**9      Attachment C - Methodology to Assess Available Transfer Capability**

The ISO shall calculate Firm and Non-Firm Available Transfer Capability ("ATC")
according to the procedures set forth in this Attachment C which adopts the "Rated System Path
Methodology" established by the North American Electric Reliability Corporation's Reliability
Standard MOD-029-1a, or its successors.. Additional information and detail shall be set forth in
the ISO's ATC Implementation Document ("ATCID").

## 9.1 Overview

The ISO shall calculate and post ATC values for its Internal and External Interfaces and for Scheduled Lines.  The ISO's Interfaces represent a defined set of transmission facilities that separate Locational Based Marginal Pricing (LBMP) Load Zones within the New York Control Area and that separate the New York Control Area from adjacent Control Areas.  External Interfaces may be represented by one or more Proxy Generator Buses for scheduling and dispatching purposes.  Each Proxy Generator Bus may be associated with distinct, posted ATC values.  Scheduled Lines represent a transmission facility or set of transmission facilities that provide a separate scheduling path interconnecting the ISO to an adjacent Control Area.  Each Scheduled Line is associated with a distinct Proxy Generator bus for which the ISO separately posts ATC.

Hourly ATCs for the current day and for the next six days, and daily and monthly ATCs shall be calculated for all External Interfaces and for Scheduled Lines.  Specifically, for External Interfaces and for all Scheduled Lines, the ISO shall calculate: (i) hourly ATC values for at least the next forty eight hours; (ii) daily values for at least the next thirty one calendar days; and (iii) monthly values for at least the next twelve  months (*i.e.*, months 2-13).  For External Interfaces and for all Scheduled Lines, the ISO shall recalculate ATC at a minimum on the following frequency, unless none of the calculated values identified in its ATC equation have changed: (i) for hourly values, once per hour (subject to the exception in MOD-001-1a which allows transmission service providers up to 175 hours per year during which calculations are not required); (ii) for daily values, once per day; and (iii) for monthly values, once per week.  Hourly ATCs shall be calculated for all Internal Interfaces for the current day and for the next day.   To the extent necessary for compliance with MOD-001-1a, the ISO:  (i) accounts for the impacts of

its internal congestion on its external interfaces as accurately as possible; and (ii) calculates

internal flows in order to fulfill its obligation to calculate external flows.  External ATC

calculations shall be performed with models that depict system conditions consistent with the

expected internal flows.

The ISO's calculation of ATC shall reflect its provision of transmission service under an

LBMP system pursuant to the schedules produced by its Day-Ahead Market software (the

"Security Constrained Unit Commitment" ("SCUC")) and Real-Time Market software (the "Real

Time Commitment" ("RTC")) in the form of "Transmission Flow Utilization" information which

is incorporated into the ISO's ATC equation as specified in sections 9.2 and 9.4, below.

The ISO continuously redispatches all resources subject to its control in order to meet

Load and to accommodate requests for Firm Transmission Service through the use of SCUC,

RTC, and its Real-Time Dispatch software.  If the posted ATC value for an Interface is zero that

is an indication that the Interface is congested.  The ISO may, however, still be able to provide

additional Firm Transmission Service over such Interfaces through redispatching and other

schedule adjustments directed by the SCUC and RTC algorithms that will be incorporated into

the Transmission Flow Utilization component of its ATC equation.

SCUC creates the ISO's Day-Ahead Market schedules and prices by performing a series

of commitment and dispatch runs.  The SCUC algorithm simultaneously minimizes the ISO's

total Bid Production Cost of: (i) supplying power or demand reductions to satisfy accepted

purchasers' Bids to buy Energy from the Day-Ahead Market; (ii) providing sufficient Ancillary

Services to support Energy purchased from the Day-Ahead Market consistent with the

Regulation Service Demand Curve and Operating Reserve Demand Curve; (iii) committing

sufficient Capacity to meet the ISO's Load forecast and provide associated Ancillary Services; and (iv) meeting Bilateral Transaction schedules submitted Day-Ahead excluding schedules of Bilateral Transactions with Trading Hubs as their POWs. The power flow information produced by the SCUC algorithm is incorporated into the ISO's ATC calculations as Transmission Flow Utilization$_{Firm}$ data pursuant to sections 9.2 and 9.4, below.

