PG&E's Emerging Technologies Program

Automated Demand Response in Title 24, Part 6:

Stakeholder Outreach Assessment

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Pacific Gas and Electric Company®

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Legal Notice

Abbreviations and Acronyms

ATTCP	Acceptance Test Training and Certification Provider
ATT	Acceptance Test Technician
Auto DR / ADR	Automated Demand Response
BOMA	Building Owners and Managers Association
BOC	Building Operator Certification
CALBO	California Association of Building Officials
CALCTP	California Advanced Lighting Controls Training Program
CBIA	California Building Industries Association
CEC	California Energy Commission
DDC	Direct Digital Control
DR	Demand Response
EMC	Electronic Message Center
EPIC	Electric Program Investment Charge (CEC program)
HAN	Home Area Network
ICC	International Code Council
IFMA	International Facility Managers Association
IREM	Institute of Real Estate Management
NLCAA	National Lighting Contractors Association of America
OCST	Occupant-Controlled Smart Thermostat
PEC	PG&E Pacific Energy Center

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Executive Summary

This assessment conducted research to determine outreach strategies and preferences to improve compliance with the demand response requirements in Title 24, Part 6 ("Building Energy Efficiency Standards", "Standards", or "Code") and to build understanding of the multiple market actors in the compliance industry, their motivations, and the challenges each group encounters in the field. Driven by State of California Zero Net Energy goals, new considerations and approaches for incorporating renewable energy generation, facility operations and control, and electricity storage into the compliance framework have increased the role that demand response plays. First introduced into the 2008 Standards, demand response requirements significantly expanded in 2013 to include both new construction and a significant portion of nonresidential existing building stock with new requirements for indoor lighting, sign lighting and HVAC systems.

A perceived lack of understanding of the demand response requirements motivated this assessment that has the following objectives:

- Increase awareness and compliance with demand response code requirements,
- Assess industry actors' preferences for information and outreach needs,
- Collect qualitative information on knowledge gaps and implementation barriers, and
- Develop recommendations to inform development of additional communication plans.

The project team identified and then prioritized market actor groups with the potential to influence code compliance and reviewed existing demand response educational materials and communication channels available to them. Initial coordination with representatives from the identified groups established preferred communication strategies. These preliminary efforts identified four market actor groups including Design and Installation, Property Operation, Code Specialists, and Energy Management Champions. Pre-existing information available to the market groups varied, and demand response content was often a small element in much larger presentations that lacked qualitative information to build understanding of the need for and rationale behind the new requirements. From this perspective, demand response specific content expanded on existing materials to avoid duplicating existing resources.

Outreach occurred through a combination of industry organizations and existing utility program contacts. In response to market actor preferences, content was created and delivered in several formats including in-person presentations and webinars, and a fact sheet and newsletters for electronic or hard copy distribution. In addition, webinar recordings, a summary of the Standards requirements, and an FAQ were posted on the PG&E Auto DR web site. The project conducted 24 in-person and webinar presentations and directly reached over 500 individuals with content tailored to each of the four market actor groups. Participant interaction was encouraged throughout presentations and at the end of each event with webinar participants provided an opportunity to give feedback through a post-event survey. A fact sheet provided customer-ready collateral while two newsletters provided tailored content that could be distributed as-is or customized by organizations prior to distribution. The Title 24 webpage www.pge-adr.com/title-24 was added to the PG&E Automated Demand Response program web site and received 234 unique visitors indicating an appetite or curiosity for information on the topic.

Improving demand response compliance will require engagement from multiple market groups in order to enable customer facilities, encourage participation in demand response events, and interact with the modernized energy system. There is currently insufficient understanding of demand response and demand response code requirements in the market place as demand response, when considered alongside core responsibilities, is a niche topic. Additional targeted information would be welcomed by market actors to augment currently available content. Each market actor group is motivated by their distinct interest in the demand response topic and culturally distinct preferences in how information is communicated to them. In promoting demand response, a strategic champion can develop and customize demand response education materials while leveraging existing utility relationships and communication channels to provide the focus needed to increase understanding across the market actors.

Assessment findings revealed the following three overarching themes:

Awareness: Demand response awareness remains low throughout the industry. As more and more projects trigger the demand response code requirements, interest in learning strategies to meet them is growing. Including additional information beyond the specific code details provides a bigger picture perspective that helps actors understand the intent of the requirements and the need for greater facility flexibility and control.

Communication Mechanisms: Flexibility in communication and outreach is important, especially for the building industry, which employs a very diverse network of professionals with a wide range of interests and differing roles in the code compliance process. That flexibility includes matching the type and level of the materials available to the market actor's role and needs, traveling to existing meeting venues, and providing the content in the preferred format to facilitate convenient access.

Timing: Timing is crucial for all stakeholders in the building industry. Depending on the actor's specific role in the process, interest in new requirements peaks at different times. Design professionals and others involved in early project development need to be aware of new code requirements prior to the effective date. Those involved during the actual project construction don't need the information until later. In addition, the building industry itself has predictable seasonal fluctuations that further impact timing for specific market actors, especially those whose businesses are weather-driven.

Background

California's Building Energy Efficiency Standards (Title 24, Part 6) require many nonresidential facilities to install controls that are capable of automatically responding to a demand response signal. The requirements are relatively new, and appear to be slowly gaining acceptance, but awareness and compliance remains low. To increase awareness and improve compliance with the code requirements, PG&E commissioned this Assessment of Automated Demand Response in Title 24, Part 6 project to identify effective outreach strategies for communicating demand response information to stakeholders in the building industry.

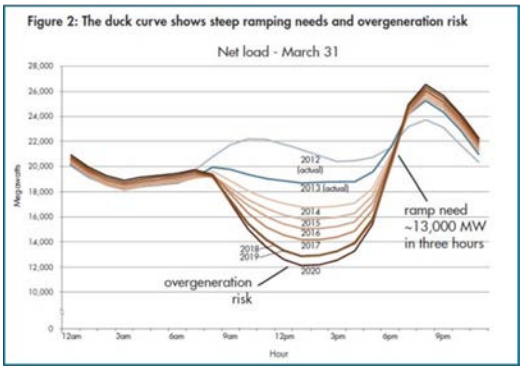
The purpose of the study is to conduct and document outreach activities to determine communication and educational preferences for those groups that have a significant impact on the implementation of code requirements. To document the efficacy of various outreach strategies, the team conducted initial outreach activities with the intent of improving awareness while gaining insights into the specific needs of each major stakeholder group.

The Building Energy Efficiency Standards (also known as the "Standards" or "Code") began setting the minimum level of efficiency required for new residential and nonresidential buildings in California in 1978. Initial iterations of the Standards were based on a prescriptive list of requirements regulating the building envelope, mechanical and lighting systems, mainly for new construction projects. The Standards are updated approximately every three years, increasing the stringency of the requirements to include newly available cost-effective technologies and controls. The scope of the Standards has expanded significantly in the past few decades and now includes existing buildings, requirements for large process energy uses such as compressed air systems and commercial refrigeration, demand response, and renewable generation. Simultaneously, rapid advances in communications, data acquisition and analysis capabilities, and the availability of cost-effective control systems and technologies are driving the code changes even faster.

As California advances toward its climate action goal of reducing greenhouse gas (GHG) emissions to 80% below 1990 levels[1], it must also change the way electricity is generated, used, and managed at the individual and system-wide levels. Approximately 15 years ago, the CPUC set the stage for the changes by adopting a loading order (prioritization of electricity resources) that placed cost-effective energy efficiency, demand response and renewable generation over building new fossil fuel-based

The "Duck Curve" [2]

The Duck Curve describes the changing shape of the daily electricity demand curve net of renewable resources.



The CAISO estimates the mid-afternoon dip in net demand on the electricity system will continue to be a challenge as renewable (especially solar) generation contributes a greater percentage of system capacity. Demand flexibility, supported by integrated controls will become increasingly important and valuable.

[2] California ISO: Fast Facts http://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf

[1] CA Global Warming Solutions Act of 2006 (Assembly Bill 32)

capacity. Additional contributing factors include mandates to increase the number of electric vehicles, and the combination of state incentives and federal tax credits which have made residential solar PV generation a cost-effective solution in many projects.

As with any major transition, successful change also generates new, sometimes unanticipated challenges. Incorporating more and more solar generation into the supply mix has dramatically changed the shape of the demand curve that traditional fossil fuel generation resources are required to meet. The new shape introduces a few interesting challenges including a fundamental shift in which the historical peak demand time becomes a period during which over-generation may be experienced and the need to curtail some generation resources may occur. In addition, the new curve is more variable and requires large changes in generation capacity within a very short timeframe. Lastly, the changes are shifting the peak demand from mid-to late-afternoon to the evening hours.

All of the changes taken together are creating the need for a "smart" grid, as well as "smart" control systems at end use customer facilities that enable individual electricity customers to manage demand more effectively to control costs and to facilitate reliable and efficient electricity system operation. The concept of the smart grid has also forced a re-evaluation of the traditional demand response vision and implementation, moving away from a narrow focus on reducing demand during emergencies and hot, summer afternoons (usually in response to a constraint on the system). As the industry continues to evolve, demand response expanded beyond simple reductions to encompass a range of demand-related strategies, including shifting and storing, on-site generation, and advanced control systems. Collectively, these strategies are termed "demand flexibility" to recognize changes to the supply system as well as customers' ability to interact with the system and control demand.

Project Genesis / Rationale

California's Building Energy Efficiency Standards are rapidly evolving to keep pace with policy and technological advances and changes in the building industry. The code compliance infrastructure required to support widespread adoption of demand response (and renewables) is developing as the Standards transition from a focus on design and specification to ensuring the capability of efficient operations. In parallel, the demand response industry is also developing and evolving, including regulatory policies, standard communication languages and protocols, equipment and controls, data management and reporting requirements. This fast pace of development led to market challenges. In the 2013 code, the development of the OpenADR communication protocol had not progressed far enough to be specified in the code language even if the protocol was central to the development of the code. The market was left to interpret the definition of 'automated signal' until a specific OpenADR reference was included in the 2016 code. Similarly, there was confusion around the baseline lighting wattage from which facilities needed to demonstrate a 15 percent load reduction and the market and regulators needed to reach consensus on what the requirement meant. As the industry and market develop and mature, ambiguities and inconsistencies such as the examples above are inevitable and must be addressed to enable a functional demand response system.

California Investor Owned Utilities Auto DR program managers (PMs) and implementers concluded that improvements to implementation and enforcement practices were required after they observed the initial implementation of the Standards DR requirements, noted specific instances of market confusion as well as witnessed a general lack of awareness about the DR requirements. Program managers received feedback from customers and vendors regarding confusion about the code within the context of the demand response

program, yet there were no requests for Standards-specific technical information or compliance support directed to any of the program managers despite the existence of the known, unintentional ambiguities. In 2014, shortly after the effective date for the 2013 Standards, the PG&E Auto DR program conducted an informal (unpublished) survey of building department staff that received 36 responses to help gauge the level of awareness about the DR requirements. Though the survey produced only anecdotal results, it provided additional confirmation that the requirements had not risen to a level that necessitated specific attention for most enforcement personnel. When asked to rate the level of familiarity with the DR requirements for lighting and HVAC systems, respondents reported on average only "moderate familiarity" with the 2008 code and "little to no experience" and being only "slightly familiar" with "no detailed knowledge" of the 2013 demand response code elements.

The combination of anecdotal evidence and the results of the survey supported the conclusion that the compliance industry was still coming up to speed with the new requirements and that an outreach effort was necessary. PG&E commissioned this outreach and assessment project to help establish and improve understanding of the requirements in the marketplace and to understand the extent of the education needs and the structural format required to effectively deliver outreach.

Automated Demand Response Requirements in Title 24, Part 6.

California's Zero Net Energy goals for both residential (2020) and nonresidential new construction (2030) necessitate the need for the Standards to integrate considerations for renewable energy generation, facility operations and control, and beginning in 2019, electricity storage into the compliance calculations. All demand response requirements in the Standards are mandatory, and are intended to provide facilities with the technical capability to automatically participate in demand response events. The Standards do not require participation in any demand response programs or events; there is no requirement for the facility or customer to reduce demand at any time. By installing the infrastructure to support, or enable the DR control, the Standards help to avoid a lost opportunity and possibly more costly future retrofits to enable the level of facility control likely to be beneficial in the near future, as electric rates and energy standards continue to evolve to meet industry needs.

Table 1: Introduction and Expansion of Title 24, Part 6 Demand Response Requirements

<table>
<tr><th>System / End Use</th><th>Required Automated Enablement</th><th>2008</th><th>2013</th><th>2016</th></tr>
<tr><td>Indoor Lighting</td><td>Reduce by 15%</td><td>Retail >50,000 square feet</td><td colspan="2">All nonresidential buildings >10,000 sq ft and LPD >0.5W/sq ft</td></tr>
<tr><td rowspan="2">HVAC</td><td rowspan="2">Adjust by ±4°F and return to original setpoint</td><td colspan="3">Systems with DDC to Zone Level</td></tr>
<tr><td>No requirement</td><td colspan="2">Single Zone Systems (no DDC): Occupant Controlled Smart Thermostat (OCST)</td></tr>
<tr><td>Electronic Message Centers (EMC)</td><td>Reduce by 30%</td><td>No requirement: Alternative to mandatory dimming</td><td colspan="2">EMC with new connected load >15kW</td></tr>
<tr><td>Residential New Construction</td><td>OCST or HAN</td><td>No requirement</td><td colspan="2">No requirement: Alternative to mandatory "solar zone"</td></tr>
</table>

2008 Standards - Initial Introduction

Automated demand responsive controls became a mandatory requirement in Title 24, Part 6 in the 2008 code cycle, effective January 1, 2010. The requirements applied only to indoor lighting in large retail spaces (sales area >50,000 square feet), and HVAC systems with direct digital controls (DDC) at the zone level. In addition, electronic message centers with new load larger than 15 kilowatts (kW) were permitted to install demand responsive controls in lieu of automatic nighttime dimming controls.

2013 Standards – Expansion of Demand Response

As part of the strategy to meet California Zero Net Energy goals, the 2013 Standards (effective July 1, 2014) underwent significant changes as existing buildings were addressed in more detail, varied controls strategies were introduced, and DR requirements were expanded to all nonresidential building types. As a result, nonresidential buildings with the following features must now be able to automatically respond to a DR signal as follows:

- Indoor Lighting: All nonresidential buildings larger than 10,000 square feet must be able to reduce baseline lighting load by at least 15%
- HVAC Systems: All systems must be able to automatically adjust temperature setpoint and return to original state. Systems with DDC controls enabled via Energy Management Control System (EMCS). Single-zone rooftop systems (new and replaced) must have OCST
- Commissioning Documentation: DR controls must be included in commissioning (Cx) documents, and
- Electronic Message Centers (EMC): EMC with new load larger than 15kW must be able to reduce load by at least 30% in response to a demand response signal.

Standards Help Prepare for New Technologies

The Standards can be an effective strategy to prepare the industry for new or promising emerging technologies or construction practices. This "enabling" strategy often allows installation of an emerging technology as an exception to another requirement, providing a compliance credit, or requiring installation of infrastructure for new technologies or practices.

One example in the 2016 code is the requirement to disaggregate electrical loads to facilitate independently monitoring various types of loads. Access to this information helps building owners or operators understand and monitor the contribution to the total load from each use type, enabling operators to manage that usage more effectively and identify the source of excessive energy usage or other problems. This disaggregation also enables facilities to harness the power of energy management and control systems (EMCS) for more precise and flexible control of building systems.

By requiring facilities to be DR-capable but not requiring action, the CEC leverages the Standards to prepare the market for more advanced energy management controls.

