



# Report on CAISO Order 755 Market Design

The California Independent System Operator Corporation (CAISO) has prepared this informational report based on operational data from the first year of the CAISO's Order 755 market design. Based on this review, the CAISO makes the following findings:

- (1) System wide mileage accuracy performance has ranged from 30 to 60 percent accuracy. Slight improvements have occurred in 2014, mostly for regulation down performance.
- (2) Performance accuracy of individual resource varies more significantly than system wide performance. Few resources consistently perform above the 50 percent threshold.
- (3) The minimum performance threshold under the CAISO's Order 755 market design may require refinements to ensure adequate regulation resources are available to meet system imbalances between each five minute real time dispatch.
- (4) Bidding behavior reflects that scheduling coordinators continue to treat regulation up and regulation down as a capacity product.

## **I. Background and scope of report**

Under the CAISO's Commission-approved tariff, regulation up and regulation down are provided by resources certified to respond automatically to control signals in an upward or downward direction to balance demand and supply in real-time. The CAISO market systems procure regulation up and regulation down for many reasons, including frequency response and market imbalances that occur between

5-minute dispatch intervals as well as for demand forecast inaccuracies and supply deviations.

In October 2011, the Commission issued Order 755, which adopted a final rule for compensation of frequency regulation in organized wholesale power markets. The Commission determined that the then-effective compensation methods for regulation service in organized markets failed to acknowledge the inherently greater amount of regulation service provided by faster-ramping resources and that certain practices result in economically inefficient dispatch of resources providing regulation service. To remedy these issues, the Commission's final rule required organized markets to compensate regulation resources based on the actual service provided, including a capacity payment that reflects the marginal unit's opportunity costs and a performance payment that reflects the quantity of regulation service actually provided by a resource when the resource accurately follows a dispatch signal. Order 755 required the use of a market-based price rather than an administrative price on which to base performance payments.<sup>2</sup>

In response to the final rule, the CAISO developed an Order 755-compliant market design, which the Commission accepted effective June 1, 2013.<sup>3</sup> The design uses a two-part structure to establish capacity and mileage clearing prices for bid-in and self-provided regulation. As part of this structure, the CAISO estimates the expected mileage from the capacity a resource bids-in or self-provides based on that resource's specific mileage multiplier. This expected mileage allows the CAISO to

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<sup>2</sup> Order 755 at P 128.

<sup>3</sup> *Cal. Indep. Sys. Operator Corp.*, 140 FERC ¶ 61,206 (2012); *Cal. Indep. Sys. Operator Corp.* 142 FERC ¶ 61,233 (2013). The Commission originally accepted the market design effective January 1, 2013, but subsequently the Commission granted successive motions for extension of time filed by the CAISO to implement the market design effective May 1, 2013 and then effective June 1, 2013. *Cal. Indep. Sys. Operator Corp.*, 141 FERC ¶ 61,184 (2012); Notice of Extension of Time, Docket Nos. ER12-1630-000, *et al.* (Apr. 30, 2013).

optimize capacity offered to satisfy regulation requirements and to establish a market clearing price for performance payments as adjusted for accuracy. Under the CAISO's market design, a resource responding to the CAISO's control signal receives a performance payment based on the resource's actual movement in response to the control signal. In other words, the CAISO adjusts a resource's performance payment based on how accurately it responds to the CAISO's control signal.

As part of its approval of the CAISO's market design, the Commission directed the CAISO to conduct an operational review of its Order 755 market design based on one year of experience and submit an informational report within 14 months of the effective date of its tariff revisions.<sup>4</sup> The Commission specified that the CAISO's operational review should include the following:

- (1) the appropriateness of the minimum performance threshold level;
- (2) the historical data used to calculate the mileage multiplier;
- (3) whether the regulation capacity procurement target should reflect historical accuracy of resources;
- (4) the level of the mileage maximum bid price and mileage scarcity price; and
- (5) any other analysis the CAISO considers appropriate.

As part of its design, the CAISO also implemented a minimum performance threshold for resources providing regulation up or regulation down. Under this tariff

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<sup>4</sup> *Cal. Indep. Sys. Operator Corp.*, 140 FERC ¶ 61,206 (2012) at P 75.

revision, the CAISO applies a minimum performance threshold of 50 percent accuracy during a calendar month in order for a resource to offer regulation up or regulation down capacity. Many resources certified to provide regulation in the CAISO's market have not met this minimum performance threshold and, on January 10, 2014, the CAISO requested a limited waiver of these tariff provisions until December 31, 2014. The CAISO requested the waiver to avoid the market disruption that might occur if it required all resources that did not meet the minimum performance threshold to recertify to provide regulation service. The CAISO also requested the waiver to allow it time to assess the design of the minimum performance threshold. The Commission granted the CAISO's waiver.<sup>5</sup> In its Order, however, the Commission directed the CAISO to include additional information in this informational report regarding the minimum performance threshold.<sup>6</sup>

Specifically, the Commission directed the CAISO to include:

- a discussion of the reliability impacts of resources that would be disqualified absent the waiver (e.g., evidence that insufficient regulation would qualify);
- an analysis of whether CAISO's current tariff mechanism of adjusting a resource's mileage multiplier based on historic regulation performance accuracy is effective in incenting more accurate performance; and
- an analysis of different methods for accounting for accuracy in compensation, including a comparison of its accuracy accounting to

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<sup>5</sup> *Cal. Indep. Sys. Operator Corp.*, 147 FERC ¶ 61,132 (2014)

<sup>6</sup> *Id.* at PP 17-18.

other RTO/ISOs' methods, that could incent more accurate performance.

