



UG 09

Wind and Solar Plant Operator Data User's Guide

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Revision History

Version	Effective Date	Revisions
1.0	7/18/2008	Initial Release
1.1	06/30/2010	<p>Global</p> <ul style="list-style-type: none"> ➤ Revised external-document links to explicitly cite URLs from which documents may be accessed. ➤ Changed the term <i>meteorological</i> to <i>real-time</i> throughout. <p>Section 1</p> <ul style="list-style-type: none"> ➤ Generalized the terminology in the overview section to make it applicable to all data requirements described in this guide. <p>Section 1.1</p> <ul style="list-style-type: none"> ➤ Added definition for <i>Maximum Available Megawatts</i>. <p>Section 2</p> <ul style="list-style-type: none"> ➤ Added cut-in/cut-out/cut-back-in static data requirements and clarified expectations for keeping information up to date with the NYISO. <p>Section 3.3.1</p> <ul style="list-style-type: none"> ➤ Added column designating measurement type to table on Units and Precision. ➤ Added criteria for Maximum Available Megawatts to table on Units and Precision. <p>Section 3.3.2</p> <ul style="list-style-type: none"> ➤ Updated requirement for collection points to ensure that no turbine is more than 5km from a collection point. <p>Section 3.3.3</p> <ul style="list-style-type: none"> ➤ Updated data transfer frequency from once every 5, 10, or 15 minutes to once every 30 seconds. <p>Section 4</p> <ul style="list-style-type: none"> ➤ Changed title to from <i>Plant Outages/Availability</i> to <i>Plant Outages/Plant Availability</i>. <p>Section 6</p> <ul style="list-style-type: none"> ➤ Removed language that was redundant to the tariff, and instead refer the reader to the appropriate section of the tariff. <p>Appendix A</p> <ul style="list-style-type: none"> ➤ Revised to reflect that NYISO and its forecast vendor each host an instance of the SendWindData Message Web service and that wind forecast data must be sent to both the NYISO and its forecast vendor. ➤ Updated Figure A-1, SendWindData Message Elements. ➤ Added information for MaxAvailableMW to Table A-1, SendWindData Message Element Descriptions. ➤ Added section A.2.1, NYISO-Hosted Instance of Send Wind Data Message Web Service.

		<ul style="list-style-type: none"> ➤ Added section A.2.2, NYISO Forecast Vendor-Hosted Instance of Send Wind Data Message Web Service. ➤ Revised section A.3, WSDL. ➤ Removed Section A.4, Message Formats - XSD, since the XSD can be retrieved via the WSDL.
1.2	06/01/2012	Section 4 - Replace with new TOA process
1.3	07/10/2013	Section 4 <ul style="list-style-type: none"> ➤ Updated section to indicate the thresholds above which the reporting requirement applies.
2.0	02/25/2015	Section 3.3.3 <ul style="list-style-type: none"> ➤ Updated to reflect current practice allowing for an optional submittal of meteorological data to AWS
2.1	06/23/2016	Section A.2.1 <ul style="list-style-type: none"> ➤ Updated to clarify that digital certificates will no longer be NYISO issued and must be NAESB compliant
2.2	09/12/2016	Appendix A <ul style="list-style-type: none"> ➤ Updated to reflect current process of having the Wind Plant Operators send real-time data only to the NYISO ➤ Removed requirement for sending real-time data to the NYISO forecast vendor ➤ Revised Section A.1.1, Removed reference to the NYISO forecast vendor's hosted SendWind Data message web service ➤ Revised section A.1.2.1, removed language referring to the NYISO forecast vendor's hosted SendWind Data message web service and requirement of having the Wind Plant Operators send real-time data to the NYISO forecast vendor ➤ Removed section A.2.2, NYISO Forecast Vendor-Hosted Instance of Send Wind Data Message Web Service ➤ Integrated section A.2.1 into section A.2 ➤ Revised section A.3, removed language referring to the WSDL details for the NYISO forecast vendor's hosted service
3.0	07/16/2018	Various updates throughout to include Solar data requirements Appendix A <ul style="list-style-type: none"> ➤ Modified section to reflect solar irradiance element added to MetType.
3.1	08/10/2020	Recertification Global <ul style="list-style-type: none"> ➤ Updated hyperlinks ➤ Updated branding & formatting Section 6 <ul style="list-style-type: none"> ➤ Corrected NYISO Service Tariff reference from Article 5.8a to Section 5.8.1.

