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27. CAISO Markets and Processes

In the Day-Ahead and Real-Time time frames the CAISO operates a series of procedures and markets that together comprise the CAISO Markets Processes. In the Day-Ahead time frame, the CAISO conducts the Market Power Mitigation (MPM) process, the Integrated Forward Market (IFM) and the Residual Unit Commitment (RUC) process. In the Real-Time time frame, the CAISO does the following: 1) accepts the Economic Bids and Self-Schedules used in the Real-Time Market procedures, 2) conducts the MPM process for the RTM, 3) accepts and awards HASP Block Intertie Schedules for Energy and Ancillary Services, 4) provides HASP Advisory Schedules for Energy and Ancillary Services for Bids that do not create a HASP Block Intertie Schedule, 5) conducts the Real-Time Unit Commitment (RTUC), 6) conducts the Short-Term Unit Commitment (STUC), 7) conducts the Fifteen Minute Market (FMM), and 8) conducts the five-minute Real-Time Dispatch (RTD). As appropriate, the CAISO Markets Processes utilize transmission and Security Constrained Unit Commitment and dispatch algorithms in conjunction with a Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 to optimally commit, schedule and Dispatch resources and determine marginal prices for Energy, Ancillary Services and RUC Capacity. Congestion Revenue Rights are available and entitle holders of such instruments to a stream of hourly payments or charges associated with revenue the CAISO collects or pays from the Marginal Cost of Congestion component of hourly Day-Ahead LMPs. Through the operation of the CAISO Markets Processes the CAISO develops Day-Ahead Schedules, Day-Ahead AS Awards and RUC Schedules, HASP Block Intertie Schedules for Energy and AS Awards, HASP Advisory Schedules, FMM Energy Schedules, and FMM Ancillary Services Awards, Real-Time AS Awards and Dispatch Instructions to ensure that sufficient supply resources are available in Real-Time to balance Supply and Demand and operate in accordance with Reliability Criteria.

27.1 LMPs and Ancillary Services Marginal Prices

Through the workings of CAISO Market Processes, the CAISO produces: 1) Locational Marginal Prices as provided in Section 27.1.1 and its subparts, and as further provided in Appendix C; and 2) Ancillary Services Marginal Prices as provided below in Section 27.1.2, and its subparts.

27.1.1 Locational Marginal Prices for Energy

As further described in Appendix C, the LMP for Energy at any PNode is the marginal cost of serving the next increment of Demand at that PNode calculated by the CAISO through the operations of the CAISO Markets considering, as described further in the CAISO Tariff, among other things, modeled Transmission Constraints (including Remedial Action Schemes), transmission losses, the performance characteristics of resources, and Bids submitted by Scheduling Coordinators and as modified through the Locational Market Power Mitigation process. The LMP at any given PNode is comprised of three marginal cost components: the System Marginal Energy Cost (SMEC); Marginal Cost of Losses (MCL); and Marginal Cost of Congestion (MCC). Through the IFM the CAISO calculates LMPs for each Trading Hour of the next Trading Day. Through the FMM the CAISO calculates distinct financially binding fifteen-minute LMPs for each of the four fifteen-minute intervals within a Trading Hour. Through the Real-Time Dispatch, the CAISO calculates five-minute LMPs for each of the twelve (12) five (5) minute Dispatch Intervals of each Trading Hour. The CAISO uses the FMM or RTD LMPs for Settlements of the Real-Time Market.

27.1.1.1 System Marginal Energy Cost

The System Marginal Energy Cost (SMEC) component of the LMP reflects the marginal cost of providing Energy from a designated reference Location. For this designated reference Location the CAISO will utilize a distributed Reference Bus whose constituent PNodes are weighted in proportions referred to as Reference Bus distribution factors. The SMEC shall be the same throughout the system.

27.1.1.2 Marginal Cost Losses

For all PNodes and Aggregated PNodes in the CAISO Balancing Authority Area, including Scheduling Points, the use of the Base Market Model adjusted as described in Sections 27.5.1 and 27.5.6 in the DAM and the RTM processes incorporates Transmission Losses. At each PNode or Aggregated PNode, the Marginal Cost of Losses is the System Marginal Energy Cost multiplied by the Marginal Loss factor at that PNode or Aggregated PNode. The Marginal Cost of Losses at a Location (PNode or APNode) may be positive or negative depending on whether an increase in Demand at that Location marginally increases or decreases the cost of Transmission Losses, using the distributed Reference Bus to balance it. The Marginal Loss factors are determined through a process that calculates the sensitivities of Transmission

Losses with respect to changes in injection at each Location in the FNM. For CAISO Controlled Grid facilities outside the CAISO Balancing Authority Area, the CAISO shall assess the cost of Transmission Losses to Scheduling Coordinators using each such facility based on the quantity of losses agreed upon with the neighboring Balancing Authority multiplied by the LMP at the PNode of the Transmission Interface with the neighboring Balancing Authority Area. The MCLs calculated for Locations within the CAISO Balancing Authority Area shall not reflect the cost of Transmission Losses on those facilities.

27.1.1.3 Marginal Cost of Congestion

The Marginal Cost of Congestion at a PNode reflects a linear combination of the Shadow Prices of the binding Transmission Constraints (including Remedial Action Schemes) in the network, multiplied by the corresponding Power Transfer Distribution Factor (PTDF) and coefficient relevant to the transmission segment within that constraint, which is described in Appendix C. The Marginal Cost of Congestion for a Transmission Constraint may be positive or negative depending on whether a power injection at that Location marginally increases or decreases Congestion.

27.1.1.4 Disconnected Pricing Node or Aggregated Pricing Node

In the event that a Pricing Node or Aggregated Pricing Node becomes electrically disconnected from the market model during a CAISO Market run, the LMP, including the System Marginal Energy Cost, Marginal Cost of Congestion and Marginal Cost of Losses, at the closest electrically connected Pricing Node will be used as the LMP at the affected location. The CAISO will include the impact of the disconnected Pricing Node on any modeled Remedial Action Scheme in determining the LMP.

27.1.2 Ancillary Service Prices

27.1.2.1 Ancillary Service Marginal Prices – Sufficient Supply

As provided in Section 8.3, Ancillary Services are procured and awarded through the IFM and the FMM, and the CAISO also accepts and awards HASP Block Intertie Schedules for Ancillary Services in HASP. Ancillary Services awarded through HASP are made financially binding in the FMM. The IFM calculates hourly Day-Ahead Ancillary Service Awards and establishes Ancillary Service Marginal Prices (ASMPs) for the accepted Regulation Up, Regulation Down, Spinning Reserve and Non-Spinning Reserve Bids. The IFM co-optimizes Energy and Ancillary Services subject to resource, network and regional constraints. In the HASP, the CAISO accepts and awards Ancillary Services from HASP Block Intertie

Schedules for the next Trading Hour as described in Section 34.2. The CAISO calculates the price for the settlement of Ancillary Services accepted and awarded in HASP based on the FMM ASMP as described herein and further described in Section 34.4. The FMM process that is performed every fifteen (15) minutes establishes fifteen (15) minute Ancillary Service Schedules, Awards, and prices for the upcoming quarter of the given Trading Hour. ASMPs are determined by first calculating Shadow Prices of Ancillary Services for each Ancillary Service type and the applicable Ancillary Services Regions. The Ancillary Services Shadow Prices are produced as a result of the co-optimization of Energy and Ancillary Services through the IFM and the Real-Time Market, subject to resource, network, and requirement constraints. The Ancillary Services Shadow Prices represent the marginal cost of the relevant binding regional constraints at the optimal solution, or the reduction of the combined Energy and Ancillary Service procurement cost associated with a marginal relaxation of that constraint. If the constraint for an Ancillary Services Region is not binding, the corresponding Ancillary Services Shadow Price in the Ancillary Services Region is zero (0). During periods in which supply is sufficient, the ASMP for a particular Ancillary Service type and Ancillary Services Region is then the sum of the Ancillary Services Shadow Prices for the specific type of Ancillary Service and all the other types of Ancillary Services for which the subject Ancillary Service can substitute, as described in Section 8.2.3.5, for the given Ancillary Service Region and all the other Ancillary Service Regions that include that given Ancillary Service Region. During periods in which supply is insufficient, the ASMP for a particular Ancillary Service type and Ancillary Services Region will reflect the Scarcity Reserve Demand Curve Values set forth in Section 27.1.2.3.

27.1.2.2 Opportunity Cost in ASMP

The Ancillary Services Shadow Price, which, as described above, is a result of the Energy and Ancillary Service co-optimization, includes the foregone opportunity cost of the marginal resource, if any, for not providing Energy or other types of Ancillary Services the marginal resource is capable of providing in the relevant market. The ASMPs determined by the IFM or FMM optimization process for each resource whose Ancillary Service Bid is accepted will be no lower than the sum of (i) the Ancillary Service capacity Bid price submitted for that resource, and (ii) the foregone opportunity cost of Energy in the IFM or FMM for that resource. The foregone opportunity cost of Energy for this purpose is measured as the positive difference between the IFM or FMM LMP at the resource's Pricing Node and the resource's Energy Bid price. If the resource's Energy Bid price is higher than the LMP, the opportunity cost measured for this calculation is $0. If a resource has submitted an Ancillary Service Bid but no Energy Bid and is under an obligation to offer Energy in the Day-Ahead Market (e.g. a non-hydro Resource Adequacy Resource), its Default Energy Bid will be used, and its opportunity cost will be calculated accordingly. If a resource has submitted an Ancillary Service Bid but no Energy Bid and is not under an obligation to offer Energy in the Day-Ahead Market, its Energy opportunity cost measured for this calculation is $0 since it cannot be dispatched for Energy. For Self-Scheduled Hourly Block Bids for Ancillary Services awarded in the Real-Time Market, the opportunity cost measured for this purpose is $0 because, as provided in Section 34.2.3, the CAISO cannot Schedule Energy in the Real-Time Market from the Energy Bid under the same Resource ID as the submitted Ancillary Service Bid.

