

June 3, 2015

The Honorable Kimberly D. Bose  
Secretary  
Federal Energy Regulatory Commission  
888 First Street, NE  
Washington, DC 20426

Re: **California Independent System Operator Corporation**

**Docket Nos. ER06-615-\_\_\_\_\_ and ER02-1656-\_\_\_\_\_  
Compliance Filing**

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO) submits this filing to comply with the Commission's orders issued on September 21, 2006, and June 3, 2014, in the above-referenced proceedings.<sup>1</sup> The September 2006 order imposed a variety of compliance obligations on the CAISO, including eventual further disaggregation of the load aggregation point (LAP) zones.<sup>2</sup> On June 3, 2014, the Commission rejected the CAISO's request for permanent waiver of that requirement and extended the deadline for complying with the Commission's directive to disaggregate existing LAPs in the CAISO's balancing authority area by one year.<sup>3</sup>

Although the Commission denied the request for a permanent waiver of the September 2006 requirements, it also stated that if the CAISO were to request further relief from the disaggregation requirements, the request must include specific details "to allow the Commission to reasonably evaluate the effects of implementing a greater level of disaggregation."<sup>4</sup> In compliance with both orders, the CAISO provides the details requested by the Commission and requests that the Commission accept the current number of LAPs as just and reasonable based on the study results and information provide in this compliance filing. The CAISO study indicates minimal price dispersion

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<sup>1</sup> *Cal. Indep. Sys. Operator Corp.*, 147 FERC ¶ 61,181 (2014) (June 2014 order); *Cal. Indep. Sys. Operator Corp.*, 116 FERC ¶ 61,274 (2006) (September 2006 order).

<sup>2</sup> Capitalized terms not otherwise defined herein have the meanings set forth in the CAISO tariff.

<sup>3</sup> In the September 21 order, the Commission conditionally accepted for filing the CAISO's proposed tariff necessary to implement its new market design. The key elements of the new design were adding a day-ahead Integrated Forward Market to the Real-Time Market and shifting from a zonal to a nodal market. The new design was referred to as the Market Redesign and Technology Upgrade (MRTU)

<sup>4</sup> June 2014 order, at P 20.

among the load nodes in the CAISO system, and thus minimal benefit from pursuing further load disaggregation. Additionally, the CAISO foresees significant implementation costs from load settlement disaggregation that would far outweigh the foreseeable benefits. Accordingly, the CAISO requests that the Commission find the CAISO to have met its obligations arising from the September 2006 order.

## I. Background

The CAISO clears and settles all CAISO load at LAPs, which are aggregations of individual pricing nodes. The CAISO clears and settles the majority of load at one of the Default LAPs, which correspond to the service territories of Pacific Gas and Electric Co. (PG&E), Southern California Edison Co. (SCE), San Diego Gas and Electric Co. (SDG&E), and the Valley Electric Authority (VEA).<sup>5</sup> For each Default LAP, the CAISO calculates a zonal locational marginal price based on the distribution of system load at the constituent pricing nodes within the applicable Default LAP. The CAISO determines the Default LAP prices by the effectiveness of the load within the default load aggregation point in relieving a transmission constraint.<sup>6</sup> The CAISO settles a scheduling coordinator's load at the applicable locational marginal price for the Default LAP in which that load is located.<sup>7</sup> In addition to the Default LAPs, the CAISO also settles some load at Custom LAPs, which are specially designed LAPs ranging in size from a single node to a sub-LAP. The CAISO makes Custom LAPs available for settlement of certain types of load such as proxy demand resources and station power under the CAISO's Station Power Protocol.<sup>8</sup>

In justifying its new market structure (*i.e.*, the Market Redesign and Technology Upgrade or "MRTU"), the CAISO explained that settling load at the Default LAPs would protect consumers in load pockets from high nodal prices and ensure that most consumers pay an average zonal price for energy regardless of their location on the grid.<sup>9</sup> The CAISO further explained that such approach was consistent with retail rate

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<sup>5</sup> The CAISO Tariff defines the term "Default LAP" as the "TAC Area at which all Bids for Demand shall be submitted and settled . . . ." The "TAC Areas" are in turn defined in Section 3 of Schedule 3 of Appendix F. At the start of the CAISO's new market in 2009, there were three Default LAPs, which corresponded to the service territories of the three major California investor-owned utilities. With the integration of Valley Electric Association into the CAISO grid as a participating transmission owner in 2013, the CAISO created a fourth Default LAP corresponding to Valley Electric's service territory.

<sup>6</sup> See CAISO Tariff Section 27.2.2. Prior to the Commission's approval of modifications to that tariff section in a letter order issued April 3, 2013 in Docket No. ER13-957, the ISO's pricing for load aggregation points was based on a weighted average of the nodal prices within the default load aggregation point.

<sup>7</sup> See, *e.g.*, ISO tariff section 11.2.1.2.

<sup>8</sup> CAISO Tariff, Appendix I, Section 5.

<sup>9</sup> September 2006 order at PP 595-96.

design in the CAISO balancing authority area. The retail rate structure for most of California, as determined by the California Public Utilities Commission (CPUC), was and continues to be an average rate across the three investor-owned utilities. Therefore, the retail rate does not reflect any locational price differences within the load serving entity service territories.

