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Methodologies for Transmission Capacity

Introduction and Background:

ISO-NE is the regional transmission organization (RTO) serving the New England Control Area. ISO-NE is responsible for the development, oversight, and fair administration of New England's wholesale market, management of the bulk electric power system and wholesale markets planning processes. The ISO serves as the Balancing Authority for the New England Control Area. The New England Control Area is comprised of PTF, non-PTF, OTF, MTF, and is interconnected to three neighboring Balancing Authority Areas (BAA) with various interface types.

As part of its RTO responsibilities, ISO-NE is registered with the North American Electric Reliability Corporation (NERC) as several functional model entities that have responsibilities related to the calculation of ATC as defined in the following NERC Standards: MOD-001 - Available Transmission System Capability (MOD-001), MOD-004 - Capacity Benefit Margin (MOD-004), and MOD-008 - Transmission Reliability Margin Calculation Methodology (MOD-008). The extent of those responsibilities is based on various Commission approved transmission operating agreements and the provisions of the ISO New England Operating Documents.

ISO-NE is the Transmission Provider of Regional Network Service (RNS) and Through or Out Service over PTF, and certain Participating Transmission Owners (PTO's) also provide local transmission service over Non-PTF within the RTO footprint and are responsible for calculating TTC and ATC associated with Local Service provided under Schedule 21. VEC is a Transmission Provider for Local Service under Schedule 21-VEC in accordance with the Transmission Operating Agreement (TOA). Pursuant to CFR§37.6(b) of the FERC Regulations, Transmission Providers are obligated to calculate and post TTC and ATC for each Posted Path.

Posted Path means any control area to control area interconnection; any path for which service is denied, curtailed or interrupted for more than 24 hours in the past 12 months; and any path for which a customer requests to have ATC or TTC posted. For this last category, the posting must continue for 180 days and thereafter until 180 days have elapsed from the most recent request for service over the requested path. For purposes of this definition, an hour includes any part of any hour during which service was denied, curtailed, or interrupted.

Capacity Benefit Margin (CBM):

CBM is defined as the amount of firm transmission transfer capability set aside by a TSP for use by the Load Serving Entities. The ISO-NE does not set aside any CBM for use by the Load Serving Entities, because of the New England approach to capacity planning requirements in the ISO New England Operating Documents. Load Serving Entities operating within the New England Control Area are required to arrange for their Capacity Requirements prior to the beginning of any given month in accordance with ISO Tariff, Section III.13.7.3.1 (Calculation

Vermont Electric Cooperative, Inc., a member-owned Cooperative founded in 1938, is Vermont's third largest electric utility, serving approximately 34,000 members in rural Vermont.

of Capacity Requirement and Capacity Load Obligation). Load Serving Entities do not utilize CBM to ensure that their capacity needs are met; therefore, CBM is not applicable within the New England market design. Accordingly, for purposes of ATC calculation, as long as this market design is in place in New England, the CBM is set to zero (0). VEC provides local transmission service over its non-PTF facilities that are connected to VELCO, the Vermont distribution utilities, and local generation. Therefore, VEC does not reserve CBM for these paths, and the CBM is presently set to zero.

Counterflows:

The scheduled energy values of transactions utilizing a Firm Transmission Service on the path in opposite direction for which an ATC is being calculated, i.e., for the purposes of ATC calculations, Counterflows are firm tagged counter-schedules

Existing Transmission Commitments, Firm (ETC_F):

The ETC_F are those Native Load forecast commitments (NL_F), plus Network Integration Transmission Service (NITS_F), plus grandfathered Transmission Service (GF_F), plus confirmed Firm transmission reservation (PTP_F), plus any rollover rights for Firm transmission reservations (ROR_F), and other service(s), contract(s) or agreement(s) (OS_F).

The ETC_F algorithm is:

$$ETC_F = NL_F + NITS_F + GF_F + PTP_F + ROR_F + OS_F$$

Existing Transmission Commitments, Non-Firm (ETC_{NF}):

The (ETC_{NF}) are Non-Firm Network Integration Transmission Service (NITS_{NF}), plus Non-Firm grandfathered Transmission Service (GF_{NF}), plus confirmed Non-Firm transmission reservations (PTP_{NF}), and or other service(s), contract(s) or agreement(s) (OS_{NF}).

The ETC_{NF} algorithm is:

$$ETC_{NF} = NITS_{NF} + GF_{NF} + PTP_{NF} + OS_{NF}$$

Operating Horizon (OH):

For the purpose of this Attachment A, the OH is noon through midnight of the next day for a total of 36 hours. As time progresses the total hours remaining in the OH decreases each hour until noon the following day when the OH is once again reset to 36 hours.

