

ATTACHMENT F
REPLACEMENT RESERVE

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. 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 bears to the total metered Demand 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 Schedules 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 Schedules shall be calculated as the sum of 5% of its scheduled Demand (except the Demand covered by firm purchases from outside the ISO Control Area) scheduled to be met by Generation from hydroelectric resources plus 7% of its scheduled Demand (except the Demand covered by firm purchases from outside the ISO Control Area) scheduled to be 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 ~~shall be pro rata based upon the same proportion as the metered Demand of the Scheduling Coordinator bears to the total metered Demand in the Zone~~ is calculated as described in Section 2.5.28.4.

2.5.28.4 Replacement Reserve. The user rate per unit of purchased

Replacement Reserve for each Settlement Period ~~in the Day-Ahead Market and Hour-Ahead Markets for each Zone shall be calculated by dividing the total cost to ISO of purchasing Replacement Reserve capacity within the Zone, for the Settlement Period by the ISO's total Replacement Reserve requirement for the Settlement Period in the Day-Ahead Market less that which has been self provided by Scheduling Coordinators within the Zone.~~ The ISO will calculate the user rate for Replacement Reserve in each Zone for each Settlement Period as: for each Zone shall be as follows:

$$\overline{ReplRateDA}_{xt} = \frac{\sum_j ReplPayTotalDA_{jxt}}{ReplObligTotal_{xt}}$$

$$ReplRate_{xt} = \frac{ReplPayTotalDA_{xt} + ReplPayTotalHA_{xt} - ReplBuyBackTotal_{xt}}{ReplObligTotal_{xt}}$$

where

ReplPayTotalDA_{xt} = Total Replacement Reserve payments for the Settlement Period t in the Day-Ahead Market for the Zone x.

ReplPayTotalHA_{xt} = Total Replacement Reserve payments for the Settlement Period t in the Hour-Ahead Market for the Zone x.

ReplBuyBackTotal = payments from Scheduling Coordinators buying back Ancillary Service capacity sold in the Day-Ahead Market or replacing capacity that was provided in the Day-Ahead Market.

ReplObligTotal_{xt} = the total ISO Replacement Reserve requirement procured in the Day-Ahead Market and Hour-Ahead Market for the Settlement Period t for the Zone x less that which has been self provided by Scheduling Coordinators.

For each Settlement Period, each Scheduling Coordinator shall pay to the ISO a sum calculated as follows for each Zone:

$ReplRateDA * ReplOblig$

where

$ReplOblig = DevReplOblig + RemRepl - SelfProv$

$DevReplOblig$ is the Scheduling Coordinator's obligation for deviation Replacement

Reserve in the Zone in the Settlement Period and $RemRepl$ is the Scheduling

Coordinator's obligation for remaining Replacement Reserve, for which it has not self provided.

Deviation Replacement Reserve for Scheduling Coordinator j in Zone x for Settlement Period t is calculated as follows:

If $ReplObligTotal_{xt} > DevReplOblig_{xt}$ then:

$$DevReplOblig_{xjt} = \left[\text{Max} \left(0, \sum_i GenDev_{ixt} \right) - \text{Min} \left(0, \sum_i LoadDev_{ixt} \right) \right]$$

If $ReplObligTotal_{xt} < DevReplOblig_{xt}$ then:

$$DevReplOblig_{xjt} = \frac{ReplObligTotal_{xt}}{DevReplOblig_{xt}} * \left[\text{Max} \left(0, \sum_i GenDev_{ixt} \right) - \text{Min} \left(0, \sum_i LoadDev_{ixt} \right) \right]$$

where,

$GenDev_i$ = The deviation between scheduled and actual Energy Generation for Generator

i represented by Scheduling Coordinator j in Zone x during Settlement Period t as

referenced in Section 11.2.4.1.

$LoadDev_i$ = The deviation between scheduled and actual Load consumption for resource i

represented by Scheduling Coordinator j in Zone x during Settlement Period t as

referenced in Section 11.2.4.1.

$DevReplOblig$ is total deviation Replacement Reserve in Zone x for Settlement Period t.

Remaining Replacement Reserve for Scheduling Coordinator j in Zone x for Settlement Period

t is calculated as follows:

$$RemRepl_{xjt} = \frac{MeteredDemand_{xt}}{TotalMeteredDemand_{xt}} * TotalRemRepl_{xt}$$

where:

MeteredDemand is the Scheduling Coordinator's total metered Demand excluding exports in Zone x for Settlement Period t.

TotalMeteredDemand is total metered Demand excluding exports in Zone x for Settlement Period t.