The Commission's consideration of the CAISO's MRTU proposal extended across a multitude of CAISO filings and Commission orders. Throughout the process, the Commission expressed some concern regarding the CAISO's proposal to settle most load at the highly aggregated Default LAPs.<sup>10</sup> In the September 2006 order, however, the Commission approved, on a time-limited basis, the CAISO's proposal to settle load in this manner, finding that it was "a reasonable and simplified approach" that provided "an acceptable starting point."<sup>11</sup> The Commission stated that "consistent with the Commission's prior guidance, we direct the CAISO to increase the number of LAP zones for [MRTU] Release 2,"<sup>12</sup> which was expected to be within the first three years of the new market's operation.<sup>13</sup> The stated basis of this requirement was the Commission's belief "that increasing the number of LAP zones will provide more accurate price signals and assist participants in the hedging of congestion charges."

In 2011, the CAISO requested an extension of time, until the fourth quarter of 2014, to increase the number of Default LAPs. The CAISO explained that, based on its analysis of locational pricing trends during the first 16 months of the new market design and in anticipation of market enhancements likely to alter pricing trends, insufficient data existed to support disaggregating the Default LAPs. The CAISO further explained that the stakeholder process revealed a nearly unanimous consensus opposing disaggregation of the Default LAPs based, in part, on the value of forging greater alignment between the respective designs of the retail rate market and the wholesale market. The Commission granted the CAISO request.<sup>14</sup>

In 2014, the CAISO requested a permanent waiver of the load disaggregation requirement. The CAISO presented analysis showing that the costs of disaggregation

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<sup>10</sup> 112 FERC ¶ 61,310, PP 16-19 (2005) (September 2005 order); 112 FERC ¶ 61,013, P 36 (2005) (July 2005 order) ("We encourage the CAISO to consider an eventual move to nodal demand pricing, but we will accept zonal demand pricing. There are many advantages to full nodal pricing"); *California Independent System Operator Corp.*, 105 FERC ¶ 61,140, P 65 (2003) (October 2003 order)

<sup>11</sup> September 2006 order at P 611.

<sup>12</sup> *Id.*

<sup>13</sup> When the CAISO filed the tariff language to enable its new market design, it explained that software limitations prevented it from including all of the market design features it wished to include when the new market went live. It stated that within three years of market operations it intended to implement "MRTU Release 2," which would include a variety of market design refinements.

<sup>14</sup> *California Independent System Operator Corp.*, 136 FERC ¶ 61,055, at P 15 (2011) (July 2011 order).

were likely to outweigh significantly the benefits. The CAISO further explained that there was broad and strong stakeholder support for the waiver request. Finally, the CAISO noted that it would initiate a new stakeholder process to consider further disaggregation if changed circumstances warranted reconsideration. The Commission rejected the CAISO request, finding that the CAISO did not meet the Commission's waiver criteria.<sup>15</sup> It also noted that the CAISO request was not sufficiently supported. The Commission found that the CAISO analysis did not, among other things, address sufficiently how the observed price differences would impact market outcomes, substantiate the metrics used in the analysis, or analyze the entire CAISO footprint.<sup>16</sup> The Commission nevertheless recognized that the CAISO raised legitimate concerns about the feasibility of complying by the then-pending October 1, 2014, disaggregation deadline. The Commission accordingly granted the CAISO a one-year extension for compliance and offered that:

should CAISO seek further relief from the disaggregation requirement, any such request must include an analysis with sufficient detail to allow the Commission to reasonably evaluate the effects of implementing a greater level of disaggregation. To the extent that CAISO uses a study like the Pricing Study to support its request, it should include additional information or changes such as the following:

- (1) A detailed description of the underlying data used, such as daily prices at individual sub-LAPs, or daily price differences between scenarios;
- (2) An analysis of a reasonable range of different alternative levels of disaggregation;
- (3) Focused discussion on those areas exhibiting the largest price differences;
- (4) Properly supported estimates of implementation costs for different levels of disaggregation with complete explanations of the methodology and assumptions that led to those estimates; and
- (5) Analysis of the entire CAISO footprint (including SDG&E).<sup>17</sup>

## **II. Explanation of CAISO Load Disaggregation Study**

In response to the June 2014 order, the CAISO conducted a fully nodal pricing study incorporating the five elements the Commission identified in the order. To evaluate the projected market impacts of load disaggregation, the CAISO study evaluated three distinct elements: (1) day-ahead nodal pricing trends and price divergence patterns between Default LAPs and individual load nodes; (2) implementation costs of various levels of disaggregation; and (3) benefits of fully nodal

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<sup>15</sup> *California Independent System Operator Corp.*, 147 FERC ¶ 61,181, at P 17 (2014) (June 2014 order).

<sup>16</sup> *Id.* at P 18.

<sup>17</sup> *Id.* at P 20.

disaggregation, given the observed spatial price dispersion.<sup>18</sup> The CAISO conducted its pricing study in conjunction with a stakeholder process.

## **A. Price Dispersion Analysis**

The CAISO conducted a four-part fully nodal spatial price dispersion analysis, analyzing hourly energy prices from the day-ahead market for the period of January 1, 2011 through November 14, 2014.<sup>19</sup> With the exception of the Greater Fresno Area,<sup>20</sup> no part of the analysis suggested a feasible level of load settlement disaggregation short of fully nodal load settlement. Also, the results show that, given the de minimis level of price dispersion there is no compelling basis for nodal disaggregation. Further, the implementation costs of modal disaggregation are significant and outweigh the inconsequential benefits.

