BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Revisit Net Energy Metering Tariffs Pursuant to Decision 16-01-044, and to Address Other Issues Related to Net Energy Metering.	Rulemaking 20-08-020 (Filed August 27, 2020)

PREPARED TESTIMONY OF TYSON SIEGELE
ON BEHALF OF THE PROTECT OUR COMMUNITIES FOUNDATION

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Dated: June 18, 2021

TABLE OF CONTENTS

PREPARED TESTIMONY OF TYSON SIEGELE
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3   I.   NAME, EMPLOYMENT, QUALIFICATIONS, PURPOSE OF TESTIMONY

4   **Name, Place Of Employment, And Business Address:**

5   My name is Tyson Siegele. I am employed by The Protect Our Communities Foundation

6   located at 4452 Park Blvd Suite 309, San Diego, CA 92116.

7   **Qualifications For Providing This Testimony:**

8   I am an energy analyst and licensed architect with 20 years of experience in the fields of

9   energy analysis, construction, building systems design, and architecture. I have designed a

10   diverse array of buildings from research laboratories to personal residences. Those buildings

11   incorporated a wide range of energy systems and efficiency measures. My work on energy

12   systems behind the meter is directly applicable to the NEM proceeding.

13   In addition to architecture and construction, I have over a decade of experience in energy

14   analysis that includes analysis of solar power, wind power, batteries, hydrogen, fuel cells, fuel

15   cell vehicles, electric vehicles, hybrid systems, heat pumps (both air source and ground source),

16   heat exchangers, energy efficiency, community choice aggregation, grid regionalization, utility

17   franchise agreements, utility municipalization, power purchase agreements, competitiveness of

18   fossil fuels, competitiveness of nuclear generation, time of use rates, the role of hydropower, net

19   energy metering, capacity procurement, and electricity transmission.

20   Since 2018 I have worked as an expert in Commission proceedings on behalf of PCF. I

21   have provided analysis and evaluations on issues within the following California Public Utilities

22   Commission proceedings: (1) the integrated resource plan proceeding evaluating reliability, cost-

23   effective procurement, renewable and fossil fuel procurement, and selection of specific resources

24   and fuel types such as geothermal, energy storage, hydrogen, natural gas, solar and wind; (2) the

25   resource adequacy proceeding evaluating local, system, and flexible resource adequacy, effective

26   load carrying capability, marginal versus average ELCC for renewable resources, maximum

27   cumulative capacity buckets, and availability assessment hours; (3) the power charge

28   indifference (PCIA) adjustment proceeding evaluating resource allocations, resource attribute

29   distributions, and legislative intent regarding the execution of the PCIA; (4) the Aliso Canyon

30   proceeding evaluating gas system capability, pipeline capacity, pipeline outages, storage needs,

1   storage capacity, electric and gas system coordination, and minimum local generation

2   requirements.

3   My diverse experience designing, installing, evaluating, assessing and researching energy

4   systems as well as those systems' contributions to and effects on the overall electricity system

5   allows me to compare behind-the-meter ("BTM") systems to in-front-of-the-meter systems and

6   evaluate the strengths and weaknesses of both. My two fields of expertise – energy and

7   architecture – combine to amplify my ability to assess the costs and benefits of BTM renewable

8   energy systems. A copy of my resume is included as Exhibit A to this testimony.

9   **Purpose Of Testimony:**

10   I submit this opening testimony on behalf of The Protect Our Communities Foundation

11   ("PCF"), pursuant to Rule 13.8 of the Commission's Rules of Practice and Procedure on the

12   costs and benefits of net energy metering ("NEM"). My analysis contained in this testimony

13   demonstrates that BTM solar provides benefits to all electricity consumers by reducing the cost

14   of transmission and distribution, as well as reducing the need to produce energy from centralized

15   resources. My testimony also addresses the issues set out by Commissioner Guzman-Aceves and

16   ALJ Hymes in their November 19, 2020 scoping memo. In response to Issues 3 and 4, I conclude

17   that the Commission should analyze program elements of any NEM tariff by the extent to which

18   they incent the installation of BTM solar and battery installations, for the reasons provided in

19   Sections II through V below.

20   **II.   Assessing new NEM solar arrays and their effect on peak demand and costs**
21   **   across ratepayer classes.**

22   As noted in the following subsections, I have analyzed how the operation of new NEM

23   solar arrays would affect peak demand, total annual demand, and peak demand time of day. By

24   assessing the total grid energy needs and how NEM reduces those grid energy needs, including at

25   peak demand time of year and peak demand time of day, I conclude that NEM solar arrays

26   reduce (1) peak load, (2) the need for front-of-the-meter grid generation, (3) the need for new

27   transmission, and (4) the need for new distribution. Accounting for all of these energy and

28   infrastructure need reductions, as detailed in Section I, A through E, of my testimony below, I

29   conclude that NEM solar arrays reduce all ratepayers' costs.