TotalRemRepl_{xt} = Max[0, ReplObligTotal_{xt} - DevReplOblig_{xt}]

Settlement and Billing Protocol

Appendix C

C 2.2.1 Day-Ahead Market

(a) Regulation. The ISO will charge the zonal cost of providing Regulation capacity that is not self provided by Scheduling Coordinators, in the Day-Ahead Market, through the application of a charge to each Scheduling Coordinator for each Trading Interval. This charge will be computed by multiplying the Regulation user rate for the Trading Interval by the Scheduling Coordinator's Regulation obligation, for which it has not self provided, for the same period.

The zonal Regulation user rate for the Day-Ahead Market is calculated by dividing the total cost to ISO of purchasing Regulation Capacity within the Zone, for the Trading Interval, by the total ISO Regulation obligation for the Trading Interval within the Zone. The Day-Ahead Regulation user rate in Zone x for Trading Interval t is calculated as follows:

$$AGCRateDA_{xt} = \frac{\sum_j AGCPayTotalDA_{jxt}}{AGCObligTotal_{xt}}$$

The Regulation capacity charge for Scheduling Coordinator j in the Day-Ahead Market in Zone x for Trading Interval t is calculated as follows:

$$AGCChgDA_{jxt} = AGCOblig_{jxt} * AGCRateDA_{xt}$$

(b) Spinning Reserve. The ISO will charge the zonal cost of providing Spinning Reserve capacity that is not self provided by Scheduling Coordinators, in the Day-Ahead Market, through the application of a charge to each Scheduling Coordinator for each Trading Interval. This charge will be computed by multiplying the Spinning Reserve capacity user rate for the Trading Interval by the Scheduling Coordinator's Spinning Reserve obligation, for which it has not self provided, for the same period.

The zonal Spinning Reserve capacity user rate for the Day-Ahead Market is calculated by dividing the total cost to ISO of purchasing Spinning Reserve capacity within the Zone, for the Trading Interval, by the total ISO Spinning Reserve obligation for the Trading Interval within the Zone.

The Day-Ahead Spinning Reserve capacity user rate in Zone x for Trading Interval t is calculated as follows:

$$SpinRateDA_{xt} = \frac{\sum_j SpinPayTotalDA_{jxt}}{SpinObligTotal_{xt}}$$

The Spinning Reserve capacity charge for Scheduling Coordinator j in the Day-Ahead Market in Zone x for Trading Interval t is calculated as follows:

$$SpinChgDA_{jxt} = SpinOblig_{jxt} * SpinRateDA_{xt}$$

(c) Non-Spinning Reserve. The ISO will charge the zonal cost of providing Non-Spinning Reserve capacity that is not self provided by Scheduling Coordinators, in the Day-Ahead Market, through the application of a charge to each Scheduling Coordinator for each Trading Interval. This charge will be computed by multiplying the Non-Spinning Reserve capacity user rate for the Trading Interval by the Scheduling Coordinator's Non-Spinning Reserve obligation, for which it has not self provided, for the same period.

The zonal Non-Spinning Reserve capacity user rate for the Day-Ahead Market is calculated by dividing the total cost to ISO of purchasing Non-Spinning Reserve capacity within the Zone, for the Trading Interval, by the total ISO Non-Spinning Reserve obligation for the Trading Interval within the Zone. The Day-Ahead Non-Spinning Reserve capacity user rate in Zone x for Trading Interval t is calculated as follows:

$$NonSpinRateDA_{xt} = \frac{\sum_j NonSpinPayTotalDA_{jxt}}{NonSpinObligTotal_{xt}}$$

The Non-Spinning Reserve capacity charge for Scheduling Coordinator j in the Day-Ahead Market in Zone x for Trading Interval t is calculated as follows:

$$NonSpinChgDA_{jxt} = NonSpinOblig_{jxt} * NonSpinRateDA_{xt}$$

~~(d) Replacement Reserve.~~ The ISO will charge the zonal cost of providing Replacement Reserve capacity that is not self provided by Scheduling Coordinators, in the Day-Ahead Market, through the application of a charge to each Scheduling Coordinator for each Trading

Interval. This charge will be computed by multiplying the Replacement Reserve user rate for the Trading Interval by the Scheduling Coordinator's Replacement Reserve obligation, for which it has not self provided, for the same period.

