

**2.5.2.2 Time-frame For Revising Ancillary Service Standards.** The ISO Technical Advisory Committee shall periodically undertake a review of the ISO Controlled Grid operation to determine any revision to the Ancillary Services standards to be used in the ISO Control Area. At a minimum the ISO Grid Operations Committee shall conduct such reviews to accommodate revisions to WSCC and NERC standards. The ISO may adjust the Ancillary Services standards temporarily to take into account, among other things variations in system conditions, real time dispatch constraints, contingencies, and voltage and dynamic stability assessments. Where practicable, the ISO will provide notice, via the ISO Home Page, of any temporary adjustments to Ancillary Service standards by 6:00 p.m. two days ahead of the Trading Day to which the adjustment will apply.

**2.5.3 Quantities of Ancillary Services Required.**

For each of the Ancillary Services, the ISO shall determine the quantity and location of the Ancillary Service which is required and which must be under the direct Dispatch control of the ISO on an hourly basis each day. The ISO shall determine the quantities it requires as follows:

**2.5.3.1 Regulation Service.** The ISO shall maintain sufficient Generating Units immediately responsive to AGC in order to provide sufficient Regulation service to allow the system to meet WSCC and NERC criteria.

**2.5.3.2 Spinning And Non-Spinning Reserves.** The ISO shall maintain minimum contingency Operating Reserve made up of Spinning Reserve and Non-Spinning Reserve in accordance with WSCC MORC criteria equal to (a) 5% of the Demand ~~(except the Demand covered by firm purchases from outside the ISO Control Area)~~ to be met by Generation from hydroelectric resources plus 7% of the Demand ~~(except the Demand covered by firm purchases from outside the ISO Control Area)~~ to be met by Generation from other resources, or (b) the single largest Contingency, if this is greater or (c) by reference to such more stringent criteria as the ISO may determine from time to

time. [When the level of Operating Reserve is determined by Demand, the ISO shall not maintain Operating Reserve with respect to Demand covered by firm purchases from outside the ISO Control Area.](#) In addition, the ISO shall maintain Operating Reserve equal to the total amount of Interruptible Imports scheduled by Scheduling Coordinators for any hour. Such additional Operating Reserve must either be self-provided or purchased from the ISO by Scheduling Coordinators. To the extent such additional Operating Reserve is self-provided by a Scheduling Coordinator, it may consist entirely of Non-Spinning Reserve. To the extent that such additional Operating Reserve is not self-provided by a Scheduling Coordinator, the ISO will procure the necessary amounts of Operating Reserve, but not necessarily entirely from Non-Spinning Reserves.

**2.5.3.3 Replacement Reserve.** The ISO shall make its determination of the required quantity of Replacement Reserve based on:

- (a) historical analysis of the deviation between actual and Day-Ahead forecast Demand,
- (b) historical patterns of unplanned Generating Unit Outages,
- (c) historical patterns of shortfalls between Final Day-Ahead Schedules and actual Generation and Demand,
- (d) historical patterns of unexpected transmission Outages, and
- (e) such other factors affecting the ability of the ISO to maintain System Reliability as the ISO may from time to time determine.

The ISO shall have discretion to determine the quantity of Replacement Reserve it requires in each Zone.

**2.5.3.4 Voltage Support.**

The ISO shall determine on an hourly basis for each day the quantity and location of Voltage Support required to maintain voltage levels and reactive margins within WSCC and NERC criteria using a power flow study based on the quantity and location of

scheduled Demand. The ISO shall issue daily voltage schedules, which are required to be maintained for ISO Controlled Grid reliability. All other Generating Units shall comply with the power factor requirements set forth in contractual arrangements in effect on the ISO Operations Date, or, if no such contractual arrangements exist and the generating unit exists within the system of a Participating TO, the power factor requirements applicable under the Participating TO's TO Tariff or other tariff on file with the FERC.