1	**A. California electricity demand is decreasing due, in part, to NEM solar.**
2	First, I reviewed the total energy consumption in California over the past 20 years by
3	reviewing data from the California Energy Commission ("CEC") and I determined from my
4	review of CEC consumption data that efficiency and BTM solar have managed to gradually
5	reduce the total energy consumption in California from grid-based generators. The CEC
6	consumption data contained in Figure 1 shows the approximate amount of California electrical
7	energy generation plus imports consumed since 2007.
8	
9	**Figure 1: California Electrical Energy Grid Generation Plus Imports[1]**
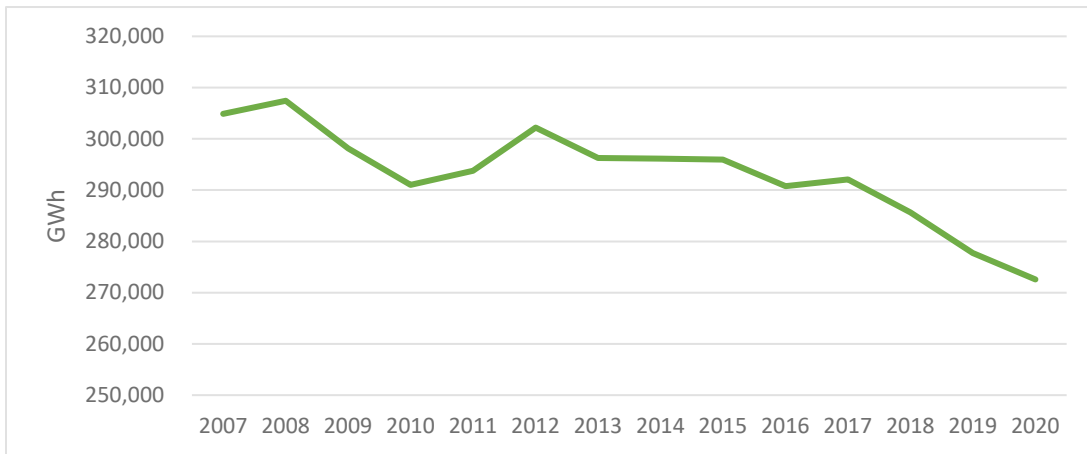
10	
11	
12	I used the most recent CEC data on grid side energy generation to create Figure 1. While
13	energy generation and consumption are not identical because consumption will be slightly
14	smaller due to minimal downward adjustments due system losses such as line losses, Figure 1
15	provides a close estimate from CEC data of California's year to year consumption for the period
16	2007 through 2020. As shown in Figure 1, electricity generation peaked in 2008 and has
17	dropped every year since 2017. During the most recent year, 2020, data shows that California
18	consumption of electricity that was generated in front of the meter was lower than any year since

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[1] California Energy Commission ("CEC"), California Electrical Energy Generation, (Data as of June 2021), see https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/california-electrical-energy-generation.

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1 2001.[2] Even though California experienced the COVID-19 pandemic in 2020, the lower energy

2 use in 2020 continued on a similar trajectory as the energy use reductions in 2018 and 2019.

3   This contribution by NEM solar is eliminating the need for expansion of the transmission

4 and distribution ("T&D") system to accommodate load growth, and not simply deferring T&D

5 expansion that will inevitably occur. This was most recently demonstrated when CAISO

6 identified the unexpected growth in NEM solar a primary reason CAISO cancelled $2.6 billion

7 in proposed transmission projects in PG&E service territory in 2018 at the end of a three-year

8 review of PG&E transmission expansion proposals.[3,4]

9   Assuming, for the sake of argument, that one-half of the cancelled PG&E transmission

10 project savings - $1.3 billion - are attributable to NEM solar, that is equivalent to an annualized

11 savings over 40 years of approximately $174 million per year.[5] PG&E added 1,685 MW of NEM

12 solar in the three-year, 2015-2017 timeframe.[6] Under this scenario, each 6 kW_{AC} of NEM solar

13 system added to PG&E territory in the 2015-2017 period avoided about $620/yr in new

14 transmission expense.[7]

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[2] *Ibid.*

[3] CAISO, *Board approves 2017-18 Transmission Plan, CRR rule changes*, March 23, 2018:
http://www.caiso.com/Documents/BoardApproves2017-18TransmissionPlan_CRRRuleChanges.pdf,
"The changes were mainly due to changes in local area load forecasts, and strongly influenced by energy
efficiency programs and increasing levels of residential, rooftop solar generation."

[4] CAISO, *2017-2018 ISO Transmission Plan*, March 22, 2018, pp. 2-3:
http://www.caiso.com/Documents/BoardApproved-2017-2018_Transmission_Plan.pdf. "In this third year
of a comprehensive review of previously-approved projects in the PG&E service territory, the ISO built
on study efforts in previous cycles and not only identified projects that were no longer needed, but also
explored re-scoping a significant number of projects to better reflect evolving needs. As a result of the
review, 18 projects are recommended to be canceled, and major scope changes have been identified for 21
other projects, paring over $2.6 billion from the ISO transmission capital program estimated costs. Seven
other projects will continue to be on hold pending reassessment in future cycles."

[5] The relationship to transmission capital cost to annualized capital cost is based on the original 2006
SDG& Sunrise Powerlink cost estimate. SDG&E, A.06-08-010 SDG&E Sunrise Powerlink (SPL)
Application for Certificate of Public Convenience and Necessity (CPCN), August 4, 2006, Chapter V, p.
V-9. Estimated capital cost = $1.265 billion; Chapter IV, p. V-11 ($164 million/yr annualized capital +
$10 million/yr O&M = $174 million/yr).

[6] See: https://www.californiadgstats.ca.gov/ (accessed June 18, 2021). PG&E NEM solar, December 31,
2014 = 1,160 MW; December 31, 2017 = 2,845 MW. NEM solar increase, 2015-2017 = 1,685 MW.

[7] 6 kW_{AC} is assumed to be the average NEM solar system capacity. NEM systems added in 2015-2017 =
1,685,000 kW_{AC} ÷ 6 kW_{AC} = 280,833 NEM systems. Avoided transmission cost per 6 kW_{AC} system =
$174 million/yr ÷ 280,833 systems = $620/NEM system/yr.

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1   The Commission in its April 2020 decision updating the Avoided Cost Calculator,

2   acknowledged qualitatively that NEM solar played a role in avoiding transmission costs but

3   declined to monetize that avoided cost.[8] Monetizing the avoided cost of non RPS-related

4   transmission projects that are cancelled because of NEM solar, assuming a benefit of

5   approximately $600/year per NEM solar system, would – by itself – largely eliminate the alleged

6   cost shift that IOU NEM 3.0 proposals attempt to address with fixed charges.