The zonal Replacement Reserve user rate for the Day-Ahead Market is calculated by dividing the total cost to ISO of purchasing Replacement Reserve Capacity within the Zone, for the Trading Interval, by the total ISO Replacement Reserve obligation for the Trading Interval within the Zone. The Day-Ahead Replacement Reserve user rate in Zone x for Trading Interval t is calculated as follows:

$$ReplRateDA_{xt} = \frac{\sum_j ReplPayTotalDA_{jxt}}{ReplObligTotal_{xt}}$$

The Replacement Reserve capacity charge for Scheduling Coordinator j in the Day-Ahead Market in Zone x for Trading Interval t is calculated as follows:

$$ReplChgDA_{jxt} = ReplOblig_{jxt} * ReplRateDA_{xt}$$

C 2.2.2

Hour-Ahead Market

(a) Regulation. The ISO will charge the zonal net cost of providing Regulation capacity that is not self provided by Scheduling Coordinators, in the Hour-Ahead Market through the application of a charge to each Scheduling Coordinator for the Trading Interval concerned. This charge will be computed by multiplying the Regulation user rate for the Trading Interval by the Scheduling Coordinator's Regulation obligation, for which it has not self provided, for the same period.

The zonal Regulation capacity user rate for the Hour-Ahead Market is calculated by dividing the total cost to the ISO of purchasing Regulation capacity within the Zone less any amounts payable to the ISO by Scheduling Coordinators for Regulation bought back from the ISO in the Hour-Ahead Market on behalf of resources located in the Zone, for the Trading Interval, by the total ISO Regulation capacity obligation for the Trading Interval within the Zone. The Hour-Ahead Regulation capacity user rate in Zone x for Trading Interval t is calculated as follows:

$$AGCRateHA_{xt} = \frac{\sum_j AGCPayTotalHA_{jxt}}{AGCObligTotal_{xt}}$$

The Regulation capacity charge for Scheduling Coordinator j in the Hour-Ahead Market in Zone x for Trading Interval t is calculated as follows:

$$AGCChgHA_{jxt} = (AGCOblig_{jxt} * AGCRateHA_{xt})$$

(b) Spinning Reserve. The ISO will charge the zonal net cost of providing Spinning Reserve capacity that is not self provided by Scheduling Coordinators, in the Hour-Ahead Market, through the application of a charge to each Scheduling Coordinator for the Trading Interval. This charge will be computed by multiplying the Spinning Reserve capacity user rate for the Trading Interval by the Scheduling Coordinator's Spinning Reserve obligation, for which it has not self provided, for the same period.

The zonal Spinning Reserve capacity user rate for the Hour-Ahead Market is calculated by dividing the total cost to ISO of purchasing Spinning Reserve capacity within the Zone less any amounts payable to the ISO by Scheduling Coordinators for Spinning Reserve bought back from the ISO in the Hour-Ahead Market on behalf of resources located in the Zone, for the Trading Interval, by the total ISO Spinning Reserve obligation for the Trading Interval within the Zone. The Hour-Ahead Spinning Reserve capacity user rate in Zone x for Trading Interval t is calculated as follows:

$$SpinRateHA_{xt} = \frac{\sum_j SpinPayTotalHA_{jxt}}{SpinObligTotal_{xt}}$$

The Spinning Reserve capacity charge for Scheduling Coordinator j in the Hour-Ahead Market in Zone x for Trading Interval t is calculated as follows:

$$SpinChgHA_{jxt} = (SpinOblig_{jxt} * SpinRateHA_{xt})$$

(c) Non-Spinning Reserve. The ISO will charge the zonal net cost of providing Non-Spinning Reserve capacity that is not self provided by Scheduling Coordinators, in the Hour-Ahead Market, through the application of a charge to each Scheduling Coordinator for the Trading Interval. This charge will be computed by multiplying the Non-Spinning Reserve capacity user rate for the concerned Trading Interval by the Scheduling Coordinator's Non-Spinning Reserve obligation, for which it has not self provided, for the same period.

The zonal Non-Spinning Reserve capacity user rate for the Hour-Ahead Market is calculated by dividing the total cost to ISO of purchasing Non-Spinning Reserve capacity within the Zone less any amounts payable to the ISO by Scheduling Coordinators for Non-Spinning Reserve bought back from the ISO in the Hour-Ahead Market on behalf of resources in the Zone, for the Trading Interval, by the total ISO Non-Spinning Reserve obligation for the Trading Interval within the Zone. The Hour-Ahead Non-Spinning Reserve capacity user rate in Zone x for Trading Interval t is calculated as follows:

$$NonSpinRateHA_{xt} = \frac{\sum_j NonSpinPayTotalHA_{jxt}}{NonSpinObligTotal_{xt}}$$

The Non-Spinning Reserve capacity charge for Scheduling Coordinator j in the Hour-Ahead Market in Zone x for Trading Interval t is calculated as follows:

$$NonSpinChgHA_{jxt} = (NonSpinOblig_{jxt} * NonSpinRateHA_{xt})$$

(d) Replacement Reserve. The ISO will charge the zonal cost of providing Replacement Reserve capacity that is not self provided by

Scheduling Coordinators, in the Hour-Ahead Market, through the application of a charge to each Scheduling Coordinator for each Trading Interval. This charge will be computed by multiplying the Replacement Reserve user rate for the Trading Interval by the Scheduling Coordinator's Replacement Reserve obligation, for which it has not self provided, for the same period.

