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**BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking to Oversee  
the Resource Adequacy Program,  
Consider Program Refinements, and  
Establish Annual Local Procurement  
Obligations.

Rulemaking 11-10-023  
Filed October 20, 2011

**COMMENTS OF THE CONCENTRATING SOLAR POWER ALLIANCE  
ON THE PROPOSED DECISION ADOPTING LOCAL PROCUREMENT  
OBLIGATIONS FOR 2014, A FLEXIBLE CAPACITY FRAMEWORK,  
AND FURTHER REFINING THE RESOURCE ADEQUACY PROGRAM**

The Concentrating Solar Power Alliance (“CSPA”) appreciates this opportunity to provide comments on the Proposed Decision issued on May 28, 2013 within Administrative Law Judge Gamson’s ruling.<sup>1</sup> CSPA submits the following comments to the California Public Utilities Commission (“Commission”) in accordance with the provisions of the May 28 ruling by Administrative Law Judge Gamson.

**I. Introduction**

The CSPA consists of concentrating solar power (“CSP”) developers and suppliers who advocate for the increasing acceptance, adoption and implementation of CSP technology and thermal energy storage. CSPA supports the efforts being undertaken by the Commission and California Independent System Operator Corporation (“CAISO”) to enhance the existing Resource Adequacy (“RA”) program in response to the changing resource mix and operational needs of California’s electric power grid. In doing so, the Commission must balance multiple

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<sup>1</sup> “Decision Adopting Local Procurement Obligations for 2014, a Flexible Capacity Framework, and Further Refining the Resource Adequacy Program,” Docket No. R.11.10.023 (May 28, 2012) (hereinafter “Proposed Decision”).

objectives – cost, reliability, the Loading Order and the State’s other energy and environmental requirements and goals and policies, such as the Renewables Portfolio Standard (“RPS”) and California’s Global Warming Solutions Act (“AB 32”). This task is made more challenging by the potential retirement of once-through cooling plants.

CSPA is generally supportive of the flexible capacity program outlined in the Proposed Decision, specifically:

- Defining flexible attributes for local reliability purposes is necessary to ensure a reliable, cost-effective energy system as the nature of the energy supply changes.
- There is no demonstrated need justifying a new requirement for a flexible capacity procurement obligation in the 2014 RA year.
- Flexible capacity procurement should be required at the time a need is demonstrated.
- The use limitations of different energy supply resources will affect whether and to what extent certain resources can contribute to meeting a flexible capacity procurement requirement and, thus, a reliable power system.
- The Commission should use this period of time, before a flexible capacity procurement need is demonstrated, to refine a flexible capacity framework.

However, CSPA proposes refinement of certain aspects of the Proposed Decision, including:

- Flexible capacity procurement should be allocated to Load Serving Entities (“LSEs”) following cost-causation principles, rather than pro-rata based on coincident peak load share. To reduce cost while maintaining reliability, LSEs’ flexible capacity procurement requirements should depend on the degree to which the portfolio of resources each LSE procures will either increase or decrease the CAISO-wide requirement for flexible capacity procurement.
- The initial “interim” period for the flexible capacity program should extend for a period long enough to support development and deployment of new resources that can meet the need. An indication of Commission intent beyond the interim period is needed to provide a sufficiently stable and reliable regulatory signal.

## **II. Concentrating Solar Power with Thermal Energy Storage Is a Preferred Resource, Providing Flexible Operating Capabilities and RPS Energy**

CSP with thermal energy storage (“TES”) plants are unique renewable energy resources that provide not only clean electric power, but also a range of operational capabilities that support the continued reliability and operational flexibility of electric power systems. CSP with TES plants utilize solar energy as fuel for a conventional steam turbine generator; augmented with thermal energy storage systems, these plants have the ability to manage the time and amount of electric generation. By providing both RPS energy and flexible capacity, CSP with TES has the potential to be an important component of the California grid’s future flexible capabilities and can contribute to a power system with both lower total costs and lower carbon emissions.

