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California Energy Commission
Docket Office, MS-4
1516 Ninth Street
Sacramento, CA 95814-5512

Re: Docket Number 07-SB-1 Staff Workshop on the Cost Effectiveness of Rooftop Solar on Newly Constructed Buildings

Dear Commissioners:

On May 29, 2013, the California Energy Commission (CEC) Staff hosted a workshop to present the draft consultant report on the *Cost-Effectiveness of Rooftop Photovoltaic Systems for Consideration in California's Building Energy Efficiency Standards* (Draft Report) prepared by Energy and Environmental Economics, Inc. (E3). The Draft Report was prepared in response to the requirements of Senate Bill 1 (Murray, Chapter 132, Statutes of 2006) to determine the cost effectiveness of rooftop photovoltaic (PV) systems for inclusion in California's Building Energy Efficiency Standards (Title 24). The CEC Staff invited parties to submit written comments on the Draft Report by June 12, 2013. In response, Southern California Edison Company (SCE) submits these comments on the Draft Report.

SCE supports renewable energy and California's desire of a clean energy future. In 2012, SCE delivered approximately 15 billion kilowatt hour (kWh) of renewable power or about 20 percent of all the electricity delivered in its service territory. That is more renewable electricity delivered by SCE than by any other utility in the United States. SCE continues its efforts to cost-effectively obtain more renewable capacity built in and around California. Furthermore, SCE believes building and efficiency standards are effective means to achieve the state's ambitious energy and environmental goals.

In its study, E3 finds that rooftop solar would be cost-effective by 2020 for inclusion into California's Title 24 building standards. SCE is concerned, however, that E3's flawed and narrowly-focused analysis presents a skewed and incomplete account of the costs and benefits of including rooftop solar PV into California's Title 24 building standards. E3's analysis is fundamentally flawed and should not be used to conclude that solar PV is suitable for inclusion into Title 24. The flaws in the E3 analysis are summarized below and are discussed further in these comments:

- E3 bases its narrowly-focused analysis on unsustainable investor owned utility (IOU) rate structures and net energy metering (NEM) rules that heavily subsidize PV owners and shift costs to customers that do not install solar PV systems.

- E3's avoided cost methods, specifically related to avoided transmission and distribution (T&D) investments, are not plausible and require substantial vetting.
- E3's time dependent valuation (TDV) analysis fails to recognize that widespread deployment of rooftop and ground-mount solar systems, including utility-scale commercial projects, will shift the peak demand hour to a time later in the day. Greater deployment of solar PV would therefore result in solar PV becoming less cost-effective because energy is valued increasingly more during hours that E3 currently considers off-peak and is valued increasingly less during hours that E3 considers peak hours.

I.
E3 bases its narrowly-focused analysis on unsustainable IOU rate structures and net energy metering (NEM) rules that heavily subsidize PV owners and shift costs to customers that do not install solar PV systems.

In the Draft Report, E3 bases its findings that rooftop solar will be cost-effective by exclusively focusing on the costs and benefits accrued to new building owners under current IOU rate structures and NEM rules. This narrow perspective ignores the substantial and inequitable cost shifts that would burden non-solar customers – especially residential customers in existing homes and apartments. These cost shifts are the result of a distorted rate design including a multi-tiered rate structure that is not based on the costs to provide electricity service to customers. Under the current flawed and distorted IOU rate design, an increasingly smaller number of customers are bearing most of the utility's incremental costs of providing reliable service, including the costs of adding, operating and maintaining infrastructure to provide service to customers who install rooftop PV systems — a decidedly unsustainable outcome for California's electricity customers.

The Warren-Alquist Act (Public Resources Code § 25000 et seq.) requires the CEC to consider the cost-effectiveness of new building standards from the perspective of the new building owner who must comply with the standards.[1] SCE is concerned that solely focusing on building owners ignores the aforementioned cost shift to residents of existing buildings. This cost shift makes the existing rate design unsustainable and leads to flawed conclusions about the cost-effectiveness of rooftop solar PV for inclusion into Title 24. SCE urges the Commission to consider other relevant factors, as provided in PRC Section 25402(b)(3), and to view this

[1] The Warren-Alquist Act, enacted as AB 1575, added Division 15 to the Public Resources (Pub. Res.) Code. Pub. Res. Code § 25402(b)(3) provides:

> "The standards adopted or revised pursuant to subdivisions (a) and (b) shall be cost-effective when taken in their entirety and when amortized over the economic life of the structure compared with historic practice. When determining cost-effectiveness, the commission shall consider the value of the water or energy saved, impact on product efficacy for the consumer, and the life cycle cost of complying with the standard. ***The commission shall consider other relevant factors***, as required by Sections 18930 and 18935 of the Health and Safety Code, including, but not limited to, the impact on housing costs, the total statewide costs and benefits of the standard over its lifetime, economic impact on California businesses, and alternative approaches and their associated costs." Emphasis added.

important issue from a broader perspective by considering the substantial impacts of including rooftop solar into Title 24 on all electricity customers, not just on those that may benefit due to a flawed rate design.

