3. Voltage Support Service

This section describes the voltage support service.

3.1. Description

In order to maintain transmission voltages on the NYS Transmission System within acceptable limits, generation facilities under the control of the ~~ISO~~NYISO are operated to produce (or absorb) reactive power. Thus, Reactive Supply and Voltage Control Service ("Voltage Support Service") must be provided to support all Transactions on the NYS Transmission System. The amount of Voltage Support Service that must be supplied will be determined based on the reactive power support necessary to maintain transmission voltages within limits that are generally accepted in the region and consistently adhered to by the ~~ISO~~NYISO.

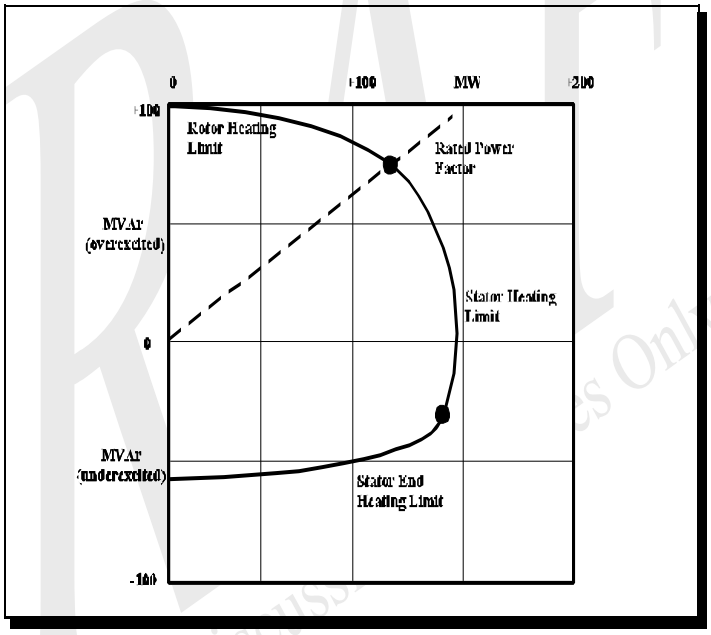

Figure 3.1: Generator MVAr versus MW Capability

Note to Reader

The generator's capability curve (D-curve) can "shrink" with heating and "expand" with cooling of the machine.

3.2. Responsibilities for Service

The NYISO directs the ~~Generating~~ Suppliers' Resources to operate within their tested reactive capability limits. The scheduling of voltage support service is the responsibility of the NYISO and Transmission Owners.

- ***NYISO*** — The NYISO coordinates the NYS Power System voltages throughout the NYCA.
- ***Transmission Owners*** — Transmission Owners are responsible for the local control of the reactive power resources that are connected to their network.
- ***Suppliers*** — To qualify for payments, Suppliers of voltage support service must provide a Resource that has an AVR and has successfully performed Reactive Power (MVAr) capability testing in accordance with the NYISO Procedures and prevailing industry standards. Suppliers are expected to operate their Resources within these demonstrated reactive capability limits. Voltage Support Service includes the ability to produce or absorb Reactive Power within the Resource's tested reactive capability range, and the ability to maintain a specific voltage level, as directed by the NYISO and the Transmission Owner System Operator, under both steady-state and post-contingency operating conditions subject to the limitations of the Resource's tested reactive capability.

3.3. Payment for Service

This section describes the payments for voltage support service and covers the following:

- Method for determining payment
- Payments made to suppliers of voltage support service

~~Payments for voltage support service by non-utility generators~~

- Payment for lost opportunity cost
- Payments made by transmission customers and LSEs

For more information, see *NYISO ~~Manual for~~ Accounting ~~&~~and Billing Manual*.

3.3.1. Method for Determining the Payments for Voltage Support Service

Payments to synchronous ~~G~~generators and synchronous condensers eligible for Voltage Support Service are based upon a fixed dollar amount per MVAr as specified in the NYISO Market Services Tariff Rate Schedule 2 and the net lagging MVAr capability as determined by annual capability testing performed by the generator and verified by the NYISO.

