



**CALIFORNIA
ENERGY**
CODES & STANDARDS

A STATEWIDE UTILITY PROGRAM

Second Stakeholder Meeting for **Demand Response Clean-up**

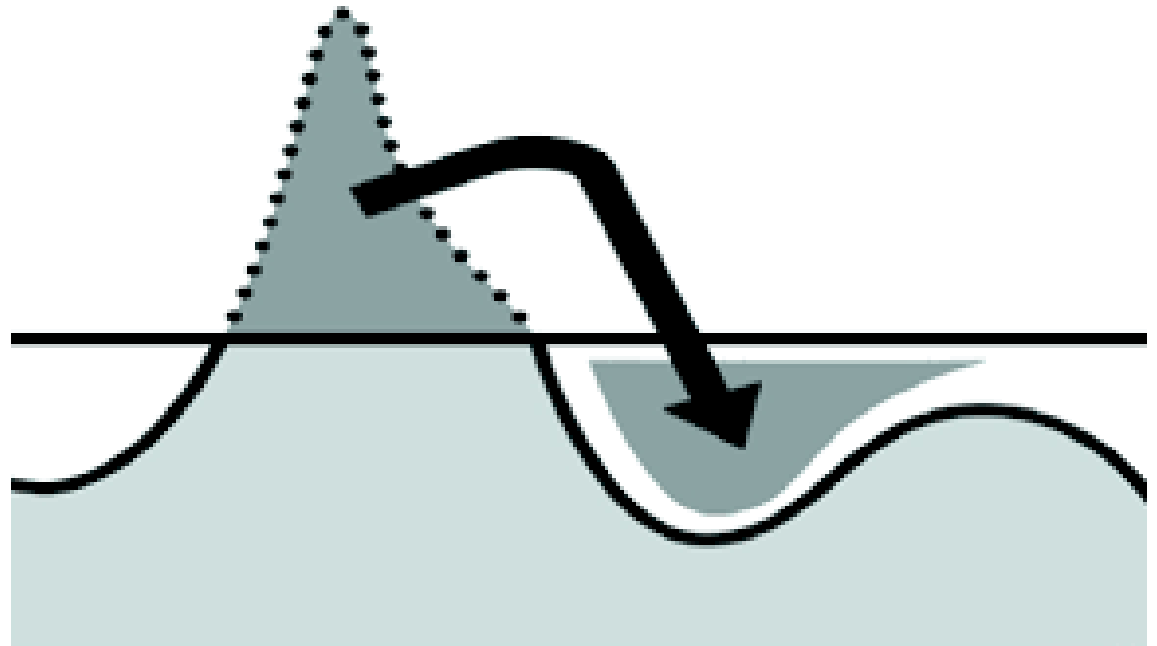
March 28, 2017

Heidi Hauenstein, Energy Solutions

Bijit Kundu, Energy Solutions



1. Background & Scope



Context for Demand Responsive Controls Requirements in Title 24

2005 (and before)

- DR included in loading order – second behind energy efficiency
- Time Dependent Valuation (TDV) methodology introduced

2008 Standards

DR requirements adopted for:

- NR HVAC (including acceptance test)
- NR lighting (no acceptance test)
- Electronic Messaging Centers (EMC)

2013 Standards

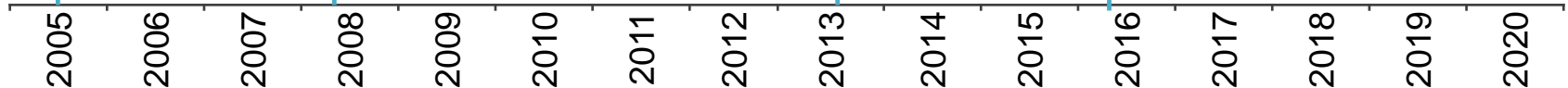
Existing DR requirements refined

New DR requirements adopted including:

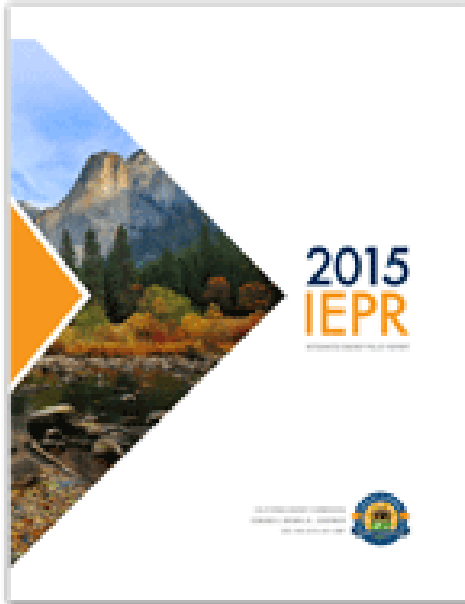
- JA5 added
- OCST trade-offs added

2016 Standards

Very Minor Clean-up



Demand Response is One Way to Achieve Load Shifting



“Load shifting is likely to be a valuable strategy for achieving zero-net-energy code buildings, and the Energy Commission can develop compliance options that provide TDV [Time Dependent Valuation] credit for such technologies.”