The zonal Replacement Reserve user rate for the Hour-Ahead Market is calculated by dividing the total cost to ISO of purchasing Replacement Reserve Capacity within the Zone less any amounts payable to the ISO by Scheduling Coordinators for Non-Spinning Reserve bought back from the ISO in the Hour-Ahead Market on behalf of resources in the Zone, for the Trading Interval, by the total ISO Replacement Reserve obligation for the Trading Interval within the Zone. The Hour-Ahead Replacement Reserve user rate in Zone x for Trading Interval t is calculated as follows:

$$ReplRateHA_{xt} = \frac{\sum_j ReplPayTotalHA_{jxt}}{ReplObligTotal_{xt}}$$

The Replacement Reserve capacity charge for Scheduling Coordinator j in the Hour-Ahead Market in Zone x for Trading Interval t is calculated as follows:

$$ReplChgHA_{jxt} = ReplOblig_{jxt} * ReplRateHA_{xt}$$

C 2.2.3 Replacement Reserve. The user rate per unit of purchased Replacement

Reserve for each Settlement Period t for each Zone x shall be as follows:

$$\text{ReplRate}_{xt} = \frac{\text{ReplPayTotalDA}_{xt} + \text{ReplPayTotalHA}_{xt} - \text{ReplBuyBackTotal}_{xt}}{\text{ReplObligTotal}_{xt}}$$

where:

ReplPayTotalDA_{xt} = Total Replacement Reserve payments for the Settlement Period t in the Day-Ahead Market for the Zone x.

ReplPayTotalHA_{xt} = Total Replacement Reserve payments for the Settlement Period t in the Hour-Ahead Market for the Zone x.

ReplBuyBackTotal = payments from Scheduling Coordinators buying back Ancillary Service capacity sold in the Day-Ahead Market or replacing capacity that was self-provided in the Day-Ahead Market.

ReplObligTotal_{xt} = the total ISO Replacement Reserve requirement procured in the Day-Ahead Market and the Hour-Ahead Market for the Settlement Period t for the Zone x less that which has been self-provided by Scheduling Coordinators.

For each Settlement Period, each Scheduling Coordinator shall pay to the ISO a sum calculated as follows for each Zone:

$$\text{ReplRate} * \text{ReplOblig}$$

where

$$\text{ReplOblig} = \text{DevReplOblig} + \text{RemRepl} - \text{SelfProv}$$

DevReplOblig is the Scheduling Coordinator's obligation for deviation Replacement Reserve in the Zone in the Settlement Period and RemRepl is the Scheduling Coordinator's obligation for remaining Replacement Reserve.

Deviation Replacement Reserve for Scheduling Coordinator j in Zone x for Settlement Period t

is calculated as follows:

If $ReplOblig_{xt} > DevReplOblig_{xt}$ then:

$$DevReplOblig_{xjt} = \left[\text{Max} \left(0, \sum_i GenDev_{ixt} \right) - \text{Min} \left(0, \sum_i LoadDev_{ixt} \right) \right]$$

If $ReplOblig_{xt} < DevReplOblig_{xt}$ then:

$$DevReplOblig_{xjt} = \frac{ReplOblig_{xt}}{DevReplOblig_{xt}} * \left[\text{Max} \left(0, \sum_i GenDev_{ixt} \right) - \text{Min} \left(0, \sum_i LoadDev_{ixt} \right) \right]$$

where,

$GenDev_{ixt}$ = The deviation between scheduled and actual Energy generation for Generator i represented by Scheduling Coordinator j in Zone x during Settlement Period t as referenced in Section 11.2.4.1.

$LoadDev_{ixt}$ = The deviation between scheduled and actual Load consumption for resource i represented by Scheduling Coordinator j in Zone x during Settlement Period t as referenced in Section 11.2.4.1.

$DevReplOblig_{xt}$ is total deviation Replacement Reserve in Zone x for Settlement Period t.

Remaining Replacement Reserve for Scheduling Coordinator j in Zone x for Settlement Period t is calculated as follows:

$$RemRepl_{xjt} = \frac{MeteredDemand_{jt}}{TotalMeteredDemand_{xt}} * TotalRemRepl_{xt}$$

where:

MeteredDemand is the Scheduling Coordinator's total metered Demand in Zone x for

Settlement Period t.

TotalMeteredDemand is total metered Demand in Zone x for Settlement Period t.

TotalRemRep_{xt} = $\text{Max}[0, \text{ReplObligTotal}_{xt} - \text{DevReplOblig}_{xt}]$