Figure 9 of the Draft Report reveals the extent of E3 erroneously focusing exclusively on solar customers in this analysis.[2] E3 asserts that the *Retail Adjustment*, which is represented by the green bar in Figure 9, accounts for 40 percent of the overall PV benefits in Climate Zone 3 for residential customers. However, this "adjustment" more accurately represents the resulting cost shift to non-solar residential customers, which will prove unsustainable as higher levels of rooftop solar are deployed throughout the state. Ignoring this cost shift and other costs in this analysis that would burden electricity customers, such as distribution system upgrades and reliability considerations, leads E3 to erroneously conclude that it would be cost-effective to include rooftop solar in Title 24.

Similarly, E3's analysis implicitly relies on the perpetuation and expansion of the current NEM tariff, under which NEM customers receive subsidies for self-generation at the full retail rate, which includes non-generation costs. In its 2010 NEM cost-effectiveness report, E3 concluded that the NEM tariff was a net cost to ratepayers.[3] Including rooftop solar in Title 24 building standards would require a significant and unsustainable expansion of the NEM program, which in turn would lead to significant increased costs incurred by non-solar customers.

Indeed, the California Public Utilities Commission (CPUC), in recognizing that a need exists to change the NEM rules, issued Decision 12-05-036 under Rulemaking 10-05-004, on May 30, 2012, and ordered the CPUC's Energy Division to prepare an updated NEM cost effectiveness report by October 1, 2013, to be used by the CPUC to refine the state's NEM rules.[4] One such rule is the cap on customer self-generation capacity that may be installed within the IOUs' service territories. This cap limits both the cost burden of NEM on non-participating customers and the negative impacts of widespread distributed generation on a distribution system that was originally designed only to handle one-way flows of electricity to customers. In its analysis, E3 implicitly assumes an expansion or elimination of the NEM cap, which further increases the costs imposed on the system and non-participants by customer-generators. E3 acknowledges that changes to utility rate structures and NEM rules could have a "dramatic

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2 Draft Report, p. 23.

3 E3 states:

> "Table 28 presents the base case benefits and costs of solar NEM on a net present value (NPV) basis for the 20-year analysis period from the perspective of ratepayers (utility costs and benefits). We estimate that on a lifecycle basis, generation installed through 2008 will result in NPV costs to ratepayers of approximately $230 million."

Net Energy Metering (NEM) Cost-Effectiveness Evaluation prepared for California Public Utilities Commission, January 2010, p. 47.

4 The Governor, in approving AB 2514 (Bradford, 2012) on September 27, 2012, also echoed the need to evaluate NEM by requiring the CPUC to determine who benefits from, and who bears the economic burden, if any, of the NEM program. The CPUC is mandated to determine the extent to which each class of ratepayers and each region of the stat receiving service under the NEM program is paying the full cost of the services provided to them by electrical corporations, and the extent to which those customers pay their share of public purpose programs.

impact on solar's cost effectiveness."[5] In fact, the CPUC has already received rate structure proposals from multiple parties, and the CPUC is scheduled to issue a proposed decision on this matter in the residential rate design proceeding, Rulemaking (R.)12-06-013, later in 2013.

E3's flawed assumptions are also implicitly carried through in E3's "Average Customer Savings" analysis, which uses the TDV metric to value the energy generated by a customer's rooftop solar system. Again, as in the NEM expansion assumption, E3 assumes that customers who install solar will realize a value stream of their PV generation exports that is equal to the costs of the energy that the customer would have otherwise consumed from the grid. These deeply flawed assumptions fail to recognize the aforementioned implicit and significant costs that would be shifted onto customers that either do not have the ability to install rooftop solar or who otherwise choose not to install rooftop solar.

Thus, SCE recommends that at a minimum E3's Draft Report should be augmented with scenarios under which both the utilities' current rate structures are revised, so that the rates are more cost-based and include a demand based charge, and the NEM rules are revised so as not to shift costs to other customers through a generation-only fixed-kWh payment.

II.
The avoided cost methods, specifically around avoided T&D investments are not plausible and require substantial vetting

E3's estimates for avoided costs, especially avoided T&D investments, appear implausible and require intensive vetting. For example, in Figure 9, E3 estimates a $0.03/kWh benefit from avoiding T&D investments,[6] yet earlier in the report, E3 acknowledges that rooftop solar may actually increase distribution costs rather than avoiding them.[7] E3's T&D avoided cost calculator does not properly estimate avoided T&D costs, because the E3 calculator allocates T&D capacity cost savings based upon temperature. Temperature is a sub-optimal proxy for circuit loads, especially when actual circuit load profiles are available. Specifically, many of SCE's residential circuits peak in the evening hours after residents return home, but well after temperatures have reached their maximum values during the early/mid-afternoon hours.

