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<b>Filer:</b>	Patty Paul
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## CODES AND STANDARDS ENHANCEMENT INITIATIVE (CASE)

# Comments on Draft Title 24 Residential Alternative Calculation Method (ACM) Reference Manual

## 2016 CALIFORNIA BUILDING ENERGY EFFICIENCY STANDARDS

California Utilities Statewide Codes and Standards Team

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# 1. PREFACE

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The Codes and Standards Enhancement (CASE) initiative presents recommendations to support California Energy Commission's (CEC) efforts to update California's Building Energy Efficiency Standards (Title 24) to include new requirements or to upgrade existing requirements for various technologies. The four California Investor Owned Utilities (IOUs) – Pacific Gas and Electric Company (PG&E), San Diego Gas and Electric (SDG&E), Southern California Edison (SCE) and Southern California Gas Company (SoCalGas) – and Los Angeles Department of Water and Power (LADWP) sponsored this effort. The program goal is to prepare and submit proposals that will result in cost-effective enhancements to energy efficiency in buildings.

This document presents the Statewide CASE Team's comments on the Draft Residential Alternative Calculation Method (ACM) Reference Manual, which CEC posted for public review on August 8, 2015. This document presents initial feedback on the proposed ruleset for the solar photovoltaic compliance option, which is an important aspect of the 2016 Title 24 Standards. CEC allotted less than two weeks to review the proposed changes to the Residential ACM Reference Manual and docket comments. This is not sufficient time to thoroughly review a new ruleset that is expected to have significant impact on the implementation of the 2016 Standards. The Statewide CASE Team will continue its review of the solar photovoltaic (PV) rulesets and other aspects of the ACM Reference Manuals in the coming months. We look forward to working with CEC to continue to improve the rulesets for the ACM Reference Manual.

## 2. HIGH PERFORMANCE ATTICS AND SOLAR PV COMPLIANCE OPTION

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The Statewide CASE Team has started reviewing the ruleset for the solar PV compliance option. Our initial feedback is provided below. As mentioned, the comment period for this draft of the ACM Reference Manual was not sufficiently long to develop robust comments. The Statewide CASE Team plans on continuing its review of the solar PV ruleset and providing CEC with additional comments at a future date.

### Section 2.6.4 Attic Conditioning

The current version of the ACM reads as follows:

#### PROPOSED DESIGN

When spray foam insulation is applied to a roof that will not be vented, it is modeled as a "conditioned" attic and the volume of the attic is included in the conditioned space. A conventional attic is assumed to be "ventilated."

This language in the ACM is incorrect and does not match how the alpha version of the CBECC-Res compliance software models unvented attics. These unvented attics are not modeled as conditioned space and their area is not part of the conditioned floor area in the CBECC-Res alpha software. Further, use of the term conditioned volume is misleading since the modeling is based on relative heat transfers between surfaces in the attic, conditioned space and outdoors, and not based on the volume of the attic.

The term “conditioned” attic implies that the attic is being kept at the same temperature as occupied space, which is not always the case, unless supply air is being deliberately introduced into the unvented attic. At best an unvented attic that is not directly conditioned could be a ‘semi-conditioned’ space.

Further, it is unclear why the language makes distinctions on how to model unvented attics based on a specific type of insulation - spray foam insulation. This implies that an unvented attic insulated with other types of insulation would be treated differently in terms of modeling whether the attic is “conditioned” or not, which is incorrect.

#### **Section 2.6.4 Attic Conditioning**

The current version of the ACM reads as follows:

##### **STANDARD DESIGN**

Attic ventilation is not a compliance variable and is the same for both proposed and standard design.

This language implies that an unvented attic in the proposed design will be compared to an unvented attic in the standard design. This is a major departure from the recommendations made in the Residential Ducts in Conditioned Space / High Performance Attics CASE Report and the adopted language in the Standards, which would have a ventilated attic with R13 below roof deck insulation, 5 percent duct leakage and R8 ducts as the standard design along with R38 ceiling (in Climate Zones 8-16). The alpha version of the software seems to be modeling this as specified in the standards by keeping the baseline equal to a ventilated attic if the user inputs an unventilated attic in the proposed design. The text in the ACM Reference Manual, however, is not consistent with the approach specified in the standards or used in the alpha version of the software.