3.2	10/14/2022	<p>Recertified</p> <p>Section 1</p> <ul style="list-style-type: none"> ➤ Added clarifying note that small Solar Plants (≤ 20 MW) are exempt from reporting meteorological data <p>Section 3.3.1</p> <ul style="list-style-type: none"> ➤ Added azimuth and tilt angle requirements for Solar Plants with tracking systems <p>Section 3.3.2</p> <ul style="list-style-type: none"> ➤ Added requirement related to the provision of azimuth and tilt angle pairs <p>Appendix A.1.1</p> <ul style="list-style-type: none"> ➤ Added azimuth and tilt message elements to Figures 1 and 2
4.0	04/16/2024	<p>Section 1</p> <ul style="list-style-type: none"> ➤ Added clarifying note that the requirements to provide static data, meteorological data, maximum availability, and outage information applies to IPRs participating in the NYISO markets either stand-alone or as part of a homogeneous Aggregation. <p>Section 2.1</p> <ul style="list-style-type: none"> ➤ Added this section to describe the required Wind Plant static data. <p>Section 2.2</p> <ul style="list-style-type: none"> ➤ Added this section to describe the required Solar Plant static data. <p>Section 3.4</p> <ul style="list-style-type: none"> ➤ Added statement to indicate that data exchange can be accomplished via a Web service or an ICCP interface. <p>Appendix A.5</p> <ul style="list-style-type: none"> ➤ Added this section to describe the data exchange option via ICCP.

1. Overview

This guide focuses on the data reporting required of Intermittent Power Resources that depend on wind or solar energy as their fuel to support the integration of renewable energy into the New York Control Area. The NYISO requires that Wind and Solar Plant Operators provide static plant data, meteorological data, maximum availability, and outage information. This data, coupled with recent plant output megawatt data (provided by the NYISO to the forecast vendor) will be used to estimate Wind and Solar Plant power output for the NYISO day-ahead market and real-time market runs. Solar Plants with a nameplate capacity of 20 MW or fewer are exempt from providing meteorological data.

The requirement to provide static data, meteorological data, maximum availability, and outage information applies to Intermittent Power Resources participating in the NYISO markets either stand-alone or as part of a homogeneous Aggregation. An Aggregator is responsible for submitting the static data required by the NYISO for each individual wind or solar facility participating in an Aggregation, when the Aggregation is a homogenous wind Aggregation or a homogenous solar Aggregation.

1.1. Terminology

The following terms are an integral part of this guide:

- **Centralized Forecast Service** – The entire program of forecasting power in real-time and Day-Ahead for Wind and Solar Plants in NYS, using a centralized approach of collecting the data and predicting output for all plants. The NYISO has contracted with a forecast vendor to produce all of the forecasts.
- **Static Plant Data** – Detailed layouts, locations, specifications, and configurations of an individual Plant’s wind turbines or solar arrays.
- **Outage Data** – Schedules of outages and deratings for a specific Plant.
- **Maximum Available Megawatts** – For all wind turbines and solar arrays that are online and currently capable of producing power (including those that are not producing any power due to poor meteorological conditions), the sum of their individual nameplate capacities. This value should exclude equipment that is not producing power due to a fault condition or a netcomm condition or that are offline for service.
- **Computer System** — Any or all such systems employed by the Plant Operator for the distinct purpose of storing and transmitting local meteorological data.
- **Meteorological Data** – The local weather data collected at a specific Plant Operator’s site.
- **Meteorological Equipment** – The equipment used to collect meteorological data.
- **Data Communications Interface** – The physical communication channels employed by the Plant Operator to transmit meteorological data over the Internet to the NYISO forecast vendor.
- **Meteorological Data Transfer Process** – The entire process of measuring, collecting, storing, and transmitting of meteorological data, including the Computer Systems, Meteorological Data itself, Meteorological Equipment, and Data Communications Interface.

