BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Continue Implementation and Administration of California Renewables Portfolio Standard Program	Rulemaking 11-05-005 (Filed May 5, 2011)

REPLY COMMENTS OF THE SOLAR ENERGY INDUSTRIES ASSOCIATION ON THE SECOND ASSIGNED COMMISSIONER'S RULING ISSUING PROCUREMENT REFORM PROPOSALS

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In accordance with the *Second Assigned Commissioner's Ruling Issuing Procurement Reform Proposals and Establishing a Schedule for Comments on Proposals* ("*2nd ACR*") issued on October 5, 2012, and the November 5, 2012 email notification from Administrative Law Judge Simon, the Solar Energy Industries Association (SEIA)[1] replies to comments filed in the above-captioned proceeding on November 20, 2012.

I. INTRODUCTION

SEIA represents the interests of solar energy companies active in both demand-side programs designed for small-scale projects in California as well as wholesale supply-side Renewable Portfolio Standard (RPS) eligible projects. SEIA is filing these reply comments due to a concern that the opening comments of a number of parties dramatically exaggerate the future impact that increased penetrations of solar photovoltaic (PV) resources will have on the profile of loads on California's electricity grid and on the value of PV resources. In addition, SEIA believes, regardless of merit, that the complaints raised by parties about the wholesale capacity

[1] The comments contained in this filing represent the position of SEIA as an organization, but not necessarily the views of any particular member with respect to any issue.

value of solar should be dealt with in the Resource Adequacy (RA) proceeding before the Commission, not in this proceeding. Finally, SEIA presents its views on a recent report from the Lawrence Berkeley National Lab (LBNL) which a number of parties cite in their opening comments.

II. REPLY COMMENTS

A. Calpine and CalWEA Overstate the Effect of Wholesale Solar PV Integration.

In its comments, Calpine Corporation (Calpine) notes that "the investor-owned utilities currently calculate 'capacity value' based on static estimates of capacity that reflect a resource's availability during a set of traditional peak hours."[2] Citing studies on the effect of increased solar PV penetration, Calpine goes on to argue that the approach used by California's investor-owned utilities (IOUs) to calculate capacity value is flawed because "it does not account for shifts in system peaks to the early evening hours that are likely to occur with increased penetrations of certain types of intermittent resources, such as solar photovoltaic (PV) resources." The California Wind Energy Association (CalWEA) makes similar claims in asking that the Commission re-visit the time-of-delivery (TOD) factors used in RPS procurement.[3] SEIA rejects Calpine's and CalWEA's assertions as to the likelihood of a shift in system peak, because the demand-side penetration of solar PV required to reach this result is far beyond present forecasts and, thus, is speculative.

SEIA first observes that it is *only* demand-side, behind-the-meter solar that will affect the profile of loads on the grid and that any shift in peak hours will occur independent of wholesale solar PV. The addition of more customer-sited solar PV systems can affect the load which

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2 *See* Calpine Corporation, November 20, 2012 comments at p.1.

3 *See* CalWEA November 20, 2013 comments, at pp. 23-24.

appears on the grid because the PV system will serve a significant portion of the customer's load at times of peak system demand. In contrast, wholesale solar PV projects simply increase available system capacity during peak periods but do not result in a change to the profile of loads which must be served on the grid. In other words, the IOUs are required to serve load net of demand-side solar, not load net of *all* solar. This is a crucial distinction to be made, as many of the projections for shifting hours of peak demand erroneously utilize all possible solar additions, both wholesale and retail/behind-the-meter.

For example, Figure 1 in Calpine's comments incorrectly depicts load net of all solar rather than load net of demand-side solar.[4] This analysis results in an overstated shift in the hours of peak loads. To articulate this point, it is helpful to consider that significant new off-peak, wholesale wind resources also are being added between now and 2020. If one were to analyze these wind resources in the same manner as Figure 1 has for solar PV (i.e., wind output netted against load), then the hourly profile of net demand would be even peakier than today. Such analysis would suggest that the value of solar should be increased; yet, Calpine and CalWEA would likely argue this should not be the case. Accordingly, it is no more correct to base capacity valuation or TOD factors on load net of wholesale solar as it is to base these values on load net of wholesale wind.