## **II. The CAISO's minimum performance threshold for regulation up and regulation down may require refinements**

As part of its design, the CAISO proposed, and the Commission accepted, a minimum performance threshold for resources providing regulation up or regulation down.<sup>7</sup> Under this tariff revision, the CAISO applies a minimum performance threshold of 50 percent accuracy in order for a resource to offer regulation up or regulation down capacity.<sup>8</sup> For purposes of this threshold, the CAISO measures a resource's accuracy in responding to a 4-second control signal. The CAISO sums a resource's automatic generation control set points for each four (4) second regulation interval every fifteen (15) minutes and then sums the total deviations from the automatic generation control set point for each four (4) second regulation interval during that fifteen (15) minute period. The CAISO then divides the sum of the resource's automatic generation control set points less the sum of the resource's total deviations by the sum of the resource's automatic generation control set points.<sup>9</sup> The CAISO then calculates the resource's monthly performance by taking a simple average of 15-minute intervals during a calendar month. If the resource fails to meet the minimum performance threshold over the month, the tariff requires the resource to recertify to offer regulation up or regulation down within 90 days from the

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<sup>7</sup> See section 8.4 of February 22, 2012 addendum to draft final proposal, available on the CAISO website at [http://www.aiso.com/Documents/Addendum-DraftFinalProposal-Pay\\_PerformanceRegulation.pdf](http://www.aiso.com/Documents/Addendum-DraftFinalProposal-Pay_PerformanceRegulation.pdf). See also *Cal. Indep. Sys. Operator Corp.*, 140 FERC ¶ 61,206, at PP 27, 72-75.

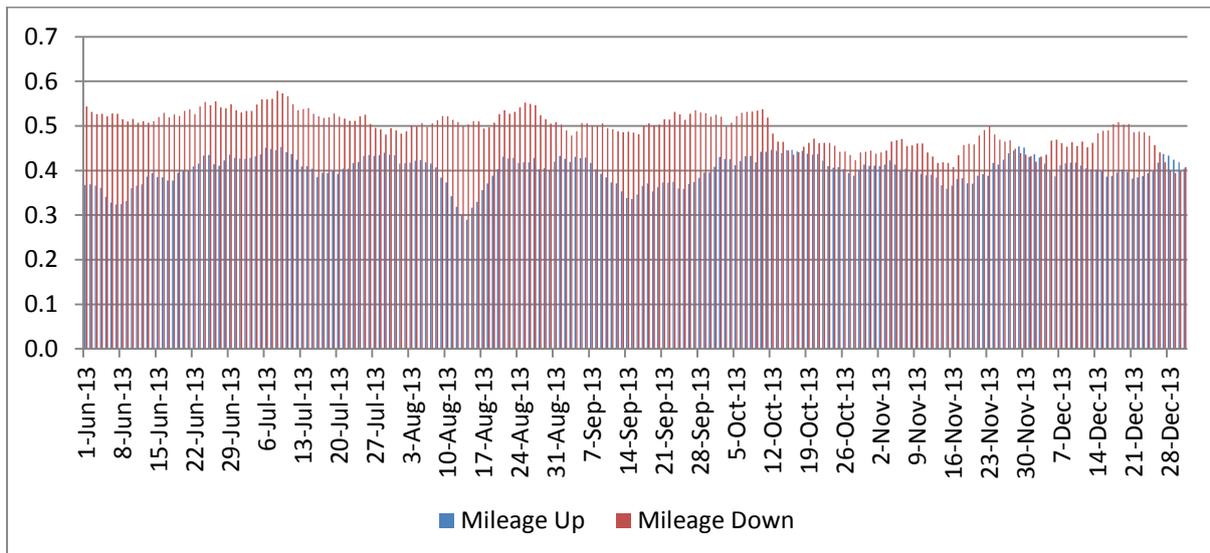
<sup>8</sup> CAISO tariff sections 8.2.3.1.1 and 8.4.1.1(h); CAISO tariff appendix K, section A 1.1.5.

<sup>9</sup> CAISO tariff section 8.2.3.1.1.

date the CAISO provided notice of the resource’s failure to meet the minimum performance threshold.<sup>10</sup> As described above, the Commission granted the CAISO a waiver from enforcing these tariff rules until December 31, 2014.

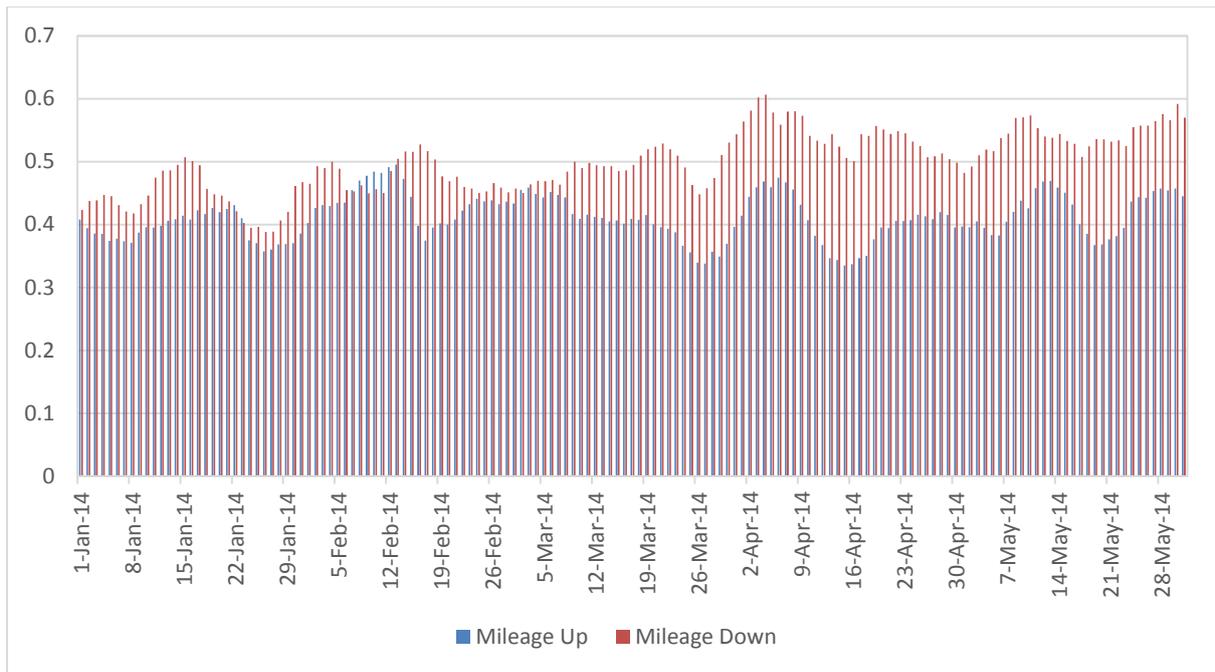
Based on a review of one year of operational data, resources providing both regulation up and regulation down have not met the minimum performance threshold. Figures 1 and 2 reflect the average performance of resources per day across the CAISO system providing regulation up and regulation down during that time period.

