

DOCKETED

Docket Number:	19-BSTD-12
Project Title:	Town of Truckee Petition to Solar PV Requirement
TN #:	234388
Document Title:	TTEA Solar PV Requirement response letter (6-4-20)
Description:	N/A
Filer:	Cheng Moua
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	8/20/2020 9:10:30 AM
Docketed Date:	8/20/2020

T T E A

Tahoe Truckee Engineer's Association
P.O. Box 851 Tahoe City
California 96145

June 4, 2020

California Energy Commission
1516 9th Street
Sacramento, CA 95814

Attn: Mr. Drew Bohan

Ref: Petition P-02-20-BCS and TTEA white paper "Snow Loads and Solar PV Requirements"

Mr. Bohan,

TTEA's structural committee was asked to review your letter and Mr. Dan West's response letter regarding an exemption on the installation of solar photovoltaic systems in high snow load areas.

In our original white paper on "Snow Loads and Solar PV Requirements", which I have attached, we recommended a ground snow load above which solar photovoltaic systems would not be required. We thought this ground snow recommendation would be a simple way to set a uniform exemption point early in the project, before involvement of a Registered Design Professional and a project specific design. The determination of the recommended ground snow load was back-calculated using typical values for roof factors and a 125 psf solar panel capacity as outlined in the white paper.

As you noted in your letter, the ground-based snow load recommendation is not site/project specific. There certainly could be projects where a solar panel capable of supporting 125 psf could be installed on a site/project where the ground snow load exceeds 223 psf. There may also be sites/projects where the roof snow load exceeds 125 psf and the ground snow load is less than 223 psf.

However, TTEA's structural committee members would also support the use of a roof snow load to determine if a project is exempt from the installation of a solar photovoltaic system. Based on the information we have, it is the rating of the solar panel in the system that is the controlling element. The use of a roof snow load would make it very clear if a solar photovoltaic panel can or can not be used for the design roof snow load. Keep in mind that the roof snow load is determined by the design professional based on the factors noted in ASCE 7-16. It would vary, depending upon the design professional's interpretation, as well as their experience in high snow design.

What we request from the CEC is a roof snow load limit, above which the installation of solar photovoltaic systems would be exempt. Based on the available panels and their design snow load capacities, as shown in the table in Mr. West's response letter, there is currently only one panel that they are aware of that can support a load of 125 psf. Will the CEC set the roof snow load limit at 125 psf, requiring projects with a roof snow load above 111 psf to use just one product, or will you set the snow load limit lower where there may be two or three product options for a project? Please keep in mind that the ultimate load or maximum down test load is not the design load and must be factored to get an allowable design load. See the table in Mr. West's letter for clarification.

We thank you for your consideration on this issue. If you have any questions, or if I can be of any assistance, please contact me at (775) 848-0053 or rick@fnwengineers.com.

Sincerely,

A handwritten signature in blue ink that reads "Rick Fitzgerald". The signature is written in a cursive style with a large, stylized "R" and "F".

Rick Fitzgerald, P.E.

TTEA Structural Committee Chair

T T E A

Tahoe Truckee Engineers Association
P.O. Box 851 Tahoe City
California 96145

California Building Standards Commission
2525 Natomas Park Drive, Suite 130
Sacramento, CA 95833-2936

Snow Loads and Solar PV Requirements (February 11, 2020)

Reference: 2019 California Energy Code (CEC) solar photovoltaic requirements, section 7.2.1 of 2019 Residential Compliance Manual. 2019 California Building Code (CBC) section 1604 and ASCE 7-16.

The members of the Structural Committee of the Tahoe Truckee Engineers Association (TTEA) have reviewed the above referenced requirements and present the following issues with implementing the installation of solar PV panels in high snow load areas.

GENERAL

The California Energy Code requires the installation of solar PV panels on new residences. The California Building Code requires that the solar PV panels and their supports be designed to support the design loads as outlined in the code. In this case the design load is a snow load. Currently, with the available solar PV panels there is a conflict between these two code requirements in high snow load areas.

