NEW YORK INDEPENDENT SYSTEM OPERATOR

REVENUE METERING REQUIREMENTS MANUAL (REDLINE VERSION)

9-10-2004

Revenue Meter Requirements Manual

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Revision	Date	Changes
1.0	**xx/xx/xx**	Initial release

1. Overview

This manual focuses on the revenue metering systems required for accurate settlement of the NYISO markets.

Reference for this document is the Guide for Uniform Practices in Revenue Quality Metering approved by the New York State Electric Meter Engineers' Committee, August 20, 2003.

- ~~***Metering Policy and Certification*** — Metering Requirements are detailed as well as testing and coordination.~~

1.1. Background

This document applies to all metering systems and equipment that is used for NYISO system operation and billing. The requirements of this document are applicable to all metering systems and equipment whose data are used for NYISO system operation and billing. Concerning the November 1999 NYISO online date, to allow for timely and economical implementation of the NYISO Market, existing metering currently in operation for the NYISO (formerly NYPP), TO's, Eligible Customers and other applicable Participants, although not conforming to these requirements, need not be upgraded until such time the need for upgrade or replacement is demonstrated to be operationally and economically required, or if required by the NYISO or TO Tariff.

~~Analog metering transmits selected line megawatt flows, generator megawatts, and bus voltages directly from the source to the New York Independent System Operator (NYISO). Primary transducers are installed in the stations and are connected to current and voltage transformers. The output of the transducer is input to the telemetering systems. The telemetering equipment is connected via a leased telephone line to the NYISO where telemetering receivers are installed.~~

~~Digital data is transmitted to the NYISO via computer-to-computer data links and the Transmission Owners (TO) computer. The above link is established using redundant leased telephone data lines or a frame relay network. Digital data expands the NYISO database to include all major transmission MW and MVAR flows, generator MWs and MVARs, tie line MWs, MVARS and MWHRS; substation breaker status, frequency, and voltage.~~

~~Digital Data is used as the primary source with Analog Data as its back up. Final settlement is based on available revenue quality metering data.~~

1.2. Terminology

The following terms are an integral part of this manual:

- ***Data Problem*** — Where the quality of a data item, either telemetered or obtained by other means at a DC, is poor enough to affect the operation of the power system and the cause of such poor quality has been traced to computer programming, communications limitations, computer equipment configuration or field metering equipment.
- ***Data Quality*** — The measure of the reliability and accuracy of a data item transmitted to the NYISO.

- ***Metering Authority*** — The designated entity responsible for the meter(s) accuracy and transmission of meter data in accord with NYISO meter standards, tariff, and/or TO contract agreements.
- ***Metering and Data Accuracy Analysis*** — Method of monitoring the quality of NYISO Data and the procedure of communications between parties and NYISO Staff can be found in Section 3.5.
- ***Metering Problem —*** Where the quality of an item of telemetered data is poor enough to affect the accuracy of accounting settlements and the cause of such poor quality has been traced to metering equipment installed.
- ***Revenue Quality Real Time Metering*** — An accurate metering system that satisfies ANSI C12 requirements for electrical energy billing purposes; approved for use by both the TO and the New York State (NYS) Public Service Commission (PSC) and is capable of providing instantaneous and/or stored energy readings.
- ***Sub-Zone*** — Subregion of a New York Control Area locational-based marginal pricing zone controlled by a single transmission owner. Subzones are defined and metered to allow allocation of energy to load.

2. Metering Equipment Standards and Specifications

The purpose of this section is to provide specifications for revenue metering system equipment.

2.1. Specification References

Specifications for metering equipment and functionality can be found in the following documents:

1. Applicable standards published by the Transmission Owner (TO) of the facilities in which the Eligible Customer is attached to the NYS Power System, and that are obtainable through the Transmission Owner.

2. NYISO Guidelines for the Installation, Operation, and Maintenance of Data Acquisition Equipment presented in Section 3.2.

3. New York State Electric Meter Engineers' Committee Guide for Uniform Practices in Inter-Utility Metering.

2.2. Metering Specifications

The following is the design for new equipment that will meet the requirements of minimal error necessary to affect efficient computer operation at both the TOs and the NYISO. For detailed specifications on meters, Transducers, Voltage Transformers (VTs), and Current Transformers (CTs) see the New York State Electric Meter Engineers' Committee Guide for Uniform Practices in Inter-Utility Metering.