**Figures 1- Performance of CAISO System for Regulation Up and Regulation Down (June 1, 2013 - December 31, 2013)**



**Figures 2 - Performance of CAISO System for Regulation Up and Regulation Down (January 1, 2014 – June 1, 2014)**

<sup>10</sup> When it implemented the Order 755 market design, the CAISO informed market participants that it would not issue notices regarding a resource’s failure to meet the minimum performance standard prior to October 15, 2013.



This data reflects that resources often performed below the 50 percent minimum performance threshold across the CAISO system during the first year of the Order 755 market design. System performance for regulation down appears to have improved slightly during the second quarter of 2014. The level of performance did not vary significantly based on resource type. The CAISO tracked regulation up and regulation down performance by the following resource types: combined cycle, generator turbine, hydro pump turbine, hydro turbine, limited energy storage resource and steam turbine. Each category of resource has performed below the 50 percent minimum performance threshold for either regulation up or regulation down during at least one calendar month.

During the first quarter of 2014, the CAISO requested information from various scheduling coordinators providing regulation up and regulation down in the CAISO markets concerning what physical or operational constraints exist that prevent their resources from meeting the minimum performance threshold and what steps, if any, can be taken to improve the accuracy of their resources' response to

CAISO control signals. Some scheduling coordinators reported physical and control limitations at hydro facilities designed for safety that may cause a delay in responding to a CAISO control signal. Scheduling coordinators also identified latency associated with the communication time of the control signal and encouraged the CAISO to reassess the minimum performance threshold in light of the actual performance provided by resources offering regulation up and regulation down. One scheduling coordinator stated it was initially concerned with the disparity between the performance of its resource and the CAISO's calculated performance results, but did not raise the concern because the settlement for performance based on mileage market clearing prices was so low. . Based on operational data and feedback received from scheduling coordinators, the CAISO intends to initiate a stakeholder process in the third quarter of 2014 to examine refinements to the minimum performance threshold associated with its Order 755 market design.

**A. Application of the minimum performance threshold would have required the CAISO to disqualify a significant amount of capacity offering regulation up and regulation down**

Based on measured performance of resources providing regulation up and regulation down, the CAISO would have had to disqualify a significant amount of this capacity if it had applied the 50 percent minimum performance threshold. The CAISO reviewed the performance of six resources offering the majority of regulation into the CAISO market in May and June 2014. These resources provided approximately 78 percent of the CAISO's regulation service during these months. Each of these resources failed the minimum performance threshold for either regulation up or regulation down in at least one calendar month between June 1, 2013 and May 31, 2014. Each would have faced the possibility of disqualification under the CAISO tariff. Table 1 reflects the total regulation up and regulation down

capacity in MWh provided by these resources in May and June 2014 and the average monthly performance for each service of the six largest suppliers of regulation up and regulation down between June 2013 and May 2014.

**Table 1 – Performance of Largest Suppliers of Combined Regulation Capacity**

Regulation Up/Down total Quantities (MWh) May and June 2014	Regulation Down 12 Month Average Monthly Performance	Regulation Up 12 Month Average Monthly Performance	Resource Fuel Type
1,052,407	0.5300	0.4009	Hydro
346,741	0.4081	0.3343	Hydro
230,214	0.6341	0.5036	Hydro
171,916	0.5440	0.3701	Combined cycle
93,832	0.4078	0.3691	Hydro
50,583	0.5422	0.3352	Hydro

Smaller suppliers of regulation capacity also did not meet the minimum performance threshold. Based on this data, had the CAISO applied its 50 percent minimum performance threshold, the overwhelming majority of resources providing regulation in the CAISO markets from June 2013 through May 2014 would have received a notice that it would need to recertify or face disqualification within 90 days. The CAISO does not know which of these resources would have requested to recertify their capacity to provide regulation up or regulation down. The CAISO believes that resource adequacy resources would likely have taken steps to recertify their capacity to offer regulation up and regulation down. The CAISO does not know whether non-resource adequacy resources certified to provide regulation would have offered their capacity in light of the possibility that they might also fail the minimum performance threshold. For these reasons, it is possible that the CAISO could have faced a reliability challenge of having insufficient regulation by disqualifying

resources from providing regulation that the CAISO uses to balance variations in load and supply between each five minute dispatch.

**B. Adjustments to resource mileage multipliers do not appear to have incentivized more accurate performance**

Under the CAISO’s Order 755 market design, the CAISO adjusts a resource's mileage multiplier based on historic regulation performance accuracy.<sup>11</sup> Resources that respond to CAISO control signals with more accuracy have a higher resource mileage multiplier; resources that respond to CAISO control signals with lower accuracy have a lower resource mileage multiplier. The resource mileage multiplier informs how much mileage the CAISO may expect from bid-in or self-provided capacity. Table 2 reflects the average monthly resource-specific mileage multiplier of six resources providing the majority of regulation up and regulation down on the CAISO system as well as the average monthly performance for each resource providing both regulation up and regulation down, respectively.

**Table 2 – Resource Specific Mileage Multipliers of Largest Suppliers of Combined Regulation Capacity**

Regulation Up/Down total Quantities (MWh) in May and June 2014	Average 12 Month Resource Specific Mileage Multiplier for Regulation Up	Average 12 Month Resource Specific Mileage Multiplier for Regulation Down	Resource Fuel Type
1,052,407	2.719093	5.719434	Hydro
346,741	2.248212	4.407275	Hydro
230,214	4.551515	9.505577	Hydro
171,916	2.365888	5.758214	Combined cycle
93,832	2.503339	4.432389	Hydro
50,583	3.598165	9.267431	Hydro

<sup>11</sup> See CAISO tariff section 8.2.3.1.1, which states in part: “The CAISO will use a resource’s Historic Regulation Performance Accuracy and certified ramp capability to determine a resource-specific expected Mileage for purposes of awarding Regulation Up and Regulation Down capacity. The CAISO will calculate a separate Historic Regulation Performance Accuracy for both Regulation Up and Regulation Down.”

