ATTACHMENT C

Methodology to Assess Available Transfer Capability

1.0 General

This attachment describes OVEC's algorithms, flowchart, and methodology for determination of Available Transfer Capability (ATC). The methodology is based on the June 1996 approved reference document published by the North American Electric Reliability Council entitled "Available Transfer Capability Definitions and Determination" as a framework for determining Available Transfer Capability (ATC) to satisfy both Federal Energy Regulatory Commission (FERC) requirements and industry needs.

2.0 Methodology

OVEC's primary methodology for calculating ATC employs a flow-based methodology which is commonly referred to by FERC as network ATC. However, there are exceptions for interfaces where OVEC administers a contract path limit. In these instances, the ATC will be the lesser of the calculated network ATC or contract path limit.

3.0 Definitions

The North American Electric Reliability Corporation (NERC) provides the following definitions in the *"Glossary of Terms Used in Reliability Standards" (updated May 2, 2007, available at: ftp://www.nerc.com/pub/sys/all_updl/standards/rs/Glossary_02May07.pdf)*

3.1 Total Transfer Capability (TTC) is the amount of electric power that can be moved or transferred reliably from one area to another area of the interconnected transmission systems by way of all transmission lines (or paths) between those areas under specified system conditions.

3.2 Available Transfer Capability (ATC) is a measure of the transfer capability remaining in the physical transmission network for further commercial activity over and above already committed uses. It is defined as Total Transfer Capability less existing transmission commitments (including retail customer service), less a Capacity Benefit Margin, less a Transmission Reliability Margin.

3.3 Firm Transmission Service is the highest quality (priority) service offered to customers under a filed rate schedule that anticipates no planned interruption.

3.4 Non-Firm Transmission Service is transmission service that is reserved on an as-available basis and is subject to curtailment or interruption.

3.5 Transmission Reliability Margin (TRM) is the amount of transmission transfer capability necessary to provide reasonable assurance that the interconnected transmission network will be secure. TRM accounts for the inherent uncertainty in system conditions and the need for operating flexibility to ensure reliable system operation as system conditions change.

3.6 Capacity Benefit Margin (CBM) is the amount of firm transmission transfer capability preserved by the transmission provider for Load Serving Entities (LSEs), whose loads are located on that Transmission Service Provider's system, to enable access by the LSEs to generation from interconnected systems to meet generation reliability requirements. Preservation of CBM for a LSE allows that entity to reduce its installed generating capacity below that which may otherwise have been necessary without interconnections to meet its generation reliability requirements. The transmission capacity preserved as CBM is intended to be used by the LSE only in times of emergency generation deficiencies.

4.0 Algorithms for ATC Determination

4.1 Power Flow Models

OVEC develops daily, weekly, and monthly power flow models for calculation and posting of ATC. These base case models include load forecast data, generation dispatch, approved outages (transmission and generation), and open access transactions (point-to-point and network) based on the appropriate calculation horizon. In addition to modeling requirements within the OVEC Control Area, power flow data described above is exchanged and coordinated with interconnection neighbors.

Generation dispatches in the power flow base cases are made by using the generation block dispatch method. The block dispatch method proportionately assigns outputs to all generators in a

block between their maximum and minimum levels until maximum block generation is reached. It starts with the first block of generation defined and continues until the control area desired generation is reached. If no defined block generation dispatch data for a control area are available via SDX, then the area slack bus adjustment and global generation scaling will be used to dispatch control area generation.

Transmission and generation outages are included in a power flow base case if they are expected to continue through 50% or more of the time period for which the ATC value is desired.

4.1.1 Hourly Base Case Power Flow Model

OVEC uses hourly peak loads obtained from SDX data or by applying a typical daily load curve if hourly SDX data are unavailable for an area.

4.1.2 Daily Base Case Power Flow Models

OVEC uses daily peaks loads that are assumed to occur at 4:00 P.M. EST.

4.1.3 Weekly Base Case Power Flow Models

OVEC uses weekly peak loads that are assumed to occur on Wednesdays.

4.1.4 Monthly Base Case Power Flow Models

OVEC uses monthly peaks loads that are assumed to occur on the 3rd Wednesday of the month.

4.1.5 Long Term Base Case Power Flow Models

OVEC annually participates in the RFC model development efforts which produces models for selected peak load periods up to ten (10) years into the future. These models would be the starting point for evaluation of

Long-Term Firm requests. OVEC's input into the model is based on 1) projected peak load for the season in question, 2) generation which is economically dispatched to serve that load, and 3) firm open access transactions (point-to-point and network) based on the planning horizon.

Rollover rights are assumed on firm transmission contracts with duration of five years or greater. OVEC does not

routinely calculate or post yearly TTC and/or ATC since Long Term Firm (LTF) transmission requests are likely to require a System Impact Study.