Whenever automated demand response controls are required by the Standards, the requirement is mandatory. In general, one may not substitute or trade off the demand response control with another equivalent savings measure, with an exception for indoor lighting. If a lighting retrofit is 15% or more below the

allowed lighting power density, demand response (and other) controls may be waived. While not providing the flexibility of DR, the installation provides equivalent energy savings at all times.

New single family homes in subdivisions with ten or more homes, and new multifamily projects are required to provide a minimum "solar zone" area on the roof to ensure there is sufficient suitable space for the future installation of a photovoltaic or solar thermal system. Although the requirement is mandatory, the Standards allow builders to install other measures to compensate when the available solar zone is smaller than the required area. DR technologies such as Home Areas Networks (HAN) systems and Occupant-Controlled Smart Thermostats (OCST) along with other requirements may be used as an alternative to the mandatory "solar zone" requirement. This exception in the Standards encourages installation of emerging technologies such as new control equipment and systems in the residential market, anticipating greater adoption of electric vehicles, battery storage and renewable generation systems, and the ability to implement advanced control strategies to optimize grid interactions.

2016 Standards – Clarifications and Corrections

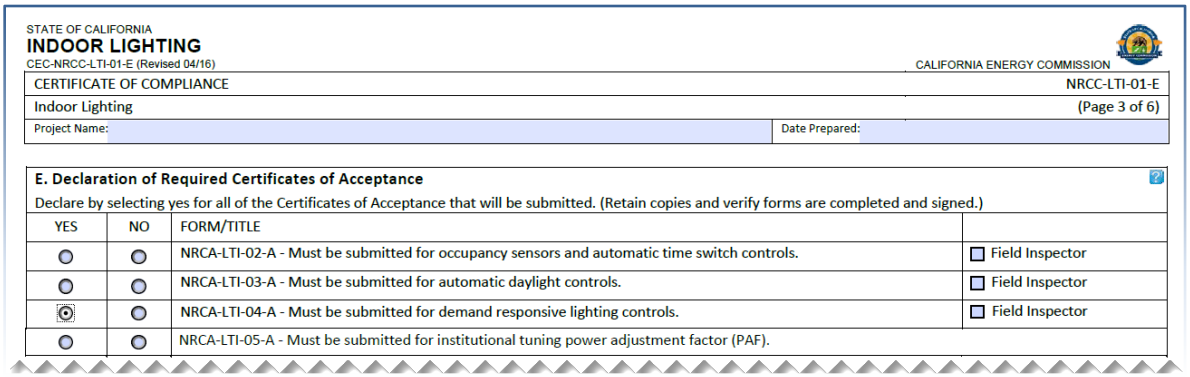
Demand response requirements in the 2016 code update, effective January 1, 2017, were limited to minor clarifications of the 2013 requirements. Demand response related updates included refinements to the technical specifications for OCST to reflect developments to the OpenADR 2.0 communications protocol since the previous Standards cycle, and simplifying the requirements for calculating areas that require demand-responsive indoor lighting controls.

Acceptance Testing

Code-required demand response controls must be verified in the field by Acceptance Test Technicians (ATT) that are certified by Acceptance Test Technician Certification Providers (ATTCP). There are Lighting ATTCP and HVAC ATTCP that manage the acceptance testing process for the respective end-uses. ATTCP are organizations approved by the CEC to train, test, and certify Acceptance Test Technicians and their employers. In addition to conducting training, ATTCPs provide oversight and quality assurance, process complaints, and submit annual reports to the Energy Commission documenting the Provider and member activities.

The acceptance testing process is similar to the HERS process in the residential industry. Certificate of Compliance forms (NRCC) submitted at permit application indicate which measures require acceptance testing, as well as the required acceptance test form for each, as shown in the excerpt from Form NRCC-LTI-01-E (Indoor Lighting Compliance) in Figure 1 below.

Figure 1: Indoor Lighting Certificate of Compliance (excerpt)



STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 04/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-LTI-01-E
Indoor Lighting	(Page 3 of 6)
Project Name:	Date Prepared:

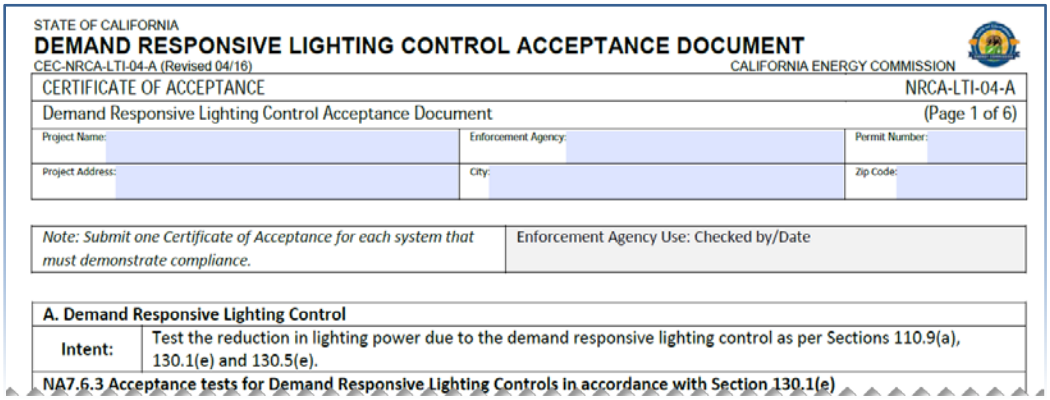
E. Declaration of Required Certificates of Acceptance

Declare by selecting yes for all of the Certificates of Acceptance that will be submitted. (Retain copies and verify forms are completed and signed.)

YES	NO	FORM/TITLE	
○	○	NRCA-LTI-02-A - Must be submitted for occupancy sensors and automatic time switch controls.	☐ Field Inspector
○	○	NRCA-LTI-03-A - Must be submitted for automatic daylight controls.	☐ Field Inspector
◉	○	NRCA-LTI-04-A - Must be submitted for demand responsive lighting controls.	☐ Field Inspector
○	○	NRCA-LTI-05-A - Must be submitted for institutional tuning power adjustment factor (PAF).	

ATTs must work for certified Acceptance Test Employers. ATTs verify that required equipment and controls, including demand response controls, are installed and functioning properly in the field. ATT are responsible for completing the Certificate of Acceptance forms (NRCA) documenting the test results and submitting the completed forms to the ATTCP. Figure 2 below is an excerpt of the Certificate of Acceptance form required when indoor lighting demand response controls are installed.

Figure 2: Demand Response Lighting Control - Certificate of Acceptance (excerpt)



STATE OF CALIFORNIA

DEMAND RESPONSIVE LIGHTING CONTROL ACCEPTANCE DOCUMENT

CEC-NRCA-LTI-04-A (Revised 04/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF ACCEPTANCE		NRCA-LTI-04-A
Demand Responsive Lighting Control Acceptance Document		(Page 1 of 6)
Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:

Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.	Enforcement Agency Use: Checked by/Date

A. Demand Responsive Lighting Control	
Intent:	Test the reduction in lighting power due to the demand responsive lighting control as per Sections 110.9(a), 130.1(e) and 130.5(e).
NA7.6.3 Acceptance tests for Demand Responsive Lighting Controls in accordance with Section 130.1(e)	

Objectives

The Automated Demand Response in Title 24, Part 6 Outreach Assessment ("Outreach Assessment") aims to gain a better understanding of the level of awareness regarding the automated demand response requirements in the Building Energy Standards, and to identify stakeholder preferences regarding outreach communications and training. The Title 24 / ADR Assessment project objectives are to:

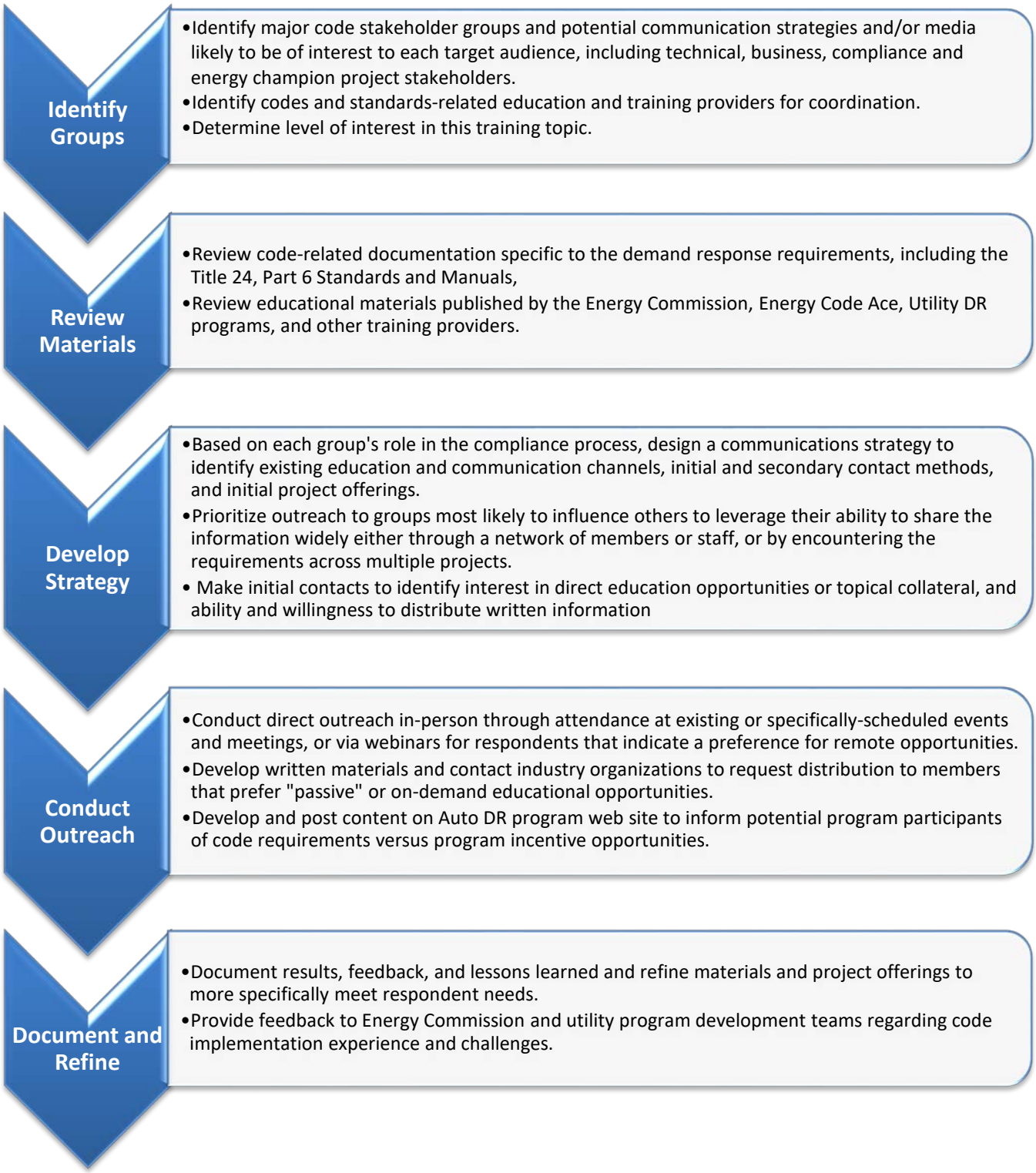
- Increase awareness of and compliance with the requirements through outreach and education to primary code stakeholders, and build a common understanding of the policy and technology drivers creating the need for them,
- Assess industry actors' preferences for information and outreach needs,
- Collect qualitative information on knowledge gaps and implementation barriers, and
- Develop recommendations for future outreach efforts to mitigate challenges and improve compliance with the requirements.

Methodology

The methodology included an initial round of outreach to several key code-related market actors to 1) confirm the accuracy of anecdotal information indicating a very low awareness level and whether there is a need for ongoing education regarding the Title 24 Part 6 demand response requirements, and 2) use that experience to identify communications preferences, assess the efficacy of different communications strategies, and obtain feedback to improve code compliance and implementation.

Figure 3: Implementation Approach provides further description of the major project implementation steps undertaken to complete the assessment.

Figure 3: Implementation Approach



Results

Using the methodology described above, the project achieved the following results.

Stakeholder Prioritization

Many different professions are involved in the process of designing, constructing, and ultimately running a code-compliant building that facilitates efficient operation and control, while maintaining a healthy and comfortable environment for its occupants. Stakeholders include design professionals, contractors, field technicians, enforcement personnel, consultants, property operations and management staff, as well as the entities that provide support for facility improvements, such as utilities and equipment vendors.

A list of target market actors, related trade organizations, and potential delivery mechanisms for each, as shown Appendix 1: Initial Target Market Actors was assembled. From this list, stakeholders were aggregated into the following logically similar groups based on their role in the code process, and on the types of information likely to be of most value to each.

- Design and Installation (Technical): Designers, Contractors and Field Technicians
- Property Operations (Business): Facility Operators, Managers and Management Companies
- Code Specialists (Compliance): Building Department Staff and Energy Consultants
- Project Stakeholders (Energy Champions): Voluntary DR Program Managers, Utility Customer Representatives, Demand Response Program Participants and Vendors

Enforcement personnel associated with the code specialists group were identified as one of the highest priority audiences for the assessment for several reasons: enforcement staff are involved at multiple phases of every project, they have regular contact with all other professions, are perceived by others as an (if not THE) code authority, and each official has the inherent ability to influence many other professions and projects on a regular basis. For example, a building inspector regularly interacts with general contractors and field installation technicians, design professionals, building owners and managers, and other enforcement staff. That inspector is likely to apply knowledge gained on one project to future projects, broadly disseminating that information to others as a normal part of their responsibilities. In contrast, an HVAC contractor may interact with many different stakeholders, but tends to be familiar with only the HVAC-related code requirements, and conversely facility operations staff may be well versed in multiple end uses or systems, but there are limited opportunities to apply that knowledge beyond the specific work site. The enforcement audience's significant industry influence, along with the other stakeholder groups' more diverse structures resulted in prioritizing enforcement staff.

The Design and Installation group was prioritized second as this group of actors is required to construct the actual facilities per the code requirements and most frequently interacts with the enforcement community. While Code typically does not address the actual operation of buildings, Property Operations and Project Stakeholders were targeted to build understanding of the enhanced building capabilities that allow for easier implementation of demand response plans. This group heavily influences how the facility will operate once occupied. Once trained, this group would be aware of existing capabilities of their property assets and be better positioned to react when presented a market opportunity in the form of adjusting rate schedules or other economic triggers.

Coordination Opportunities

The project team contacted or met with several other programs offering Standards training and did not identify any duplication of efforts between the Automated Demand Response in Title 24, Part 6 Outreach Assessment and other code-related outreach and education activities. Rather, the project was complementary to the broader code education activities as it focused only on a single aspect of the code. In other trainings, the demand response component is relatively small compared to other topics, it is seldom addressed independently, and tends to be grouped with a large list of other mandatory requirements. The team coordinated with related outreach and training teams to maintain open communications and share experiences, and leveraged opportunities to coordinate for specific events or activities, such as the Auto DR Forum.