All Participating Generators shall maintain the ISO specified voltage schedule at the transmission interconnection points to the extent possible while operating within the power factor range specified in their interconnection agreements or, for Regulatory Must-Take Generation, Regulatory Must-Run Generation and Reliability Must-Run Generation consistent with existing obligations. For Generating Units, that do not operate under one of these agreements, the minimum power factor range will be within a band of 0.90 lag (producing VARs) and 0.95 lead (absorbing VARs) power factors. Participating Generators with Generating Units existing at the ISO Operations Date that are unable to meet this operating power factor requirement may apply to the ISO for an exemption. Prior to granting such an exemption, the ISO shall require the Participating TO or UDC to whose system the relevant Generating Units are interconnected to notify it of the existing contractual requirements for voltage support established prior to the ISO Operations Date for such Generating Units. Such requirements may be contained in CPUC Electric Rule 21 or the Interconnection Agreement with the Participating TO or UDC. The ISO shall not grant any exemption under this Section from such existing contractual requirements. The ISO shall be entitled to instruct Participating Generators to operate their Generating Units at specified points within their power factor ranges. Generators shall receive no compensation for operating within these specified ranges.

If the ISO requires additional Voltage Support, it shall procure this either through Reliability Must-Run Contracts or, if no other more economic sources are available by

instructing a Generating Unit to move its MVar output outside its mandatory range. Only if the Generating Unit must reduce its MW output in order to comply with such an instruction will it be compensated in accordance with Section 2.5.18.

All Loads directly connected to the ISO Controlled Grid shall maintain reactive flow at grid interface points within a specified power factor band of 0.97 lag to 0.99 lead. Loads shall not be compensated for the service of maintaining the power factor at required levels within the bandwidth. A UDC interconnecting with the ISO Controlled Grid at any point other than a Scheduling Point shall be subject to the same power factor requirement.

The power factor for both the Generating Units and Loads shall be measured at the interconnection point with the ISO Controlled Grid. The ISO will develop and will be authorized to levy penalties against Participating Generators, UDCs or Loads whose Voltage Support does not comply with the ISO's requirements. The ISO will establish voltage control standards with UDCs and the operators of other Control Areas and will enter into operational agreements providing for the coordination of actions in the event of a voltage problem occurring.

Wheeling Through and Wheeling Out transactions may also be subject to a reactive charge as developed by the ISO. If the ISO shall determine that a reactive charge should be payable at a future date, it shall, subject to FERC acceptance and approval, publish annually the Voltage Support obligations and applicable charges for Wheeling Through and Wheeling Out transactions at Scheduling Points. The obligations shall be predetermined by the ISO based on the estimated amount of the Wheeling Through and Wheeling Out transactions each year.

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**2.5.6.1 Operating Characteristics Required to Provide Ancillary Services.** Each Generating Unit, System Unit, Load or System Resource which a Scheduling Coordinator

wishes to schedule or bid to provide Ancillary Services must comply with the requirements for the specific Ancillary Service in regard to the following:

- (a) ramp rate increase and decrease (MW/minute);
- (b) power factor (leading and lagging) as required by Section 2.5.3.4;
- (c) maximum output (real and reactive), except that System Resources shall be required to comply only with the requirement for maximum real power;
- (d) minimum output (real and reactive), except that System Resources shall be required to comply only with the requirement for minimum real power;
- (e) AGC capability, control scheme, and range; and
- (f) minimum length of time the resource can be available to provide the relevant Ancillary Service.

The ISO will differentiate the operating characteristics according to the Ancillary Service being provided.

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**2.5.7.4.4** Scheduling Coordinators may utilize transmission service under Existing Contracts to self-provide Regulation (consistent with the applicable ISO Protocols), ~~Spinning Reserve, Non-Spinning Reserve or Replacement Reserve~~ from resources located outside the ISO Control Area, where technically feasible, consistent with WSCC standards.

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**2.5.9 Provision of System Information to Scheduling Coordinators Market Participants.**

By 6:00 p.m. two days prior to the Trading Day, the ISO shall make available to Scheduling Coordinators general system information including those items of

information set forth in Section 2.2.10. This information shall be provided at the same time as the ISO provides general system information to all Scheduling Coordinators wishing to schedule power on the ISO Controlled Grid.

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#### **2.5.11 Information To Be Submitted By Bidders.**

Bids shall be submitted by Scheduling Coordinators acting on behalf of Participating Generators, and owners or operators of Loads. Bids must be in the format specified by the ISO and include the bid information for each service described in Sections 2.5.14 to 2.5.19 and such other information as the ISO may determine it requires to evaluate bids as published from time to time in ISO Protocols. The ISO will verify and respond to submitted bid data in accordance with Appendix E and the ISO Protocols. Bidders may submit new bids on a daily basis (or hourly basis for the Hour-Ahead mMarket).