2. Static Plant Data

As part of the registration process, Wind and Solar Plant Operators are required to supply the NYISO with data describing the physical layout of their Plants, details of the wind turbines or solar arrays being used, manufacturer's power curves, cut-in/cut-out/cut-back-in settings where applicable, and meteorological towers.

Detailed instructions for providing this information for standalone wind or solar IPRs are contained within the NYISO Registration Package, available from the NYISO Web site at the following URL:

<https://www.nyiso.com/support>.

Aggregators of DER are required to provide the applicable information to NYISO Distributed Resources Operations (DRO) at DER@nyiso.com upon submission of Aggregation and DER enrollment information to the NYISO's Aggregation System. An Aggregator must submit a unique file for each facility comprising a homogenous wind Aggregation or homogenous solar Aggregation. Please notify NYISO of changes to the applicable information immediately by submitting an updated file to the aforementioned email address.

Wind and Solar Plant Operators shall notify the NYISO upon any changes to this static data.

2.1. Wind IPR Static Plant Data

Wind Plant Operators are required to supply the NYISO the following data as part of the registration or enrollment process, for each wind IPR participating either standalone or as part of a homogenous wind Aggregation:

- Organization
- IPR name – name of the standalone wind IPR or the Aggregation to which the wind IPR belongs to.
- IPR Facility ID – equal to the ID assigned by the Aggregation System to each wind IPR member of a homogeneous Aggregation. Blank for standalone wind IPRs.
- Gen PTID or Aggregation ID - equal to the Gen PTID assigned to the standalone wind IPR or the Aggregation ID assigned by the Aggregation System to each homogeneous Aggregation composed of wind IPRs (equivalent to the Gen PTID assigned to generators)
- Number of Turbines
- Turbines make/model
- Hub Height
- Number of Inverters
- Inverters make/model
- Inverters Maximum Efficiency
- Total Operating Capacity (DC and AC) MW
- Coordinate System

- Coordinate Datum
- Low temperature operational limit (Celsius/Fahrenheit)
- Cold Weather Package (Yes or No)
- Size of electrical auxiliary heating load (kW)
- Turbine/Meteorological Data Sensor information (e.g., latitude, longitude, sensor height, speed, direction, temperature, pressure, humidity, dew point)

2.2. Solar IPR Static Plant Data

Solar Plant Operators are required to supply the NYISO the following data as part of the registration or enrollment process, for each solar IPR participating either standalone or as part of a homogenous solar Aggregation:

- Organization
- IPR name – name of the standalone solar IPR or the Aggregation to which the solar IPR belongs to.
- IPR Facility ID – equal to the ID assigned by the Aggregation System to each solar IPR member of a homogeneous Aggregation. Blank for standalone solar IPRs.
- Gen PTID or Aggregation ID - equal to the Gen PTID assigned to the standalone solar IPR or the Aggregation ID assigned by the Aggregation System to each homogeneous Aggregation composed of solar IPRs (equivalent to the Gen PTID assigned to generators)
- Number of PV Modules
- PV Module make/model
- Number of Inverters
- Inverters make/model
- Inverters Maximum Efficiency
- Total Operating Capacity (DC and AC) MW
- Coordinate System
- Coordinate Datum
- Array/Tracking System/Meteorological Data Sensor information (e.g., latitude, longitude, tilt, azimuth, panel elevation, axes of rotation, back panel temperature at avg array height, POA irradiance)

3. Real-Time Data Transfer Process

This section describes the Meteorological Data Transfer Process requirements for Wind and Solar Plant Operators.

3.1. Wind and Solar Plant Operator Responsibility

Each Wind and Solar Plant Operator is responsible for the cost assumed with purchase, installation, and appropriate maintenance of all equipment involved with the Real-Time Data Transfer Process.

Each Wind and Solar Plant Operator is expected to monitor and control its computer systems, meteorological equipment, and data communications interfaces.

The Plant Operator shall transmit data according to the specification as defined in [Appendix A – Data Transfer Technical Specification](#) of this guide.