7   **B. NEM solar also avoids the cost of new RPS transmission to access remote**
8   **solar**

9   NEM solar also has the benefit of displacing transmission-dependent remote renewables

10 to achieve the same amount of GHG reduction. Using SDG&E's Sunrise Powerlink as an

11 example, the transmission line's authorization was predicated on it supplying SDG&E with

12 1,000 MW of renewable energy.[9] The proposed decision in the proceeding denied the

13 transmission line as not necessary for reliability purposes.[10] The ultimate cost of the Sunrise

14 Powerlink was $1.889 billion,[11] with a 40-year annual amortized cost of $254 million/yr.[12] If

15 NEM solar, assuming an average system capacity of 6 kW_{AC}, had been used to provide the 1,000

16 MW of renewable energy and the Sunrise Powerlink had not been built, each of those 6 kW_{AC}

17 systems would have avoided about $1,500/yr/system in RPS transmission cost.[13] This NEM cost

18 savings, by itself, is greater than the cost shift identified by the IOUs.

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[8] D.20-04-010, p. 60. "We acknowledge that distributed energy resources avoid transmission costs but, at this time, the record in this proceeding provides no reasonable alternate method of determining unspecified avoided transmission costs."

[9] T&D World, *SDG&E's Sunrise Powerlink Reaches 1000 MW Renewable Energy Goal*, December 18, 2014: https://www.tdworld.com/grid-innovations/transmission/article/20964943/sdges-sunrise-powerlink-reaches-1000-mw-renewable-energy-goal.

[10] A.06-08-010, *Decision Denying a Certificate of Public Convenience and Necessity for the Sunrise Powerlink Transmission Project*, October 31, 2008, p. 4. "The record shows, on balance, that all of the transmission proposals likely would provide additional reliability to SDG&E's service area. However, SDG&E's service area will not experience a reliability need or "shortfall" until 2014, and the shortfall may be met more economically and more reliably with generation-based alternatives."

[11] D.08-12-058, December 18, 2008, Finding of Fact 42, p. 289.

[12] Ratio of final $1.889 billion capital cost in D.08-12-058 to original capital cost multiplied by original annualized cost in A.06-08-010, plus annual O&M: [($1.883 billion/$1.265 billion) x $164 million/yr] + $10 million/yr O&M = $244 million/yr + $10 million/yr O&M = $254 million/yr

[13] 1,000,000 kW_{AC} ÷ 6 kW_{AC}/system = 166,667 NEM systems. $254 million/yr ÷ 166,667 systems = $1,524/yr/system.

1   California is currently projecting that it will construct 16,900 MW of new utility-scale

2   solar by 2030.[14] New transmission will be built to support this utility-scale solar expansion.[15]

3   California would achieve its GHG reduction targets more cost-effectively by accelerating NEM

4   solar under the current NEM structure and de-emphasizing remote utility-scale solar dependent

5   on new transmission construction.

6   **C. NEM has decreased the CAISO single day peak load.**

7   My review of the California Independent System Operator ("CAISO") data on

8   California's peak load electricity usage from 2007 to 2020 also demonstrates that California peak

9   electricity load has also continued to trend down. Figure 2, that I created using CAISO data,

10   charts the CAISO balancing authority's annual peak load history since 2007 and calculates a

11   linear best fit line showing the gradual reduction in average peak load over that timeframe.

12

13   **Figure 2: MW at Annual Peak Load[16]**
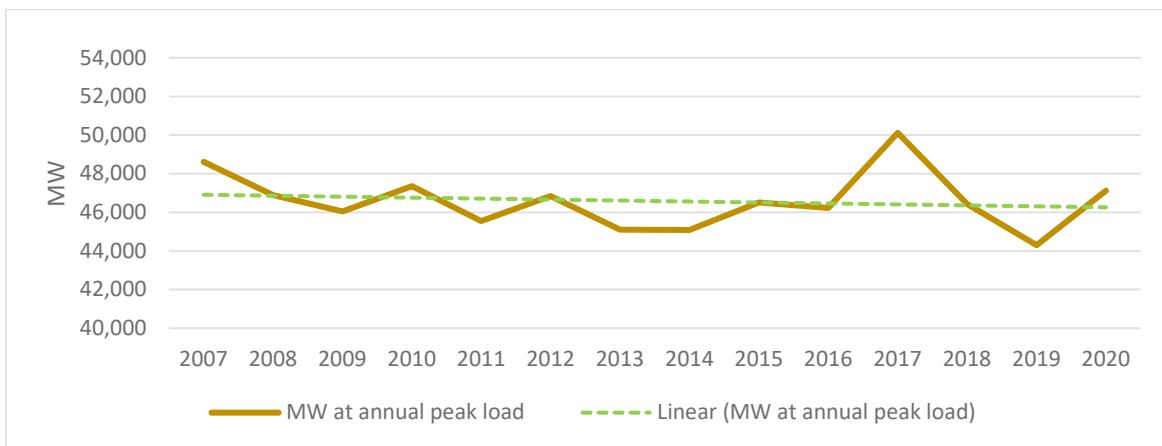
14

15   The trend line above shows a decline in annual peak demand. As described in the following

16   sections, this decline in annual peak demand also likely results from the growth in NEM solar.

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[14] California Energy Commission, *2021 SB 100 Joint Agency Report Summary Achieving 100% Clean Electricity in California*, March 15, 2021, p. 10.
[15] California Energy Commission, *2021 SB 100 Joint Agency Report*, March 15, 2021, p. 131. "New transmission will also be necessary to achieve the large resource builds needed to meet the SB 100 goals."
[16] Data Source: CAISO, California ISO Peak Load History 1998 through 2020, see
https://www.caiso.com/documents/californiaisopeakloadhistory.pdf.

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1   **D. NEM solar has moved the time of peak annual load later in the day.**

2   I reviewed CAISO's peak load data regarding time of day of peak load on the day that the

3 CAISO balancing authority experienced its peak load for the year. Using this data, I assessed

4 whether NEM solar produced an effect on the time of day of California's peak load. The data I

5 reviewed included the peak time of day for the peak annual load from 2007 to 2020. To assess

6 whether NEM solar created an effect I calculated the linear best fit of the time of day over the

7 14-year timeframe. My analysis found the following result: NEM solar has operated in California

8 to reduce California's peak electricity load by reducing the mid-day and afternoon peak thereby

9 shifting each new annual peak (on average) later in the day to times when the peak load has

10 historically been lower then mid-day and afternoon peaks.