27.1.2.3 Ancillary Services Pricing – Insufficient Supply

The CAISO will develop Scarcity Reserve Demand Curves as further described in an applicable Business Practice Manual that will apply to both the Day-Ahead Market and the Real-Time Market during periods in which supply is insufficient to meet the minimum procurement requirements for Regulation Down, Non-Spinning Reserve, Spinning Reserve and Regulation Up as required by Section 8.3. The CAISO shall review the performance of the Scarcity Reserve Demand Curves and assess whether changes are necessary every three (3) years or more frequently, if the CAISO determines more frequent reviews are appropriate. When supply is insufficient to meet any of the minimum procurement requirements for Regulation Down, Non-Spinning Reserve, Spinning Reserve and Regulation Up, the Scarcity Reserve Demand Curve Values for the affected Ancillary Services, as set forth in this Section 27.1.2.3 and as reflected in the Scarcity Demand Curve Value described in Section 27.1.2.3.5, shall apply to determine the Shadow Prices of the affected Ancillary Services. ASMPs for an Ancillary Service type will not sum these Shadow Prices across Ancillary Service Regions, if there is insufficient supply for the Ancillary Service type in both the Expanded System Region and an Ancillary Service Sub-Region.

27.1.2.3.1 Regulation Down Pricing – Insufficient Supply

When the shortage of supply to meet the Regulation Down requirement in the Expanded System Region or in an Ancillary Service Sub-Region is less than or equal to thirty-two (32) MW, the Scarcity Reserve Demand Curve Value for Regulation Down shall be fifty (50) percent of the Soft Energy Bid Cap or the Hard Energy Bid Cap, as applicable based on the conditions specified in Sections 27.4.3.2 and 27.4.3.3, as specified in the tables in Section 27.1.2.3.5. When the shortage of supply to meet the Regulation Down requirement in the Expanded System Region is less than or equal to eighty-four (84) MW but greater than thirty-two (32) MW, the Scarcity Reserve Demand Curve Value for Regulation Down shall be sixty (60) percent of the Soft Energy Bid Cap of the Hard Energy Bid Cap, as applicable based on the conditions specified in Section 27.4.3.2 and 27.4.3.3, as specified in the tables in Section 27.1.2.3.5. When the shortage of supply to meet the Regulation Down requirement in the Expanded System Region is greater than eighty-four (84) MW, the Scarcity Reserve Demand Curve Value for Regulation Down shall be seventy (70) percent of the Soft Energy Bid Cap or the Hard Energy Bid Cap, as applicable based on the conditions specified in Section 27.4.3.2 and 27.4.3.3, as specified in the tables in Section 27.1.2.3.5.

27.1.2.3.2 Non-Spinning Reserve Pricing – Insufficient Supply

When the shortage of supply to meet the Non-Spinning Reserve requirement in the Expanded System Region or in an Ancillary Service Sub-Region is less than or equal to seventy (70) MW, the Scarcity Reserve Demand Curve Value for Non-Spinning Reserve shall be fifty (50) percent of the Soft Energy Bid Cap or the Hard Energy Bid Cap, as applicable based on the conditions specified in Section 27.4.3.2 and 27.4.3.3, as specified in the tables in Section 27.1.2.3.5. When the shortage of supply to meet the Non-Spinning Reserve requirement in the Expanded System Region is less than or equal to two-hundred ten (210) MW but greater than seventy (70) MW, the Scarcity Reserve Demand Curve Value for Non-Spinning Reserve shall be sixty (60) percent of the Soft Energy Bid Cap or the Hard Energy Bid Cap, as applicable based on the conditions specified in Sections 27.4.3.2 and 27.4.3.3, as specified in the tables in Section 27.1.2.3.5. When the shortage of supply to meet the Non-Spinning Reserve requirement in the Expanded System Region is greater than two-hundred ten (210) MW, the Scarcity Reserve Demand Curve Value for Non-Spinning Reserve shall be seventy (70) percent of the Soft Energy Bid Cap or the Hard Energy Bid Cap, as applicable based on the conditions specified in Section 27.4.3.2 and 27.4.3.3, as specified in the tables in Section 27.1.2.3.5.

27.1.2.3.3 Spinning Reserve Pricing – Insufficient Supply

The Scarcity Reserve Demand Curve Value for Spinning Reserve in the Expanded System Region or in an Ancillary Service Sub-Region shall be ten (10) percent of the Soft Energy Bid Cap or the Hard Energy Bid Cap, as applicable based on the conditions specified in Section 27.4.3.2 and 27.4.3.3, as specified in the tables in Section 27.1.2.3.5.

27.1.2.3.4 Regulation Up Pricing – Insufficient Supply

The Scarcity Reserve Demand Curve Value for Regulation Up in the Expanded System Region or in an Ancillary Service Sub-Region shall be twenty (20) percent of the Soft Energy Bid Cap or the Hard Energy Bid Cap, as applicable based on the conditions specified in Section 27.4.3.2 and 27.4.3.3, as specified in Section 27.1.2.3.5.

27.1.2.3.5 Scarcity Demand Curve Value Tables

Scarcity Demand Curve Value ($/MWh) When Energy Pricing Parameters based on Soft Energy Bid Cap as Specified In Section 27.4.3.2				
	Percent of Soft Energy Bid Cap			
Reserve	**Expanded System Region**	**System Region and Sub-Region**	**Expanded System Region**	**System Region and Sub-Region**
Regulation Up	20%	20%	$200	$200
Spinning	10%	10%	$100	$100
Non-Spinning Shortage > 210 MW	70%	70%	$700	$700
Non-Spinning Shortage > 70 & ≤ 210 MW	60%	60%	$600	$600
Non-Spinning Shortage ≤ 70 MW	50%	50%	$500	$500
Upward Sum	**100%**	**100%**	**$1000**	**$1000**
Regulation Down Shortage > 84 MW	70%	70%	$700	$700
Regulation Down Shortage > 32 & ≤ 84 MW	60%	60%	$600	$600
Regulation Down Shortage ≤ 32 MW	50%	50%	$500	$500

Scarcity Demand Curve Value ($/MWh) When Energy Pricing Parameters based on Hard Energy Bid Cap as Specified In Section 27.4.3.3				
	Percent of Hard Energy Bid Cap			
Reserve	**Expanded**	**System Region**	**Expanded**	**System Region**

	System Region	and Sub-Region	System Region	and Sub-Region
Regulation Up	20%	20%	$400	$400
Spinning	10%	10%	$200	$200
Non-Spinning Shortage > 210 MW	70%	70%	$1,400	$1,400
Non-Spinning Shortage > 70 & ≤ 210 MW	60%	60%	$1,200	$1,200
Non-Spinning Shortage ≤ 70 MW	50%	50%	$1,000	$1,000
Upward Sum	**100%**	**100%**	**$2,000**	**$2,000**
Regulation Down Shortage > 84 MW	70%	70%	$1,400	$1,400
Regulation Down Shortage > 32 & ≤ 84 MW	60%	60%	$1,200	$1,200
Regulation Down Shortage ≤ 32 MW	50%	50%	$1,000	$1,000

27.1.2.4 Opportunity Cost in LMPs for Energy

In the event that there is insufficient supply to meet an Ancillary Services procurement requirement in a particular Ancillary Service Region or Sub-Region, the Ancillary Services Shadow Prices will rise automatically to the Scarcity Reserve Demand Curve Values in that Ancillary Service Region or Sub-Region. LMPs for Energy will reflect the forgone opportunity cost of the marginal resource, if any, for not providing the scarce Ancillary Services consistent with the CAISO's co-optimization design.

27.1.3 Regulation Mileage Clearing Price

As provided in Section 8.3, Regulation Up and Regulation Down are procured and awarded through the Day Ahead Market and Real-Time Market. The CAISO will calculate uniform Mileage clearing prices for Regulation Up and Regulation Down, respectively, based on the intersection of the demand curve for Mileage requirements and supply curve for Bid-in Mileage. These uniform Mileage clearing prices shall apply to the CAISO Expanded System Region.

The CAISO will calculate a System Mileage Multiplier for Regulation Up by summing the total Mileage provided by all resources with Regulation Up awards each week for a corresponding hour of each Trading Day and then dividing that sum by the Regulation Up capacity procured for that week in that same hour. The CAISO will calculate a System Mileage Multiplier for Regulation Down by summing the total Mileage provided by all resources with Regulation Down awards each week for a corresponding hour of each Trading Day and then dividing that sum by the Regulation Down capacity procured for that week in that same hour. For purposes of these calculations, the CAISO shall calculate each week using a rolling seven-day period. The CAISO will use the System Mileage Multiplier to assess Mileage requirements for Regulation Up and Regulation Down capacity.

The CAISO will calculate resource specific Mileage multipliers and apply these multipliers to resources' Bid-in Regulation Up and Regulation Down capacity. The resource specific Mileage multipliers will reflect resources' Historic Regulation Performance Accuracy and certified 10-minute ramp capability. The CAISO will apply resource specific Mileage multipliers to Bid-in Regulation Up and Regulation Down capacity to determine the expected Mileage. In the event that an existing certified resource has not provided Regulation over the prior thirty (30) days, the CAISO will use the resource's last Historic Regulation Performance Accuracy as an adjustment factor. For newly certified or recertified resources, the CAISO will use the simple average Historic Regulation Performance Accuracy for all resources from the prior thirty (30) days as an initial adjustment factor. Upon request, the CAISO will provide a resource with historical data used to derive its Mileage multipliers. A resource will receive a Mileage award that is at least as much as its self-provided or awarded Regulation Up or Regulation Down capacity, but not more than the product of its resource specific mileage multiplier and its self-provided or awarded capacity. The CAISO may adjust resource specific Mileage multipliers to align a resource's awarded Mileage with the resource's expected Mileage. The CAISO will use Mileage awards to determine a uniform clearing mileage price for Regulation Up and Regulation Down, but the Mileage quantity awards will not be financially binding. Resources will receive payments based upon Instructed Mileage as calculated pursuant to Section 11.10.1.7. The CAISO will publish on OASIS the Mileage clearing prices for each hour of the Day-Ahead Market and each fifteen (15) minute period in Real-Time for the Trading Day.