1. ZNE buildings should be “smart” in how they draw from and feed to the grid
2. The Energy Commission can establish Title 24 requirements for load shifting
3. DR one way to achieve load shifting

Scope of DR Clean-Up Measure

Observation	Goals for DR Clean-up Measure
Current DR requirements are confusing	Improve the clarity of existing code language
Compliance might be low	Identify compliance and enforcement barriers
Are occupants taking advantage of DR capabilities by enrolling in utility DR programs	Improve market actors' comprehension of existing DR requirements with the goal of enrolling more occupants in DR programs
Desire to encourage "smart" ZNE through building code	Establish a foundation within the Standards upon which future DR and load shifting requirements can added in the future

This code change proposal will not change the stringency of the existing requirements or add new DR requirements

Sections of Standards and Reference Appendices With DR Requirements

Standards

- 10-103 – Permit, Certificate, Informational, and Enforcement Requirements for Designers, Installers, Builders, Manufacturers, and Suppliers
- 100.1 – Definitions and Rules of Construction
- 110.2 – Mandatory Requirements for Space Conditioning Equipment
- 110.10 – Mandatory Requirements for Solar Ready Buildings
- 110.x (proposed section) – Required Demand Responsive Controls
- 110.y (proposed section) – Requirements for Energy Management Control Systems
- 120.2 – Required Controls for Space-conditioning Systems
- 130.0 – Lighting System and Equipment, and Electrical Power Distribution Systems - General
- 130.1 – Mandatory Indoor Lighting Controls
- 130.3 – Sign Lighting Controls
- 130.5 – Electronic Power Distribution Systems
- 140.6 – Prescriptive Requirements for Indoor Lighting
- 141.0 – Additions, Alterations, and Repairs to Existing Nonresidential, High-Rise Residential, and Hotel/Motel Buildings, to Existing Outdoor Lighting, and to Internally and Externally Illuminated Signs
- 150.1 – Performance and Prescriptive Compliance Approach for Low-rise Residential
- 150.2 – Energy Efficiency Standards for Additions and Alterations to Existing Low-rise Residential Buildings

Reference Appendices

- Joint Appendix 5 – Technical Specifications for Occupant Controlled Smart Thermostats
- Nonresidential Appendix 7 Section NA7.5.10 Automatic Demand Shed Control Acceptance
- Nonresidential Appendix 7 Section NA7.6.3 Demand Responsive Controls Acceptance Tests

2. Proposed Code Changes



Proposed Code Changes: General

- Building Energy Efficiency Standards
 - Revise operational documentation requirements to explicitly include a requirement to document the buildings' DR capabilities
 - Add and update definitions
 - Move all DR requirements into one section (section 110.x)
 - Move all requirements for EMCS systems into one section (section 110.y)
 - Improve clarity of requirements for thermostatic controls
- Reference Appendices
 - Re-write JA5 to improve clarity
 - Update NR HVAC acceptance test language to use up-to-date terminology

Download draft language from the references pod to the right →

Add and Update Definitions

- New definition for:
 - Automatic Control System (based on ASHRAE 90.1)
 - Home Automation System (*definition pending*)
 - Thermostatic Control (harmonize with ASHRAE 90.1)
 - Gateway (*might add definition*)
 - Virtual End Node (*might add definition*)
- Revisions to definitions for:
 - Demand Response Signal
 - Demand Responsive Control
 - Energy Management Control System
 - Thermostat (harmonize with ASHRAE 90.1)

Move All DR Requirements into One Section

- Create new subsection for all DR requirements
- Other sections will reference section 110.x

Outline for Section 110.x: Required Demand Responsive Controls

- 110.x(a): define requirements for all demand responsive controls
- 110.x(b): required DR control strategy requirements for NR lighting
- 110.x(c): required DR control strategy requirements for sign lighting
- 110.x(d): required DR control strategy requirements NR HVAC