RTC is a multi-period security constrained unit commitment and dispatch model that co-optimizes to solve simultaneously for Load, Operating Reserves and Regulation Service on a least as-bid production cost basis over a two hour and fifteen minute optimization period. RTC makes binding unit commitment and de-commitment decisions for the periods beginning fifteen minutes (in the case of resources that can respond in ten minutes) and thirty minutes (in the case of resources that can respond in thirty minutes) after the scheduled posting time of each RTC run, provides advisory commitment information for the remainder of the two and a half hour optimization period, and will produce binding schedules for External Transactions to begin at the start of each quarter hour. RTC co-optimizes to solve simultaneously for all Load, Operating Reserves and Regulation Service requirements and to minimize the total as bid production costs over its optimization timeframe. RTC considers SCUC's resource commitment for the day, load forecasts that RTC itself will produce each quarter hour, binding transmission constraints, and all Real-Time Bids and Bid parameters. The schedules produced by RTC are incorporated into the ISO's ATC calculation as Transmission Flow Utilization$_{Firm}$ data pursuant to sections 9.2 and 9.4 below.

At the conclusion of the SCUC and RTC processes, the ISO's Non-Firm Transaction Scheduler ("NFTS") software performs the calculation for determining ATC values for the current day and the next day in accordance with section 9.2. ATC is first calculated taking into

consideration only firm transactions with the resultant values being ATC exclusive of non-firm transactions. The NFTS subsequently determines if there is remaining ATC for any submitted non-firm transactions for the given ATC calculation period. NFTS will then schedule those non-firm transactions, which are included in Transmission Flow Utilization$_{\text{Non-Firm variable}}$ for purposes of sections 9.2 and 9.4, and calculate ATC values inclusive of non-firm transactions. Both sets of hourly ATC values are then posted to the ISO's OASIS as "ATC w/o Non-Firms" and "ATC w/Non-Firms." In addition, the ISO's long-term ATC calculator software runs twice a day and calculates daily and monthly ATC values, and hourly values further ahead than the next day, for the ISO's External Interfaces and all Scheduled Lines, which are in turn posted to the ISO's OASIS.

When calculating ATC the ISO shall use assumptions no more limiting than those used in the planning of operations, for the corresponding time period studied, provided that such planning of operations has been performed for that time period. When different inputs are used in ATC calculations because the calculations are performed at different times, such that the most recent information is used in any calculation, a difference in that input data shall be not be considered to be a difference in assumptions.

### 9.2 Methodology for Computing Firm and Non-Firm ATC

The ISO calculates hourly Firm ATC and Non-Firm ATC based on the market schedules determined using its SCUC process for the Day-Ahead Market and its RTC processes for the Real-Time Market for the next day and current day time periods. These Firm and Non-Firm ATC values shall be posted for all Interfaces and Scheduled Lines in compliance with applicable North American Energy Standards Board requirements. The ISO also calculates and posts Firm and Non-Firm ATC for External Interfaces for the additional hourly, as well as the daily and monthly periods specified in section 9.1, above..

When calculating Firm ATC ("$ATC_F$") for all Interfaces for each of the time periods specified in section 9.1 above, the ISO shall use the algorithm established under Requirement 7 of MOD-029-1a. Specifically:

$$ATC_F = TTC - ETC_F - CBM - TRM + Postbacks_F + counterflows_F$$

Where

$ATC_F$ is the firm Available Transfer Capability for the Interface for that period.

$TTC$ is the Total Transfer Capability of the Interface for that period.

$ETC_F$ is the sum of existing firm commitments for the Interface during that period (including Firm Transmission Flow Utilization).

$CBM$ is the Capacity Benefit Margin for the Interface during that period.

$TRM$ is the Transmission Reliability Margin for the Interface during that period.