There are many jurisdictions throughout the state that have large design snow loads which exceed the capacity of currently available solar PV panels. In our area of the Northern Sierra Nevada range, we have design ground snow loads of up to 545 psf and down South up to 300 psf in the Town of Mammoth Lakes.

SNOW LOADS

Snow loads are typically given as Ground Snow Loads (P_g) that are then adjusted to roof snow loads as outlined in ASCE 7-16 Chapter 7. The flat roof snow load is determined from the following equation:

$$P_f = 0.7 \cdot C_e \cdot C_t \cdot I_s \cdot P_g \text{ (ASCE 7-16 Eq. 7.3-1)}$$

P_f – Flat roof snow load

C_e – Exposure factor (ASCE 7-16 Table 7.3-1)

Ct – Thermal factor (ASCE 7-16 Table 7.3-2)
Is – Importance factor (ASCE 7-16 Table 1.5-2)
Pg – Ground snow load (As determined by the local jurisdiction)

The flat roof snow load can be further adjusted for a sloped roof using the following equation:

$P_s = C_s * P_f$ (ASCE 7-16 Eq. 7.4-1)
Ps – Sloped roof snow load
Cs – Sloped roof factor.

For determining a general design snow load on solar PV panels, the following values are typical:

Ce = 1.0 (Partially exposed)
Ct = 1.0
Is = 0.8 (Risk Category I)
Cs = 1.0 (Roof slope < 7/12, non-slippery)

Using the above noted values, a general sloped roof design snow load can be determined using $P_s = 0.56 * P_g$.

There are other factors that need to be considered for each site and roof configuration and the actual design roof snow load on any project must be determined by the design professional. However, for determining a base load where the installation of solar PV panels is routinely problematic or onerous we will use $P_s = 0.56 * P_g$. Since design snow loads are typically given as ground snow loads, we will note the base load in terms of ground snow loads as determined using the following equation:

$P_g = (1/0.56) * P_{s1}$ or $P_g = 1.79 * P_{s1}$ where P_{s1} is the allowable load capacity of the solar panel.

SOLAR PV PANELS

Most manufacturer's solar panels are rated for 113 psf to 125 psf with standard 2-rail mounting systems. Thus we have used 125 psf in determining the limit of an acceptable base ground snow load.

Using the equation above to determine a base ground snow load above which the installations of the solar PV panels are routinely problematic or onerous, we get a ground snow load of 223 psf.

CONCLUSION

Currently, most solar PV panels are rated for 113-125 psf maximum snow load. Installing solar PV panels in areas where the design roof snow load is greater than 125 psf is a problem. The CBC requires that the solar PV panels and their supports be capable of supporting the design load. Where we have roof design snow loads above 125 psf, solar PV panel installation with commonly available solar panels is not possible without exceeding the manufacturer's tested ratings and potentially causing a failure of

the solar PV panels and/or supports and/or voiding any warranty given by the manufacturer of the panels.

Based on these issues we are requesting an exemption of the California Energy Code requirement for the installation of solar PV panels where the ground snow load exceeds 223 psf as determined by the local jurisdiction.

If you have any questions please contact our committee chair, Rick Fitzgerald, P.E. at (775) 848-0053 or by e-mail at rick@fnwengineers.com

Respectfully,

TTEA Structural Committee

Rick Fitzgerald, P.E. – Chair
Dennis Dodds, P.E.
Annie VonFelten, S.E.
Darcey Messner, P.E.
Paul Laudenschlager, P.E.
Donavan Rae, P.E.
David Hodder, S.E.
Abe Haen, S.E.

Rocky Woods, S.E.
Ron Mooiweer, P.E.
Eric Bacon, P.E.
Jay Garbarino, P.E.
Doug Gadow, S.E.
Daryl Mills, P.E.
Brandon Brooks