Instead, E3 should have considered utilizing the study titled *Coincidence of Solar Production with SCE's Load and Distribution Circuits* (Coincidence Study) that SCE presented to E3 in October 2012.[8] The purpose of the Coincidence Study was to investigate the coincidence of solar production with SCE's system load and SCE's distribution circuits, which

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[5] Draft Report, p. 1. On p. 40 of the Draft Report, E3 also states:
"If the structure of utility rates is changed, for example by reducing energy-based charges and increasing demand-based and/or service charges, utility bill savings achieved installing PV could drop significantly. Similarly, if NEM were replaced with a different policy, for example, a flat compensation rate per kWh of distributed generation, the cost-effectiveness of solar may decrease."

[6] Draft Report, p. 23.

[7] Draft Report, p. 6.

[8] Post-Workshop Comments of Southern California Edison Company on Phase 1 of the Net Energy Metering Cost-Benefit Study, November 5, 2012, p. 4.

can be used to determine the T&D avoided costs. The coincidence correlates with the effectiveness of residential and commercial and industrial solar production in reducing the system peak load or in dampening the load on distribution circuits that serves solar energy customers. Thus, the avoided T&D capacity allocation factors that E3 is using can be improved upon as SCE recommended in its post-workshop comments on E3's scope of work for Phase 1 of the NEM Cost-Benefit Study.[9]

Other potential flaws exist in E3's avoided cost calculations. For example, E3 uses a 3 percent real discount rate for building owners in its TDV analysis and a 3.43 percent and 6.13 percent discount rate for residential and non-residential customers, respectively, in its "Market Segmented Savings" analysis. These discount rates are extremely low given that debt costs are not the only consideration customers make before making this sort of long-term investment decision. SCE recommends using an accepted discount rate to measure private investments. The private investment rate used by the Federal Office of Management and Budgets (OMB) —the private real discount rate of 7 percent — is more appropriate.[10]

Another example of a potential flaw in the analysis is that the projected greenhouse gas allowance prices appear to be inconsistent with the prices observed in the market. E3's Draft Report does not provide sufficient details in order for stakeholders such as SCE to conduct an in-depth review of E3's input assumptions and cost versus benefit calculations. SCE requests the CEC to make additional details available behind E3's Draft Report, and allow additional comments to be offered before the CEC finalizes this report for further distribution.

III.
E3's TDV analysis fails to recognize the fact that widespread deployment of rooftop solar PV moves the peak demand hour to time later in the day. Greater deployment of solar PV would therefore result in solar PV becoming less cost-effective as energy is valued more during the evening

In its "Average Consumer Savings" analysis, E3 used the TDV metric to value energy generated from rooftop PV. However, E3's report failed to consider that, as widespread PV deployment would occur after inclusion into Title 24, the demand peak would shift to a period later in the day and extending into the evening. This would, in turn, result in high value energy prices during the evening, which results in rooftop solar becoming less cost-effective for solar customers as more solar is deployed. Therefore, in its TDV analysis, E3 also overestimates the cost-effectiveness of rooftop solar from the perspective of new building owners. Future building owners that are required install solar PV will increasingly find that solar becomes less cost-effective to install even though they would be required to do so to comply with Title 24.

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[9] *Ibid*

[10] This rate approximates the marginal pretax rate of return on an average investment in the private sector in recent years. *See* OMB Circular A-94, p. 9. OMB Circular A-94 is available at http://www.whitehouse.gov/omb/circulars_default; a direct link to the text of OMB Circular A-94 in PDF format is available at http://www.whitehouse.gov/sites/default/files/omb/assets/a94/a094.pdf.

IV.
Additional Recommendation

SCE recommends that the CEC should form a working group of stakeholders to further evaluate the cost effectiveness of solar PV systems while also studying the impact of mandatory solar PV installations on utility distribution systems and on system reliability. A complete cost effectiveness study should also contain a sensitivity analysis of alternative utility rate structures as proposed in R.12-06-013 and also provide cost effectiveness results that extend beyond the subsidized participants only scenario.

V.
Conclusion

SCE appreciates the opportunity to provide these comments on the Draft Report. Imposing any kind of solar PV requirement in building standards would shift costs to residential customer in existing homes and create an unfair and inequitable cost burden that is ignored completely in the analysis. Creating a building code with cost effectiveness based upon an unattainable subsidy is not good policy. Furthermore, such a requirement would represent a critical challenge to SCE's ability to maintain reasonable rate levels. SCE looks forward to working with the CEC and interested stakeholders to further evaluate the Draft Report and the cost effectiveness of solar PV systems.

Respectfully submitted,

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