4.2 Transfer Capability Methodology

OVEC utilizes a flow-based network ATC methodology to calculate transfer capabilities with its first tier neighbors. OVEC recognizes constraints and limitations both internal and external to the OVEC Transmission System. The ATC values that OVEC Calculates and posts on OASIS are equal to the First Contingency Incremental Transfer Capabilities (FCITC), which is the output derived from the power flow simulation of transfers. Total Transfer Capability (TTC) values are derived from ATC plus Existing Transmission Commitments (ETC). ETC is the amount of confirmed transmission capacity reserved on OVEC's OASIS (point-to-point and network) including native load.

Existing Transmission Commitments (ETC) are composed of OVEC native load and firm transmission reservations on the OVEC transmission system. Connected load is included in the power flow base cases used to calculate ATC and TTC values. The load magnitude is based on a forecast of customer demand. Firm transmission reservations are incorporated into the ATC calculations by adjusting the initial AFC values by the impacts of the firm reservations (or schedules). Point-To-Point reservations are assumed to be scheduled between OVEC and its directly-connected Sponsors (joint owners of the system) only. Rollover rights associated with firm reservations are assumed to be exercised by their holders.

Available Flow gate Capability (AFC) is the remaining power-carrying capability (MW) of a flow gate after accounting for its initial power flow, which can include the impact of a contingency or not. A flow gate is a transmission facility or associated group of transmission facilities and a critical facility outage if it is a contingency flow gate, or no outage if it is a base case flow gate.

Initial AFC values are calculated by subtracting the initial power flow (MW) on a flow gate from its applicable rating (summer normal or emergency or winter normal or emergency).

ATC values are calculated by first adjusting the initial AFC values to account for: 1) flow gate power flow increases due to

committed reservations (or schedules) in the same direction as the ATC desired, and 2) the flow gate transmission reliability margin (TRM). Firm reservations (or schedules) only are used if a firm ATC is desired, and both firm and non-firm reservations(or schedules) are used if a non-firm ATC is desired.

The ATC value calculation is then completed by dividing the adjusted AFC value by the flow gate transfer distribution factor (TDF) for the transfer direction of the ATC desired. An ATC value is calculated for each OVEC flow gate. The minimum value of the results of these calculations is posted as the ATC for the desired transfer direction.

Initial power flows on flow gates are obtained from a base case which is a power flow program model representative of the predicted state of the electrical system for the time period of the ATC desired.

The reservations, loads, generation dispatches, and scheduled transmission system outages incorporated in the base case are obtained from the OVEC Open Access Same-time Information System (OASIS) and the System Data Exchange (SDX) databases. The base case, and the electrical system topology and parameters it contains, is a derivative of a base case from the library of base cases developed by the Multi-regional Modeling Working Group (MMWG) for the members of NERC. It is derived by removing inter-area transactions that impact OVEC ATC values from the base case in the MMWG library.

4.2.1 Transmission Reliability Margin (TRM)

Transmission Reliability Margin is the transmission system capability that is set aside to provide OVEC flexibility to handle the shift in power flows on facilities caused by the maintenance of generation and transmission equipment, the forced outages of such equipment, and a wide range of other system variable conditions, such as construction delays, higher than expected customer demands, and generating fuel shortages.

4.2.2 Capacity Benefit Margin (CBM)

Capacity Benefit Margin is set to zero MW in determining OVEC ATC values.

4.2.3 Software used in Calculating Transfer Capabilities

OVEC uses industry accepted software from Siemens Power Technologies International (PSSE and MUST) to calculate transfer capabilities. OVEC also uses the PowerGem AFC-ATC Calculator (PAAC) program developed by Power Grid Engineering & Markets (PowerGEM). The PAAC program computes commercial AFC/ATC values for posting. The PAAC software also provides an Excel interface along with several custom Visual Basic functions such as universal sheet comparison, custom charting, and sorting.

4.2.4 Frequency of Updating Transfer Capabilities

Calculations of TTC and ATC are performed and updated daily on OVEC's OASIS. ATCs are updated more frequently than TTC, since ATC is updated as both firm and non-firm transmission service requests are granted on OASIS.

4.3 Calculations for an AFC value

The algorithm used by OVEC to calculate an initial AFC value for a flow gate is:

Initial AFC = Rating –Initial Power Flow

Where:

- *Rating = Appropriate rating for the season (summer or winter) and flow gate type (base case or contingency)*

- *Initial Power Flow = Power flow in the powerflow model for the selected period prior to the inclusion of incremental transactions impacts.*

4.4 Calculations for an ATC value

The algorithm used by OVEC to calculate an ATC value is:

ATC = Adjusted AFC / TDF

Where:

- *Adjusted AFC = Initial AFC – Transactions Impacts – TRM*

- *TDF = Transfer Distribution Factor applicable to the flow gate and direction of transfer for which the ATC value is desired.*

- *Transactions Impacts = The sum of the changes in flow on the flow gate in question resulting from all included incremental transactions*

A firm ATC value is calculated using the impacts of firm transactions only.