27.2 Load Aggregation Points (LAP)

The CAISO shall create Load Aggregation Points and shall maintain Default LAPs at which all Demand shall Bid and be settled, except as provided in Sections 27.2.1 and 30.5.3.2.

27.2.1 Metered Subsystems

The CAISO shall define specific MSS LAPs for each MSS. The MSS LAP shall be made up of the PNodes within the MSS that have Load served off of those Nodes. The MSS LAPs have unique Load Distribution Factors that reflect the distribution of the MSS Demand to the network Nodes within the MSS. These MSS LAPs are separate from the Default LAPs, and the Load Distribution Factors of the Default LAP do not reflect any MSS Load. As further provided in Sections 11.2.3 and 11.5, MSS Demand is settled either at the price at the Default LAP for MSS Operators that have selected gross Settlement or at the price at the applicable MSS LAP for MSS Operators that have selected net Settlement.

27.2.2 Determination of LAP Prices

27.2.2.1 IFM LAP Prices

The IFM LAP Price for Settlement of Demand at any LAP for a given Trading Hour is the price as produced by the IFM optimization run based on the distribution of system Load at the constituent Pricing Nodes within the applicable LAP and is determined by the effectiveness of the Load within the LAP in relieving a Transmission Constraint within the effectiveness threshold as specified in Section 27.4.3.6.

27.2.2.2 Real-Time Market LAP Prices

The FMM LAP Price and RTD LAP Price for a fifteen-minute FMM interval and five minute Dispatch Interval is the price as produced by the FMM and RTD optimization runs, respectively, based on the distribution of system Load at the constituent Pricing Nodes within the applicable LAP and is determined by the effectiveness of the Load within the LAP in relieving a Transmission Constraint within the effectiveness threshold as specified in Section 27.4.3.6. The Hourly Real-Time LAP Price is then determined for Settlement purposes as further described in Section 11.5.2.2.

27.3 Trading Hubs

The CAISO shall create and maintain Trading Hubs, including Existing Zone Generation Trading Hubs, to facilitate bilateral Energy transactions in the CAISO Balancing Authority Area. Each Trading Hub will be based on a pre-defined set of PNodes. The CAISO Market run will produce a Trading Hub price for each Settlement Period or Settlement Interval that is derived from the CAISO Market optimization based on the effectiveness of the Trading Hub aggregation in relieving congestion. The Trading Hub price will reflect congestion on Transmission Constraints whose effectiveness factor for the respective Trading Hub is greater than the effectiveness threshold specified in Section 27.4.3.6. There are three Existing Zone

Generation Trading Hubs, which correspond geographically to the three Existing Zones. Each Existing Zone Generation Trading Hub is comprised of an aggregation of PNodes for Generating Units within the corresponding Existing Zone. The specification of seasons will be identical to the seasons used in the annual CRR Allocation, and the annual calculation of Existing Zone Generation Trading Hub weights will be performed in a timely manner to be coordinated with the annual CRR Allocation and CRR Auction processes.

27.4 Optimization in the CAISO Market Processes

The CAISO runs the Day-Ahead Market and Real-Time Market and their component CAISO Markets Processes utilizing a set of integrated optimization programs, including SCUC and SCED.

27.4.1 Security Constrained Unit Commitment

The CAISO uses SCUC to run the MPM process associated with the DAM and the RTM. SCUC is conducted over multiple varying intervals to commit and schedule resources as follows: (1) in the Day-Ahead time frame, to meet Demand reflected in Bids submitted in the Day-Ahead Market and considered in the MPM process and IFM, and to procure AS in the IFM; (2) to meet the CAISO Forecast of CAISO Demand in the RUC, HASP, STUC and FMM, and in the MPM process utilized in the HASP and RTM; and (3) to procure any incremental AS in the RTM, and (4) to procure Flexible Ramping Product in the RTM. In the Day-Ahead MPM, IFM and RUC processes, the SCUC commits resources over the twenty-four (24) hourly intervals of the next Trading Day. In the FMM, which runs every fifteen (15) minutes and commits resources for the RTM, the SCUC optimizes over a number of 15-minute intervals corresponding to the Trading Hours for which the Real-Time Markets have closed. The Trading Hours for which the Real-Time Markets have closed consist of (a) the Trading Hour in which the applicable run is conducted and (b) all the fifteen-minute intervals of the entire subsequent Trading Hour. In the HASP, which runs once per hour, the SCUC: (1) accepts and awards HASP Block Intertie Schedules for Energy and Ancillary Services, respectively; (2) provides HASP Advisory Schedules to Economic Hourly Block Bids with Intra-Hour Option that will change for economic reasons at most once in the Trading Hour; and (3) provides HASP Advisory Schedules to all other participants in the RTM. In the STUC, which runs once an hour, the SCUC commits resources over the last fifteen (15) minutes of the imminent Trading Hour and the entire next four Trading Hours. The CAISO will commit Extremely Long Start Resources, for which commitment in the DAM does not provide sufficient time to Start-Up and be available to supply Energy during the next Trading Day as provided in Section 31.7.

27.4.1.1 Timing of Unit Commitment Instructions

For the applicable market intervals of any given CAISO Markets Process, the associated SCUC optimization will typically commit resources having different Start-Up Times, not all of which need to be started up immediately upon completion of that CAISO Markets Process. The CAISO may defer issuing a Start-Up Instruction to a resource that can be started at a later time and still be available to supply Energy at the time the CAISO Markets Process indicated it would be needed. The CAISO shall re-evaluate the need to commit such resources in a subsequent CAISO Markets Process based on the most recent forecasts and other information about system conditions.

27.4.2 Security Constrained Economic Dispatch

SCED is the optimization engine used to run the RTD to determine the optimal five-minute Dispatch Instructions throughout the Trading Hour consistent with resource constraints and Transmission Constraints within the CAISO Balancing Authority Area. In any given hour, the Real-Time Economic Dispatch of the Real-Time Market runs every five (5) minutes during which the SCED produces binding Dispatch Instructions for the immediately subsequent five-minute interval. For the applicable five-minute time period, through its SCED, the CAISO produces LMPs at each PNode that are used for Settlements as described in Section 11.5.

27.4.3 CAISO Markets Scheduling and Pricing Parameters

27.4.3.1 Generally

The SCUC and SCED optimization software for the CAISO Markets utilize a set of configurable scheduling and pricing parameters to enable the software to reach a feasible solution and set appropriate prices in instances where Effective Economic Bids are not sufficient to allow a feasible solution. The scheduling parameters specify the criteria for the software to adjust Non-priced Quantities when such adjustment is necessary to reach a feasible solution. The scheduling parameters are configured so that the SCUC and SCED software will utilize Effective Economic Bids as far as possible to reach a feasible solution, and will skip Ineffective Economic Bids and perform adjustments to Non-priced Quantities pursuant to the scheduling priorities for Self-Schedules specified in Sections 31.4 and 34.12. The scheduling parameters utilized for relaxation of enforced internal and Intertie Transmission Constraints are specified in Section 27.4.3.2.1 and 27.4.3.3.1. The pricing parameters specify the criteria for establishing market prices in instances where one or more Non-priced Quantities are adjusted by the Market Clearing software. The pricing parameters are specified in Sections 27.4.3.2.2, 27.4.3.2.3, 27.4.3.2.4, 27.4.3.3.2, 27.4.3.3.3, and 27.4.3.3.4. The complete set of scheduling and pricing parameters used in all CAISO Markets is maintained in the Business Practice Manuals.

27.4.3.2 Parameters Related to Soft Energy Bid Cap

For CAISO Market intervals for which the conditions specified in Section 27.4.3.3 do not apply, the CAISO will apply the parameters specified in Sections 27.4.3.2.1 through 27.4.3.2.4, 31.4, 34.12, and the Ancillary Services Scarcity Prices in Section 27.1.2.3.5.

27.4.3.2.1 Scheduling Parameters for Transmission Constraint Relaxation

In the IFM, the enforced internal and Intertie Transmission Constraint scheduling parameter is set to $5,000 per MWh for the purpose of determining when the SCUC and SCED software in the IFM will relax an enforced Transmission Constraint rather than adjust Supply or Demand bids or Non-priced Quantities as specified in Sections 31.3.1.3, 31.4 and 34.12 to relieve Congestion on the constrained facility. This scheduling parameter is set to $1,500 per MWh for the RTM. The effect of this scheduling parameter value is that if the optimization can re-dispatch resources to relieve Congestion on a Transmission Constraint at a cost of $5,000 per MWh or less for the IFM (or $1,500 per MWh or less for the RTM), the Market Clearing software will utilize such re-dispatch, but if the cost exceeds $5,000 per MWh in the IFM (or $1,500 per MWh for the RTM) the market software will relax the Transmission Constraint. The corresponding scheduling parameter in RUC is set to $1,250 per MWh.

27.4.3.2,2 Pricing Parameters for Transmission Constraint Relaxation

For the purpose of determining how the relaxation of a Transmission Constraint will affect the determination of prices in the IFM and RTM, the pricing parameter of the Transmission Constraint being relaxed is set to the Soft Energy Bid Cap. In the case of Contingency-related Transmission Constraints, the CAISO will determine the amount of relaxation required to clear the market using the most limiting condition among the applicable Contingencies and the base case. The CAISO will establish prices based on the parameter pricing specified in this Section as it applies to the most limiting Contingency and base case. The corresponding pricing parameter used in the RUC is set at the maximum RUC Availability Bid price specified in Section 39.6.1.2.

27.4.3.2.3 Insufficient Supply to Meet Self-Schedule Demand in IFM

In the IFM, when available supply is insufficient to meet all self-scheduled Demand, self-scheduled Demand is reduced to the point where the available supply is sufficient to clear the market. For price-setting purposes in such cases, the cleared self-scheduled Demand is deemed to be willing to pay the Soft Energy Bid Cap price.