### **1. Simple Average Nodal Price Analysis**

The CAISO first reviewed the simple average nodal price at each load node during the review period.<sup>21</sup> The simple average price at each load node can reflect: (1) spatial variation across the system of average prices; and (2) areas where groups of nodal prices have tended to be higher or lower than other nodal prices. The CAISO analyzed pricing trends geographically and temporally to identify contiguous regions that it could use to define more granular zones and to ascertain an expectation of continued persistence of any significant pricing trends. The data indicated that prices at load nodes tended to fall in a relatively narrow range, with 90 percent of those average prices falling between \$44/MWh and \$35/MWh.<sup>22</sup> With the exception of the Greater Fresno Area, discussed in more detail below, the load nodes with particularly high or low average prices were dispersed throughout the three major Default LAPs rather than

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<sup>18</sup> Significant additional detail regarding the CAISO study is included in the Load Granularity Refinements Draft Final Proposal, available at: [http://www.caiso.com/Documents/DraftFinalProposal\\_LoadGranularityRefinements.pdf](http://www.caiso.com/Documents/DraftFinalProposal_LoadGranularityRefinements.pdf).

<sup>19</sup> The CAISO used day-ahead prices rather than real-time market prices because: 1) the ISO generally schedules over 95 percent of real time load in the day-ahead market, and 2) the day-ahead market is the only market into which load is bid. Studying real-time prices would have increased the volume of data by a factor of 12 (12 five-minute intervals per hour in the real-time market vs. one 60-minute interval for the day-ahead market) while unlikely to add meaningful analytic value.

<sup>20</sup> The Greater Fresno Area is defined as Fresno, Madera, Merced, Mariposa, and Kings Counties.

<sup>21</sup> The CAISO used a simple average price at each node rather than a load-weighted average because the load distribution factor at a given node does not significantly change from one hour to the next. A load weighted average nodal price, with the same weight each hour, would be the same as the un-weighted average price. Consequently, the study results would not have changed significantly had the CAISO tried to account for this additional complexity.

<sup>22</sup> Draft Final Proposal at 8.

being concentrated in one, and the average price variation across the system was relatively stable from year-to-year. The fact that the few “outlier” nodes were dispersed widely throughout the Default LAPs suggests that it would be difficult to define more disaggregated load settlement areas short of fully nodal disaggregation. The stability from year-to-year suggests that the results are durable.

## **2. Comparison of Nodal Prices to Default LAP Prices.**

The CAISO then analyzed the relative amount of load served at nodes with prices close to the Default LAP price as compared to the amount of load served at nodes with significantly different prices from the Default LAPs. Analyzing these differences can reflect the extent to which load within each Default LAP is currently settled at a lower/higher average Default LAP price relative to the nodal price. Overall, most of the day-ahead CAISO load during the study period was located at nodes with hourly LMPs within \$2/MWh of the hourly Default LAP LMP. In PG&E, SCE, SDG&E, and VEA, 85 percent, 89 percent, 94 percent, and 98 percent, respectively, of the day-ahead load during the study period was located at nodes with prices that were within \$2 of the Default LAP price.<sup>23</sup> These results demonstrate that the majority of load is located at nodes with nodal LMPs close to the Default LAP LMPs. Therefore, load serving entities are not paying materially higher or lower average prices at the currently defined Default LAPs than they would under a fully nodal market. If the prices that load serving entities would pay would not be significantly changed with even fully nodal disaggregation, then it is questionable as to whether the incentives that load serving entities face from the CAISO energy markets would change in any meaningful way.

## **3. Spatial Distribution of Nodes with Price Divergent from Default LAPs**

The CAISO also evaluated the spatial distribution of load nodes whose prices diverged significantly from the Default LAP price for at least some hours to identify any potential pricing trends that may have been weakened in previous analyses which averaged the pricing trends over the study period. The CAISO identified all load nodes in its market that experienced a nodal price that was different from the Default LAP price by more than \$25/MWh in at least one hour during the study period. The frequency and spatial distribution of these instances of high variation between the nodal and Default LAP prices can reflect the extent to which significant differences are concentrated to a few nodes or distributed among several nodes within a particular Default LAP. Any observed patterns could be instructive in considering further disaggregation of LAPs. The CAISO analysis reflects that significant price divergence events have been relatively rare and have not been concentrated at geographically adjacent load nodes.

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<sup>23</sup> *Id.* at 14.

Instead, nodes that have exhibited these price divergences have been scattered throughout the Default LAPs. Therefore, there are no contiguous regions with similar pricing trends that have been significant and persistent enough to be used in defining a more granular load aggregation point.

There were only six nodes in SCE and no nodes in VEA in which the nodal price differed from the Default LAP price by more than \$25/MWh for more than one percent of the hours.<sup>24</sup> Approximately ten percent of SDG&E nodes had over one percent of hours in which the nodal price differed from the Default LAP price by more than \$25/MWh. Importantly, the average load located at those nodes was relatively small. Approximately 18 percent of the nodes in the PG&E Default LAP had significant divergence from the Default LAP price in more than one percent of hours. However, almost 40 percent of those nodes are in the Greater Fresno Area, and the CAISO addresses the unique circumstances in that region below. Setting aside the Greater Fresno Area, the PG&E area is comparable to SDG&E with respect to the percentage of nodes that differed from the Default LAP price by more than \$25/MWh. As with the other three Default LAP areas, only in a very small percentage of the hours evaluated and at only a small percentage of the nodes did the load located at the nodes in the PG&E Default LAP show significant divergence from the Default LAP price.