The Proposed Decision outlines that “the increased flexibility requirements due to the state’s 33% Renewable Portfolio Standard might change the reliability characteristics of the grid over the next several years.”<sup>2</sup> As the magnitude of net load ramps increases in direct relationship to the penetration of renewables, such as wind and solar photovoltaic plants, CSP with TES plants can provide flexibility to the grid, by storing energy during the day, dispatching it as needed and reducing the need for additional natural gas plants to operate.

CSP with TES plants can be designed and operated to resemble a use-limited conventional dispatchable generator. For CSP with TES plants, the limitations result from its fuel stock, which depend on a combination of the amount of sun the plant receives each day (known as direct normal solar insolation (“DNI”)) and its storage system’s technical

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<sup>2</sup> Proposed Decision at 12.

specifications.<sup>3</sup> Energy production from a CSP with TES plant can be dispatched for economic or reliability purposes, such as ancillary services, multi-hour ramp support and flexi-ramp reserves. These operational capabilities have typically been provided by fossil-fuel generators.

Moreover, CSP with TES plants are non-fossil fuel-based flexible capacity resources that can contribute to successfully meeting the RPS and AB 32 requirements. Flexible capacity procurement that is heavily weighted toward fossil fuel-based resources in the short run will make California's goals more difficult to attain in the long run. The dispatchability and flexibility characteristics of CSP with TES, combined with its renewable fuel source, make it a logical component of a flexible capacity program.

The incorporation of CSP with TES in the California resource portfolio will contribute the following benefits:

1. Reduction of net load ramp magnitude, especially in the late afternoon, due to shifting out of solar energy production.
2. Reduction of output forecast errors and intra-hourly variability of the aggregate variable energy resource portfolio.
3. Provision of dispatchable energy, fast ramp capabilities and wide operating ranges to serve flexible capacity needs.

The Proposed Decision cites comments by all three investor-owned utilities ("IOUs")<sup>4</sup> that recommend consideration and incorporation of use-limited resources into the flexible capacity program. Specifically, Southern California Edison Company suggested the "establishment of refined eligibility criteria and/or removal of participation barriers" for such

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<sup>3</sup> CSP with TES is unlike other energy storage device in that it does not require charging from the grid; however, these plants can be equipped to charge from the grid, to relieve over-generation or otherwise if warranted and cost-effective to do so.

<sup>4</sup> Proposed Decision at 47 – 48.

resources, including storage resources.<sup>5</sup> Further, Energy Division supported San Diego Gas & Electric's ("SDG&E") comments on preferred resources, proposing:

[f]urther discussions about modifying the counting and bidding rules, as necessary and in alignment with operational needs, for use-limited resources such as storage and demand resource.<sup>6</sup>

CSPA members are committed to working with the Commission and stakeholders to help establish appropriate eligibility, counting and must-offer criteria for CSP with TES plants within a flexible capacity program.

### **III. Quantification of Effective Flexible Capacity for Concentrating Solar Power with Thermal Energy Storage will Require a Resource-Specific Methodology**

To ensure a least-cost solution to meeting flexible capacity needs, all resources that contribute to the fundamental need and purpose of flexible capacity should be eligible for procurement. Different resources can and should have different eligibility and Effective Flexible Capacity ("EFC") treatment, and any use limitations of those resources should be accounted for in the counting methodology. Similar to the proposals for differentiated EFC counting methodology for hydroelectric resources, to reflect its contribution to the system reliability and to avoid redundant procurement, CSP with TES plants would require a resource-specific approach that incorporates both technical storage capabilities and fuel, or solar resource, availability. CSPA agrees with the Proposed Decision's favorable reference to SDG&E's comment that:

[e]ligibility requirements and must-offer obligations applicable to demand response and energy-storage resources will need to be more specifically defined and tailored to address the unique

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<sup>5</sup> *Id.* at 48.