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#### **2.5.18 Voltage Support.**

As of the ISO Operations Date, the ISO will contract for Voltage Support service with the owners of Reliability Must-Run Units. Payments for public utilities under the FPA shall be capped at the FERC authorized cost based rates unless and until FERC authorizes different pricing. The ISO shall pay owners of Reliability Must-Run units for long term Voltage Support through their Scheduling Coordinators.

In addition, any Participating Generator who is producing Energy shall, upon the ISO's specific request, provide reactive energy output outside the Participating Generator's Voltage Support obligation defined in Section 2.5.3.4.

The ISO shall select Participating Generator's Generating Units which have been certified for Voltage Support to provide this additional Voltage Support. Subject to any locational requirements, the ISO shall select the least costly Generating Units from a

computerized merit order stack to back down to produce additional Voltage Support in each location where Voltage Support is needed.

The ISO shall pay to the Scheduling Coordinator for that Participating Generator the opportunity cost of reducing Energy output to enable reactive energy production. This opportunity cost shall be:

$\text{Max}\{0, \text{Zonal Hourly Ex Post Price} - \text{Generating Unit bid price}\} \times \text{reduction in Energy output (MW)}$ .

If necessary, the ISO shall develop a regulatory cost based determination of marginal operating cost to be used in place of the Generating Unit bid price.

#### **2.5.19 Black Start Capability and Energy Output.**

As of the ISO Operations Date, the ISO will contract for Black Start capability and Energy with owners of Reliability Must-Run Units and Black Start Generators. Public utilities under the FPA will be paid rates capped at the FERC authorized cost base rates unless and until FERC authorizes different pricing. The ISO shall pay owners of Reliability Must-Run Units for Black Start Energy output through their Scheduling Coordinators. The ISO shall pay Black Start Generators for Black Start Energy output directly.

#### **2.5.20 Obligations for and Self Provision of Ancillary Services.**

**2.5.20.1 Ancillary Service Obligations.** Each Scheduling Coordinator shall be assigned a share of the total Regulation, Spinning Reserve, Non-Spinning and Replacement Reserve requirements by the ISO. Any references in this Tariff to the Ancillary Service "Regulation" shall be read as referring to "Regulation Up" or "Regulation Down". The share assigned to each Scheduling Coordinator is described in Section 2.5.20 and in Section 2.5.28 as that Scheduling Coordinator's obligation. Each Scheduling Coordinator's Regulation obligation in each Zone shall be pro rata based upon the same proportion as the Scheduling Coordinator's metered hourly Demand (excluding

exports) bears to the total metered Demand (excluding exports) served in each hour in that Zone. Each Scheduling Coordinator's Operating Reserve obligation in each Zone shall be pro rata based upon the same proportion as the ratio of the product of its percentage obligation based on metered output and the sum of its metered Demand and firm exports bears to the total of such products for all Scheduling Coordinators in the Zone. The Scheduling Coordinator's percentage obligation based on metered output shall be calculated as the sum of 5% of its ~~scheduled~~ real time Demand (except the Demand covered by firm purchases from outside the ISO Control Area) met by Generation from hydroelectric resources plus 7% of its Demand (except the Demand covered by firm purchases from outside the ISO Control Area) met by Generation from non-hydroelectric resources in that Zone, plus 100% of any Interruptible Imports and on-demand obligations which it schedules. Each Scheduling Coordinator's Replacement Reserve obligation in each Zone is calculated as described in Section 2.5.28.4.

Scheduling Coordinator obligations for each Ancillary Service will be calculated based on the requirement for each Ancillary Service as the ISO determines prior to the adjustment set forth in Section 2.5.3.6.

