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)

COMMENTS OF BRIGHTSOURCE ENERGY, INC. ON THE APRIL 5th ASSIGNED COMMISSIONER'S RULING AND THE 2012 RENEWABLES PORTFOLIO STANDARD PROCUREMENT PLANS

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Pursuant to the schedule set forth in Attachment A of the April 5th Ruling of Assigned Commissioner Ferron Identifying Issues and Schedule of Review for 2012 Renewables Portfolio Standard Procurement Plans Pursuant to Public Utilities Code Sections 399.11 et seq. and Requesting Comments on New Proposals (the "ACR"), BrightSource Energy, Inc. ("BrightSource") respectfully submits these comments on the integration issues addressed by the ACR, and in 2012 Renewables Portfolio Standard ("RPS") Procurement Plans and accompanying filings.

I. Introduction

It is increasingly clear that integration costs and burdens are likely to be significant as California approaches the 33% Renewables Portfolio Standard ("RPS") goal, as demonstrated by multiple studies. It is equally clear that the

nature of the portfolios, and their diversity of resources and locations, will substantially impact the extent of those costs and burdens. It follows that to ensure a least-cost, reliable energy supply, procurement of renewables and other resources must be guided to minimize integration issues.

BrightSource supports the proposal to extend the least-cost, best fit ("LCBF") valuation of renewable resources to include integration requirements and resulting costs, as well as sales of ancillary services. We concur with Pacific Gas & Electric Company ("PG&E") and Southern California Edison Company ("SCE") in supporting consideration of integration issues in this renewables procurement cycle, as well as with the Center for Energy Efficiency and Renewable Technologies ("CEERT") and the Large-scale Solar Association ("LSA") in recommending focused workshops on these issues. Focused workshops would provide an appropriate public process on how procurement should take integration issues into account, could build on the growing literature on this subject to identify areas and approaches for which there is sufficient basis for taking action now, and could be scheduled promptly, avoiding any delay to the renewables procurement process.

II. Discussion

The ACR proposes that integration costs be considered as one of several variables to be standardized as part of the RPS procurement process. ACR at pp. 16-17. PG&E and SCE, in their 2012 RPS Plans, call for inclusion of integration

cost adders in this renewables procurement cycle. BrightSource generally agrees with SCE that appropriate consideration of integration issues must be "flexible," in order to consider multiple factors, many of which may not yet be ready to be fully standardized. Southern California Edison Company's (U 338-E) Comments on Assigned Commissioner's April 5, 2012 Ruling Requesting Comments on New Proposals Related to Renewables Portfolio Standard Procurement Plans, at pp. 2-3 ("SCE Comments"). At the same time, the Commission was fully justified in concluding, in D. 11-04-030, that "an adder should only be used if it is developed in a public forum and, in addition, with Commission supervision." D.11-04-030, at p. 23. A limited number of focused workshops on this topic are therefore appropriate, as is adoption of uniform guidelines that are flexible in their application to the specific portfolio needs of each CPUC-jurisdictional, RPS-obligated entity.

A. The Importance of Public Input to Integration Factors & Clear, Transparent Market Signals

To attain true least-cost, balanced portfolios, all market participants must have a clear understanding of the rules that will govern procurement. The factors that CPUC-jurisdictional, RPS-obligated entities can use in assessing procurement should be discussed in a limited number of focused workshops, considering the current state of the academic literature (as discussed below).

Renewable energy developers can only effectively compete to meet the needs of each RPS-obligated entity if a clear market signal is given as to what is

needed, and the Commission can best weigh whether procurement is well-tailored to meet portfolio needs if those needs are reasonably articulated and established, both in terms of categories and application of those categories to each entity's portfolio. While work remains to be done to better quantify integration needs, the growing consensus that those needs exist, and the narrowing range on the valuation of those needs, [1] supply ample guidance to consider the needs and their

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[1] The studies on the subject of California and the West's integration needs and valuation of those needs include the following:

California Independent System Operator Corporation ("CAISO"), "Integration of Renewable Resources: Operational Requirements and Generation Fleet Capability at 20% RPS" (Aug. 2010), available at http://www.caiso.com/2804/2804d036401f0.pdf .

CAISO, "Track I Direct Testimony of Mark Rothleder on Behalf of the California Independent System Operator Corporation," Before the Public Utilities Commission of the State of California, Order Instituting Rulemaking to Integrate and Refine Procurement Policies and Consider Long-Term Procurement Plans, Rulemaking 10-05-006.

