ATTACHMENT N

CONGESTION-RELATED SETTLEMENTS: TCCS, TCC AUCTIONS AND TRANSMISSION AVAILABILITY

1.0 Overview of Allocation and Distribution of Congestion-Related Revenues and Costs

The ISO shall allocate and distribute all revenue resulting from the collection of Congestion Rents in the Day-Ahead Market and from the sale of TCCs in the Centralized TCC Auctions.[1] In its settlement process, the ISO shall collect payments for reductions in Day-Ahead Congestion Rents and Centralized TCC Auction revenue attributable to transmission facilities that are out-of-service in the Day-Ahead Market and that were modeled as in-service in the last Centralized TCC Auction, and shall make payments for increases in Day-Ahead Congestion Rents and Centralized TCC Auction revenue attributable to transmission facilities that are returned to service in the Day-Ahead Market and that were modeled as out-of-service in the prior auction. Finally, the ISO shall allocate and distribute all accumulated Excess Congestion Rents resulting from the settlement of the Day-Ahead Market.

For the purposes of Attachment N, Tariff references to transmission outages, or transmission out-of-service, shall also pertain to transmission deratings. Similarly, all Tariff references to returning a line that is out-of-service back into service, shall also pertain to transmission upratings.

2.0 Day-Ahead Market

2.1 Overview of ISO Congestion-Related Revenues and Costs

ISO Revenues. In each hour of the Day-Ahead Market, the ISO shall collect Congestion Rents from parties scheduling Energy transactions in the LBMP Market and from parties scheduling Bilateral Transactions. It shall also collect Congestion Shortfall Charges from Transmission Owners responsible for transmission facility outages that lead to reductions in the collection of Day-Ahead Congestion Rents, in instances in which such facilities were modeled as in-service in the last Centralized TCC Auction for TCCs valid in the hour.

ISO Costs. In each hour of the Day-Ahead Market, the ISO shall make Congestion payments to Primary Holders of TCCs, and shall also make Congestion Surplus Payments to Transmission Owners responsible for returning transmission facilities to service that lead to increases in the collection of Day-Ahead Congestion Rents, in instances in which the facilities were modeled as out-of-service in the last Centralized TCC Auction for TCCs valid in the hour.

[1] For purposes of Attachment N, the term "Centralized TCC Auction" shall include "Reconfiguration Auctions."

The calculation of each source of ISO congestion-related revenue or cost in the Day-Ahead Market is described in one of the sections that follow.

In each hour, *h*, of the Day-Ahead Market, the ISO shall accumulate Excess Congestion Rents equal to the difference between its congestion-related collections and payments, calculated as follows:

$$\text{Excess Congestion Rents}_h = \text{Congestion Rents}_h + \text{Congestion Shortfall Charges}_h - \text{TCC payments}_h - \text{Congestion Surplus Payments}_h \quad \text{(N-1)}$$

Excess Congestion Rents may be negative. The ISO shall calculate the Excess Congestion Rents in each hour, and shall allocate and distribute them as described in Section 2.5 below.

2.2 Congestion Rents Collected in the Day-Ahead Market

In each hour of the Day-Ahead Market, the ISO shall collect Congestion Rents from parties scheduling Energy transactions in the LBMP Market and from parties scheduling Bilateral Transactions.

The ISO shall collect Congestion Rents through the Congestion Component of the LBMP settlement price applied to Energy injections and withdrawals scheduled in the Day-Ahead Market. The total Congestion Rents for Day-Ahead LBMP Energy schedules in an hour are calculated as follows:

$$\sum_{W=EnergyWithdrawals} MW_W * CCPOW_W - \sum_{I=EnergyInjections} MW_I * CCPOI_I \quad \text{(N-2)}$$

Where,

MW_W = Megawatts of Energy withdrawal schedule, *W*, in the hour

$CCPOW_W$ = Day-Ahead Congestion Component ($/MWh) at the Point of Withdrawal (POW) for Energy withdrawal schedule, *W*, in the hour

MW_I = Megawatts of Energy injection schedule, *I*, in the hour

$CCPOI_I$ = Day-Ahead Congestion Component ($/MWh) at the Point of Injection (POI) for Energy injection schedule, *I*, in the hour.

The ISO also shall collect Congestion Rents as part of the Transmission Usage Charge (TUC) applied to Day-Ahead Bilateral Transaction schedules. Total Congestion Rents for Bilateral Transactions scheduled in the Day-Ahead Market are calculated as follows:

$$\sum_{B=BilateralTransactions} MW_B * CCTUC_B \quad \text{(N-3)}$$

Where,

MW_B = Megawatts of Bilateral Transaction, *B*, in the hour

$CCTUC_B$ = Day-Ahead Congestion Component of the TUC ($/MWh) for Bilateral Transaction, *B*, in the hour, equal to $CCPOW_B$ - $CCPOI_B$.

Total Congestion Rents for an hour of the Day-Ahead Market, $Congestion\ Rents_h$ in Equation (N-1), is the sum of the Congestion Rents collected for Energy transactions scheduled in the LBMP Market (Equation (N-2)) and for Bilateral Transactions (Equation (N-3)).

2.3 Congestion Shortfall Charges Collected for the Day-Ahead Market and Congestion Surplus Payments Made in the Day-Ahead Market

Differences between the transmission grid representation used in the Day-Ahead Market and that used in the last Centralized TCC Auction prior to the Day-Ahead Market may lead to Congestion Rent Shortfalls and surpluses.

In each hour of the Day-Ahead Market the ISO shall collect Congestion Shortfall Charges from Transmission Owners responsible for facility outages that lead to reductions in the collection of Day-Ahead Congestion Rents, in instances in which such facilities were modeled as in-service in the last Centralized TCC Auction for TCCs valid in the hour.

In each hour of the Day-Ahead Market, the ISO also shall make Congestion Surplus Payments to Transmission Owners responsible for returning facilities to service that lead to increases in the collection of Day-Ahead Congestion Rents, in instances in which such facilities were modeled as out-of-service in the last Centralized TCC Auction for TCCs valid in the hour.

2.3.1 Congestion Shortfall Charges and Congestion Surplus Payments

The ISO shall collect the Day-Ahead Congestion Shortfall Charge from the Transmission Owner of the transmission element whose outage has caused a reduction in Transmission Capability in the hour of the Day-Ahead Market. In situations in which there are different Transmission Owners for elements of a set of transmission facilities that are connected in series, the Congestion Shortfall Charge shall be collected from the owner of the single facility that causes the outage of the set of facilities. Thus, the ISO may collect a Congestion Shortfall Charge from the Transmission Owner of a circuit breaker if the circuit breaker experiences a forced or unforced outage, resulting in the outage of a related transmission line.

Similarly, the ISO shall make Congestion Surplus Payments to the Transmission Owner of the transmission element whose return to service has caused an increase in Transmission Capability in the hour of the Day-Ahead Market. In situations in which there are different Transmission Owners for elements of a set of transmission facilities that are connected in series, the Congestion Surplus Payment will be made to the owner of the single facility that causes the set of facilities to return to service. Thus, the Transmission Owner of a circuit breaker may

receive Congestion Surplus Payments if the circuit breaker was scheduled out-of service in the last Centralized TCC Auction, but is returned to service during the month.

In instances in which a transmission element is jointly owned by more than one Transmission Owner, the ISO shall allocate Congestion Shortfall Charges and Congestion Surplus Payments in proportion to the ownership shares used to apportion TCC auction revenue.

2.3.2 Calculation of Congestion Shortfall Charges and Congestion Surplus Payments

The ISO will collect a Congestion Shortfall Charge on account of a transmission facility outage in situations in which the set of valid TCCs and scheduled Grandfathered Rights[2] in the hour is not simultaneously feasible on the Day-Ahead Market transmission grid configuration when the transmission facility is out-of-service, and there is a cost to this infeasibility. The ISO will not collect a Congestion Shortfall Charge in an hour on account of a transmission facility outage if the facility was represented as out-of-service in the last Centralized TCC Auction in which TCCs were sold that are valid in the hour.

The ISO will make a Congestion Surplus Payment on account of a transmission facility that returns to service in situations in which its return enables the ISO to accommodate Day-Ahead schedules in excess of those that arise from the set of valid TCCs and scheduled Grandfathered Rights, and there is a value to this increase. The ISO will not make a Congestion Surplus Payment in an hour on account of a transmission facility that returns to service if the facility was represented as in-service in the last Centralized TCC Auction in which TCCs were sold that are valid in the hour.

2.3.2.1 Calculation of Constraint Residuals

The ISO shall determine the Congestion Shortfall Charges and Congestion Surplus Payments for an hour of the Day-Ahead Market by first calculating the total Congestion Rent Shortfall or Congestion Rent Surplus for each Constraint that is binding in the Day-Ahead Market. These values shall be called the Constraint Residuals. As a second step, described in Section 2.3.2.2 below, the ISO shall allocate each Constraint Residual, as appropriate, in the form of Congestion Shortfall Charges or Congestion Surplus Payments.