#### **2.5.20.2 Right to Self Provide.**

Each Scheduling Coordinator may choose to self provide all, or a portion, of its ~~Regulation and Reserve~~ Regulation, Operating Reserve, and Replacement Reserve obligation in each Zone. The ISO shall schedule self provided Ancillary Services, Day-Ahead and Hour-Ahead, and Dispatch self provided Ancillary Services in real time. To the extent that a Scheduling Coordinator self provides, the ISO shall correspondingly reduce the quantity of the Ancillary Services concerned, which it procures as described in Sections 2.5.14 to 2.5.17. In accordance with Section 2.5.22.11 and Section 2.5.26.2, if a Scheduling Coordinator uses capacity scheduled to self-provide Spinning Reserve, Non-Spinning Reserve, or Replacement Reserve to supply Uninstructed Imbalance Energy to



the ISO from a Generating Unit, Curtailable Demand, or System Resource under circumstances that would cause the elimination of payments to the Scheduling Coordinator under Section 2.5.26.2 if the capacity had been bid and was selected by the ISO to supply the Ancillary Service, the Scheduling Coordinator shall pay to the ISO the amount of the payment that would be eliminated under that section. Scheduling Coordinators may trade Ancillary Services obligations so that any Scheduling Coordinator may reduce its Ancillary Services obligation through purchase of Ancillary Services capacity from another Scheduling Coordinator, or self-provide in excess of its obligation to sell Ancillary Services to another Scheduling Coordinator, subject to the limits specified under Section 2.5.20.5.2. If a Scheduling Coordinator's Day-Ahead self-provided Ancillary Service schedule is decreased in the Hour-Ahead Market, such decrease shall be deemed to be replaced at the Market Clearing Price in the Hour-Ahead Market, pursuant to Section 2.5.21.

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**2.5.20.7 Acceptance of Self Provided Ancillary Service Schedules.** The ISO will refuse to accept self provided Ancillary Service schedules only to the extent that they fail to meet requirements contained in this ISO Tariff. In particular, self provided Ancillary Service schedules must satisfy the following conditions:

- (a) the Scheduling Coordinator has a current certificate of technical eligibility for the Generating Units, System Units, Loads or System Resources selected for the Ancillary Services in question;
- (b) to the extent not provided under (a), the Generating Units, System Units, Loads and System Resources have the instrumentation, communication and metering equipment necessary to permit the ISO to dispatch the offered Ancillary Services and verify that the services have been provided;

- (c) the scheduling information provided by the Scheduling Coordinator is deemed to be valid in accordance with Appendix E and the ISO Protocols; and
- (d) the Generating Units, System Units, Loads or System Resources meet the ISO's locational requirements for the Ancillary Services; and
- (e) ~~for self-provided Ancillary Services delivered from another control area, that, under Existing Contracts, the Scheduling Coordinator has arranged for the firm transmission of the Ancillary Services to the point of interconnection between the other control area and the ISO-Controlled Grid.~~

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#### **2.5.22.4.1 Timing of Supplemental Energy Bids.**

Supplemental Energy bids must be submitted to the ISO no later than ~~thirty (30)-forty-five (45)~~ minutes prior to the operating hour. Bids may also be submitted at any time after the Day-Ahead Market closes. These Supplemental Energy bids cannot be withdrawn after ~~thirty (30)-forty-five (45)~~ minutes prior to the Settlement Period. The ISO may dispatch the associated resource at any time during the Settlement Period.

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**2.5.22.10 Dispatch Instructions.** Dispatch instructions shall include the following information:

- (a) name of the Generating Unit, System Unit, Load or System Resource being dispatched;
- (b) specific MW value to which the Generating Unit, System Unit, Load or System Resource is being dispatched;
- (c) operating level and price point to which the Generating Unit, System Unit, Load or System Resource is being dispatched;

- (d) time the Generating Unit, System Unit, Load or System Resource is required to achieve the Dispatch instruction;
- (e) time of the Dispatch instruction; and
- (f) any other information which the ISO considers relevant.

All Dispatch instructions except those for the Dispatch of Regulation (which will be communicated by direct digital control signals) will be communicated by telephone or fax, at the ISO's discretion. Except in the case of deteriorating system conditions or emergency, and except for instructions for the Dispatch of Regulation, the ISO will send all Dispatch instructions to the Scheduling Coordinator for the Generating Unit, System Unit, Load or System Resource, which it wishes, to Dispatch. The recipient Scheduling Coordinator shall ensure that the Dispatch instruction is communicated immediately to the operator of the Generating Unit, System Unit, external import of System Resources or Load concerned. The ISO may, with the prior permission of the Scheduling Coordinator concerned, communicate with and give Dispatch instructions to the operators of Generating Units, System Units, external imports of System Resources and Loads directly without having to communicate through their appointed Scheduling Coordinator.