While wholesale RPS solar PV projects do not change the hourly profile of load on the grid, future wholesale solar installations could reduce the market value of power during afternoon hours. However, this is purely speculative at this point and will depend on the ultimate mix of RPS projects that are successfully developed and brought on-line. For example, to date most of the RPS projects that have come on-line have been off-peak wind, as shown in

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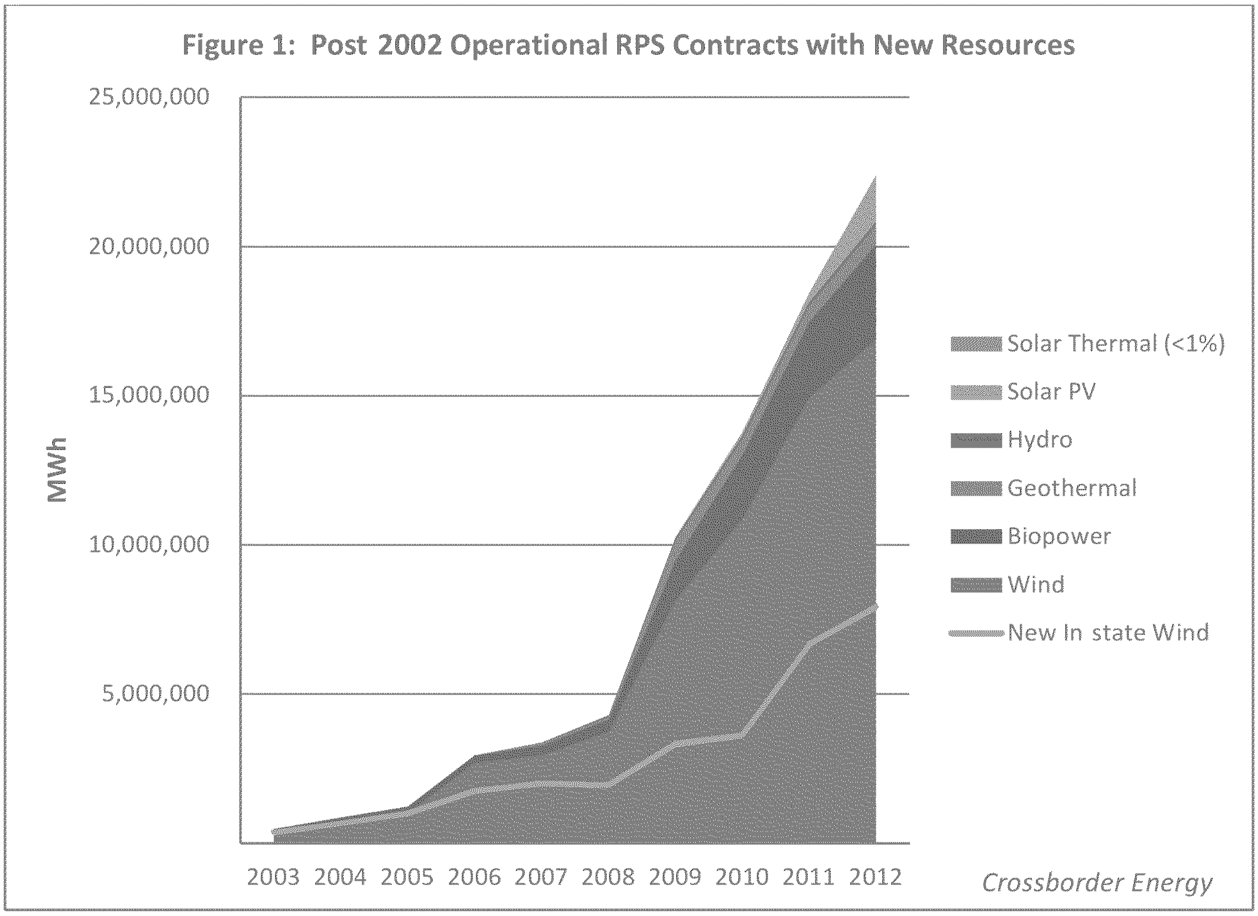
4 *Ibid.* at p. 3.

Figure 1[5] which presents the mix of RPS projects that have come on-line over the last decade. This trend may continue as many large-scale wholesale solar projects face serious siting challenges. If more off-peak wind comes on-line than on-peak solar, the value of off-peak energy may be reduced, which could create wholesale prices that are peakier than today. This indicates that the apparent alarm about the effects of solar PV on load shapes is misplaced and uncertain.



5 The sources for this figure are the IOUs' March 2012 RPS Compliance Reports, the IOUs' August 2012 Provisional 20% RPS Compliance Reports (for 2003-2010 data), the CPUC's Large IOU RPS Data 2003-2011 (October 2012), and the CEC's November 2011 Publicly-Owned Utility (POU) Database. The figure reflects post-2002 contracts, excluding pre-existing resources with new (post-2002) RPS contracts, and includes both in-state and out-of-state RPS contracts. Links to these sources are provided in footnote 16.

