2. Market Operations Overview

2.5 Market Information

This section summarizes and describes the common information that is used by the Day-Ahead and Real-Time processes.

2.5.1 Resource Static Data

Static data is information that is expected to change infrequently. See Attachment B of *BPM for Market Instruments*, for Master File reference data.

2.5.2 Bids

Bids are submitted by SCs for each of the CAISO Markets. These Bid components are summarized as follows and are described further in the *BPM for Market Instruments*, Section 5:

- Start-Up Time and Start-Up Cost
- Minimum Load Cost
- Transition Costs
- RUC Availability Bid
- Regulation Up and Regulation Down Capacity Bids
- Regulation Up and Regulation Down Mileage Bids
- Spinning Reserve and Non-Spinning Reserve Bids
- Import Bid and Export Bid
- Energy Bid Curve and daily Energy Limits
- Generation Distribution Factors
- Ramp Rates
- Virtual Supply and Virtual Demand Bids in Day-Ahead Market.

SIBR processes Bids through a series of validation rules and, in the case of Virtual Bids, submits such bids to a credit check prior to Market Close. A warning is issued from SIBR if the Bid is not valid and the Scheduling Coordinator is given an opportunity to cancel the Bid and resubmit the bid, time permitting. After Market Close, SIBR creates Clean Bids, or generates Bids (described in more detail in the *BPM for Market Instruments*, Section 8) in accordance with CAISO Market rules. Clean Bids and Generated Bids are pushed to the DAM market processes. Additional detail regarding the Bid validation process is in the BPM for Market Instruments.
4. Ancillary Services

Welcome to the Ancillary Services (AS) section of the CAISO BPM for Market Operations. In this section, you will find the following information:

- A description of each of the AS Regions
- How CAISO determines AS requirements
- How CAISO procures AS
- How CAISO calculates AS Marginal Prices
- Other AS considerations
- Certification and testing requirements

4.1 Ancillary Services Regions

AS Regions are network partitions that are used to explicitly impose regional constraints in the procurement of AS, where the AS Region is defined as a set of PNodes. Regional AS procurement from resources associated with the CNodes defining the region is constrained by a lower and upper requirement. The upper requirement may be defined for each AS and also for upward AS.

AS regional constraints reflect transmission limitations between AS Regions that restrict the use of AS procured in one AS Region to cover for i) Outages in another AS Region and ii) constraints between the regions. AS regional constraints secure a minimum AS procurement (to ensure reliability) and/or a maximum AS procurement target (that increases the probability of deliverability of AS to each Region), such that the total AS procurement among Regulation Up, Spinning Reserve, and Non-Spinning Reserve reflects the current system topology and deliverability needs. Ancillary Service Regions and Sub regions are defined in the CAISO Tariff in Section 8.3.3. The CAISO may only establish New Ancillary Service Regions and Sub regions after first conducting a stakeholder process, and then only through the filing of a
tariff amendment with the FERC (See Section 4.1.2, [Ancillary Services Region Changes Process], below, for more information).

4.1.1 Ancillary Services Region Definition

There are always at least two AS Regions with non-zero minimum procurement limits applied:

- **Expanded System Region** – The Expanded System Region is defined as the entire CAISO Balancing Authority Area plus all System Resources at Scheduling Points at an outside boundary of the CAISO Balancing Authority Area. Total CAISO AS procurement requirements for each of the four types of AS that are further described in the *BPM for Market Instruments* (Regulation Up, Regulation Down, Spinning Reserve and Non-Spinning Reserve) are procured from certified Generating Units and Participating Loads, PDRs (non-spinning reserve only) and System Resources within the Expanded System Region. *Procurement requirements for Regulation Up and Regulation Down Mileage are enforced at the Expanded System Region only. There are no Regulation Mileage procurement requirements at the sub-regional level.*

- **System Region** – The System Region is defined as the sub-set of certified resources defined in the Expanded System Region that are located internal to the CAISO Balancing Authority Area. The minimum AS regional constraints for the AS System Region are only a percentage of the AS requirements for the Expanded System Region, currently at 50%, to limit the AS procurement from System Resources for reliability purposes. The purpose of this limitation is to guard against the consequences of losing interconnection tie facilities, which would limit the AS procurement, i.e., AS delivered over a tie cannot protect the tie itself.