The Constraint Residuals shall be calculated using the following procedures:

1. *Identify Binding Constraints.* The ISO shall identify all Constraints (either pre-contingency or post-contingency) that are binding (i.e., active) in the power flow based on the final schedules for an hour of the Day-Ahead Market.

2. *Determine Day-Ahead Flows on Constraints.* The ISO shall calculate the Energy flows on each binding Constraint resulting from the LBMP Energy schedules and Bilateral Transaction schedules for the hour. This calculation shall be based on the actual hourly

[2] For purposes of Attachment N, the term "Grandfathered Rights" excludes Existing Transmission Capacity for Native Load.

transmission grid model (including Shift Factors) used in scheduling the Day-Ahead Market.

3. *Determine TCC Flows on Constraints.* The ISO shall calculate flows on each binding Constraint associated with the set of TCCs valid in the hour and those Grandfathered Rights scheduled in the hour. This calculation shall be based on the actual hourly transmission grid model (including Shift Factors) used in scheduling the Day-Ahead Market.

4. *Determine Megawatt Difference.* The ISO shall subtract (3) from (2) to determine the difference between the megawatts scheduled to flow over each Constraint in the Day-Ahead Market ("DA Flows"], and the megawatt flow calculated for the set of valid TCCs and scheduled Grandfathered Rights over those Constraints ("TCC Flows") . This difference shall be adjusted for differences in Energy flows resulting from differences in PAR schedules in the last Centralized TCC Auction held for TCCs valid in the hour, and the PAR settings in the hour of the Day-Ahead Market.

5. *Calculate Constraint Residual.* For each Constraint with a non-zero difference calculated in (4), the ISO shall multiply the MW quantity calculated in (4) by the shadow price of the Constraint for the hour, to place a value on the difference between the DA Flows and the TCC flows on the Constraint. This value, the Constraint Residual, may be positive or negative. **Note:** If included as a definition it doesn't need to be separately stated.]

The following equations summarize these five steps for calculating the Constraint Residual, $DCR_{a,h}$, for Constraint *a* in hour *h* of the Day-Ahead Market.

$$DCR_{a,h} = SP_{a,h} * \left(F_{a,I,h} - F_{a,J,h}\right) \quad \text{(N-4)}$$

Where,

$DCR_{a,h}$= The Constraint Residual for binding Constraint *a* in hour *h* of the Day-Ahead Market, in $

$SP_{a,h}$= The shadow price of binding Constraint *a* in hour *h* of the Day-Ahead Market, in $/MWh

I = The set of Day-Ahead Market LBMP Energy and Bilateral Transaction schedules for hour *h*

$F_{a,I,h}$= The flow on binding Constraint *a* produced by imposing the set of injections and withdrawals from *I* on the transmission network in hour *h* of the Day-Ahead Market, in MW [Note: cut the following text to simplify….]

J = A set consisting of TCCs valid for month *J* and those Grandfathered Rights scheduled in hour *h*

$F_{a,J,h}$= The flow on binding Constraint *a* produced by imposing the set of injections and withdrawals from *J* on the transmission network used for hour *h* of the Day-Ahead Market, in MW. [Note: cut text to simplify….]

The Constraint Residual may be increased or decreased as a result of differences between the PAR schedules in the last Centralized TCC Auction and the PAR schedules applied in the hour of the Day-Ahead Market. Thus, in Equation (N-4), the difference in flows on Constraint *a*, $F_{a,I,h} - F_{a,J,h}$ shall be adjusted for differences in Energy flows resulting from differences in PAR schedules in the last Centralized TCC Auction held for TCCs valid in the hour and the PAR schedules applied in the hour of the Day-Ahead Market.

In some instances, the Constraint Residual may be positive (i.e., there may be a Congestion Rent surplus on the Constraint) in whole or in part because the Constraint was not binding in the last Centralized TCC Auction. If $DCR_{a,h}$ is positive for Constraint *a* , it shall be adjusted to account for any rated capacity in excess of the flows on the constraint in the last Centralized TCC Auction for TCCs valid on the Constraint following the last Centralized TCC Auction for TCCs valid in hour *h*. To make this adjustment, the ISO shall recalculate Equation (N-4) setting $F_{a,J,h}$ equal to the rating limit for Constraint *a* used in the last Centralized TCC Auction , instead of calculating $F_{a,J,h}$ as described above. This adjusted $DCR_{a,h}$ will be allocated as described below in section 2.3.3.2.

2.3.2.2 Allocation of Constraint Residuals as Congestion Shortfall Charges and Congestion Surplus Payments

Following the calculation of the Constraint Residuals for an hour, the ISO shall use the following procedures to allocate each Constraint Residual, as appropriate, as Congestion Shortfall Charges or Congestion Surplus Payments.

2.3.2.2.1 Identification of Transmission Facilities Potentially Contributing to Congestion Shortfall Charges or Congestion Surplus Payments

First, the ISO shall identify all transmission facilities that are potential contributors to a Congestion Shortfall Charge or Congestion Surplus Payment.

Transmission Facilities Out-of-Service. The ISO shall identify all transmission facility and equipment outages during hour *h* that may contribute to a reduction in the collection of Day-Ahead Congestion Rents. (For purposes of this Attachment these will be referred to as "facility outages"). The following facilities shall be excluded from this list: transmission facilities modeled as out-of-service in the last Centralized TCC Auction for TCCs valid in hour *h,* and grid configuration changes that were included in the last Centralized TCC Auction for TCCs valid in hour *h*. Derated facilities may be included in the list. The list will include only one entry for the outage of a set of transmission facilities connected in series, for which the outage of one of the facilities automatically leads to the outage of the others. For each transmission facility, *d* (an index for derates), on this list, the ISO shall determine, based on power flow analysis or similar

types of analyses, whether the transmission facility is contributing to the Constraint Residual calculated for each binding Constraint, *a.* The variable, $Outage_{a,d}$ shall have the value 1 if the outage of facility *d* contributes to $DCR_{a,h}$, and 0 otherwise.

Transmission Facilities In-Service. Similarly, the ISO shall identify all transmission facilities and equipment that have returned to service during hour *h* that may contribute to an increase in the collection of Day-Ahead Congestion Rents. (For purposes of this Attachment these will be referred to as "facilities returning to service").The ISO shall exclude from the list Transmission facilities modeled as in-service in the last Centralized TCC Auction for TCCs valid in hour h. Uprated facilities may be included in the list. The list will include only one entry for the uprate of a set of transmission facilities connected in series, in instances in which transmission capability is only increased when all serially-connected elements in the set are returned to service. For each transmission facility, *u* (an index for uprates), on this list, the ISO shall determine, based on power flow analysis or similar types of analyses, whether the transmission facility is contributing to the Constraint Residual calculated for each binding Constraint, *a.* The variable, $In\text{-}Service_{a,u}$ shall have the value 1 if the return-to-service of facility *u* contributes to $DCR_{a,h}$, and 0 otherwise.

The lists, $Outage_{a,d}$ and $In\text{-}Service_{a,u}$, of transmission facilities and equipment impacting each Constraint Residual shall be used to determine the allocation of the Constraint Residual, as described in the following subsections.

2.3.2.2.2 Allocation of Negative Constraint Residuals to Transmission Facility Outages

If the Constraint Residual for Constraint *a*, $DCR_{a,h}$, is negative, there is a Congestion Rent Shortfall on the Constraint. This section describes the allocation of a negative Constraint Residual when it results only from facility outages . The allocation process when both facility outages and facilities returning to service contribute to the same Constraint Residual is described in Section 2.3.2.2.4.

If the Constraint Residual for Constraint *a*, $DCR_{a,h}$, is negative and $In\text{-}Service_{a,u}$ is equal to 0 for all *u*, then the Constraint Residual for Constraint *a* shall be allocated to those facilities for which $Outage_{a,d}$ is equal to 1 during the hour. When $DCR_{a,h}$ is negative, the allocation of $DCR_{a,h}$ to Transmission Owner *t* in hour *h* is a Congestion Shortfall Charge denoted $DCSC_{a,t,h}$.

The allocation of the Constraint Residual, $DCR_{a,h}$, shall depend on the specific combination of facilities for which $Outage_{a,d}$ is equal to 1 during the hour.