- Project Kickoff: The Outreach Assessment team held a kickoff meeting on January 25, 2016 to inform demand response and energy efficiency program staff of the project to coordinate activities and avoid duplication. Attendees included representatives from SCE Demand Response Emerging Technologies program and from PG&E's Auto DR and Codes and Standards Compliance Improvement (Energy Code Ace) programs as well as PG&E's Pacific Energy Center.
- Auto DR Program and PEC: The project team coordinated with the Auto DR program and the Pacific Energy Center on the Auto DR Forum held on April 28, 2016. The Forum is a showcase for vendors, customers, utility program staff and customer representatives to view and become familiar with a variety of products, solutions, and other DR industry events and activities. The Outreach Assessment team presented the demand response requirements in the code to attendees, focusing on the difference between mandatory code requirements and voluntary program measures (a point of confusion for many Auto DR Program participants).
- Auto DR Program: The project team worked with the Auto DR program to add a new Title 24 page to the "Learn" Tab on the PG&E Auto DR program web site. The Title 24 page includes content summarizing Title 24 demand response requirements, links to resources, and a section for Frequently Asked Questions. The Title 24 page also includes a recorded webinar discussing the requirements with three segments, each approximately five minutes. This new information helps vendors and program participants distinguish between demand response controls required by code and voluntary measures that may be eligible to receive incentives through the program. An excerpt of the new page is included in Appendix 4: Marketing Collateral.
- CEC EPIC Project: The Outreach Assessment team held regular calls with ASWB Engineering to coordinate the outreach efforts with the Energy Commission demand response training project implemented by ASWB. The teams have continued to look for ways to leverage each other's work. Although they did not identify any specific opportunities, they did determine there was no overlap or likelihood of duplication.
- Acceptance Test Training and Certification Providers (ATTCP): The team contacted Lighting ATTCP organizations (CalCTP and NLCAA) to identify opportunities to collaborate, gain potential insights into implementation issues or challenges about which training providers may be aware, and to identify any useful tips or other information for enforcement personnel. Although the Providers were receptive to coordinating, we did not identify any opportunities to coordinate or leverage each other's activities during this project.
- Energy Code Ace: Energy Code Ace allowed the project to leverage its extensive contact list of code stakeholders to advertise webinars, significantly increasing interest and attendance. Throughout the

project, the team maintained contact with Energy Code Ace staff to ensure activities remained complementary.

- Utility Representatives: The team offered to host a webinar or present the materials at a departmental or staff meeting to inform PG&E assigned customer representatives of the 2016 demand response code requirements. After internal discussion, the group decided that interested representatives would participate in other webinars offered more broadly.

Existing Demand Response Messaging Assessment

Existing messaging and educational materials regarding the demand response code requirements do not explain the larger context driving the need for demand response. While nearly all the materials include a description of the requirements, very few provide any contextual information about demand response and its role in system stability, the differences between controls installed for demand response purposes versus those for achieving efficiency, or any of the voluntary programs or resources available to support implementation.

Energy Commission Documents. The Energy Commission web site includes content related to demand response, but it is primarily focused on research results. The Title 24, Part 6 Standards documentation focuses on individual facilities and the specifics of the requirements themselves. Although the Nonresidential Compliance Manual, which provides additional information about the code, includes a brief discussion of the types of lighting control systems, there is no discussion of the impacts of integrating renewables on the overall system demand, nor does it address the need for customers to interact with the grid, and to be able to shift demand in response to price signals or system constraints.

Energy Code Ace Online Training. Energy Code Ace provides online self-study training modules covering several topics in the code. As shown in Figure 4 below, the mandatory indoor lighting requirements course includes a discussion of the demand response requirements, but does not provide additional information or context for the requirements. Oftentimes, because the code is so voluminous and demand response is only a narrow slice of the requirements, it is perceived as just another mandatory requirement, rather than an enabling control positioning the facility to meet future operational needs.

Figure 4: Excerpt from Energy Code Ace Nonresidential Indoor Lighting Online Training

Utility Program Messaging. Utility demand response and energy management programs spur customers to action with the goal of increasing participation and delivering societal benefits. In most program designs, equipment that is required by code cannot also be supported by the energy management program, though assistance may be available for additional activities required to participate in a demand response program. Often, programs need to educate customers on targeted energy management practices and the associated program processes. Energy efficiency, transportation and distributed generation programs avoid complicating their program messaging to keep customers focused on the goal of installing targeted measures. Even in program areas where there is a natural fit between energy management practices, such as the control practices of retro commissioning and automated demand response, program messaging usually focuses on the positive benefits of each practice as opposed to the nuts and bolts code requirements that would drive higher code compliance rates. Even the PG&E Automated Demand Response program refers to making the most of the buildings systems capabilities and steers clear of advising on specific code requirements.

PG&E's website contains content covering the broad range of energy efficiency and energy management practices. Under the current website design, demand response is the sole topic shown under the energy management programs header. The site does not currently acknowledge the changes occurring to the California electric grid that are a main driver for the current emphasis on demand response and inclusion of demand response readiness requirements in the building code. Rather, the context provided regarding the need for demand response participation remains focused on responding to emergencies or planned outages, stating 'Occasional storms and heat waves, as well as periodic power plant repairs and maintenance, have the potential to affect California's supply.'

Figure 5: PG&E Business Customer Energy Savings Opportunities

Other Trainers. Several industry and trade organizations discussed later in this report represent contractors, designers, building operators, property management firms, and other code professionals and provide trainings to their sector-specific market actors. With regards to demand response as a topic, organizations either provide targeted information of the specific requirements applicable to their constituents or address the topic at a high level only, avoiding in-depth discussions.

Target Market Actors

Based on each group's primary role in the compliance process, a research strategy was designed to identify existing education and communication channels, contact methods, and initial project offerings. Stakeholders were prioritized into groups most likely to influence others and to leverage their ability to share the information widely either through a network of members or staff or by applying the requirements across multiple projects. Initial contacts were made to identify interest in direct education opportunities or topical collateral and to assess ability and willingness to distribute training announcements and written information. Each of these groups of market actors has at least one industry organization representing their members on policy and other industry-related developments. These organizations are often one of the main sources of education resources and industry-related news. For example, the Building Owners and Managers Association (BOMA) Oakland East Bay chapter provides its members educational information through a committee structure that includes topic specific committees on environment and codes & standards.

This section documents each group's role in code compliance, project development and property operations. In addition, it explores the specific characteristics of each target group, preferences expressed, existing communications channels, and specific outreach approach employed.

Design and Installation (Technical)

Designers and installers include a broad and diverse group of market actors. Design and installation teams are the principal actors that specify and install equipment in the building that meets the requirements set forth in the building code. As a group, they are a principal beneficiary of the utility Energy Code Ace education effort. Many are already familiar with the energy efficiency standards, but they benefit from receiving additional perspective on newer elements as the community begins to translate between what is written in the standards

and what is required in practice. This group consists of end-use/system specific lighting and HVAC equipment and control manufacturers, distributors, designers, architects, engineers, and contactors. Contractors themselves are a broad group, with lighting-specific contractors historically being very proactive in energy efficiency programs, resulting in many conducting proactive outreach to encourage customers to install higher efficiency equipment. While the specific roles in the compliance process vary, the groups tended to have similar interests with respect to demand response-related code outreach.

In addition to specific actors in the supply chain, several organizations serve this market.

American Lighting Association (ALA) is a trade association representing the lighting and ceiling fan industries in the United States and Canada. Its membership includes leading lighting and fan manufacturers, showrooms (retailers), manufacturers' representatives and designers.

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) is an organization devoted to the advancement of indoor-environment-control technology in the heating, ventilation, and air conditioning (HVAC) industry. ASHRAE was founded in 1894 to serve as a source of technical standards and guidelines. It has grown into an international society that offers educational information, courses, seminars, career guidance, and publications. One of the most important functions of the organization is to promote research and development in efficient, environmentally friendly technologies.

Heating, Air-conditioning and Refrigeration Distributors International (HARDI) focuses on wholesaler/distributor organizations but membership also includes suppliers, manufacturers, service vendors, and energy efficiency partners. The organization offers networking, education, and benchmarking information.

International Association of Lighting Designers (IALD). IALD's vision is to create a better world through leadership and excellence in lighting design; to cultivate the universal acknowledgement and appreciation of the Power of Light in human life.

Illuminating Engineering Society of North America (IES) is the recognized technical and educational authority on illumination. Its objective is to communicate information on all aspects of good lighting practice to its members, to the lighting community, and to consumers through a variety of programs, publications, and services. The strength of IES is its diversified membership: engineers, architects, designers, educators, students, contractors, distributors, utility personnel, manufacturers, and scientists, all contributing to the mission of the Society: to improve the lighted environment by bringing together those with lighting knowledge and by translating that knowledge into actions that benefit the public. IES is a forum for the exchange of ideas and information and a vehicle for its members' professional development and recognition.

National Comfort Institute (NCI) is an organization that provides heating, air conditioning, plumbing and electrical contractors with a focused offering of services and tools to help them improve their businesses, differentiate themselves, grow, and become more profitable. NCI accomplishes this through membership groups and by providing unique business management, sales, marketing and technical tools, training, support and coaching - all designed with the goal of helping mechanical, electrical and plumbing professionals differentiate their companies through measured performance, quality and value.

National Electrical Manufacturers Association (NEMA) is the association of electrical equipment and medical imaging manufacturers. Nearly 350 member companies manufacture a diverse set of products

including power transmission and distribution equipment, lighting systems, factory automation and control systems, and medical diagnostic imaging systems.

Western HVAC Performance Alliance (WHPA) is a fusion of HVAC, energy efficiency, facility, and property management organizations, researchers, educators, utilities, and regulatory agencies whose decision-maker-level appointees work with one another to curb energy waste. WHPA member organizations employ over a million professionals.

Designers are often office-based staff and are usually members of professional organizations that provide continuing education credits and networking opportunities. Designers may be interested in big picture perspective once detailed requirements are well understood so that they are better equipped to review and explain the impact of the code on design decisions with the building owners or occupants. As members of professional organizations, covering topics at conferences and through continuing education are potential opportunities.

Distributors and manufacturers provide direct training and education to contractors on industry trends as well as specific updates to product lines to maintain and strengthen relationships between the groups. Presentation materials that are accessible and concise communicate equipment specification and implementation requirements in a manner to fit within larger, and often very detailed project plans. Contractors are typically more interested in detailed actionable information than big picture considerations as their focus is on meeting specified project requirements and closing sales. Their focus on sales and the seasonal variations in workload often limits their availability for trainings and is exemplified by an HVAC distributor's focus on new sales during the hot summer months of the cooling season.

A common preference for online webinars emerged for these two groups as the format provided the required information in a short period of time and was accessible to both office and field personnel. Incorporating demand response into larger trainings or conferences proved difficult as demand response was a tangential topic to the main themes of their communications. This group did express interest in marketing collateral both in the form of base newsletter content and customer-ready fact sheets. Outreach focused on actors that were involved in industry groups, that participated in energy efficiency programs, or that were active in the broader code enhancement conversation.

Property Operations (Business)

Charged with operating, maintaining, and developing properties, this group needs to be aware of basic requirements and triggers of the code and to understand the value of the enhanced capabilities available in a code-compliant property. As this group is answerable to the property ownership who have a financial stake in the property's operation, tenants who have contractual terms for the space they occupy, and occupants who have day-to-day experiences in the building, property teams must also be able to represent the benefits and implications of participating in voluntary demand response programs. This group consists of property managers and facility engineers with asset managers and property brokers also having influence.

As property based professionals, attendance at offsite meetings and seminars is limited though they often welcome one-on-one presentations. Even when affiliated with property management or engineering firms, it is rare for information to be provided from top down through the corporate structure and each property team operates independently. Property teams are focused in meeting the needs of site specific ownership, tenants and occupants more so than complying with corporate objectives. The relationships between firms serving this market is very fluid in that actual services offered to a property can vary from site to site. As an example, Jones

Lang LaSalle may provide property management services at property A with engineering support from CBRE, while at property B the relationship can be reversed. Multi-firm structures are also seen where, for example, Jones Lang LaSalle may be a strategic advisor, CBRE provides property management services and Able Services provides engineering services and together they serve property ownership, tenants, and occupants. As specific relationships between these parties can be varied and complex, effectively engaging these teams on a topic such as demand response in which no one role has primary responsibility is a challenge.

One benefit that engaging this group can provide is that they operate in a very competitive environment where identifying new areas of market advantage and capitalizing on them can be rewarded. For innovative strategies that prove unsuccessful, there are undesirable consequences and so this group shows a varied risk tolerance. This competitive environment does inspire interest in new, potentially beneficial, ideas though uptake can be limited where the value statement is not clear.

Several organizations serve this group and typically provide a combination of social, educational, and or advocacy benefits. Industry organizations are typically run by an executive director and assistant with only the largest offices supported by additional paid staff. Local activity is organized through mostly voluntary boards and committees assembled from membership.

> Building Operator Certification (BOC) is a national certification program offered by BOC Partners, which comprise a large network of organizations throughout the United States and Canada. Investor owned utilities and Sacramento Municipal Utility District provide financial support to the training program in California.
>
> Building Owners and Managers Association (BOMA) serves its members by creating a community environment where education and policy advocacy are encouraged. While BOMA is an international organization, specific offices operate under a federated structure and are largely independent. In California, a portion of member dues go to fund the State and National organizations.
>
> Institute of Real Estate Management (IREM®) serves its members through education and certification programs such as Certified Property Manager (CPM), Accredited Residential Manager (ARM), Accredited Commercial Manager (ACoM), and Accredited Management Organization (AMO). It is an affiliate of the National Association of REALTORS®.
>
> International Facility Management Association (IFMA) builds value for members through educational programs, fun and informative networking events, and as a forum for professional enhancement for the facilities professional. Membership is at the local level and then members are assigned to a chapter based on their location.

Program messaging highlighting benefits of demand response over detailed code requirements and triggers is of interest for this group. Focus should be on participation benefits, then code triggers and finally a high-level review of the actual code requirements. Members should be aware that lighting and HVAC demand response requirements exist and have a high-level understanding of potential reduction strategies, but detailed information covering specific applications of the requirements likely would be managed by the design and installation communities that serve them.

Presentation materials should be upbeat and engaging as actors in this group are interested in demand response as a professional development opportunity more than a core responsibility expectation. If implemented successfully at a specific site, demand response can differentiate that property from the competition. As this topic requires initiative to engage in rather than mandated by core responsibility, it is even more important that materials are available on demand and their availability marketed so that actors are reminded of the resource.

The strategy with this group was to develop engaging, easily digestible information and then work through industry groups and individual industry contacts to disseminate that information. Outreach occurred through regional offices and announcements were included in weekly member emails. When reaching out to this group, leveraging existing utility and program relationships proved most successful.

Code Specialists (Compliance)

The compliance group has primary responsibility for ensuring projects are constructed in a manner that complies with code requirements and is key to achieving energy savings and required facility performance. This group includes energy consultants who are responsible for preparing code compliance documents and enforcement staff who review plans and documents, issue permits, and inspect completed projects. As compliance experts intimately involved with the code, this group needs to be aware of the specific code triggers and requirements, as well as implementation barriers or challenges. As noted above, the Auto DR Program team conducted a brief survey of enforcement staff that confirmed there is a significant knowledge and awareness gap regarding the demand response requirements in the Standards.

The two compliance sub-groups expressed different communication preferences based upon typical work environments: those that prepare compliance documentation preferred online or distance learning opportunities, and those who enforce the requirements requested in-person trainings. Energy analysts and others that prepare compliance documentation often work in small or single-person shops and reserve traveling to in-person trainings for events that offer more comprehensive code information. Enforcement staff usually interact with their customers in-person, whether at the office or at the project site during inspections, and tend to prefer in-person educational opportunities also. Enforcement staff tend to be either public employees that work directly for local jurisdictions or employees of private companies that support building departments. In most jurisdictions, from an enforcement perspective, private enforcement staff are seamlessly integrated into building departments and tend to have consistent communications preferences as their local government counterparts.