4.2 Ancillary Services Requirements
4.2.1 Self-Provided Ancillary Services

This section is based on CAISO Tariff Section 8.6.2.

As stated in the Overview, Generating Units and Participating Loads and PDRs certified for AS may submit Submissions to Self-Provide an AS in the IFM. Self-Provided AS effectively reduces the aggregate AS requirements that must be met from AS Bids within the same AS Region, and reduces the AS Obligation for the SC Self-Providing the AS, in the AS cost allocation. For submissions to self-provide Regulation Up or Regulation Down, the price for the capacity reservation shall be $0/MWh and the price for Mileage shall be $0.

The CAISO performs a two-step process to qualify Submissions to Self-Provide AS (referred to as “SPAS”):

4.2.6 Regulation Up & Down Requirements

A minimum requirement for Regulation Up capacity and a minimum requirement for Regulation Down capacity can be specified for each AS Region and each Trading Hour. In addition, there is a Mileage requirement for Regulation Up and Regulation Down, representing the expected amount of system-wide resource operating point travel required to provide the service. Separate requirements are created for Regulation Up and Regulation Down, and are enforced at the Expanded System Region only. Finally, there is a maximum requirement for all upward AS collectively. Both Regulation Bids and Regulation self-provisions can participate in meeting these requirements. Only on-line Generating Units can be awarded Regulation service to contribute to the Regulation Up and Regulation Down requirements.

CAISO sets its Regulation reserve target as a percentage of CAISO Forecast of CAISO Demand for the hour based upon its need to meet the WECC and NERC performance standards (primarily CPS1 and CPS2). However, the percentage targets can be different for Regulation Up and Regulation Down. The percentage targets can also vary based on the hour of the Operating Day. CAISO’s Regulation targets (in MWh) may change if its Demand Forecast changes after running the Day-Ahead Market.

For each hour, the Mileage procurement requirement is calculated as the lower of three values:

1) The product of each regulating service’s capacity requirement and a System Mileage Multiplier for that service and hour. The System Mileage Multiplier is the amount of total expected generator movement (up or down), or Mileage, from 1 MW of Regulation Up or Down capacity. CAISO calculates an hourly System Mileage Multiplier from the measurement of Mileage of the prior 7 days for each
hour. For example, if the regulation up capacity procurement target for a given hour is 350MW, and the System Mileage Up Multiplier is 3.61, the mileage procurement target would be 1263 MW (350 x 3.61).

2) The average hourly actual mileage from the prior 7 days for that hour. This is calculated as the total mileage for the relevant hour divided by 7.

3) The sum of the product of each resource’s resource-specific Mileage multiplier and the resource bid-in regulation capacity. This number represents the total Mileage capability of the resources that have bid into the market. Inclusion of this number prevents a potential Mileage scarcity situation.

CAISO may adjust the mileage requirement based on operational needs.

See Appendix Attachment J for more details on the calculation of the System Mileage Multiplier and the resource-specific Mileage multiplier.

4.3 Ancillary Services Procurement

The bidding rules for AS procurement are as follows:

- All AS Bids (not Self-Provided) may be accompanied by an Energy Bid in DAM, and must be accompanied by an Energy Bid in RTM, which are used as the AS Bid is considered in the AS selection process (which is part of the simultaneous Energy, AS, and Congestion Market Clearing process). Only exception to this is Capacity that is awarded Regulation. Energy Bid is optional in RTM in the case of Capacity that is awarded Regulation except for MSS load-following resources. If an AS Bid in DAM is included and the Energy Bid does not extend to the full available capacity of the resource, then all or part of the AS Bid is considered to use available capacity that is not covered by the Energy Bid, and no opportunity cost is considered in the co-optimization of Energy and AS. For example, let’s assume there is a resource with a Pmax of 100 MW. It provides an Energy Bid of 90 MW and AS Bid of 20 MW in DAM. The software will co-optimize until 90 MW of capacity. It will calculate if it has to use 80 MW of Energy and 20 MW of AS or 90 MW of Energy and 10 MW of AS, if it has to use this resource at all depending on the economics of the bid. Any AS Bid beyond the Energy Bid Curve has zero opportunity cost. In this case, the last 10 MW of AS bid has zero opportunity cost. See the bid curve below. The portion of the
awarded AS capacity that is covered by an Energy Bid has a non-zero opportunity cost only if the total resource capacity is allocated between Energy and Ancillary Services, as would be in the case below if 80 MW of Energy were scheduled and 20 MW of spin were awarded.