Single Outage. If the ISO has determined that only a single outage is contributing to the shortfall on Constraint *a*, *i.e*., $Outage_{a,d}$ is equal to 1 for only a single outage *d*, then $DCR_{a,h}$ shall be allocated to the Transmission Owner responsible for this facility outage. (See Section 2.3.1)

Multiple Outages, One Transmission Owner. If the ISO identifies two ore more outages contributing to the shortfall on Constraint *a*, *i.e*., $Outage_{a,d}$ is equal to 1 for more than one outage *d*, and the same transmission owning entity is responsible for each of these outages then $DCR_{a,h}$

shall be allocated to the Transmission Owner responsible for these facility outages. (See Section 2.3.1)

Multiple Outages, Multiple Transmission Owners. If the ISO identifies two or more outages contributing to the shortfall on Constraint *a*, *i.e.*, $Outage_{a,d}$ is equal to 1 for more than one outage *d*, and more than one transmission owning entity is responsible for these outages (See Section 2.3.1)then the ISO shall allocate $DCR_{a,h}$ among the Transmission Owners responsible for the facility outages. $DCR_{a,h}$ shall be allocated among the responsible Transmission Owners in proportion to the stand-alone impact of each outage, individually, on flows over Constraint *a.* The ISO shall use power flow analysis or similar types of analyses to determine the effect of each outage, individually, on the flows over Constraint *a*.

The following equation summarizes the allocation of the Constraint Residual in instances in which there is more than one responsible Transmission Owner.

$$DCSC_{a,t,h} = V_{t,l} \Big/ \sum_{y \in D} V_{s,y} * DCR_{a,h} \qquad \text{(N-5)}$$

Where,

$DCSC_{a,t,h}$ = The Congestion Shortfall Charge assigned to Transmission Owner *t* for binding Constraint *a* in hour *h* of the Day-Ahead Market

$V_{t,l}$ = The overload in megawatts on binding Constraint *a* from a power flow analysis in which the set of injections and withdrawals *J* (for TCCs and scheduled Grandfathered Rights) is represented on the TCC auction grid model for month *J*, modified so as to represent transmission facility *l* owned by Transmission Owner *t* as out-of-service

$V_{s,y}$= The overload in megawatts on binding Constraint *a* from a power flow analysis in which the set of injections and withdrawals *J* (for TCCs and scheduled Grandfathered Rights is represented on the TCC auction grid model for month *J*, modified so as to represent transmission facility *y* owned by Transmission Owner *s* as out-of-service

D= The set of all transmission facilities out-of-service that affect binding Constraint *a*, *i.e.*, the set of all *d* for which $Outage_{a,d}$ is equal to 1.

No Outages. If the ISO identifies no outages contributing to the shortfall on Constraint *a*, *i.e.*, $Outage_{a,d}$ is equal to 0 for all outages *d*, then $DCR_{a,h}$ shall not be allocated as a Congestion Shortfall Charge but, instead, shall be part of the value that is calculated through application of the formula for Excess Congestion Rents for hour *h*.

2.3.2.2.3 Allocation of Positive Constraint Residuals to Transmission Facilities Returned to Service.

If the Constraint Residual for Constraint *a*, $DCR_{a,h}$, is positive there is a Congestion Rent surplus on the Constraint. This section shall describe the allocation of a positive Constraint Residual when it results only from transmission facility uprates or transmission facilities returning to service . The allocation process when both facility outages and facilities returning to service contribute to the same Constraint Residual is described in Section 2.3.2.2.4.

If the Constraint Residual for Constraint *a*, $DCR_{a,h}$, is positive and $Outage_{a,d}$ is equal to 0 for all *d*, then $DCR_{a,h}$ shall be allocated to the facilities for which $In\text{-}Service_{a,u}$ is equal to 1 during the hour. When $DCR_{a,h}$ is positive, the allocation of $DCR_{a,h}$ to Transmission Owner *t* in hour *h* is a Congestion Surplus Payment denoted $DCSP_{a,t,h}$..

The allocation of the Constraint Residual, $DCR_{a,h}$, shall depend on the specific combination of transmission facilities for which $In\text{-}Service_{a,u}$ is equal to 1 during the hour.

Single Facility Returning to Service. If the ISO has determined that only a single facility returning to service is contributing to the surplus on Constraint *a*, i.e., $In\text{-}Service_{a,u}$ is equal to 1 for only a single facility *u*, then $DCR_{a,h}$ shall be allocated to the Transmission Owner responsible for this facility. (See Section 2.3.1).

Multiple Facilities Returning to Service, One Transmission Owner. If the ISO identifies two or more facilities returning to service that are contributing to the surplus on Constraint *a*, i.e., $In\text{-}Service_{a,u}$ is equal to 1 for more than one facility *u* returning to service, and the same transmission owning entity is responsible for each of these facilities (See Section 2.3.1), then $DCR_{a,h}$ shall be allocated to the Transmission Owner responsible for these facilities *u* that are returning to service.

Multiple Facilities Returning to Service, Multiple Transmission Owners. If the ISO identifies two or more facilities returning to service that are contributing to the surplus on Constraint *a*, i.e., $In\text{-}Service_{a,u}$ is equal to 1 for more than one facility *u* returning to service, and more than one transmission owning entity is responsible for these facilities (See Section 2.3.1) then the ISO shall allocate $DCR_{a,h}$ among the Transmission Owners responsible for the facilities returning to service. $DCR_{a,h}$ shall be allocated among the responsible Transmission Owners in proportion to the stand-alone impact of each facility returning to service, individually, on flows over Constraint *a.* The ISO shall use power flow analysis or similar types of analyses to determine the effect of each facility returning to service, individually, on the flows over Constraint *a*.

The following equation summarizes the allocation of the Constraint Residual in instances in which there is more than one responsible Transmission Owner.

$$DCSP_{a,t,h} = X_{t,l} \Big/ \sum_{y \in U} X_{s,y} * DCR_{a,h} \qquad \text{(N-6)}$$

Where,

$DCSP_{a,t,h}$= The Congestion Surplus Payment assigned to Transmission Owner *t* for binding Constraint *a* in hour *h* of the Day-Ahead Market

$X_{t,l}$= The change in flow in megawatts on binding Constraint *a* from a power flow analysis in which the set of injections and withdrawals *J* (for TCCs and scheduled Grandfathered Rights) is represented on the TCC auction grid model for month J, modified so as to represent transmission facility *l* owned by Transmission Owner *t* as in-service

$X_{s,y}$= The change in flow in megawatts on binding Constraint *a* from a power flow analysis in which the set of injections and withdrawals *J* (for TCCs and scheduled Grandfathered Rights) is represented on the TCC auction grid model for month J, modified so as to represent transmission facility *y* owned by Transmission Owner *s* as in-service

U= The set of all facilities returning to service that affect binding Constraint *a*, i.e., the set of all *u* for which $In\text{-}Service_{a,u}$ is equal to 1.

No Facilities Returning to Service. If the ISO identifies no facilities returning to service that contribute to the surplus on Constraint *a*, i.e., $In\text{-}Service_{a,u}$ is equal to 0 for all facilities returning to service *u*, then $DCR_{a,h}$ shall not be allocated as a Congestion Surplus Payment but, instead, shall be part of the value that is calculated through application of the formula for Excess Congestion Rents for hour *h*.

2.3.2.2.4 Allocation of Either a Positive or Negative Constraint Residual Impacted by both Transmission Facilities Out-of-Service and Transmission Facilities Returned to Service.

This section describes the allocation process in instances in which both facility outages and facilities returning to service have been identified as contributing to the same Constraint Residual in the same hour. In these instances the ISO may need to apply allocation rules to separately identify the increase in Congestion Rents attributable to facilities that are returning to service and the reduction in Congestion Rents attributable to facilityoutages, since these may have off-setting impacts on the Constraint Residual. These rules shall be applied to either positive or negative Constraint Residuals, $DCR_{a,h}$.

If for Constraint *a,* $Outage_{a,d}$ is equal to 1 for one or more outages *d* and $In\text{-}Service_{a,u}$ is equal to 1 for one or more transmission facilities returning to service, *u*, then the ISO shall allocate both Congestion Shortfall Charges, $DCSC_{a\ t,h,}$ and Congestion Surplus Payments, $DCSP_{a,t,h}$, among the relevant Transmission Owners *t* for hour *h.*

The allocation of the Constraint Residual, $DCR_{a,h}$, shall depend on the specific combination of transmission facilities that have been identified as contributing to it.

One Transmission Owner. If the same transmission owning entity is responsible for each of the facilities *d* for which $Outage_{a,d}$ is equal to 1 and for each of the facilities *u* for which $In\text{-}Service_{a,u}$ is equal to 1, then $DCR_{a,h}$ shall be allocated to the Transmission Owner responsible for these facilities.

Multiple Transmission Owners. If there is more than one transmission owning entity responsible for the facilities *d* for which $Outage_{a,d}$ is equal to 1 and for the facilities *u* for which $In\text{-}Service_{a,u}$ is equal to 1, then the ISO shall use the following procedure to allocate Congestion Shortfall Charges, $DCSC_{a\,t,h,}$ and Congestion Surplus Payments, $DCSP_{a\,t,h}$ to these Transmission Owners.