In addition to state agencies and utility education providers, the major industry organizations serving this group are:

International Code Council (ICC) is the primary industry organization serving enforcement personnel. There are 28 ICC chapters in California, four of which are focused only on Fire Prevention. Appendix 5: International Code Council Chapters contains a list of chapters and the counties served by each. Each regional chapter covers approximately three counties, and meets monthly to discuss code-related topics and activities. Membership is a mix of local government staff and contracted private enforcement companies.

The California Building Officials (CALBO) chapter of the ICC, is an over-arching chapter serving the enforcement community across the state. CALBO is responsible for education and statewide issues such as providing code development and implementation advice to the Energy Commission. CALBO has several standing committees, including an Energy Committee comprised of ten members, mostly building officials from across the state, but also including representation from the Energy Commission and building industry (California Building Industry Association, CBIA).

The County Building Officials chapter is also statewide, and is dedicated to supporting efforts towards greater communication, education and networking among code officials, industry and design professionals.

California Association of Building Energy Consultants (CABEC) specifically represents the interests of Title 24 energy consultants in California. CABEC provides training and networking, and administers a voluntary Certified Energy Analyst certification program available to its nearly 300 members.

Code specialists are one of the primary audiences for code-related training provided by Energy Code Ace, Energy Commission and other education providers. However, because the Energy Standards and related documentation are complex, voluminous and rapidly changing, especially in recent cycles, there is an ongoing demand for training. Although demand response is included in all applicable courses, there is no other existing training that focuses specifically on the demand response requirements.

Code enforcement staff and energy consultants must possess a detailed understanding of the specific requirements, triggers, documentation, and implementation processes, and often act as guides, helping clients and customers navigate the compliance process. This group tends to be very hands-on and prefers in-person communications that include information to facilitate implementation in addition to information about the requirements themselves. Educational materials must be engaging, but also include code-specific reference material (forms, code language, etc.) In addition, it is helpful for this group to be familiar with the drivers behind the requirements. This additional knowledge enables consultants to advise clients regarding design and equipment decisions and enforcement staff to help ensure the intent of the requirements is fulfilled at installation.

Project Stakeholders (Energy Champion)

Additional stakeholders are made up of utility account representatives, energy efficiency and demand response program staff, as well as targeted vendors that help customers optimize energy usage practices to reduce costs. This group has traditionally focused on energy efficiency objectives, but as energy management practices have expanded, so have their roles. Each acts as an energy champion to end-use customers and has access to marketing collateral, websites, and one-on-one end-use customer communications as well as programs or plans to help the end-use customer determine the best course of action. As subject matter experts, information flows to them from many different sources and they are required to synthesize the information to provide leadership in the topic area.

PG&E maintains a website with content covering the broad range of energy efficiency and energy management practices. In addition to the website, PG&E has an assigned training coordinator who assembles content and training for periodic conference calls for customer-facing account management staff. As staff are spread throughout PG&E's Northern California territory, conference calls are most effective in communicating targeted program messages. In-person meetings do occur, but are typically full day or multi-day events that focus on bigger picture coordination opportunities and strategies to meet energy efficiency goals. Account management staff have individual and team energy efficiency goals as opposed to a more general requirement to promote demand response and all demand-side energy management programs.

Outreach to this group occurred through the internal utility training coordinator. Rather than providing a single webinar as part of the periodic schedule, the training coordinator provided account management staff the existing training schedule to allow staff to attend and also to forward the invitation to customers or other market actors. This approach allowed for a slightly longer presentation and with multiple scheduled time slots, more flexibility for representatives to attend the training.

Outreach and Collateral

Initial outreach engaged market actors for their input on the value of informational materials and training on demand response requirements in Title 24 as well as their preferred format. Of the market actors and industry groups contacted, nearly all acknowledged that some form of education is valuable and needed for each new code cycle. Each group expressed preferences for the communication format, ranging from a live presentation, either in-person or an online webinar, marketing collateral (fact sheets and newsletter publications), providing content for internal presentations, or a combination of all three.

In response to initial outreach and contacts, the project team noted that respondents tended to form two groups with respect to communications preferences: those who preferred more passive communications, such as fact sheets, newsletters, and presentation content, and those who preferred interactive, live communications, such as in-person presentations and online webinars. Several groups, including some lighting and HVAC industry groups and manufacturers preferred passive communications, and education leads or newsletter editors agreed to distribute newsletter articles to their members. For example, CBRE, a leading property management firm with a strong presence in the BOMA San Francisco office, was very interested in the material, but found pre-recorded webinars for short, policy-related topics most accessible to BOMA membership.

For those groups that preferred live trainings, outreach was conducted via two formats: online webinars and in-person presentations. Webinars were often preferred by those who are remotely located and aren't able to travel or dedicate extra time to attend in-person. Additionally, those with unpredictable schedules appreciated the convenience of being able to choose between various webinar dates and listen to a webinar while remaining in the office. In contrast, building department staff overwhelmingly preferred in-person communications, preferably at existing regional gatherings, events, or staff meetings. This breakdown of communication preferences is consistent with anecdotal information obtained by utility and other program implementers that offer similar trainings.

To reach the groups that preferred direct, live communication, the project team completed 24 in-person and webinar presentations, reaching over 500 market actors, including approximately 175 code enforcement staff, 140 energy consultants, 50 Auto DR Program participants and vendors, and 200 HVAC and lighting contractors, designers, engineering students, and other market actors. Presentation and webinar registrants were gathered through outreach via International Code Compliance (ICC) chapters in California, city building departments, industry groups such as the National Electrical Manufacturers Association (NEMA), American Lighting Association (ALA), National Comfort Institute (NCI), California Association of Building Energy Consultants (CABEC), and Energy Code Ace, a building code training and resources effort offered by the California Statewide Codes & Standards Program.

Materials Development

Prior to conducting any outreach, the project team created a matrix of Title 24, Part 6 stakeholders and several potential delivery mechanisms for each group, as shown in the Appendix 1: Initial Target Market Actors. Initial feedback informed the refinement and aggregation of the stakeholders into four distinct groups, each comprised of stakeholders with similar interests in the content and delivery of code-related information, as shown in Figure 6: Target Market Actor Groups. Based on this feedback, materials were tailored to the interest and needs for each group. For example, most compliance groups preferred direct, live communications, whether in-person or remotely via webinar, while business groups and energy management champions tend to

prefer written, passive communications available at the user's convenience, and the technical group's preferences spanned both methods.

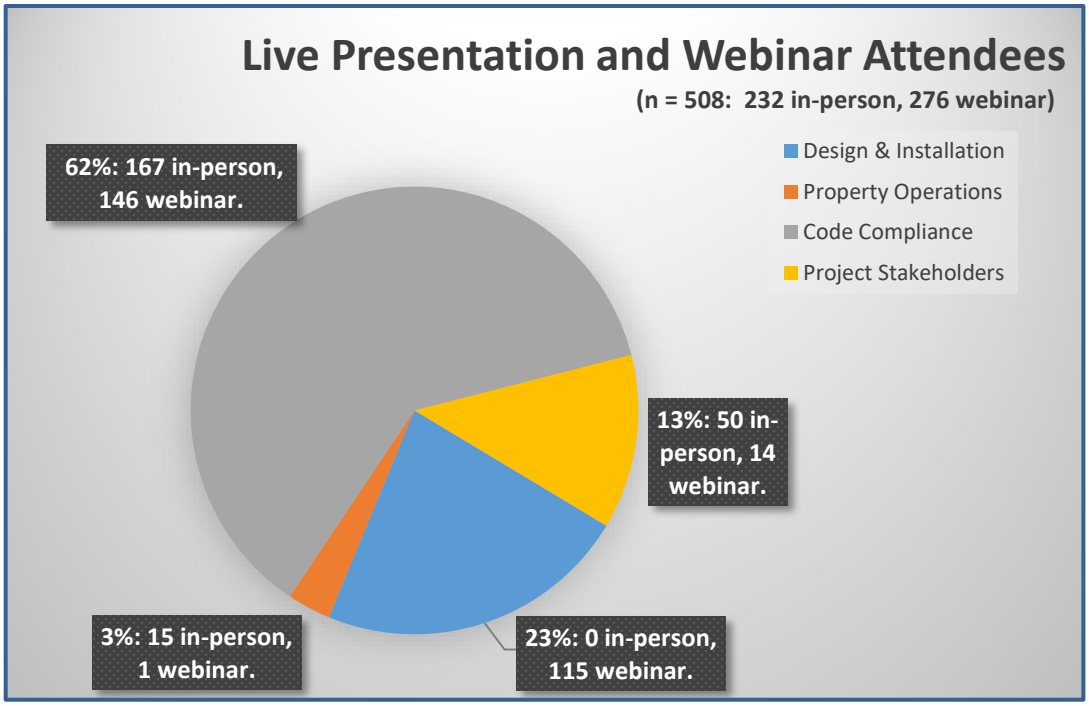
Figure 6: Target Market Actor Groups

Presentations and Webinars

The project team developed 30- to 60-minute presentations on Title 24, Part 6 requirements related to demand response tailored to each group's role in the compliance process. The presentations began with an introduction to demand response and its growing importance to the electric grid and provided a description of manual and automated demand response activities. Presentations were interactive and encouraged questions from participants. Presentations were also customized to the anticipated audience with the biggest distinction occurring between materials presented to enforcement officials, technical, and business audiences. The presentation then covered in more detail the specific demand response requirements related to HVAC, indoor lighting, and electronic message centers. Finally, the presentation concluded with a more in-depth explanation of how automated demand response programs work and how building owners and operators can take advantage of their code-compliant building systems. A focused time to ask questions and/or provide feedback was provided to conclude each session.

A total of 13 live presentations and 12 online webinars were given between April 2016 and February 2017. During registration for the webinar, attendees were asked to provide information about their industry or type of work. Industry representation of in-person presentations were designated by their host organization. A breakdown of attendees by Target Market Actor group can be seen in Figure 7 below.

Figure 7 – Distribution of In-Person and Online Webinar Presentation Attendees by Target Market Actor Groups



Webinar Survey Results

To capture input and feedback on the effectiveness of the webinars, the project team requested that registrants complete a post-webinar survey, which asked six questions:

1. After the webinar, do you have a better understanding of the value of automated demand response (ADR)? (Answered on a scale of 1 to 5, 1 being the same understanding, 5 being a much better understanding)
2. Did you find the webinar valuable to your work? (Answered on a scale of 1 to 5, 1 being not valuable, 5 being very valuable)
3. Do you feel more confident you can guide your projects through compliance with the demand response requirements in Title 24, Part 6? (Answered on a scale of 1 to 5, 1 being same confidence, 5 being much more confident)
4. Would you prefer to receive this information in another format other than a webinar? (Open ended question)
5. Was the webinar applicable to a specific project? If so, can you tell us a bit about the project? (Open ended question)
6. Please identify any organizations in the HVAC or lighting industry that may be interested in receiving information on demand response code requirements. (Open ended question)

21 registrants completed the survey, and their responses are summarized in Table 2: Webinar Survey Results. Overall, the survey respondents indicated a better understanding of the value of automated demand response, found the webinar to be valuable to their work, although not to a specific project, and felt more confident in guiding their projects through compliance with the demand response requirements in the Code. Respondents

also seemed to favor the webinar format for the training. Finally, while responses were lowest for the last question, survey respondents indicated that they believed PG&E, electrical contractors, IES, and ASHRAE would be interested in receiving information on demand response code requirements.

Table 2: Webinar Survey Results

Question	Responses
1. Understanding of code	Average response: 3.7
2. Value to work	Average response: 4.0
3. Confidence in compliance	Average response: 3.6
4. Preference of format	15 answered "Webinar"; 2 answered "Yes"
5. Applicability to a project	6 answered the webinar was applicable to a specific project; 8 not applicable. No respondents described their projects.
6. Additional organizations	Suggested organizations included: PG&E, electrical contractors, IES, and ASHRAE

Websites

The project team developed a web page dedicated to the Title 24, Part 6 demand response requirements, which can be found at http://pge-adr.com/title-24/. The webpage includes recorded webinar presentations, summaries of code requirements for HVAC, indoor lighting, and electronic message centers, and resources for stakeholders, including links to the Code documents, compliance manuals, acceptance test documents, and reference appendices. Additionally, the webpage includes frequently asked questions received during the presentations described in the previous section.

Table 3 provides statistics of website traffic from the time the website went live on August 18, 2016 to March 17, 2017. Unique views refer to the number of individuals, based on unique IP addresses that visited the site. The average time spent on the page appears low but may be influenced by many short visits. If many short visits occurred, then it would suggest that the other visitors that engaged with the page content may have spent an appropriate amount of time for the available content.

Table 3: Website Statistics from September 2016 to March 2017

Unique Page Views	Average Time on Page
234	3 minutes, 41 seconds

In addition, the recording of the webinar targeting the code compliance group resides on CABEC's web site as part of the organization's "Brown Bag Series", offered free to members at: https://cabec.org/learning/2016-t24-demand-response-requirements/

Although many of the webinar recordings are presented for a fee, the publicly-funded Automated Demand Response in Title 24, Part 6 presentation is available free to anyone.

Marketing Collateral

Marketing collateral was developed for distribution to stakeholders that preferred passive training rather than live presentations. This marketing collateral included the following:

- Presentation Content
  - Microsoft PowerPoint slide decks similar to those used for webinars and in-person presentations. The slide decks are offered in this document as Appendix 3: Sample Presentations.
- Fact Sheet
  - The fact sheet is a one-sided PDF document that summarized the code requirements for HVAC, indoor lighting, and electronic message centers. The PG&E Auto DR website and contact information is offered at the bottom of the sheet for more information. The fact sheet is offered in this document as Appendix 4: Marketing Collateral.
- Newsletters
  - Two newsletter articles were developed: one focused on code-specific details, and a second geared more towards the bigger picture of demand response and Auto DR programs. These newsletters are offered as Appendix 4: Marketing Collateral.

Project Findings

Many of the project findings applied to all stakeholder groups though the extent varied depending on the specific actor's role in the compliance process. Findings generally fell into three categories: Demand Response Awareness, Outreach and Communication Mechanisms, and Message Timing.

Demand Response Awareness. Awareness of demand response generally, and specifically regarding the Title 24, Part 6 automated demand response requirements, is low across all groups.

Demand Response: Awareness of the term "demand response" and the concept of automated demand response and demand flexibility appears to remain very low. Very few people were willing (or possibly able) to offer a definition or an accurate description of the term. However, most are familiar with the demand response concept and the need to manage demand to ensure grid stability and are aware that utilities have essentially always had demand response programs.

Title 24 Demand Response Requirements: There appears to be very little awareness of the specific requirements related to demand response. The measure that seems to have the highest awareness level is nonresidential Occupant Controlled Smart Thermostats (OCST).

Ability to Respond versus Requirement to Respond: Despite repeated emphasis on the enabling purpose of the requirements in the Standards, many attendees continue to confuse the ability to respond with a requirement to respond.

Grid / Electricity System Changes: Awareness of the pace and magnitude of changes to the electricity system and challenges caused by the recent and predicted increase in renewable energy contributions was low.

Though awareness is low, discussion of the larger context appears to engage participants, generating discussion about solutions, controls, uncertainties about technologies, and other related topics.

Voluntary Demand Response Programs: Unlike energy efficiency programs, awareness of voluntary demand response programs is very low. The code and the Auto DR program have the common objective of enabling DR controls. The code structure provides an opportunity for efficient lighting alteration projects to participate in the Auto DR program and to obtain financial assistance for installing controls that aren't required by code now but will enable better flexibility and load control in the future.

Resource Constraints: The economic downturn several years ago forced staffing reductions in many jurisdictions, often losing the most experienced employees to save costs. As the economy recovers, jurisdictions are struggling to manage the increased workload caused by the uptick in construction activity with fewer staff.