1. ***Data Transmission to NYISO*** — Digital data transmission with a maximum error of more than 0.1percent of reading, or as current technology permits, is the preferred means from the remote terminal for both Analog and Digital Data telemetry. However, where analog data transmission must be used, the system shall have a combined error of less than 1.0percent of full scale reading, or current technology accuracies, end-to-end for the telemetering oscillator and converter. End-to-end is defined as including all equipment from the input terminals of the telemetering oscillator to the output ends of the telemetry converter.

2. ***General Specifications***

   a. Metering and data transmission equipment shall be powered by the station DC bus or an uninterruptible power supply, with sufficient capability to support the metering for a minimum of eight (8) hours.

   b. Multiple parameters measured at generating plants or critical transmission stations (KW, KWH, etc.), shall be from the same CTs, VTs, and transducers so that data used at the plant, the operating headquarters, and the NYISO are common. Analog metering shall have the same data quality as Digital metering.

   c. Metering connection drawings, schematics, and documentation shall be maintained by the Metering Authority in conformance with the New York State Electric Meter Engineers' Committee Guide for Uniform Practices in Revenue Quality Metering.

3. Guidelines for the Installation, Calibration and Maintenance of Revenue Metering Systems

This guideline provides metering standards for any participant of the NYISO, including generation companies, transmission owners (TO), and load serving entities (LSEs). The NYISO requires accurate metering from all of its participants to ensure the accurate settlement of its economic markets. These standards provide guidelines for the installation and maintenance of all equipment utilized for recording and reporting of electrical generation, transmission, station power consumption, and other energy data to enable the NYISO to settle electric accounts timely and accurately.

The standards stated in this section are "minimum standards" and do not supersede other agreements. In cases where standards differ, the most restrictive criteria shall be used.

3.1. Responsibilities

Each Participant, not a retail customer, is responsible for the cost assumed with purchase, installation, and appropriate maintenance of meters, wiring, communications equipment, and all components essential to their accurate and reliable operation. This includes spare equipment, if applicable, in accordance with the requirements of the NYISO and the appropriate TO.

All metering shall be calibrated within the guidelines of this manual and in accordance with the TO requirements. Maintenance and calibration shall be performed by the metering authority or its designated representative, who will maintain control over the equipment in accordance with New York State (NYS) Public Service Commission (PSC) rules and regulations as stated in section 3.2.3.

3.2. Installation

Generation meters will be compensated to the high side of the Generator Step-Up Transformer (GSU). Subzonal TIE lines will be compensated to the appropriate boundary point between sub-zones.

Revenue metering system installations ~~for use in revenue metering system~~ must ensure accurate~~ly~~ measurement of energy while minimizing the influence of voltage variation, power factor, burden, temperature, frequency, and harmonics. Instrument transformers used must be suitable for use in revenue metering systems and shall comply with the minimum acceptable accuracy standards listed in the Guide for Uniform Practices in Revenue Quality Metering.

TOs may require the Eligible Customer install an approved remote terminal unit (RTU) or analog telemetry equipment for the accurate and economical transmission of their data to the TO.

3.2.1. Calibration and Maintenance

Periodic calibration of existing metering installations must be made to achieve performance, as defined in the Guide for Uniform Practices in Revenue Quality Metering. All revenue metering data supplied for final balancing and billing purposes must be based on energy measurements made with instruments that are traceable to the National Institute of Standards and Technology (NIST) and approved for billing purposes within NYS. If existing metering systems are not compliant with the Guide for Uniform Practices in Revenue Quality Metering, the metering systems should be calibrated to meet the following standards:

1. ***Calibration Interval*** — Calibration of equipment shall be performed in accordance with manufacturer's recommended intervals and procedures. Where a manufacturer does not provide calibration interval recommendations, the interval should be based on equipment stability as demonstrated by historic data. In no case should the calibration interval exceed two years.

2. ***Test Range Increments*** — Checks shall be made in 20percent increments for Transducers from zero to 100percent, inclusive, of rated input, or as specified by the manufacturer if more stringent. Test range increments for revenue grade metering devices shall reflect those specified in ANSI C12.1 - American National Standard Code for Electricity Metering.