$Postbacks_F$ are changes to firm Available Transfer Capability due to a change in the use of Transmission Service for that period, as defined in Business Practices.

**counterflows$_F$** are the adjustments to ATC$_F$ as determined by the ISO and specified in its ATCID.

When calculating Non-Firm ATC ("ATC$_{NF}$") for all Interfaces for each of the time periods specified in section 9.1 above, the ISO shall use the algorithm established under Requirement 8 of MOD-029-1a.  Specifically:

$$ATC_{NF} = TTC - ETC_F - ETC_{NF} - CBM_S - TRM_U + Postbacks_{NF} + counterflows_{NF}$$

Where

**ATC$_{NF}$** is the non-firm Available Transfer Capability for the Interface for that period.

**TTC** is the Total Transfer Caoability of the Interface for that period.

**ETC$_F$** is the sum of existing firm commitments for the Interface during that period (including Firm Transmission Flow Utilization).

**ETC$_{NF}$** is the sum of existing non-firm commitments for the Interface during that period.

**CBM$_S$** is the Capacity Benefit Margin for the Interface that has been scheduled during that period.

**TRM$_U$** is the Transmission Reliability Margin for the Interface that has not been released for sale (unreleased) as non-firm capacity by the ISO during that period.

**Postbacks$_{NF}$** are changes to non-firm Available Transfer Capability due to a change in the use of Transmission Service for that period, as defined in Business Practices
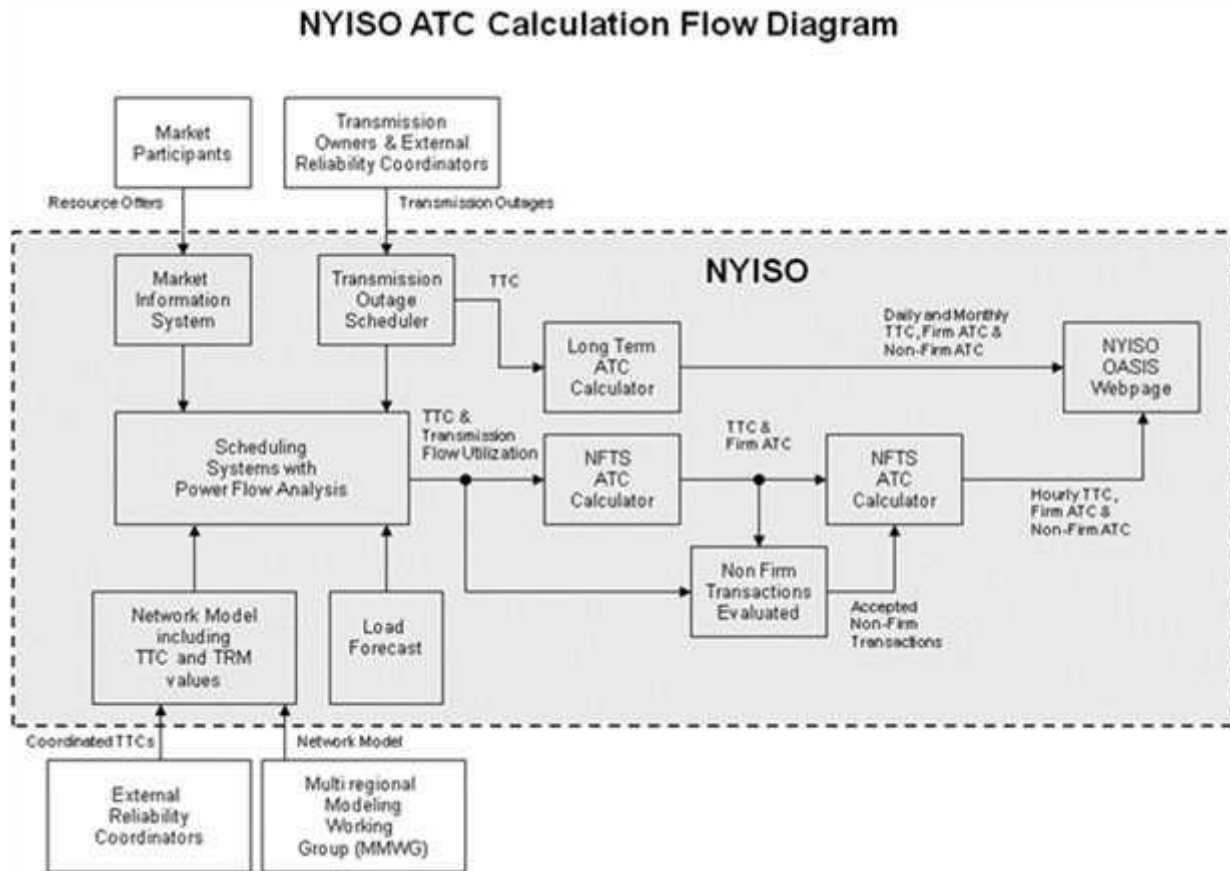
**counterflows$_{NF}$** are the adjustments to ATC$_{NF}$ as determined by the ISO and specified in

