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Demand Response and Cooling Towers

Additional submitted attachment is included below.

CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Comments on Demand Response and Cooling Tower Measures in 2019 Title 24, Part 6 45-Day Language

California Statewide Utility Codes and Standards Team

February 20, 2018

1. Introduction

The California Statewide Utility Codes and Standards Team (Statewide CASE Team) appreciates the opportunity to participate in the rulemaking and the thoughtful feedback we have received from the California Energy Commission (Energy Commission) on the Codes and Standards Enhancement (CASE) proposals.

The CASE initiative presents recommendations to support the Energy Commission's efforts to update California's Building Energy Efficiency Standards (Title 24, Part 6) to include new requirements or to upgrade existing requirements for various technologies. The four California Investor Owned Utilities – Pacific Gas and Electric Company, San Diego Gas and Electric, Southern California Edison and SoCalGas® – and several publicly Owned Utilities – Los Angeles Department of Water and Power, and Sacramento Municipal Utility District – sponsored this effort.

The Statewide CASE Team actively supports the Energy Commission in developing revisions to Title 24, Part 6 by developing code change proposals that will result in feasible, enforceable, and cost-effective enhancements to the building energy efficiency standards. In developing these proposals, the Statewide CASE Team conducts research and market surveys, holds stakeholder meetings, and evaluates the energy savings and cost-effectiveness of considered measures. The CASE Reports, which present pertinent information that supports the code change proposals, are posted within each measure topic page on title24stakeholders.com.

The Statewide CASE Team encourages the Energy Commission to consider the following changes for the sections pertaining to demand response and the prescriptive efficiency requirements for cooling towers.

Recommended revisions to the 45-Day Language are included in this document in turquoise. The Statewide CASE Team's recommended language insertions are double underlined and recommended language ~~deletions are double struck~~. Recommended revisions to the 45-Day Language are summarized in Table 1.

2. Demand Response Cleanup

2.1 Summary

The 45-Day Language has incorporated a number of the suggested edits to clarify and improve the readability of the demand responsive (DR) control requirements in Title 24, Part 6. Moving all of the DR control requirements to one section of the standards (Section 110.12 in the 45-Day Language) will be helpful to improve the clarity of the standards, and we commend this change. We also support the clarification that DR controls must be capable of sending and receiving signals using OpenADR 2.0a or

2.0b. This provides clearer direction than requiring communication using a "standards-based protocol" and will likely lead to improved compliance.

The Statewide CASE Team has provided the Energy Commission with recommendations to revise the DR language to improve readability and clarity without changing the requirements as presented in the 45-Day Language. For example, the addition of clarifying details in Sections 120 and 130 directs only those who must comply with DR controls requirements to read Section 110.12. In addition to the non-substantive revisions to the code language, the Statewide CASE Team recommends two clarifications to the DR controls language that are addressed in more detail below in Sections 2.2 and 2.3:

1. Cloud-based Virtual End Nodes (VEN) should be allowed; and
2. VENs to be "certified" to OpenADR 2.0a or 2.0b.

The Statewide CASE Team encourages the Energy Commission to consider these changes to create a well-defined path for compliance and enforcement while aligning the DR controls requirements with market realities.

2.2 Allow Cloud-Based Virtual End Nodes

To ensure the building code remains relevant and up-to-date in the evolving DR market, cloud-based VENs must be allowed. VENs can be physically located on the building site or they can be located on a server that is not physically located on the building site. Most of the off-site servers are located in the cloud. Although some participants in DR programs choose to use an on-site VEN, it is more common to use cloud-based VENs, especially in the small and medium business and residential segments. In addition to cloud-based VENs being common today, indicators point to cloud-based VENs continuing to be prevalent throughout the 2019 code cycle. The utility staff experts who contributed to this comment letter, which includes representation from incentive programs and emerging technologies programs, anticipate cloud-based VENs will maintain a high market share.

To the best of our knowledge, there is only on smart thermostat with DR capability that uses an on-site VEN. All other thermostats, of which there are many, connect to their manufacturers' cloud-based VEN. Allowing cloud-based VENs will allow more residential customers to use their connected technologies to participate in DR programs. Smart thermostats are used to fulfill the Title 24, Part 6 DR controls requirements in small and medium nonresidential buildings and the DR controls trade-off options for residential buildings. Disallowing cloud-based VENs would significantly limit the availability of qualified smart thermostats to meet the Part 6 requirements.

Cloud-based VENs can be more cost-effective because any upgrade that is required can be implemented in one cloud-based VEN that serves multiple buildings, including security upgrades and revisions that may be required if the entity that offers DR programs makes revisions to how the DR signal is sent to VENs. When the VEN is physically located in the building, somebody at the building may be required to initiate VEN upgrades. This requires more interaction with the building occupant and/or thermostat provider, and is less desirable from the perspective of program implementation.

The Statewide CASE Team recommends departing from the vision of requiring non-proprietary communication for every link of the communication chain to the building; this is not how the DR market has evolved. If the building code continues to demand all links be non-proprietary by disallowing cloud-based VENs, the code will be requiring a system that is not aligned with current practice. Adopting requirements that are not aligned with current practice would require many DR programs to change their eligibility requirements. Some members of our team have also expressed concern that disallowing cloud-based VENs could lead to building departments not enforcing the requirement as written, which would undermine the value of the standards.