3.3.2. Payments made to Suppliers for Voltage Support Service

The rate provided in Rate Schedule 2 shall be used to calculate payments to all eligible Suppliers providing Voltage Support Service as applied on a Resource-specific basis. The NYISO shall calculate the payments on an annual basis as the product of the compensation rate specified in Rate Schedule 2 and the net lagging MVAr capability as demonstrated by actual test in the preceding calendar year. The NYISO shall~~, and~~ make payments to Suppliers on a monthly basis. Suppliers whose Resource(s) meet the requirements to supply Installed Capacity and are under contract to supply Installed Capacity receive one-twelfth the annual payment for Voltage Support Service ~~except as noted in Section 3.3.3 below with respect to Non-Utility Generators~~. Suppliers whose Generators are not under contract to supply Installed Capacity and Suppliers with synchronous condensers receive one-twelfth the annual payment pro-rated by the number of hours that Generator or synchronous condenser operated in that month, as recorded by the NYISO.

~~For Non-Utility Generators that are operating under existing power purchase agreements, the entity that is purchasing Energy and/or Capacity under such agreement or providing Transmission Service under that agreement is contacted by the NYISO when the NYISO requires Voltage Support Service from the contracted Resource. The NYISO pays holders of the contracts for such Resources, which are operating under existing power purchase agreements, the product of the annual $/MVAr rate for the NYISO and the MVAr capacity of the Non-Utility Generator as described in Section 3.3.3.~~

~~3.3.3. Payments for Voltage Support Service Provided by Non-Utility Generators with Existing Power Purchase Agreements~~

~~The NYISO pays each holder of a contract for a Non-Utility Generator operating under an existing power purchase agreement, which provides Voltage Support Service.~~

- ~~If that non-utility Generator provides installed capacity, the NYISO will pay it the product of: (1) one-twelfth of the annual $/MVAr rate for NYISO payments to Suppliers of Voltage Support Service and (2) the lesser of the tested Reactive Power production capability (MVAr) of the Non-Utility Generator or the contract MVAr capability.~~
- ~~If that non-utility Generator does not provide Installed Capacity, the NYISO will pay it the product of (1) and (2), as calculated above, multiplied by the number of hours in the month the Non-Utility Generator provided Voltage Support Service divided by the number of hours in the month.~~

~~The NYISO calculates and makes payments on a monthly basis.~~

~~3.3.4.~~3.3.3. Payments for Lost Opportunity Cost

A Supplier providing Voltage Support Service from a Generator that is In-Service is entitled to receive Lost Opportunity Costs (LOCs) in the event that the NYISO dispatches or directs the Generator to reduce its real power (MW) output in order to allow the unit to produce or absorb more reactive power (MVAr).

The method for calculating LOC is based on the following:

- Real-Time LBMP
- Original dispatch point
- New dispatch point
- Bid curve of Generation supplying Voltage Support Service

Figure 3.3.4 graphically portrays the calculation of the LOC for a Generator, which reduced its MW output to allow it to produce or absorb more reactive power (MVAr).