3. Maximum Errors — Transducer error shall not exceed 0.25percent of full scale or manufacturer's specifications, whichever is less. Errors exceeding the above, after calibration, indicate the transducer should be replaced or returned for repair and recalibration. If replacement is required, a new state-of-the-art transducer shall be used.

   If Digital Telemetry error is found to be more than 0.1percent ± the least significant bit outside the manufacturer's specifications, whichever is less, the cause shall be determined and the error reduced to specifications.

   If analog telemetry is found to be outside accuracy specifications, the cause shall be determined and the error corrected to specifications. The error should not exceed ± 0.1percent of reading or as current technology permits.

4. ***Overall Tests*** — Each data point shall be calibrated from source (transducer) to NYISO in 20percent increments from zero to 100percent of rated input. Using a calibrated power supply input to the transducer, the final NYISO reading shall not exceed ±0.25percent.

   Where the same data is telemetered in both analog and digital forms, the calibration shall be performed at the same time and the data received at the NYISO must be within the ±1percent range of each other. The comparison shall be performed using actual live data.

5. ***Test Equipment*** — All test equipment shall be traceable to the NIST. Test equipment shall conform to the requirements of Section 4.3. Calibration intervals shall be in accordance with manufacturer recommendations.

6. ***Maintenance*** — If periodic maintenance or failures indicate poor reliability, the equipment shall be replaced. If errors exist, the defective component shall be isolated and remedial action taken.

4. NYISO Revenue Data Requirements

This section provides information and background on MWHr revenue meter data requirements and, analog and digital telemetry data requirements to support settlements.

~~The following guidelines shall be used for the determination of NYISO minimum data requirements resulting from changes being made to the NYS Power System. They are intended to cover the normal requirement but may be superseded by special situations.~~

4.1. Revenue Metering Data

All revenue metering data supplied for final balancing and billing purposes must be based on energy measurements made with instruments that are traceable to the National Institute of Standards and Technology (NIST), meet the specifications of the Guide for Uniform Practices in Revenue Quality Metering, and are approved for billing purposes within New York State (NYS). The use of Supervisory Control and Data Acquisition (SCADA) data for settlement will be precluded if revenue grade data is available. In the event revenue quality metering data is not available for a final settlement, the NYISO will consult with ALL affected parties and at that time it will be determined the best data to be used in the settlement.

Revenue metering systems will be required:

1. MWhr are required on inter-NYCA ties, intra-NYCA ties and subzonal ties.
2. MWhr are required on all generators above 1 MW. Non-dispatchable generation may be provided in the form of plant total or group total dependent on how the owner intends to bid the generation. MWhrs will be measured on the high side of the Generation Step-up Transformer (GSU).

4.2. Digital Telemetering

Digital telemetry is used for settlement processes such as the determination of generation and load profiles for each real-time dispatch.~~data is presently obtained by the NYISO computer via the data links between the Transmission Owner's (TO's) computer and the NYISO computer. Therefore, only data available in the TO's computer can be obtained by this method. Required data that is not available in the TO's computer should be provided as soon as practical. The NYISO Operations Staff will designate the required data.~~

Digital telemetering will be required:

1. MW, MVAR, and MWh are required on inter-NYCA ties, intra-NYCA ties and subzonal ties.
2. MW are required on all generators above 1 MW. Non-Dispatchable generation may be provided in the form of plant total or group total dependent on how owner intends to bid generation. MWs will be measured on the high side of the Generation Step-up Transformer (GSU).
3. MVAR will be required on designated generators. If generator MW is provided in the form of plant total or group total, as allowed in item 4, then MVAR output may be provided in that form.

4. MVAR will be required on designated synchronous condensers, generators that can be operated as synchronous condensers, and Static Vars Compensators (SVCs).

Ancillary Service suppliers shall provide metering as determined by the NYISO to meet all appropriate service performance tracking requirements.