Resource specific mileage multipliers vary significantly across these resources by operating day and by regulation service. The CAISO has reviewed these mileage multipliers with actual performance of resources and has not identified any sustained correlation between higher mileage multipliers and more accurate actual performance. Stated otherwise, based on the data available a resource may have a higher or lower mileage multiplier for a specific operating day but that measure may not predict future performance in response to a control signal. Under the CAISO's Order 755 market design, however, sustained accuracy performance will result in a higher mileage multiplier that will inform how the CAISO market systems expect self-provided or awarded regulation capacity will perform in response to CAISO control signals and thereby influence the amount of regulation that the resource may provide through a qualified self-provision or capacity award. The ISO's market optimization should in turn select resources with higher mileage multipliers to provide capacity in order to meet the mileage requirement at least cost. As referenced in Section IV of this report, the ISO receives a significant amount of self-provided regulation capacity that even with a lower mileage multiplier may be more economic in meeting the ISO's mileage requirement.

**C. Alternative approaches to measure accuracy in ISO/RTO markets may offer opportunities to examine refinements to the CAISO's Order 755 market design**

The CAISO reviewed different methods for accounting for accuracy used by other independent system operators and regional transmission operators in their Order 755 market designs. Alternative approaches adopted by the Midcontinent Independent System Operator (MISO), the New York Independent System Operator (NYISO) and PJM Interconnection may provide some guidance on how to refine the ISO's performance metric.

MISO measures performance every five minutes based on the ratio between the actual mileage and the desired mileage over the five minute interval. Under MISO's design, actual mileage is the accumulation of changes in output resulting from automatic generation control signals sent every four seconds, with a positive value for any change moving toward the automatic generation control set point and a negative value for any change moving away from the automatic generation control set point. The desired mileage in MISO's terminology is the absolute mileage of the path that actual output of the regulating resource is expected to trace in its response to the control signal. Specifically, for each 5-minute interval, MISO maps this path starting at the actual generation output level at the starting time of the 5-minute interval. The path moves toward the automatic generation control set point for the next 4 seconds (one full automatic generation control cycle later) for the resource's MW level with movement constrained by the ramp rate. The path continues one cycle at a time. The total absolute mileage of this path is the desired mileage.

NYISO evaluates the performance of a resource providing regulation mileage by a measure called a performance index, calculated for each 5-minute real-time dispatch interval. The performance index is between zero and one-hundred percent and is the remaining portion of regulation capacity in percentage terms after being subtracted by the positive control error and negative control error followed by a ten percent adder. Positive control error, a five-minute quantity, is the amount of the resource's actual output exceeding the automatic generation control set point, averaged over the five-minute interval. Similarly, the negative control error is the absolute value of the amount of the resource's actual output below the automatic generation control set point, averaged over the 5-minute interval. Both positive and negative control errors are non-negative.

PJM calculates a performance score for resources providing regulation on an hourly basis. The performance is evaluated under three different sub-categories, each with a score between zero and one. The final performance score is the weighted average of the three component scores. The hourly evaluation process compares the time sequence of the regulation resource's actual output over the hour in response to the time sequence of automatic generation control set points with the resource's ramped constrained economic dispatch base point subtracted out from the two sequences. For purposes of this explanation, the former time sequence is called the output while the latter one is called the input. PJM determines the accuracy and delay scores through a correlation calculation. PJM calculates correlation between the input time sequence that starts at the beginning of the hour and the output time sequence that starts at varying times during the hour. When the resource's output time sequence best correlates with its input time sequence, the resource's accuracy score is set to this value. The time delay start of the output time sequence that maximizes the correlation represents the time delay of the regulation resource in responding to the control signal. The longer the time delay, the lower the resource's delay score. Finally, PJM sets the precision score to 1 less the absolute difference between input and output of the same time point as a fraction of the regulation capacity, averaged over the hour.

These different approaches to calculate a resource's performance in response to a control signal may help inform future refinements to the CAISO's market design.

### **III. Historical data used to calculate the mileage multiplier have resulted in mileage requirement and system mileage multipliers that vary by operating hours**

Under the CAISO's Order 755 market design, the CAISO establishes a mileage requirement for each settlement period of the day-ahead market and real-time market.<sup>12</sup> The CAISO determines these mileage requirements based on regulation capacity requirements as well as the bid-in regulation capacity for that settlement period. Subject to operator adjustment, the mileage requirement for either regulation up or regulation down reflects the minimum of three variables:

- (a) The first variable reflects the mileage the CAISO expects from resources based on the relationship between historical awards and self-provisions of regulation capacity and mileage. The CAISO calculates the hourly system mileage multiplier<sup>13</sup> by summing the total mileage from all resources (both self-supplied and procured in the CAISO market) over the prior seven days for the given hour and dividing that number by the regulation capacity procured for the week in that hour.<sup>14</sup>
- (b) The second variable is based on the mileage the CAISO actually instructed in the prior calendar week. This variable seeks to capture an approximate requirement based on current system conditions given the time of year.
- (c) The third variable is the product of a resource-specific mileage multiplier and a resource's self-provided or bid-in regulation capacity, which number is then summed for all resources. This variable reflects the maximum mileage in either the up or down direction that the CAISO expects self-provided and bid-in regulation capacity can provide.

Figures 3 and 4 reflect the average mileage requirements across each hour of an operating day for the regulation up and regulation down during the first year of operating the CAISO's Order 755 market design.