The recipient Scheduling Coordinator of a Dispatch instruction shall confirm the Dispatch instruction by repeating the Dispatch instruction to the ISO. The ISO shall record on tape all voice conversations, which occur on the Dispatch instruction communication equipment.

These recordings may be used to audit the Dispatch instructions, and to verify the response of Generating Units, System Units, external imports of System Resources and Loads ~~and System Resources~~ to Dispatch instructions.

The Dispatch instruction and all information associated with it shall be logged and recorded by the ISO as soon as practical after issuing each instruction. The ISO

Protocols govern the content, issue, receipt, confirmation and recording of Dispatch instructions.

**2.5.22.11 Failure to Conform to Dispatch Instructions.** All Scheduling Coordinators, Participating Generators, owners or operators of Curtailable Demands and operators of System Resources providing Ancillary Services (whether self provided or procured by the ISO) or whose Supplemental Energy bids have been accepted by the ISO shall be obligated to respond or to secure response to the ISO's Dispatch instructions in accordance with their terms, and to be available and capable of doing so, for the full duration of the Settlement Period. If a Generating Unit, Curtailable Demand or System Resource is unavailable or incapable of responding to a Dispatch instruction, or fails to respond to a Dispatch instruction in accordance with its terms, the Generating Unit, Curtailable Demand or System Resource:

- (a) shall be declared and labeled as non-conforming to the ISO's instructions;
- (b) cannot set the Hourly Ex Post Price; and

the Scheduling Coordinator for the Participating Generator, owner or operator of the Curtailable Demand or System Resource concerned shall pay to the ISO the difference between the Generating Unit's, Curtailable Demand's or System Resource's instructed and actual output (or Demand) at the Hourly Ex Post Price in accordance with Section 11.2.4.1. This applies whether the Ancillary Services concerned are contracted or self provided.

The ISO will develop additional mechanisms to deter Generating Units, Curtailable Demand and System Resources from failing to perform according to Dispatch instructions, for example reduction in payments to Scheduling Coordinators, or suspension of the Scheduling Coordinator's Ancillary Services certificate for the Generating Unit, Curtailable Demand or System Resource concerned.

## 2.5.23 Pricing Imbalance Energy.

**2.5.23.1 General Principles.** Imbalance Energy shall be priced ~~in two (2) time intervals~~ using the BEEP Interval Five Minute Ex Post Prices for Instructed Imbalance Energy per resource and the Hourly Ex Post Price for Uninstructed Imbalance Energy. The ~~Five Minute~~ Ex Post Prices shall be based on the bid of the marginal Generating Units, System Units, Loads and System Resources dispatched by the ISO to reduce Demand or to increase or decrease Energy output in each ~~five minute period (including resources that provide Imbalance Energy and Ancillary Services resources that increase or decrease Energy output or reduce Demand)~~ BEEP Interval.

The marginal Generating Unit, System Unit, Load or System Resource dispatched in ~~the five (5) minute period~~ each BEEP Interval is

- (a) if generation output is increased, or Demand reduced, the Generating Unit, System Unit, Load or System Resource with the highest bid that is accepted by the ISO's BEEP Software for incremental Generation, or Demand reduction;  
or
- (b) if generation output is decreased, the Generating Unit, System Unit, Load or System Resource with the lowest bid that is accepted by the ISO's BEEP Software for decremental Generation.

When an Inter-Zonal Interface is operated at the capacity of the interface (whether due to scheduled uses of the interface, or decreases in the capacity of the interface), the marginal incremental or decremental bid prices in some Zones may differ from one another. In such cases, the ISO will determine separate ~~Hourly~~ Ex Post Prices for the Zones.

The ISO will respond to the Dispatch instructions issued by the BEEP Software to the extent practical in the time available and acting in accordance with Good Utility

Practice. The ISO will record the reasons for any variation from the Dispatch instructions issued by the BEEP Software.