3.2. Availability

The Plant Operator’s Real-Time Data Transfer Process shall be designed to operate 24x7x365.

3.3. Real-Time Data Elements

3.3.1. Units and Precision

Measurement	Type	Solar Required/ Optional	Wind Required/ Optional	Height of measurement	Unit	Precision (to the nearest...)
Max Available Megawatts	SCADA	R	R	N/A	MW	0.1 MW
Wind Speed	Meteorological	N/A	R	Hub	Meters/Second (m/s)	0.1 m/s
Wind Direction	Meteorological	N/A	R	Hub	Degrees from True North (between 0 and 360 degrees)	1 degree
Ambient Air Temperature	Meteorological	R	O	2m and Hub (wind) Back panel temp (solar)	Degrees Centigrade (°C)	0.1° C
Global Plane of Array Irradiance	Meteorological	R	N/A	Array height	W/m ²	+/- 25 W/m²
Ambient Air Dewpoint	Meteorological	O	O	2m	Degrees Centigrade (°C)	0.1° C
Ambient Air Relative Humidity	Meteorological	O	O	2m	(Percentage)	1.0 %
Barometric Pressure	Meteorological	O	O	2m	HectoPascals (hPa)	60 Pa

Azimuth Angle	Meteorological	R (tracking systems only)	N/A	N/A	Degrees from True North (between 0 and 360 degrees)	1 degree
Tilt Angle	Meteorological	R (tracking systems only)	N/A	N/A	Degrees (between 0 and 180 degrees)	1 degree

3.3.2. Data Collection Points

Each wind turbine or solar array at the plant site must be within 5 kilometers of a meteorological data collection point. This is the minimum requirement only. For Wind Plants specifically, ideally, the minimum amount of data would be provided from a stand-alone meteorological tower(s) and augmented with additional sensor data from the turbines. If no such stand-alone tower exists on the site, data may be collected from turbine-mounted sensor equipment alone. For Solar Plants with single or multi-axis tracking systems specifically, at least one pair of Azimuth and Tilt angle points must be provided that reasonably represent the plant’s overall orientation. More than one pair of Azimuth and Tilt angle points may be provided, if available, to better represent the plant’s capabilities. Changes to the location of a Data Collection Point and the addition or deletion of Data Collection Points must be approved by the NYISO.

3.3.3. Frequency

Real-time data must be transmitted to the NYISO at least once every 30 seconds.

The values provided shall represent an instantaneous measurement of the data rather than an average.

3.4. Data Transfer

The NYISO currently provides Wind and Solar Plant Operators with the ability to exchange data with the NYISO via a web service and via the Inter-Control Center Communication (ICCP) protocol.

Please see Section A.1 in [Appendix A](#) for details of the data transfer technical specification that must be followed by Plant Operators to exchange data via the NYISO web service. Section A.5 in [Appendix A](#) describes the details of the process that must be followed by Plant Operators to exchange data via ICCP.

4. Plant Outages/Plant Availability

In order to calculate forecasts as accurately as possible, it is critical that Plant Operators provide the NYISO with available capacity ratings for their plants in advance of reductions in plant output capacity. The instructions below apply to any reduction in plant output capacity which is for 1MW or more, and lasting for 1 hour or more. Any reduction in plant output capacity which is less than 1MW, or which lasts less than 1 hour, does not need to be reported to the NYISO.

To report plant availability for the NYISO Centralized Forecasting Service, follow the procedures outlined in the *NYISO Outage Scheduling Manual* (available from the NYISO Web site at <https://www.nyiso.com/manuals-tech-bulletins-user-guides>).

Planned outages should be reported at least 2 operating days in advance to ensure that the NYISO day-ahead market runs get forecasts reflecting the true Plant availability.

Unplanned outages should be reported as soon as practicable.

5. Equipment Maintenance

5.1. Testing and Calibration

Meteorological Equipment should be tested and, if appropriate, calibrated, per manufacturer's recommendations or when indications are suspect or maintenance has been performed that may have interrupted or otherwise adversely impacted the accuracy of operational data.