### **3. SOLAR PV COMPLIANCE CREDIT**

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#### **Magnitude of Solar PV Credit**

The Statewide CASE Team has requested additional information from CEC to substantiate the claims on the magnitude of the solar PV credit. As of August 20, 2015, CEC has not provided additional detail on the energy impacts of the solar PV credit. Based on the alpha version of CBECC-Res, the credit seems higher than the combined savings from both High Performance Attics (HPA) and High Performance Walls (HPW) (approximately 2 to 3 percent compliance margin difference between using PV credit or using HPA and HPW). The Statewide CASE Team will continue its review of the magnitude of the savings and will provide additional feedback at a future date.

#### **PV System Requirements**

The 2016 draft ACM Manual requires that PV systems follow the requirements of Residential Appendix RA4.6.1. The 2016 Appendices (already approved by CEC as part of standards adoption) have the following PV system requirements:

##### **RA4.6.1 Photovoltaic Systems**

When photovoltaic (PV) system performance is used in the performance compliance approach as specified in the Residential ACM Reference Manual, the PV system shall meet the eligibility criteria in (a) or (b).

- a) PV systems meeting all requirements of the NSHP Guidebook; or,
- b) PV systems meeting all of the following requirements:
  - 1) The PV modules and inverter(s) meet the equipment eligibility requirements in the NSHP Guidebook.
  - 2) The PV system nameplate DC power rating, measured under Standard Test Conditions, is no less than 2000 watts.
  - 3) The PV array is installed at a slope no greater than 2.4 degrees from the horizontal (ratio of rise to run no greater than 0.5:12); or, the PV array is installed at a slope no greater than 30.3 degrees from the horizontal (ratio of rise to run no greater than 7:12) and with an orientation between 110 degrees and 270 degrees of true north.
  - 4) The PV system is equipped with a system energy production meter that is integral to the inverter, a standalone system energy production meter, or an energy production monitoring system.
  - 5) Any obstruction that projects above a PV array shall be located at least twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the PV array, measured in the vertical plane.
  - 6) Prior to occupancy of the building, the building inspector shall confirm that PV system is operational.

The Statewide CASE Team proposes that the ACM Manual contain the PV requirements within the body of the manual and that the language be edited to reflect the fact that New Solar Homes Partnership (NSHP) requirements may or may not be active for the duration of time the 2016 Standard is in effect. Further, some of the requirements of the NSHP may not be appropriate for the PV Credit such as the requirement that solar system *“must receive electrical distribution service from an existing in-state electrical corporation collecting funds to support the program as stated in Chapter I. These in-state electrical corporations are PG&E, SCE, SDG&E, and BVES.”*

The Statewide CASE Team proposes the following language to incorporate relevant NSHP requirements into the PV requirements rather than refer to the NSHP Handbook. The Statewide CASE Team requests additional time to review and edit the suggested text below (specifically the parts highlighted in yellow) that require additional inputs and consultations:

#### **Photovoltaic System Requirements**

When photovoltaic (PV) system performance is used in the performance compliance approach as specified in the Residential ACM Reference Manual, the PV system shall meet the following eligibility criteria:

1. Technology and System Ownership - Flat-plate photovoltaic technology is the only technology eligible to receive NSHP incentives. The PV system nameplate DC power rating, measured under Standard Test Conditions, is no less than 2000 watts, measured after the inverter. The solar energy system must be located on the same site where the end-use customer’s own electricity demand is located. It is the intent of the program that eligible systems remain interconnected to the utility distribution grid and be operated at the original location for at least the 10-year warranty period.
2. Energy Efficiency Requirements - Code-Compliant: The building must comply with the 2013 Standards prior to claiming the solar compliance credit for the 2013 Standards. Each building where a portion of the electrical load is served by the solar energy system shall meet the NSHP energy efficiency requirements. Energy efficiency compliance shall be demonstrated for a building as a whole and cannot combine unrelated or detached buildings.
3. Permanent Foundation - Eligible solar energy systems must be installed on newly constructed buildings permanently fixed to their foundation. Permanent foundation is defined in the “Permanent Foundations Guide for Manufactured Housing” (HUD-7584)