**2.5.23.2 Determining ~~Five Minute Ex Post Prices and Hourly Ex Post Price.~~**

2.5.23.2.1 BEEP Interval Ex Post Prices. For each ~~five minute period~~ BEEP Interval, the ISO will compute an updated dispatch price curve, using the Generating Units, System Units, Loads and System Resources dispatched according to the ISO's BEEP Software during that time period to meet Imbalance Energy requirements. For each BEEP Interval of the Settlement Period, BEEP will compute an incremental Ex Post Price and a decremental Ex Post Price. The incremental Ex Post Price will equal the highest price bid selected in the BEEP Interval. The decremental Ex Post Price will equal the lowest price bid selected the BEEP Interval. The ~~Five Minute Ex Post Prices~~ for each ~~five (5) minute period~~ BEEP Interval will equal the marginal bid of the marginal Generating Unit, System Unit, Load, or System Resource as described in Section 2.5.23.1.

The BEEP Interval incremental Ex Post Price will be computed for each BEEP Interval i as If the net quantity of Imbalance Energy in the five (5) minute period t is positive then

$$P5Min_r PJ_i = \text{Max}(EnBid_{it})_{ij}$$

The BEEP Interval decremental Ex Post Price will be computed for each BEEP Interval as

$$P5Min_r PD_i = \text{Max}(EnBid_{it})_r - \text{Min}(EnBid_{it})_{ij}$$

Where

$EnBid_{it}$  = Energy bid prices of the ~~Generating Units, Loads and System Resources~~ resource providing Ancillary Services Energy, ~~and or the Supplemental Energy bids of other Generating Units, Loads and System Resources dispatched by the ISO during the five minute period.~~

If the net quantity of Imbalance Energy in the five (5) minute period t is negative then

$$P5Min_t = \text{Min}(EnBid)_t$$

In the event of Inter-Zonal Congestion, the ISO will develop a dispatch price curve, and an Ex-Post Five Minute Price  $P5Min_{xt}$ , the BEEP Interval Ex Post Prices for each Zone where congestion exists.

**2.5.23.2.2 Hourly Ex Post Price Applicable to Uninstructed Deviations.** The Hourly Ex Post Price applicable to Uninstructed Imbalance Energy in Settlement Period t in each zone will equal the Energy weighted average of the ~~twelve (12) Five Minute Ex Post Prices~~ BEEP Interval Charges in each Zone, calculated as follows:

$$PHourExPost_x = \frac{\sum_{t=1}^{12} (P5Min_{xt} * SysDev)_t}{\sum_{t=1}^{12} SysDev_t}$$

$$PHourExPost_x = \frac{(\sum_{ji} |MWh_{jix}| * BIP_{ix})}{\sum_{ji} |MWh_{jix}|}$$

Where:

$PHourExPost_x$  = Hourly Ex Post Price in Zone x

$P5Min_{xt}$   $BIP_{ix}$  = Five minute BEEP Interval Ex Post Price in Zone x in period t

$J$  = the number of Scheduling Coordinators with instructed deviations

$SysDev_t$   $IIEC_{jix}$  = the absolute difference (whether positive or negative) between (the deviation between scheduled and metered Demand) and (the deviation between scheduled and metered Generation) in five (5) minute period t Instructed Imbalance Energy Charges for Scheduling Coordinator j for the BEEP Interval i in Zone x.

[/MWH<sub>jix</sub>=the Instructed Imbalance Energy for Scheduling Coordinator j for the BEEP Interval i in Zone x.](#)

If the ISO declares a System Emergency, e.g. during times of supply scarcity, and involuntary load shedding occurs during the real time eDispatch, the ISO shall set the Hourly Ex Post Price at the Administrative Price.

#### **2.5.24 Verification of Performance of Ancillary Services.**

Availability of both contracted and self provided Ancillary Services shall be verified by the ISO by unannounced testing of Generating Units, ~~System Units~~, Loads and System Resources, by auditing of response to ISO Dispatch instructions, and by analysis of the appropriate Meter Data, [or interchange schedules](#). Participating Generators, owners or operators of Loads, operators of System Units or System Resources and Scheduling Coordinators shall notify the ISO immediately whenever they become aware that an Ancillary Service is not available in any way. All Participating Generators, owners or operators of Loads and operators of System Units or System Resources shall check, monitor and/or test their system and related equipment routinely to assure availability of the committed Ancillary Services. These requirements apply whether the Ancillary Services are contracted or self provided. For a duration specified by the ISO, the ISO may suspend the technical eligibility certificate of a Scheduling Coordinator for a Generating Unit, System Unit, Load or System Resource, which repeatedly fails to perform. The ISO shall develop measures to discourage repeated non-performance on the part of both bidders and self providers.