Planning Horizon (PH):

For the purpose of this Attachment A, PH is any time before the OH. ISO New England - ISO New England Inc. Transmission, Markets and Services Tariff

Postbacks:

A Postback is the confirmed firm transmission reservation that has been redirected to another transmission path for the period of time that the redirection is effective. Postbacks for the non-firm ATC calculation also include any non scheduled portion of a firm transmission service reservation on the associated path.

Scheduling Horizon (SH):

For the purpose of this Attachment A, SH is Real-Time and the hour before.

Total Transfer Capability (TTC):

TTC is the amount of electric power that can be transferred reliably from one area to another area of the interconnected systems by way of all transmission lines (or paths) between those areas under specified system conditions. VEC provides local transmission deliveries over non-Pool Transmission Facilities (Non-PTF). Some of these facilities are interconnected exclusively with the ISO-NE system, through the Vermont Transco, LLC system (VT Transco or VELCO), either directly or indirectly through the transmission of others. Other portions of VEC's transmission can be electrically configured to accept deliveries directly from the Hydro Quebec system, which is asynchronous with the ISO-NE system. To accept these Hydro Quebec deliveries, VEC transfers portions of its system (electrical loads) from ISO-NE to Hydro Quebec. The transfer of these radial loads to Hydro Quebec is commonly referred to as "Block Loading".

As a practical matter, the ratings of VEC's radial transmission paths are always higher than the transmission requirements of the Transmission Customers connected to that path. As such, transmission services over these posted paths are considered to be always available. For transmission service deliveries over VEC's facilities that are interconnected exclusively with the ISO-NE system, these posted paths are considered to be always available. For radial deliveries over VEC's facilities that are interconnected with Hydro Quebec Block Loading constraints limiting the transferability of capacity or energy may arise because there is insufficient load available to receive or deliver all of the capacity or energy scheduled for delivery by the Transmission Customer from the Hydro Quebec source. The Hydro Quebec Block Loading point to point transmission TTC's planning horizon analysis of the hourly loads available for Block Loading are posted on VEC's website.

Transmission Reliability Margin (TRM):

The Transmission Reliability Margin (TRM) is the portion of the TTC that cannot be used for the reservation of firm transmission service because of uncertainties in system operation conditions and the need for operating flexibility to ensure reliable system operation as system conditions change. It is used only for external interfaces under the New England market design. Since VEC provides transmission service over its non-PTF facilities that are connected only to the internal New England system, VEC does not reserve TRM for these paths, and the TRM is presently set to zero.

Calculation of ATC for VEC's Local Facilities:

VEC uses a contract path method to calculate Firm and Non-Firm Available Transfer Capability (ATC). As described below, ATC for transactions relating to VEC's Transmission System will be determined for a path in the direction of the transfer. Path calculations are determined based on the two types of facilities on VEC's Transmission System that are covered under this Schedule 21-VEC: (1) non-Pool Transmission Facilities (Non-PTF) that do not involve the use of rights for deliveries from Hydro Quebec, and (2) Non-PTF that do involve the use of rights for deliveries from Hydro Quebec. Pre-OATT grandfathered Transmission Service deliveries from Hydro Quebec are pursuant to the non-FERC jurisdictional Block Loading Facilities Transmission Agreement (BLFTA). ATC for any specific contract path represents the amount of unused capacity after consideration of reliability requirements to meet obligations of existing and pending valid Applications for Network Service including VEC's existing use of such service to serve its native load; and obligations under existing firm and pending valid Applications for Firm Point-to-Point Transmission Service or other existing agreements predating this Tariff and Local Service Schedule.

System Path Methodology defines the required items to be identified when describing a transmission provider's ATC methodology.

All of VEC's Schedule 21-VEC transmission facilities are Non-PTF and used to serve its native loads and the connected loads of its Transmission Customers. VEC has obligations to serve its native loads and the connected loads of grandfathered Transmission Customers under Vermont Public Service Board jurisdictional transmission agreements. One of these non-OATT agreements is the BLFTA. BLFTA obligations will affect the contract path determination of ETC's. The availability of load for Block Loading limits the transferability of energy from Hydro Quebec. VEC also has long-term firm OATT Schedule 21-VEC reservations to provide local point to point transmission for generation which is located within the Block Loading area.