An Energy Bid is not required for AS that is Self-Provided in the DAM. However, an Energy Bid is required in RTM for DA Spin and Non-Spin awards. While Conditionally Qualified Self-Provided AS is included in the optimization, unconditionally qualified Self-Provided AS does not enter the optimization.

The cost of procuring the AS by CAISO on behalf of the SCs is allocated to Measured Demand on a CAISO Balancing Authority Area basis.

The ISO procures Ancillary Services from Multi-Stage Generating Resources at the MSG Configuration level.
Ancillary Services Procurement in Day-Ahead Market

CAISO procures 100% of its AS needs associated with the CAISO Forecast of CAISO Demand net of unconditionally qualified Self-Provided AS. AS Bids are evaluated simultaneously with Energy Bids in the IFM to clear bid-in Supply and Demand. Thus, the IFM co-optimizes Energy and AS; the capacity of a resource with Energy and AS Bids is optimally used for an Energy schedule, or it is reserved for AS in the form of AS Awards. Furthermore, AS Bids from System Resources compete with Energy Bids for intertie transmission capacity.

Energy Schedules and AS Awards from System Resources are constrained over Interties. Therefore, the optimal Dispatch of Energy and AS capacity can be accomplished by assigning the same Congestion cost to each commodity. This process allows Energy and AS capacity to compete for the transmission access to (or from) the CAISO Balancing Authority Area directly, based on their Bids. This cannot be done for transmission internal to the CAISO Balancing Authority Area because the particular use of Ancillary Services in RTM is unknown during the AS procurement process. For this reason, Energy and AS capacity cannot directly compete for transmission across the internal CAISO Balancing Authority Area grid.

In the optimization of Energy and AS clearing, the limits on AS Regions are enforced as constraints represented by penalty prices in the application software, while Energy and AS are economically optimized subject to the AS Region procurement constraint(s).

AS are procured in the IFM to meet the AS requirements, net of qualified AS self-provision, subject to resource operating characteristics and regional constraints.

For Regulation Up and Regulation Down, Capacity and Opportunity Cost Bids are combined into a single bid which is co-optimized with Energy, Mileage, and other Ancillary Services. Additional constraints are added in the optimization problem to limit the Mileage awards for each resource with regulation capacity awards within a range based on the respective resource mileage multiplier. If economical, the optimization may procure Regulation from resources more likely to provide Mileage, i.e., have a higher resource Mileage multiplier, in order to meet the Mileage requirement. However, in general the optimization will not procure additional Regulation capacity in order to meet the Mileage requirement.

Because inter-tie transmission capacity must be reserved for AS Import Awards, AS Import Awards are charged with explicit Congestion charges when the relevant intertie is congested. For Energy Schedules, Congestion charges are included in the LMPs. However the ASMPs do not reflect congestion. For this reason, AS imports are charged with a separate Congestion charge that amounts to the AS Import Award multiplied by the shadow price of the relevant congested inter-tie. Regulation Up, Spinning Reserve and Non-Spinning Reserve are charged when the relevant intertie is congested in the import direction, whereas Regulation Down is charged when the relevant intertie is congested in the export direction. Unlike Energy imports and exports, AS imports are not paid when the relevant inter-tie is congested in the opposite direction because they do not create counterflow inter-tie transmission capacity.
Absent binding inter-temporal constraints (such as block energy constraints), the ASMP for a given AS and Import Resource minus the shadow price of the relevant inter-tie (in the appropriate direction) would be no less than the accepted AS bid price plus any opportunity cost.

Unlike other AS Awards, the Mileage procurement for Regulation Up and Regulation Down is not a financially binding award. Resources will be settled based on Instructed Mileage as adjusted for accuracy. See the BPM for Settlements and Billing for more information.

4.3.2 Ancillary Services Procured in Real-Time

- Ancillary Services are procured in the Real-Time Market from resources internal to the ISO system and Dynamic System Resources, through the RTUC process, as needed to satisfy the NERC requirements.

- Ancillary Services are procured on an hourly basis in the HASP from Non-Dynamic System Resources.