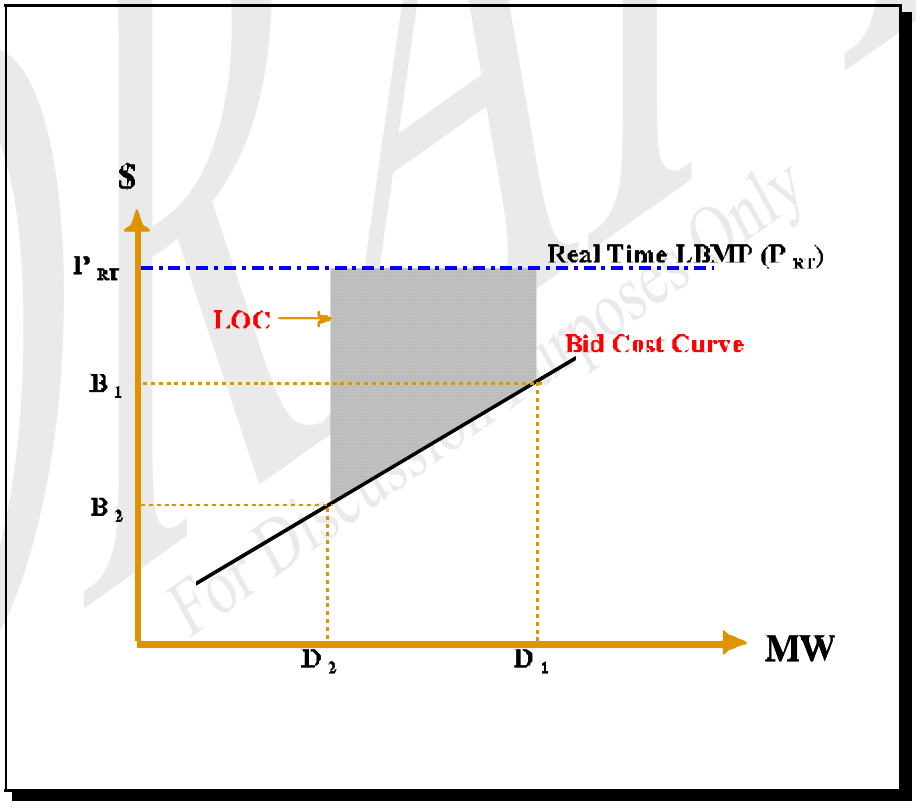

Figure 3.3.4: Method for Calculating LOC

$$LOC = P_{RT}\,(D_1 - D_2) - \int_{D_2}^{D_1} Bid$$

Where: P_{RT} = Real Time LBMP
D_1 = Original Dispatch Point
D_2 = New Dispatch Point
Bid = Bid curve for generation supplying voltage support services

~~3.3.5.~~3.3.4. Payments made by Transmission Customers and LSEs

Transmission Customers and Load Serving Entity (LSEs) taking service under the ~~ISO~~NYISO OATT pay the NYISO for Voltage Support Service associated with energy withdrawals from the transmission system in accordance with Rate Schedule No. 2 of the OATT. ~~The NYISO computes the Voltage Support Service Rate as follows:~~

- ~~The sum of the projected NYISO payments to Suppliers providing Voltage Support including:~~
  - ~~total annual costs eligible for payment.~~
  - ~~any applicable Lost Opportunity Costs to provide Voltage Support Service.~~
  - ~~total of prior year payments to Suppliers of Voltage Support Service less the total of payments received by the NYISO from Transmission Customers and LSEs in the prior year for Voltage Support Service (including all payments for penalties).~~
- ~~This sum is divided by annual forecasted transmission usage for the year as projected by the NYISO, including Load within the NYCA, Exports~~Exports, and Wheels Through.

~~Transmission Customers engaging in Wheels Through or Exports pay to the NYISO a charge for this service equal to the rate as determined above multiplied by their Energy wheeled in the hour. Load Serving Entities serving loads in the NYCA pay to the NYISO a charge for this service equal to the hourly rate as determined above multiplied by the Energy withdrawn from the transmission system in order to serve that LSEs Load in the hour.~~

~~The NYISO calculates the payment hourly and bills each Transmission Customer or LSE monthly.~~

3.4. Failure to Perform by Suppliers

A resource will have failed to provide voltage support if it:

1) fails at the end of 10 minutes to be within 5% (+/-) of the requested reactive power (VArs) level of production or absorption as requested by the NYISO or applicable Transmission Owners for levels below the resource's demonstrated reactive power capability at Dependable Maximum Net Capability (DMNC).

2) fails at the end of 10 minutes to be at 95% or greater of the resource's demonstrated reactive power capability (tested at its Normal Operating Limit or at 90% of its DMNC, whichever is greater in MW) in the appropriate lead or lag direction when requested to go to maximum lead or lag reactive capability by the NYISO or applicable Transmission Owner.

3) fails to automatically respond, following a system contingency, to produce (or absorb) the reactive power required in accordance with published NYISO (or Transmission Owner) system operating studies.

4) fails to maintain the automatic voltage regulator (AVR) in service and in automatic voltage control mode, or fails to make timely repairs to the AVR.

Any resource that fails to provide voltage support when it is being paid to provide voltage support will be penalized in accordance with Sections 3.4.1 ~~and~~ through 3.4.~~2~~3.

