lighting systems and controls with nonnative openADR VEN.
- Additional flexibility in DR lighting response.
- Additional flexibility in DR lighting control verification.

Cost Effectiveness

- Cost effective in all climate zones.
- Cost effective in all building types.

Demand Responsive Controls Requirements

Demand Responsive Controls Requirements

Cleanup demand responsive controls language in section 110.12(a).

- Broaden language in section 110.12(a)2 citing “bi-directional communication.”
- Remove section 110.12(a)3
  - Demand responsive controls may incorporate and use additional protocols beyond those specified in Section 110.12(a) 1 and 2.

Proposed cleanup language which may not be included.

- Remove section 110.12(a)4.
  - When communications are disabled or unavailable, all demand responsive controls shall continue to perform all other control functions provided by the control.

Staff Questions

Demand responsive lighting controls questions:

- Q1: does the assumption that all applicable spaces are employing DR lighting result in an overestimation of energy savings?

Demand responsive controls requirements questions:

- Q1: is the term “bi-directional communication pathway” appropriate?

Comments for Todays Workshop

Due Date September 24, 2020 By 5:00 PM

Comments to be submitted to:
https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=19-BSTD-03

Contact Information

Haile Bucaneg, Senior Mechanical Engineer
- Phone: (916) 651-8858
- Email: Haile.Bucaneg@energy.ca.gov

Payam Bozorgchami, P.E. 2022 BEES Project Manager
- Phone: (916) 654-4618
- Email: Payam.Bozorgchami@energy.ca.gov

Larry Froess, **P.E.** CBECC Project Manager
- Phone: (916) 654-4525
- Email: Larry.Froess@energy.ca.gov

Thank You!

Controlled Receptacles Proposal for 2022

Staff Pre-Rulemaking Workshop

Presenter: Thao Chau, Electrical Engineer

Date: 9/9/2020

Acknowledgement

- Special thanks to the California Energy Alliance (CEA) who authored this Controlled Receptacles proposal

Proposal Summary

- New mandatory requirement for newly constructed buildings, additions, and alterations.
- Require controlled receptacles be capable to respond to demand response.
- This proposal supplements the Nonresidential Grid Optimization Proposal.

Sections Affected

- Section 110.12(e): Demand Responsive 120-V Controlled Receptacles
- Section 130.4(a)8: Lighting Control Acceptance and Installation Certificate Requirements
- Section 130.5(e): Demand Responsive Controls and Equipment
- Section 141.2(P)iv: Electrical Power Distribution Systems
- Reference Appendix 7.6.3: Demand Responsive Lighting Controls

Detailed Description

- When controlled receptacles and demand responsive lighting controls are required, the controlled receptacles will also be capable of turning off connected devices in responding to a demand signal.
    - **Exception:** Any building spaces not required to install both controlled receptacles and demand responsive lighting controls.

Implementation Cost

- For lighting demand responsive controls by network lighting controls or building management systems using native Virtual End Nodes (VEN), there is no incremental cost.
- When non-native VENs are not used, additional wiring will be required.
- Average first cost in this case is $284.13.

Greenhouse Gas Emission Impact

Electricity Savings (GWH/yr)	Reduced GHG Emissions from Electricity Savings (MT CO_2e)	Natural Gas Savings (Million Therm/yr)	Reduced GHG Emissions form Natural Gas Savings (MT CO_2e)	Total Reduced CO2e Emissions (MT CO_2e)
0.85	192.6	0	0	192.6

Emission factor is assumed to be 498.7 lbs-CO2e/GWh.