11   Figure 3 shows the time of day of peak demand since 2007 served by grid resources.

12

13   **Figure 3: Time of Peak Demand by Year[17]**
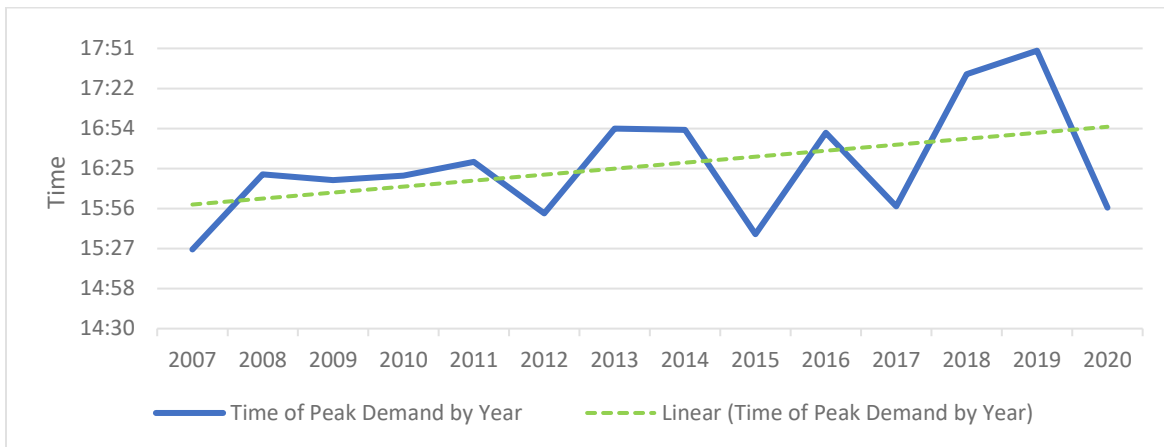
14

15   My review of the data shows that prior to 2018, California had never experienced a peak

16 demand later than 5:00 p.m. However, the data shows that in both 2018 and 2019 peak demands

17 occurred after 5:00 p.m., with the 2019 demand nearly at 6 p.m. From 2007 to 2020, the trend

18 line shows a change of approximately one hour from around 4 p.m. to 5 p.m. The average time of

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[17] Data Source: CAISO, California ISO Peak Load History 1998 through 2020, see
https://www.caiso.com/documents/californiaisopeakloadhistory.pdf.

Prepared Testimony of Tyson Siegele on Behalf of PCF

day for the peak annual demand for the years 2001-2005 occurred at 3:36 p.m.[18] The average

time of day for the peak annual demand for the years 2016-2020 occurred at 4:49 p.m.[19] Based

on this data, I conclude that NEM installations will continue to cause the peak day to trend later

and later in the day. The trend will continue at least until the peak time of day for the peak day of

year demand regularly occurs after sunset. As explained below, in Section III the increasing

attachment rate of battery storage to NEM solar installations will further serve to push the peak

time of day to a time after the IOUs' TOU rates' "on peak" window.

E. NEM solar reduces California's total annual electricity demand.

I reviewed the data provided on the California Distributed Generation Statistic ("CA DG

Stats") website and have reprinted a chart from that website as Figure 4.[20] The reprint is to

provide clarity and ease of access for this section of testimony and has been reprinted without

changes or additions. The data from CA DG Stats is collected from the utilities and solar

programs administrators with input and direction from the Commission.

The data and chart on NEM solar in Figure 4 show the latest NEM solar capacity

numbers in California. As of April 30, 2021, NEM solar capacity equaled 9,627 MW. From my

review this data, I conclude that the increasing capacity of NEM solar from 2016 – 2020 aligns

with the reduction in total grid-based energy consumption over that timeframe. The increasing

capacity also aligns with the downward trend of peak load required to be served by grid

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[18] *Ibid.*

[19] *Ibid.*

[20] DG Stats, April 30, 2021 release, see https://www.californiadgstats.ca.gov/charts/.

Prepared Testimony of Tyson Siegele on Behalf of PCF

1   resources. And it is reasonable to conclude that the NEM installations have been a source of the

2   decreasing demand and peak load.

3

4   **Figure 4: NEM Solar Installations 2019-2030- (Reprint from CA DG Stats)[21]**
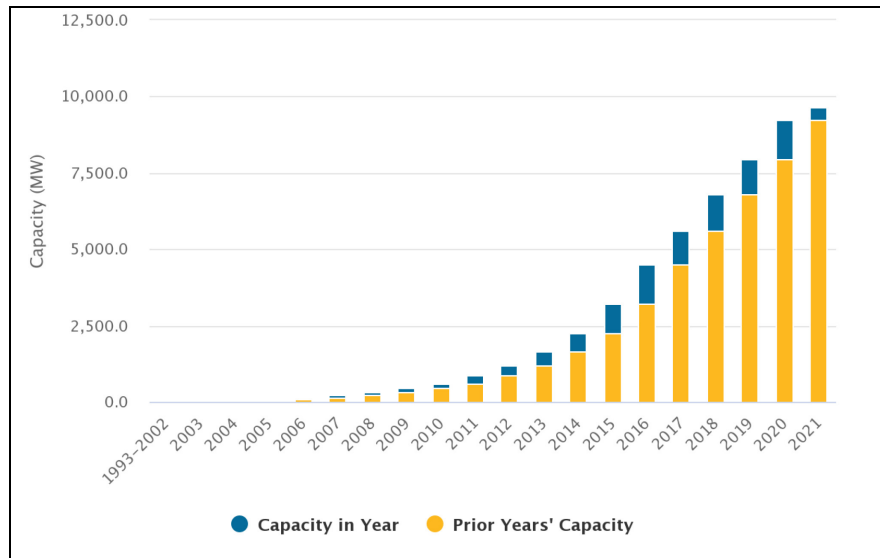
5

6   I used the National Renewable Energy Laboratory's ("NREL") solar calculator PV Watts

7   to estimate the annual energy use from solar arrays in California.[22] By setting a reasonable

8   location for a representative California solar array and keeping the rest of the configurable

9   options at their default settings, I used PV Watts to calculate the annual energy production from

10   a 1 MW array at 1,661 MWh/year.[23] Using that assumption, I calculated that the 9,627 MW of

11   statewide installed NEM capacity will produce approximately 15,990 GWh of electricity per

12   year.[24] That equals approximately 6% of the total electricity use in California in 2020.[25] As the

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[21] DG Stats, April 30, 2021 release.