The ISO shall monitor the performance of a MSS via a Metered Subsystem Regulation Error (MSRE). The MSRE is obtained by comparing the sum of the metered power flows at the MSS interface points to the sum of the MSS's power scheduled or instructed at these same interface points. The ISO may bias the MSRE for purposes of



testing or control of Ancillary Services provided by the MSS. The MSRE shall incorporate this bias.

The MSRE shall be reported to the ISO on a real time basis, and checked at five minute intervals to determine whether the MSS meets specified performance criteria.

The ISO has authority to suspend MSS control and direct, via communications with the MSS operator, the operation of units within the MSS if such control is necessary to maintain ISO Controlled Grid reliability.

If the MSS operator does not conform with Good Utility Practice, the ISO may suspend MSS control until the MSS operator demonstrates the ability and willingness to conform with Good Utility Practice.

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#### **2.5.27 Settlements for Contracted Ancillary Services.**

Based on the prices and quantities determined in accordance with this Section, the ISO shall operate a daily Settlement function for Ancillary Services it contracts for with Scheduling Coordinators.

The ISO shall calculate imbalances between scheduled, instructed and actual quantities of Energy provided based upon Meter Data obtained pursuant to Section 10. Schedules between Control Areas shall be deemed as being delivered in accordance with Good Utility Practice. The difference between actual and scheduled interchange shall then be addressed in accordance with the WSCC and NERC inadvertent interchange practices and procedures. Following this practice, all dynamic schedules for Ancillary Services provided to the ISO by other Control Areas shall be deemed delivered to the ISO. The difference between the Energy requested by the ISO and that actually

delivered by the other Control Area shall then be accounted for and addressed through the WSCC and NERC inadvertent interchange practices and procedures.

Separate payments shall be calculated for each Settlement Period  $t$  for each Generating Unit, System Unit, System Resource and Curtailable Demand. The ISO shall then calculate a total daily payment for each Scheduling Coordinator for all the Generating Units, System Units, System Resources and Curtailable Demands that it represents for each Settlement Period  $t$ .

The settlements for the Hour-Ahead markets shall be calculated by substituting Hour-Ahead prices in the relevant formulae and deducting any amounts due to the ISO from Scheduling Coordinators who buy back in the Hour-Ahead Market Regulation, Spinning Reserve, Non-Spinning Reserve or Replacement Reserve capacity they sold to the ISO in the Day-Ahead Market.

#### **2.5.27.1 Regulation.**

Regulation Up and Regulation Down payments shall be calculated separately. ~~Quantities and prices for Regulation Down shall be calculated by substituting the Regulation Up quantities and prices in the relevant formulae.~~

**Quantities.** The following quantity definitions shall be used for each Scheduling Coordinator in the settlement process:

$AGCUpQDA_{xt}$  = the Scheduling Coordinator's total quantity of Regulation Up capacity in Zone X sold through the ISO auction, and scheduled Day-Ahead  $j$  for Settlement Period  $t$ .

~~$AGCDownQDA_{xt}$  = the Scheduling Coordinator's total quantity of Regulation Down capacity in Zone X sold through the ISO auction, and scheduled Day-Ahead  $j$  for Settlement Period  $t$ .~~

~~$EnQUnst_{xt}$  = Uninstructed Imbalance Energy increase or decrease in Zone X in real time Dispatch for Settlement Period  $t$ , determined in accordance with the ISO Protocols.~~

~~$EnQUnst_{xt}$~~   ~~$EnQAGCUp_{ixt}$~~  = ~~Uninstructed Imbalance~~ the net Energy increase or decrease (deviation from Scheduled output) from a Generating Unit i providing Regulation in Zone X in real-time Dispatch for Settlement Period t, determined in accordance with the ISO Protocols.

**Prices.** The prices in the Settlement process for Regulation Up and Regulation Down shall be those determined in Section 2.5.14.