4.3. Analog Telemetering

Analog Telemetering may be used as a back-up source of data required for settlement of the NYISO markets. ~~provided to enable the NYISO to coordinate operation of the NYS Power System when the NYISO computer system is out of service or when any of the computer-to-computer data links between the NYISO and TOs is not functioning.~~

Analog telemetering will be required:

a. On each interconnection to adjacent areas outside the New York Control Area (NYCA). These should be from the billing meter end to the NYISO independent of the TO.

b. On all circuits that are part of an internal NYISO interface for which transfer limits are observed, from one end to the NYISO independent of the TO .

c. For generation at units 500 MW and above or complexes where the total generation is 500 MW or above where loss of the complex is determined by the NYISO Staff to have a significant impact on NYS Power System security. Generator MW readings may be obtained from the TO s, but should be independent of the TO's computer.

d. For TO total area net generation which may be computed by the TO's computer, but should be independent of the TO to the NYISO computer data link.

~~Voltage telemetering shall be required on busses 230 kV and above when the need is indicated by a review of transmission configuration changes or operating practices.~~

~~Frequency telemetering shall be required when the need is indicated by a review of transmission configuration or operating practices.~~

4.4. Data Quality Indication

Data quality is an indication of the currency of the MW, MWh, MVAR, voltage, and frequency telemetry values exchanged among the Market Participants and the NYISO. Each value must be accompanied by a data quality flag. When the flag is set to true, the corresponding value is not being updated by its source. When set to false (the expected or “normal” state), the value is considered valid and represents the real-time condition of the value to the best ability of the source. Only the source of the value may set the quality indication.

Invalid (flag = false) data may be handled at its source by substitution (by an operator) of a manually entered value or by switching to a back-up source. At the NYISO, such data failures may be handled with manual substitution or by the substitution of analog data. Where analog back-up exists, the quality bit controls its automatic substitution. If a TO dispatcher replaces a failed value or switches to an alternate source, then the corresponding quality bit should be restored to normal since the condition is considered managed.

4.5. Data Processing

All metering systems whose data is used for settlement of NYISO markets must have a designated Meter Authority. The Metering Authority will provide instantaneous and stored metered data which meets the NYISO (and Transmission Owner) requirements to the NYISO and applicable TO.

Any Load that is not metered on an hourly or instantaneous basis will have its Load determined by the TO in whose Load Subzone they are located, until such time the Meter Point is upgraded and in compliance with this document.

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For any existing customer who is obtaining their full power requirement from a single TO, other than from the TO in who's load area the customer is located, the TO supplying the generation to this customer will provide 24 hourly intervals of load profile data, for this customer, transmitted once per day to the NYISO and the other appropriate TO.

All Meter Authorities that report data for Sub-Zonal Ties and Generators used in the calculation of the NYISO market settlements shall also include hourly load profile data. These values are used for NYISO Invoicing.

Revenue metering data should be submitted the ISO by the next business day.

~~All Revenue Meter points for Subzonal Ties and Generators must also have backup data for the Revenue grade metering. Although revenue quality metering is not required, the TO must be able to use metering for revenue purposes.~~

~~Except as provided in the preceding paragraphs, all metering systems for customers must meet the requirements of the NYISO and of the Transmission Owner of the facilities in which they attach to the NYS Power System.~~

~~All metering systems will adhere to the document entitled "NYISO Guidelines for the Installation, Operation, and Maintenance of Revenue Meter Systems" (Section 3.2), and to the document entitled, "New York Electric Meter Engineers' Committee Guide for Uniform Practices in Revenue Quality Metering."~~

~~Ancillary Service suppliers shall provide metering as determined by the NYISO to meet all appropriate service performance tracking requirements.~~

~~The TO may require the Eligible Customer install an approved remote terminal unit (RTU) or analog telemetry equipment for the accurate and economical transmission of their data to the TO.~~

~~Metering for use in revenue metering system must accurately measure energy while minimizing the influence of voltage variation, power factor, burden, temperature, frequency, and harmonics. Instrument transformers must be suitable for use in revenue metering systems and shall comply with the minimum acceptable accuracy standards listed in Appendix.~~

4.6. Metering Improvement Priorities

The various data types transmitted to NYISO shall be prioritized based on electric system costs, flow limits, operating limits, and security considerations. These priorities shall determine the basis on which metering replacements and improvements are to be completed. The priority classes are as follows:

1. Subzonal TIEs Transmission Lines Megawatts/MWHRs Inter-NYCA Transmission Lines Megawatts and Megavars
2. Generator Megawatts/MWHRs and Megavars
3. Transmission Lines Megawatts and Megavars

The priorities for metering improvements for use by the SCADA system should also be taken into account, and can be found in the NYISO's Control Center Requirements Manual.