3.4.1. Failure to Respond to NYISO's Request for Steady State Voltage Control

a) An installed capacity ~~provider~~supplier of voltage support that fails to provide steady-state voltage support on a given day will forfeit 1/12th of the annual payment that resource would have received for providing voltage support, and must reimburse the ~~ISO~~NYISO for any lost opportunity costs paid to replacement sources of steady-state voltage support.

b) A non-installed capacity ~~provider~~supplier of voltage support that fails to provide steady-state voltage support on a given day will forfeit the voltage support payment received by that resource in the last month in which that payment was positive (as a proxy for 1/12th of the annual payment that resource would have received for providing voltage support), and must reimburse the ~~ISO~~NYISO for any lost opportunity costs paid to replacement sources of steady-state voltage support.

c) A ~~provider~~Resource will be disqualified as a ~~provider~~supplier of voltage support after it fails to provide steady-state voltage support on three separate days within a 30-day period.

Reinstatement of Payments

The NYISO may reinstate payments once the Supplier complies with the following conditions to the NYISO's satisfaction:

- the Supplier's Resource must successfully perform a Reactive Power (MVAr) capability test, and
- the Resource must provide Voltage Support Service for 30 consecutive days without any compliance failures. No payments for Voltage Support Service or LOC are made to the Supplier during this period.

3.4.2. Failure to Provide Voltage Support Service when a Contingency Occurs on the NYS Power System

a) An installed capacity ~~provider~~supplier of voltage support that fails to provide voltage support following a contingency on a given day will forfeit 1/12th of the annual payment that resource would have received for providing voltage support on the first such occurrence, and 1/4th of the annual payment that resource would have received for providing voltage support on the second such occurrence. Generators that fail to provide voltage support following contingencies will not be charged lost opportunity costs for replacement sources of voltage support because there will not be enough time to arrange for replacement sources.

b) A non-installed capacity ~~provider~~supplier of voltage support that fails to provide voltage support following a contingency on a given day will forfeit the voltage support payment received by that resource in the last month in which that payment was positive (as a proxy for 1/12th of the annual payment that resource would have received for providing voltage support) on the first occurrence. Additionally, it will forfeit the payment received by that resource in the last three months in which those payments were positive (as a proxy for 1/4th of the annual payment that resource would have received for providing voltage support) for the second failure.

c) A ~~provider~~Resource will be disqualified as a ~~provider~~supplier of voltage support after it fails to
provide voltage support following a contingency on two separate occasions within a 30-day period.

Reinstatement of Payments

In addition, the Supplier that is in violation is prohibited from receiving Voltage Support Service payments for the non-complying Resource until the Supplier complies with the following conditions to the NYISO's satisfaction:

- the Supplier's Resource successfully performs a Reactive Power (MVAr) capability test, and

- the Resource provides Voltage Support Service for 30 consecutive days without any compliance failures. No payments for Voltage Support Service or LOC are made to the Supplier during this period.

3.4.3. Failure to Maintain Automatic Voltage Regulator In Service

a) A Resource will be disqualified as a supplier of voltage support after it fails to maintain the automatic voltage regulator in operation, or fails to make timely repairs following a failure of the automatic voltage regulator within a 30-day period.

Reinstatement of Payments

The Supplier will not receive Voltage Support Service payments for the disqualified Resource until the Supplier complies with the following conditions to the NYISO's satisfaction:

- the Supplier provides documentation to the NYISO of the completion of the repairs,
- the Supplier's Resource successfully performs a Reactive Power (MVAr) capability test, and
- the Resource provides Voltage Support Service for 30 consecutive days without any compliance failures. No payments for Voltage Support Service or LOC are made to the Supplier during this period.

3.5. Generator Reactive Capability Testing

The purpose for capability testing is to establish a uniform procedure of determining, confirming, and documenting the reactive capability of resources ~~generators used~~ for real-time system voltage control, and provides the basis for compensation to suppliers of voltage support service. This procedure provides the NYISO with accurate and timely information on the reactive capability of the generating units.

Units to be Tested

All resources that ~~are used for~~participate in the ~~v~~Voltage ~~s~~Support ~~s~~Service must be tested in accordance with this procedure. All tests will be coordinated ~~by~~with the ~~ISO~~NYISO and the

Transmission Owner in whose service territory the unit is located. Test data reports must be submitted electronically within five (5) business days of the test to the NYISO for review and, upon ~~for any unit will be~~ acceptance~~d and~~ will be incorporated into the appropriate databases.

