23. Temporary Changes to the Real-Time Market for Imbalance Energy

NOTE: MATERIAL SHOWN AS DELETED IN THE TARIFF SHEETS FOR SECTIONS 23.2.1 AND 23.5 HAS BEEN OMITTED

23.2.1 Amendments to the Body of the ISO Tariff

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2.5.23.2   Determining Ex Post Prices

2.5.23.2.1   BEEP Interval Ex Post Prices. For each BEEP Interval, the ISO will compute an updated dispatch price curve, using the Generating 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 in the BEEP Interval. The Ex Post Prices for each ~~five minute~~ BEEP Interval will equal the marginal bid of the marginal Generating 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

$PI_i = Max(EnBid_r)_i$

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

$PD_i = Min(EnBid_r)_i$

where

$EnBid_{r\,i}$ = Energy bid prices of the resources providing Ancillary Service Energy, or Supplemental Energy

In the event of Inter-Zonal Congestion, the ISO will develop a dispatch price curve, and BEEP Interval Ex Post Price 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 BEEP Interval ~~C~~charges in each Zone, calculated as follows:

$$\cancel{PHourExPostx = \frac{\sum_{ji}|IIEC_{jix}|}{\sum_{ji}|IMWH_{jix}|}} \quad PHourExPostx = \frac{(\sum_{ji}|MWh_{jix}| * BIP_{ix})}{\sum_{ji}|MWh_{jix}|}$$

where:

PHourExPost$_x$ = Hourly Ex Post Price in Zone x

~~HBI = the number of BEEP intervals in the Settlement Period~~

BIP$_{ix}$ = BEEP Interval Ex Post Price

j = the number of Scheduling Coordinators with instructed deviations

IIEC$_{jix}$ = the Instructed Imbalance Energy Charges for Scheduling Coordinator j for the BEEP ~~i~~Interval i in Zone x

IMWH$_{jix}$ = the Instructed Imbalance Energy for Scheduling Coordinator j for the BEEP ~~i~~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 Dispatch, the ISO shall set the Hourly Ex Post Price at the Administrative Price.

11.2.4.1 Net Settlements for Uninstructed Imbalance Energy.

Uninstructed Imbalance Energy attributable to each Scheduling Coordinator in each Settlement Period in the relevant Zone shall be deemed to be sold or purchased, as the case may be, by the ISO and charges or payments for Uninstructed Imbalance Energy shall be settled by debiting or crediting, as the case may be, the Scheduling Coordinator with an amount for each Settlement Period equal to:

IE Charge =

$$\left(\sum_i GenDev_i - \sum_i LoadDev_i\right) * P + \left(\sum_q ImpDev_q\right) * P - \left(\sum_q ExpDev_q\right) * P + UFEC$$

where:

The deviation between scheduled and actual Energy Generation for Generator i represented by the Scheduling Coordinator for the Settlement Period is calculated as follows:

$$GenDev_i = G_s * GMM_f - \left[\!\left(G_a - G_{adj}\right) * GMM_{ah} - G_{a/s}\right]$$

The deviation between scheduled and actual Load consumption for Load i represented by the Scheduling Coordinator for the Settlement Period is calculated as follows:

$$LoadDev_i = L_s - \left[\!\left(L_a - L_{adj}\right) + L_{a/s}\right]$$

The deviation between forward, scheduled and Real Time adjustments to Energy imports, adjusted for losses, for Scheduling Point q represented by the Scheduling Coordinator for the Settlement Period is calculated as follows:

$$ImpDev_q = I_s * GMM_{fq} - \left[\left(I_a - I_{adj}\right) * GMM_{ahq}\right] + I_{a/s}$$

The deviation between forward, scheduled and Real Time adjustments to Energy exports for Scheduling Point q represented by the Scheduling Coordinator for the Settlement Period is calculated as follows:

$$ExpDev_q = E_s - E_a - E_{adj}$$

and where:

G_s =   sum of effective schedules for Day-Ahead and Hour-Ahead

GMM_f =   estimated GMM for Day-Ahead

G_a =   actual metered Generation

G_{adj} =   deviations in real time ordered by the ISO for purposes such as Congestion Management

GMM_{ah} =   hour-ahead GMM (proxy for ex-post GMM)

$G_{a/s}$ =   Energy generated from Ancillary Service resource or Supplemental Energy resource due to ISO dispatch instruction

L_s =   sum of Demand scheduled for Day-Ahead and Hour-Ahead

L_a =   actual metered Demand

L_{adj} =   Demand deviation in real time ordered by ISO for purposes such as Congestion Management

$L_{a/s}$ =   Demand reduction from Ancillary Service resource or Demand increase or reduction from Supplemental Energgy resource due to ISO dispatch instruction

GMM_{fq} = estimated GMM for an Energy import at Scheduling Point q for Day-Ahead

GMM_{ahq} =   estimated GMM for an Energy import at Scheduling Point q for Hour-Ahead (proxy for

ex-post GMM)

I_S = sum of Scheduled Energy import scheduled through Scheduling Point q for Day-Ahead and Hour-Ahead

I_a = sum of actual Energy import scheduled through Scheduling Point q.