The ISO shall first use power flow analysis or similar types of analyses to determine the effect of each facility that is out-of-service and each facility that is returning to service, individually, on the flows over Constraint *a*. The results of these power flow analysis shall be used for two purposes. First, to calculate the total charges to be allocated as Congestion Shortfall Charges and the total payments to be allocated as Congestion Surplus Payments. Second, to allocate these total charges and total payments among multiple responsible Transmission Owners.

Total Charges. When both facilityoutages and facilities returning to service impact the same Constraint in an hour, the ISO shall use Equation N-7 to determine the total shortfall charges to be allocated among the Transmission Owners of those facilities *d*, for which $Outage_{a,d}$ is equal to 1. For equity, the equation is an average of two alternative ways to calculate the total shortfall charges.

$$\text{Charges}_{a,h} = \frac{1}{2}\left\{SP_{a,h} * \sum_{y \in D} V_{s,y} + \left(DCR_{a,h} + SP_{a,h} * \sum_{y \in U} X_{s,y}\right)\right\} \qquad \text{(N-7)}$$

Where,

$DCR_{a,h}$= The Constraint Residual for binding Constraint *a* in hour *h* of the Day-Ahead Market, in $

$SP_{a,h}$= The shadow price of binding Constraint *a* in hour *h* of the Day-Ahead Market, in $/MWh

Vs,y= The overload in megawatts on binding Constraint *a* from a power flow analysis in which the set of injections and withdrawals *J* (for TCCs and scheduled Grandfathered Rights) is represented on the TCC auction grid model for month *J*, modified so as to represent transmission facility *y* owned by Transmission Owner *s* as out-of-service

D= The set of all transmission facilities out-of-service that affect binding Constraint *a*, i.e., the set of all *d* for which $Outage_{a,d}$ is equal to 1

$X_{s,y}$= The change in flow in megawatts on binding Constraint *a* from a power flow analysis in which the set of injections and withdrawals *J* (for TCCs and scheduled Grandfathered Rights) is represented on the TCC auction grid model for month J, modified so as to represent transmission facility *y* owned by Transmission Owner *s* as in-service

U= The set of all transmission facilities returning to service that affect binding Constraint *a*, i.e., the set of all *u* for which $In\text{-}Service_{a,u}$ is equal to 1.

The ISO shall allocate $Charges_{a,h}$ among the Transmission Owners of those facilities *d*, for which $Outage_{a,d}$ is equal to 1 in proportion to the stand-alone impact of each facility that is out-of-service, individually, on flows over Constraint *a,* according to the following formula:

$$DCSC_{a,t,h} = V_{t,l} \Big/ \sum_{y \in D} V_{s,y} * \text{Charges}_{a,h} \qquad \text{(N-8)}$$

Where $DCSC_{a,t,h}$ is equal to the Congestion Shortfall Charge assigned to Transmission Owner *t* for binding Constraint *a* in hour *h* of the Day-Ahead Market, as before.

Total Payments. When both facility outages and facilities returning to service impact the same Constraint in an hour the ISO shall use Equation N-9 to determine the total surplus payments to be allocated among the Transmission Owners of those facilities *u*, for which $In\text{-}Service_{a,u}$ is equal to 1. For equity, the equation is an average of two alternative ways to calculate the total surplus payments.

$$\text{Payments}_{a,h} = \frac{1}{2}\left\{ SP_{a,h} * \sum_{y \in U} X_{s,y} + \left(SP_{a,h} * \sum_{y \in D} V_{s,y} - DCR_{a,h} \right) \right\} \qquad \text{(N-9)}$$

Where the variables are as defined in the previous equations.

The ISO shall allocate $Payments_{a,h}$ among the Transmission Owners of those facilities *u*, for which $In\text{-}Service_{a,u}$ is equal to 1 in proportion to the stand-alone impact of each facility that is returning to service, individually, on flows over Constraint *a,* according to the following formula:

$$DCSP_{a,t,h} = X_{t,l} \Big/ \sum_{y \in U} X_{s,y} * Payments_{a,h} \qquad \text{(N-10)}$$

Where $DCSP_{a,t,h}$ is equal to the Congestion Surplus Payment allocated to Transmission Owner *t* for binding Constraint *a* in hour *h* of the Day-Ahead Market, as before.

2.3.2.3 Total Congestion Shortfall Charges and Surplus Payments

The total Congestion Shortfall Charge allocated to Transmission Owner, *t*, in hour *h*, is:

$$DCSC_{t,h} = \sum_{Constraints=a} DCSC_{a,t,h} \qquad \text{(N-11)}$$

The total ISO Congestion Shortfall Charges for hour *h*, Congestion Shortfall $Charges_h$ in Equation (N-1), are the sum of $DCSC_{t,h}$ over all Transmission Owners, *t*.

The total Congestion Surplus Payment allocated to Transmission Owner, *t*, in hour *h*, is:

$$DCSP_{t,h} = \sum_{Constraints=a} DCSP_{a,t,h} \qquad \text{(N-12)}$$

The total ISO Congestion Surplus Payments for hour *h*, Congestion Surplus $Payments_h$ in Equation (N-1) are the sum of $DCSP_{t,h}$ over all Transmission Owners, *t*.

2.4 Congestion Payments Made To Primary Holders

For each hour of the Day-Ahead Market, the ISO shall make Congestion payments to the Primary Holders of TCCs. The Congestion payment is calculated as follows:

$$\text{Congestion Payment (\$/hr)} = (CCPOW - CCPOI) * TCCMW \qquad (13)$$

Where:

CCPOW = Congestion Component ($/MWh) at the POW for the TCC

CCPOI = Congestion Component ($/MWh) at the POI for the TCC

TCCMW = The number of TCCs in MW from POI to POW.

(See Attachment J for the calculation of the Congestion Component of the LBMP price at either the POI or the POW.)

The total ISO TCC Congestion payments in hour *h*, TCC $payments_h$ in Equation (N-1) is the sum of the Congestion payments made for all TCCs valid in hour *h*.

The ISO shall pay the Primary Holders for the Congestion payment from revenues collected from Congestion $Rents_h$, Congestion Shortfall $Charges_h$, and Excess Congestion $Rents_h$.

2.5 Excess Congestion Rents Allocated to Transmission Owners

Excess Congestion Rents in hour *h* shall be calculated from Equation (N-1) of Attachment N. The Excess Congestion Rents for each hour of a month shall be summed over the month, so that positive and negative values net to a monthly total, ECR_m (*i.e.*, congestion rent surpluses accumulated over the month shall be used to reduce the congestion rent shortfalls occurring over the same month).

ECR_m shall be allocated monthly to the Transmission Owners in proportion to the imputed value of all outstanding TCCs and Grandfathered Rights for the month. Each Transmission Owner's imputed value shall be the sum of: (1) a monthly share of the revenue the Transmission Owner has received from sale of Residual TCCs in Centralized TCC Auctions, for auctions in which the TCCs sold remain valid in the present month; (2) a monthly share of the Centralized TCC Auction revenue received as payment for its ETCNL, for auctions in which the TCCs sold remain valid in the present month; (3) a monthly share of the revenue imputed to the bilateral sale of Residual TCCs, for which the TCCs remain valid in the present month; and (4) the monthly imputed value of Grandfathered TCCs and Grandfathered Rights for which the Transmission Owner is the selling party, and for which the Existing Transmission Agreement remains valid in the present month. The Grandfathered TCCs and Grandfathered Rights shall be valued at the monthly Reconfiguration Auction Market Clearing Prices. Each Transmission Owner's allocation factor for ECR_m shall be the ratio of its imputed value to the total imputed value for all Transmission Owners.

The ISO shall allocate the Excess Congestion Rents, ECR_m to the Transmission Owners in accordance with Attachment H for creditor collection through their respective TSC or NTAC.

3.0 Centralized TCC Auctions

3.1 Overview of ISO Congestion-Related Revenues and Costs

The ISO shall allocate and distribute all revenue from the sale of TCCs in the Centralized TCC Auctions. It shall also collect Auction Shortfall Charges from Transmission Owners responsible for facility outages that lead to reductions in the collection of Centralized TCC Auction revenue and pay Auction Surplus Payments to Transmission Owners responsible for returning facilities to service that lead to increases in Centralized TCC Auction revenue, in instances in which such facilities were modeled as out-of-service in a prior Centralized TCC Auction of a longer duration.

3.2 Charges and Payments for TCCs Bought and Sold (excluding Residual TCCs) and Payments for ETCNL

As described in Attachment M, in each Centralized TCC Auction the ISO shall collect payment of the Market Clearing Price for all TCCs awarded for each round of the auction. The ISO shall distribute to each holder of a TCC selling that TCC in the Centralized TCC Auction, including holders of Grandfathered TCCs, the Market Clearing Price of that TCC in the round of the Centralized TCC Auction in which that TCC was sold.

The ISO shall distribute to each holder of ETCNL, taking into account any reductions made under Section 3.0 of Attachment M, the Market Clearing Price of that ETCNL in the round of the Centralized Auction in which that ETCNL was sold, provided that such Market Clearing Price has a monetary value greater than or equal to zero. If the Market Clearing Price is negative for any ETCNL, the value shall be set to zero for purposes of allocating auction revenues from the sale of ETCNL.