These results suggest that there are no contiguous regions with similar and persistent pricing trends that would allow for a natural way to further disaggregate load settlement.

#### **4. Regression of Nodal Prices on Default LAP Prices**

Finally, the CAISO performed a regression analysis to ascertain the relationship between the nodal and Default LAP prices. The CAISO regressed day-ahead nodal prices on the Default LAP prices during the study period. In all four Default LAPs, the majority of regression results indicated that prices have moved consistently with Default LAP prices and that the average nodal LMPs were not significantly different from the average Default LAP LMPs.<sup>25</sup> Therefore the pricing signals in the nodal LMPs are also reflected in the Default LAP LMPs and no additional transparency would be realized through nodal pricing. The only meaningful exception was the Greater Fresno Area in 2014. These results suggest the price signals would not significantly differ with more granular disaggregation.

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<sup>24</sup> The \$25/MWh threshold was chosen to align with the tails ends of distribution charts included in parts of the CAISO analysis and to ensure that the analysis did not overlook pricing trends in those tail ends due to the averaging of previous analyses.

<sup>25</sup> *Id.* at 21-25.

## 5. Unique Considerations Regarding the Greater Fresno Area.

The CAISO analysis indicated that the Greater Fresno Area had higher average nodal prices that were, on average, \$3 above the Default LAP price. This pricing trend, and the price separation between the Fresno nodes and the rest of the PG&E Default LAP, suggests that the CAISO consider creating a Fresno-based Default LAP. The CAISO assessed this possibility but believes the pricing trend observed in the study is transitory and unlikely to persist over time.

The CAISO analyzed the pricing trends by year and found that the significant price separation between the Greater Fresno Area and the remainder of the PG&E Default LAP materialized in summer 2014.<sup>26</sup> The Fresno area contains several significant hydropower resources. Under normal hydrologic conditions, these units generate during the day to serve high summer load in Fresno area. Because of the current drought, however, output from these units has been at historical lows. Absent output from these resources, the CAISO has had to rely on the transmission system to serve in this area. This has resulted in congestion into the Fresno area during peak hours. This congestion produced generally higher locational marginal prices in the Greater Fresno Area. The congestion was partially relieved by dispatching the Helms pumped hydro unit, which is located within the Greater Fresno Area. However, dispatching Helms more frequently in turn requires Helms to replenish its water supply more often, thereby increasing the net load in the Greater Fresno Area during off-peak hours. Although Helms could pump in off-peak hours, doing so increases off-peak congestion.

An important additional factor is that the CAISO's 2012-2013 Transmission Plan identified reliability-driven transmission projects to address potential overload and voltage concerns in the Greater Fresno area, including the Gates-Gregg 230 kV Line.<sup>27</sup> In the 2012-2013 Transmission Planning Process, the CAISO's economic assessment of the Greater Fresno Area modeled the Gates-Gregg 230kV line as in service. This economic assessment showed that there would be no significant congestion in the Greater Fresno Area. With this expanded transmission capacity into the Greater Fresno Area, the price separation observed in 2014 is unlikely to recur at the levels it did even if poor hydrologic conditions persist.

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<sup>26</sup> The Greater Fresno periodically experienced higher prices and price separation from the Default LAP LMP in prior years as well, but the pricing trend was not persistent until the summer months of 2014.

<sup>27</sup> More details on projects identified to address concerns in the Greater Fresno area are provided in the CAISO's 2012-2013 Transmission Plan, *available at* <http://www.aiso.com/planning/Pages/TransmissionPlanning/2012-2013TransmissionPlanningProcess.aspx>



## B. Cost Estimates of Load Settlement Disaggregation

To evaluate the implementation costs of disaggregating load settlement, the CAISO requested that stakeholders provide their estimates for nine categories of implementation costs incurred under four possible levels of load settlement disaggregation. The four levels of disaggregation included: (1) slight disaggregation, such as creating two default LAPs for SCE and PG&E; (2) load aggregation to minimize error with creation of 23 Default LAPs; (3) customized LAPs for each load serving entity; and (4) fully nodal load settlement. The nine cost categories included: load forecasting; metering and telemetry; price forecasting; bidding and scheduling; settlements and billing; demand response CRR procurement and settlement; data integration and storage; and other business costs. For each cost category, the CAISO asked stakeholders to identify whether the cost would be a one-time implementation cost, capital cost, or an ongoing annual expense. Eight stakeholders provided cost estimates, representing approximately 80 percent of scheduled day-ahead load. The CAISO also developed estimates of the costs it would incur under the four scenarios.