[22] NREL, PV Watts ("PV Watts"), see https://pvwatts.nrel.gov/.

[23]PV Watts, 1 MW array, located in Los Angeles, retaining all other preset options, finds an annual production of 1,661,257 kWh = 1,661 MWh. The assumed location for the array makes sense because it is near the two largest population centers in California with some of highest solar per capita.

[24] 1,661 MWh/1 MW x 9,627 MW = 15,990,447 MWh = 15,990 GWh

[25] (15,990 GWh / 272,576 GWh) = 0.0586 = 6%

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1   number of NEM installations continue to grow, NEM will serve a larger and larger portion of

2   California load unless total load grows at a faster rate than NEM installations.

3   **F. The data reviewed establish that NEM solar reduces peak electricity**
4   **demand.**

5   Solar arrays produce much of their electricity during the afternoon. As I describe in

6   Section II(D) above, the afternoon corresponds to the highest electricity demand hours of the day

7   and thus the time when generators on the grid must produce the most electricity to meet that

8   demand. The growth in capacity of NEM solar reduces the generation needs of grid-based

9   generators and, as a result, the peak demand served by the grid continues to shift later in the day

10   as seen in Figure 3 above. The CAISO peak demand in 2020 occurred at 3:57 p.m. on August

11   18.[26] My review of the CAISO data establishes that on that day CAISO reported that peak solar

12   production reached 10,531 MW at 12:10 p.m. and declined to 6,435 MW by 4:00 p.m.[27] Thus, at

13   the peak demand time of the day, solar production continued to supply 61% of its mid-day

14   peak.[28]

15   My continued assessment of the data detailing the production of electricity from solar

16   arrays shows that even two hours later at 7 p.m., solar still produced 2,876 MW, equal to 27% of

17   its mid-day peak.[29] My analysis of CAISO's data shows that until peak demand shifts to after

18   dark, new NEM solar arrays will continue to reduce peak demand.

19   My experience in evaluating the effect of shaving peak demand and its relationship to

20   reducing costs shows that reductions in peak demand reduce all ratepayers' costs by reducing the

21   need for additional T&D infrastructure and generation. Limited additional T&D or generation

22   capacity are needed if demand remains relatively flat.

23   **III.   Increasing deployment of battery storage will reduce net peak demand, flatten**
24   **the demand curve, and reduce all customers' costs.**

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[26] Data Source: CAISO, California ISO Peak Load History 1998 through 2020, see
https://www.caiso.com/documents/californiaisopeakloadhistory.pdf.
[27] CAISO, Today's Outlook, Renewables Trend (August, 18, 2020), see
http://www.caiso.com/TodaysOutlook/Pages/supply.html.
[28] (6,435 MW / 10,531 MW = 0.611 = 61%)
[29] CAISO, Today's Outlook, Renewables Trend (August, 18, 2020), (2,876 MW / 10,531 MW = 0.273 =
27%), see http://www.caiso.com/TodaysOutlook/Pages/supply.html.

1   My review and research into the data identifying the use of battery storage with NEM

2   solar arrays shows an increasing pairing of battery storage systems with solar arrays. The data

3   establish that battery paired solar installations increased by a factor of 4 from 2019 to 2020.[30]

4   Additionally, as of March 2021, the second largest BTM solar installer in the country has

5   stopped installing solar arrays without battery storage.[31] Increasing battery deployment is

6   happening despite my identification that the cost of BTM batteries remains 3-4 times higher than

7   battery production costs.

8   I identified that Tesla now sells its residential battery, the Powerwall product, for $10,500

9   bundled with solar.[32] My review of the specifications for the Tesla Powerwall system shows that

10   a Powerwall has a 13.5 kWh capacity.[33] My calculations conclude that the cost per kWh for a

11   Powerwall equals $777/kWh. My review of the battery manufacturing industry and providers

12   also shows that some cell manufacturers, including some Tesla suppliers, have already achieved

13   a cost of $80/kWh at the pack level.[34, 35] My calculations show that an $80/kWh pack cost

14   equates to a $1,080 battery pack cost for the Powerwall.

15   My review and analysis of the battery storage industry and the availability, price and

16   capacity of battery storage available to NEM solar arrays in California establishes that the

17   difference in manufacturing cost and the Tesla Powerwall price indicates how much the

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[30] Bloomberg, California Household Battery Sales to Quadruple in 2020, (February 10, 2020), see
https://about.bnef.com/blog/california-household-battery-sales-to-quadruple-in-2020/.
[31] Electrek, Tesla stops taking orders for Powerwall without solar panels, (March 15, 2021),
https://electrek.co/2021/03/15/tesla-stops-taking-orders-powerwall-without-solar-panels/.
[32] Tesla, solar panel order page, see https://www.tesla.com/energy/design.
[33] Tesla, Powerwall specification sheet, see
https://www.tesla.com/sites/default/files/pdfs/powerwall/Powerwall%202_AC_Datasheet_en_northameri
ca.pdf.
[34] BloombergNEF, Battery Pack Prices Cited Below $100/kWh for the First Time in 2020, While Market
Average Sits at $137/kWh, (December 16, 2020), see https://about.bnef.com/blog/battery-pack-prices-
cited-below-100-kwh-for-the-first-time-in-2020-while-market-average-sits-at-137-kwh/.
[35] Reuters, Exclusive: Tesla's secret batteries aim to rework the math for electric cars and the grid, (May
14, 2020), ("The cost of CATL's cobalt-free lithium iron phosphate battery packs has fallen below $80
per kilowatt-hour, with the cost of the battery cells dropping below $60/kWh, the sources said."),
available at https://www.reuters.com/article/us-autos-tesla-batteries-exclusive/exclusive-teslas-secret-
batteries-aim-to-rework-the-math-for-electric-cars-and-the-grid-idUSKBN22Q1WC.