Ancillary Services Awards for internal resources and Dynamic System Resources are only considered binding the first 15-minute interval of each RTUC run including the RTUC run supporting HASP. Ancillary Service Awards from Non-Dynamic System Resources can procured in the HASP are considered binding for the HASP Trading Hour. The resources that are committed in Real-Time to provide Imbalance Energy and/or AS are eligible for Start-Up and Minimum Load Cost compensation, except for Non-Resource Specific System Resources.

Additional AS are procured in Real-Time in HASP (Non-Dynamic System Resources) or the Real-Time Market (Generators and Dynamic System Resources) only from resources that are certified to provide these services.

Refer to Section 7.6.2, Real-Time Ancillary Services Procurement, for additional information.

4.3.2.1 Regulation

CAISO can procure Regulation in RTM from resources which are available and offer Regulation and Mileage bids in RTM. WECC allows Regulation to be used for Spinning Reserve. Although Regulation Up won’t necessarily be used as spin, it does count to ensure that there are sufficient Operating Reserves available.

4.3.2.2 Spinning & Non-Spinning Reserve

This section is based on CAISO Tariff Section 31.5.6.

Real-Time procurement and pricing of Spinning Reserve and Non-Spinning Reserve is performed using dynamic co-optimization of Energy and Spinning and Non-Spinning Reserve. Spinning Reserve and Non-Spinning Reserve procured in Real-Time are for Contingency Only.
These requirements are calculated as part of the RTM based on the Demand Forecast and can be adjusted by the CAISO Operator.

### 4.4 Ancillary Services Marginal Prices

Generally speaking, the Ancillary Services Marginal Price (ASMP) for a given service at a given “location” is the cost of procuring an increment (MW) of that service at that location. It is, however, understood that the use of the word “location” here is not entirely precise because the “locations” where AS requirements are defined are AS Regions, whereas ASMPs are determined for individual PNodes.

This is a somewhat academic distinction, however, because in practice all PNodes belonging to the same set of AS Regions have the same ASMP. To better understand this statement, consider the AS Expanded System Region along with all of the AS Regions. Because some AS Regions have common areas (are nested), collectively they divide up the AS Expanded System Region into smaller areas. The ASMP for all PNodes within each of these smaller areas is the same.

ASMPs can be described more precisely in terms of Regional Ancillary Service Shadow Prices (RASSPs). RASSPs are produced as a result of the co-optimization of Energy and AS for each AS Region, and represent the cost sensitivity of the relevant binding regional constraint at the optimal solution, i.e., the marginal reduction of the combined Energy-AS procurement cost associated with a marginal relaxation of that constraint.

The opportunity cost for a resource which is awarded AS rather than energy when the energy bid is otherwise competitive is not computed explicitly, rather it is implicit in RASSP for that AS Region.

If neither of the constraints (upper or lower bound) is binding for an AS Region, then the corresponding RASSP is zero. The ASMP for a given service at a particular PNode is the sum of all RASSPs for that service over all AS Regions that include that PNode. It thus follows that all PNodes located in exactly the same set of AS Regions have the same ASMP. For example, if the defined AS Regions with non-zero RASSPs consist of “South of Path 26”, the System Region, the Scheduling Points, and the Expanded System Region, then all resources within “South of Path 26” have the same ASMP.

Exhibit 4-4 presents an example of how the RASSPs and ASMPs are related for a given set of the AS Regions. In this example the RASSPs are “given” from a pricing run for a specific AS product. The resulting ASMPs are for the PNodes within each AS Region.

#### Exhibit 4-4: Example for Spinning Reserve AS

<table>
<thead>
<tr>
<th>AS Region</th>
<th>RASSP (Given)</th>
<th>ASMP @ PNode</th>
</tr>
</thead>
<tbody>
<tr>
<td>South of Path 26</td>
<td>$20/ MW</td>
<td>20 + 10 + 5 = $35/MWh</td>
</tr>
<tr>
<td>AS Region</td>
<td>RASSP (Given)</td>
<td>ASMP @ PNode</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>System</td>
<td>$10/ MW</td>
<td>$10 + 5 = $15/MWh</td>
</tr>
<tr>
<td>Expanded System</td>
<td>$5/ MW</td>
<td>$5/MWh</td>
</tr>
</tbody>
</table>

ASMP reflects any lost opportunity costs associated with keeping the resource capacity unloaded for AS instead of scheduling that capacity as Energy in the same market when the entire available capacity of a given resource is totally allocated among Energy and AS Awards.