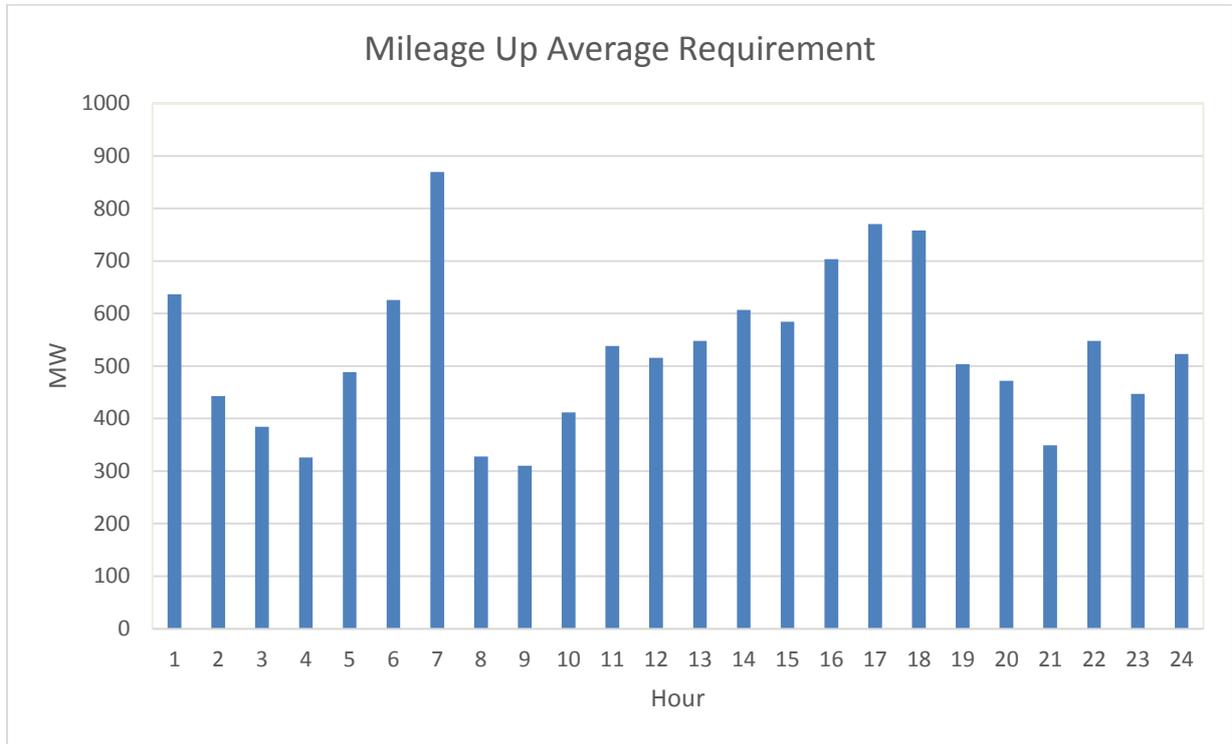
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<sup>12</sup> CAISO tariff at section 8.2.3.1.

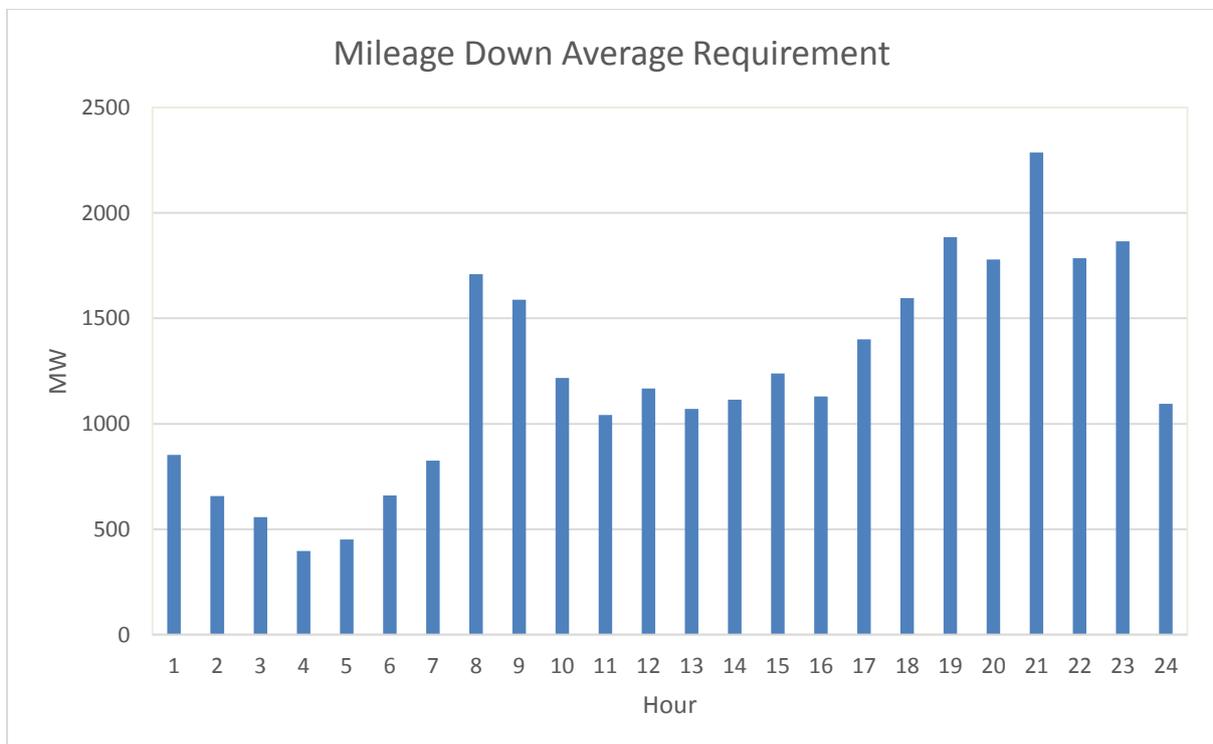
<sup>13</sup> The system mileage multiplier is defined as "a quantity reflecting expected Mileage from 1 MW of Regulation Up and Regulation Down capacity in a given hour." See Appendix A to CAISO tariff.

<sup>14</sup> CAISO tariff section 27.1.3.