In addition, regardless of the future resource mix, as California's population shifts from the cooler coastal areas to hotter inland areas and as the climate in California warms generally, trends that are widely acknowledged, demand for electricity also is expected to become peakier. This trend will tend to offset any reduction in wholesale energy prices or wholesale capacity value from the integration of solar projects. For example, as load shifts to hotter climate zones and as the climate warms generally, the ratio of average electricity consumption to peak consumption (also known as the "load factor") will decrease. The most recent California Energy Commission (CEC) electricity consumption and peak demand projections for 2022 show that the state's overall electric load factor is anticipated to drop from 56% in 2000 to 51% in 2022.[6] This change in load factor from 2000 to 2022 is equivalent to an increase of 5,600 MW in the state's non-coincident peak demand relative to what peak demand would be at a 55% load factor. Such an increase in peak demand would require roughly 11 GW of PV capacity to offset (compared to 1.3 GW of PV installed today), assuming that 50% of installed PV capacity is available at the time of system peak. In sum, demographic and climate trends are making California's electric demand peakier, and it will be difficult for demand-side solar PV installations to even stop this trend, much less to reverse it.

B. Penetration of Demand-Side Solar PV Remains Relatively Low.

Calpine's Figure 1 shows that there is only a noticeable shift in peak loads with solar PV penetrations of 10% or more. However, as previously discussed, the shift in peak loads will only occur from demand-side solar PV and these customer-sited systems are nowhere near a 10% market penetration.

Combined demand-side solar PV capacity from the California Solar Initiative (CSI), the Emerging Renewables Program (ERP) and the Self Generation Incentive Program (SGIP) is

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6 *See* the CEC's *2012 Integrated Energy Report Update*, at Table 1, available at http://www.energy.ca.gov/2012publications/CEC-100-2012-001/CEC-100-2012-001-LCD.pdf .

currently at approximately 1,400 MW- or about 2,200 GWh per year using an 18% capacity factor.[7] According to the CEC's current demand forecast, statewide retail loads in 2020 are expected to be 310,210 GWh,[8] which means that current demand-side PV penetration represents 0.7% of 2020 load. Assuming the present statewide cap on net energy metering of 5% non-coincident peak load is met, IOU PV capacity in 2020 would be about 5,300 MW,[9] or 8,400 GWh of annual generation at an 18% capacity factor. Even this level of demand-side PV would represent just a 4% market penetration in 2020 relative to expected 2020 IOU loads of 212,000 GWh, an amount which does not appear likely to produce a major shift in peak demand. This is particularly true given the trend toward higher peak consumption of electricity in California, noted above. As such, any concerns about the effect of solar PV on peak demand are unfounded at this point in time.

C. Reductions to Solar PV's Capacity Value Are Premature and Unnecessary.

Calpine asserts that "…the methodology used to calculate capacity value must be revised to account for expected changes in system conditions and the associated diminution in the capacity value of certain types of resources, such as solar PV, as a result of such shifts in peak demand."[10] Contrary to Calpine's insinuation, SEIA believes it would be far more prudent to wait to see if a 10% penetration of demand-side solar PV ever materializes before PV's capacity value is reduced. Devaluing solar PV prior to achieving such penetration levels would be presumptuous and restrictive – and appears to be a thinly-disguised effort on the part of

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7 *See* http://www.californiasolarstatistics.ca.gov/.

8 *See* "California Energy *Demand* 2012-2022 Final Forecast Volume 1", at Table ES-1, available at http://www.energy.ca.gov/2012_energypolicy/documents/index.html#EnergyDemandForecast.

9 Based on 5% of non-*coincident* peak demands of 48,229 MW for PG&E, 44,775 MW for SCE, and 12,237 MW for SDG&E.

10 *Ibid.* at p. 6.

competing generators to ensure that solar never achieves a 10% market penetration. As noted above, solar is not even at a 1% penetration today. Ultimately, however, if the Commission determines - within this proceeding or any other - that a shift in the system peak warrants a re-evaluation of the capacity value of solar PV resources, SEIA urges the Commission to also consider the benefits associated with such a change. It is certainly worth noting that the new evening peak demand will be significantly lower than the peak demand today, and the benefits of such a paradigm shift should be determined and assigned solely to the solar resources that cause the shift, up to the penetration level that the Commission has assumed for the expected market penetration of solar.