Definitions

Lagging MVAr — Reactive power that is generated out of a generator and into the power system. By convention, lagging MVAr is a positive (+) number.

Leading MVAr — Reactive power that is absorbed by a generator out of the power system. By convention, leading MVAr is a negative (-) number.

3.5.1. Frequency of Testing

Each synchronous generator and synchronous condenser providing ~~this~~ voltage support service must be tested at least once each calendar year to demonstrate maximum lagging and leading MVAr capability. *The demonstrated Net Lagging MVAr capability will be the basis for compensation in the next compensation (calendar) year.*

Lagging MVAr and Leading MVAr capability testing must be performed ~~can be demonstrated any time during the year while lagging MVAr capability can be tested~~ only during the ~~peak~~ Summer ~~load~~ capability period (May 1 through October 31, inclusive) ~~of the year for the Transmission District where that resource is located. More frequent tests may be performed by the Suppliers~~. Failure to perform required testing will result in the ~~forfeiture of the voltage support payments~~disqualification of the unit(s) in the next compensation year.

3.5.2. Test Procedure for Generators

Each Supplier has the responsibility to ~~conduct~~ perform and report reactive capability testing on its respective units. The tests are to be carried out under normal operating conditions. Extreme measures are not to be taken to avoid overstating a unit's normally expected reactive capability. Both leading and lagging MVAr are to be measured at the generator terminals (gross) and at the point of interconnection (net). Measurements should be made with the unit operating with normal hydrogen pressure (or other normal coolant conditions). The Transmission ~~Provider~~ Owner System Operator is responsible for coordinating the test with the respective plant. Each Transmission ~~Provider~~ Owner System Operator notifies the NYISO at least one hour prior to the initiation of generator MVAr testing. The NYISO in turn notifies ~~all~~ any other affected Transmission ~~Providers~~Owners.

Annual Tests

It is the responsibility of the supplier to submit appropriate bids in the NYISO Day-Ahead Market such that the unit will be operating at the appropriate MW level for all tests. The

Lagging MVAr test should be performed during the on-peak period of the load cycle, and the Leading MVAr test should be performed during the off-peak period of the load cycle.

To test maximum lagging MVAr capability, the unit being tested must be operated at, or above 90% of its Demonstrated Maximum Net ~~normal~~ MW ~~Operating~~ Capability (DMNC). The unit is then moved to maximum lagging MVAr and held at this point for a minimum of one hour.

To test maximum leading MVArR capability, the unit being tested is operated at its normal MW low limit. The unit is moved to maximum leading MVAr and held at this point for a minimum of one hour.

For Nuclear units and units with normal MW low limits equal to normal MW operating capability, both leading and lagging MVAr capability are tested with the unit operating at its normal MW operating capability. Maximum lagging and leading MVAr test points are held for a minimum of one hour each.

Test Results

Attachment B shows the form that is used to document the test results that are submitted by the Supplier to the NYISO within five (5) business days after the test. The test report shall include the supporting performance data, and must be submitted electronically If the lagging and leading MVAr capability tests are performed on different dates, then the results can be
submitted separately.

3.5.3. Test Procedure for Synchronous Condensers

Each synchronous condenser providing this service will be required to demonstrate the maximum leading and lagging MVAr capability it can maintain for one hour.

3.6. Voltage Support

The following procedures apply to voltage support service.

3.6.1. Request for Voltage Support Service

The NYISO may request corrective actions from voltage support facilities that are already in service and available. The procedures for Real-Time voltage control are covered in the *NYISO Manuals for Emergency Operations* and *Transmission & Dispatching Operations*.

3.6.2. Automatic Voltage Regulator Availability

Supplier Actions

The supplier must perform the following:

1) The Automatic Voltage Regulator (AVR) shall be maintained in service in automatic voltage regulation mode at all times, unless instructed otherwise by the NYISO or the Transmission Owner System Operator.

~~1~~2) Provide immediate notification to the NYISO whenever its AVR is forced out of service or prior to removal from service for maintenance.

~~2~~3) Notify the NYISO of the estimated time for completion of needed AVR repairs or scheduled maintenance.