**Figure 3 - Average Mileage Requirement for Regulation Up for each Operating Hour**



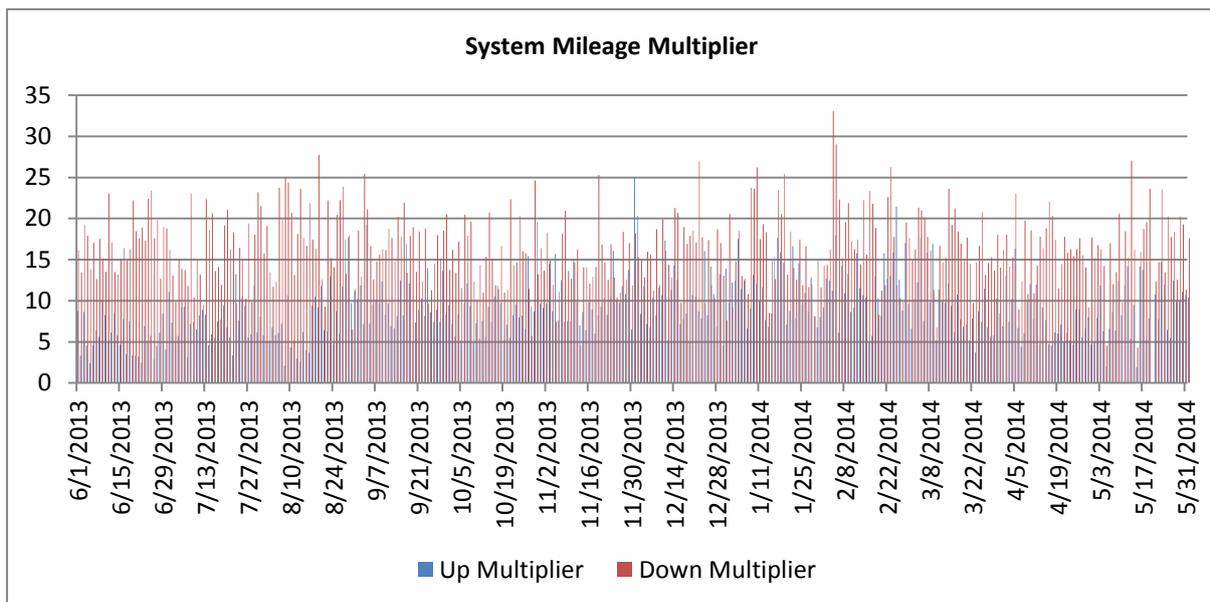
**Figure 4 - Average Mileage Requirement for Regulation Down for each Operating Hour**



As reflected in the x axis of Figure 4, the mileage requirement for regulation down is greater than the mileage requirement for regulation up. The difference likely reflects the ISO’s need for downward dispatchability between five minute real-time dispatch intervals and the fact that the real-time dispatch target is set above net load. The hour-by-hour mileage requirement in the up and down directions in total is likely a good indicator of the amount of net load fluctuations across different hours.

Figure 5 reflects the historical system mileage multipliers for regulation up and regulation down for the period June 1, 2013 through May 31, 2014. These averages suggest that the system mileage multiplier varies depending on regulation capacity requirements and system operating conditions.

**Figure 5 - System Mileage Multipliers for Regulation Up and Regulation Down**



**IV. The CAISO’s regulation capacity procurement target is set independent of mileage requirements but historical accuracy of resources can impact the level of the capacity procurement target**

Under the CAISO’s Order 755 market design, the ISO sets separate requirements for capacity and mileage. The capacity requirement informs the

market clearing price for regulation up and regulation down capacity. The mileage requirement informs the market clearing price for payments to resources providing regulation up and regulation down based on their actual performance in response to a control signal.

The CAISO establishes regulation up and regulation down capacity requirements for the CAISO system and also imposes requirements in ancillary service sub-regions. These capacity requirements reflect an hourly MW value. The CAISO calculates these capacity values based on the maximum regulation up and regulation down capacity ramping needs projected to occur in each operating hour.<sup>15</sup> The CAISO uses these values to clear bids and self-schedules for regulation up and regulation down. These values do not directly change based on the accuracy or speed of resources' response to CAISO control signals.

As explained in section III of this report, the CAISO also establishes hourly mileage requirements for regulation up and regulation down. The CAISO will relax its mileage requirement to avoid a scarcity condition for regulation up or regulation down capacity. If, however, the CAISO repeatedly does not obtain sufficient mileage from capacity that clears its market processes, the CAISO will establish a higher capacity requirement. More accurate and faster resources (i.e. resources with higher resource-specific mileage multipliers) can help mitigate the need for the CAISO to procure additional regulation up or regulation down capacity to meet the mileage requirements. In this way, the CAISO's Order 755 market design can inform the CAISO's determination of capacity requirements for regulation up and regulation down.

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<sup>15</sup> These ramps are already increasing as a result of the CAISO integrating variable energy resources on its system and create challenges for the CAISO to meet control performance standards.

**V. Average market clearing prices for regulation up and regulation down mileage have not cleared at the CAISO’s maximum mileage bid price.**

The CAISO’s Order 755 market design establishes a minimum bid price of \$0<sup>16</sup> and a maximum regulation mileage bid price of \$50.<sup>17</sup> Table 3 reflects the minimum bid price, the average bid price, the maximum bid price, and the average market clearing price for regulation up mileage. Table 4 reflects the minimum bid price, the average bid price, the maximum bid price, and the average market clearing price for regulation down mileage.

**Table 3 – Regulation Down Mileage Bid and Market Clearing Prices (\$MWh)**

Month	Minimum Bid Price	Average Bid Price	Maximum Bid Price	Average Market Clearing Price
Jun-13	0	2.14	50	0.0820
Jul-13	0	2.18	50	0.0226
Aug-13	0	1.88	50	0.0519
Sep-13	0	1.68	50	0.0507
Oct-13	0	1.79	50	0.0261
Nov-13	0	1.24	50	0.0786
Dec-13	0	0.58	12.5	0.1256
Jan-14	0	0.60	12.5	0.0497
Feb-14	0	0.63	15	0.2899
Mar-14	0	0.62	12.5	0.1350
Apr-14	0	0.66	50	0.0910
May-14	0	0.77	15	0.0550