3.3 Distribution of Revenues from Sale of Certain Grandfathered TCCs (excluding ETCNL) in the Centralized TCC Auction [old Section 2.0]

In the event a Grandfathered TCC[3] is terminated by mutual agreement of the parties to the Grandfathered Existing Transmission Agreement ("ETA") prior to the conditions specified within Attachments K and L, then the ISO shall distribute the revenues from the sale of the newly created Residual TCCs, which correspond to the terminated Grandfathered TCCs, in the Centralized TCC Auction directly back to the Transmission Owner identified in Attachment L, until such time the conditions specified within Attachment K and L and met. Upon such time that the conditions within Attachments K and L are met, the ISO shall allocate the revenues from the sale of the newly created Residual TCCs, which correspond to terminated Grandfathered TCCs, in the Centralized Auction in accordance with Section 3.4 of this Attachment.

3.4 Allocation of Revenues from the Sale of Residual TCCs

The ISO shall allocate the Centralized TCC Auction revenue from the sale of Residual TCCs as follows:

1. Revenue associated with Residual TCCs that were determined before the first Centralized TCC Auction was conducted shall be distributed directly to each Primary Owner for the duration of the LBMP Transition Period. The Primary Owner of such a Residual TCC shall be paid the Market Clearing Price of the Residual TCC in the round of the Centralized TCC Auction in which that Residual TCC was sold, provided that such Market Clearing Price has a monetary value greater than or equal to zero. If the Market Clearing Price is negative for any Residual TCC, the value shall be set to zero for purposes of allocating auction revenues from the sale of Residual TCCs.

2. Revenue associated with all other Residual TCCs, including Residual TCCs determined during the Centralized TCC Auction and TCCs released from Grandfathered ETAs when they are terminated (see Attachment M), shall be part of

[3] These TCCs include TCCs, if any, associated with those rate schedules to which footnote 9 of Attachment L pertains, whether by mutual agreement or otherwise.

the Residual Auction Revenue and shall be allocated back to the Transmission Owners using the Facility Flow-Based Methodology described in Section 3.6.

3.5 Auction Shortfall Charges and Auction Surplus Payments

In each Centralized TCC Auction, the ISO shall collect Auction Shortfall Charges from Transmission Owners responsible for facility outages that lead to reductions in the collection of Centralized TCC Auction revenue.

The ISO also shall make Auction Surplus Payments to Transmission Owners responsible for returning facilities to service that lead to increases in the collection of auction revenue, in instances in which the facilities were modeled as out-of-service in the last Centralized TCC Auction of a longer duration.

3.5.1 Assignment of Auction Shortfall Charges and Auction Surplus Payments

The ISO shall collect the Auction Shortfall Charge from the Transmission Owner of the transmission facility or equipment whose outage has caused a reduction in Transmission Capability in the Centralized TCC Auction. In situations in which there are different Transmission Owners for facilities or equipment of a set of transmission facilities that are connected in series, the ISO shall collect the Auction Shortfall Charge from the owner of the single facility that causes the outage of the set of facilities. Thus, the Transmission Owner for a circuit breaker may be assigned an Auction Shortfall Charge if the circuit breaker experiences a forced or unforced outage, resulting in the outage of a related transmission line.

Similarly, the ISO shall make Auction Surplus Payments to the Transmission Owner of the transmission facility or equipment whose return to service has caused an increase in Transmission Capability in the Centralized TCC Auction in instances in which such facility was modeled as out of service in a prior Centralized TCC Auction of a longer duration. In situations in which there are different Transmission Owners for facilities or equipment in a set of transmission facilities that are connected in series, the ISO shall make the Auction Surplus Payment to the owner of the single facility that causes the set of facilities to return to service. Thus, the Transmission Owner for a circuit breaker may receive an Auction Surplus Payment if the circuit breaker was scheduled out-of service in a Capability Period Auction, for example, but is returned to service prior to the monthly Reconfiguration Auction.

In instances in which transmission facility or equipment is jointly owned by more than one Transmission Owner, the ISO shall assign Auction Shortfall Charges and Auction Surplus Payments in proportion to the ownership shares used to apportion TCC auction revenue.

3.5.2 Calculation of Auction Shortfall Charges and Auction Surplus Payments

A transmission facility outage will not lead to an Auction Shortfall Charge if the facility was modeled as out-of-service in the last Centralized TCC Auction of a longer duration. A

transmission facility that returns to service will not be eligible for an Auction Surplus Payment in an hour if the facility was modeled as in-service in the last Centralized TCC Auction of a longer duration.

3.5.2.1 Calculation of Auction Constraint Residuals

The ISO shall determine the Auction Shortfall Charges and Auction Surplus Payments for a Centralized TCC Auction by first calculating the total surplus or shortfall for each Constraint that is binding in the Centralized TCC Auction. These values shall be called the Auction Constraint Residuals. As a second step, described in Section 3.5.2.2 below, the ISO shall allocate each Auction Constraint Residual, as appropriate, in the form of Auction Shortfall Charges and Auction Surplus Payments.

The Auction Constraint Residual shall be calculated using the following procedures:

1. *Identify Binding Constraints.* The ISO shall identify all Constraints (either pre-contingency or post-contingency) that are binding (i.e., active) in the final Optimal Power Flow solution to the Centralized TCC Auction.

2. *Determined Flows on Constraints in Centralized TCC Auction.* The ISO shall calculate the flows on each binding Constraint resulting from the TCCs and Grandfathered ETAcontained in the Optimal Power Flow solution to the Centralized TCC Auction model.

3. *Determine Base Case Flows on Constraints.* The ISO shall calculate flows on each binding Constraint associated with a base case set of TCCs and Grandfathered Rights. This calculation shall be based on the actual transmission grid model used for the Centralized TCC Auction. The ISO shall apply the actual Shift Factors for the Centralized TCC Auction transmission grid configuration to the net injection at each bus calculated from the set of base case TCCs and Grandfathered Rights.

    a. For monthly Reconfiguration Auctions, the base case shall consist of the TCCs and Grandfathered Rights valid following the Capability Period Auction in which TCCs were sold for that month.

    b. For Capability Period Auctions, the ISO shall determine a base case by running a "but for" Capability Period Auction using the same grid model as that used for the Capability Period Auction, but representing all transmission facilities that were out-of-service in the actual auction model as back in-service. Using the actual bids and offers made into the Capability Period Auction, the ISO shall run a "but for" auction to determine a set of base case Capability Period TCCs and Grandfathered Rights.

    c. For auctions of other periods, if relevant, the ISO shall determine the appropriate base case following procedures analogous to those described for Reconfiguration

Auctions and Capability Period Auctions, per parts (a) and (b) above.

4. *Determine Megawatt Difference.* The ISO shall subtract (3) from (2) to determine the difference between the megawatts scheduled to flow over each Constraint in the Centralized TCC Auction and those calculated for the base case. This difference shall be adjusted for any differences in flows resulting from differences in the PAR schedules in the Centralized TCC Auction and the PAR schedules applied in the model used for the base case.

5. *Calculate Auction Constraint Residual.* For each Constraint with a non-zero difference calculated in (4), the ISO shall multiply the megawatt quantity calculated in (4) by the shadow price of the Constraint in the Centralized TCC Auction. This value, the Auction Constraint Residual, may be positive or negative.

The following equations summarize these five steps for calculating the Auction Constraint Residual, $ACR_{a,n}$, for Constraint *a* for Centralized TCC Auction *n:*

$$ACR_{a,n} = SP_{a,n} * \left(F_{a,I,n} - F_{a,J,n}\right) \quad \text{(N-14)}$$

Where,

$ACR_{a,n}$= The Auction Constraint Residual for binding Constraint *a* in Centralized TCC Auction *n*, in $

$SP_{a,n}$= The shadow price of binding Constraint *a* in Centralized TCC Auction *n*, in $/MWh

I = The set of TCCs and Grandfathered Rights valid in the solution to the Optimal Power Flow for Centralized TCC Auction *n*

$F_{a,I,n}$= The flow on binding Constraint *a* produced by imposing the set of injections and withdrawals from *I* on the transmission network for Centralized TCC Auction *n*, in MW, i.e., the flow on binding Constraint *a* in the solution to Centralized TCC Auction *n*

J = The set of base case TCCs and Grandfathered Rights for Centralized TCC Auction, *n.* For a monthly Reconfiguration Auction, *n*, the base case shall consist of the TCCs and Grandfathered Rights valid following the Capability Period Auction in which TCCs were sold for that month. For a Capability Period Auction, *n,* the ISO shall determine a base case set of TCCs and Grandfathered Rights by running a "but for" Capability Period Auction representing all transmission facilities that were out-of-service in the actual auction model as back in-service and using the actual bids and offers made into the Capability Period Auction

$F_{a,J,n}$= The flow on binding Constraint *a* produced by imposing the set of injections and withdrawals from *J* on the transmission network for Centralized TCC Auction *n*, in MW.