4. Transient Housing - Solar energy systems installed on transient residences are not eligible. Only buildings where 50 percent or more of the residential units are occupied for 30 days or more and are one of the following occupancy groups listed in the California Building Code, Title 24, Part 218 are eligible.
5. Grid Interconnection - Eligible solar energy systems must be permanently interconnected to the electrical distribution grid of the utility serving the customer's electrical load.
6. System Components - Major solar energy system components are defined as flat-plate photovoltaic modules, inverters, and meters. All major system components must be new and must not have been previously placed in service in any other location or for any other application. System components must satisfy the eligibility requirements specified in the most recently approved edition of Guidelines for California's Solar Electric Incentive Programs (Senate Bill 1) [[www.energy.ca.gov/sb1/meetings/index.html](http://www.energy.ca.gov/sb1/meetings/index.html)]. Approved major components will be posted on the Energy Commission's eligible equipment website available at [[www.gosolarcalifornia.ca.gov/equipment/index.php](http://www.gosolarcalifornia.ca.gov/equipment/index.php)].
7. Meters - All solar energy systems must be installed with a stand-alone performance meter or an inverter with a built-in performance meter so that the customer can determine the amount of energy produced by the system. Projects that qualify for virtual net metering (VNM), as adopted by the California Public Utilities Commission (CPUC) in decisions including but not limited to Decision 08-10-036 that was modified in Decision 11-07-031, are not required to separately net-meter each residential dwelling unit that will be allocated electricity from the solar system.
8. System Installation - Solar energy systems must be installed in conformance with the manufacturer's specifications and installation instructions; all applicable electrical, fire, and building codes and standards; all utility interconnection requirements; and any local codes and ordinances. If installed under contract, systems must be installed by an appropriately licensed contractor in accordance with rules and regulations adopted by the California Contractors State License Board. Installation contractors must have an active A, B, C-10, or a C-46 license. Contractors with roofing-specific licenses may install photovoltaic modules in accordance with limitations of their specific licenses; however, electrical connections must be made by an above-mentioned contractor. Owner-builders are allowed under the NSHP to install their own systems. The Energy Commission encourages installation contractors to become certified by the North American Board of Certified Energy Practitioners (NABCEP). See [[www.nabcep.org](http://www.nabcep.org)] for additional information.
9. Solar Energy System Field Verification - All installed solar energy systems shall be third-party field-verified as described in Appendix B to ensure that installations are consistent with the information used to determine the estimated performance, reservations, and ultimately the final incentive amount. Field verification procedures shall be consistent with the current Building Energy Efficiency Standards [[www.energy.ca.gov/title24](http://www.energy.ca.gov/title24)]. Field verification of solar energy systems in new housing developments shall employ the sampling approach described in Appendix B, Section A. Field verification will determine if the installed solar energy system is consistent with the "California Flexible Installation" criteria (including the minimal shading criteria) or the uniquely specified orientation, tilt, and shading characteristics of the system, as appropriate.
10. Warranty Requirements - All solar energy systems must have a minimum 10-year warranty provided in combination by the manufacturer and equipment seller/installer. During the 10-year period, the warranty must protect against: 1) defects in materials and workmanship, 2) system or component breakdown, and 3) degradation in electrical output of more than 15 percent from the originally rated electrical output. The warranty must cover the solar generating system, including the flat-plate photovoltaic modules, inverters, and meters, and provide for no-cost repair or replacement of the system or system components, including any associated labor during the warranty period.
11. Leases and Power Purchase Agreements - Solar energy systems that are leased by an end-use customer or provide electricity to an end-use customer under a power purchase agreement (PPA) are eligible.
12. The PV array is installed at a slope no greater than 2.4 degrees from the horizontal (ratio of rise to run no greater than 0.5:12); or, the PV array is installed at a slope no greater than 30.3 degrees from the horizontal (ratio of rise to run no greater than 7:12) and with an orientation between 110 degrees and 270 degrees of true north.

13. The PV system is equipped with a system energy production meter that is integral to the inverter, a standalone system energy production meter, or an energy production monitoring system.
14. Any obstruction that projects above a PV array shall be located at least twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the PV array, measured in the vertical plane.
15. Prior to occupancy of the building, the building inspector shall confirm that PV system is operational.