27.4.3.2.4 Insufficient Supply to Meet CAISO Forecast of CAISO Demand in the RTM

In the RTM, in the event that Energy offers are insufficient to meet the CAISO Forecast of CAISO Demand, the SCUC and SCED software will relax the system energy-balance constraint. In such cases the software utilizes a pricing parameter set to the Soft Energy Bid Cap for price-setting purposes.

27.4.3.3 Parameters Related to Hard Energy Bid Cap

(a) **Integrated Forward Market and Real-Time Market.** The scheduling and pricing parameters in Sections 27.4.3.3.1 through 27.4.3.3.4, 31.4, and 34.12 will apply for all Trading Hours of the IFM and Real-Time Market for the same Trading Day if the CAISO has accepted a Bid with an Energy Bid price that exceeds the Soft Energy Bid Cap pursuant to Section 30.7.12, or the Maximum Import Bid Price exceeds the Soft Energy Bid Cap for any Trading Hour of the IFM.

(b) **Real-Time Market Only.** If the CAISO has not accepted a Bid with an Energy Bid price that exceeds the Soft Energy Bid Cap pursuant to Section 30.7.12, or the Maximum Import Bid Price does not exceed the Soft Energy Bid Cap for any Trading Hour of the IFM for the same Trading Day, the parameters in Sections 27.4.3.3.1 through 27.4.3.3.4, 31.4, and 34.12 will apply

(i) in any Trading Hour of the Real-Time Market for which the CAISO has accepted a Bid with an Energy Bid price that exceeds the Soft Energy Bid Cap pursuant to Section 30.7.12, or the Maximum Import Bid Price exceeds the Soft Energy Bid Cap; and

(ii) for all intervals of the applicable Real-Time Market run for which these conditions apply in at least one interval of the applicable market run.

27.4.3.3.1 Scheduling Parameters for Transmission Constraint Relaxation

In the IFM, the enforced internal and Intertie Transmission Constraint scheduling parameter is set to $10,000 per MWh for the purpose of determining when the SCUC and SCED software in the IFM will relax an enforced Transmission Constraint rather than adjust Supply or Demand bids or Non-priced Quantities as specified in Sections 31.3.1.3, 31.4 and 34.12 to relieve Congestion on the constrained facility. This scheduling parameter is set to $3,000 per MWh for the RTM. The effect of this scheduling parameter value is that if the optimization can re-dispatch resources to relieve Congestion on a Transmission Constraint at a cost of $10,000 per MWh or less for the IFM (or $3,000 per MWh or less for the RTM), the Market Clearing software will utilize such re-dispatch, but if the cost exceeds $10,000 per MWh in the IFM (or $3,000 per MWh for the RTM) the market software will relax the Transmission Constraint. The corresponding scheduling parameter in RUC is set to $1,250 per MWh.

27.4.3.3.2 Pricing Parameters for Transmission Constraint Relaxation

In the case of Contingency-related Transmission Constraints, the CAISO will determine the amount of relaxation required to clear the market using the most limiting condition among the applicable Contingencies and the base case. The CAISO will establish prices based on the parameter pricing specified in this Section as it applies to the most limiting Contingency and base case. The corresponding pricing parameter used in the RUC is set at the maximum RUC Availability Bid price specified in Section 39.6.1.2.

27.4.3.3.3 Insufficient Supply to Meet Self-Schedule Demand in IFM

In the IFM, when available supply is insufficient to meet all self-scheduled Demand, self-scheduled Demand is reduced to the point where the available supply is sufficient to clear the market. For price-setting purposes in such cases, the cleared self-scheduled Demand is deemed to be willing to pay the Hard Energy Bid Cap price.

27.4.3.3.4 Insufficient Supply to Meet CAISO Forecast of CAISO Demand in the RTM

In the RTM, in the event that Energy offers are insufficient to meet the CAISO Forecast of CAISO Demand, the SCUC and SCED software will relax the system energy-balance constraint. In such cases, for price-setting purposes the software utilizes a pricing parameter set to

(a) the highest-priced cleared Economic Bid if the infeasibility detected in the scheduling run does not exceed the Constraint Relaxation Threshold, but no less than the Soft Energy Bid Cap price; or

(b) the Hard Energy Bid Cap price if the infeasibility detected in the scheduling run exceeds the Constraint Relaxation Threshold.

27.4.3.4 Protection of TOR, ETC and Converted Rights Self-Schedules in the IFM

In accordance with the submitted and accepted TRTC Instructions, valid Day-Ahead TOR Self-Schedules, Day-Ahead ETC Self-Schedules and Day-Ahead Converted Rights Self-Schedules shall not be adjusted in the IFM in response to an insufficiency of Effective Economic Bids. The scheduling parameters associated with the TOR, ETC, or Converted Rights Self-Schedules will be set to values higher than the scheduling parameter associated with relaxation of an enforced internal and Intertie Transmission Constraint as specified in Section 27.4.3.2, so that when there is a congested Transmission Constraint that would otherwise subject a Supply or Demand resource submitted in a valid and balanced ETC, TOR or Converted Rights Self-Schedule to adjustment in the IFM, the IFM software will relax the Transmission Constraint rather than curtail the TOR or ETC Self-Schedule. This priority will be adhered to by the operation of the IFM Market Clearing software, and if necessary, by adjustment of Schedules after the IFM has been executed and the results have been reviewed by the CAISO operators.

27.4.3.5 Effectiveness Threshold

The CAISO Markets software includes a lower effectiveness threshold setting that governs whether the software will consider a bid “effective” for managing congestion on a congested Transmission Constraint, which in the case of Nomograms will be applied to the individual flowgates that make up the Nomogram, rather than to the Nomogram itself. The CAISO will set this threshold at two percent (2%).

27.5 Full Network Model

27.5.1 Network Models used in CAISO Markets

The FNM is a representation of the WECC network model including the CAISO Balancing Authority Area that enables the CAISO to produce a Base Market Model that the CAISO then uses as the basis for formulating the individual market models used to conduct power flow analyses to manage Transmission Constraints for the optimization of each of the CAISO Markets.

27.5.1.1 Base Market Model used in the CAISO Markets

Based on the FNM the CAISO creates the Base Market Model, which is used as the basis for formulating, as described in section 27.5.6, the individual market models used in each of the CAISO Markets to establish, enforce, and manage the enforced internal and Intertie Transmission Constraints associated with network facilities. The Base Market Model is derived from the FNM by (1) introducing locations for modeling Intertie Schedules; and (2) introducing market resources that do not currently exist in the FNM due to their size and lack of visibility. In the Base Market Model, external Balancing Authority Areas and external transmission systems are modeled to the extent necessary to 1) improve the accuracy of the CAISO Market solutions for purposes of reliable operations, and 2) support the commercial requirements of the CAISO Markets. For those portions of the FNM that are external to the CAISO Balancing Authority Area, the Base Market Model may model the resistive component for accurate modeling of Transmission Losses, but accounts for losses in the external portions of the market model separately from Transmission Losses within the CAISO Balancing Authority Area. As a result, the Marginal Cost of Losses in the LMPs is not affected by external losses. For portions of the Base Market Model that are external to the CAISO Balancing Authority Area, the CAISO Markets only enforce Transmission Constraints that reflect limitations of the transmission facilities and Entitlements turned over to the Operational Control of the CAISO by a Participating Transmission Owner, or that affect Congestion Management within the CAISO Balancing Authority Area or on Interties. External connections are retained between Intertie branches within Transmission Interfaces. Certain external loops are modeled, which allows the CAISO to increase the accuracy of the Congestion Management process. The CAISO Markets’ optimizations also factor in forecasted unscheduled flow at the Interties consistent with the requirements specified in the Business Practice Manuals. Resources are modeled at the appropriate network Nodes.

The pricing Location (PNode) of a Generating Unit generally coincides with the Node where the relevant revenue quality meter is connected or corrected, to reflect the point at which the Generating Unit is connected to the CAISO Controlled Grid. The Dispatch, Schedule, and LMP of a Generating Unit refers to a PNode, but the Energy injection is modeled in the Base Market Model for network analysis purposes at the corresponding Generating Unit’s physical interconnection point), taking into account any losses in the non-CAISO Controlled Grid leading to the point where Energy is delivered to CAISO Controlled Grid.

Based on the Base Market Model, the market models used in each of the CAISO Markets incorporate physical characteristics needed for determining Transmission Losses and model Transmission Constraints within the CAISO Balancing Authority Area, which are then reflected in the Day-Ahead Schedules, AS Awards and RUC Awards, FMM Schedules, Dispatch Instructions, and LMPs resulting from each CAISO Markets Process. The Dispatch, Schedule, and LMP of a Dynamic System Resource or Pseudo-Tie of a Generating Unit to the CAISO Balancing Authority Area refer to a PNode, or Aggregated Pricing Node, if applicable, of the resource at its physical location in the external transmission systems that are modeled in the Base Market Model, subject to the modeling of Transmission Losses in the portions of the FNM and exclusion of such Transmission Losses' effects on the LMPs that are external to the CAISO Balancing Authority Area described in this Section 27.5.1.1. The LMP price thus associated with a Dynamic System Resource or Pseudo-Tie Generating Unit will be used for Settlement of Energy and will include the Marginal Cost of Congestion and Marginal Cost of Losses components of the LMP to that Dynamic System Resource or Pseudo-Tie Generating Unit point, excluding losses and congestion external to the CAISO Balancing Authority Area, in accordance with this Section 27.5.1.1. Further, in formulating the market models for the CAISO Market processes, except for specific Intertie locations as specified in the BPM, power flow parameters developed from applicable data sources, including available outage information, system status data, and the State Estimator for the Real-Time Dispatch, are applied to the Base Market Model.