5.2. Software/Security Upgrades

Computer system hardware and software should be maintained and upgraded, per manufacturer's recommendations.

5.3. Upgrading Equipment

Equipment not meeting the accuracy specified by the manufacturer's standards should be repaired or replaced.

6. Penalties and Procedures for Dispute Resolution of Data Issues

Please see NYISO Services Tariff Section 5.8.1 for details of the financial sanctions that may be applicable due to a failure to comply with the requirement of collecting and communicating meteorological data. The Tariff is available from the NYISO Web site at the following URL:

<https://www.nyiso.com/regulatory-viewer>.

Appendix A Data Transfer Technical Specification

This Appendix details the formats and protocols that must be followed to enable data exchange between individual Wind and Solar Plant Operators and the NYISO.

The Web service can be implemented with any Web services technology such as J2EE or Microsoft®-based products. Adherence to this specification guarantees interoperability regardless of technology platform.

During the registration process, Wind and Solar Plant Operators will provide the NYISO with detailed static data including descriptions of their individual site configuration, turbine and solar array locations, met tower locations, make/model information, and unique identifiers for each meteorological data collection point. The NYISO forecast vendor will model the Plant's site using this information.

Once the Plant's site is modeled in the NYISO forecast vendor's systems, the Plant Operator can begin sending real-time data to the NYISO.

A.1 Web Service Definition

Web Service Description Language (WSDL) is used to describe the technical details of each message and operation defined in the service to be called. WSDL describes a Web service in two fundamental stages: one abstract and one concrete. At an abstract level, it is specified in terms of the messages it sends and receives; messages are described independent of a specific wire format using a type system, typically XML Schema. At a concrete level, a binding specifies transport and wire format details for one or more interfaces; an endpoint associates a network address with a binding; and, finally, a service groups together endpoints that implement a common interface.

A.1.1 Send Meteorological Data Message

The NYISO hosts the SendMetData message web service.

- SendMetData message: Consumed by Plant Operators to send meteorological data.

SendMetData message is used to send the real-time data for each plant. Figure 1 illustrates the elements of the SendMetData message, while Figure 2 provides descriptions of these elements.

Figure 1: SendMetData Message Elements

WindParametersType		MetType	
GenPTID	string	MetID	string
MaxAvailableMW	decimal	WindSpeed	decimal
MetData	MetType	WindDirection	decimal
		BarometricPressure	decimal
		AmbientTemperature	decimal
		DewPoint	decimal
		Humidity	decimal
		Irradiance	decimal
		Azimuth	decimal
		Tilt	decimal
		BeginTimeStamp	dateTime
		EndTimeStamp	dateTime

Figure 2: SendMetData Message Element Descriptions

Element	Description
GenPTID	The GenPTID element is the NYISO's unique representation of the Wind Plant. This is a unique ID given to each Plant Operator as part of the registration process. (Solar and Wind)
BeginTimeStamp	The BeginTimeStamp element represents the start time of the data collection interval. (Solar and Wind)
EndTimeStamp	The EndTimeStamp element represents the end time of the data collection interval. For instantaneous values, the EndTimeStamp should equal the BeginTimeStamp. (Solar and Wind)
SendMetData	The SendMetData element is the root element for the WindParameters message. It may contain zero or more WindParameters elements. (Solar and Wind)
WindParameters	The WindParameters element provides a mechanism for grouping wind unit parameters that may have common attributes. (Solar and Wind)
MaxAvailableMW	For all turbines or panels that are online and currently capable of producing power (including those turbines that are not producing any power due to low wind speeds), this value represents the sum of their individual nameplate capacities. This value should exclude those turbines that are not producing power due to a fault condition or a netcomm condition or that are offline for service. (Solar and Wind)
MetData	The MetData element represents a single set of meteorological data. It contains the required elements MetID, WindSpeed, BarometricPressure, AmbientTemperature, DewPoint, Humidity and Irradiance. (Portions Solar and Portions Wind)
MetID	The MetID element is the unique representation of the point (turbine ID/met tower ID) at the Wind Plant Operator's site where the met data was collected. (Solar and Wind)