D. The LBNL Study Shows the High Current Value of Solar PV Resources.

Calpine's comments and those of Brightsource Energy (BSE) focus on a recent study from the Lawrence Berkeley National Lab (LBNL) which examined how the value of different renewable technologies may change as a function of increases in the penetration of each technology.[11] BSE's comments argue at length that the LBNL study proves that solar thermal projects with storage will provide significantly higher value than solar PV or wind resources, particularly at higher penetrations of solar thermal resources.[12]

SEIA strongly disagrees with the Calpine and BSE readings of the LBNL Study. A more careful reading of LBNL's work leads to the following conclusions:

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[11] Mills, A., and R. Wiser, "Changes in the Economic Value of Variable Generation at High Penetration Levels: Pilot Case Study of California," Lawrence Berkeley National Laboratory, LBNL-5445E (June 2012), available at http://eetd.lbl.gov/ea/emp/reports/lbnl-5445e.pdf, hereafter "the LBNL Report."

[12] BSE opening comments, at 25. For example, BSE says that "concentrated solar power with 6 hours of storage offers a $19/MWh benefit over solar PV at 5% penetration of solar energy, and a $35/MWh benefit by 10% penetration — roughly the penetration levels currently being planned towards in California under the 33% RPS."

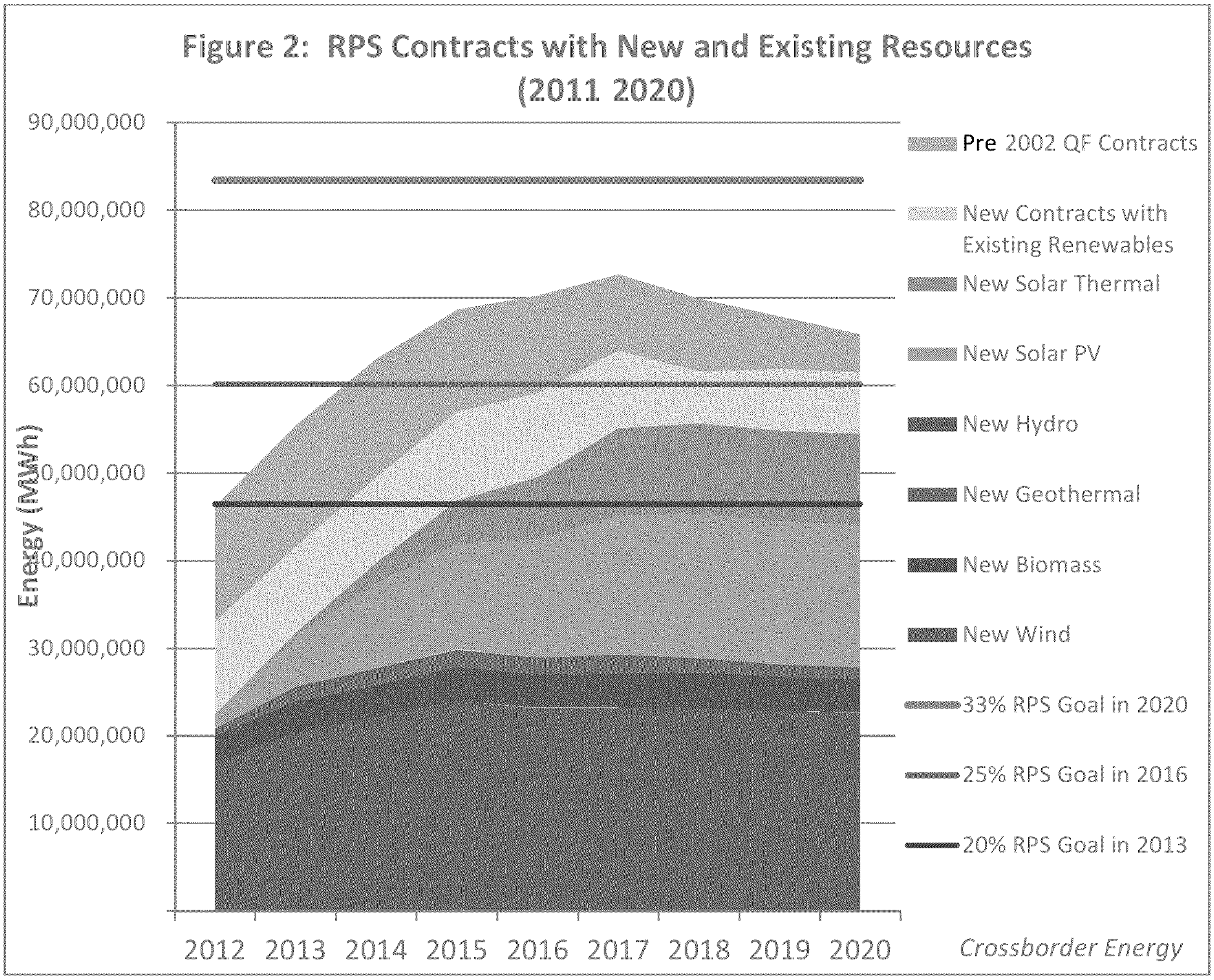
- **What is valuable at high solar penetrations is storage.** The LBNL study shows that solar thermal with storage retains much of its value at higher penetrations as a result of storage, not of solar thermal technology. Table ES-1 and Figure 10 of the LBNL Report show that, without storage, the value of solar thermal is less than solar PV or wind at all penetration levels over 5%. There are many possible ways to add storage to an electric grid, of which adding storage to a solar thermal unit is just one way, and probably not the least expensive way. The LBNL researchers explicitly acknowledge this, and plan further studies of how "price responsive demand, more flexible thermal generation, or lower cost bulk storage" might increase the value of systems with high penetrations of solar and wind resources.[13]
- **The current mix of RPS resources may be close to optimal.** SEIA observes that LBNL's results for a 10% penetration each of solar PV, solar thermal, and wind resources show very similar values for each of these technologies, with solar PV slightly higher in value than wind or solar thermal.[14] Another key finding is that solar resources have higher values than wind at penetrations lower than 10%.[15] California's current mix of contracts for the 33% RPS would result in relatively balanced amounts of these three technologies by 2020, at roughly a 10% penetration for each, as shown in **Figure 2** below, which illustrates the

