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First Solar Comments on Draft 2016 IEPR Update

Additional submitted attachment is included below.

December 29, 2016

Karen Douglas, Commissioner
California Energy Commission
Dockets Office, MS-4
Docket No. 16-IEPR-01
1516 Ninth Street
Sacramento, CA 95814-5512

RE: *Response to Comments on the Draft 2016 Integrated Energy Policy Report Update*

Dear Commissioner Douglas,

First Solar respectfully submits the following comments on the Draft 2016 Integrated Energy Policy Report (IEPR) Update, specifically responding to comments submitted by SolarCity on November 7, 2016.[1]

Summary of Comments

Planning for, developing and running a clean, highly-reliable and cost-effective electric grid is a complex task. For many decades, under California's legislative and policy leadership, this state has challenged the industry to find innovative ways to achieve these important co-equal goals. The state's energy agencies are actively engaging stakeholders in dozens of proceedings designed to grapple with market and procurement design and technological requirements required to reliably manage our grid, and acknowledging these efforts and the challenges is an important part of the public dialogue.

[1] SolarCity Comments – 2016 Draft IEPR Update. Nov. 7, 2016. http://docketpublic.energy.ca.gov/PublicDocuments/16-IEPR-01/TN214403_20161107T153532_Damon_Franz_Comments_SCTY_comments__2016_Draft_IEPR_Update.pdf.

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First Solar fully supports the statements in the Draft 2016 IEPR Update that acknowledge the complexity of planning for and developing a reliable, highly distributed electric grid. The statements are accurate, important for furthering the analytical and modeling efforts needed to understand the complex interchange between the distribution and high-voltage grids, and are consistent with recent perspectives and positions expressed by staff at the California Public Utilities Commission (CPUC) and the California Independent System Operator (CAISO).

Background on First Solar

First Solar designs, manufactures and sells PV solar modules with an advanced thin-film semiconductor technology. First Solar is the world's largest thin-film PV solar module manufacturer, with net sales anticipated to be at least $3.8 billion in 2016. The company also develops, designs and constructs PV solar power systems throughout the world, using its vertically-integrated structure across the supply chain to deliver meaningful PV solar energy solutions to a variety of energy problems worldwide. First Solar is headquartered in the United States, has been in business for ten years, and its stock trades on the NASDAQ. The company is currently the only pure-play renewable energy company in the S&P 500 Index.

About one-third of the installed utility-scale solar PV capacity serving California today comes from projects developed by First Solar; electric supply from our projects displaces over 2 million metric tons of CO_2 annually in California. The company has constructed over twenty generating facilities that operate to serve the state, including two of the largest solar facilities in the world, the 550 MW Desert Sunlight project and the 550 MW Topaz project, both located in California.

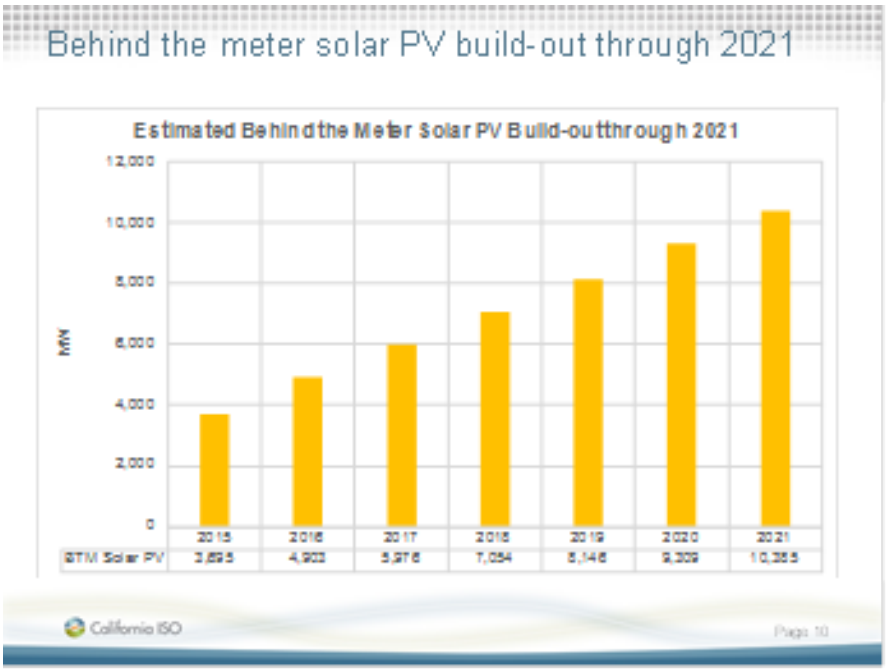
Impact of Solar PV Systems on the Duck Curve