<sup>6</sup> *Id.* at 52.

characteristics of discrete technologies or classes potentially qualifying resources.<sup>7</sup>

For CSP with TES plants, resource eligibility and EFC should be based on technical storage capabilities, such as megawatt-hour storage capacity, megawatt discharge capacity and ramping rates, as well as average monthly expectations for DNI. The National Renewable Energy Laboratory's ("NREL") modeling and analysis of the CAISO 33%'s RPS case could inform an EFC counting methodology, as it provides an analytical foundation to estimate the availability of various CSP with TES plant configurations to meet net load ramps requirements.

#### **IV. Energy Storage Resources Differ from Conventional Resources and Should Have Different Effective Flexible Capacity Counting Conventions**

The three hour ramping capability outlined in the definition of "flexibility" in the Joint Parties' Proposal<sup>8</sup> should not be a threshold for eligibility for storage resources, but rather a basis for quantifying the EFC of a storage resource.<sup>9</sup> Storage resources can either provide their maximum output over a shorter period of time, or extend the duration of production by reducing the level of output. In other words, a storage resource will have a maximum discharge potential, which is measured in capacity (MW), but may not be able to sustain that maximum discharge over three hours. Given a device's total storage capacity, which is measured in energy (MWh), it could ramp to a given output level over three hours or produce energy at an output level less than

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<sup>7</sup> *Id.* at 51.

<sup>8</sup> *Id.* at 15-16.

<sup>9</sup> The Commission should clarify this point on three hour ramping requirements. The Joint Parties' proposed counting convention for non-use-limited thermal resources suggests EFC is set based on a resource's achievable megawatt range in three hours based on ramping capabilities; in contrast, the PG&E proposal for hydro suggests a minimum requirement of six hours of generation capabilities at  $P_{\max}$ . In several instances of the Proposed Decision, flexible resources are cited as able to "sustain" energy output for three hours, but not necessarily at  $P_{\max}$ . A requirement of three hours of constant ramping, compared to three hours of  $P_{\max}$  output, would have a significant impact on defining eligibility and quantifying the EFC of a storage-based Flexible Capacity resource.

its maximum potential over a three hour period. The grid operator is best equipped by knowing how long a resource can sustain maximum output as well as what lower level of output it can sustain over three hours. This lower output level could be reflected in the EFC rating.

Alternatively, storage resources with less than three hours of discharge capacity at  $P_{\max}$  could be dispatched in coordination to jointly meet the three hour ramping need, providing their full output over the shorter period of time. To make the most efficient use of a resource portfolio, the EFC should match the capabilities of the resources without artificial constraints that do not fully reflect the operational value of all resources.

## **V. Flexible Capacity Resource Adequacy Requirements Should Consider Concentrating Solar Power with Thermal Energy Storage Plants**

As noted previously in these comments, CSP with TES has the ability to mitigate the flexible capacity requirement, because its inclusion in the solar portion of the RPS portfolio inherently lessens system net load ramps.<sup>10</sup> There are two sources for this effect:

1. CSP with TES plants shift some solar production from sunlight hours to other hours of the day. By substituting CSP with TES energy, on an equivalent energy (MWh) basis, for “must-take” solar energy (such as PV or CSP without TES) that produces only during sunlight hours, the aggregate profile of solar production is “flattened” somewhat, illustrated below in Figure 1 and in CSPA and NREL reports.<sup>11,12</sup> This flattening effect inherently reduces the net load ramps caused by the aggregate solar portfolio.