*Regulation Up and Regulation Down Mileage Marginal Prices are published for the Expanded System Region only, since the Mileage requirements are set only for the Expanded System Region.*

### 4.6 Ancillary Services Certification & Testing Requirements

This section is based on CAISO Tariff Section 8.3.4, Certification and Testing Requirements, and Section 8.4, Technical Requirements for Providing Ancillary Services.

Each Generating Unit, System Unit, or Load and PDRs that are allowed to submit a Bid or AS self-provision under the CAISO Tariff, and each System Resource that is allowed to submit a Bid to provide AS under the CAISO Tariff, must comply with CAISO’s certification and testing requirements as contained in the *BPM for Compliance Monitoring*.

The CAISO certifies Multi-Stage Generating Resources for Ancillary Services at the MSG Configuration level.

CAISO has the right to inspect Generating Units, Participating Loads and PDRs, or the individual resources comprising System Units and other equipment for the purposes of the issue of a certificate and periodically thereafter to satisfy itself that the technical requirements continue to be met. If at any time CAISO’s technical requirements are not being met, CAISO may withdraw the certificate for the Generating Unit, System Unit, Participating Load, PDRs or System Resource concerned.¹

¹ Participating Generators, Participating Loads and Dynamically-Scheduled System Resources are governed by pro-forma Agreements that are included as Appendix B of the Tariff. Each of these Agreements has a Termination clause that permits cancellation of the Agreement under certain conditions, including failure to meet technical requirements. See, for example, Section 3.2.1 of the Participating Generator Agreement.
The AS certification and the associated maximum AS capacity are registered in the Master File after testing that demonstrates satisfactory delivery of each AS.

### 4.6.1 Regulation Certification & Testing Requirements

This section is based on CAISO Tariff Section 8.3.4, Certification and Testing Requirements and Section 8.4.1.1.

Each Generating Unit and System Unit that submits a Bid Regulation or Self-Provides Regulation must be certified and tested by CAISO using the process defined in Part A of Appendix K of the CAISO Tariff. Each Dynamic System Resource offering Regulation must comply with the Dynamic Scheduling Protocol in Appendix X of the CAISO Tariff.

Generating Units with Automatic Generation Control capability may be certified for Regulation Up and Regulation Down. Their maximum Regulation Up and Regulation Down capacity is limited to their widest Regulation range, or their 10-minute Ramping capability with their best Regulation Ramp Rate, whichever is lower.

A resource may lose its ability to provide Regulation if its performance falls below a minimum performance threshold for Regulation Up or Regulation Down. If a resource’s measured accuracy, based on a simple average of fifteen minute intervals during a calendar month, is less than fifty percent for Regulation Up or Regulation Down, the CAISO may provide notice to the resource’s Scheduling Coordinator of the resource’s failure to meet the minimum performance threshold. The resource must re-certify to provide the respective service within ninety days from the date of the notice. In the event of lost accuracy data, the CAISO will not use data from these intervals to calculate the resource’s Historic Regulation Performance Accuracy or to assess the minimum performance threshold.

Resource-specific System Resources may also be certified for Regulation Up and Regulation Down. Such units must have AGC and dynamic interchange capability to provide Regulation.

Non-generator resources selecting Regulation Energy Management may also be certified for Regulation Up and Regulation down. Using Regulation Energy Management, an NGRs’ maximum Regulation Up and Regulation Down capacity is based on four (4) times the maximum Energy (MWh) the resource can generate or consume for fifteen (15) minutes after issuance of a Dispatch Instruction. Otherwise NGRs selecting Regulation Energy Management must meet the same certification requirements as generators.
6. Day-Ahead Market Processes

Welcome to the Day-Ahead Market Processes section of the CAISO BPM for Market Operations. In this section, you will find the following information:

- How CAISO determines and applies Market Power Mitigation
- How CAISO clears the Integrated Forward Market
- How CAISO performs the Residual Unit Commitment process

A timeline and data flow diagram is included for the Day-Ahead Market Processes, as shown in Exhibit 6-1, Day-Ahead Market Timeline.