5. Data Analysis and Data Problem Resolution

This section provides procedures on monitoring the quality of NYISO data so that problems can be analyzed, and communications between the NYISO staff and Participants, which facilitate addressing and resolving data and metering problems. It also provides a procedure for resolving disputes resulting from data errors and guidelines for auditing the accuracy of a disputed meter.

5.1. Metering and Data Accuracy Analysis

The purpose of this section is to outline the process for analyzing, reporting and resolving data problems.

5.1.1. Responsibilities

1. The NYISO Staff is responsible for analyzing all metering and data accuracy anomalies as reported to them by NYISO Staff or Participants staff.

2. The Metering Task Force (MTF) of the Billing and Accounting Working Group (BAWG) is responsible for maintaining a liaison between the NYISO and Participants staffs for problem analysis and resolution. Additionally, all metering problems that cannot be satisfactorily resolved at the NYISO staff level will become the responsibility of MTF.

5.1.2. Procedure

If the NYISO Staff, or the Participants MTF representative, determines that a potential metering or data problem exists, an investigation into the cause of the problem will be initiated. In the case of a Participant initiated investigation, contact will be made through a designated NYISO Staff representative who will coordinate problem analysis with the MTF.

The Meter Authority representative receiving the request must respond by the next working day supplying the following information:

a. Probable cause of the data or metering problem;

b. Proposed resolution and expected time to implement.

c. If the proposed resolution and time for implementation are not acceptable to affected parties, the Dispute Resolution process may be used (see section 5.3).

5.1.3. Reporting

A report will be issued semi-annually by the NYISO Staff, to the MTF and will be posted on the NYISO website. The report shall include:

a. A summary of problems and resolutions during the report period, and

b. Details of unresolved problems.

5.2. Loss of Metering Data

If data is lost due to a meter or communications failure, the Meter Authority will use the best available information (e.g. logs, schedules, combinations of other meter readings, etc.) to fill in values for data lost. If the data transmission is delayed due to a telemetry failure, the Meter Authority will make its reasonable effort to transmit the data using some electronic means acceptable to the NYISO billing staff. All failed telemetry, metering, and communications equipment will be rendered operable in the shortest practical time and calibration compliance must be reported to the TO and the NYISO. In all cases, NYS PSC rules will be enforced.

5.3. Procedures for Dispute Resolution of Data Issues

If after an analysis of metering and data accuracy per section 5.2 of this manual, an entity (any Market Participant) is suspected of manipulating metering or metering data or it has been determined an entity has exhibited continued negligence in performing required duties or submitting required data, all details will be turned over to the NYISO Market Monitoring Unit for further investigation. A response from the NYISO to the complainant should be available to all affected Market Participants within 30 days of receipt. In all cases, relevant NYS PSC rules will be enforced.

5.4. Audits

Beyond any NYS PSC rules, each metering system will be subject to periodic testing and inspection by the NYISO, TO, and/or Market Participant at the request of either party. If any inspection request is initiated, other than periodical routine testing, the nature and magnitude of the suspected accuracy problem must be stated. If after inspection it is determined that the suspected metering is within specifications, the requestor will be responsible for testing expenses incurred.

The NYISO will maintain documentation for all test and calibration records. If it is determined that the suspected metering equipment is not within specifications, the Meter Authority will submit an action plan addressing the situation to the NYISO.

Additional material

~~The operating practices presented herein include:~~

- ~~Meter Certification for Participants of the NYISO~~
- ~~NYISO Guidelines for The Installation, Operation and Maintenance of Data Acquisition Equipment~~
- ~~New York State Electric Meter Engineer Committee Guide for Uniform Practice in Revenue Quality Metering~~
- ~~Metering and Data Accuracy Analysis~~
- ~~Data Requirements Coordination~~

~~3.1.3 Revenue Metering Data~~

~~Revenue metering data should be submitted the ISO by the next business day.~~

Figure 1.1.1-1 Add Figure or Table here