Table 3 in the Draft Final Proposal, reproduced below, provides the combined stakeholder and CAISO cost estimates for the four disaggregation scenarios.<sup>28</sup>

	Slight Disaggregation			LAPs to minimize error			Custom LSE Specific LAPs			Fully Nodal		
	One Time costs	Capital Costs	Yearly Costs	One Time	Capital Costs	Yearly Costs	One time	Capital Costs	Yearly Costs	One time	Capital Costs	Yearly Costs
Load Forecasting	\$ 310,776	\$ 3,600,000	\$ 456,492	\$ 1,138,646	\$ 6,750,000	\$ 692,492	\$ 473,422	\$ 3,300,000	\$ 249,820	\$ 2,174,052	\$ 10,850,000	\$ 1,249,820
Metering and Telemetry	\$ 734,776	\$ 4,400,000	\$ 821,164	\$ 1,909,646	\$ 20,150,000	\$ 2,349,164	\$ 1,340,422	\$ 10,800,000	\$ 932,328	\$ 2,340,052	\$ 45,600,000	\$ 3,420,328
Price Forecasting	\$ 129,000	\$ 520,000	\$ 110,000	\$ 339,000	\$ 1,410,000	\$ 473,000	\$ 94,000	\$ 650,000	\$ 85,000	\$ 489,000	\$ 1,850,000	\$ 523,000
Bidding and Scheduling	\$ 182,500	\$ 550,000	\$ 85,164	\$ 421,000	\$ 1,532,000	\$ 230,746	\$ 337,000	\$ 650,000	\$ 171,328	\$ 911,000	\$ 2,575,000	\$ 1,028,910
Settlements and Billing	\$ 294,776	\$ 1,050,000	\$ 155,576	\$ 715,646	\$ 4,420,000	\$ 275,582	\$ 615,422	\$ 1,500,000	\$ 231,164	\$ 1,254,052	\$ 5,942,000	\$ 406,164
Demand Response	\$ 20,000	\$ 100,000	\$ 150,000	\$ 220,000	\$ 1,100,000	\$ 300,000	\$ 50,000	\$ 500,000	\$ 50,000	\$ 440,000	\$ 2,200,000	\$ 575,000
CRR Procurement/Settlement	\$ 159,000	\$ 110,000	\$ 91,740	\$ 267,810	\$ 110,000	\$ 126,746	\$ 160,810	\$ 100,000	\$ 82,328	\$ 654,900	\$ 120,000	\$ 282,328
Data Integration and Storage	\$ 233,000	\$ 700,000	\$ 112,000	\$ 977,000	\$ 2,400,000	\$ 307,000	\$ 442,000	\$ 950,000	\$ 132,000	\$ 1,283,000	\$ 6,200,000	\$ 1,506,000
Other Business Integration Costs	\$ 1,088,800	\$ 7,566,120	\$ 486,000	\$ 3,185,900	\$ 24,729,380	\$ 1,582,200	\$ 1,189,750	\$ 7,296,500	\$ 111,600	\$ 5,061,150	\$ 57,258,940	\$ 3,630,700
<b>Total</b>	<b>\$ 3,152,628</b>	<b>\$ 18,596,120</b>	<b>\$ 2,468,136</b>	<b>\$ 9,174,648</b>	<b>\$ 62,601,380</b>	<b>\$ 6,336,930</b>	<b>\$ 4,702,826</b>	<b>\$ 25,746,500</b>	<b>\$ 2,045,568</b>	<b>\$ 14,607,206</b>	<b>\$ 132,595,940</b>	<b>\$ 12,622,250</b>

## C. Benefit Estimates of Load Settlement Disaggregation

The CAISO and stakeholders identified the following potential benefits from load settlement disaggregation including: (1) increased investment incentives due to more accurate price signals; (2) improved congestion hedging opportunities; and (3) a more efficient day-ahead market.

In quantifying the benefits, the CAISO and stakeholders generally agreed that any benefit assessment should be made in light of two key factors. First, the CAISO

<sup>28</sup> Draft Final Proposal at 30. The CAISO requested that the cost estimates only include costs that would be incurred as a result of disaggregation and that they exclude any retail-side billing costs. The CAISO also iterated with the stakeholders providing the cost estimates to understanding the deeper assumptions made and costs included in the estimates. Entities providing the estimated costs noted capital costs are likely to be incurred every five to seven years as systems need to be upgraded over time.

analysis should focus on wholesale-side benefits that may be realized without regulatory changes in the retail rate structure. Retail electricity rates in California are established by the CPUC and other Local Regulatory Authorities. These retail rates do not reflect locational price differences between regions within the existing Default LAPs, and the CPUC is unlikely to make meaningful changes to this aspect of the status quo in the foreseeable future. Second, the CAISO analysis only should consider benefits that are incremental to the benefits that already can be realized through existing products and processes. A benefit should not be credited as resulting from load settlement disaggregation unless that benefit could not be realized but for further CAISO load settlement disaggregation.

**1. Quantifying Benefits – Investment Incentives Created by More Accurate Price Signals**

In theory, granular load settlement could provide investment signals for transmission, generation, and even participating load. The CAISO analysis, however, indicated that further disaggregation would not incrementally improve these signals, and that these benefits can be achieved through existing CAISO processes and procedures.

Investment in transmission projects has the potential to relieve congestion and lower price dispersion between nodes and Default LAPs. Accurate price signals can signal to potential investors where transmission is needed most. However, the CAISO's Transmission Planning Process already performs a cost benefit analysis of transmission projects using CAISO market results. Therefore, the accurate price signals are already available and being used to identify where new transmission investment is needed most. For example, although the Gates-Gregg line was primarily a reliability project, the CAISO analysis also showed that it provided public policy and economic benefits. Therefore, nodal disaggregation would provide not incremental benefit because there is no need for additional price signals to incent transmission investment. The CAISO's transmission planning process already adequately addresses this matter.<sup>29</sup>

Accurate price signals also have the potential to incent investment in generation projects, which can potentially relieve congestion and lower price dispersion. This potential benefit is unlikely to materialize, though, because the CAISO already posts nodal load LMPs on its OASIS site and settles supply based on the nodal prices. In other words nodal prices already provide signals to guide potential generation investment decisions. Therefore, there is no need for additional price signals to incent investment in generation, and nodal disaggregation would provide no incremental benefit.<sup>30</sup>

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<sup>29</sup> *Id.* at 33.