1   worldwide battery shortage has affected the market.[36] Even Tesla, the largest electric vehicle

2   manufacturer in the world, has stated that it cannot source enough batteries to meet its demand.[37]

3   I conclude that Tesla's cell production and sourcing shortfalls, indicates that most, if not all,

4   other companies are struggling to meet demand as well. This worldwide shortfall in battery

5   production allows the limited battery supply to be sold to consumers at far above production

6   costs. When battery supplies catch up to demand, NEM solar plus storage customers will see

7   battery prices drop to prices close to the level of production costs. In the case of Tesla and its

8   suppliers that will likely be a price drop equal to approximately 70-80% below current prices.

9   My analysis of the costs of an average solar array coupled with the pricing structure

10   currently approved by the Commission in the NEM program shows that, under the current NEM

11   tariff, solar customers can recoup their costs in less than 8 years without the use of a battery.[38]

12   However, assessing the costs and recovery when NEM solar customers have access to a battery

13   that cost 80% less than the current batteries, results in my conclusion that the payback would

14   occur faster because solar customers could avoid electricity use during each on-peak pricing

15   window.

16   My review of the current and projected future prices of commercially available battery

17   storage systems that can be used by solar array customers in California leads to my conclusions

18   that installation of a battery will not only reduce NEM customers' costs, but it will also reduce

19   all customers costs because it will reduce the peak electricity demand, and that in turn reduces

20   the need for more T&D infrastructure.

21   The most expensive time of day for NEM customers to buy electricity from the grid is

22   during the on-peak TOU window of 4:00 - 9:00 p.m. This window also corresponds to the peak

23   grid wholes prices for utilities as well as the peak hours of usage of transmission and distribution

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[36] Washington Post, Biden's plan to rev up the electric car market is complicated by battery supplies, (April 4, 2021), https://www.washingtonpost.com/climate-environment/2021/04/04/electric-cars-batteries/ .

[37] PC Magazine, The Only Thing Stopping Tesla Semi Production Is a Lack of Batteries (January 28, 2021).

[38] NEM 2.0 Lookback Study, (January 21, 2021), Table 5-5, p. 85.

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1   infrastructure.[39] Thus, NEM customers with batteries are incentivized through TOU prices to use

2   electricity from their batteries instead of the grid during 4:00 - 9:00 p.m. which also decreases

3   load and the amount of needed electricity from grid generators during that window. Thus, my

4   conclusion based on analysis of the data is that NEM customers value to the grid will

5   significantly increase as battery attachment rates increase.

6   **IV.   California IOU transmission and distribution costs have increased far beyond**
7   **the national average costs and NEM can help to reduce those costs.**

8   Transmission and distribution cost reductions are two of the main benefits of NEM

9   generation. California's electricity delivery costs exceed the national average and comprise the

10   majority of total customer electricity rates. Thus, the NEM cost reduction benefits are needed.

11   **G. Transmission costs in California are multiple times higher than transmission**
12   **costs in other states, and the IOUs have forced a substantial portion of the**
13   **transmission costs onto residential customers.**

14   The transmission revenue requirement ("TRR") is the revenue collected from utility

15   customers. CAISO's 2021 high voltage TRR equals $13.6152/MWh.[40] The low voltage TRR

16   varies by investor owned utility ("IOU") service territory. The SDG&E low voltage TRR equals

17   $24.4522/MWh.[41] Thus the combined transmission cost equals $38.0674/MWh for customers in

18   SDG&E's territory.[42] SDG&E's transmission fee actually charged to residential customers on

19   SDG&E's default TOU equals $64.44/MWh,[43] 69% higher than the cost of CAISO's high and

20   low voltage transmission rates.[44]

21   Meanwhile SDG&E charges its commercial and industrial customers $33.76/MWh for

22   transmission,[45] a rate below the CAISO's transmission revenue requirement. These numbers

23   show that SDG&E methodically shifts transmission costs on to its residential customers for the

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[39] CAISO, CAISO Energy Markets Price Performance Report, p. 23
http://www.caiso.com/Documents/FinalReport-PricePerformanceAnalysis.pdf
[40] CAISO January 01, 2021 TAC Rates, (January 13, 2021), see
http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveJan01_2021.pdf.
[41] *Ibid.*
[42] $13.3599/MWh + $17.6287/MWh = $38.0674/MWh
[43] SDG&E, SCHEDULE TOU-DR1, residential time of use effective June 1, 2021 (Submitted May 13, 2021), p. 3, see http://regarchive.sdge.com/tm2/pdf/ELEC_ELEC-SCHEDS_TOU-DR1.pdf.
[44] 64.44 / 38.0674 = 2.06
[45] SDG&E, SCHEDULE TOU-A, Effective March 1, 2021 (Submitted Feb 26, 2021), p. 2, see
http://regarchive.sdge.com/tm2/pdf/ELEC_ELEC-SCHEDS_TOU-A.pdf.

1   benefit of its commercial and industrial customers by unevenly distributing the transmission

2   charge among customer classes. For comparison, the average U.S. investor-owned utilities' costs

3   for transmission, distribution, and administrative costs *combined* are less than $40/MWh.[46] The

4   reduction in peak load and total annual generation caused by new NEM generation can eliminate

5   most new transmission spending.