Move All EMCS Requirements into One Section

- Create new subsection for all EMCS requirements
- Other sections will reference section 110.y

Outline for Section 110.y: Required Demand Responsive Controls

- 110.y(a): Minimum requirements for all EMCSs
- 110.y(b): Using an EMCS for NR HVAC controls
- 110.y(c): Using EMCS for NR lighting controls
- This section needs additional work to:
 - Clarify when EMCSs can be used to meet control requirements
 - Clarify relationship between EMCS and gateway/VEN
 - Clarify minimum DR control requirements for EMCSs

Improve Clarity of Requirements for Thermostatic Controls

- Clarify language for “setback thermostats” (section 110.2(a))
- Clarify language that allows the use of Occupant Controlled Smart Thermostats (OCSTs) in lieu of other measures

Re-write JA5 To Improve Clarity

- Intention is to keep requirements within JA5 unchanged, but present the requirements more clearly
- Focuses of re-write
 - Reorganize content so related requirements are grouped together
 - Use consistent terminology throughout document
 - Change the name of “OCST”
 - Clarify that the requirements can be met with independent devices or a control system comprised of multiple devices

Update NR HVAC Acceptance Test Language

- Update to use more recent terminology to describe demand responsive controls and how they are initiated
- Modify language that implies Demand Response Signal is always routed through the EMCS

What about the proposed code changes?



3. Technical and Market Barriers

Technical and Market Considerations

- Code language should:
 - Be specific enough to allow relatively straightforward compliance verification
 - Provide sufficient leeway to allow and encourage innovation
 - Be technology-neutral
- DR markets are rapidly evolving
 - More cloud-based communication
 - Decentralized management of control settings (e.g., control building with your phone)

Items That Need Further Discussion and Consideration

Communications

- Appropriate code requirements for communications protocols
 - Leave vague
 - Clarify vague language by adding specificity
 - For example, add a definition of “standards-based messaging protocol”
 - Back away from communications protocol requirements that are prescriptive
- How to address cloud-based communication in the standards
- Integration of lighting and HVAC controls strategies
- Clarify definitions and relationship between EMCS, gateway, virtual end node

Needs Further Discussion and Consideration

Security

- Security is critically important to all market actors
- What is appropriate to specify in Title 24 to address security?

4. Compliance & Enforcement

Compliance and Enforcement

- Potential revisions to existing compliance and enforcement process:
 - Add question to manufacturer JA5 declaration asking for which utility (*or DR aggregator?*) programs the DR Thermostat complies
 - Add requirement that HVAC and lighting controls designer checks with local utility and specify DR controls that meets local DR program eligibility requirements

Compliance and Enforcement

- Statewide CASE Team will:
 - Recommend revisions to the Compliance Manuals
 - Recommend that fact sheets or frequently asked questions documents be developed to explain requirements in JA5 and NA7 more thoroughly

Compliance Process for Existing DR Requirements



Equipment Certification

- Manufacturers submit declaration to Energy Commission stating DR Thermostat complies with Title 24
- Energy Commission reviews declarations, confirms compliance, and posts list of compliant DR Thermostats
- http://www.energy.ca.gov/title24/equipment_cert/ocst/



Design Phase

- Designers identify required DR control requirements and specify building systems and controls that will meet the requirements.
- Designers complete appropriate design review forms (CF1Rs or NRCCs)

Compliance Process for Existing DR Requirements



Permit Application Phase

- Plans checker confirms designs are in compliance



Construction Phase

- Compliant systems and controls are installed



Inspection Phase

- Acceptance Tests completed (NR HVAC and NR Lighting only)

Common Compliance and Enforcement Questions

- When are DR controls required?
 - What is a non-habitable space and how does that factor into the prescriptive DR power adjustment factor credit?
 - How does the 0.5 W/SF exception impact whether the entire building needs to comply with DR lighting control requirements?
 - The building is over 10,000 ft², but lighting power is under 05.W/ft² in 4,000 ft². Does the remaining 6,000 ft² have to comply with DR lighting requirements?
 - Are any space types excluded (hotel/motel, high-rise residential?)
- How do I comply with JA5?
 - Where do I find a list of thermostats that comply with JA5?
 - If a thermostat is compliant with JA5 does it meet all other Title 24, Part 6 requirements?