<sup>30</sup> *Id.* at 33.

Participating load and proxy demand response resources have an existing incentive to locate at higher priced nodes to maximize the value of their demand response. Accurate price signals are essential when determining if, and where, demand response resources should locate. However, participating load resources already have the option to schedule and settle at a more granular level in the current market by using Custom LAPs. Custom LAPs can be comprised of a single node to several nodes, and a participating load is scheduled and settled at the Custom LAP price. Also nodal prices already are already posted on OASIS for potential demand response providers to utilize in any economic assessment. Because existing price signals are already sufficient to incent demand response and proxy demand response resources can opt for Custom LAPs, providing load settlement disaggregation would not provide incremental benefits in terms of providing more accurate investment signals.<sup>31</sup>

## **2. Quantifying Benefits – Increased Congestion Hedging Opportunities**

More granular load settlement potentially could allow increased allocation of congestion revenue rights in the first tier of the annual allocation process. In turn, increasing released congestion revenue rights could impact the congestion revenue rights revenue adequacy. The CAISO analysis indicated that disaggregating load settlement likely would generate tangible, although relatively small, benefits by increasing load serving entities' ability to hedge against congestion. Essentially, in allocating congestion rights "sunked" to a Default LAP the process limits the allocation to whatever energy can flow to the most constrained node within the Default LAP. In theory, including fewer nodes within a Default LAP would reduce the frequency of an allocation being curtailed because a single node within the Default LAP was constrained. The CAISO estimated the foregone congestion hedge by identifying all congestion revenue rights that were nominated but not allocated in the first tier of the annual allocation process, and then valuing<sup>32</sup> the additional congestion revenue rights. The CAISO analysis identified the amount this benefit to be between \$1.08 million and \$2.75 million per year.<sup>33</sup>

In addition, the CAISO examined the impact load disaggregation may have on revenue adequacy. Revenue inadequacy occurs when the funds collected from congestion in the energy market are insufficient to meet congestion revenue rights settlement obligations. Past instances of revenue inadequacy primarily have been

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<sup>31</sup> *Id.* at 33.

<sup>32</sup> The valuation varies depending on whether the analysis values the benefit as: (1) the average monthly auction price for each season and time of use; (2) the average monthly auction price for each season and time of use, excluding negatively priced congestion revenue rights; or (3) the hourly day-ahead marginal congestion components of the source and sink nodes.

<sup>33</sup> Draft Final Proposal at 35.

driven by differences in the congestion revenue rights market model and day-ahead market model. These differences are exacerbated by releasing too many congestion revenue rights. Changes in load settlement would not improve consistency between the two network models, and therefore are unlikely to improve revenue adequacy. The CAISO notes that other efforts are ongoing to reduce the modeling inconsistencies that largely drive revenue inadequacy. Starting in the 2015 annual process, the congestion revenue rights model not only increased the enforced constraints and contingencies, but also updated the list of constraints and contingencies based on more recent information. In addition, the CAISO now applies the break-even analysis to internal paths rather than just to interties. Through the break-even analysis, the congestion revenue rights model determines the limit on constraints based on the quantity of congestion rights that could have been released and remained revenue neutral using data from the previous three years. As previously noted, load disaggregation has the potential to increase allocated congestion revenue rights, and revenue inadequacy has historically been driven by releasing too many congestion revenue rights. Furthermore, an increase in allocated congestion revenue rights may decrease congestion revenue rights awarded through the auction. This in turn would decrease auction revenues used to fund the balancing account. Therefore, load disaggregation potentially could increase, rather than decrease, revenue inadequacy because of the need to settle more congestion revenue rights and the potential decrease in the auction revenues that are used to fund the CRR balancing account. Therefore, nodal disaggregation provides no incremental benefits toward reducing revenue inadequacy.<sup>34</sup>

### **3. Quantifying Benefits – More Efficient Day-Ahead Market Outcomes**

Granular load settlement also theoretically could provide a more efficient day-ahead market by ensuring that loads and resources are optimized at a more precise level. Currently, in the day-ahead market the optimization may have to adjust load to solve a constraint. When load is adjusted, it is adjusted at the Default LAP level, which means that all nodes within the Default LAP move up or down in lockstep according to their load distribution factors until the constraint is solved. If the Default LAPs were disaggregated, then in theory the optimization may be able to adjust load at an individual node by a fraction of the amount to solve the constraint.

However, virtual bidding already in large part provides the theoretical benefit of more fine-tuned load adjustments. Virtual supply bids submitted in the day-ahead market can provide the market optimization with a more efficient way to solve constraints. Currently, a market participant can submit a virtual supply bid at a node effective in solving a constraint. The day-ahead market can then use the virtual supply to potentially solve the constraint rather than adjusting load at the Default LAP level.

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<sup>34</sup> *Id.* at 36-37.

The extent to which virtual supply bids would be effective in providing the same benefit as disaggregated load depends on: (1) the ability and willingness of market participants to submit virtual supply bids at the effective nodes; and (2) the bid price of the virtual bid. Even if an effective virtual supply bid were submitted, depending on the bid price, it still may be less costly to adjust load at the Default LAP to solve the constraint rather than utilize the virtual supply bid at a node with a higher effectiveness factor.