Element	Description
WindSpeed	The WindSpeed element represents the Wind speed at hub height collected from each met tower. (Wind only)
WindDirection	The WindDirection element represents the Wind direction at hub height collected from each met tower. (Wind only)
BarometricPressure	The BarometricPressure element represents the pressure at 2m (WMO standard height) or 30m collected from each met tower. (Wind only)
AmbientTemperature	The AmbientTemperature element represents the Temperature at 2m (WMO standard height) or 30m collected from each met tower. (Solar and Wind)
Dew Point	The Dew Point element represents the dew point at 2m (WMO standard height) or 30m collected from each met tower. (Wind only)
Humidity	The Humidity element represents the humidity at 2m (WMO standard height) or 30m collected from each met tower. (Wind only)
Irradiance	The Irradiance element represents the solar angle on the solar array. (Solar only)
Azimuth	The Azimuth element represents the azimuth angle of a solar array's panels. This element is only required for solar arrays equipped with a single or multi-axis tracking system.
Tilt	The Tilt element represents the tilt angle of a solar array's panels. This element is only required for solar arrays equipped with a single or multi-axis tracking system.

A.1.2 Web Service Operations

A.1.2.1 Send Met Data

The NYISO hosts the SendMetData message web service. Plant Operators will send real-time data (wind/solar parameters) collected from each collection point to the NYISO by calling this service. The data sent using this operation will be constrained according to the definition of the Wind Parameters Message. Only collection points for which the Plant Operator has actual measured data to report should be included in the XML. If a collection point is not yet measuring data, it should not be reported in the XML feed.

A.2 Web Service Security

Services will be available only over two-way SSL over HTTP. The requestor opens a connection to the Web service using a secure transport, i.e., SSL. In this scenario, the message confidentiality and integrity are handled using the existing transport security mechanisms.

Wind and Solar Plant Operators will interact with the NYISO-hosted instance of the Send Wind Data message Web service. Existing RTU/ICCP integration is not affected by this project.

The NYISO will enforce two-way SSL for all hosted services. The NYISO requires a NAESB compliant digital certificate. This certificate is required in order to successfully send a message to the NYISO-hosted

instance of the Web service. For instructions on obtaining and using a NAESB compliant digital certificates, refer to the *NYISO Market Participant User's Guide*, available from the NYISO Web site at the following URL:

<https://www.nyiso.com/manuals-tech-bulletins-user-guides>

Additionally, the NYISO Send Met Data message Web service requires that a valid userid and password be provided with the transmittal to ensure that only authorized processes are able to deliver data to the NYISO. Your company's Market Information System (MIS) administrator can create this userid/password using the NYISO MIS Marketplace application by establishing a new user for your organization with the appropriate Wind Service privilege of *Wind – Wind Met Data*.

A.3 WSDL

WSDL allows a Web service to document the messages it receives and sends. Following is the WSDL describing various “functions” of the service hosted by the NYISO.

NYISO WSDL:

<https://windpower.nyiso.com/WeatherService/WeatherWindServicePortType?wsdl>

or

<https://metdata.nyiso.com/MetService/MetServicePortType?wsdl>

A.4 References

Web Services: <http://www.w3.org/2002/ws/>

WSDL: <http://www.w3.org/2002/ws/desc/>

WS Security standard: <http://www.verisign.com/wss/wss.pdf>

A.5 Data Transfer via ICCP

The data exchange via the ICCP option requires the implementation of a telemetry infrastructure for data communications with the NYISO. The NYISO currently utilizes ICCP over Multi-Protocol Label Switching (MPLS) on dedicated Tier 1 (T1) circuits to send and receive telemetry data. The NYISO also supports ICCP data exchange over a public internet-based Software-Defined Wide Area Network (SD-WAN). Market Participant portfolio (MW) size according to telemetry infrastructure type eligibilities are detailed in the Control Center Requirements Manual Appendix D.

Details for the implementation of an infrastructure for data communications with the NYISO via ICCP is described in the Direct Communications Procedure. The Direct Communications Procedure is a secure CEII

document not available on the NYISO website. To request authorization to receive the Direct Communications Procedure, please contact stakeholder_services@nyiso.com.