For paths affected by Hydro-Quebec Block Loading, VEC prioritizes ETC_F components such that ETC_F cannot exceed the TTC. The prioritization order is as follows:

1. PTP_F generation located within the block load path that utilizes Firm Long-Term Schedule 21-VEC service.
2. GF_F Hydro-Quebec Block Load third-party reservations submitted pursuant to the BLFTA.
3. NL_F VEC's native load committed to accept VEC's Hydro-Quebec Block Load schedule reservations.
4. NIT_F firm capacity reserved for network integration service serving load.
5. ROR_F firm capacity reserved for Roll-over rights for contracts granting the 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.
6. OS_F firm capacity reserved for any other service(s), contract(s), or agreement(s).

The ETC_F algorithm expressed in the order of prioritization is:

$$\text{Block Loading ETC}_F = \text{PTP}_F + \text{GF}_F + \text{NL}_F + \text{NITS}_F + \text{ROR}_F + \text{OS}_F$$

Where: the Block Loading ETC_F cannot exceed the Block Loading TTC

If the sum of the Block Loading ETC_F component reservations exceeds the TTC the availability will be curtailed in the reverse prioritization order. For example, OS_F would be curtailed first; ROR_F would be curtailed second; etc. If curtailments are required within a prioritization group and there are multiple Transmission Customers within the group the reductions will be made pro rata.

For Non-PTF transmission paths unaffected by Hydro-Quebec Block Loading the ratings of the radial transmission paths are always higher than the transmission requirements of the Transmission Customers connected to that path. As such, transmission services over these posted paths are considered to be always available. Common practice is not to calculate, recalculate, or post firm and non-firm ATC values for the non-PTF assets described above, on any given interval as set out in Reliability Standard MOD-1, as ATC is positive and listed as 9999. Transmission customers are not restricted from reserving firm or non-firm transmission service on Non-PTF transmission paths that are unaffected by Hydro-Quebec Block Loading.

As Real-Time approaches, ISO-NE utilizes the Real-Time energy market rules to determine which of the submitted energy transactions will be scheduled in the coming hour. Basically, the ATC of the Non-PTF transmission paths that are unaffected by Hydro-Quebec Block Loading is almost always positive. The ATC is equal to the amount of net energy transactions that ISO-NE will schedule on an interface for the designated hour. With this simplified version of ATC, there is no detailed algorithm to be described or posted other than, for Non-PTF

transmission paths that are unaffected by Hydro-Quebec Block Loading: ATC equals TTC. Thus, for those Non-PTF transmission paths that unaffected by Hydro-Quebec Block Loading VEC has posted the ATC as 9999, consistent with industry practice. ATC on these paths varies depending on the time of day. However, it is posted with an ATC of "9999" to reflect the fact that there are no restrictions on these paths for commercial transactions.

Calculation of ATC_F in the Planning Horizon (PH):

For purposes of this Attachment A, PH is any period before the Operating Horizon. Consistent with the NERC definition, ATC_F is the capability for Firm transmission reservations that remain after allowing for TRM, CBM, ETC_F , $Postbacks_F$ and $counterflows_F$. As discussed above, TRM and CBM are zero. Firm Transmission Service over Schedule 21-VEC that is available in the PH includes: Yearly, Monthly, Weekly, and Daily. $Postbacks_F$ and $counterflows_F$ of Schedule 21-VEC reservations are not considered in the ATC calculation. Therefore, ATC_F in the PH is equal to the TTC minus ETC_F .

Calculation of ATC_F in the Operating Horizon (OH):

Consistent with the NERC definition, ATC_F is the capability for Firm transmission reservations that remain after allowing for ETC_F , CBM, TRM, $Postbacks_F$ and $counterflows_F$. As discussed above, TRM and CBM is zero. Daily Firm Transmission Service over Schedule 21-VEC is the only firm service offered in the Operating Horizon (OH). $Postbacks_F$ and $counterflows_F$ of Schedule 21-VEC transmission reservations are not considered in the ATC_F calculation. Therefore, ATC_F in the OH is equal to the TTC minus ETC_F .

Calculation of ATC_F in the Scheduling Horizon (SH):

Firm Schedule 21-VEC transmission service is not offered in the SH. Therefore ATC_F in the SH is zero.

Calculation of ATC_{NF} in the PH:

ATC_{NF} is the capability for Non-Firm transmission reservations that remain after allowing for ETC_F , ETC_{NF} , scheduled CBM (CBM_S), unreleased TRM (TRM_U), Non-Firm Postbacks ($Postbacks_{NF}$) and Non-Firm counterflows ($counterflows_{NF}$). As discussed above, the TRM and CBM for Schedule 21-VEC are zero. $Postbacks_{NF}$ and $counterflows_{NF}$ of Schedule 21-VEC transmission reservations are not considered in this calculation. Therefore, ATC_{NF} in the PH is equal to the TTC minus ETC_F and ETC_{NF} .