Denholm, P. and M. Mehos, "Enabling Greater Penetration of Solar Power via the Use of CSP with Thermal Energy Storage, National Renewable Energy Laboratory, Technical Report," NREL/TP-6A20-52978 (Nov. 2011), available at http://www.nrel.gov/csp/pdfs/52978.pdf.

Denholm, P., S.H. Madaeni and R. Sioshansi, "Capacity Value of Concentrating Solar Power Plants, National Renewable Energy Laboratory, Technical Report," NREL/TP-6A20-51253 (June 2011), available at http://www.nrel.gov/docs/fy11osti/51253.pdf,

GE Energy, "California ISO Frequency Response Study, Final Draft" (Nov. 2011), available at http://www.caiso.com/Documents/Frequency%20response%20study%20report.

GE Energy/ National Renewable Energy Laboratory (NREL), "Western Wind and Solar Study, NREL, Golden, Colorado (May 2010), executive summary available at http://www.nrel.gov/docs/fy10osti/47781.pdf

Lawrence Berkeley National Laboratory (LBNL), "Use of Frequency Response Metrics to Assess the Planning and Operating Requirements for Reliable Integration of Variable Renewable Generation" (Dec. 2010), available at http://www.ferc.gov/industries/electric/indus-act/reliability/frequencyresponsemetrics-report.pdf .

Madaeni, S.H., R. Sioshansi, & P. Denholm, "How Thermal Energy Storage Enhances the Economic Viability of Concentrating Solar Power," Proceedings of the IEEE, 2011.

Navigant, Sandia National Laboratories, & Pacific Northwest National Laboratory, "Large-Scale PV Integration Study prepared for NV Energy" (July 2011), available at http://www.navigant.com/~/media/Site/Insights/NVE_PV_Integration_Report_Energy.ashx.

proper valuation; where there is a lack of quantification, there is more than a sufficient basis to establish relative valuation.

B. Integration Needs are Sufficiently Well-Understood to be Considered in Procurement Decisions.

Integration costs primarily consist of the additional variable costs of ancillary services and load-following capability procured by the California Independent System Operator Corporation ("CAISO") to meet the forecast errors and variability associated with variable energy production, the additional operation and maintenance ("O&M") costs for providing those services, the additional costs of greenhouse gas emissions associated with those services, and the additional capital costs of retro-fitting existing generating resources or procuring new resources – generation, storage or demand response – specifically for purposes of renewable integration. Integration costs also include the costs of curtailment of renewable energy for operational reasons (due to over-generation or ramp constraints), as well as lost market value if renewable has to be exported to other states at a reduced market price.

Mills, A. & R. Wiser, "Changes in the Economic Value of Variable Generation at High Penetration Levels," LBNL-5445E (June 2012), available at http://eetd.lbl.gov/ea/ems/reports/lbnl-5445e.pdf.

Madaeni, S.H.,, R. Sioshansi, & P. Denholm, "Estimating the Capacity Value of Concentrating Solar Power Plants with Thermal Energy Storage: A Case Study of the Southwestern United States," submitted to IEEE Transactions on Power Systems.

Sioshansi, R., & P. Denholm, "The Value of Concentrating Solar Power and Thermal Energy Storage, National Renewable Energy Laboratory," NREL/TP-6A2-45833 (Feb. 2010), available at http://www.nrel.gov/docs/fy10osti/45833.pdf.

California entities have conducted a number of integration studies over recent years, beginning with the California Energy Commission ("CEC") in the mid-2000s, and continuing through CAISO integration studies of integration needs under a 20% RPS (CAISO 2010), and the ongoing studies by CAISO, with CPUC support, of a 33% RPS (CAISO 2011, CAISO/GE 2011).[2] All of these studies suggest that the California and western U.S. power systems are *capable* of integrating a large quantity of renewable energy— although at some cost.

The actual integration capabilities and costs over time will be a function of many factors, including fuel prices, availability of dispatchability on the California power system, coordination with neighboring balancing authorities, the portfolio of "must-take" wind and solar over time (and resulting production profiles), the ability to reduce forecast errors, and other factors.

Integration costs are also likely to vary substantially from hour to hour depending on the sum of variability on power system, load variations, wind production variations and solar production variations, as well as other variations of supply caused by other factors, such as imports. This sum is often called the "net load," and is the primary variability measurement undertaken by the CAISO integration models. Hence, non-dispatchable solar energy, even if it is geographically widespread to avoid the impacts of localized weather variability, may cause significant and largely predictable system ramps that coincide with

[2] There are many other integration studies from other locations around the Western and Eastern United States, and ranging from integration in smaller utilities, such as NV Energy (Navigant et al, 2011), to interconnection-wide models, such as those being implemented by the CAISO, LBNL and NREL (e.g., CAISO 2011, LBNL 2010, GE/NREL 2010).

sunrise and sunset. Wind energy can be expected have more highly variable integration impacts across the day, although again geographic diversity will help minimize those impacts to the system overall. The net load is what matters most for integration costs and reliability – for example, high wind days that have relatively stable production may cause fewer operational difficulties than lower wind production days with strong morning and evening ramps.