The Auction Constraint Residual may be increased or decreased as a result of differences between the PAR schedules in the Centralized TCC Auction and those applied in the model used for the base case. Thus, in Equation (N-14), the difference in flows on Constraint *a*, $F_{a,I,n} - F_{a,J,n}$, shall be adjusted for differences in Energy flows resulting from difference in PAR schedules between the Centralized TCC Auction and the model used for the base case.

In some instances, the Auction Constraint Residual may be positive (i.e., there may be a surplus on the Constraint) in whole or in part because the Constraint was not binding in the last Centralized TCC Auction of a longer duration. If $ACR_{a,n}$ is positive for Constraint *a*, it shall be adjusted to account for any rated capacity in excess of the flows on the constraint after imposing the base case set of TCCs and Grandfathered Rights on the transmission grid for Centralized TCC Auction, *n*. To make this adjustment, the ISO shall recalculate Equation (N-14) setting $F_{a,J,n}$ equal to the rating limit for Constraint *a* used in the transmission grid model used to determine the base case TCCs and Grandfathered Rights, instead of calculating $F_{a,J,n}$ as described above. For a monthly Reconfiguration Auction, *n*, the rating limit shall be that applied in the Capability Period Auction in which TCCs were sold for that month. For a Capability Period Auction, *n*, the rating limit shall be that used in the ISO's "but for" Capability Period Auction, in which all transmission facilities are represented as in-service. This adjusted $ACR_{a,n}$ shall be allocated as described below.

3.5.2.2 Allocation of Auction Constraint Residuals as Auction Shortfall Charges and Auction Surplus Payments

Following the calculation of the Auction Constraint Residuals for Centralized TCC Auction *n*, the ISO shall use the following procedures to allocate each Constraint Residual, as appropriate, as Auction Shortfall Charges or Auction Surplus Payments.

3.5.2.2.1 Identification of Transmission Facilities Potentially Eligible for Auction Shortfall Charges or Auction Surplus Payments.

First, the ISO shall identify all transmission facilities that are eligible for an Auction Shortfall Charge or Auction Surplus Payment.

Transmission Facilities Out-of-Service. The ISO shall identify all transmission facility and equipment outages during a Centralized TCC Auction *n* that may lead to a reduction in the collection of Centralized TCC Auction revenue. (For purposes of Attachment N these shall be referred to as "facility outages.") The following facilities shall be excluded from this list: transmission facilities modeled as out-of-service in a prior Centralized TCC Auction for TCCs valid during the same time period as the TCCs sold in Centralized TCC Auction *n,* and grid configuration changes that were included in a prior Centralized TCC Auction for TCCs valid during the same time period as the TCCs sold in Centralized TCC Auction *n*. Derated facilities may be included in the list. The list will include only one entry for the outage of a set of transmission facilities connected in series, for which the outage of one of the facilities

automatically leads to the outage of the others. For each transmission facility, *d*, on this list, the ISO shall determine, based on power flow analysis or similar types of analyses, whether the transmission facility is contributing to the Auction Constraint Residual calculated for each binding Constraint, *a.* The variable, $AOutage_{a,d}$, shall have the value 1 if the outage of facility *d* contributes to $ACR_{a,n}$, and 0 otherwise.

Transmission Facilities In-Service. The ISO shall allocate $ACR_{a,n}$ to transmission facilities and equipment returning to service during Centralized TCC Auction *n* only when a prior Centralized TCC Auction has been held for TCCs valid during the same time period as the TCCs sold in Centralized TCC Auction *n* (e.g., a Reconfiguration Auction). When a prior Centralized TCC Auction has been held for TCCs valid during the same time period as the TCCs sold in Centralized TCC Auction *n*, the ISO shall identify all transmission facilities and equipment that have returned to service during Centralized TCC Auction *n* that were modeled as out-of-service in the prior Centralized TCC Auction (e.g., a Capability Period Auction) that may contribute to an increase in the collection of Centralized TCC Auction revenue. (For purposes of Attachment N these shall be referred to as "facilities returned to service.") Transmission facilities modeled as in-service in the prior Centralized TCC Auction shall be excluded from this list. Uprated facilities may be included in the list. The list shall include only one entry for a set of transmission facilities connected in series, in instances in which transmission capability is increased only when all serially-connected elements in the set are returned to service. For each transmission facility, *u*, on this list, the ISO shall determine, based on power flow analysis or similar types of analyses, whether the transmission facility is contributing to the Auction Constraint Residual calculated for each binding Constraint, *a.* The variable, $AIn\text{-}Service_{a,u}$, shall have the value 1 if the return-to-service of facility *u* contributes to $ACR_{a,n}$, and 0 otherwise.

The lists, $AOutage_{a,d}$ and $AIn\text{-}Service_{a,u}$, of transmission facilities impacting each Auction Constraint Residual shall be used to determine the allocation of the Constraint Residual, as described in the following subsections.

3.5.2.2.2 Allocation of Negative Auction Constraint Residuals to Facility Outages.

If the Auction Constraint Residual for Constraint *a* is negative there is a shortfall on the Constraint. This section describes the allocation of a negative Auction Constraint Residual when it results only from facility outages . The allocation process when both facility outages and facilities returning to service contribute to the same Auction Constraint Residual is described in Section 3.5.2.2.4.

If the Auction Constraint Residual for Constraint *a*, $ACR_{a,n}$, is negative and $AIn\text{-}Service_{a,u}$ is equal to 0 for all *u*, then the Auction Constraint Residual for Constraint *a* shall be allocated to the transmission facilities for which $AOutage_{a,d}$ is equal to 1. When $ACR_{a,n}$ is negative, the allocation of $ACR_{a,n}$ to Transmission Owner *t* for Centralized TCC Auction *n* shall be an Auction Shortfall Charge denoted $ASC_{a\,t,n}$.

The allocation of the Auction Constraint Residual, $ACR_{a,n}$, shall depend on the specific combination of transmission facilities for which $AOutage_{a,d}$ is equal to 1.

Single Outage. If the ISO has determined that only a single facility outage is contributing to the shortfall on Constraint *a*, i.e., $AOutage_{a,d}$ is equal to 1 for only a single outage *d*, then $ACR_{a,n}$ shall be allocated to the Transmission Owner responsible for this facility outage. (See Section 3.5.1)

Multiple Outages, One Transmission Owner. If the ISO identifies two or more facility outages contributing to the shortfall on Constraint *a*, i.e., $AOutage_{a,d}$ is equal to 1 for more than one outage *d*, and the same transmission owning entity is responsible for each of these outages then $ACR_{a,n}$ shall be allocated to the Transmission Owner responsible for these facility outages. (See Section 3.5.1)

Multiple Outages, Multiple Transmission Owners. If the ISO identifies two or more facility outages contributing to the shortfall on Constraint *a*, i.e., $AOutage_{a,d}$ is equal to 1 for more than one outage, and more than one transmission owning entity is responsible for these outages (See Section 3.5.1) then the ISO will allocate $ACR_{a,n}$ among the Transmission Owners responsible for the facility outages. $ACR_{a,n}$ shall be allocated among the responsible Transmission Owners in proportion to the stand-alone impact of each outage, individually, on flows over Constraint *a*. The ISO shall use power flow analysis or similar types of analyses to determine the effect of each outage, individually, on the flows over Constraint *a*.

The following equation summarizes the allocation of the Auction Constraint Residual in instances in which there is more than one responsible Transmission Owner.

$$ASC_{a,t,n} = V_{t,l} \Big/ \sum_{y \in D} V_{s,y} * ACR_{a,n} \qquad \text{(N-15)}$$

Where,

$ASC_{a,t,n}$= The Auction Shortfall Charge assigned to Transmission Owner *t* for binding Constraint *a* in Centralized TCC Auction *n*

$V_{t,l}$= The overload in megawatts on binding Constraint *a* from a power flow analysis in which the set of injections and withdrawals *J* (for base case TCCs and Grandfathered Rights) is represented on the grid model for TCC Auction *n*, modified so as to represent transmission facility *l* owned by Transmission Owner *t* as out-of-service

$V_{s,y}$= The overload in megawatts on binding Constraint *a* from a power flow analysis in which the set of injections and withdrawals *J* (for base case TCCs and Grandfathered Rights) is represented on the grid model for TCC Auction *n*, modified so as to represent transmission facility *y* owned by Transmission Owner *s* as out-of-service

D= The set of all facilityoutages that affect binding Constraint *a*, i.e., the set of all *d* for which $AOutage_{a,d}$ is equal to 1.