6.1 Pre-Market Activities

There are many activities that take place in preparation for the DAM, as shown by the overview timeline in Exhibit 2-1 and as described in this section.

6.1.1 Congestion Revenue Rights

Congestion Revenue Rights (CRRs) have no direct effect on the scheduling of Power in the CAISO Markets. However, the holders of CRRs are charged or credited for Congestion in DAM as described in the BPM for Settlements & Billing.

6.1.2 Full Network Model Build

One of the continuing CAISO processes is that of building and updating the FNM for power system operations and for the CAISO Markets. This process is described in more detail in the BPM for Managing Full Network Model.

6.1.3 Bid Information

Seven days before the Trading Day, the DAM is opened and ready to accept Virtual and physical Bid information from the SCs.

See the BPM for Market Instruments for more information.

6.1.4 Outage Information

Outage information may be submitted up to 12 months in advance of the Trading Day.

Three days before the Trading Day, the DAM (via the SLIC application) is ready to process Outage information for the DAM applications:

- Planned transmission Outage requests received 45 days in advance
- Review for possible adverse impacts on the CAISO Controlled Grid and CAISO Balancing Authority Area
- Planned Generating Unit Outage requests received 72 hours in advance for all types of units
- Review for possible adverse impacts on the CAISO Balancing Authority Area
Approve or deny the requests.
Outages over-ride Bids. If outage results in a more restrictive range in supplying Energy and providing Ancillary Services, the more restrictive range is used in market applications in performing Scheduling.

Create the Outage schedule to be used by the market applications

For resources, outage information may be submitted for the following limitations:

- Resource is offline
- Resource is unable to provide Regulation
- Resource has more restrictive minimum and maximum operating limits than is recorded in the Master File.
- Resource has a different ramp rate than what was bid in.

6.6 Integrated Forward Market

This section is based on CAISO Tariff Section 31.3, Integrated Forward Market.

6.6.1 IFM Inputs

In addition to the data identified in earlier sections of this BPM, this section lists those inputs that are particularly important in IFM:

6.6.1.1 Bids Usage & Treatment in IFM

The following Bids are considered in IFM:

- Energy Bids (multi-segment)
  - Three-part Energy Bids for Generating Resources (including Aggregate Generating Resources with specified Generation Distribution Factors)
  - Three-part Energy Bids for logical generators that represent Participating Loads in association with fixed (i.e., Price Taker), non-conforming Load Schedules
- One-part Energy Bids for non-Participating Loads (including aggregated Loads with specified Load Distribution Factors)
- One-part Energy Bids for System Resources (imports and exports)
- One-part Energy Bids for Virtual Supply or Virtual Demand.

Three-part Energy Bids consist of Start-Up Cost (up to three segments), Minimum Load Cost (single value), and incremental Energy Bid (up to ten segments).

If the first Energy Bid MW breakpoint is higher than the Minimum Load, then there must be submitted Self-Schedules that add up to that MW level. The Self-Schedules between the Minimum Load and the first Energy Bid MW breakpoint are subject to uneconomic adjustments for Congestion Management based on artificial prices (penalties) that reflect various scheduling priorities, such as RMR pre-dispatch, TOR and ETC Self-Schedules.

Since Virtual Bids can be submitted per Eligible PNode/APNode for each eligible SC ID, in order to manage the volume of Virtual Bids into the IFM optimization, the following methodology will be utilized in SIBR and the IFM:

At the Day-Ahead Market close (currently 10:00 a.m.) the application will aggregate the Virtual Bids at each Eligible PNode/APNode to create one aggregate Virtual Supply Bid and one aggregate Virtual Demand Bid at each location (the aggregate bid can contain many more than 10 segments). For aggregation of Bids, the application will follow the standard of stacking up Bid segments when Energy Prices are different while adding MWs if Energy Prices are the same.

After the day-ahead application completes, the cleared Virtual Bid results will be de-aggregated at the eligible SC ID level before the Day-Ahead Market results, which include Virtual Awards, are published to Market Participants. For de-aggregation of a non-marginal segment, it is straight forward to assign the individual cleared MW to the eligible SCID. For the marginal segment, the relevant MW cleared amount may be associated with multiple bid segments and hence a prorating is needed to obtain the individual cleared MW amount at the SCID level. The CAISO will prorate the awarded MWs proportional to the submitted MWs of the marginal segment of each Virtual Bid contributing to the marginal aggregate segment.