6   **H. Transmission and distribution costs comprise the majority of electric costs**
7   **and any Commission programs like NEM that reduce those costs will reduce**
8   **electricity costs for all customers.**

9   The majority of electricity rate is transmission and distribution ("T&D") charges.

10   SDG&E's default residential time-of-use rate ("TOU") rate includes $64.44/MWh for

11   transmission and $121.8/MWh for distribution.[47] The combined total equals $186.24/MWh for

12   T&D.[48] To understand the percentage of the T&D rates compared to the overall electricity rate,

13   one can use the simplifying approach of comparing total T&D rates to SDG&E's non-TOU

14   residential rate available to non-NEM customers. The non-TOU rate is the Schedule DR tariff.[49]

15   Under that tariff the baseline rate equals $329.24/MWh and the T&D charges are identical to the

16   default TOU tariff.[50] Using those metrics, the T&D rate equals 56% of the total electricity rate.[51]

17   NEM solar generation occurs behind the meter. Much of the generation serves the on-site

18   load immediately. The generation that doesn't serve on-site load immediately goes to serving the

19   load of the NEM customer's immediate neighbors' load. That reduces the peak load and

20   eliminates the need for a percentage of new transmission. It also reduces the distribution grid

21   load by reducing the distance that generated energy must travel to reach the point of use.

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[46] The University Texas at Austin, Trends in Transmission, Distribution, and Administration Costs for U.S. Investor Owned Electric Utilities. (June 1, 2016) Figure 33, at p. 29. Available at https://energy.utexas.edu/sites/default/files/UTAustin_FCe_TDA_2016.pdf.
[47] SDG&E, SCHEDULE TOU-DR1, residential time of use effective June 1, 2021 (Submitted May 13, 2021), p. 3, see http://regarchive.sdge.com/tm2/pdf/ELEC_ELEC-SCHEDS_TOU-DR1.pdf.
[48] $121.8/MWh + $64.44/MWh = $186.24/MWh
[49] SDG&E, SCHEDULE DR, residential service, effective June 1, 2021 (Submitted May 13, 2021), see http://regarchive.sdge.com/tm2/pdf/ELEC_ELEC-SCHEDS_DR.pdf.
[50] *Id,* p. 1.
[51] 186.24 / 329.24 = 0.5656 = 56%

Prepared Testimony of Tyson Siegele on Behalf of PCF

1   As long as the total peak load and the total annual load continue to decrease (as shown in

2   Figures 1-2) then California customers do not need additional transmission or distribution

3   infrastructure except under specific and limited scenarios.

4   **V.   The Legislature and the Commission have instituted electricity use reduction**
5   **programs that incentivize NEM generation and reducing the benefits of NEM**
6   **would undercut Legislative intent.**

7   If the Commission were to eliminate or reduce the NEM program benefits, it would

8   reduce the number of ways that customers can avoid the significant electricity usage penalties

9   that the Commission has allowed the utilities to institute.

10   In SDG&E residential tariffs the "Total Rate Adjustment Component" ("TRAC") adds a

11   per kWh charge to customers' bills that use over 130% of the electric baseline amount.[52] The

12   TRAC charge equals $112.93/MWh in the winter and $29.88/MWh in the summer.

13   In addition to the TRAC, customers are subject to a 130% baseline electricity use adjustment

14   ("Baseline Adjustment"). Customers that use over 130% of baseline electricity are charged

15   $85.31/MWh more than customers with usage below 130% of baseline usage.[53] During winter

16   months, the combined TRAC and Baseline Adjustment equals $198.24/MWh. Those charges

17   amount to a penalty for using electricity. The U.S. Energy Information administration lists the

18   average cost of electricity in the U.S. at $105.4/MWh.[54] Thus, the electricity usage "penalty" in

19   SDG&E service territory is almost double the average cost of electricity nationwide.

20   TRAC and Baseline Adjustment incentivize customers to reduce or eliminate their

21   electricity purchased from the grid in any way they can. The main ways to decrease electricity

22   use have been efficiency or self-generation of electricity through BTM solar. Figures 1-3 above

23   show that the TRAC and Baseline Adjustment rate design mechanisms are working as intended.

24   Electricity customers are reducing their electricity consumption from the utilities through

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[52] SDG&E, SCHEDULE TOU-DR1, residential time of use effective March 1, 2021 (Feb 26, 2021), p. 3,
see http://regarchive.sdge.com/tm2/pdf/ELEC_ELEC-SCHEDS_TOU-DR1.pdf.
[53] *Id,* p. 2.
[54] U.S. Energy Information Administration, State Electricity Profiles for 2019 (November 2, 2020), see
https://www.eia.gov/electricity/state/.

1   avoided electricity use, efficiency, or BTM electricity production. The total electricity demand

2   has decreased by 6.3%.[55]

3   The Lookback 2.0 Study shows that customers who install solar and switch to NEM

4   increase their electricity usage by 28% in SDG&E service territory.[56] If the Commission were to

5   reduce NEM benefits it would reduce customers' incentive to switch to cleaner fuels undermine

6   California's clean energy goals.

7   **VI.   The Commission should adopt the PCF NEM proposals.**

8   PCF provided the Commission with five NEM proposals. Two of the proposals were

9   NEM tariff proposals and three were policy proposals. The Commission should adopt all five

10   proposals. The following sections will address PCF proposals A and E, PCF's tariff proposals.

11   **I. PCF Proposal A: NEM 3.0 Community Storage, provides an up-front direct**
12   **payment from NEM customers to all customers that optimizes grid**
13   **operations and continually reduces ratepayer costs.**

14   PCF's Proposal A ("PCF-A") that I wrote recommended the Commission retain the NEM

15   2.0 tariff and institute a one-time fee on NEM 3.0 systems at interconnection equal to 20% of the

16   total NEM system cost. In its evaluation of PCF-A, E3 stated that:

17   PCF proposal A suggested a methodology for calculating the benefits of
18   community storage. This is outside the scope of the customer bill model. As
19   a simplification, it was assumed that the benefits of community storage are
20   equal to their costs. Thus, the 20% interconnection fee on new systems is
21   treated as a direct nonparticipant benefit.[57]

22

23   I disagree with E3's assessment of the benefits of PCF's proposal. First, the dollar value

24   benefit would greatly exceed the 20% interconnection fee because the 20% fee would be

25   transferred to the local government or local CCA to be used for community storage. For the

26   purpose of the rest of the discussion on PCF-A PCF will use the assumption of the fee being

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[55] California Energy Commission ("CEC"), California Electrical Energy Generation, (Data as of June 2021), (1 – (291,046 GWh / 272,576 GWh) = 0.0635 = 6.3%).
[56] NEM 2.0 Lookback Study, (January 21, 2021), Table 1-1, p. 4.
[57] R.20-08-020, Cost-effectiveness of NEM Successor Rate Proposals under Rulemaking 20-08-020, (June 15, 2021), p. 31.