27.5.1.2 [Not Used]

27.5.1.2.1 [Not Used]

27.5.1.2.2 [Not Used]

27.5.1.2.3 [Not Used]

27.5.2 Metered Subsystems

The FNM includes a full model of MSS transmission networks used for power flow calculations and Congestion Management in the CAISO Markets Processes. Transmission Constraints (i.e. circuit ratings, thermal ratings, etc.) within the MSS, or at its boundaries, that are modeled in the Base Market Model shall be monitored but not enforced in operation of the CAISO Markets. If overloads are observed in the forward markets, are internal to the MSS or at the MSS boundaries, and are attributable to MSS operations, the CAISO shall communicate such events to the Scheduling Coordinator for the MSS and coordinate any manual Re-dispatch required in Real-Time. If, independent of the CAISO, the Scheduling Coordinator for the MSS is unable to resolve Congestion internal to the MSS or at the MSS boundaries in Real-Time, the CAISO will use Exceptional Dispatch Instructions on resources that have been bid into the RTM to resolve the Congestion. The costs of such Exceptional Dispatch will be allocated to the responsible MSS Operator. Consistent with Section 4.9, the CAISO and MSS Operator shall develop specific procedures for each MSS to determine how Transmission Constraints will be handled.

27.5.3 Integrated Balancing Authority Areas

To the extent sufficient data are available or adequate estimates can be made for an IBAA, the Base Market Model used by the CAISO for the CAISO Markets Processes will include a model of the IBAA's network topology. The CAISO monitors but does not enforce the Transmission Constraints for an IBAA in running the CAISO Markets Processes. Similarly, the CAISO models the resistive component for transmission losses on an IBAA but does not allow such losses to determine LMPs that apply for pricing transactions to and from an IBAA and the CAISO Balancing Authority Area, unless allowed under a Market Efficiency Enhancement Agreement. For Bids and Schedules between the CAISO Balancing Authority Area and the IBAA, the CAISO will model the associated sources and sinks that are external to the CAISO Balancing Authority Area using individual or aggregated injections and withdrawals at locations in the FNM that allow the impact of such injections and withdrawals on the CAISO Balancing Authority Area to be reflected in the CAISO Markets Processes as accurately as possible given the information available to the CAISO.

27.5.3.1 Currently Established Integrated Balancing Authority Areas

The FNM includes the established IBAAs listed below. Additional details regarding the modeling specifications for these IBAAs are provided in the Business Practice Manuals.

(1) The Sacramento Municipal Utility District (SMUD) IBAA including the transmission facilities of the following entities:

(a) Western Area Power Administration – Sierra Nevada Region

(b) Modesto Irrigation District

(c) City of Redding

(d) City of Roseville

(2) Turlock Irrigation District IBAA

27.5.3.2 Information Required to Develop and Obtain Pricing under a Market Efficiency Enhancement Agreement

The CAISO shall enter into an MEEA with an entity controlling supply resources within an IBAA to provide modeling and pricing for imports or exports between the IBAA and the CAISO Balancing Authority Area if the entity agrees to provide the information as specified herein. These information requirements apply to all entities seeking to enter into and having entered into an MEEA, including external Balancing Authorities within the IBAA or sub-entities therein such as Scheduling Coordinators or sub-Balancing Authority Areas in control of specific resources or a portfolio of resources. For these purposes, the term resource includes sources or sinks within the IBAA. An MEEA signatory may use generation as a resource to support an import to the CAISO and may use load or reduce generation to support an export from the CAISO. Control includes ownership or any contractual arrangements that provide authority to schedule and/or receive the financial benefits of a resource. Entities controlling a portfolio of resources within the IBAA are eligible to enter into MEEAs for interchange transactions using portfolios of resources. For the purposes of this provision, Western Area Power Administration base resource customers have sufficient control over Western Area Power Administration base resource portfolio of resources within the IBAA to be eligible to enter into MEEAs for interchange transactions utilizing these resources.

In order to obtain non-default, location-specific pricing for interchange transactions with the CAISO Balancing Authority Area, an MEEA signatory must provide the information described in this section 27.5.3.2. The information is necessary to: (i) establish the location of the resources that will be used to calculate location-specific prices under the MEEA, (ii) verify that the resources operating to implement an interchange transaction are the same as the resources identified in the MEEA, (iii) verify the amount of an interchange transaction that was implemented by the dispatch of resources identified in the MEEA, and (iv) settle all charges and payments for interchange transactions under the MEEA.

Subject to the requirements in Section 27.5.3.2.2, the CAISO will provide an LMP to an MEEA signatory for an interchange transaction between the CAISO Balancing Authority Area and the IBAA at the Scheduling Point at which the actual Import or Export Bid is submitted to the CAISO Markets. This

MEEA-specific LMP for MEEA transactions shall be calculated for each such Scheduling Point and reflect the nodes where the specific import or export is demonstrated in the MEEA to actually be located. The CAISO will develop generation distribution factors that apply to the relevant MEEA transactions as provided in Section 27.5.3.2.1. The CAISO and an MEEA signatory may negotiate an alternative to the historical average distribution generation factors of MEEA resources, if an MEEA signatory establishes that a different structure more accurately identifies the actual location of resources within the IBAA that support interchange transactions with the CAISO.

27.5.3.2.1 Information Required to Develop a Market Efficiency Enhancement Agreement

An entity seeking to enter into an MEEA with the CAISO will provide the CAISO with historical hourly metered generation data for the supply resources to be identified in the MEEA and the historical hourly metered load data within the IBAA for the load served by the MEEA signatory, if any. The data shall be provided in a format that the WECC accepts or other commonly used format. MEEA pricing will typically be based on historical average distribution of generation among a portfolio of resources identified in an MEEA, using negotiated generation distribution factors, subject to revision to reflect changes in usage. The CAISO and an MEEA signatory may, therefore, agree on a set of weighted distribution factors for a specified set of resource locations, which will be used to calculate the MEEA price that will apply to Bids, including Self-Schedules, cleared and processed as further provided in the CAISO Tariff, submitted for resources identified in an MEEA. By applying a set of weighted distribution factors to a set of generator locations, an MEEA signatory is not required to associate a specific generator within a MEEA portfolio of resources with a specific customer of the MEEA signatory. The CAISO will negotiate any generation distribution factors as provided below. For portfolios of resources, the CAISO and a potential MEEA signatory will develop a weighted average price methodology based upon an agreed set of weights for the resources that comprise the MEEA portfolio. Such weights will be based on historical data of operation of the resources comprising the portfolio.

The distribution factors may reflect seasonal, peak and off-peak or other usage and may be periodically revised through bilateral negotiations using updated historical operation data of the MEEA portfolio. All executed MEEAs between the CAISO and an entity with resources within the IBAA must include:

(a) a list of the external supply resources and loads within the IBAA over which the MEEA signatory has control or serves (for these purposes control includes ownership or any contractual arrangements that provide authority to schedule and/or receive the financial benefits of a resources);

(b) the location of the resource identified in the MEEA for which non-default LMP's will be calculated;

(c) the injection and withdrawal points for the resources identified in the MEEA; and

(d) the appropriate Resource IDs that apply for the MEEA transactions.

27.5.3.2.2 Information Needed to Determine Application of MEEA Specific Pricing in any Settlement Interval or Settlement Period

If an MEEA signatory submits a Bid in the CAISO Market and seeks to obtain an MEEA-specific LMP for an interchange transaction, the CAISO must be capable of verifying what portion (output in MWh) of the resources identified in the MEEA, if any, were dispatched to implement the interchange transaction. To the extent that the resources identified in the MEEA, or portion thereof, were dispatched and operated for purposes other than the interchange transaction submitted in the CAISO Market, the Schedule or Imbalance Energy associated with the Bid submitted and cleared in the CAISO Market will not receive an MEEA-specific LMP, and will instead receive the default IBAA price specified in Appendix C, Section I.1.1. The CAISO will establish Resource IDs that are to be used only to submit Bids, including Self-Schedules, for the purpose of obtaining MEEA-specific pricing. MEEA signatories may obtain and use other Resource IDs to submit Bids, including Self-Schedules, that are not covered by an MEEA. Prior to obtaining and settling Resource IDs under the terms of the MEEA, the relevant Scheduling Coordinator shall attest that use of the Resource ID shall mean that the MEEA signatory dispatched a resource identified in an MEEA to support the MEEA interchange transaction. This attestation shall be executed under oath by an officer of the MEEA with knowledge of the MEEA signatory's operations. By actually using such Resource IDs, the Scheduling Coordinator represents that MEEA resources are dispatched to support such Bids, including Self-Schedules. The CAISO may challenge the use of these Resource IDs and conduct an audit under Section 27.5.3.7.

In connection with any such audit, the MEEA signatory shall support its certification with information demonstrating that an MEEA signatory resource was dispatched to support the interchange transaction.

This information may include, but is not limited to, NERC tags, OASIS transmission service data, day-ahead load and resource plans, power purchase agreements or contracts demonstrating use of the California Oregon Transmission Project as well as marginal cost information. An MEEA signatory, however, is not required to provide marginal cost information to the CAISO to support its self-certification and may support its self-certification with other information, including information identified in the preceding sentence. The MEEA signatory shall provide data in a format that the WECC accepts or other commonly used format. For any Settlement Interval or Period for which the CAISO challenges the use of Resource IDs under an MEEA, the CAISO shall apply MEEA pricing to the Settlement Interval or Period pending resolution of the challenge.

In addition, in the event that there is a Dynamic Resource-Specific System Resource in the IBAA, the MEEA may further provide that the MEEA signatory in control of such resource may also obtain pricing under the MEEA for imports to the CAISO Balancing Authority Area from the Dynamic Resource-Specific System Resource. For any portion of an interchange transaction for which the MEEA Entity has not self-certified that the resources were used to support interchange transactions, the default IBAA price specified in Appendix C, Section I.1.1 will apply for the corresponding volume and time period.

27.5.3.3 Process for Establishing a Market Efficiency Enhancement Agreement

Any entity seeking to negotiate an MEEA with the CAISO may submit a written request to the CAISO. The CAISO and the requesting entity shall negotiate in good faith the terms and conditions of the MEEA. The CAISO shall file any executed MEEA with FERC for review and approval under Section 205 of the Federal Power Act. In the event an MEEA is not executed within 180 days of the initial written request for an MEEA, a requesting entity may invoke the CAISO ADR Procedures under Section 13.