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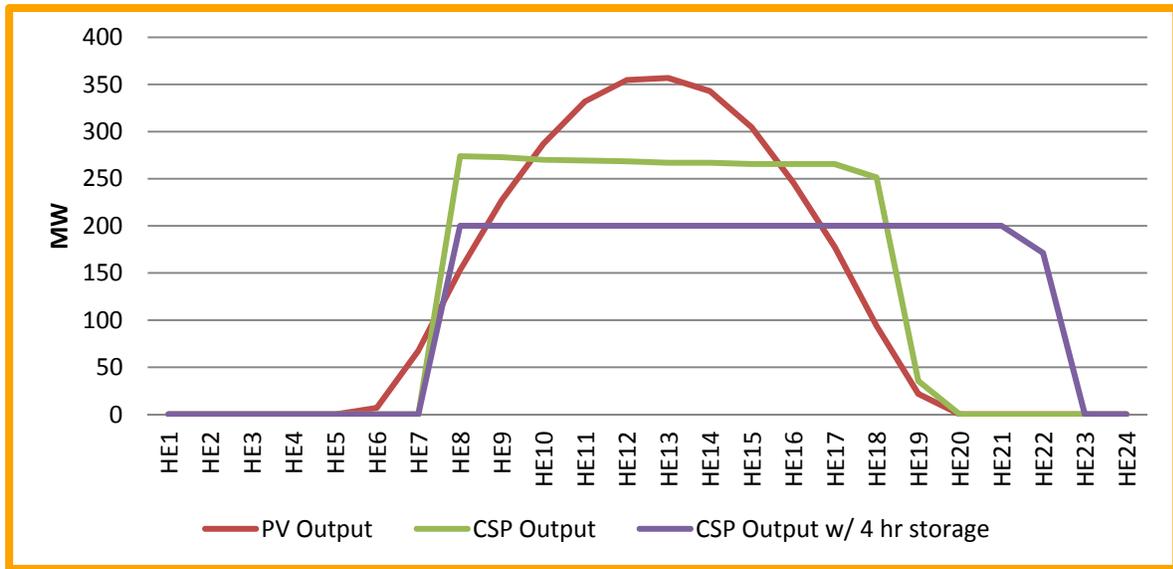
<sup>10</sup> Denholm, P. and M. Mehos, “Enabling Greater Penetration of Solar Power via the Use of CSP with Thermal Energy Storage,” National Renewable Energy Laboratory, Technical Report, NREL/TP-6A20-52978, November 2011. See <http://www.nrel.gov/csp/pdfs/52978.pdf>.

<sup>11</sup> CSP Alliance, The Economic and Reliability Benefits of CSP with Thermal Energy Storage: Recent Studies and Research Needs, December 2012. See <http://www.cspa.org/>.

<sup>12</sup> Paul Denholm, Yih-Huei Wan, Marissa Hummon, and Mark Mehos, “An Analysis of Concentrating Solar Power with Thermal Energy Storage in a California 33% Renewable Scenario,” Technical Report, NREL/TP-6A20-58186, March 2013.

- Dispatchable energy from a CSP with TES plant provides the flexible capacity capabilities that can mitigate the remaining net load ramps.<sup>13</sup>

**Figure 1: Equivalent energy production profile of 2,970 MWh on a clear day for 200 MW CSP plant with 4 hours of storage, 275 MW CSP plant without storage, and 360 MW fixed-tilt PV plant<sup>14</sup>**



CSP with TES plant operating profiles demonstrate that these plants can (a) reduce the system need for other flexible capacity procurement by reducing variability, net load ramps and output forecast errors of the solar portfolio, and (b) provide flexible, dispatchable capabilities to meet the remaining operational needs. CSPA requests that the Commission ensure that the CAISO reflect the impact of CSP with TES plants on the annual flexibility capacity procurement

<sup>13</sup> In actual operations, the highest economic value uses of the stored solar energy may or may not correspond to dispatch within the net load ramps. A CSP with TES plant may obtain higher economic value on a particular day by providing ancillary services for a longer set of hours than by producing energy during the net load ramps.

<sup>14</sup> The four hours of storage plant configuration and its energy production profile are illustrative and are not reflective of any design or dispatch optimization decisions.

requirement.<sup>15</sup> The CAISO is currently planning to model the dispatch capabilities of a CSP with TES plant in the Long Term Procurement Planning – Operational Flexibility Study.<sup>16</sup>

## **VI. The Assessment and Allocation of Flexible Capacity Resource Adequacy Requirements Should Reflect Contribution to System Needs**

At a minimum, the annual flexible capacity requirement across the CAISO balancing authority should reflect the mitigating effect of certain resources, such as CSP with TES, on flexible capacity requirements. This would signal to both new generation and participating loads that resource attributes that mitigate net load ramps have specific value. The net effect would be to reduce the overall need, and expense, of flexible capacity requirements by providing an incentive for LSEs to procure resources that reduce system-wide the flexible capacity program costs.