1   transferred to a CCA. Because the 20% interconnection fee accrues as cash, the CCA does not

2   have to take out a loan to pay for the battery.

3   When IOUs purchase assets, they borrow the money and ratepayers reimburse the cost of

4   the asset plus the interest cost plus a return on investment when the IOU owns the asset. E3 can

5   do a straight-forward calculation to determine both the increased value to nonparticipants from

6   not having to pay for interest as well as avoiding paying an IOU's rate of return. Applying a rate

7   of return assumption to determine the benefit of future community battery storage facilities

8   makes sense because the Commission has been allowing IOUs to structure storage purchases as

9   utility-owned.[58]

10   Finally, it is well known that IOUs' pay significantly above market rate for utility-owned

11   assets. This makes strategic sense for IOUs because the more an IOU pays for an asset, the

12   greater the income for its shareholders. A recent example of above market purchases of

13   equipment is SDG&E's purchase of electric vehicle charging infrastructure. SDG&E paid

14    $21,815/port for its charging infrastructure in its Power Your Drive ("PYD") program.[59]

15   Comparatively, CCAs pay market rate for electric vehicle charging infrastructure. MCE averages

16    $4,708/port for its EV infrastructure.[60] Thus, SDG&E pays 4.6 times the amount for electric

17   vehicle infrastructure that CCAs pay.[61]

18   While PCF is not asking for E3 to assume that the IOUs will pay 4.6 times more for

19   battery storage than CCAs will, PCF believes a reasonable assumption would be to assume that

20   the IOUs will overpay for battery storage by at least 2.5 to 3 times market rates. This makes the

21   assumption that the IOUs will be more consciences with ratepayer dollars than the IOUs' past

22   performance indicates. However, whatever multiple E3 assigns, PCF is not aware of any

23   historical evidence that supports E3's "simplifying assumption" to apply a multiple of one.

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[58] PG&E, PG&E, Tesla Break Ground on Landmark Battery Energy Storage System, (July, 29, 2020), see https://www.pge.com/en/about/newsroom/newsdetails/index.page?title=20200729_pge_tesla_break_ground_on_landmark_battery_energy_storage_system.
[59] A.19-10-012, Table 3, p. 39.
[60] R.18-12-006, Comments Of The Joint CCAs On Sections 6, 11.1, And 11.2 Of The Draft Transportation Electrification Framework, (August 21, 2020), p. 10.
[61] $21,815/port /$4,708/port = 4.633

Prepared Testimony of Tyson Siegele on Behalf of PCF

1   In summary, I request that E3 revise its assumptions for its evaluation of PCF-A to: (1)

2   assume IOUs will purchase batteries at 2.5 times CCA purchase prices, (2) include an adder on

3   the IOU side of the ledger for the interest payments for IOU purchases, and (3) include the IOU

4   rate of return. These reasonable adjustments will result in significant differences in the cost-

5   effectiveness findings for PCF-A.

6   **J. PCF proposal E: "NEM 3.0 Time of Use Rates" revises IOU time of use rates**
7   **for all customers and will result in equitable NEM resource valuation.**

8   PCF Proposal E ("PCF-E") that I wrote revises TOU rates for all customers to align retail

9   rates and wholesale rates. The proposal would also apply TOU rates as year-round instead of the

10   de-facto 5-month TOU rates currently adopted.

11   In its evaluation of PCF-E, E3 stated that PCF's proposal was difficult to evaluate, and

12   "[a]s a result, the proposal was not modeled."[62] PCF requests that the Commission direct E3 to

13   model the proposal which PCF believes would likely result in Total Resource Cost test result

14   above 1. E3 modeling should occur even if the modeling employs simplifying assumptions. If the

15   TRC test returns a result of above 1, then the proposal would require some adjustments to

16   increase benefits to NEM customers prior to final adoption. However, the proposal would

17   provide a good base proposal for a NEM 3.0 tariff and should be combined with PCF-A to

18   construct the NEM 3.0 tariff.

19   **VII.   Conclusion**

20   For the reasons stated above, I conclude that NEM solar arrays provide a monetary

21   benefit to the energy system and to all customers. Further, the benefits to the energy system

22   derived from NEM solar arrays will increase as battery prices decrease because more batteries

23   will be installed with NEM solar arrays. However, even without batteries NEM solar arrays

24   continue to decrease the cost of all customers' electricity because NEM solar arrays reduce the

25   total electricity demand, reduce the peak electricity demand, and shift the peak demand later in

26   the day. As noted in Section II (A), the Avoided Cost Calculator should be updated to better

27   evaluate the benefits of NEM solar so that the Commission has an accurate tool with which to

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[62] R.20-08-020, Cost-effectiveness of NEM Successor Rate Proposals under Rulemaking 20-08-020,
(June 15, 2021), p. 31.

1   assess NEM and updates to the NEM tariff. Finally, as noted in Section VI, PCF's proposals for

2   NEM tariff updates should be fully evaluated by the Commission's consultant instead of

3   discarded as difficult to evaluate. Nothing in the NEM scoping memo or order instituting

4   rulemaking restricts NEM tariff updates to only easily evaluated changes.

5

6   Respectfully submitted,

7   /s/ Tyson Siegele_____
8
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