No Outages. If the ISO identifies no outages contributing to the shortfall on Constraint *a*, i.e., $AOutage_{a,d}$ is equal to 0 for all outages *d*, then $ACR_{a,n}$ shall not be allocated as a Congestion Shortfall Charge but, instead, shall be part of the value that is calculated through application of the formula for Residual Auction Revenue for Centralized TCC Auction *n*.

3.5.2.2.3 Allocation of Positive Auction Constraint Residuals to Transmission Facilities Returned to Service.

If the Auction Constraint Residual for Constraint *a,* $ACR_{a,n}$, is positive there is a surplus on the constraint. This section describes the allocation of a positive Auction Constraint Residual when it results only from auction facility uprates or auction facilities returning to service. The allocation process when both auction facility outages and auction facilities returning to service contribute to the same Auction Constraint Residual is described in Section. 3.5.2.2.4.

The ISO shall allocate $ACR_{a,n}$ to auction facilities returning to service during Centralized TCC Auction *n* only when a prior Centralized TCC Auction has been held for TCCs valid during the same time period as the TCCs sold in Centralized TCC Auction *n*. In these instances, if the Auction Constraint Residual for Constraint *a* is positive and $AOutage_{a,d}$ is equal to 0 for all *d*, then $ACR_{a,n}$ shall be allocated to the transmission facilities *u* for which $AIn\text{-}Service_{a,u}$ is equal to 1. When $ACR_{a,n}$ is positive, the allocation of $ACR_{a,n}$ to Transmission Owner *t* for Centralized TCC Auction *n* is an Auction Surplus Payment denoted $ASP_{a\,t,n}$.

The allocation of the Auction Constraint Residual, $ACR_{a,n}$, shall depend on the specific combination of transmission facilities for which $AIn\text{-}Service_{a,u}$ is equal to 1.

Single Facility Returning to Service. If the ISO has determined that only a single facility returning to service is contributing to the surplus on Constraint *a*, i.e., $AIn\text{-}Service_{a,u}$ is equal to 1 for only a single facility *u*, then $ACR_{a,n}$ shall be allocated to the Transmission Owner responsible for this facility. (See Section 3.5.1)

Multiple Facilities Returning to Service, One Transmission Owner. If the ISO identifies two or more facilities returning to service that are contributing to the surplus on Constraint *a*, i.e., $AIn\text{-}Service_{a,u}$ is equal to 1 for more than one facility *u* returning to service, and the same transmission owning entity is responsible for each of these facilities then $ACR_{a,n}$ shall be allocated to the Transmission Owner responsible for these facilities *u* that are returning to service.

Multiple Facilities Returning to Service, Multiple Transmission Owners. If the ISO identifies two or more facilities returning to service that are contributing to the surplus on Constraint *a*, i.e., $AIn\text{-}Service_{a,u}$ is equal to 1 for more than one facility *u* returning to service, and more than one transmission owning entity is responsible for these facilities, then the ISO shall allocate $ACR_{a,n}$ among the Transmission Owners responsible for the facilities returning to service. $ACR_{a,n}$ shall be allocated among the responsible Transmission Owners in proportion to the stand-alone impact of each facility returning to service, individually, on flows over

Constraint *a.* The ISO shall use power flow analysis or similar types of analyses to determine the effect of each facility returning to service, individually, on the flows over Constraint *a*.

The following equation summarizes the allocation of the Auction Constraint Residual in instances in which there is more than one responsible Transmission Owner.

$$ASP_{a,t,n} = X_{t,l} \Big/ \sum_{y \in U} X_{s,y} * ACR_{a,n} \qquad \text{(N-16)}$$

Where,

$ASP_{a,t,n}$= The Auction Surplus Payment assigned to Transmission Owner *t* for binding Constraint *a* in Centralized TCC Auction *n*

$X_{t,l}$= The change in flow in megawatts on binding Constraint *a* from a power flow analysis in which the set of injections and withdrawals *J* (for base case TCCs and Grandfathered Rights) is represented on the grid model for TCC Auction *n*, modified so as to represent transmission facility *l* owned by Transmission Owner *t* as in-service

$X_{s,y}$= The change in flow in megawatts on binding Constraint *a* from a power flow analysis in which the set of injections and withdrawals *J* (for base case TCCs and Grandfathered ETAs) is represented on the grid model for TCC Auction *n*, modified so as to represent transmission facility *y* owned by Transmission Owner *s* as in-service

U= The set of all facilities returning to service that affects binding Constraint *a*, i.e., the set of all *u* for which AIn-Service$_{a,u}$ is equal to 1.

No Facilities Returning to Service. If the ISO identifies no facilities returning to service that contribute to the surplus on Constraint *a*, i.e., AIn-Service$_{a,u}$ is equal to 0 for all facilities returning to service *u*, then $ACR_{a,n}$ shall not be allocated as an Auction Surplus Payment, but, instead, shall be part of the value that is calculated through application of the formula for Residual Auction Revenue for Centralized TCC Auction *n*.

3.5.2.2.4 Allocation of Either a Positive or Negative Auction Constraint Residual to Facilities Out-of-Service and Facilities Returned to Service.

This section describes the allocation process to be applied in instances in which both facility outages and facilities returning to service have been identified as contributing to the same Auction Constraint Residual. In these instances the ISO may need to apply allocation rules to separately identify the increase in Centralized TCC Auction revenue attributable to facilities that are returning to service and the reduction in Centralized TCC Auction revenue attributable to

transmission facilities that are out-of-service, since these may have off-setting impacts on the Auction Constraint Residual. These rules shall be applied to either positive or negative Auction Constraint Residuals, $ACR_{a,n}$.

If for a Constraint *a,* $AOutage_{a,d}$ is equal to 1 for one or more outages *d* and $AIn\text{-}Service_{a,u}$ is equal to 1 for one or more transmission facilities returning to service, *u*, then the ISO shall allocate both Auction Shortfall Charges, $ASC_{a\,t,n,}$ and Auction Surplus Payments, $ASP_{a\,t,n}$, among the relevant Transmission Owners *t* Centralized TCC Auction *n.*

The allocation of the Auction Constraint Residual, $ACR_{a,n}$, shall depend on the specific combination of transmission facilities that have been identified as contributing to it.

One Transmission Owner. If the same transmission owning entity is responsible for each of the facilities *d* for which $AOutage_{a,d}$ is equal to 1 and for each of the facilities *u* for which $AIn\text{-}Service_{a,u}$ is equal to 1, then $ACR_{a,n}$ shall be allocated to the Transmission Owner responsible for these facilities.

Multiple Transmission Owners. If there is more than one transmission owning entity responsible for the facilities *d* for which $AOutage_{a,d}$ is equal to 1 and for the facilities *u* for which $AIn\text{-}Service_{a,u}$ is equal to 1, then the ISO shall use the following procedure to allocate Auction Shortfall Charges, $ASC_{a\,t,n,}$ and Auction Surplus Payments, $ASP_{a\,t,n}$ to these Transmission Owners.

The ISO shall first use power flow analysis or similar types of analyses to determine the effect of each facility that is out-of-service and each facility that is returning to service, individually, on the flows over Constraint *a*. The results of these power flow analysis shall be used for two purposes. First, to calculate the total charges to be allocated as Auction Shortfall Charges and the total payments to be allocated as Auction Surplus Payments. Second, to allocate these total charges and total payments among multiple responsible Transmission Owners.

<u>*Total Charges*</u>. When both facilities out-of-service and facilities returning to service impact the same Constraint in a Centralized TCC Auction, the ISO shall use Equation N-17 to determine the total shortfall charges to be allocated amoung the Transmission Owners of those facilities d for which $AOutage_{a,d}$ is equal to 1. For equity, the equation is an average of two alternative ways to calculate the total auction shortfall charges.

$$A\text{Charges}_{a,n} = \frac{1}{2}\left\{SP_{a,n} * \sum_{y \in D} V_{s,y} + \left(ACR_{a,n} + SP_{a,n} * \sum_{y \in U} X_{s,y}\right)\right\} \qquad \text{(N-17)}$$

Where,

$ACR_{a,n}$= The Auction Constraint Residual for binding Constraint *a* in Centralized TCC Auction *n*, in $

$SP_{a,n}$= The shadow price of binding Constraint *a* in Centralized TCC Auction *n*, in $/MWh

$V_{s,y}$= The overload in megawatts on binding Constraint *a* from a power flow analysis in which the set of injections and withdrawals *J* (for base case TCCs and Grandfathered ETAs) is represented on the grid model for TCC Auction *n*, modified so as to represent transmission facility *y* owned by Transmission Owner *s* as out-of-service

D= The set of all transmission facilities out-of-service that affect binding Constraint *a*, i.e., the set of all *d* for which $AOutage_{a,d}$ is equal to 1

$X_{s,y}$= The change in flow in megawatts on binding Constraint *a* from a power flow analysis in which the set of injections and withdrawals *J* (for base case TCCs and Grandfathered ETAs) is represented on the grid model for TCC Auction *n*, modified so as to represent transmission facility *y* owned by Transmission Owner *s* as in-service

U= The set of all facilities returning to service that affects binding Constraint *a*, i.e., the set of all *u* for which $AIn\text{-}Service_{a,u}$ is equal to 1.