its ATCID.

The ISO's ATC calculation algorithms are posted at the "ATC Detailed Algorithms" link

at:

http://www.nyiso.com/public/webdocs/market_data/power_grid_info/ATCDetailedAlgorithm.pdf

**9.3     Process Flow Diagram**

The following diagram illustrates the process that the ISO follows when computing and posting ATC.

## NYISO ATC Calculation Flow Diagram

**9.4     Existing Transmission Commitments ("ETC")**

The ISO shall calculate ETC for firm Existing Transmission Commitments (ETCF) for a

specified period for an Interface, using the formula established under Requirement 5 of MOD-

029-1a.  Specifically:

ETCF = NLF + NITSF + GFF + PTPF + RORF + OSF

**Where:**

**NLF** is the firm capacity set aside to serve peak Native Load forecast commitments for the time
period being calculated, to include losses, and Native Load growth, not otherwise included in
Transmission Reliability Margin or Capacity Benefit Margin.

**NITSF** is the firm capacity reserved for Network Integration Transmission Service serving Load,
to include losses, and Load growth, not otherwise included in Transmission Reliability Margin or
Capacity Benefit Margin.

**GFF** is the firm capacity set aside for grandfathered Transmission Service and contracts for
energy and/or Transmission Service, where executed prior to the effective date of a Transmission
Service Provider's Open Access Transmission Tariff or "safe harbor tariff."

**PTPF** is the firm capacity reserved for confirmed Point-to-Point Transmission Service.

**RORF** is the firm capacity reserved for Roll-over rights for contracts granting Transmission
Customers the right of first refusal to take or continue to take Transmission Service when the
Transmission Customer's Transmission Service contract expires or is eligible for renewal.

**OSF** is the firm capacity reserved for any other service(s), contract(s), or agreement(s) not
specified above using Firm Transmission Service as specified in the ATCID.


The ISO shall calculate ETC for non-firm Existing Transmission Commitments (ETCNF)
for a specified period for an Interface, using the formula established under Requirement 6 of
MOD-029-1a.  Specifically:

ETCNF = NITSNF + GFNF + PTPNF + OSNF

**Where:**

**NITSNF** is the non-firm capacity set aside for Network Integration Transmission Service serving
Load (i.e., secondary service), to include losses, and load growth not otherwise included in
Transmission Reliability Margin or Capacity Benefit Margin.

**GFNF** is the non-firm capacity set aside for grandfathered Transmission Service and contracts for energy and/or Transmission Service, where executed prior to the effective date of a Transmission Service Provider's Open Access Transmission Tariff or "safe harbor tariff."

**PTPNF** is non-firm capacity reserved for confirmed Point-to-Point Transmission Service.

**OSNF** is the non-firm capacity reserved for any other service(s), contract(s), or agreement(s) not specified above using non-firm transmission service as specified in the ATCID.