Energy Code Generally: There remain signs of "code fatigue" experienced by many during the 2013 code cycle transition. Many attendees expressed their general frustration with the energy code and with the complexity of the current compliance process. Many people had mixed reactions to the news that the 2016 DR requirements are not different than 2013: mixed because they were glad there are no new requirements but somewhat dismayed to discover there were existing requirements with which they were unfamiliar.

Outreach and Communication Mechanisms. Customized messages and flexibility with respect to the communication media and physical location are essential to reach an industry with stakeholders that have widely ranging education, experience, and roles in the process.

Tailored Messages: Messaging can be aggregated for stakeholder groups that have similar roles but is most effective if tailored to focus on the group's primary interests.

Topic Breadth: Code requirements related to demand response may be too narrow of a topic to stand alone for some groups. Including discussion of the larger system and technological drivers tends to spark more interest and build appreciation regarding the need for, and benefit of the requirements.

Existing Meetings: Outreach and training efforts are most effective when integrated into existing gatherings or training opportunities, including staff meetings.

Meeting Format: Trade organizations, without exception, refused an in-person training and requested either a webinar format or printed materials. Members are widespread geographically, and have limited resources available for training. Especially for courses that address a single topic such as demand responsive controls that isn't universally applicable, it's not cost-effective for many members to attend trainings in-person. However, enforcement personnel work closely with their clients and generally prefer in-person interactions over online or remote learning experiences. To effectively reach actors in this community, outreach must go to the jurisdiction.

Preview Materials: Prior to agreeing to distribute webinar marketing materials to members, each organization requested a copy of the presentation content for review, or at a minimum, a summary and outline of the agenda and contents. Given that knowledge, it's important to prepare at least draft materials in advance of making initial contact to be able to follow up immediately and maintain the interest and momentum for the project generated during the call.

Regional Meetings versus Single Jurisdictions: Regional gatherings and individual jurisdiction meetings offer unique outreach opportunities for enforcement staff. Generally, supervisory staff and building officials

attend regional gatherings such as ICC meetings or the CALBO Annual Business Meeting. Supervisory staff are usually responsible for sharing information with their teams providing an opportunity to reach more people. In larger jurisdictions, where there are sufficient staff to justify the cost of a separate presentation, the best way to conduct outreach is generally by attending an existing staff meeting.

Message Timing. Because of the seasonal nature of the construction industry and periodic code updates, timing is an extremely important factor for all market actor groups irrespective of the message format, topic or the recipient's role or level of awareness.

Standards Cycle: The need (and interest) to understand new code requirements especially for new construction projects which can span several years, impacts different groups at different times. For example, plans examiners, design professionals, and energy consultants are often interested in learning about the code in advance of the effective date, as they are involved in the initial design stages of a project. However, field personnel such as installers, inspectors, and facility operations personnel become involved later, during construction and generally want to learn about the code after the effective date.
The entire building code is updated (approximately) every three years. As there are 11 Parts of Title 24 in addition to the Part 6 Energy Code that are also updated and require training, building departments can be inundated with training opportunities during the code cycle transition. Access can be easier following the initial rush.

Work Cycle: Construction tends to follow seasonal fluctuations which impact stakeholders' availability for training. In addition, some trades are heavily impacted by changes in weather. For example, HVAC contractors tend to be extremely busy during changes in the season and extreme weather events. To reach this group effectively, one must be aware that projects generated as a result of these weather-related events appropriately take precedence over training during this time.

Standards Implementation Feedback

While not part of the assessment, engagement with market actors provided an opportunity to collect feedback on standards implementation. As enforcement staff strongly preferred in-person presentations, this group offered the greatest opportunity to informally collect information regarding code implementation experience and challenges. Feedback gathered by the team originated from the compliance audience and was either directly related to demand response-specific code implementation questions and challenges, or more broadly related to general code questions and concerns. Code-specific feedback was provided to the Codes and Standards Program's 2019 Advocacy team to inform the development of the 2019 Standards.

Code-Specific Implementation:

- Occupant Controlled Smart Thermostats (OCST): Building inspectors reported concerns regarding the inability to visually determine if a thermostat meets the Joint Appendix 5 (JA5) communications and technical requirements. The team conducted research to address the concerns, and was unable to provide an adequate short term solution, as the required technical capabilities are implemented in different ways by different manufacturers. Some participants suggested requiring standard labeling indicating the thermostat is a "communicating" thermostat. Functional testing is confirmed by an Acceptance Test Technician, but because the systems are not connected to a utility DR program at the time of inspection, there is no way to verify the ability to receive a DR signal. Although the Energy

Commission publishes a list of certified OCST, it is not part of the official documentation (Standards and Manuals) and there appears to be little to no awareness of its existence. Additionally, voluntary DR program staff have identified a potential implementation and customer satisfaction challenge regarding the potential for equipment incompatibility. Some OCST comply with the Standards but are incompatible with the utility communication systems, meaning that a customer may be required to duplicate the purchase to participate in voluntary DR programs.

- Acceptance Tests: Generally, staff are aware of acceptance tests and many stated that they collect the paperwork. There was much less familiarity with Providers (ATTCP) and the supporting infrastructure. Very few, if any enforcement staff were aware that support from ATTCP is available to confirm compliance. One Provider, CALCTP, stated that they have a contact at each building department that receives all communications and messages. However, when asked, no participants could name an ATTCP contact within their department. Although awareness of the support available through ATTCP is low, it is likely to grow as the acceptance testing infrastructure matures.
- Electronic Message Centers: Field inspectors expressed similar concerns regarding inspecting EMC as they did for OCST, stating that confirming compliance on-site is often difficult as the signs are typically operated remotely. Some inspectors have indicated that at minimum, they confirm the communication equipment is installed. Research with manufacturers indicates that many EMC have the capacity to meet the DR requirements as they are typically connected to the internet, and many jurisdictions have requirements to dim the signs during nighttime hours.

General Questions and Concerns:

- Electric Vehicles: There is significant interest in the code requirements and the impact electric vehicles will have on associated infrastructure requirements, as well as the larger impacts that will result from the anticipated increase in EV in the coming years. In addition, there is a high level of interest in how EV will interact with the grid, the need to provide storage or reserve capacity, and related safety issues, such as during an outage.
- Electricity Storage: Several participants inquired about how storage will fit into the system and the Standards, with specific concern expressed regarding ensuring safety during outages.
- Cybersecurity: Some participants expressed concerns that demand response controls could compromise security in a building by allowing a new avenue of access to building operations equipment. The team provided the participants additional information regarding OpenADR cybersecurity requirements.
- Rate Impacts: Changes to the system pushing the peak from late afternoon to evening hours caused some concern about impacts on residential rates and costs.
- Customer vs Utility Control: Several participants expressed skepticism regarding the motivation for the controls.

Recommendations

As California moves towards a low carbon electric grid with increased renewable energy supply, the integration of demand response as an energy management practice including both basic code compliance and facility engagement will become increasingly important. Current awareness of the role of demand response remains quite low so continued and increased education regarding the code requirements as well as the overall need for, and the potential financial benefits of demand response as an energy management practice can be effective at increasing market awareness and improving compliance with the code.

Education campaigns that recognize the role of each market actor group involved in securing the benefits associated with demand response will be more effective than those that treat all market actors as one homogeneous group. Design and installation teams must first "enable" the facility. An enabled facility is simply one that has building systems in place so that property teams can participate in demand response events with a reasonable amount of administrative effort. Ideally, an 'enabled' facility does not require additional hardware investment to automatically respond to a demand response signal, if so desired. Enabling a facility can be achieved through code compliance, voluntary program participation, or by using existing control functionality. Additionally, property teams themselves must recognize that their facilities have the technical potential to participate and that participation yields net benefits to the property as well as society at large. A third component is embodied by a code compliance community that acknowledges the various motivations of the market actors and ensures that facilities that trigger demand response code requirements are constructed so that demand response enabled systems actually result. Once a facility is demand response-enabled, energy champions, either on site or external (e.g., a utility representative), can work with the customer to take advantage of the control equipment to participate in demand response programs. Each of these groups provide an important role in realizing participation in demand response programs. Recognizing the differences between the groups' interest in technical systems, regulatory compliance, and market opportunity can increase the impact of an outreach campaign.

The following best practices were identified to guide the development of a communication plan:

- Tailor message. The importance of demand response to any one actor is limited so outreach must be tailored to meet the specific needs of the target audience. The marketing message and the way that message is delivered varies by market actor. A message intended for the design and installation community would leave property teams overwhelmed by specifics while a message intended for property teams would leave the design and installation community wanting detail. Market actors also have specific preferences in how messages are received with in-person presentations, webinars, on-demand webinars, webpage content, fact sheets and press releases all being desirable methods depending on the actor.
- Time message. Acknowledge specific timing requirements for each market actor group. Attempting to educate property teams of the benefits of demand response in late fall would be as ineffective as trying to deliver similar messages to the HVAC community during the hot summer months. The former is involved in budget season while the latter is making the most of their peak sales season at the respective times.
- Integrate message with Voluntary Programs. Training materials and marketing collateral highlighting code required functionality can be added to demand response program web pages.
- Develop messages approach through Strategic Champion. A utility resource charged with integrating training material and interfacing with Domain Leads can leverage existing market actor networks.

- Deliver message in conjunction with Domain Leads. A utility resource that handles all issues for a specific market actor may be more effective in introducing or delivering a demand response message than a Strategic Champion acting on their own. The Strategic Champion can help shape the message that the Domain Lead can introduce or deliver. Examples of Domain Leads may be program staff that operate Upstream HVAC programs, account relationship managers who attend BOMA meetings, or emerging technology managers who interface with manufacturers.
- Reinforce message. In order to increase understanding, a message should be reinforced via multiple methods. This can include presentations, recorded webinars, cross marketing (featuring complementary information in materials), or actual marketing collateral. In addition, the message can be reinforced by providing materials to facilitate implementation of the requirements, such as reference materials, handouts, or checklists.
- Document results and refine message. Gather feedback and document results of initial outreach activities. Feedback obtained through formal mechanisms such as participant surveys as well as informal channels, including questions, comments and suggestions received as part of the larger interaction can provide valuable direction to fine tune the message for each market actor group. Refining the outreach materials and processes will improve success in subsequent efforts.

As the Standards are enhanced with a view towards advancing the State of California Zero Net Energy goals, increased market coordination and outreach is beneficial toward realizing the envisioned changes. This assessment confirmed the market has multiple stakeholders with interest in focused content and with the ability to host trainings and distribute training materials on demand response and other emerging topics. By performing additional outreach, ambiguities and inconsistencies that naturally occur when new concepts and ideas are introduced can be better identified and addressed so the desired changes can be realized most effectively.

Appendices

Appendix 1: Initial Target Market Actors and Potential Delivery Mechanisms

ADR Outreach: Initial Target Actors and Potential Delivery Mechanisms								
Target Audience	**Related Industry Organizations**	**Delivery Mechanisms**	Presentations	Webinars	Fact Sheets	Curriculum Additions	Newsletter Articles	Design Brief
Design Professionals								
Electrical Engineers, Lighting Designers	Illuminating Engineering Society			X	X		X	
	USGBC (LEED)		X	X	X		X	EDR
	IALD : International Assoc. of Lighting Designers			X	X		X	EDR
	NCQLP (Certified Prof Program)					X	X	EDR
	IEEE (local chapters)		X	X	X		X	EDR
Mechanical Engineers	ASHRAE (local chapters)			X	X		X	
Architects	AIACC				X		X	
Enforcement Community								
Building Department Plans Examiners, Inspectors	CALBO, ICC		X	X	X		X	
Code Check Consultants	CALBO, ICC		X	X	X		X	
Contractors / Installers								
HVAC contractors	NEBB (ATTCP)				X	X		
	TABB (ATTCP)				X	X		
	IHACI			X	X		X	
	SMACNA			X	X		X	
Lighting contractors	CalCTP (ATTCP)				X	X		EDR
	NLCAA (ATTCP)				X	X		EDR
	NECA				X		X	EDR
Signs	TBD				X		X	
Consultants / Advisors								
Energy Consultants	CABEC			X	X		X	
	AEE		X		X		X	
Utility Staff			X	X	X			EDR
Manufacturers / Distributors								
Lighting Distributors			X		X		X	EDR
HVAC Distributors			X		X		X	EDR
Owners / Property Managers					X			
BOMA					X		X	

Appendix 2: Outreach Schedule

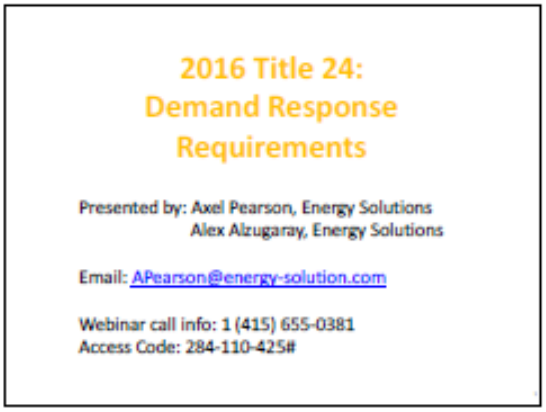
Automated Demand Response in Title 24, Part 6 - Presentation Schedule

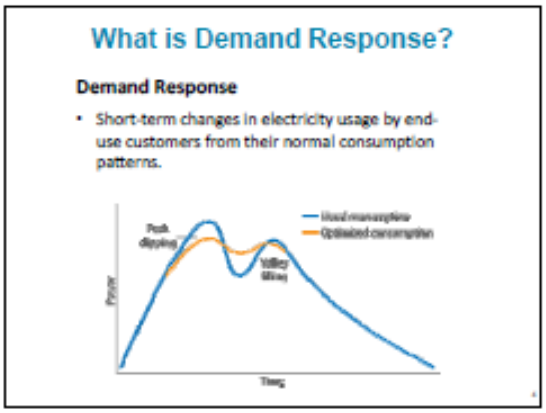
Presentation Type	April	May June	July	Aug	Sept	Oct	November	December	January	February
In-Person Presentations										
2016 ADR Forum (PEC)	4/28/2016									
ICC - East Bay Chapter (San Ramon)			7/12/2016							
ICC - Tri Valley Code Committee (Milpitas)			7/14/2016							
City of Milpitas Building Dept. Staff (Milpitas)				8/23/2016						
ICC - Napa / Solano (Fairfield)			7/5/2016		9/7/2016					
ICC - San Joaquin Valley (Kingsburg)					9/8/2016					
City of Fremont Building Dept. Staff (Fremont)					9/21/2016		11/16/2016			
ICC - CalBIG (Foster City)						10/12/2016				
ICC - Monterey Bay Chapter (Marina)						10/20/2016				
ICC - Redwood Empire Chapter (Petaluma)							11/8/2016			
ICC - Peninsula Chapter (Santa Clara)								12/7/2016		
Interwest Consulting (Roseville)									1/30/2017	
Webinars										
HVAC and Ltg Contractors, Installers					9/13/2016					
HVAC and Ltg Contractors, Installers					9/14/2016					
HVAC and Ltg Contractors, Installers					9/22/2016					
HVAC and Ltg Contractors, Designers, Others					9/28/2016					
HVAC and Ltg Contractors, Designers, Others						10/4/2016				
HVAC and Ltg Contractors, Designers, Others						10/13/2016				
CABEC (Energy Consultants)						10/25/2016				
HVAC and Ltg Contractors, Designers, Others								12/9/2016		
HVAC and Ltg Contractors, Designers, Others								12/13/2016		
HVAC and Ltg Contractors, Designers, Others								12/15/2016		
CABEC (Energy Consultants)									1/25/2017	
Property Managers										2/2/2017

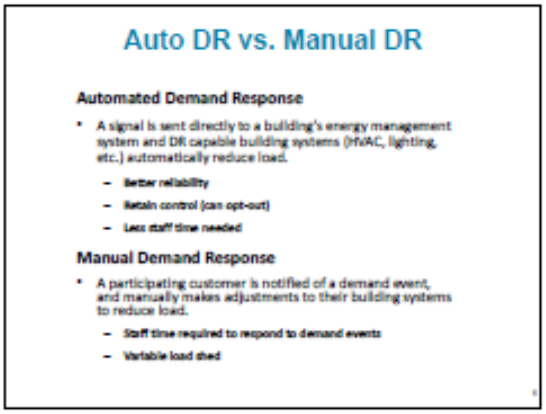
Appendix 3: Sample Presentations

The following presentations are examples of the 30-minute and 60-minute versions of the core presentations.