SolarCity is critical of statements in the Draft 2016 IEPR Update related to the impact of distributed solar generation on the state's electric grid, and suggests that certain statements be

removed.[3] SolarCity's criticism is not valid. In its critique, SolarCity relies on a consultant report that draws conclusions uncorroborated by other technical studies. The consultant report ignores that the CAISO's "duck curve" includes in its calculation not just utility-scale solar projects, but also rooftop solar.[4] From a simple physics perspective, the electrical grid does not care whether the electrons come from a rooftop solar or from a utility-scale solar plant. The net load is determined by subtracting all solar generation from the actual load. If all solar energy in California was produced only by distributed solar, it would result in the same net effect. There is no way that the report could accurately distinguish between utility-scale and distributed solar to draw this conclusion about distinct effects on the grid.

The Draft 2016 IEPR Update properly acknowledges that there may be tools and models that could be developed to help the growing distributed generation resources participate effectively in managing the grid, but those tools and models do not yet exist. In the meantime, the state has seen a significant increase in rooftop solar PV installation. Currently, there are more than 5,000 MW of rooftop solar PV, and that number is expected to exceed 9,000 MW by 2020 (Figure 1).[5]

[3] SolarCity Comments p.2, quoting Draft 2016 IEPR Update at p.67.
[4] California ISO, "Fast Facts: What the duck curve tells us about managing a green grid." Nov. 2016. https://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf.
[5] California ISO, "Draft Flexible Capacity Needs Assessment for 2017." Presented by Clyde Loutan and Karl Meeusen. April 18, 2016. http://www.caiso.com/Documents/Presentation-2017FlexibilityCapacityNeedsAssessment.pdf.



(Figure 1)

Rooftop solar PV does not count towards RPS, but does have an impact on grid operations, especially during the ramping hours in the morning and evening. High levels of solar generation – from both the distribution and utility-scale resources - during mid-day hours are already causing over-supply, especially on light load days when renewable production is high. Sharp changes in the real-time ramping needs are also happening during afternoon-evening hours. This is especially evident during the spring and fall months when loads are relatively light and hourly penetrations of renewable generation are high.

The CPUC staff have recognized these impacts, and recently stated in a white paper that "dynamic rates, which involve smaller time intervals, and properly grid-aligned time-of-use periods can shift peak load demand, incentivize energy consumption during low-demand periods

to minimize over-generation, and reduce the need for flexible capacity resources."[6] The CPUC staff drew their conclusion from CAISO data that revealed that accelerated growth in solar generation has already resulted in traditionally accepted time-of-use periods becoming increasingly misaligned with energy demand and cost.

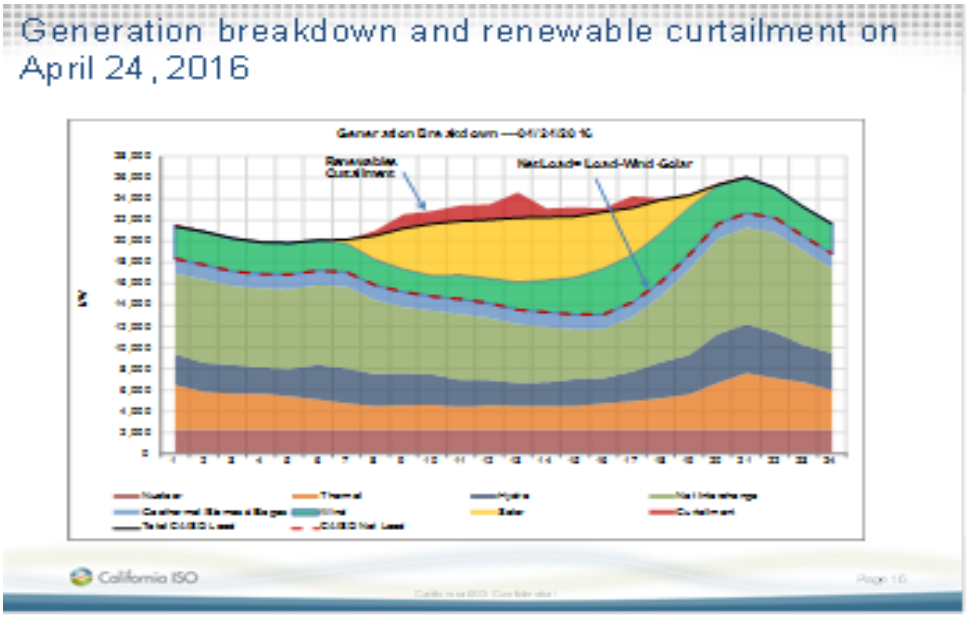
Continuous growth of the rooftop PV systems will continue to escalate California's problem of the supply-demand balance on its electricity grid, without better tools and incentives. The CAISO has actively been working on improvements to manage the utility-scale solar generation, and has developed both technological and pricing mechanism to assist with running the grid reliably. The same will need to be developed for distribution resources that have an equal effect on the grid.