**Table 4 –Regulation Up Mileage Bid and Market Clearing Prices (\$MWh)**

Month	Minimum Bid Price	Average Bid Price	Maximum Bid Price	Average Market Clearing Price (\$/MWh)
Jun-13	0	2.13	50	0.0294
Jul-13	0	2.16	50	0.0141
Aug-13	0	1.87	50	0.0280
Sep-13	0	1.67	50	0.0837

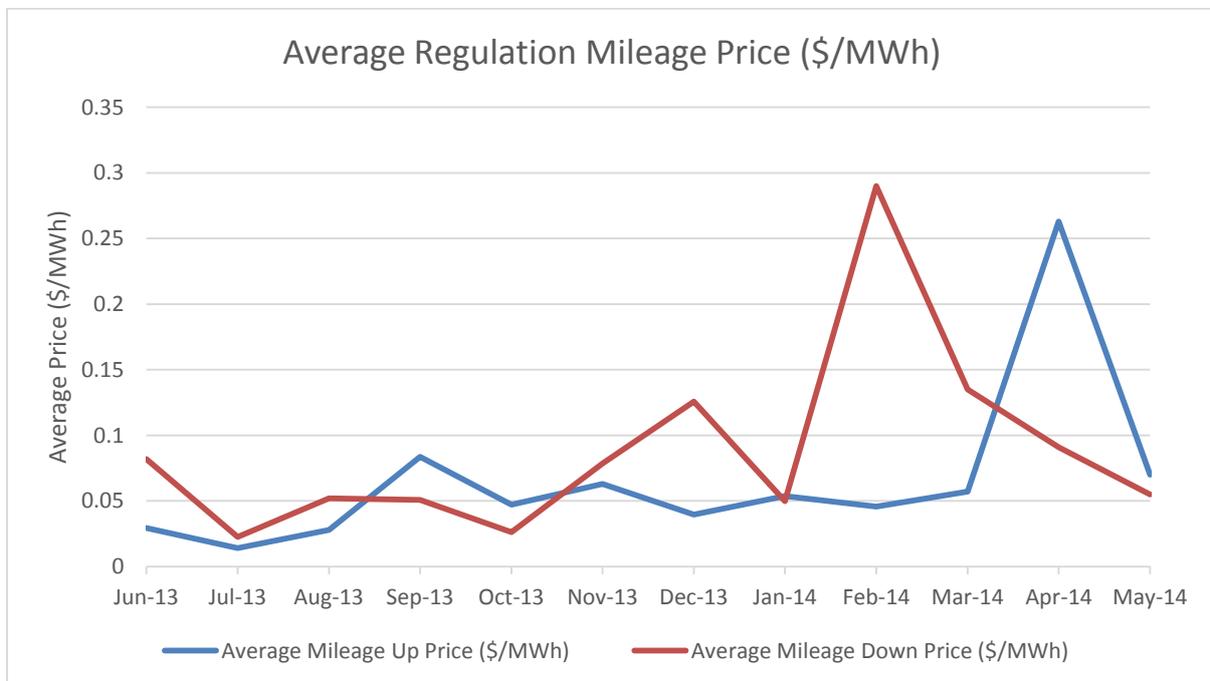
<sup>16</sup> CAISO tariff section 39.6.1.5.1.

<sup>17</sup> CAISO tariff section 39.6.1.3.1.

Oct-13	0	1.81	50	0.0471
Nov-13	0	1.25	50	0.0630
Dec-13	0	0.58	12.5	0.0397
Jan-14	0	0.60	12.5	0.0537
Feb-14	0	0.61	15	0.0456
Mar-14	0	0.61	12.5	0.0572
Apr-14	0	0.65	50	0.2630
May-14	0	0.76	15	0.0700

Figure 6 depicts the average market clearing price for regulation up and regulation down mileage in each month from June 2013 through May 2014.