Given the hours in the day-ahead market in 2014 with significant congestion where load disaggregation may have resulted in a less costly market solution, the average shadow price during hours the Default LAP bid was marginal is less than the average shadow price during hours the Default LAP bid was not marginal. This indicates that the market efficiency gained between solving a constraint by adjusting load at the Default LAP as opposed to simply adjusting supply at more granular location would be minimal. Therefore, the CAISO does not believe that nodal disaggregation would provide any incremental benefit in terms of a more efficient market outcome.<sup>35</sup>

### **III. Explanation of Compliance**

The results of the recent load disaggregation study conducted by the CAISO, reviewed by stakeholders, and evaluated by the Market Surveillance Committee, support the conclusion that the current aggregation of load settlement points is just and reasonable and that departing from the current level of aggregation is unwarranted at this time. The CAISO analysis reveals that there is minimal and largely unsystematic price dispersion in the CAISO balancing authority area. The only notable price dispersion – observed in the Greater Fresno Area – is unlikely to persist because it is due to historically atypical hydrologic conditions and is expected to be resolved by pending transmission projects. Because there has been limited price dispersion, disaggregation would result in minimal tangible market benefits. The minimal benefits need to be considered in light of the significant implementation costs identified by the CAISO. The total estimated annual benefit of \$1.08 - \$2.75 million amounts to only approximately 15 percent of the estimated annual costs of disaggregation, and that does not include covering any of the \$14.6 million in one-time implementation costs or \$132.6 million in capital costs. Accordingly, the CAISO, with the overwhelming support of its stakeholders, requests that the Commission find the CAISO has met its outstanding load settlement compliance obligations from the September 2006 order.

The June 2014 order indicated that the Commission was amenable to granting further relief if the CAISO could support its request with a study that incorporated five considerations. The CAISO's request to maintain the status quo is guided directly by a pricing study that incorporates each of these elements. The first factor the Commission mentioned was that the study should include detailed description of the underlying data.

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<sup>35</sup> *Id.* at 40.

The CAISO's draft final proposal contained extensive discussion of data used in the analysis. There has been significant transparency as to the data the CAISO used as the basis of its study. The second factor was that the study should evaluate a range of potential levels of disaggregation. As discussed above, the CAISO conducted a fully nodal pricing study, which it also used to identify other potential levels of disaggregation. Given that the pricing study results consistently indicated there was no other level of granularity, short of nodal, that could be used to create a new Default LAP, and the benefits of fully granular disaggregation were minimal, there was no other level of disaggregation for the CAISO to evaluate. The third factor was that the study should focus on areas showing the greatest price divergences. The pricing study, as well as the stakeholder process, devoted substantial attention to the Greater Fresno Area. This was the only area that showed any notable price divergences. As discussed above, the CAISO determined that the price divergences in that area are unlikely to persist. The fourth factor was the study should have support for the estimated implementation costs. Rather than relying on conjecture, the CAISO received cost estimates from eight stakeholders, representing approximately 80 percent of day-ahead scheduled load. The CAISO scrutinized stakeholders' submitted implementation costs for reasonableness and internal consistency. For example, the CAISO considered whether different stakeholders serving a similar number of customers submitted comparable cost estimates and whether cost increases and decreases seen between stakeholders that served more or fewer customers, respectively, were reasonably proportionate. Finally, the Commission noted that the analysis should cover the entire CAISO footprint. The CAISO study was robust and covered the entire CAISO footprint.

In addition to complying with all five elements the Commission identified as necessary in any request for further relief, the CAISO's retention of the current level of disaggregation is just and reasonable and not unduly discriminatory. The Commission must find that rates are just and reasonable. The CAISO's current load settlement approach is just and reasonable because it protects consumers in load pockets from high nodal LMPs and ensures that most consumers pay an average zonal price for energy regardless of their location on the grid. Protecting consumers in this way is an important aspect of recognizing that, as was the case when the CAISO's nodal market was first proposed, the transmission grid in the CAISO footprint was not built with the expectation that the system would be used to support a nodal market.

Although the Commission need not find that a proposal yields the most just rate possible and it need not consider the merits of alternative proposals,<sup>36</sup> it is also

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<sup>36</sup> *Calpine Corp. v. California Independent System Operator Corp.*, 128 FERC ¶ 61,271, P 41 (2009). See also *California Independent System Operator Corp.*, 141 FERC ¶ 61,135, P 44 (2012) ("Upon finding that CAISO's Proposal is just and reasonable, we need not consider the merits of alternative proposals."); *New England Power Co.*, 52 FERC ¶ 61,090, at 61,336 (1990), *aff'd sub nom. Town of Norwood v. FERC*, 962 F.2d 20 (D.C. Cir. 1992), *citing City of Bethany v. FERC*, 727 F.2d 1131, 1136 (D.C. Cir. 1984) (rate design proposed need not be perfect, it merely needs to be just and reasonable).

instructive in this case that the CAISO does not see any reasonable alternatives to maintaining the status quo. Although further disaggregation might theoretically provide a de minimis level of benefits, it is not reasonable to pursue a change given that the minimal benefits are outweighed by the significant cost associated with additional disaggregation. The CAISO analysis indicates that increasing the number of Default LAPs would neither be particularly effective at providing more accurate price signals nor would it provide increased opportunities for hedging congestion.