The most significant persistent increase in the integration requirements calculated by the CAISO under 33% RPS scenarios appears to be in the late afternoon, when the solar ramp down interacts with the daily wind and load pattern, causing extreme, but predictable "net load" ramp ups (meaning that other resources on the grid would have to be ramped upwards to compensate for the solar ramp down). CAISO calculates that the late afternoon solar ramp could be as high as 7-8,000 MW per hour under the 33% RPS Trajectory scenario (2011 vintage), or higher in scenarios with more solar generation. This aspect of the integration cost would simply be the cost of committing other resources to provide a rapid upward ramp of this magnitude, followed by a possibly rapid downward ramp if wind production picks up.

For these reasons, integration cost estimates vary. The cost of additional ancillary services at high renewable penetrations, such as 33% RPS in California, has generally been estimated in studies to be under $10/MWh of wind and solar PV, on average. However, as the nature of the portfolio will significantly change the integration costs of the system, assigning those costs to individual generation

may not be appropriate except in a relative sense, in order to build a more balanced portfolio that, as a whole, result in lower integration costs.

C. Solar Thermal Projects Incorporating Storage and/or Hybridization can Reduce Renewable Integration Costs & Burdens.

To date, there have been several studies of integration of concentrating solar power with storage onto power systems and how it compares to other wind and solar resources (Denholm and Mehos, 2011; Madaeni, Sioshansi, and Denholm, 2011). Additional results may be forthcoming from an ongoing study at the National Renewable Energy Lab ("NREL") later in 2012, as well as other studies. However, in the interim, there is substantial data available from other studies of renewable integration in California and elsewhere in the western U.S.

Concentrating solar thermal power plants, with 2-3 hours (or more) of thermal energy storage, or with hybridization, can effectively lower system integration costs. This is in part by reducing variability but also because the energy from thermal storage can be used to reduce the late afternoon solar ramp down, as well as held in reserve overnight and possibly used to reduce the mid-morning solar ramp up; hybridization can provide similar results. Thermal storage or hybridization could effectively ensure that a plant does not cause any integration costs, and can potentially reduce system integration costs resulting from other resources.[3] These sustained long-term values of concentrating solar power with thermal storage at high renewable penetrations are illustrated most

[3] This is only one component of the value of the thermal storage, with the remainder being additional value of energy and ancillary services and improved capacity value over time, compared to other incremental solar resources (Denholm, Madaeni and Sioshansi, 2011).

recently in Mills and Wiser (2012), for plants with 6 hours of thermal storage.[4] These studies, viewed as a whole, demonstrate that solar thermal units can provide a profile that reduce integration costs, and it is appropriate that the values solar thermal can bring the energy supply be considered in procurement decisions.

III. Conclusion

Despite the uncertainty about system capabilities and integration costs, now is the time to consider integration requirements and at least indicative costs in renewable procurement. As the units that are procured now will serve the energy system for decades to come, our success in controlling the ultimate cost of our energy supply is dependent on taking what we already know about integration into consideration. We must be thoughtful about integration costs in determining what is procured, and where it is procured from, in terms of both technology and geographical diversity. BrightSource believe a limited number of focused workshops on this issue will provide sufficient clarity and transparency to allow the CPUC-jurisdictional, RPS-obligated entities to adequately consider integration

[4] Their study does not attempt to optimize the number of hours of storage.

costs in their procurement, and to thereby protect ratepayer interest while attaining California's renewable energy and climate goals.

Dated: June 27, 2012

Respectfully Submitted,

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VERIFICATION

I, Arthur L. Haubenstock, am the Vice-President of Regulatory Affairs for BrightSource Energy, Inc. I am authorized to make this Verification on its behalf. I declare that the statements in the foregoing copy of *Comments of BrightSource Energy, Inc. on the April 5th Assigned Commissioner's Ruling and the 2012 Renewables Portfolio Standard Procurement Plans* are true of my own knowledge, except as to the matters which are therein stated on information and belief, and as to those matters I believe them to be true.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on June 27, 2012 at Oakland, California.

/s/ Arthur L. Haubenstock

Arthur L. Haubenstock
Vice-President, Regulatory Affairs
BrightSource Energy, Inc.