13 LBNL Report, at 8.

14 *Ibid.,* at Table ES-1 and Figure 10.

15 *Ibid.,* at 71, also Table ES-1 and Figure 10.

present mix of RPS contracts.[16] These results suggest that California's RPS is on the right course for an optimal mix of resources, and that significant changes to the least-cost, best-fit methodology or the RPS procurement process are not warranted at this time.



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16 Figure 2 shows the present mix of RPS contracts signed by the California investor-owned (IOU) and publicly-owned (POU) utilities. The IOU data is from the December 2012 update to the CPUC staff's RPS project data base (http://www.cpuc.ca.gov/NR/rdonlyres/EAAA73DA-C2DB-40CB-A0F4-B193165083D5/0/RPS_Project_Status_Table_2012_Dec.xls) and the March 2012 IOU RPS compliance reports (http://www.cpuc.ca.gov/NR/rdonlyres/01BC5E40-4247-42BC-9032-D699AA09C145/0/March2012RPSProcurementProgressReports.zip). The POU data is from the CEC's November 2011 POU contract spreadsheet: http://www.energy.ca.gov/2008publications/CEC-300-2008-005/CEC-300-2008-005_rev.xlsx posted at http://www.energy.ca.gov/2008publications/CEC-300-2008-005/index.html .

- **Further reviews of the RPS portfolio are warranted.** The LBNL Report provides an important methodology for examining the relative value of different renewable technologies. However, the work has its limitations, as the LBNL researchers candidly admit. For example, the study examines the value of different technologies one at a time, assuming that the technology being valued is the only one added to the system. California's RPS portfolio clearly will have a diverse mix of technologies, and LBNL plans further study of combinations of intermittent renewable technologies.[17] Finally, the LBNL work does not consider the cost side of the equation – it does not examine the relative costs of renewable technologies or of different forms of storage.[18] Even if Resource A has a higher value than Resource B, the higher costs of Resource A may mean that the less-expensive, lower-valued Resource B should be selected. And if the higher value of Resource A is due to its combination with storage, there may be a lower-cost storage resource elsewhere on the grid which would be more economical to use in combination with Resource B. The LBNL Report leaves such important trade-offs for further study.[19]

III. CONCLUSION

SEIA appreciates the opportunity to comment at this time and urges the Commission to retain any discussion of the wholesale capacity value of solar PV, or any other resource type, within the Resource Adequacy proceeding.

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[17] LBNL Report, at 3 and 8.

[18] *Ibid.*

[19] *Ibid., at* 71.

Respectfully submitted,

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Date: December 12, 2012

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