- **AS Bids (single capacity segment)**
  - Regulation Up Bids *(single segment capacity and price, single segment opportunity cost, and single segment Mileage price)*
  - Regulation Down Bids *(single segment capacity and price, single segment opportunity cost, and single segment Mileage price)*
  - Spinning Reserve Bids
  - Non-Spinning Reserve Bids

AS may be simultaneously Self-Provided and Bid. AS Self-Provision from Non-Dynamic System Resources can be accomplished by submitting AS Bids at 0 $/MWhr. AS exports are not allowed in the CAISO Markets.
7. Real-Time Processes

7.2 Scheduling Coordinator Activities

7.2.1 Respond to Commitment & Dispatch Instructions

Upon publication of Schedules and Awards, SCs are advised to review the Schedules and Awards in order to be prepared to respond to Dispatch Instructions issued from ADS and CMRI. Start-Up Instructions may be issued by the CAISO before Dispatch Instructions are issued, which require resources to Start-Up prior to the relevant Dispatch Interval. Resources must be started in time for the resource to be available for the Dispatch Interval for which they are committed. The following instructions result from the Real-Time applications.

7.2.1.1 Commitment Instructions

Binding commitment instructions are generated and sent through ADS every 15 minutes from RTUC for dispatchable resource. Shut-Down instructions in the first interval of the RTUC Time Horizon are always binding. Shut-Down instructions in subsequent intervals are advisory and thus not sent through ADS. Start-Up instructions are binding if they cannot be revised in subsequent RTUC runs due to the relevant Start-Up Time. Only binding Start-Up instructions are sent through ADS. Transition Instructions are binding if they cannot be revised in subsequent Real-Time Unit Commitment runs due to the relevant transition notification time. Only binding transition instructions are sent through ADS.

7.2.1.2 Ancillary Service Awards

AS Awards are generated and sent through ADS and CMRI for Generating Units and System Resources every fifteen minutes, as required for dispatchable resources. For Non-Dynamic System Resources AS awards will be sent to ADS and CMRI for the target hour once an hour after each associated HASP run. The AS Award separately identifies the Day-Ahead Award, the Real-Time qualified self-provision, and the Real-Time AS Awarded Bid. Any Real-Time Award for Spinning and Non-Spinning Reserve are considered Contingency Only. AS procurement in the HASP and RTM is done optimally based on system conditions during each 15-minute RTUC interval. Because the CAISO must then maintain adequate reserves during the 15-minute interval, with no further opportunity for AS procurement, the HASP and RTM AS Awards are protected from being dispatched by RTED through designation as "contingency only". The CAISO will not Dispatch any Energy from the associated Energy Bid if there is no Ancillary Services awarded to the Non-Dynamic System Resource. See CAISO Tariff Section 30.5.2.6 and the BPM for Market Instruments.
7.6 Real-Time Unit Commitment

7.6.4 Real-Time Unit Commitment Outputs

The resulting RTUC-based commitment instructions are the final decisions regarding resource commitments to adjust Day-Ahead Schedules:

- **Ancillary Service Awards** – generated by RTUC and as modified by the CAISO Operator are sent to ADS and CMRI every fifteen minutes for dispatchable resources. The AS Award separately identifies the Day-Ahead Award, the Real-Time qualified self-provision, and the Real-Time AS Award. For Spinning and Non-Spinning Reserve, the Contingency Dispatch indicator is also reported. In any given interval where the software solution does not converge, the CAISO will issue binding Ancillary Services Awards based on the advisory results produced by the previous successful RTUC run for the applicable interval. In such cases, all 15-minute data including Ancillary Services Awards, prices, and other supporting data are copied from the advisory results of the previous run.

- **Commitment Instructions** – generated by RTUC and as modified by the CAISO Operator are sent to ADS every fifteen minutes from RTUC. In any given interval where the software solution does not converge, the CAISO will issue binding commitment instructions based on advisory commitment instructions obtained from the previous successful RTUC run, if the previous advisory instructions become binding in the current time frame based on the associated startup time, shutdown time or transition times as further described in Tariff Section 34.4 and 34.5. When determined binding, the commitment instructions and all information associated with those instructions of the previous run are copied and carried over into the current run horizon.