I_{adj} = deviation in real time import ordered by ISO for purposes such as Congestion Management, and import curtailment.

$I_{a/s}$ = Energy generated from Ancillary Service System Resources ~~pursuant to Existing Contracts~~ or Supplemental Energy from interties due to dispatch instruction

E_S = sum of scheduled Energy export scheduled through Scheduled Point q for Day-Ahead and Hour-Ahead

E_a = sum of actual Energy export scheduled through Scheduling Point q for Day-Ahead and Hour-Ahead

E_{adj} = deviation in real time export ordered by ISO for purposes such as Congestion Management, and export curtailment

P = Hourly Ex Post Price for Uninstructed Imbalance Energy for the relevant hour, as defined in Section 2.5.23.2.2

$UFEC$ = the Unaccounted for Energy Charge for the Scheduling Coordinator calculated as follows:

Unaccounted for Energy Charge

The hourly Unaccounted for Energy Charge on Scheduling Coordinator j for Settlement Period t for each relevant Zone is calculated in the following manner:

The UFE for each utility service territory *k* is calculated as follows,

$$E_{UFE\_UDC\_k} = \left(I_k - E_k + G_k - \left(RTM_k + LPM_k\right) - TL_k\right)$$

The Transmission Loss calculation per Settlement Period t per relevant Zone for each utility service territory k is calculated as follows,

$$TL_k = \sum \left[G_a * \left(1 - GMM_{ah}\right)\right] + \sum \left[I_a \left(1 - GMM_{ahq}\right)\right]$$

Each metered demand point, either ISO grid connected or connected through a UDC, is allocated a portion of the UFE as follows:

$$E_{UFE\_z} = \frac{D_z}{\sum_Z D_z} E_{UFE\_UDC\_k}$$

The UFE charge for Scheduling Coordinator j per Settlement Period per relevant Zone is then,

$$UFEC_j = \left(\sum_z E_{UFE\_z} \right) * P_{xt}$$

Where the terms used in the equations have the following meaning:

$E_{UFE\_UDC\_k}$ -- MWh

The Unaccounted for Energy (UFE) for utility service territory k.

E_{UFE_z} -- MWh

The portion of Unaccounted for Energy (UFE) allocated to metering point z.

I_k -- MWh

The total metered imports into utility service territory k in Settlement Period t.

E_k -- MWh

The total metered exports from utility service territory k in Settlement

Period t.

G_k -- MWh

The total metered Generation in Settlement Period t in utility service territory k.

RTM_k -- MWh

The Settlement Period t total of the real-time metering in utility service territory k in Settlement Period t.

LPM_k -- MWh

The calculated total of the Load Profile metering in utility service territory k per Settlement Period t.

TL_k -- MWh

The Transmission Losses per Settlement Period t in utility service territory k.

D_z -- MWh

The Demand including Exports in Settlement Period t at metered point z.

Replacement Reserve Dispatch Charge

For each Scheduling Coordinator whose Generators falls below its Schedule, or whose

Demand exceeds its Schedule, such that the net Schedule is unbalanced, the following additional charge will apply:

$RepResDispChrg_{jt} = D_{jt} * RRDispCost_i$

where:

$$D_{jt} = \frac{Max\left(0, \left\{\sum_i GenDev_i - \sum_i LoadDev_i + \sum_q ImpDev_q + \sum_q ExpDev_q + E_{UFE\_jk}\right\}\right)}{\sum Max\left(0, \left\{\sum_i GenDev_i - \sum_i LoadDev_i + \sum_q ImpDev_q + \sum_q ExpDev_q + E_{UFE\_jk}\right\}\right)}$$

$$D_{jt} = \frac{Max\left(0, \left\{\sum_i GenDev_i - \sum_i LoadDev_i + \sum_q ImpDev_q + \sum_q ExpDev_q + E_{UFE\_jk}\right\}\right) * ReplObligRatio_{jxt}}{\sum \left(Max\left(0, \left\{\sum_i GenDev_i - \sum_i LoadDev_i + \sum_q ImpDev_q + \sum_q ExpDev_q + E_{UFE\_jk}\right\}\right) * ReplObligRatio_{jxt}\right)}$$

where:

$$ReplObligRatio_{jxt} = \frac{ReplOblig_{jxt}}{\sum_{\overline{j}} ReplOblig_{jxt}}$$

ReplOblig_jxt is the replacement reserve capacity obligation as defined in Section 2.5.28.4; and

RRDispCost is defined in Section 2.5.28.4 of this ISO Tariff.