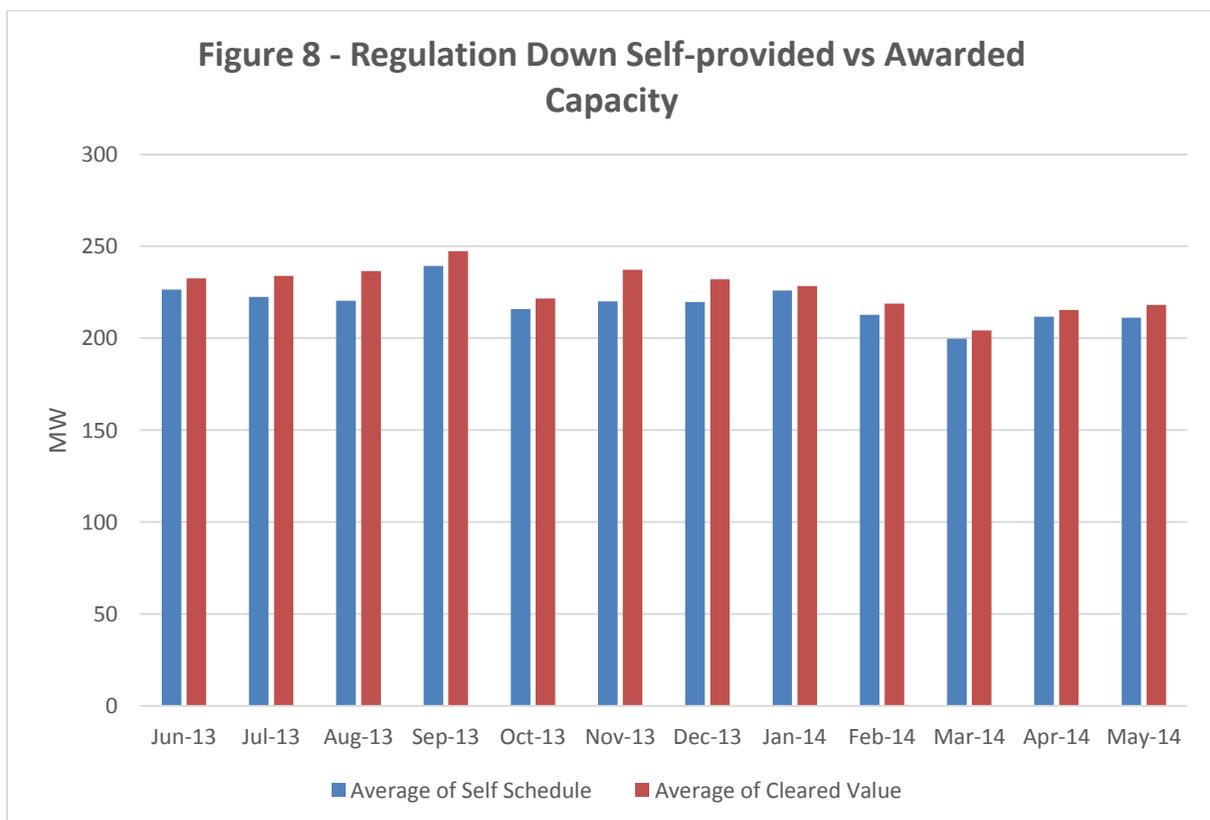
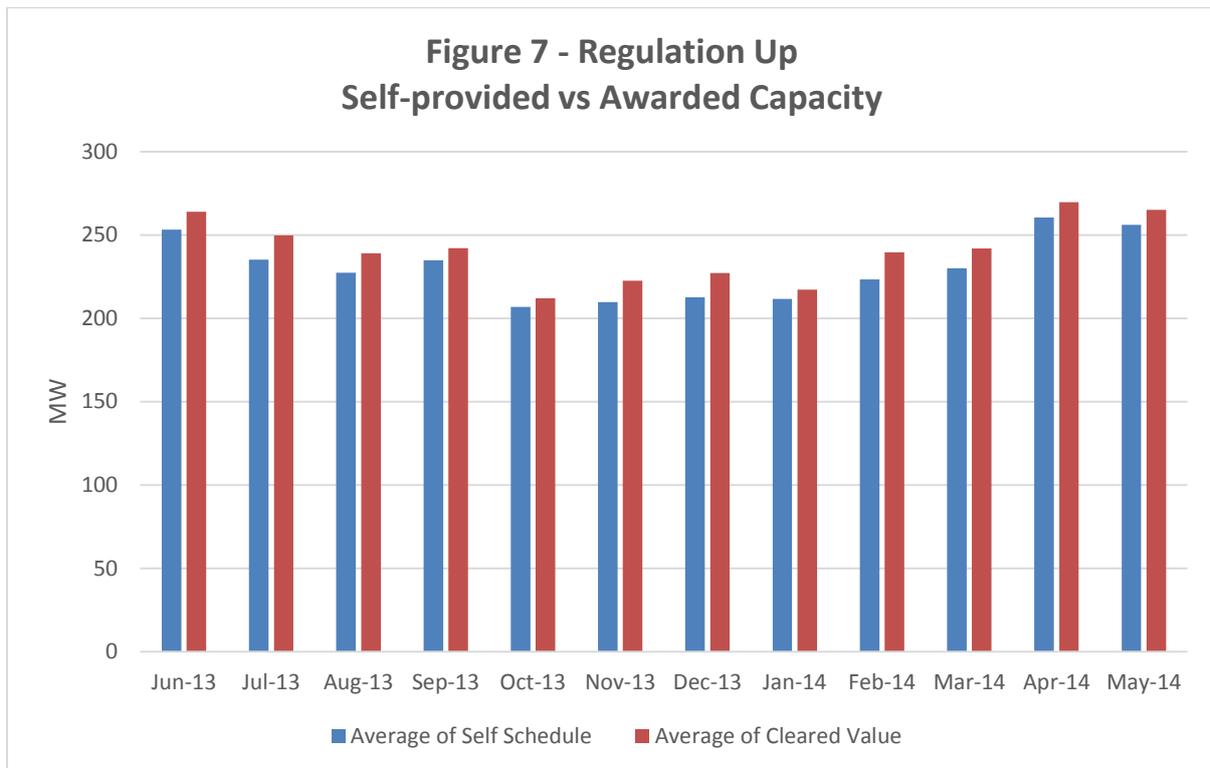
**Figure 6 7 – Average MCP for Regulation Up and Regulation Down**



In all months, the average price is well below \$1/MWh. A significant driver of this average market clearing price is the amount of regulation up and regulation down capacity self-provided by scheduling coordinators. When scheduling coordinators self-provide regulation up or regulation down capacity, the CAISO sets the mileage bid price as \$0 for that regulation capacity.<sup>18</sup> Figures 7 and 8 depict the

<sup>18</sup> CAISO tariff section 30.5.2.6.1.

amount of self-provided regulation capacity as opposed to capacity cleared through economic bids in the CAISO market from June 1, 2013 through May 31, 2014.



With respect to a mileage scarcity price, the CAISO's market design to comply with Order 755 establishes a mileage requirement in each operating hour that will not exceed the sum of each resource's specific mileage multiplier and its self-provided or bid-in regulation capacity. This design avoids mileage scarcity by never setting the mileage requirement at a level that is greater than what bid-in capacity is able to provide. In addition, this variable prevents a scarcity condition in regulation capacity from creating a scarcity condition in regulation mileage. Although the CAISO discussed developing a scarcity price for mileage during its stakeholder process to develop its Order 755 market design, the ISO ultimately determined not to include a scarcity price for mileage based on its formula to establish mileage requirements. The CAISO continues to believe that it is not necessary to adopt a scarcity pricing mechanism for mileage.

Under its Order 755 market design, the CAISO retains its existing scarcity pricing demand curves and pricing when there is an insufficient supply of regulation capacity. The CAISO's mileage requirement does not impact these demand curves for purposes of pricing regulation capacity when there is insufficient supply.

## **VI. Conclusion and Next Steps**

The CAISO plans to initiate a stakeholder process in the near future to examine refinements to its minimum performance threshold for regulation up and regulation down. The CAISO will discuss with stakeholders the need for other refinements to its Order 755 market design as part of its stakeholder initiatives catalog process this fall.

**CERTIFICATE OF SERVICE**

I hereby certify that I have served the foregoing document upon the parties listed on the official service list in the captioned proceeding, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated at Folsom, CA this 1<sup>st</sup> day of August, 2014.

*/s/ Sarah Garcia*  
Sarah Garcia