Finally, stakeholders fully support the CAISO's proposal to retain the current level of aggregation and unanimously oppose further disaggregation. Any proposal to disaggregate load aggregation points further would garner significant opposition in this or other proceedings. The overwhelming lack of evidence for the need of further disaggregation supports retaining the current level of aggregation and avoiding such controversy.

#### **IV. Stakeholder Process**

The CAISO initiated a stakeholder process in September 2014 to consider the June 2014 order and discuss the parameters of potential studies that would inform the CAISO and its stakeholders as to whether the costs of disaggregation would still likely outweigh any related benefits.<sup>37</sup> The stakeholder process proceeded with the CAISO discussing potential study design and initial results. The CAISO determined that the further study should encompass the five elements mentioned in the September 2014 order. The CAISO made multiple adjustments to its study based on stakeholder feedback and input from the Market Surveillance Committee. These adjustments included: accounting for the load currently settled at lower/higher Default LAP prices relative to the higher/lower nodal prices; creating more detailed analysis of estimated benefits of disaggregation; and incorporating greater detail on projected congestion conditions in the greater Fresno area. After posting the study results the CAISO then posted a straw proposal and draft final proposal in which the CAISO presented its proposed retention of the current load settlement methodology. This proposed approach was met with universal stakeholder support, as well as support from the Market Surveillance Committee in its written opinion.

The Market Surveillance Committee discussed the CAISO's pricing study at three Market Surveillance Committee meetings and participated in the stakeholder process. In their adopted opinion on Load Granularity Refinements, the Committee states: "Our major conclusion is that we support the ISO's recommendation against further

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<sup>37</sup> Details on the CAISO stakeholder process are available at the following link:  
<http://www.aiso.com/informed/Pages/StakeholderProcesses/LoadGranularityRefinements.aspx>

disaggregation at this time because the likely benefits are small in the near future, and are likely to be well outweighed by the reported costs of implementation.”<sup>38</sup>

The stakeholder process is summarized in the table below.

August 22, 2014	MSC Meeting discussion
September 22, 2014	Issue Paper posted
September 29, 2014	Stakeholder Meeting to discuss issue paper
October 13, 2014	Stakeholder comments on Issue Paper due
October 28, 2014	Posted paper on pricing study design
November 6, 2014	Stakeholder call to discuss pricing study design
November 20, 2014	Implementation cost data due from Stakeholders
December 15, 2014	Posted preliminary pricing study results
December 16, 2014	MSC Meeting to discuss preliminary results
January 14, 2015	Posted pricing study results paper
January 21, 2015	Stakeholder call to discuss pricing study results
January 30, 2015	Stakeholder comments on pricing study results due
February 19, 2015	MSC Meeting to discuss pricing study results
February 19, 2015	Posted Straw Proposal
March 3, 2015	Stakeholder meeting to discuss Straw Proposal
March 13, 2015	Stakeholder comments on Straw Proposal due
March 24, 2015	Post Draft Final Proposal
March 31, 2015	Stakeholder call to discuss Draft Final Proposal
April 10, 2015	Stakeholder comments on Draft Final Proposal due
May 13, 2015	Draft MSC Opinion posted
May 18, 2015	Stakeholder call to adopt MSC Opinion
May 22, 2015	Draft MSC Opinion completed

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<sup>38</sup> Market Surveillance Committee Load Granularity Refinements Opinion, at 3.



## **V. Communications**

Correspondence and other communications regarding this filing should be directed to:

Anna A. McKenna  
Assistant General Counsel  
David S. Zlotlow  
Counsel  
California Independent System  
Operator Corporation  
250 Outcropping Way  
Folsom, CA 95630  
Tel: (916) 351-4400  
Fax: (916) 608-7222  
[amckenna@caiso.com](mailto:amckenna@caiso.com)  
[dzlotlow@caiso.com](mailto:dzlotlow@caiso.com)

## **VI. Service**

The CAISO has served copies of this filing on the California Public Utilities Commission, the California Energy Commission, and all parties with Scheduling Coordinator Agreements under the CAISO tariff. In addition, the CAISO has posted a copy of the filing on the CAISO website.

## **VII. Contents of this Filing**

In addition to this transmittal letter, this filing includes the following attachments:

- |              |  |
|--------------|--|
| Attachment A | CAISO Load Granularity Refinements Draft Final Proposal, March 24, 2015.     |
| Attachment B | CAISO Market Surveillance Committee Opinion on Load Granularity Refinements. |

### **VIII. Conclusion**

For the reasons set forth in this filing, the CAISO respectfully requests that the Commission find the CAISO to have met its load settlement disaggregation obligations arising from the September 2006 order.

Respectfully submitted,

**By: /s/ David S. Zlotlow**

Roger E. Collanton

General Counsel

Anna A. McKenna

Assistant General Counsel

David S. Zlotlow

Counsel

California Independent System

Operator Corporation

250 Outcropping Way

Folsom, CA 95630

Tel: (916) 351-4400

Fax: (916) 608-7222

[dzlotlow@caiso.com](mailto:dzlotlow@caiso.com)

Counsel for the California Independent  
System Operator Corporation

ATTACHMENT A

*CAISO Load Granularity Refinements Draft Final Proposal, March 24, 2015*

ATTACHMENT B

*CAISO Market Surveillance Committee Opinion on Load Granularity Refinements*

## CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon the parties listed on the official service lists in the above-referenced proceedings, 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, California this 3<sup>rd</sup> day of June 2015.

*Anna Pascuzzo*

Anna Pascuzzo