27.5.3.4 Use of Data Provided under a Market Efficiency Enhancement Agreement

Data provided to the CAISO pursuant to an MEEA shall be used for purposes of modeling and pricing Interchange transactions between the CAISO Balancing Authority Area and the relevant IBAA at Scheduling Points specified in the MEEA. The configuration of the pricing points for the MEEA, which may include specific distribution factors for the represented resources, established through the negotiation of the MEEA will also be used for the purposes of modeling the resources in the IBAA subject to the MEEA. The CAISO and the MEEA signatory may agree to changes to these configurations over time that do not require the renegotiation of the terms of the MEEA or may agree to static terms until such time the parties re-execute a new MEEA. Such modeling information regarding the location of the resources will be incorporated into the Full Network Model, including the CRR FNM, which is used for all CAISO Markets as further described in Sections 27.3, 27.5.1 and 27.5.6. The FNM and the CRR FNM will not include the hourly transactional data provided pursuant to Section 27.5.3.2, except in such cases where the CAISO and the MEEA signatory have agreed to dynamic changes to the configuration of the modeling of the MEEA resources during the life of the agreement as further provided by the MEEA.

27.5.3.5 Measures to Preserve Confidentiality of Data under a Market Efficiency Enhancement Agreement

Subject to the provisions of Section 27.5.3.4, data provided to the CAISO by any entity under an MEEA or in connection with negotiations to develop an MEEA shall be treated as confidential data. Consistent with applicable law, the CAISO shall take all steps reasonably necessary to limit disclosure of this information to CAISO personnel that need to review such information as part of their work-related responsibilities. In the event a disclosing entity does not execute an MEEA, the CAISO shall return the confidential data to the disclosing entity if the CAISO can physically return the data and shall destroy the confidential data if the CAISO cannot physically return the confidential data to the disclosing entity.

27.5.3.6 Dispute Resolution under Market Efficiency Enhancement Agreements

Any disputes arising out of or in connection with an MEEA shall be subject to the CAISO ADR Procedures of Section 13.

27.5.3.7 Audit Rights under Market Enhancement Efficiency Agreement

The CAISO reserves the right to audit data supplied under an MEEA by giving written notice at least ten (10) Business Days in advance of the date that the CAISO wishes to initiate such audit, with completion of the audit occurring within 180 days of such notice. The audit shall be for the limited purposes of verifying that the MEEA signatory has accurately represented available resources and has met the requirements specified for MEEA pricing. Upon request of the CAISO as part of such audit, any signatory to an MEEA shall provide information to support its certification under Section 27.5.3.2. An MEEA signatory may audit the price for any transaction entered into under an MEEA through the CAISO's

Settlement and billing process set forth in Section 11 and through data provided to the MEEA signatory as a Market Participant under the CAISO Tariff. Each party will be responsible for its own expenses related to any audit.

27.5.3.8 Process for Establishing a New IBAA or Modifying an Existing IBAA

Except under exigent circumstances, the CAISO must follow a consultative process with the applicable Balancing Authority and CAISO Market Participants pursuant to the process further defined in the Business Practice Manuals, to establish a new IBAA or modify an existing IBAA. Changes to an existing IBAA may include among others changes to the modeling of the IBAA's network topology, the specification of the default Resource IDs or the default pricing points. Upon completion of this process and having determined it necessary to establish a new IBAA or modify an existing IBAA, the CAISO will seek FERC approval under Section 205 of the Federal Power Act of the proposed new IBAA or changes to the existing IBAA requirements, at which time the CAISO shall also provide its supportive findings for the establishment of the new IBAA or modification to an existing IBAA.

27.5.3.8.1 Factors to be Considered in Establishing a New Integrated Balancing Authority Area or Modifying an Existing Integrated Balancing Authority Area

In establishing a new IBAA or modifying an existing IBAA, the factors that the CAISO will consider shall include, but are not limited to, the following:

(1) The number of Interties between the potential or existing IBAA and the CAISO Balancing Authority Area and the distance between them;

(2) Whether the transmission system(s) within the other Balancing Authority Area runs in parallel to major parts of the CAISO Controlled Grid;

(3) The frequency and magnitude of unscheduled power flows at applicable Interties;

(4) The number of hours where the actual direction of power flows was reversed from scheduled directions;

(5) The availability of information to the CAISO for modeling accuracy; and

(6) The estimated improvement to the CAISO's power flow modeling and Congestion Management processes to be achieved through more accurate modeling of the Balancing Authority Area.

27.5.3.9 Default Designation of External Resource Locations for Modeling Transactions Between the CAISO Balancing Authority Area and an IBAA

Prior to the establishment of a new IBAA or a change to an existing IBAA, the CAISO will define and publish default Resource IDs to be used for submitting import and export Bids and for settling import and export Schedules between the CAISO Balancing Authority Area and the potential or existing IBAA. These default Resource IDs will specify in the Master File the default associations of Intertie Scheduling Point Bids and Schedules to supporting individual or aggregate injection or withdrawal locations in the FNM. The CAISO will determine the supporting injection and withdrawal locations to allow the impact of the associated Intertie Scheduling Point Bids and Schedules to be reflected in the CAISO Markets Processes as accurately as possible given the information available to the CAISO. The CAISO's methodology for determining such default Resource IDs, as well as the specific default Resource IDs that have been adopted for the currently established IBAAs, are provided in the Business Practice Manuals. Alternative Resource IDs to be used instead of the default Resource IDs will be created and adopted for use in conjunction with Intertie Scheduling Point Bids and Schedules between the CAISO Balancing Authority Area and the IBAA based on a Market Efficiency Enhancement Agreement.

27.5.4 Accounting for Changes in Topology in IFM

The CAISO will incorporate into the FNM information received pursuant to Section 24 for transmission expansion and Section 25 for generation interconnection to account for changes to the CAISO Controlled Grid and other facilities located within the CAISO Balancing Authority Area. This information will be incorporated into the network model data base in which the electrical network model is maintained for use by the State Estimator and which forms the basis for the Base Market Model used by the CAISO Markets. The updated power system network model will be transferred at periodic model update cycle intervals established by the CAISO and incorporated into the {Base Market Model} for use in the CAISO Markets. The Business Practice Manual for managing the Full Network Model will describe the information to be provided by Market Participants, the process by which the CAISO incorporates this information in the FNM, and operational details of the FNM. If the CAISO becomes aware of a material error or omission in the FNM, it will make a timely correction of the FNM.

27.5.5 Load Distribution Factor

The CAISO will maintain a library of system-wide Load Distribution Factors for use in distributing Demand scheduled at the Default LAPs. The system Load Distribution Factors are derived from the State Estimator and are stored in the Load Distribution Factor library, and are updated periodically. For IFM the Load Distribution Factor library uses a similar-day methodology for smoothing the most recent Load Distribution Factors. The similar-day methodology uses data separately for each type of day. More recent days are weighted more heavily in the smoothing calculations. The market application then uses the set of Load Distribution Factors from the library that best represents the Load distribution conditions expected for use in the CAISO Markets Processes. For the RTM, the State Estimator solution is used as a source for determining Load Distribution Factors. The Load Distribution Factor are also maintained for use for Demand scheduled at Custom LAPs. These custom Load Distribution Factors are not generated from the State Estimator and are fixed quantities representing the characteristics of the Custom LAP.

27.5.6 Management & Enforcement of Constraints in the CAISO Markets

The CAISO operates the CAISO Markets through the use of a market software system that utilizes various information including the Base Market Model, the State Estimator, submitted Bids including Self-Schedules, Generated Bids, Transmission Constraints, and transmission and generation Outages, including due to Remedial Action Schemes. The market model used in each of the CAISO Markets is derived from the most current Base Market Model available at that time. To create a more relevant time-specific network model for use in each of the CAISO Markets, the CAISO will adjust the Base Market Model to reflect Outages and derates that are known and applicable when the respective CAISO Market will operate, and to compensate for observed discrepancies between actual real-time power flows and flows calculated by the market software. Through this process the CAISO creates the market model to be used in each Day-Ahead Market and each process of the Real-Time Market. The CAISO will manage the enforcement of Transmission Constraints, consistent with good utility practice, to ensure, to the extent possible, that the market model used in each market accurately reflects all the factors that contribute to actual Real-Time flows on the CAISO Controlled Grid and that the CAISO Market results are better aligned with actual physical conditions on the CAISO Controlled Grid. In operating the CAISO Markets, the CAISO may take the following actions so that, to the extent possible, the CAISO Market solutions are feasible, accurate, and consistent with good utility practice:

(a) The CAISO may enforce, not enforce, or adjust flow-based Transmission Constraints if the CAISO observes that the CAISO Markets produce or may produce results that are inconsistent with observed or reasonably anticipated conditions or infeasible market solutions either because (a) the CAISO reasonably anticipates that the CAISO Market run will identify Congestion that is unlikely to materialize in Real-Time even if the Transmission Constraint were to be ignored in all the markets leading to Real-Time, or (b) the CAISO reasonably anticipates that the CAISO Market will fail to identify Congestion that is likely to appear in the Real-Time. The CAISO does not make such adjustments to intertie Scheduling Limits.

(b) The CAISO may enforce or not enforce Transmission Constraints if the CAISO has determined that non-enforcement or enforcement, respectively, of such Transmission Constraints may result in the unnecessary pre-commitment and scheduling of use-limited resources.

(c) The CAISO may not enforce Transmission Constraints if it has determined it lacks sufficient visibility to conditions on transmission facilities necessary to reliably ascertain constraint flows required for a feasible, accurate and reliable market solution.

(d) For the duration of a planned or unplanned Outage, the CAISO may create and apply alternative Transmission Constraints that may add to or replace certain originally defined constraints.

(e) The CAISO may adjust Transmission Constraints for the purpose of setting prudent operating margins consistent with good utility practice to ensure reliable operation under anticipated conditions of unpredictable and uncontrollable flow volatility consistent with the requirements of Section 7.