$OS_F$ and $OS_{NF}$ shall include a Transmission Flow Utilization value which shall be based on the market schedules determined using the SCUC and RTC market software for the current and next day time periods.  The Day-Ahead Market and Real-Time Market schedules established by the market software are security constrained network powerflow solutions that are used to determine the Transmission Flow Utilization value for the ISO's Interfaces and Scheduled Lines. Thus:

*Transmission Flow Utilization$_{Firm}$* for each Internal and External Interface is determined by the corresponding security constrained network powerflow solutions of SCUC or RTC, as applicable.

*Transmission Flow Utilization$_{Non-Firm}$* for each Internal and External Interface is the sum of Non-Firm Transactions scheduled.

*Transmission Flow Utilization$_{Firm}$* for Scheduled Lines is determined by the corresponding security constrained network powerflow solutions of SCUC or RTC, as applicable.

*Transmission Flow Utilization$_{Non-Firm}$* for Scheduled Lines is the sum of Non-Firm Transactions scheduled.

The Transmission Flow Utilization value for $OS_F$ and $OS_{NF}$ for time periods beyond the next day shall be zero because the ISO's Commission-approved market design does not permit transactions to be scheduled for such time periods.

**9.5     Total Transfer Capability ("TTC")**

The ISO shall develop TTC values for each Interface and Scheduled Line in conformance with all applicable requirements of MOD-001-1a and MOD-029-1a, or their successors. External Interfaces may be represented by one or more Proxy Generator Buses for scheduling and dispatching purposes.  Each Proxy Generator Bus associated with an External Interface may be associated with distinct, posted TTC values.  Each Scheduled Line is associated with a distinct Proxy Bus for which the ISO separately posts a TTC value.

The TTC value for each Interface and Scheduled Line shall be the maximum amount of electric power that can be reliably transferred over the New York State Transmission System. The ISO shall use studies that it performs, joint studies conducted with neighboring Control Areas, and real-time system monitoring to determine the appropriate TTC values.  The TTC values are periodically reviewed and may be updated as warranted to ensure that accurate values are posted.  When calculating TTC the ISO shall use assumptions no more limiting than those used in the planning of operations, for the corresponding time period studied, provided that such planning of operations has been performed for that time period.  When different inputs are used in TTC calculations because the calculations are performed at different times, such that the most recent information is used in any calculation, a difference in that input data shall be not be considered to be a difference in assumptions.

Databases used in the determination of the TTC values include ~~MultiRegional Modeling Working Group~~ Eastern Interconnection Reliability Assessment system representations, and the ISO's Day-Ahead Market and Real-Time Market system representations.

The normal maximum Interface and Scheduled Line TTC values correspond to TTC assessments that assume: (1) all significant Bulk Power System transmission facilities are in service, (2) Capability Period forecast peak-load conditions, (3) no significant generation outages with generation output levels consistent with typical operation for Capability Period forecast peak-load conditions, and (4) coordination with neighboring Control Area transfer capability assessments.

Interface or Scheduled Line TTC values may be modified in response to identified transmission facility or generation outage conditions. TTC values may also be modified to account for neighboring Control Area transfer capability assessments for identified transmission facility or generation outage conditions, assuming the ISO receives timely notification of such conditions, or to account for operating conditions affecting the New York State Transmission System.

### 9.6  Transmission Reliability Margin ("TRM")

TRM is the amount of transmission transfer capability necessary to ensure that the interconnected transmission network remains secure under a reasonable range of system conditions.  TRM accounts for the inherent uncertainty in system conditions and the need for operating flexibility to ensure reliable system operation as system conditions change.

The ISO shall maintain a TRM Implementation Document ("TRMID") in compliance with the requirements of MOD-008-1, or its successors..

Databases used in the determination of the TRM values include the MultiRegional Modeling Working Group system representations and the ISO's Day-Ahead Market and Real-Time Market system representations.