Calculation of ATC_{NF} in the OH:

ATC_{NF} is the capability for Non-Firm transmission reservations that remain after allowing for TTC, ETC_F , ETC_{NF} , scheduled CBM (CBM_U), unreleased TRM (TRM_U), Non-Firm Postbacks ($Postbacks_{NF}$), and Non-Firm counterflows ($counterflows_{NF}$). ATC_{NF} available in the OH includes: Daily and Hourly. As discussed above TRM and CBM are zero. TRM_U , $counterflows_{NF}$ and ETC_{NF} are not considered in this calculation. Therefore, ATC_{NF} in the OH is equal to the TTC minus ETC_F , plus postbacks of PTP_F in OH as PTP_{NF} ($Postbacks_{NF}$)

Calculation of ATC_{NF} in the SH:

ATC_{NF} in the SH is equal to the ATC_{NF} in the OH for the designated hour. With this simplified version of ATC, there is no detailed algorithm or flow chart to be described or posted other than: ATC_{NF} in the SH equals ATC_{NF} in the OH.

Posting of ATC:

ATC values for VEC Non-PTF Posted Paths will be posted on the VEC page of ISO's OASIS site. As described above, the ATC values for Non-PTF transmission paths that are unaffected by Hydro-Quebec Block Loading are always positive, and are thus set at 9999. The ATC values for these internal posted paths are posted in accordance with NAESB standards on VEC's provider page of the ISO-NE OASIS website. Common practice is not to calculate or post firm and non-firm ATC values for the non-PTF assets described above, as ATC is positive and listed as 9999. Transmission customers are not restricted from reserving firm or non-firm transmission service on Non-PTF transmission paths that are unaffected by Hydro-Quebec Block Loading.

Updates to ATC:

When any of the variables in the ATC equations change, the ATC values are recalculated and reposted.

Negative ATC:

For paths affected by Hydro-Quebec Block Loading, the ATC cannot exceed the TTC. Therefore, ATC for paths affected by Hydro-Quebec Block Loading, may become zero, but will not become negative.

For Non-PTF transmission paths that are unaffected by Hydro-Quebec Block Loading the ratings of radial paths will always higher than the transmission requirements of Transmission Customers connected to such path. Therefore, ATC values for Non-PTF transmission paths that are unaffected by Hydro-Quebec Block Loading are considered to be always available and will not be negative.

Coordination of ATC Calculations:

Schedule 21-VEC is does not require the coordination of ATC values with external interfaces. Therefore it is not necessary to coordinate the values.

Jointly Owned or Controlled Transmission Facilities:

Where VEC jointly owns or controls transmission with other utilities or adjoining areas, will consider in its determination of ATC its entitlement for use of such lines in accordance with provisions of this Tariff and consistent with pre-existing agreements on its rights governing such use. Obtaining Firm Transmission Service over other utilities' facilities is the responsibility of the requesting Transmission Customer.

Mathematical Algorithms:

Planning Horizon:

$ATC_F = (TTC - TRM - CBM - ETC_F)$; but, TRM and CBM are zero (-0-); therefore, $ATC_F = (TTC - ETC_F)$

$ATC_{NF} = (TTC - ETC_F - ETC_{NF} - CBM_S - TRM_U + Postbacks_{NF} + counterflows_{NF})$; but, TRM and CBM are zero (-0-) and Postbacks and counterflows are not considered in this calculation; therefore, $ATC_{NF} = (TTC - ETC_F - ETC_{NF})$

Operating Horizon (OH):

$ATC_F = (TTC - TRM - CBM - ETC_F + Postbacks_F + counterflows_F)$; but, TRM and CBM are zero (-0-) and Postbacks and counterflows are not considered in this calculation; therefore,
 $ATC_F = (TTC - ETC_F)$

$ATC_{NF} = (TTC - ETC_F - ETC_{NF} - CBM_U - TRM_U + Postbacks_{NF} + counterflows_{NF})$; but, TRM and CBM are zero (-0-), and Postbacks and counterflows are not considered in this calculation; therefore,
 $ATC_{NF} = (TTC - ETC_F - ETC_{NF})$

Scheduling Horizon (SH):

ATC_F is not offered in the SH; therefore, $ATC_F = \text{zero } (-0-)$

$ATC_{NF} = ATC_{NF}$ in the OH

ATC Process Flow Diagram:

This process flow diagram illustrates the steps through which ATC is calculated both on an operating and planning horizon.