(f) The CAISO may adjust Transmission Constraints for the purpose of reserving internal transfer capability in the Day-Ahead or Real-Time Markets, based on anticipated conditions on the natural gas delivery system, to reliably serve load in specific geographic regions of the CAISO Balancing Authority Area, or to assure deliverability of Ancillary

Services. The CAISO may or may not release such reserved internal transfer capability based on natural gas and electric system conditions, or observed market inefficiencies. Upon determining that an adjustment is necessary, the CAISO will issue a notification specifying the amount of the adjustment.

To the extent that particular Transmission Constraints are not enforced in the operations of the CAISO Markets, the CAISO will operate the CAISO Controlled Grid and manage any Congestion based on available information including the State Estimator solutions and available telemetry to Dispatch resources through Exceptional Dispatch to ensure the CAISO is operating the CAISO Controlled Grid consistent with the requirements of Section 7.

27.6 State Estimator

The State Estimator produces a power flow solution based upon the modeled representation of the electrical network and available Real-Time SCADA telemetry. When this solution is applied to the FNM, it provides a reference of system conditions for determining Dispatch Instructions. The State Estimator also provides a reference for Real-Time Load Distribution Factors used to distribute the Real-Time CAISO Forecast of CAISO Demand as well as provide a source of historical data for the LDF library. If the State Estimator is not capable of providing CAISO with a solution to clear the CAISO Markets, the CAISO shall use the last best State Estimator solution for determining Dispatch Instructions, provided the State Estimator is not unavailable for an extended period. If the State Estimator is not available for an extended period of time, the CAISO shall use the Load Distribution Factors from the Load Distribution Factors library as applicable to the prevailing system and time of use conditions to determine Dispatch Instructions.

27.7 Constrained Output Generation

27.7.1 Election of Constrained Output Generator Status

A Scheduling Coordinator on behalf of a Generating Unit eligible for COG status must make an election to have the resource treated as a COG before each calendar year by registering the resource’s PMin in the Master File as equal to its PMax less 0.01 MW (PMin = PMax – 0.01 MW) within the timing requirements specified for Master File changes described in the applicable Business Practice Manual. Generating Units with COG status will be eligible to set LMPs in the IFM and RTM based on their Calculated Energy

Bids.

As with all Generating Units that are not Use-Limited Resources, a Scheduling Coordinator on behalf of a COG that is not a Use-Limited Resource must use the Proxy Cost methodology, as provided in Section 30.4, for determining its Default Start-Up Bids and Default Minimum Load Bids. A Scheduling Coordinator on behalf of a COG that is a Use-Limited Resource must elect to use either the Proxy Cost methodology or the Registered Cost methodology, as provided in Section 30.4, for determining its Default Start-Up Bids and Default Minimum Load Bids. A Calculated Energy Bid of a COG that is not a Use-Limited Resource will be calculated based on the Proxy Cost methodology. A Calculated Energy Bid of a COG that is a Use-Limited Resource will be calculated based on its election of the Proxy Cost methodology or the Registered Cost methodology. Whenever a Scheduling Coordinator for a COG submits an Energy Bid into the IFM or RTM, the CAISO will override that Bid and substitute the Calculated Energy Bid if the submitted Bid is different from the Calculated Energy Bid.

27.7.2 Election to Waive COG Status

A Scheduling Coordinator on behalf of a Generating Unit eligible for COG status may elect to waive COG status. If such Generating Unit has a non-zero operating range (PMax greater than PMin), it is eligible to participate in the CAISO Markets like any other resource.

27.7.3 Constrained Output Generators in the IFM

In the IFM, resources electing COG status are modeled as though they are not constrained and can operate flexibly between zero (0) and their PMax. A COG is eligible to set IFM LMPs based on its Calculated Energy Bid in any Settlement Period in which a portion of its output is needed as a flexible resource to serve Demand. A COG is not eligible for recovery of Minimum Load Costs or BCR in the IFM due to the conversion of its Minimum Load Cost to an Energy Bid and its treatment by the IFM as a flexible resource. A COG is eligible for Start-Up Bid Cost recovery based on its Commitment Period as determined in the IFM, RUC, STUC or RTUC.

27.7.4 Constrained Output Generators in RUC

In RUC, any COG that has capacity that did not fully clear in the IFM is treated as constrained, so that the entire capacity of the COG is committed by RUC. Any such RUC commitment would apply to scheduled capacity in RUC in excess of the higher of: (a) the relevant Day-Ahead Schedule; or (b) the relevant

Minimum Load. In the event of a RUC commitment, the COG is not eligible to receive a RUC Award.

27.7.5 Constrained Output Generators in the Real-Time Market

A COG that can be started up and complete its Minimum Run Time within a five-hour period can be committed by the STUC. A COG that can be started up within the applicable RTUC run as described in Section 34.3 can be committed by the RTUC. The RTD will dispatch a COG up to its PMax or down to zero (0) to ensure a feasible Real-Time Dispatch. The COG is eligible to set the RTM LMP in any Dispatch Interval in which a portion of its output is needed to serve Demand, not taking into consideration its Minimum Run Time constraint. For the purpose of making this determination and setting the RTM LMP, the CAISO treats a COG as if it were flexible with an infinite Ramp Rate between zero (0) and its PMax, and uses the COG's Calculated Energy Bid. In any Dispatch Interval where none of the output of a COG is needed as a flexible resource to serve Demand, the CAISO shall not dispatch the unit. In circumstances in which the output of the COG is not needed as a flexible resource to serve Demand, but the unit nonetheless is online as a result of a previous commitment or Dispatch Instruction by the CAISO, the COG is eligible for Minimum Load Bid Cost compensation.

27.8 Multi-Stage Generating Resources

27.8.1 Registration and Qualification

Scheduling Coordinators responsible for resources that meet the definition of a Multi-Stage Generating Resource based on their Master File registered characteristics must register such resources with the CAISO as Multi-Stage Generating Resources as further discussed in this Section, and must comply with all requirements that apply to such resources specified in the CAISO Tariff. Scheduling Coordinators must comply with the registration and qualification process described in this Section 27.8.1, in order to effectuate any of the changes described in Section 27.8.3. No less than sixteen (16) days prior to the date that Scheduling Coordinator seeks to have the resource participate in the CAISO Markets under the new settings or MSG Configuration details, the Scheduling Coordinator must complete and submit to the CAISO the registration form and the resource data template provided by the CAISO for registration and qualification purposes. After the Scheduling Coordinator submits a request for registration of a Generating Unit as a Multi-Stage Generating Resource or a change in the attributes in Section 27.8.3, the CAISO will coordinate with that Scheduling Coordinator to validate that the resource qualifies for the requested status and that all the requisite information has been successfully provided to the CAISO. The resource will be successfully registered and qualified as a Multi-Stage Generating Resource, or the requested changes in the attributes listed in Section 27.8.3 will be successfully registered and qualified as of the date on which the CAISO sends the responsible Scheduling Coordinator a notice that the resource has been successfully qualified as such. In the absence of extenuating circumstances, the ISO will provide such notice on the sixteenth day after the Scheduling Coordinator provides new settings or MSG Configuration details. After the date on which the CAISO has provided such notice, any changes to the items listed in Section 27.8.3 will be subject to the timing and process requirements in this Section 27.8.1 and 27.8.3. The Scheduling Coordinator may modify all other Multi-Stage Generating Resource registered characteristics pursuant to the timing and processing requirements specified elsewhere in this CAISO Tariff, as they may apply. If the CAISO has reason to believe that the resource's operating and technical characteristics are not consistent with the registered and qualified attributes, the CAISO may request that the Scheduling Coordinator provide additional information necessary to support their registered status and, if appropriate, may require that the resource be registered and qualified more consistent with the resource's operating and technical characteristics, including the revocation of its status as a Multi-Stage Generating Resource. Failure to provide such information may be grounds for revocation of Multi-Stage Generating Resource status. Such changes in status or MSG Configuration details would be subject to the registration and qualification requirements in this Section 27.8. Scheduling Coordinators may register the number MSG Configurations as are reasonably appropriate for the resource based on the technical and operating characteristics of the resource, which may not, however, exceed a total of ten MSG Configurations and cannot be fewer than two MSG Configurations. The information requirements specified in Section 27.8.2 will apply.

27.8.2 Information Requirements

As part of the registration process described in Section 27.8.1, the Scheduling Coordinators for Generating Units that seek to qualify as Multi-Stage Generating Resources must submit to the CAISO a Transition Matrix, which contains the Transition Costs and operating constraints associated with MSG Transitions. The Scheduling Coordinator may register up to six (6) MSG Configurations without any limitation on the number of transitions between the registered MSG Configurations in the Transition

Matrix. If the Scheduling Coordinator registers seven (7) or more MSG Configurations, then the Scheduling Coordinator may only include two (2) eligible transitions between MSG Configurations for upward and downward transitions, respectively, starting from the initial MSG Configuration in the Transition Matrix. For each MSG Configuration, the responsible Scheduling Coordinator shall submit an Operational Ramp Rate and, as applicable, an Operating Reserve Ramp Rate and Regulating Reserves ramp rate, each of which shall have at least one (1) segment and no more than two (2) segments. The Scheduling Coordinator must establish the default MSG Configuration and its associated Default Resource Adequacy Path that apply to Multi-Stage Generating Resources that are subject to Resource Adequacy must-offer obligations. The Scheduling Coordinator may submit changes to this information consistent with Sections 27.8.1 and 27.8.3, as they may apply.

27.8.3 Changes in Status and Configurations of Resource

Scheduling Coordinators may seek modifications to the Multi-Stage Generating Resource attributes listed below consistent with the process and timing requirements specified in Section 27.8.1 and the additional requirements discussed below in this Section 27.8.3:

(1) Registration and qualification of a Generating Unit as a Multi-Stage Generating Resource.

(2) Changes to the MSG Configurations attributes, which include:

a. addition of new MSG Configurations;

b. removal of an existing MSG Configuration;

c. a change in the physical units supporting the MSG Configuration;

d. a change to the MSG Configuration Start Up and Shut Down flags;

e. adding or removing an MSG Transition to the Transition Matrix;

f. a material change in the Transition Times contained in the Master File, which consists of a change that more than doubles the Transition Times or reduces it to less than half; and

g. a material change to the maximum Ramp Rate of the MSG Configuration(s) contained in the Master File, which consists of a change that more than doubles the maximum Ramp Rate or reduces it to less than half.