TRM equal to the sum of the following components shall be applied to calculations conducted up to eighteen months before the Dispatch Day to address unexpected system conditions including:  (1) uncertainty in unscheduled loop or parallel flows ranging in value from zero (0) MW to five hundred (500) MW based on the greater of the average of the last three months of historical parallel flows observed for each External Interface or the average of the deviation in parallel flows observed over the last three months for each External Interface, (2) load forecast uncertainty (normally this value is set to zero (0) MW), (3) uncertainty in external system conditions (normally this value is set to zero (0) MW), and (4) External Interface transmission facility availability ranging in value from zero (0) MW to one thousand (1000) MW reflecting the uncertainty of transfer capability resulting from the most significant single transmission facility outage for each External Interface.

The TRM used for purposes of ATC calculations conducted for External Interfaces for the Day-Ahead Market and the Real-Time Market shall be used to address unexpected system conditions equal to the sum of the following components: (1) uncertainty in unscheduled loop or parallel flows ranging in value from zero (0) to five hundred (500) MW based on the greater of the average of the last three months of historical parallel flows observed for each External Interface or the average of the deviation in parallel flows observed over the last three months for each External Interface, (2) load forecast uncertainty, normally of value zero (0) MW, and (3) uncertainty in external system conditions, normally of value zero (0) MW.

The TRM used for purposes of the ATC calculations conducted for Internal Interfaces for the Day-Ahead Market and the Real-Time Market shall normally be equal to the sum of the following components or a value of one hundred (100) MW, although the ISO may increase it above that level if necessary. TRM is applied to these ATC calculations to address unexpected system conditions including: (1) unscheduled loop or parallel flows normally of value zero (0) MW, (2) load forecast uncertainty normally of value zero (0) MW, (3) uncertainty in external and internal system conditions normally of value one hundred (100) MW, and (4) ISO Balancing Authority requirements normally of value zero (0) MW.

The TRM used for purposes of the ATC calculations conducted for Scheduled Lines for the Day-Ahead Market and the Real-Time Market shall normally be equal to the sum of the following components, which will ordinarily be expected to have a combined value of zero (0) MW, although the ISO may increase it above that level if necessary: (1) unscheduled loop or parallel flows ranging based on the average of the last three months of historical parallel flows observed for each associated External Proxy Generator Bus, normally of value zero (0) MW,

(2) load forecast uncertainty, normally of value zero (0) MW, and (3) uncertainty in external system conditions, normally of value zero (0) MW.

TRM is used to decrement TTC from External and Internal Interfaces and from Scheduled Lines when calculating ATC, and thus is not available when requesting Non-Firm transmission service. The ISO may, however, still be able to provide additional Firm Transmission Service over Internal Interfaces for Transmission Customers that are willing to pay congestion charges by redispatching the New York State Power System.

The specific values of TRM used on each Internal and External Interface and Scheduled Line are posted on the ISO's website. The TRM values are periodically reviewed by the ISO and may be updated as warranted. In compliance with Requirement 4 of MOD-008-1, or its successors, the ISO shall establish TRM values at least every thirteen months in accordance with its TRMID.

**9.7      Capacity Benefit Margin**

The ISO shall not set aside transmission capacity as CBM but shall maintain a CBM Implementation Document ("CBMID") in compliance with the requirements of MOD-004-1, or its successors, which shall include all of the information required by that Reliability Standard.  In compliance with Requirements 5 and 6 of MOD-004-1, or its successors, the ISO shall establish CBM values at least every thirteen months in accordance with its CBMID.

## 9.8    Coordinated ATC Calculations

The ISO's seasonal operating studies are an input into its TTC calculations for External Interfaces that represent Control Area boundaries.  The ISO coordinates those seasonal operating studies, and exchanges data necessary to support that coordination, with neighboring Control Areas.

The ISO also coordinates transmission outages and the TTCs associated with these system conditions, and exchanges related data, with neighboring Control Areas.  The ISO's and neighboring Control Areas' practice is to provide relevant information to each other in sufficient time for it to be incorporated into their own scheduling and ATC calculation processes.  If a neighboring Control Area determines a more limiting TTC corresponding to a transmission outage, the ISO will use the other Control Area's TTC in its scheduling system (SCUC and RTC).  These values are correspondingly used in the calculation of ATC consistent with the algorithms set forth in section 9.2 above.