Common Compliance and Enforcement Questions

- Communications Requirements
 - Communications requirements for DR controls are not clear.
 - Is a system that uses a standards-based messaging protocol to the cloud and proprietary communication downstream compliant with Title 24, Part 6 requirements?
 - Can a control system with a gateway be used to comply with JA5 requirements?
 - Does the DR Signal have to be routed through the EMCS?

Limitations of Demand Responsive Control Requirements

- Title 24, Part 6 can require that buildings are capable of demand responsive control
- Title 24, Part 6 cannot require building occupants to:
 - enable controls (verify bi-directional communication is functional)
 - enroll in DR programs (sign up to participate in DR programs).
- Building occupant must take additional steps beyond the scope of Title 24 compliance verification to take advantage of DR capabilities

Opportunities to Bridge the Gap Between Title 24 Compliance and Enrolling in a Utility DR Program



Codes and Standards Actions

- Clarify existing DR requirements
- Add requirement that building owner/occupant be provided with documentation of DR capabilities
- Revise compliance manuals
- Cover DR requirements in code compliance trainings
- Encourage dialogue about DR capabilities and how they can be used to participate in DR programs

Other Market Actors' Actions

- *Looking to fill this in today?*

Questions About Complying With Existing Requirements?

- Current requirements summarized in Appendix
- EnergyCodeAce:
<http://energycodeace.com/>
- California Energy Commission Code Enforcement Resources:
<http://www.energy.ca.gov/title24/enforcement/>
- Chat questions into the group chat and we will get back to you after the meeting



5. Cost-Effectiveness

Cost-Effectiveness Analysis

- Cost-effectiveness analysis is not required because stringency of existing requirements will not change
- Although there are no direct energy savings, the measure will result in:
 - Better comprehension of DR requirements
 - Improved compliance and enforcement for DR requirements
 - Improved readiness for building occupants to enroll in DR programs
 - Increased participation in DR events
 - More people realizing energy and cost benefit from DR capabilities
 - Increased grid reliability

What about encouraging DR?



7. Next Steps

Next Steps

- Please send any additional feedback to:
 - CASE Authors (hhauenstein@energy-solution.com or bkundu@energy-solutions.com)
 - Info@title24stakeholders.com
- Keep an eye on Title24Stakeholders.com for:
 - Presentations from today's meeting
 - Draft Code Change Language
 - Notes from today's meeting
 - Draft CASE Report (will be posted in April)

Appendix:

Second Stakeholder Meeting for Demand Response

March 28, 2017

Heidi Hauenstein, Energy Solutions

Bijit Kundu, Energy Solutions

References

- [Title24Stakeholders.com](https://www.title24.com)
- [EnergyCodeAce.com](https://www.energycodeace.com)
 - See [Reference Ace](#) for 2016 Standards, Appendices, and Compliance Manuals
- [California Energy Commission 2019 Standards Webpage](#)
- List references that will be available on Adobe Connect during meeting

Existing DR Control Requirements in Title 24, Part 6

DR Requirements for Nonresidential Buildings

Building System	When DR Requirement Applies	Required Automatic Response to DR Signal	Technology Required for Compliance	Compliance Verification
Nonresidential Lighting	<ul style="list-style-type: none"> • Building area $\geq 10,000$ square feet • Habitable spaces where lighting power density > 0.5 watts/square foot 	Reduce lighting power by $\geq 15\%$	<ul style="list-style-type: none"> • Lighting system capable of reducing lighting power (e.g., dimming) • DR lighting control (could be an EMCS) 	Acceptance Test
Nonresidential HVAC (with DDC to zone level)	All building types	Adjust temperature setpoints in non-critical zones $\geq 4^\circ \text{ F}$	DR HVAC control (could be an EMCS)	Acceptance Test
Nonresidential HVAC (without DDC to zone level)	All building with single-zone AC or heat pumps*	Adjust temperature setpoints $\geq 4^\circ \text{ F}$	OCST	Certified OCST installed
Sign Lighting	<ul style="list-style-type: none"> • Electronic Message Centers • Connected load $\geq 15\text{kW}$ 	Reduce lighting power by $\geq 30\%$	<ul style="list-style-type: none"> • System capable of reducing lighting power • DR control (could be EMCS) 	design review

* Except buildings served by package terminal AC/heat pump or room AC/heat pump and when system is serving an exempt process load that must have constant temperature

Existing DR Control Requirements in Title 24, Part 6

DR Requirements for Residential Buildings

- Solar-ready Trade-off:
 - Install OCST plus other measure(s) instead of the solar-ready requirements
- Refrigerant Charge Trade-off
 - Option to install OCST and use alternate refrigerant charge test