When transitioning to implement these changes across the midnight hour, for any Real-Time Market run in which the changes specified in this Section 27.8.3 are to take effect within the time horizon of any of the Real-Time Market runs, the CAISO will Schedule, Dispatch, or award resources consistent with either the prior or new status and definitions, as appropriate, and required by any Real-Time conditions regardless of the resource's state scheduled or awarded in the immediately preceding Day-Ahead Market. A Scheduling Coordinator may unregister a Generating Unit from its Multi-Stage Generating Resource status subject to the timing requirements for Master File changes, and such changes are not subject to the timing requirements in Section 27.8.3. Changes to the attributes listed above in this Section may take effect, including the registration of new Multi-Stage Generating Resources, provided Scheduling Coordinators have previously followed the registration process requirements listed in Section 27.8.1. Changes to these attributes may only be made every sixty (60) days after the day on which any such changes have taken effect.

27.9 Non-Generator Resources and Pumped-Storage Hydro Unit Constraints

Scheduling Coordinators may elect to provide the CAISO with Non-Generator Resources' and Pumped-Storage Hydro Units' MWh constraints. In such cases, the CAISO will observe MWh constraints in the IFM, RUC, Real-Time Unit Commitment, and FMM as part of the co-optimization except for Non-Generator Resources using Regulation Energy Management. The CAISO will observe MWh constraints in Real-Time Dispatch, including constraints of resources using Regulatory Energy Management. Consistent with Section 4.6.11 and in addition to Master File parameters available to Generating Units, Scheduling Coordinators for Non-Generator Resources with physical operating constraints may include in the Master File:

(a) continuous energy limits: minimum and maximum states of charge in MWh values; and

(b) generation capacity limits: minimum and maximum charge and discharge limits in MW.

Consistent with Section 4.6.11 and in addition to Master File parameters available to Generating Units, Scheduling Coordinators for Pumped-Storage Hydro Units with physical operating constraints may include in the Master File:

(a) generation capacity limits: minimum and maximum pumping and generating limits in MW;

(b) pump minimum up time: minutes a pump must continue pumping;

(c) pump minimum down time: minutes a pump cannot return to pumping after shutting down;

(d) minimum on time: minutes Generating Unit must stay on before shut down or switch to pumping mode;

(e) gen-to-pump minimum down time: minutes after being de-committed from generation mode before able to be dispatched in pumping mode; and

(f) pump-to-gen minimum down time: minutes after being de-committed from pumping mode before able to be dispatched in generation mode.

27.10 Election to Use Non-Generator Resource Generic Modeling Functionality

The CAISO employs functionality to model Non-Generator Resources' participation in the CAISO's markets. Resource types other than Non-Generator Resources that have a PMax greater than zero may also elect to use this modeling functionality. As further described in the Business Practice Manual and consistent with the CAISO's Full Network Model database release schedule, Scheduling Coordinators may elect to use Non-Generator Resource Generic Modeling functionality for individual resources or an aggregation of resources. For these resources, the CAISO will not observe costs normally associated with resource management, including but not limited to Start-Up Costs, Minimum Load Costs, or Transition Costs. The CAISO will not observe these resources' MWh constraints. The CAISO's market power mitigation processes, including Local Market Power Mitigation, will apply to resources electing to use Non-Generator Resource Generic Modeling functionality consistent with the provisions of Sections 31.2 and 34.1.5 of the CAISO Tariff. If Bids from a particular resource type are not subject to market power mitigation pursuant to the provisions Sections 31.2 and 34.1.5 of the CAISO Tariff, then use of Non-Generator Resource Generic Modeling functionality will not make Bids from the resource subject to market power mitigation. Resources subject to market power mitigation that elect to use Non-Generator Resource Generic Modeling functionality may use any of the methods under the CAISO's Tariff to establish a Default Energy Bid. Resources electing to use Non-Generator Resource Generic Modeling functionality are not eligible to be Resource Adequacy Resources.

27.11 Natural Gas Constraint

The CAISO may enforce constraints that limit the maximum amount of natural gas that can be burned by natural gas-fired resources in the Southern California Gas Company and San Diego Gas & Electric Company gas regions, based on limitations in applicable gas regions anticipated by the CAISO during specific hours. In the event that such a constraint is binding, the Shadow Price of the constraint will be reflected in the Marginal Cost of Congestion component of the Locational Marginal Prices of only the affected natural gas-fired resources. The Shadow Price of the constraint will not be reflected in the Marginal Cost of Congestion component of the Locational Marginal Prices for purposes of settling cleared Demand, Virtual Bids, or Congestion Revenue Rights. The same Marginal Cost of Congestion used for settling Demand, Virtual Bids, or Congestion Revenue Rights is used for the calculation of the Real-Time Congestion Offset pursuant Section 11.5.4.1.1. The CAISO will allocate any non-zero amounts that are attributable to the price differential between the Marginal Cost of Congestion used for settling a Generating Unit's scheduled or Dispatched amounts at their location and the Marginal Cost of Congestion used for settling Demand, Virtual Bids, or Congestion Revenue Rights pursuant to Section 11.5.4, except that for Day-Ahead settlements the CAISO will allocate the difference through the CRR Balancing Account pursuant to Section 11.2.4.5. The CAISO will provide, through the procedures set forth in Section 6.5.10.1.1, information on whether the CAISO plans to enforce a natural gas constraint in the Day-Ahead Market, and after the Day-Ahead Market is executed, whether it enforced a natural gas constraint in the Day-Ahead Market. In addition, to the extent feasible in advance of the deadline for submitting Bids for the Day-Ahead or Real-Time Market, as applicable, the CAISO will issue a notice through its market notification system indicating its intent to enforce a natural gas constraint along with the affected areas and the magnitude and expected duration of the natural gas constraint.

27.12 Operator Imbalance Conformance

27.12.1 Operator Conformance in the Real-Time Market

The CAISO Operator may conform the CAISO Forecast of CAISO Demand prior to executing a Real-Time Market run to obtain a Real-Time Market solution that is feasible and accounts for known system conditions for reliable operations. The EIM Entity operator may conform the EIM Demand forecast prior to the CAISO executing a Real-Time Market run to obtain a Real-Time Market solution that is feasible and accounts for known system conditions of the respective EIM Entity's Balancing Authority Area for reliable operations. System operators conform the CAISO Forecast of CAISO Demand or EIM Demand through an adjustment of the respective forecast. The CAISO or EIM Entity operators will consider factors such as: load forecast discrepancies; Area Control Error adjustments; Variable Energy Resource deviations; resource outages not entered in the Outage Management System; generator testing; reliability curtailments due to transmission or equipment outages; weather changes; and pumping resource schedule changes. The CAISO and the EIM Entity will log Operator conformances.

27.12.2 Conformance Limiter in the Real-Time Market

The CAISO will limit an Operator conformance in the Real-time Market to ensure the conformance does not trigger shortage or surplus pricing for any interval in which there is no shortage or surplus of Energy indicated during the pricing of resources for that interval. The conformance limiter logic will: (1) be based on the conformance and ramping capability shortages or surplus changes between intervals; (2) consider information from current and previous intervals; (3) not require that the conformance is the same direction of the shortages or surpluses of ramp capability; and (4) consider the conformance magnitude in previous intervals and whether the limiter was applied in the corresponding intervals.

27.13 Aggregate Capability Constraint

The CAISO may enforce an Aggregate Capability Constraint that reflects a Generating Facility's maximum and minimum capability for purposes of Day-Ahead Market Awards, Real-Time Market Awards, and Real-Time Dispatch as described in the CAISO's Business Practice Manuals. If the combined PMax of Co-located Resources associated with a single Generating Facility would exceed the Interconnection Service Capacity of that Generating Facility, the Interconnection Customer may request that the CAISO enforce an Aggregate Capability Constraint. If the Interconnection Customer elects to forego an Aggregate Capability Constraint, the combined PMax of the Co-located Resources registered in the Master File for that Generating Facility may not exceed the Generating Facility's Interconnection Service Capacity. EIM Participating Resource Scheduling Coordinators also may request that the CAISO enforce an Aggregate Capability Constraint for Co-located Resources, subject to the prior written approval of the applicable EIM Entity Balancing Authority that enforcing an Aggregate Capability Constraint for Co-located Resources does not create a threat to safety or reliability.

Notwithstanding Section 34.13, a Generating Facility whose Co-located Resources, including Variable

Energy Resources, do not comply with Dispatch Instructions such that their output would exceed the Interconnection Service Capacity of the Generating Facility, will be ineligible for the Aggregate Capability Constraint. In such cases, the CAISO will adjust those Co-located Resources' PMaxes proportionate to each Generating Unit's capacity such that the sum of the PMaxes equals the Interconnection Service Capacity of the Generating Facility, or as requested by the Interconnection Customer so long as the total value does not exceed the Interconnection Service Capacity of the Generating Facility.

In the event that Co-located Resources in an EIM Entity Balancing Authority area do not comply with Dispatch Instructions such that their output exceeds the interconnection service for the Co-located Resources, the CAISO will ask the applicable EIM Entity Balancing Authority whether it will revoke its prior approval of enforcing the Aggregate Capability Constraint for such Co-located Resources.

The following resources are not eligible to use the Aggregate Capability Constraint: Multi-Stage Generators, Pseudo-Tie Resources, Proxy Demand Response, Pumped Storage Hydro Units, Metered Sub-Systems, and Use-Limited Resources.

Scheduling Coordinators may not offer or self-provide Ancillary Services into the CAISO's Markets or receive Uncertainty Awards from Generating Units that are subject to Aggregate Capability Constraints until the CAISO issues a Market Notice stating this restriction will no longer apply. The Pricing Node for the Generating Units or EIM Participating Resources subject to an Aggregate Capability Constraint will be their Point of Interconnection.