A non-firm ATC value is calculated using the impacts of both firm and non-firm transactions.

ATC values for the scheduling horizon are calculated using the impacts of scheduled transactions only.

ATC values for all other horizons are calculated using all transactions that have reservations whether or not they have been scheduled.

TRM is applied in calculating both firm and non-firm ATC values. The TRM value for each flow gate is 5% of its applicable rating.

4.5 OVEC ATC Calculation Process

A diagram of the OVEC ATC calculation process is provided in Exhibit 1 at the end of this attachment.

4.5.1 Calculation of ATC Components

The Total Transfer Capability value is mathematically defined as the lower of:

TTC = Firm ATC + ATC Path Transactions Included in Base Case (= network value),

Or: *TTC = Contract Path Total Interconnection Capability*

Where, *ATC Path Transactions = Transactions in the same transfer direction as ATC and TTC*

Total Interconnection Capability = Sum of Applicable ratings of physical interconnections between companies

The base case referred to in the first formula for TTC is a power flow program model representative of the state of the electrical system for the time period for which the TTC is being calculated. The databases used to develop the base case and the assumptions on load levels, generation dispatch, and modeling of planned and contingency outages used to conduct TTC assessments are discussed in section 4.5.3.

5.0 Calculations for the Scheduling Horizon

The algorithm used by OVEC to calculate an ATC value in the Scheduling Horizon (same day and real-time) is:

ATC = Adjusted AFC / TDF

Where, *Adjusted AFC = Initial AFC – Transactions Impacts – TRM*

TDF = Transfer Distribution Factor applicable to the flow gate and direction of transfer for which the ATC value is desired.

- *Transactions Impacts = The sum of the changes in flow on the flow gate in question resulting from all included incremental transactions*

ATC values for the scheduling horizon are calculated using the impacts of scheduled transactions only.

TRM is applicable to both firm and non-firm ATC values.

Firm ATC is not available during the Scheduling Horizon due to timing requirements in the Open Access Transmission Tariff (OATT).

6.0 Calculations for the Operating Horizon

The algorithm used by OVEC to calculate an ATC value in the Operating Horizon (day ahead and pre-scheduled) is:

ATC = Adjusted AFC / TDF

Where, *Adjusted AFC = Initial AFC – Transactions Impacts – TRM*

TDF = Transfer Distribution Factor applicable to the flow gate and direction of transfer for which the ATC value is desired.

- *Transactions Impacts = The sum of the changes in flow on the flow gate in question resulting from all included incremental transactions*

Firm ATC values are calculated using the impacts of firm transactions only.

Non-firm ATC values are calculated using the impacts of both firm and non-firm transactions.

ATC values for the Operating horizon are calculated using all transactions that have reservations whether or not they have been scheduled.

TRM is applicable to both firm and non-firm ATC values.

7.0 Calculations for the Planning Horizon

The algorithm used by OVEC to calculate an ATC value in the (beyond the Operating Horizon) is:

ATC = Adjusted AFC / TDF

Where, *Adjusted AFC = Initial AFC – Transactions Impacts – TRM*

TDF = Transfer Distribution Factor applicable to the flow gate and direction of transfer for which the ATC value is desired.

- *Transactions Impacts = The sum of the changes in flow on the flow gate in question resulting from all included incremental transactions*

A firm ATC value is calculated using the impacts of firm transactions only.

A non-firm ATC value is calculated using the impacts of both firm and non-firm transactions.

ATC values for the planning horizon are calculated using all transactions that have reservations whether or not they have been scheduled.

TRM is applicable to both firm and non-firm ATC values.

8.0 ATC Coordination

OVEC coordinates base case model development with interconnecting neighbors for reliability assessments and other studies. In the calculation of ATC these models are the starting point for determining the hourly, daily, weekly, and monthly ATC values.

OVEC uses the SDX (System Data Exchange) and OASIS (Open Access Sametime Information System) databases to exchange planned and forced transmission and generation outage information with neighboring transmission providers, along with projected load levels. The data is gathered from these databases every time the ATC program is run.

9.0 Link to ATC Algorithm

http://www.oatioasis.com/OVEC/OVECdocs/OVEC_OATT_Attachment_C.pdf

EXHIBIT 1

OVEC ATC CALCULATION PROCESS