We strongly recommend that the Energy Commission allow cloud-based VENs for the 2019 Title 24, Part 6 standards.

2.3 Require Virtual End Nodes to be "Certified"

The Statewide CASE Team recommends that the code language clearly state that the DR control systems include a VEN that is "certified" to OpenADR 2.0a or OpenADR 2.0b. Requiring a certified VEN creates a clear pathway to compliance – something that is lacking in the 2016 standards. Requiring the use of an OpenADR 2.0 (a or b) certified VEN also provides assurance that all 2019 Title 24-compliant buildings that have DR controls are capable of communicating through an OpenADR 2.0 network, which provides reliability, security, and interoperability. It also ensures that the that the control system will continue to be capable of communicating with DR signalers for years to come, even if the initial occupant does not enable the controls or participate in any DR programs.

Some manufacturers claim that their VENs are "compliant", but they are not OpenADR "certified" VENs. The OpenADR Alliance maintains a thorough and closely monitored certification process that is designed to ensure that certified VEN are able to communicate with OpenADR certified virtual top nodes (VTNs)[1]. This provides assurance that certified VENs can communicate with certified VTNs with minimal time and materials required for software upgrades and trouble-shooting to validate the communication. On the contrary, a manufacturer-claimed "compliant" VEN has not gone through the OpenADR certification process and may not be able to communicate or receive DR signals from a certified VTN. If using a manufacturer-claimed "compliant" VEN, the building occupant has no assurance that their VEN will be able to communicate with OpenADR certified VTNs. If Title 24, Part 6 does not specify that VEN be "certified" to OpenADR 2.0a or 2.0b, some VENs will be "compliant" and some will be "certified", which could result in interoperability issue between OpenADR certified VTNs and Title 24, Part 6 VENs.

The purpose of the DR control requirements in Title 24, Part 6 standards is to partly to ensure that newly constructed buildings have controls in place so they are capable of participating in DR programs should the building occupant choose to enable the control system and enroll in a program. Aligning Title 24, Part 6 with existing program eligibility requirements will help ensure that buildings that are compliant with the building code can participate in DR programs. Additional justification requiring certification to OpenADR 2.0a or OpenADR 2.0b can be found in Appendix C of the Demand Response Cleanup CASE Report.[2]

2.3.1 Proposed Code Language Markup

Proposed revisions to the 45-Day Language are provided below.

Section 110.12(a)

All demand responsive controls shall ~~be capable of functioning as~~ have an OpenADR 2.0a or OpenADR 2.0b certified Virtual End Node (VEN), as part of the control system. Off-site VENs shall be considered part of the demand responsive controls system if a demand response signal received by the off-site VEN is capable of resulting in the required automated demand response strategy in accordance with requirements in items (b) through (d) ~~, specified under Clause 11, Conformance, in the applicable OpenADR 2.0Specification.~~

3. Prescriptive Efficiency Requirements for Cooling Towers

The Statewide CASE Team applauds the Energy Commission's decision to adopt a prescriptive requirement for axial cooling towers that is more stringent than the 2016 Title 24, Part 6 mandatory

[1] OpenADR certified VENs receive DR signals through OpenADR certified VTNs.

[2] The final Demand Response Cleanup CASE Report is available here: http://title24stakeholders.com/wp-content/uploads/2017/09/T24-2019-CASE-Report-Demand-Response-Cleanup_Final_September-2017.pdf

requirement. This new requirement will save energy while providing building owners with more cost-effective heat rejection systems.

While the new 60 gallons per minute (gpm) / horsepower (hp) requirement for axial cooling towers connected to condenser water systems 900 gpm or greater is a positive change for energy efficiency, the Statewide CASE Team would like to call attention to the original code change proposal which recommended an 80 gpm/hp requirement[3]. The market survey and energy analysis concluded that the 80 gpm/hp requirement was cost-effective in all except climate zones except Climate Zones 1 and 16, similar to the 60 gpm/hp requirement present in the 45-Day Language. The Statewide CASE Team recommends the Energy Commission consider the cost-effectiveness of 80 gpm/hp cooling towers in future code change proposals.

Additionally, the Statewide CASE Team recommends altering the language so that the requirement is not limited to cooling towers connected to chilled water plants. The proposal showed that cooling towers at higher efficiency are cost-effective, so the language should be modified to apply to all cooling towers 900 gpm or greater.

The energy models used in the analysis all featured an air side economizer, so the cooling tower runtime hours are reduced during the cooler seasons in most climates. An HVAC system that uses cooling towers without a chilled water plant, such as a water-loop heat pump system will require the use of cooling towers to run more often due to a typical lack of an air side economizer. This longer runtime will result in the higher efficiency cooling towers providing greater energy savings, thus resulting in an even greater benefit-to-cost ratio for non-chiller applications.

3.1.1 Proposed Code Language Markup

Proposed revisions to the 45-Day Language are provided below.

140.4(h)5

5. **Cooling tower efficiency.** Axial fan, open-circuit cooling towers serving condenser water loops ~~for chilled water plants~~ with a total of 900 gpm or greater, shall have a rated efficiency of no less than 60 gpm/hp when rated in accordance with the conditions as listed in Table 110.2-G.

[3] The final Cooling Tower Minimum Efficiency CASE Report is available here: http://title24stakeholders.com/wp-content/uploads/2017/09/2019-T24-CASE-Report-_Cooling-Towers_Final_September-2017.pdf