If there is Congestion in the Day-Ahead Market the ISO will allocate the Replacement Reserve Dispatch Charges on a Zonal basis. If there is no Congestion in the Day-Ahead Market the ISO will allocate the Replacement Reserve Dispatch Charges on a ISO Control Area-wide basis (irrespective of whether there is Congestion in the Hour-Ahead Markets or not).

This additional charge *(RepResDispChrg)* allocates the cost of dispatched Replacement Reserve to Scheduling Coordinators in proportion to their contribution to the need for the dispatch of that Replacement Reserve, as measured by the magnitude of the Energy insufficiency served through the Imbalance Energy market. The ISO shall develop protocols and procedures for the monitoring of persistent intentional excessive imbalances by Scheduling Coordinators and for the imposition of appropriate sanctions and/or penalties to deter such behavior. The net balance of the charges attributable to all Scheduling Coordinators represents the Transmission Losses imbalance total for each hourly Settlement Period.

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23.5   Amendments to the Settlement and Billing Protocol

C 2.1.3 Real Time Market

The total payment to each Scheduling Coordinator for real time Energy output from all resources which it represents for a given Trading Interval in a given Zone is calculated by summing all the payments for the resources of the Scheduling Coordinator in the Zone for the Trading Interval. This payment for Scheduling Coordinator j in Zone x for Trading Interval t is calculated as follows:

$$EnQPayTotal_{ijxt} = \sum_i EnQPay_{ijxt}$$

C 3.18   EnQ$_{ijx}$ – MWh

The Dispatched and Supplemental Energy output in the Real Time Market from resource i by Scheduling Coordinator j in Zone x for.

C 3.20   P$_{xt}$ - $/MWh

The Hourly Ex Post Price of Imbalance Energy in the Real Time Market in Zone x for Trading Interval t.

D 2.1.1 Uninstructed Imbalance Energy Charges on Scheduling Coordinators

The Imbalance Energy charge for Settlement Period t for Scheduling Coordinator j for Zone x is calculated using the following formula:

$$IEC_j = \left(\sum_i GenDev_i - \sum_i LoadDev_i \right) * P_{xt} + \left(\sum_q ImpDev_q \right) * P_{xt} - \left(\sum_q ExpDev_q \right) * P_{xt} + UFEC_j$$

The deviation between scheduled and actual Energy Generation for Generator i represented by Scheduling Coordinator j in Zone x during Settlement Period t is calculated as follows:

$$GenDev_i = G_s * GMM_f - [(G_a - G_{adj}) * GMM_{ah} - G_{a/s}]$$

The deviation between scheduled and actual Load consumption for Load i represented by Scheduling Coordinator j in Zone x during Trading Interval t is calculated as follows:

$$LoadDev_i = L_s - \left[\left(L_a - L_{adj} \right) + L_{a/s} \right]$$

The deviation between forward scheduled and Real Time adjustments to Energy imports[1], adjusted for losses, for Scheduling Point q represented by Scheduling

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[1]   Note that this deviation is a difference between a forward Market value and a Real Time value. It is not inadvertent energy.

[2]   Note that this deviation is a difference between a forward Market value and a Real Time value. It is not inadvertent energy.

Coordinator j into zone x during Settlement Period t is calculated as follows:

$ImpDev_q = I_s * GMM_{lq} - [(I_a - I_{adj}) *GMM_{ahq}]+I_{a/s}$

The deviation between forward scheduled and Real Time adjustments to Energy exports[2] for Scheduling Point q represented by Scheduling Coordinator j from Zone x during Settlement Period t is calculated as follows:

$$ExpDev_q = E_s - Ea - E_{adj}$$

The Hourly Ex Post Price applicable to uninstructed deviations in Settlement Period t in each zone will equal the Energy weighted average of the BEEP Interval charges in each zone, calculated as follows:

$$P_{xt} = \frac{\sum_{ji} |IIEC_{jix}|}{\sum_{ji} |IMWH_{jix}|} \qquad P_{xt} = \frac{(\sum_{ji} |IMWh_{jix}| * BIP_{ix})}{\sum_{ji} |IMWh_{jix}|}$$

Where:

BIP_{ix} = BEEP Interval Ex Post Price

$\mathbf{P}_{xt}$ = the Hourly Ex Post Price in Zone x

$\mathbf{IIEC}_{jix}$ = the Instructed Imbalance Energy Charges for Scheduling Coordinator j for BEEP Interval i in Zone x

$\mathbf{IMWH}_{jix}$ = the Instructed Imbalance Energy for Scheduling Coordinator j for the BEEP Interval i in Zone x

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