30 Minute Presentation (Recording available at http://pge-adr.com/title-24/)







Title 24 DR Requirements

Demand Response requirements apply to the following systems and processes:

- HVAC Systems - Sec. 120.2(h)
- Indoor Lighting Systems - Sec.130.1(e)
- Electronic Message Centers - Sec. 130.3



HVAC System Requirements

Facility systems with DDC to Zone level must have ability to:

1. Automatically adjust temperature set point by ±4°F in non-critical zones from central point.
2. Return the system to its original state following the event
3. Provide an adjustable rate of change that allows ramping the system up or down.
4. Provide three operating states: Automated Demand Shed, Manual, and Disabled.

Thermostat Requirements

Reference Joint Appendix 5 (JA5) defines technical specifications for occupant controlled smart thermostats (OCSTs), and requires units to be capable of demand responsive control.

- Thermostatic controls for all single zone air conditioners and heat pumps, shall comply with the requirements of Section 110.2(c) and JA5
- For altered units, thermostats must also comply with JA5

Indoor Lighting Requirements

Buildings >10,000 ft² shall be capable of automatically reducing lighting power in response to a demand signal

- Total lighting power must be lowered by a minimum of 15%

Indoor Lighting Requirements

Demand response in small building can help comply with overall Code requirements

- Buildings <10,000 ft² that respond to a Demand Signal can qualify for a Power Adjustment Factor (PAF) of 0.05
- Reducing lighting in non-habitable spaces (bathrooms, storage, hallways, etc.) or spaces with LPD < 0.5 w/ft² do not qualify for this PAF

When are lighting controls required?

New Construction, Alterations, and Luminaire Component Modifications

- Alterations consist of:
  - Removing and reinstalling a total of 10% or more of the existing luminaires
  - Replacing or adding entire luminaires
  - Adding, removing, or replacing walls or ceilings along with any redesign of the lighting system
- Luminaire Component Modifications, where 70 or more existing luminaires are modified, consist of:
  - Replacing the ballasts or drivers and the associated lamps in the luminaire
  - Permanently changing the light source of the luminaire
  - Changing the optical system of the luminaire

When are lighting controls required?

TABLE 141.0-E CONTROL REQUIREMENTS FOR ENTIRE LUMINAIRE ALTERATIONS

Control requirements that shall be met when 10% or more of existing luminaires in an enclosed space are altered	Resulting lighting power, compared to the lighting power allowance specified in Section 140.6(c)2, Area Category Method	
	Lighting power is ≤ 85% of allowance	Lighting power is >85% to 100% of allowance
Section 130.1(a)1, 2, and 3 Area Controls	Yes	Yes
Section 130.1(b) Multi-Level Lighting Controls – only for alterations to general lighting of enclosed spaces 100 square feet or larger with a connected lighting load that exceeds 0.5 watts per square foot	For each enclosed space, minimum one step between 50-70 percent of lighting power regardless of luminaires type, or must Section 130.1(b)	Yes
Section 130.1(c) 1 Shut-Off Controls	Yes	Yes
Section 130.1(d) Automatic Daylight Controls	Not Required	Yes
Section 130.1(e) Demand Responsive Controls – only for alterations > 10,000 ft² in a single building, where the alteration also changes the area of the space, or changes the occupancy type of the space, or increases the lighting power	Not Required	Yes

Electronic Message Centers

Digital Signage, or Electronic Message Centers, with new connected lighting load >15 kW must be capable of reducing lighting power by at least 30%

- Unless not permitted by health and safety statue or another ordinance / regulation

Acceptance Documents

DEMAND RESPONSIVE LIGHTING CONTROL ACCEPTANCE DOCUMENT

CERTIFICATE OF ACCEPTANCE

Demand Responsive Lighting Control Acceptance Document

Acceptance Documents

AUTOMATIC DEMAND SHED CONTROL ACCEPTANCE

CERTIFICATE OF ACCEPTANCE

Automatic Demand Shed Control Acceptance

What is Automated Demand Response?

Demand Response Signal

- A signal sent by the local utility to a customer, indicating a request to modify electricity consumption, for a limited time period.

OpenADR

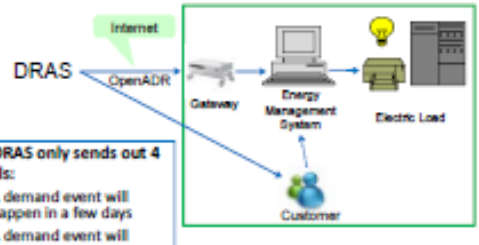
- A communication protocol used by multiple utilities, product manufacturers, and demand response providers

Demand Response Automation Server (DRAS)

- A central server used by a specific utility to send out DR signals to customers

openADR ALLIANCE

Automated Demand Response



The DRAS only sends out 4 signals:

1. A demand event will happen in a few days
2. A demand event will happen in a few hours
3. A demand event has started
4. A demand event is done

How to Participate in ADR

1. Comply with code
2. Plan for demand response
3. Enroll in a utility sponsored DR program
4. Receive ADR signals

For more information on developing an action plan or voluntary enrollment in automated demand response programs, contact the PG&E ADR program at PGE-ADR@energy-solution.com

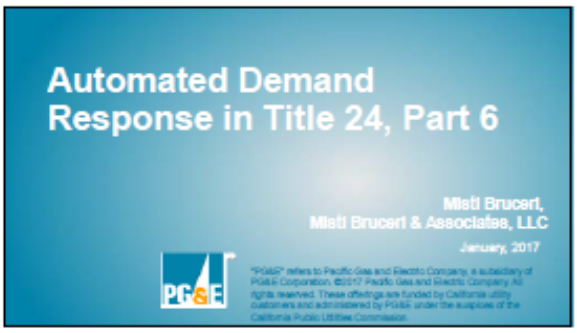
Questions?

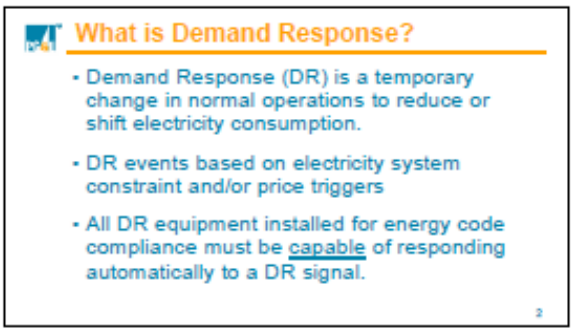
Email: APearson@energy-solution.com

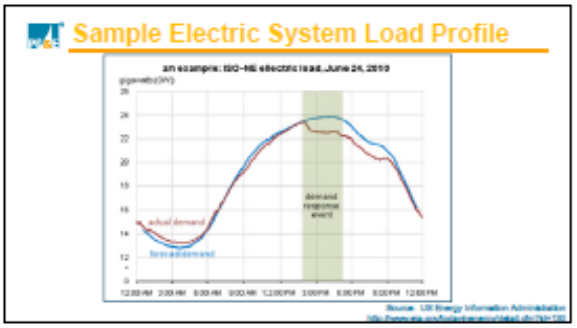
For more info, please visit
http://pge-adr.com/title-24/

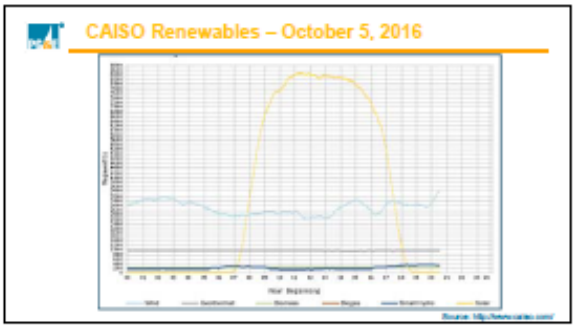
60 Minute Presentation: Recording available at

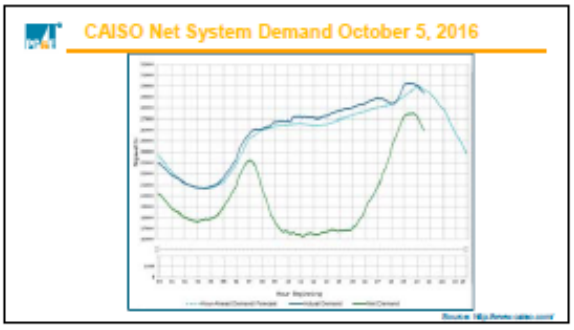
https://cabec.org/learning/2016-t24-demand-response-requirements/



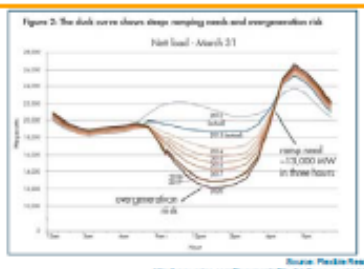




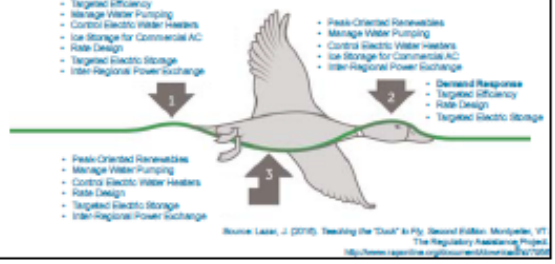




CAISO Net System Load March 31, 2012-2020



Teaching the Duck to Fly – One Example



Title 24, Part 6 Demand Response

- Enabling technologies
  - (no demand reduction required)
- Must have ability to respond automatically
- Mandatory
  - (not allowed to trade away)
- Function confirmed via acceptance testing
- 2016: Mostly clarifications

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Title 24 Demand Response Scope

- Apply to the following NR systems and processes:
  - Indoor Lighting Systems - Sec.130.1(e)
  - HVAC Systems - Sec. 110.2(c), 110.10(b) and 120.2(b), (h)
  - Electronic Message Centers - Sec. 130.3, and
  - Commissioning - Sec. 120.8
- Additions and Alterations
  - Nonresidential
    - HVAC - Sec. 141.0(b) C, E
    - Lighting - Sec. 141.0(b) F, H, I, and J
- Residential –Sec. 110.10(b)1 and 150.2(b)1F

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Indoor Lighting Requirements

New Construction

- All new nonresidential buildings >10,000 square feet must be able to receive and automatically respond to a Demand Response signal to reduce lighting power by at least 15% below total installed lighting power.
  - Excluding areas with LPD ≤0.5W/sqft
  - Must maintain uniform level of illumination for safety and visual aesthetics (Standards Table 130.1-A)
    - Requirements apply at luminaire level and vary by installed technology.

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Indoor Lighting (continued)

Additions and Alterations

- Permitted area >10,000 square feet **AND**
  Increase in lighting load or change to space area or occupancy type.
- Applies to Entire Luminaire Alterations and
  If ≥70 luminaires modified, Luminaire Component Modifications
  (lamps and ballasts, light source, optical system)
- New option: No DR (or multi-level or daylighting) controls required if:
  - No change to lighting system design or area **AND**
  - Reduce existing wattage by 50% in office, retail, and hotel occupancies, 35% in others.

* Requirements apply only to the permitted area, not the existing building.

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Indoor Lighting - Entire Luminaire Alterations

Table 141.0-E Control Requirements for Entire Luminaire Alterations

Control Requirements that shall be met when 10% or more of existing luminaires in an enclosed space are altered	Resulting lighting power, compared to the lighting power allowance specified in Section 140.6(c)2, Area Category Method.	
	Lighting Power is ≥90% of allowance	Lighting Power is ≥80% to 100% of allowance
Section 130.1(a)1, 2, and 3 Area Controls	Yes	Yes
Section 130.1(b) Multi-level Lighting Controls – only for alterations to general lighting of enclosed spaces 100 square feet or larger with a connected lighting load that exceeds 0.5 watts per square foot	For each enclosed space, control in one step between 30-70 percent of lighting power regardless of luminaire type, or meet Section 130.1(a)	Yes
Section 130.1(c) Shut-Off Controls	Yes	Yes
Section 130.1(d) Automatic Daylight Controls	Not Required	Yes
Section 130.1(e) Demand Responsive Controls – only for alterations > 10,000 ft² in a single building, where the alteration also changes the area of the space, or changes the occupancy type of the space, or increases the lighting power	Not Required	Yes

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HVAC Systems (New and Alterations)

- Systems with DDC to zone level must have ability to:
  - Automatically adjust temperature setpoint by ±4°F in non-critical zones from central point.
  - Return the system to its original state following the event
  - Provide an adjustable rate of change
  - Provide three operating states: Automated Demand Shed, Manual, and Disabled.
- Unitary, single zone systems (AC, heat pumps, furnaces) must have:
  - Occupant Controlled Smart Thermostats (OCST)

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Other Nonresidential DR Requirements

- Sign Lighting
  - Electronic Message Centers with new connected lighting load >15 kW must be capable of reducing lighting power by at least 30%
    - Unless not permitted by health and safety statue or another regulation
- Commissioning
  - Buildings ≥10,000 sqft must complete commissioning documentation.
  - DR controls must be documented in Owner's Project Requirements (OPR) and included in Commissioning Plan

Note: Buildings <10,000 sqft need only meet design review requirements.

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DR Measures on Compliance Forms

- Most DR information included on other forms
- Lighting and Mechanical Compliance forms (NRCC-XXX-01) indicate required Installation (NRCI) and Acceptance (NRCA) forms.
- Acceptance Test Forms (NRCA) related to DR
  - LTG-04: Demand Responsive Lighting Control
  - MCH-04 – Acceptance Tests for Single Zone Systems
  - MCH-11: Automatic Demand Shed Control

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Demand Response, Title 24 Part 6

System	DR Requirement Applies To:	System Response to DR Signal Must:	Equipment Needed for Compliance
Lighting	Building area > 10,000 square feet Excluding spaces where lighting power density ≤ 0.5 watts/sq. foot	Reduce lighting ≥ 15%	ADR-capable lighting control system or ADR-capable EMCS
HVAC with DDC	Non-critical zones and Non-temperature-sensitive processes	Adjust space temperature setpoint ≥4°F, and return to original setting	ADR-capable HVAC control system or ADR-capable EMCS
HVAC without DDC			Demand responsive setback thermostat (also called OCST) or ADR-capable EMCS
Sign Lighting	Electronic Message Centers only AND New Connected load >15 kW	Reduce lighting ≥ 30%	ADR-ready lighting control system or ADR-capable EMCS

Automated Demand Response in New Construction Technical Design Guidelines, Energy Design Resources, May 2014 (modified)

Residential DR – Exceptions Only

Occupant Controlled Smart Thermostats may be used as an Exception

- New Construction
  - Exception to Solar Zone Minimum Area
    - May also require: EnergyStar dishwasher, and refrigerator or whole house fan, or home automation system, or graywater irrigation system, or rainwater catchment system.
- Additions and Alterations
  - Exception in cooling climates to HVAC system requirement for minimum airflow.