Energy Cost Impact

Building Type	Statewide Construction in 2023 (Nonres: million sf)	First Year Electricity Savings (GWh)	First Year Peak Electrical Demand Reduction (MW)	First Year Source Energy Savings (million-kBtu)	Lifecycle Present Valued Energy Cost Savings (PV$ million)
Small Office	2.39	0.04	1.5	0.010	$ 0.431
Medium Office	19.60	0.29	12.1	0.078	$ 3.527
Large Office	24.81	0.37	15.3	0.099	$ 4.465
Strip Mall	0.16	0.00	0.1	0.001	$ 0.046
Stand-alone Retail	0.27	0.00	0.1	0.002	$ 0.075
Large Retail	3.65	0.05	2.0	0.022	$ 1.022
Mixed Use Retail	0.30	0.00	0.2	0.002	$ 0.083
Primary School	2.59	0.04	1.5	0.013	$ 0.467
Secondary School	1.73	0.03	1.0	0.009	$ 0.311
Warehouse	1.15	0.02	0.6	0.006	$ 0.207
Quick Service Restaurant	0.16	0.00	0.1	0.001	$ 0.044
Small Hotel	0.28	0.00	0.1	0.001	$ 0.064
TOTAL	**57.08**	**0.85**	**34.6**	**0.243**	**$ 0.743**

Product Availabilities

Manufacturers	Products/Systems	Remarks
Autani	EnergyCenter	Controlled receptacles are simply added to a demand response control zone via existing Autani EnergyCenter software.
Eaton / Cooper	WaveLinx / Greengate	Controlled receptacles are simply added to a demand response control zone via existing WaveLinx software.
Honeywell	LCBS Connect	Utilizes Internet of Things / Cloud base technology supporting multiple platforms such as Zigbee, OpenADR, WiFi, etc. that can send a signal to enable/disable controlled receptacles from the HVAC control system.
Legrand / WattStopper	DLM / Legrand	Legrand/WS have several solutions to accomplish the management and control of electrical systems, and can be controlled from WS DLM network lighting controls VEN or to an HVAC control system VEN.
Lutron	Vive	Vive wireless hub utilized to control the lighting system is able to control and manage Vive controlled receptacles.
RAB Lighting	LightCloud	Controlled receptacles are simply added to a demand response control zone via existing LightCloud software.
Leviton	GreenMax	Controlled receptacles are simply added to a demand response control zone via existing software.

Cost Effectiveness

- Cost effective in all climate zones.
- Cost effective in all building types with at least 1,900 sqft of dedicated spaces required receptacle controls per Section 130.5.
- If the proposed Demand Responsive Lighting Control requirement for 4,000W is adopted, such spaces will be exempt.
- If not, spaces under 2,000 sqft will be exempted.

Life Cycle Cost Per Square Foot

Prototype Building	Benefits TDV Energy Cost Savings + Other PV Savings (2023 PV $)	Costs Total Incremental Present Valued (PV) Costs (2023 PV $)	Benefit-to-Cost Ratio
Small Office	$0.18	$0.10	1.8
Medium Office	$0.18	$0.08	2.3
Large Office	$0.18	$0.07	2.6
Strip Mall	$0.28	$0.13	2.2
Stand-alone Retail	$0.28	$0.15	1.9
Large Retail	$0.28	$0.08	3.5
Mixed Use Retail	$0.28	$0.09	3.1
Primary School	$0.18	$0.07	2.6
Secondary School	$0.18	$0.08	2.3
Warehouse	$0.18	$0.15	1.2
Quick Service Restaurant	$0.28	$0.15	1.9
Small Hotel	$0.23	$0.13	1.8

Staff Questions

1. Does the 2,000 sq.ft exemption make sense if the 4,000W demand responsive lighting control threshold not adopted?

2. How common is the non-VEN approach in additions and alterations?

3. Are there any concerns regarding to connected load be capable of turning off during a demand response event?

Comments for Today's Workshop

Due Date September 24, 2020 By 5:00 PM

Comments to be submitted to:
https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=19-BSTD-03

Contact Information

Thao Chau, Electrical Engineer
- Phone: (916) 654-4168
- Email: Thao.Chau@energy.ca.gov

Payam Bozorgchami, P.E. 2022 BEES Project Manager
- Phone: (916) 654-4618
- Email: Payam.Bozorgchami@energy.ca.gov

Larry Froess, **P.E** CBECC-Res Project Manager
- Phone: (916) 654-4525
- Email: Larry.Froess@energy.ca.gov

Thank You!