*Adjustment:* penalty described in Section 2.5.26.1.

$PAGCUpDA_{xt}$  = the market clearing price, PAGC, in Zone X for Regulation Up capacity in the Day-Ahead market for Settlement Period t.

$PAGCDownDA_{xt}$  = the market clearing price, PAGC, in Zone X for Regulation Down capacity in the Day-Ahead market for Settlement Period t.

**Payments.** Scheduling Coordinators for Generating Units providing Regulation Up capacity through the ISO auction shall receive the following payments for Regulation Up:

$$AGCUpPay_{xt} = AGCUpQDA_{xt} * PAGCUpDA_{xt} - Adjustment$$

Scheduling Coordinators for Generating Units providing Regulation Down capacity through the ISO auction shall receive the following payments for Regulation Down:

$$AGCDownPay_{xt} = AGCDownQDA_{xt} * PAGCDownDA_{xt} - Adjustment$$

Scheduling Coordinators for Generating Units shall receive the following payment for Energy output from Regulation:

$REPA_{ixt}$  = the Regulation Energy Payment Adjustment for Generating Unit i

$$\sum_i [(EnQUnst_{ixt} * HourlyExPostPriceinZoneX) + REPA_{ixt}]$$

in Zone X for Settlement Period t calculated as follows:

$$[(R_{UPixt} * C_{UP}) + (R_{DNixt} * C_{DN})] * \max(\$20/MWh, P_{xt})$$

Where

$R_{UPixt}$  = the upward range of generating capacity for the provision of Regulation from Generating Unit i in Zone X included in the bid accepted by the ISO for Generating Unit i for

Settlement Period t, weighted in proportion to the ISO's need for upward Regulation. The weighting factors will be specified within a range from 0-100 percent. The weighting factors will be set at the discretion of the ISO based on system conditions, and will be set at a level that will provide sufficient incentive to the market to supply upward Regulation for the ISO's purposes of satisfying WSCC criteria and NERC control performance standards. The ISO shall post the weighting factors consistent with the ISO Weighting Procedure, posted on the ISO website.

\_\_\_\_\_  $R_{DNit}$  = \_\_\_\_\_ the downward range of generating capacity for the provision of Regulation for Generating Unit i in Zone X included in the bid accepted by the ISO for Generating Unit i for Settlement Period t, weighted in proportion to the ISO's need for downward Regulation. The weighting factors will be specified within a range from 0-100 percent. The weighting factors will be set at the discretion of the ISO based on system conditions, and will be set at a level that will provide sufficient incentive to the market to supply downward Regulation for the ISO's purposes of satisfying WSCC criteria and NERC control performance standards. The ISO shall post the weighting factors consistent with the ISO Weighting Procedure, posted on the ISO website.

$$\text{_____ } C_{UP} \text{ _____} = 1$$

$$\text{_____ } C_{DN} \text{ _____} = 1$$

$$\text{_____ } P_{xt} \text{ _____} = \text{_____ the Hourly Ex Post Price for Zone X in Settlement Period t.}$$

The ISO may modify the value of the constants  $C_{UP}$  or  $C_{DN}$  within a range of 0-1 either generally in regard to all hours or specifically in regard to particular times of the day, after the ISO Governing Board approves such modification, by a notice issued by the Chief Executive Officer of the ISO and posted on the ISO Internet "Home Page," at <http://www.caiso.com>, or such other Internet address as the ISO may publish from time to time, specifying the date and time from which the modification shall take effect, which shall be not less than seven (7) days after the Notice is issued.

REPA shall not be payable unless the Generating Unit is available and capable of being controlled and monitored by the ISO Energy Management System over the full range of its Scheduled Regulation capacity for the entire Settlement Period at ~~at~~ least the ramp rates (increase and decrease in MW/minute) stated in its bid. In addition, the total Energy available ( $R_{UP}$  plus  $R_{DN}$ ) may be adjusted to be only  $R_{UP}$  or only  $R_{DN}$ , a percentage of  $R_{UP}$  or  $R_{DN}$ , or the sum of  $R_{UP}$  and  $R_{DN}$ , depending on the needs of the ISO for each direction of Regulation service.

*~~EnQUnst<sub>xt</sub> \* Hourly Ex Post Price in Zone X~~*

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