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DEMAND RESPONSE PROGRAMS AND STRATEGIES

PG&E Demand Response Programs

PG&E offers several voluntary programs that provide incentives to reduce usage during peak demand times.

- Varying structures, requirements, and incentives
- Focus on medium and large customers

Auto DR Program

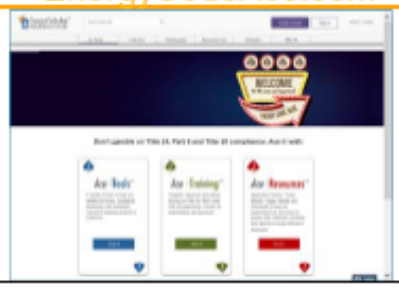
- "DR-enabling" program. Provides incentives to help businesses enable and pre-program energy management and control systems.
  - Lighting retrofit opportunity

Common Automated Demand Response Strategies

1. Temperature Reset or Cycle Off Rooftop Packaged Units
2. Limit or Shut Off Lighting
3. Curtail Industrial Processes (manufacturing)
4. Curtail Municipal Water Pumping or Shut Down Irrigation Pumps
5. Curtail Refrigeration Load (cold storage)
6. Curtail Battery Chargers (forklifts, carts, manufacturing)
7. Limit Air Handler Fan Speeds
8. Limit Demand or Turn Off Chillers or Air Compressors

TITLE 24, PART 6 RESOURCES

EnergyCodeAce.com



Demand Response Resources

CEC Energy Standards Hotline: 800-772-3300

CEC Web Site
http://www.energy.ca.gov

Lighting Acceptance Test Training Providers
CalCTP: 877-670-7910 or info@calctp.org
NLCAA: 310-890-0878

Mechanical Acceptance Test Training Providers
NEMIC: administrator@attcp.org
NEBB: 866.497.4447

Energy Design Resources: Demand Response Design Brief, and Automated Demand Response in New Construction Technical Design Guidelines
http://www.energydesignresources.com

Auto DR Program Web Site
http://www.pge-adr.com

Questions?

Misti Brucerl, Principal
Misti Brucerl & Associates, LLC
(707) 320-2500
misti@pacbell.net

www.mbaenergy.com

ADR

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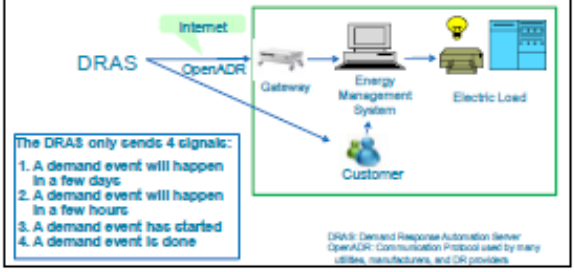
APPENDIX

Related 2016 Title 24, Part 6 Excerpts and References

Automated Demand Response



The DRAS only sends 4 signals:

1. A demand event will happen in a few days
2. A demand event will happen in a few hours
3. A demand event has started
4. A demand event is done

DRAS: Demand Response Automation Server
OpenADR: Communication Protocol used by many utilities, manufacturers, and DR providers

Compliance Documentation – Demand Response Measures

DR Information on Compliance Forms

Lighting

Compliance (NRCC)
- LTI-01 Indoor Lighting
- LTI-02 Lighting Controls
- LTI-03 Indoor Lighting Power Allowance

Installation (NRCI)
- LTI-01 All Buildings
- LTI-02 Controls or EMCS
- LTI-05 Power Adjustment Factors (control for credit)

Acceptance (NRCA)
- LTI-04 Demand Responsive Controls

Mechanical

Compliance (NRCC)
- MCH-01 Mechanical Systems
- MCH-02 HVAC Dry and Wet System Requirements
- MCH-04 Acceptance Tests
- MCH-05 Single Zone Units

Installation (NRCI)
- MCH-01 Mechanical

Acceptance (NRCA)
- MCH-11A Automatic Demand Shed Control

Commissioning

Compliance (NRCC)
- CXR-02 Construction Documents
- CXR-03 Simple HVAC
- CXR-04 Complex HVAC

Signs

Compliance (NRCC)
- LTS-01 Sign Lighting

Installation (NRCI)
- LTS-01Sign Lighting

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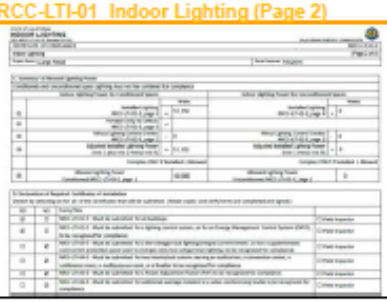
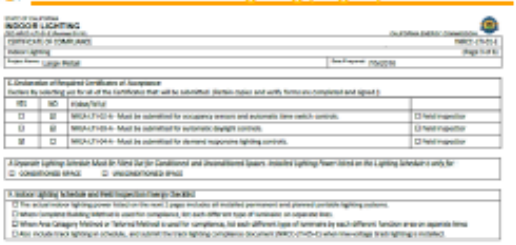
NRCC-LTI-01 Indoor Lighting (Page 1)

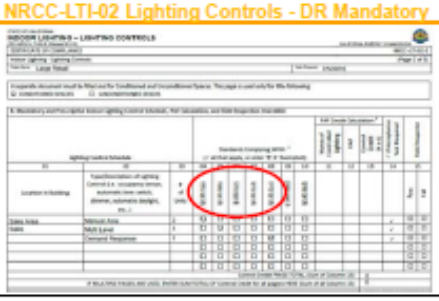
NRCC-LTI-01 Indoor Lighting (Page 2)



NRCC-LTI-01 Indoor Lighting (Page 3)



NRCC-LTI-02 Lighting Controls - DR Mandatory



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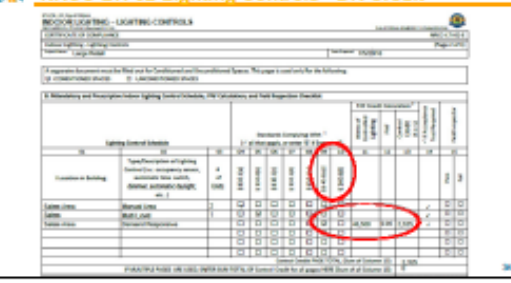


Acceptance Document – DR Lighting

Acceptance Document – Demand Shed

Excerpt from Section 120.2(b)4

SECTION 120.2 – REQUIRED CONTROLS FOR SPACE-CONDITIONING SYSTEMS (NR)

(b) Criteria for Zonal Thermostatic Controls.

4. Thermostatic controls for all unitary single zone, air conditioners, heat pumps, and furnaces, shall comply with the requirements of Section 110.2(c) and Reference Joint Appendix JA5 or, if equipped with DDC to the Zone level, with the Automatic Demand Shed Controls of Section 120.2(h).

EXCEPTION 1 to Section 120.2(b)4: Systems serving exempt process loads that must have constant temperatures to prevent degradation of materials, a process, plants or animals.

EXCEPTION 2 to Section 120.2(b)4: Gravity gas wall heaters, gravity floor heaters, gravity room heaters, non-central electric heaters, fireplaces or decorative gas appliances, wood stoves, room air conditioners, and room air-conditioner heat pumps.

Excerpt from Joint Appendix (JA)5.2

JA5.2 Required Functional Resources

Section JA5.2 describes the functional requirements for OCSTs in the following categories:

- Setback Capabilities
- OCST Messages and Attributes
- Price Signals
- Demand Response Periods
- Event Response
- Other Requirements

Excerpt from Section 120.2(h)

SECTION 120.2 – REQUIRED CONTROLS FOR SPACE-CONDITIONING SYSTEMS

(h) Automatic Demand Shed Controls.

HVAC systems with DDC to the Zone level shall be programmed to allow centralized demand shed for non-critical zones as follows:

1. The controls shall have a capability to remotely setup the operating cooling temperature set points by 4 degrees or more in all non-critical zones on signal from a centralized contact or software point within an Energy Management Control System (EMCS).
2. The controls shall have a capability to remotely setdown the operating heating temperature set points by 4 degrees or more in all non-critical zones on signal from a centralized contact or software point within an EMCS.
3. The controls shall have capabilities to remotely reset the temperatures in all non-critical zones to original operating levels on signal from a centralized contact or software point within an EMCS.
4. The controls shall be programmed to provide an adjustable rate of change for the temperature setup and reset.
5. The controls shall have the following features:
   A. Disabled. Disabled by authorized facility operators; and
   B. Manual control. Manual control by authorized facility operators to allow adjustment of heating and cooling set points globally from a single point in the EMCS; and
   C. Automatic Demand Shed Control. Upon receipt of a demand response signal, the space-conditioning systems shall conduct a centralized demand shed, as specified in Sections 120.2(h)1 and 120.2(h)2, for non-critical zones during the demand response period.

Excerpt from Section 120.8(b)

SECTION 120.8 - BUILDING COMMISSIONING

(b) Owner's or Owner Representative's Project Requirements (OPR). The energy-related expectations and requirements of the building shall be documented before the design phase of the project begins. This documentation shall include the following:

1. Energy efficiency goals;
2. Ventilation requirements;
3. Project documentation requirements, including facility functions and hours of operation, and need for after hours operation;
4. Equipment and systems expectations; and
5. Building envelope performance expectations.

EXCEPTION to Section 120.8(b): Buildings less than 10,000 square feet.

Excerpt from Nonresidential Compliance Manual, Section 12.2.2

4. Equipment and Systems Expectations –

Describe the following for each system commissioned:

a. Level of quality, reliability, equipment type, automation, flexibility, maintenance and complexity desired

b. Specific efficiency targets, desired technologies, or preferred manufacturers for building systems

c. Degree of system integration, automation, and functionality for controls; *i.e. load shedding, demand response*, energy management

Excerpt from Section 130.1(e)

SECTION 130.1 – INDOOR LIGHTING CONTROLS THAT SHALL BE INSTALLED

(e) Demand Responsive Controls.

Lighting power in buildings larger than 10,000 square feet shall be capable of being automatically reduced in response to a Demand Response Signal, so that the building's total lighting power can be lowered by a minimum of 15 percent below the total installed lighting power. Lighting shall be reduced in a manner consistent with uniform level of illumination requirements in TABLE 130.1-A. Spaces that are non-habitable shall not be used to comply with this requirement, and spaces with a lighting power density of less than 0.5 watts per square foot shall not be counted toward the building's total lighting power.

Excerpt from Section 130.3(a)3

SECTION 130.3 – SIGN LIGHTING CONTROLS

(a) Controls for Sign Lighting

All sign lighting shall meet the requirements below as applicable:

3. Demand Responsive Electronic Message Center Control. An Electronic Message Center (EMC) having a new connected lighting power load greater than 15 kW shall have a control installed that is capable of reducing the lighting power by a minimum of 30 percent when receiving a demand response signal.

EXCEPTION to Section 130.3(a)3: Lighting for EMCs that is not permitted by a health or life safety statute, ordinance, or regulation to be reduced by 30 percent.

Excerpt from Section 130.5(e)

SECTION 130.5 –ELECTRICAL POWER DISTRIBUTION SYSTEMS

(e) Demand responsive controls and equipment.
Demand responsive controls and equipment shall be capable of receiving and automatically responding to at least one standards based messaging protocol which enables demand response after receiving a demand response signal.

Appendix 4: Marketing Collateral

Fact Sheet

2016 Title 24, Part 6: Demand Response Requirements

Demand Response, a temporary reduction in energy use in response to a signal from a utility or other entity, is one of several strategies used to manage the electricity system and ensure reliability of service. Recognizing the importance of maintaining system flexibility, the California Building Energy Efficiency Standards, Title 24, Part 6, include requirements to help ensure facilities have the ability to participate in demand response events. Customers may also obtain support from the PG&E Automated Demand Response Program to help facility teams put demand response plans into practice. The Code Requirements are as follows:

HVAC Requirements (§120.2)

Heating, Ventilation, and Air Conditioning systems with Direct Digital Control to Zone level must have ability to:

1. Automatically adjust temperature set point by ±4° Fahrenheit in non-critical zones from a central point
2. Return the system to its original state following the event
3. Provide an adjustable rate of change
4. Provide three operating states: Automated Demand Shed, Manual, and Disabled.

Thermostatic controls for all new and altered single zone air conditioners and heat pumps must have occupant-controlled smart thermostats (OCST) that are capable of demand-responsive control. Each thermostat must be able to receive a DR event signal and automatically adjust the temperature in the space based on pre-programmed instructions. Thermostats must comply with the mandatory requirements of Section 110.2(c) and with the communications protocols and technical specifications listed in Reference Joint Appendix JA5.

Indoor Lighting Requirements (§130.1 and §141.0)

New nonresidential buildings greater than 10,000 ft² must be capable of automatically reducing lighting power by at least 15% in response to a demand signal. Spaces with a Lighting Power Density (LPD) ≤ 0.5 W/ft² are excluded from the calculations. Smaller buildings (<10,000 ft²) that install controls to automatically respond to a Demand Signal may qualify for a 5% Power Adjustment Factor (PAF) which can be used to help meet the code.

Automated Demand Response Controls are required in significant indoor lighting system alterations in permitted spaces >10,000 ft², if there is a change to the area or occupancy type of the space, or if the alteration increases lighting power. Projects subject to the demand response requirements include:

Entire Luminaire Alterations:

- Removing and reinstalling a total of 10% or more of the existing luminaires
- Replacing or adding entire luminaires
- Adding, removing, or replacing walls or ceilings along with any redesign of the lighting system

Luminaire Component Modifications, where 70 or more existing luminaires are modified:

- Replacing the ballasts or drivers and the associated lamps
- Permanently changing the light source
- Changing the optical system

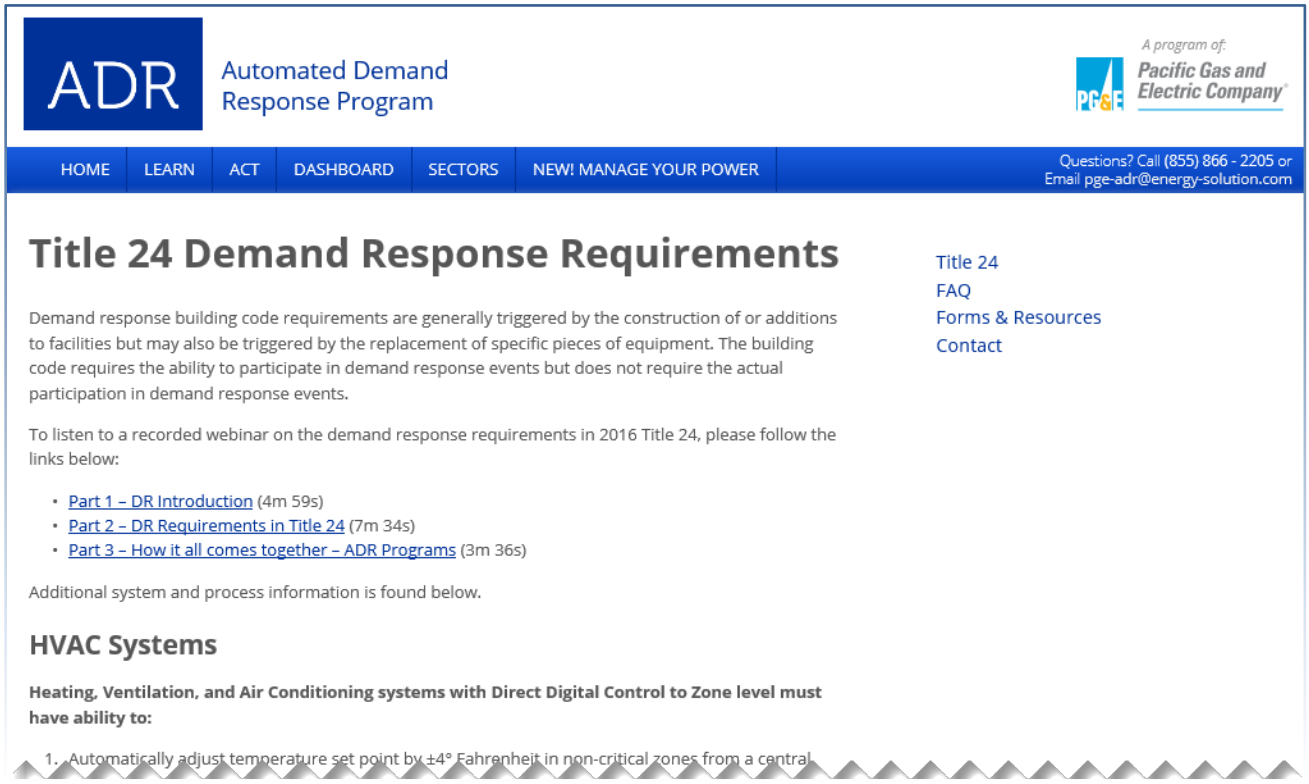
If an alteration results in energy savings greater than 15% over the lighting power allowance, demand response controls are not required. In addition, the demand response controls are not required if the alteration is eligible to use the new compliance method which requires a minimum lighting power reduction below the existing lighting system.