To properly motivate utilities and resource providers to reduce overall system cost, the flexible capacity requirements for an LSE should reflect the procurement and load management decisions of that LSE. Allocation of flexible capacity requirements should therefore be based on each LSE's contribution to system-wide maximum net load ramps. Comments by Ormat Technologies referenced in the Proposed Decision<sup>17</sup> also suggest this potential improvement to a flexible capacity program.

CSPA understands that this allocation methodology would be more complex than an allocation based on each LSE's share of monthly system peak, as outlined in the Proposed

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<sup>15</sup> The recent Assigned Commissioner Ruling Proposing Storage Procurement Targets and Mechanisms (June 10, 2013) suggests that other renewable resources co-located with storage may be deployed and have the ability of reducing net load ramps.

<sup>16</sup> CPUC Workshop "R.12-03-014: Energy Division Workshop – Operating Flexibility Modeling" (April 24, 2012)

<sup>17</sup> Proposed Decision at 29.

Decision.<sup>18</sup> However, the proposed allocation based on an LSE's contribution to the coincident peak would not follow cost-causation principles, nor would it provide appropriate economic incentives, resulting in overall increases in costs and burdens to California ratepayers. CSPA recommends that the Commission coordinate with CAISO to develop a methodology to allocate flexible capacity requirements that better reflects an LSE's contribution to net load ramps and the flexible capacity need. This approach more directly signals LSEs to procure resource portfolios that produce lower total system costs.

## **VII. The Commission Should Evaluate Ratepayer Cost Outcomes of Different Flexible Capacity Program Scenarios**

Through this proceeding, the Commission is proposing to institute a new procurement requirement for LSEs that is likely to have a cost impact on ratepayers. As noted in the Proposed Decision, “no party is able to provide any reliable cost estimates”<sup>19</sup> at this time; nonetheless, the Commission should seek to ascertain the estimated cost impact of a flexible capacity program on total Commission-jurisdictional production costs, including all energy and capacity costs. This analysis should examine the total system cost outcomes of different resource eligibility and counting criteria for unconventional resources, such as storage and demand response. It should be completed between now and the time that eligibility, counting and must-offer criteria are finalized. Without considering varying resource portfolio scenarios and their impact on system costs, the Commission cannot expect to structure a flexible capacity program that 1) ensures reliability, 2) is least cost, and 3) is non-discriminatory toward use-limited, preferred resources.

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<sup>18</sup> *Id.* at Appx. A, p. 4.

<sup>19</sup> *Id.* at 43.

### **VIII. Resource Adequacy Counting Rules Should be Modified to Appropriately Reflect the Value of the Operational Characteristics of Concentrating Solar Power with Thermal Energy Storage**

The true contribution to RA value – both generic and flexible – of CSP with TES plants are not captured by current RA qualifying capacity (“QC”) rules; these rules should be modified to reflect the operational characteristics of these plants. As the Proposed Decision limits a resource’s EFC by its net QC (“NQC”),<sup>20</sup> the utility of a flexible capacity program, and the avoidance of unnecessary costs, requires such a revision to the RA counting convention. The EFC and NQC metrics serve different purposes, and equating them, without this proposed amendment to the RA program, can lead to perverse results that would be unnecessarily detrimental to California ratepayers.

The Commission’s current exceedence methodology for assessing the QC of variable wind and solar resources is not entirely applicable to, and discourages the use of, CSP with TES for flexibility and integration purposes. CSP with TES plants have portions of the operating day that are similar to dispatchable, flexible gas plants and other periods that may be more similar to non-dispatchable, must-take renewable resources. While an exceedence methodology may be appropriate for any “as-available” or “must take” portions of generation, an availability-based QC assessment methodology is much more appropriate for periods when a facility is fully-dispatchable. Under the current convention, it is possible that a plant’s NQC in a certain month would inappropriately limit its EFC, since a CSP with TES plant could be operated to maximize its ability and availability to provide three hours of sustained output over a 17-hour period, rather than operated to maximize its NQC.