Utility-Scale Solar and Grid Benefits

SolarCity's comments also assert that rooftop solar generation does not rely on support from the electric grid in the form of increased operating reserves and ancillary resources, simply because the method for accounting for the solar generation is to subtract from the load. This ignores the basic physics and engineering of the grid. Not only does the distribution grid rely on support from the high-voltage transmission grid, but the only solar resources that are currently managed to help maintain grid reliability are the utility-scale solar generation resources. For example, as the risk of over-supply increased with low net loads, significant levels of renewables curtailment took place during certain days of the spring of 2016 (Figure 2). This mitigation was done by utilizing utility-scale generation. The CAISO can ask utility-scale project owners for their project curtailment to maintain supply-demand balance of the system, but cannot control the

[6] California Public Utilities Commission, "Beyond 33% Renewables: Grid Integration Policy for a Low-Carbon Future." Nov. 2015. www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=9141.

rooftop generator in the same manner. Thus, the curtailment of utility-scale solar PV projects assists with grid reliability, helping support the inflexible effect of thousands of megawatts of rooftop solar generation. Because utility-scale solar generation can be ramped up and down, curtailment can become a helpful resource to relieve over-supply, provide frequency regulation and ramping services.



(Figure 2)

Furthermore, utility-scale solar PV projects also can provide an ancillary service for the electrical grid support, where rooftop solar PV cannot. Utility-scale solar PV projects can provide voltage control and regulation, voltage and frequency-fault ride-through, reactive and real power control, and frequency response. For example, in a recent presentation to its Board, the CAISO reported on a study of how a 300 MW solar plant can provide essential reliability services, noting that utility-scale solar matches or exceeds the capabilities of conventional generation for regulation-

up accuracy and responding to high-frequency events.[7] In 2015, the NERC task force on Essential Reliability Services published a report explaining important directional measures to help the energy sector understand and prepare for the increased deployment of variable renewable generation. According to this report, to maintain an adequate level of reliability through this transition, generation resources (including solar and wind) need to provide sufficient voltage control, frequency support, and ramping capability—essential components of a reliable bulk power system.[8] These same tools need to be developed for the distribution grid, as the Draft 2016 IEPR Update has acknowledged, but that effort is in the earliest stages.

Conclusion

First Solar urges the Commission to retain the recognition in its Draft 2016 IEPR Update that work to integrate the distribution and high-voltage grid systems is just beginning, and that there are many complex challenges to effectively managing the two systems in tandem and to designing the right technological and financial mechanism that will allow rooftop solar to be controlled in a manner that supports grid reliability.

Respectfully submitted,

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Director-Global Grid Integration, First Solar

[7] California ISO, "Briefing on using renewables to integrate renewables." Presented by Clyde Loutan. Dec. 14-15, 2016. http://www.caiso.com/Documents/Briefing_UsingRenewables_IncorporateRenewables-Presentation-Dec2016.pdf.
[8] North American Electric Reliability Corp, "Essential Reliability Services Task Force Measures Framework Report." Nov. 2015. http://www.nerc.com/comm/Other/essntlrlbltysrvcstskfrcDL/ERSTF%20Framework%20Report%20-%20Final.pdf.