Electronic Message Center Requirements (§130.3)

Electronic Message Centers (also known as digital billboards) with new connected lighting load >15 kW must be capable of reducing lighting power by at least 30%, unless not permitted by health and safety statue or another ordinance / regulation.

For more information on the Demand Response Requirements in Title 24, please visit pge-adr.com/title-24. For more information on how facilities can take advantage of demand response capabilities required by code, please contact the PG&E Automated Demand Response program at (855) 866-2205 or pge-adr@energy-solution.com.

Automated Demand Response Web Site: Title 24 Page



ADR Automated Demand Response Program

A program of: Pacific Gas and Electric Company

HOME | LEARN | ACT | DASHBOARD | SECTORS | NEW! MANAGE YOUR POWER

Questions? Call (855) 866 - 2205 or Email pge-adr@energy-solution.com

Title 24 Demand Response Requirements

Title 24
FAQ
Forms & Resources
Contact

Demand response building code requirements are generally triggered by the construction of or additions to facilities but may also be triggered by the replacement of specific pieces of equipment. The building code requires the ability to participate in demand response events but does not require the actual participation in demand response events.

To listen to a recorded webinar on the demand response requirements in 2016 Title 24, please follow the links below:

- Part 1 – DR Introduction (4m 59s)
- Part 2 – DR Requirements in Title 24 (7m 34s)
- Part 3 – How it all comes together – ADR Programs (3m 36s)

Additional system and process information is found below.

HVAC Systems

Heating, Ventilation, and Air Conditioning systems with Direct Digital Control to Zone level must have ability to:

1. Automatically adjust temperature set point by ±4° Fahrenheit in non-critical zones from a central

Newsletter Article 1

2016 Title 24 Demand Response Requirements

As the modern electric grid evolves, markets are becoming more sophisticated in how they respond to fluctuations in demand that may result from increases in consumption and renewable energy production. Demand response is one strategy used to manage the electric transmission and distribution system through these fluctuations and helps to ensure reliability of service in our communities. Demand response is a temporary change in energy use in response to a signal posted by a utility or other entity, where participants are asked to voluntarily alter their energy usage during period of high electrical demand. Demand response is gaining focus as California optimizes the operation of the electric grid and increases the proportion of renewable energy supply.

In recognition of its increasing importance, demand response requirements are included in the California Building Code Title 24, Part 6. These relatively new requirements help ensure facilities have base functionality to automatically participate in demand response events. The PG&E Automated Demand Response (ADR) Program helps customers comply with the demand response requirements of the building code and positions facility teams to benefit from reduced costs or performance payments.

The California 2016 Building Energy Efficiency Standards, effective January 1, 2017, include Demand Response readiness requirements for the following systems and processes:

- HVAC Systems - Sec. 120.2(h)
- Indoor Lighting Systems - Sec.130.1(e)
- Electronic Message Centers - Sec. 130.3

Demand response building code requirements are generally triggered by the construction of or addition to facilities but may also be triggered by the replacement of specific pieces of equipment. The building code requires the *ability* to automatically participate in demand response events but does not require the *actual participation* in demand response events. This means that the facility systems must be equipped with demand response capable controls, but does not have to change energy consumption patterns. To take advantage of the built in capability, facilities can voluntarily participate in utility demand response programs.

Basic functionality of demand response is supported by OpenADR 2.0, a cross-industry communications protocol that facilitates smooth communication and interoperability. If a utility customer decides to participate during a demand response event, the building's energy management system can be configured to automatically determine when a demand response event is going to occur and the ADR capable building systems (like HVAC or lighting) automatically reduce electric load at the appropriate time. On event days, thermostat set points may be automatically increased to reduce cooling load, lights may be automatically dimmed, or other actions may be implemented based on the customer specific pre-defined plan. This type of automated demand response is reliable, in that it provides predictable energy and cost savings to customers, and predictable load shed to utilities and the California Independent System Operator (CAISO).

HVAC Requirements

All Heating, Ventilation, and Air Conditioning (HVAC) systems must be capable of demand responsive control.

HVAC systems with Direct Digital Control to Zone level must have ability to:

1. Automatically adjust temperature set point by ±4° Fahrenheit in non-critical zones from a central point

2. Return the system to its original state following the event
3. Provide an adjustable rate of change
4. Provide three operating states: Automated Demand Shed, Manual, and Disabled.

In addition, new and replacement single-zone, packaged HVAC units must have occupant controlled smart thermostats (OCSTs). OCSTs are "smart" thermostats, meaning they are internet connected and can communicate with a surrounding network. The code includes appendices focused technical specifications, one of which is Joint Appendix 5 (JA5) which contains specifications for OCSTs.

Indoor Lighting Requirements

Large buildings (those greater than 10,000 ft^2) need to be capable of automatically reducing lighting power in response to a demand signal by a minimum of 15% of the baseline installed wattage. However, the baseline does not consider further load reductions that may result from variable control strategies such as reduced lighting load from occupancy sensors, daylight harvesting, or manual switching.

Smaller buildings (less than 10,000 ft^2) that install controls to respond to a demand signal can qualify for a 5% Power Adjustment Factor (PAF), which can be applied to the allowed Lighting Power Density (LPD) to help meet the code. However, reducing lighting in spaces with LPD $\leq$ 0.5 w/ft^2 does not qualify for this PAF.

In existing buildings, when are Demand Responsive lighting controls required?

Automated Demand Response Controls are required in significant indoor lighting system alterations in permitted spaces >10,000 ft^2, if there is also a change to the area or occupancy type of the space, or if the alteration increases lighting power. In existing buildings, maintaining an existing lighting system does not necessitate demand response controls. However, an alteration which is changing a building's use type (e.g., was used for warehouse but is being converted to an office) or relocating fixtures within the building may trigger demand response requirements.

More precisely, the Standards define an Entire Luminaire Alteration as:

- Removing and reinstalling a total of 10% or more of the existing luminaires
- Replacing or adding entire luminaires
- Adding, removing, or replacing walls or ceilings along with any redesign of the lighting system

Similarly, Luminaire Component Modifications, where 70 or more existing luminaires are modified, consist of:

- Replacing the ballasts or drivers and the associated lamps in the luminaire
- Permanently changing the light source of the luminaire
- Changing the optical system of the luminaire

The code also provides some flexibility in control requirements for luminaire alterations. If an alteration results in energy savings greater than 15% over the lighting power allowance, the demand response controls are not required. So, if you install new energy efficienct LEDs and the new lighting system is at least 15% more efficient than required, demand responsive controls are not required. Simiarly, depending on specific project features, if a lighting retrofit results in a lighting power reduction of 35% (in hotel, office, and retail occupancies; 50% in all other spaces) compared to existing, then neither demand response, multi-level lighting controls, nor automatic daylight controls are required.

Electronic Message Center Requirements

Electronic Message Centers (also known as digital signage or digital billboards) with new connected lighting load >15 kW must be capable of reducing lighting power by at least 30%, unless not permitted by health and safety statue or another ordinance / regulation.

Resources

California's Building Energy Efficiency Standards website hosts a number of resources, including full Title 24 Building Code language and the Reference Appendices, including JA5, mentioned above.

The Title 24 Nonresidential Compliance Manual helps building owners, architects, engineers, designers, energy consultants, builders, enforcement agencies, contractors and installers, and manufacturers comply with and enforce the California Building Energy Efficiency Standards (Energy Standards) for nonresidential buildings.

The PG&E ADR program helps facility teams develop site specific demand response plans and then put those plans into practice. For more information on how facilities can take advantage of demand response capabilities required by code, please contact the PG&E Automated Demand Response program at (855) 866-2205 or pge-adr@energy-solution.com.

Newsletter Article 2

Demand Response in California's Renewable Energy System

Reaching for a 50 percent renewable energy supply by 2030, Californians are forging a way to a renewable energy infrastructure that significantly reduces greenhouse gas emissions from the sixth largest world economy. Following a commitment to advanced metering infrastructure and initial forays into innovative electric rate schedules, attention is now being turned to demand response as a proactive energy management practice that will add new intelligence to how energy is used in the state.

Once considered a practice used only to ensure reliability during extreme weather conditions, demand response is now playing a pivotal role in the greening of the California electric system. Participating customers make short-term changes in their electricity usage in response to changes in the price or availability of electricity. By lowering electricity demand when wholesale market prices are high or when the electric system is stressed, participating customers will play an increasingly important role as the energy grid continues to transition from traditional to renewable sources of electricity.

Newer buildings and even buildings that have had significant recent improvements are now constructed so that they can more easily participate in demand response. In recognition of its increasing importance, the California 2016 Building Energy Efficiency Standards (Title 24, Part 6) include demand response readiness requirements for the following systems:

- Heating, Ventilation, and Air Conditioning (HVAC) Systems - Sec. 120.2(h)
- Indoor Lighting Systems - Sec.130.1(e)
- Electronic Message Centers - Sec. 130.3

The building code requires the *ability* to automatically participate in demand response events but does not require the *actual participation* in demand response events. Those interested in making the most of their new energy management capabilities can contact the PG&E Automated Demand Response program that helps property teams develop site-specific demand response plans. The building's energy management system can then be configured to automatically implement the customer defined plan when a demand response event is set to occur.

Based on the new system capabilities and the property specific requirements, thermostats can automatically increase to reduce cooling load, lights can automatically dim, or other actions may be implemented based on the customer specific pre-defined plan.

Below are more details on the demand response requirements included in the California Building Code Title 24, Part 6:

HVAC Requirements

All HVAC systems will be capable of demand responsive control. HVAC systems with Direct Digital Control to Zone level now will have ability to:

- Automatically adjust temperature set point by ±4° Fahrenheit in non-critical zones from a central point.
- Return the system to its original state following the event.
- Provide an adjustable rate of change.
- Provide three operating states: Automated Demand Shed, Manual, and Disabled.

New and replacement single-zone, packaged HVAC units will have occupant controlled smart thermostats (OCSTs). OCSTs are "smart" thermostats, meaning they are internet connected and can communicate with a surrounding network in order to respond to a demand event.

Indoor Lighting Requirements

New large buildings and some existing buildings (those greater than 10,000 square feet) will be capable of automatically reducing lighting power in response to a demand signal by a minimum of 15 percent of the baseline installed wattage. For existing large buildings, the capability will be present if there was a recent change to the area or occupancy type of the space, or an increase in lighting power. Some smaller buildings (less than 10,000 square feet) that install controls to respond to a demand signal can qualify for a power adjustment factor (PAF), which can be applied to the allowed lighting power density (LPD) to help meet broader code requirements.

Electronic Message Center Requirements

Electronic Message Centers (also known as digital signage or digital billboards) with new connected lighting load of more than 15 kilowatts must be capable of reducing lighting power by at least 30 percent, unless not permitted by health and safety statue or another ordinance / regulation.

For more information on how facilities can take advantage of demand response capabilities required by code, please contact the PG&E Automated Demand Response program at (855) 866-2205 or pge-adr@energy-solution.com.

Appendix 5: International Code Council (ICC) Chapter List

ICC Chapters in PG&E Service Territory		
ICC Chapter Name	**Member Counties**	**Web Site**
California Building Inspection Group	San Mateo, Santa Clara	http://www.calbig.org/
California Building Officials	Statewide	http://www.calbo.org/
Central Coast Chapter	Santa Barbara, San Luis Obispo	http://www.centralcoasticc.com/
County Building Officials Assn of California	Statewide	http://www.cboac.org
East Bay Chapter	Alameda, Contra Costa	http://www.eastbayicc.org/
Monterey Bay Chapter	Monterey, Santa Cruz	http://www.iccmontereybay.org
Napa/Solano Chapter	Napa, Solano	http://napasolanoicc.org
Peninsula Chapter	Santa Clara, San Mateo	http://www.iccpeninsula.org
Redwood Empire Assn of Code Officials	Lake, Marin, Mendocino, Sonoma	http://reaco.org/
Sacramento Valley Assn of Building Officials	Sacramento, Shasta, Tehama, Glenn, Colusa, Yolo, Solano, Butte, Yuba, Sutter, Placer	http://www.svabo.org/
San Joaquin Valley Chapter	San Joaquin, Fresno, Kings, Merced, Madera, Stanislaus, Tulare	http://sanjoaquinvalleyicc.com
Shasta Cascade Chapter	Shasta, Siskiyou, Tehama, Trinity	http://sccicc.org/
Tri-Chapter Uniform Code Committee	ICC Chapters—East Bay, Peninsula, Monterey	http://www.eastbayicc.org/index.php/tucc
Yosemite Chapter	Calaveras, Madera, Mariposa, Merced, San Joaquin, Stanislaus and Tuolumne	http://www.yosemitechapter-icc.org/

Appendix 6: Trade Organizations

Trade Organizations Contacted in PG&E Service Territory		
Organization Name	**Region**	**Web Site**
Building Owners and Managers Association (BOMA)	California	www.bomacal.org
	Oakland East Bay	www.bomaoeb.org
	Silicon Valley	www.boma-sv.org
	San Francisco	www.bomasf.org
	Sacramento	www.bomasacramento.org
Institute of Real Estate Management (IREM)	Central Coast	www.irem102.org
	San Joaquin	www.iremchapter85.com
	Sacramento	www.iremsac.org
	San Francisco	www.iremsf.org
International Facility Managers Association (IFMA)	Central Valley	www.ifmacv.org
	Silicon Valley	www.ifmasv.org
	East Bay	www.ifmaeb.org
	Redwood Empire	www.ifmare.org
Building Operators Certification		http://www.theboc.info/find-training/california
Illumination Engineering Society (IES)		www.ies.org
National Electrical Manufacturers Association (NEMA)		www.nema.org
American Lighting Association (ALA)		www.americanlightingassoc.com/
Heating, Air-conditioning and Refrigeration Distributors International (HARDI)		www.hardinet.org
Western Heating Performance Alliance (WHPA)		www.performancealliance.org
National Comfort Institute (NCI)		www.nationalcomfortinstitute.com
International Association of Lighting Designers (IALD)		www.iald.org