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<sup>20</sup> *Id.* at Appx. A, p. 3.

CSP with TES plants can be evaluated for their degree of dispatchability, based on technical storage configurations and projected solar resources, using simulations to evaluate their capacity value, as a percentage of  $P_{\max}$ . This kind of analysis has been performed recently by NREL and Lawrence Berkeley National Laboratories (“LBNL”). The key finding is that capacity credit, a proxy for QC and stated as a percentage of  $P_{\max}$ , is a function of the storage capacity, solar field size, steam turbine capacity and CSP technology type. The methodologies and results within these studies may be able to assist in establishing appropriate QC levels for CSP with TES, especially in the context of flexible capacity program design. CSPA and its members would welcome the opportunity to further discuss an appropriate QC counting methodology for CSP with TES with the Commission and stakeholders.

The need for modification of the QC assessment methodology is not unique to CSP with TES, and would have application to any facility that combines as-available and dispatchable characteristics, e.g., renewable resources co-located with storage. A modification of the RA program to apply an availability-based QC assessment, when appropriate, will encourage plants with an intermittent fuel source to consider incorporating dispatchable features to further the goal of system reliability inherent in the RA, and prospective flexible capacity programs.

#### **IX. The Interim Nature of the Proposed Flexible Capacity Program Poses a Potential Barrier for the Development of Long Term Resources**

The CSPA supports the institution of a flexible capacity requirement, which will include appropriate eligibility, counting and must-offer criteria for use-limited, preferred and storage resources. While providing for an “interim” program to “determine the efficacy of the framework and consider additional flexibility requirements”<sup>21</sup> is a prudent, measured approach, a

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<sup>21</sup> *Id.* at 67.

three-year interim program would inhibit the deployment of new resources that rely on longer-term market value signals.

When a procuring utility evaluates the net market value of a potential new resource, it will consider all the expected revenue streams, or avoided costs, from the resource. Similarly, designers, developers and merchant owners need to project the market value of an asset's attributes based on existing, or likely, regulatory structures in a given jurisdiction. Renewable and storage resources typically exhibit high upfront capital costs that are recouped over five to twenty-five year asset lives. Long-term eligibility as a flexible capacity resource will have a significant impact on the valuation of these resources.

Designers, developers, utilities and asset owners cannot rely on the Proposed Decision's flexible capacity program structure if it is limited to a three year interim period. Interim program expiration will have the effect of discouraging the development of low carbon resources that can cost-effectively provide reliability services while furthering the State's environmental policy goals. To better clarify intent beyond the interim program period, the Commission should elaborate further in a Final Decision on the plan for re-examining the flexible capacity program leading up to the expiration of the interim period.

## **X. Conclusion**

The CSPA supports the Commission's Proposed Decision in proposing the mandatory procurement of flexible capacity resources based on the CAISO-determined requirements. Further, the Commission has rightly accepted the critical task over the next twelve months of establishing, through stakeholder engagement, the eligibility, counting and must-offer criteria of the flexible capacity program for use-limited, unconventional resources, such as preferred and

storage resources. This effort will begin to shape the way low-carbon resources will be used to reliably operate the State's power system and meet its environmental policy goals.

CSP with TES plants have the capability to jointly meet renewable energy and carbon policy goals as well as system reliability needs associated with a growing portfolio of variable energy resources. CSP with TES has already been the subject of a number of technical studies on its operational performance, which can form the basis or be enhanced for the development of appropriate rules. CSPA members are pleased to participate in the stakeholder effort to define and tailor the flexible capacity framework for use-limited, preferred resources, especially CSP with TES. CSPA appreciates this opportunity to comment on the Commission's Proposed Decision.

Respectfully Submitted,

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