The ISO shall allocate $ACharges_{a,n}$ among the Transmission Owners of those facilities *d*, for which $AOutage_{a,d}$ is equal to 1 in proportion to the stand-alone impact of each facility that is out-of-service, individually, on flows over Constraint *a,* according to the following formula:

$$ASC_{a,t,n} = V_{t,l} \Big/ \sum_{y \in D} V_{s,y} * \text{ACharges}_{a,n} \qquad \text{(N-18)}$$

Where $ASC_{a,t,n}$ is equal to the Auction Shortfall Charge assigned to Transmission Owner *t* for binding Constraint *a* in Centralized TCC Auction *n*, as before.

Total Payments. When both facilities out-of-service and facilities returning to service impact the same Constraint in a Centralized TCC Auction the ISO shall use Equation (N-19) to determine the total surplus payments to be allocated to the Transmission Owners of those facilities *u* for which $AIn\text{-}Service_{a,u}$ is equal to 1. For equity, the equation is an average of two alternative ways to calculate the total surplus payments.

$$A\text{Payments}_{a,n} = \frac{1}{2}\left\{ SP_{a,n} * \sum_{y \in U} X_{s,y} + \left(SP_{a,n} * \sum_{y \in D} V_{s,y} - ACR_{a,n} \right) \right\} \qquad \text{(N-19)}$$

Where the variable as are defined in the previous equations.

The ISO shall allocate $APayments_{a,n}$ among the Transmission Owners of those facilities *u*, for which $AIn\text{-}Service_{a,u}$ is equal to 1 in proportion to the stand-alone impact of each facility that is returning to service, individually, on flows over Constraint *a,* according to the following formula:

$$ASP_{a,t,n} = X_{t,l} \Big/ \sum_{y \in U} X_{s,y} * APayments_{a,n} \quad \text{(N-20)}$$

Where $ASP_{a,t,n}$ is equal to the Auction Surplus Payment allocated to Transmission Owner *t* for binding Constraint *a* in Centralized TCC Auction *n*, as before.

3.5.2.3 Total Auction Shortfall Charges and Auction Surplus Payments

The total Auction Shortfall Charge allocated to Transmission Owner, *t*, for Centralized TCC Auction *n* is:

$$ASC_{t,n} = \sum_{a} ASC_{a,t,n} \quad \text{(N-21)}$$

The total ISO Auction Shortfall Charges for Centralized TCC Auction *n,* Auction $Shortfall\ Charges_n$, are the sum of $ASC_{t,n}$ over all Transmission Owners, *t*.

The total Auction Surplus Payment allocated to Transmission Owner, *t* for Centralized TCC Auction *n* is:

$$ASP_{t,n} = \sum_{a} ASP_{a,t,n} \ . \quad \text{(N-22)}$$

The total ISO Auction Surplus Payments Centralized TCC Auction *n,* Auction $Surplus\ Payments_n$, are the sum of $ASP_{t,n}$ over all Transmission Owners, *t*.

3.6 Facility Flow-Based Allocation of Residual Auction Revenue

In each Centralized TCC Auction, the ISO shall use the Facility Flow-Based Methodology to allocate Residual Auction Revenue. The Facility Flow-Based Methodology shall be used to allocate Residual Auction Revenue for Centralized TCC Auctions of any duration. In particular, it shall be used to allocate Residual Auction Revenue for both the Capability Period auctions and Reconfiguration Auctions.

3.6.1 Calculation of Residual Auction Revenue

The ISO shall calculate Residual Auction Revenue as the difference between its auction-related revenues and costs, as follows:

RAR_n = Total $Revenue_n$ – TCCs $Sold_n$ – $ETCNL_n$ – Residual $TCCs_n$ + Auction Shortfall $Charges_n$ – Auction Surplus $Payments_n$ (N-23)

Where,

RAR_n =	Residual Auction Revenue for Centralized TCC Auction *n*
Total $Revenue_n$ =	Total revenue ISO collects from the award of TCCs to purchasers in Centralized TCC Auction *n*
TCCs $Sold_n$ =	Total payments ISO makes to parties selling TCCs, including Grandfathered TCCs, in Centralized TCC Auction *n*
$ETCNL_n$ =	Total payments ISO makes to Transmission Owners with ETCNL, in Centralized TCC Auction *n*
Residual $TCCs_n$ =	Total payments ISO makes to parties with Residual TCCs determined prior to the first Centralized TCC Auction, in auction *n*
Auction Shortfall $Charges_n$ =	Total charges made to Transmission Owners with transmission facilities out-of-service in Centralized TCC Auction *n*
Auction Surplus $Payments_n$ =	Total payments made to Transmission Owners with transmission facilities returning to service in Centralized TCC Auction *n*.

Residual Auction Revenue may be positive or negative.

3.6.2 Facility Flow-Based Methodology

Where the Facility Flow-Based Methodology applies, the ISO shall allocate to each Transmission Owner *t* an amount equal to the product of the $FFB_{t,n}$ coefficient and the Residual Auction Revenue for Centralized TCC Auction *n*.

The Facility Flow-Based Method allocates Residual Auction Revenue based on the Market Clearing Prices and megawatt flows in the solution to the Centralized TCC Auction. For each transmission facility, the ISO shall calculate the product of the pre-contingency flows on the facility from the set of Residual TCCs sold in the auction, and the difference between the Market Clearing Prices in the Centralized TCC Auction at the nodes at each end of the

transmission facility.[4] The sum of these values, in absolute terms, for all facilities owned by a Transmission Owner, shall determine that owner's proportionate share of the Residual Auction Revenue, i.e. its Facility Flow-Based coefficient.

The Facility Flow-Based coefficients are calculated only from those facility flows associated with the sale of Residual TCCs that were not determined prior to the first Centralized TCC Auction. To calculate the flows associated with the sale of Residual TCCs, the ISO shall calculate the flow on a transmission facility associated with all TCCs and Grandfathered ETAs represented in the solution to the Centralized TCC Auction, and subtract from this the flow on the same transmission facility caused by all TCCs, ETCNL, residual TCCs that were estimated prior to the Centralized TCC Auction and allocated among the Transmission Owners utilizing the Interface MW-Mile Methodology and Grandfathered Rights that were valid prior to the auction for the same period covered by the auction. The power flow from the TCCs, ETCNL, residual TCCs that were estimated prior to the Centralized TCC Auction and allocated among the Transmission owners utilizing the Interface MW-Mile Methodology and Grandfathered Rights that were valid prior to the auction for the period covered by the auction is called the Initial Condition. An Initial Condition shall be determined prior to each Centralized TCC Auction, for the same transmission network configuration used in the auction.

The Facility Flow-Based allocation factor for Transmission Owner *t,* for Centralized TCC Auction *n*, is expressed as follows:

$$FFB_{t,n} = \frac{\sum_{l \in L} \left| \left(F_{l,n} - F_{l,IC}\right) * \left(P_{y,l} - P_{x,l}\right) \right|}{\sum_{l \in T} \left| \left(F_{l,n} - F_{l,IC}\right) * \left(P_{y,l} - P_{x,l}\right) \right|} \qquad \text{(N-24)}$$

Where,

$FFB_{t,n}$=	The Facility Flow-Based allocation for Transmission Owner *t,* for Centralized TCC Auction *n*
L =	The set of all transmission facilities owned by Transmission Owner *t*
T =	The set of all transmission facilities owned by New York Transmission Owners that are modeled in the TCC auction transmission network model
l =	A transmission facility from bus *x* to bus *y*
$F_{l,n}$ =	The megawatt flow on transmission facility *l* from all TCCs and Grandfathered Rights represented in the solution to the Centralized TCC Auction *n*

[4] The results of a Centralized TCC Auction include the TCCs awarded, their associated Market Clearing Prices, nodal prices and binding constraints. The TCC auction software provides nodal prices at all nodes in the network.

$F_{l,IC}$=	The Initial Condition, i.e., the megawatt flow on transmission facility *l* from the TCCs, ETCNL, residual TCCs that were estimated prior to the Centralized TCC Auction and allocated among the Transmission owners utilizing the Interface MW-Mile Methodology and Grandfathered Rights that were valid prior to the auction for the period covered by Centralized TCC Auction *n*
$P_{y,l}$ =	The Market Clearing Price at bus *y* on transmission facility *l* in the solution to Centralized TCC Auction *n*
$P_{x,l}$ =	The Market Clearing Price at bus *x* on transmission facility *l* in the solution to Centralized TCC Auction *n*

F_l will likely equal $F_{l,IC}$ in situations in which a transmission facility is fully subscribed by Grandfathered TCCs and/or Grandfathered Rights, so that this transmission facility will not contribute to the Facility Flow-Based coefficient.