2020 NOV 19

Implementation of Phasor Technology

Khaqan Khan Manager Real-Time Applications
Nilkamal Fernandopulle Senior Engineer Real-Time Applications

ieso
Connecting Today. Powering Tomorrow.

Webinar Participation (including audio)

- [Registration Link](#)

  - Use the "Ask a Question" function to submit a question during the webinar

- Teleconference participation (audio only):

  - Local (+1) 416 764 8640; Toll Free (+1) 888 239 2037

  - Press *1 to alert the operator that you have a question

  - When asking a question, please state your name and who you represent so those participating are aware

- This webinar is conducted according to the [IESO Engagement Principles](#)

ieso
Connecting Today. Powering Tomorrow.

Purpose

- Comparison of Present vs. Proposed Real-Time Data Technologies

- IESO Vision for PMU Data Applications

- Proposed Rules

- Revised Implementation Schedule

- Review of Stakeholder Feedback

- Proposed Market Manual Updates

Comparison of Real-Time Measurement Technologies

- Currently used technologies in Ontario to obtain real-time measurements:

  (a) SCADA (continuous, 1 data sample every per 2-10 sec, uses local time, no angle available)

  (b) DFR[1], DDR[1] (snapshot only during abnormal voltage or frequency, higher sample rate available, angle available)

[1] DFR = Digital Fault Recorder, DDR = Dynamic Disturbance Recorder

ieso
Connecting Today. Powering Tomorrow.

Comparison of Real-Time Measurement Technologies - 2

- Proposed PMU technology to obtain real-time measurements:

  - Combines benefits of (a) and (b) to a single device

  - Continuous, angle & magnitude available, higher rate (30-60 data sample per sec)

  - Uses universal time from Global Positioning System

- Increased implementation across North America last 15 years

ieso
Connecting Today. Powering Tomorrow.

IESO Vision for PMU Data Applications

Off-Line Applications:

- Improve power system models to enable better planning and operation decisions

- After-the-fact forensic event analysis

ieso
Connecting Today. Powering Tomorrow.

IESO Vision for PMU Data Applications - 2

Real-Time Applications:

- Allows all Reliability Coordinators to consistently view wider power grid

- State Estimator gets correctly timed measurement inputs

- Increased ability to predict possible system separations and to identify oscillations

- Improved resilience by faster restoration of equipment from outages

Proposed Rules

The IESO proposes PMUs would be required for the following facilities only :

Generators

- Single Generator Unit ≥ 100 MVA

  - Required data are current, voltage and frequency from generator terminal

- Aggregated Generator Facility ≥ 100 MVA

  - Required data are aggregated current, voltage and frequency from customer side of connection point to the grid

Transmitters

- 500 kV Stations, Bulk Power Stations, Stations in Grid Restoration Paths

  - Required data are voltages and frequency from two separate buses

- Major Transmission Interfaces, Inter-ties, Static Var Compensators

  - Required data are currents, voltages and frequency from terminals

Note : Required currents and voltages are positive sequence quantities only

ieso
Connecting Today. Powering Tomorrow.

Revised Implementation Schedule

- Draft Market Rules to be presented to IESO Technical Panel in Q1 2021
- Facilities connected to the IESO-controlled grid "pre-Market Rule" effective date:
  - Market Participants having one facility, provide data on or before Dec 31, 2023
  - Market Participants having multiple facilities, provide data via mutually agreed staged implementation plan
- Facilities connecting to the IESO-controlled grid "post-Market Rule" effective date[1]: Provide data on latter of the time of connection or Dec 31, 2023

  [1] Any exceptions will be managed on case to case basis

ieso
Connecting Today. Powering Tomorrow.

Review of Stakeholder Feedback
IESO responses to select feedback received in relation to the June 24, 2020 Webinar

PMU Locations

The PMU data from generators are from low side of output transformer (reflect primarily dynamics of the generator). PMU data from transmitters are from transmission levels (reflect overall dynamics of the network). Thus, the PMU data both from transmitters as well as generators is required.

The need for PMU data either from generators and Static Var Compensators (SVC) in close vicinity will be determined by facility MVA, controls and their complexity, number of models etc.

Review of Stakeholder Feedback

IESO responses to select feedback received in relation to the June 24, 2020 Webinar

Priority Order List of Facilities

The Market Participants who own multiple facilities and the IESO will work on a mutually agreed staged implementation plan based on a priority order list of facilities. The order will be based on critical reliability related needs and impact of the facility. The IESO will also examine a process for exclusions if any critical facility is expected to be retired within next 10 years.

ieso
Connecting Today. Powering Tomorrow.

Review of Stakeholder Feedback
IESO responses to select feedback received in relation to the June 24, 2020 Webinar

Bandwidth and Latency Requirement

Provide bandwidth adequate to transmit required volume of data at 30 data per sec. The required bandwidth depends the size & configuration of the facility, the communication section for which bandwidth is used (i.e. from PMU to PDC, from PDC to control center)

Provide data with latency adequate to be used in real-time applications.
- If data is to be used in state estimator, the latency is to be no more than 100 msec.
- If data is to be used only in visualisation, the latency is to be no more than 1 sec.

ieso
Connecting Today. Powering Tomorrow.

Review of Stakeholder Feedback
IESO responses to select feedback received in relation to the June 24, 2020 Webinar

Acceptable PMU Standard

The format and accuracy of the data shall be as per the IEEE C37.118-2005 standard level 1 where Total Vector Error (TVE) shall be less than 1%.

ieso
Connecting Today. Powering Tomorrow.

Proposed Market Manual Updates

Area	Proposed Minimum Requirement
Measurement Co-ordinates	polar coordinates (angles in degrees in 0° to 360° and magnitudes in SI units)
System Frequency	continuously at frequency between 57 Hz and 62 Hz
Scan Rate	once in every one thirtieth of a second (i.e. 30 samples per second)
Time Tag Accuracy	equal or less than one microsecond from Coordinated Universal Time (UTC)
Data Format	IEEE C37.118-2005 standard level 1 (Total Vector Error < 1%)
Network Protocol	use any communication medium and comply with TCP/IP or UDP/IP protocol
Bandwidth	adequate to transmit required volume of data at selected sample rate
Total Latency	delay must not impede IESO applications
Instrument Transformers	accuracy equal or better than those used for SCADA measurements

ieso
Connecting Today. Powering Tomorrow.

Next Stakeholder Feedback

- The IESO is seeking feedback on the revised implementation plan and the proposed Market Rules and Draft Market Manual

- Please use the feedback form found under the November 19th entry on the Updates to IESO Monitoring Requirements: Phasor Data webpage to provide feedback and send to engagement@ieso.ca by December 10, 2020

ieso

Connecting Today. Powering Tomorrow.

Thank You

ieso.ca

1.888.448.7777

customer.relations@ieso.ca

engagement@ieso.ca

@IESO_Tweets

facebook.com/OntarioIESO

linkedin.com/company/IESO

ieso
Connecting Today. Powering Tomorrow.