Market Rule Amendment Proposal Form

Part 1 - Market Rule Information

Identification No.:	MR-00487-R00
Subject:	Synchrophasor Data Requirements
Title:	Updates to IESO Monitoring Requirements: Phasor Data
Nature of Proposal:	☒ Alteration ☐ Deletion ☒ Addition
Chapter:	4
Appendix:	4.15, 4.24
Sections:	Chapter 4, Section 7.2; Appendix 4.15, Appendix 4.24
Sub-sections proposed for amending:	• Addition of Section 7.2.1 to Chapter 4. • Appendix 4.15 - Amended the section on Synchrophasor Data Requirements for Generation Facilities. • Appendix 4.24 - added "SCADA" to the table headings to now read: SCADA Information Requirements; added a table section on Synchrophasor Data Requirements for Electricity Storage Facilities.
Current Market Rules Baseline:	54.1

Part 2 - Proposal History

Version	Reason for Issuing	Version Date
1.0	Draft for Stakeholder review	December 8, 2025
2.0	Draft for Technical Panel review	April 7, 2026

Approved Amendment Publication Date:

Approved Amendment Effective Date:

Part 3 - Explanation for Proposed Amendment

Provide a brief description that includes some or all of the following points:

- The reason for the proposed amendment and the impact on the *IESO-administered markets* if the amendment is not made.
- Alternative solutions considered.
- The proposed amendment, how the amendment addresses the above reason and impact of the proposed amendment on the *IESO-administered markets*.

Summary

The IESO proposed to amend the market rules to update grid connection requirements related to synchrophasor data as follows:

1. Insert a provision in Chapter 4 specifying market participant obligations relating to the infrastructure required to support synchrophasor data;
2. Amend the respective phase measurements that should be provided by generators; and
3. Expand the requirements for synchrophasor data to apply to electricity storage facilities that have an aggregate rating greater than 20 MVA.

Synchrophasor data, collected through PMUs, have been providing the IESO with greater situational awareness since they were first required for generators and transmitters in January 2025.

Further information can be found on the Updates to IESO Monitoring Requirements stakeholder engagement webpage.

Background

Ontario's power system is continuously monitored in real-time by the IESO using a traditional technology called Supervisory Control and Data Acquisition (SCADA). This technology utilizes power system measurements ("data") from all facilities connected to the IESO-controlled grid across the province every 2-10 seconds. Receiving data at this frequency, and in this manner, presents two challenges:

- Data for certain system events is not obtained. This was evident on January 2019 when an event occurred in Florida that grew and propagated across the eastern interconnection, causing oscillations, including in Ontario, but was uncaptured by the SCADA.

- Data received is not synchronized. Without precise time stamps on each piece of data, it is not always possible to have a precise picture of the impact of system events.

PMU technology is more advanced than traditional SCADA technology in its ability to provide real-time and/or after the fact synchrophasor data with greater granularity (up to 120 samples every second), accuracy and detail. This aids in providing an early warning of potential system events and consistent information about actual power system conditions. In addition, it replaces traditionally used time-consuming methods to benchmark power system models and also helps to perform after-the-fact forensic work on system events more effectively. Further, synchrophasor data can assist grid operators in restoration of system equipment situations and improves IESO's ability to comply with several NERC reliability standards.

Discussion

There are three main elements of amendments to this proposal.

1- Chapter 4, new section 7.2.1. This new section will outline the obligations market participants have relating to the infrastructure required to support synchrophasor data. These obligations previously existed in Market Manual 1.7, but are being relocated to the market rules as this is the more appropriate place for such obligations.
2- Chapter 4, Appendix 4.15. There are several changes proposed that will revise the respective measurements that should be provided, and recognize the ability for the IESO to provide exceptions to the requirements that are outlined in Market Manual 1.7 – Synchrophasor Data Requirements.
3- Chapter 4, Appendix 4.24. The amendments to these rules will introduce a new section outlining the requirements for synchrophasor data from storage resources. The existing requirements for SCADA data will be re-labelled as such for clarity. The requirements for storage are consistent with those for generators, aside from the size requirement.

Part 4 - Proposed Amendment

Chapter 4

7. Provision of Connection-Related Information

7.2 ~~[Intentionally left blank]~~Synchrophasor Data Requirements

7.2.1 Each *generator, transmitter and electricity storage participant* identified in Appendices 4.15, 4.16 and 4.24 respectively, shall install and maintain at their own expense, *synchrophasor* data generating devices and associated infrastructure, including transformers and communications channels and provide *synchrophasor* data in accordance with the applicable *market manual* and the applicable Appendix.

Appendix 4.15-IESO Monitoring Requirements: Generators

Type	Synchrophasor Data Requirements
Generation facility	For all three phases the voltage and current phasor measurements and frequency measurements, as further described in the applicable *market manual*, shall be required for each *generation unit* as outlined below~~The following are required unless otherwise specified by the IESO~~: (1) For *generation units* with a name-plate rating ~~rated~~ greater than or equal to 100 MVA ~~(name-plate rating)~~, measured from the *generation facility* side of the *connection point* to the *IESO-controlled grid*~~each *generation unit* shall provide positive sequence voltage phasor, positive sequence current phasor and frequency from generator terminal~~. (2) For *generation units* connected to the ~~IESO-controlled grid~~ *IESO-controlled grid* through a common connection point, whose aggregated ~~rated size~~nameplate rating is greater than or equal to 100 MVA ~~(aggregate nameplate rating)~~, measured from the *generation facility* side of the *connection point* to the *IESO-controlled grid*~~positive sequence voltage phasor, aggregated positive sequence current phasor and frequency shall be provided from the generation facility side of the connection point to the grid~~. (3) For *generation units*, regardless of rated size, whose output power flow is a part of an Interconnection Reliability Operating Limit ~~(IROL) definition~~, measured from the terminals defining the Interconnection Reliability Operating Limit ~~positive sequence voltage phasor, positive sequence current phasor and frequency shall be provided at the terminals defining the IROL~~. (4) Notwithstanding the foregoing, a *market participant* is not required to measure and provide such data when exempted from such requirement as determined in accordance with the applicable *market manual*.

~~Unless otherwise specified by the IESO, synchrophasor data requirements shall comply with the corresponding Market Manual.~~

Appendix 4.24-IESO Monitoring Requirements: Electricity Storage Participants

The following information, as a minimum, shall be available on a continual basis to the *IESO* from:

(a) any *electricity storage participant* (i) whose *electricity storage facility* is *connected* to the *IESO-controlled grid*, or (ii) that is participating in the *IESO-administered markets*; and

(b) any *embedded electricity storage participant* (i) that is not a *market participant* or whose *embedded electricity storage facility* is not associated with any *resources*; (ii) whose *embedded electricity storage facility* includes an *electricity storage unit* with an *electricity storage unit* size rated at greater than 20 MVA or that comprises multiple *electricity storage units*, the aggregated *electricity storage unit* size ratings of which exceeds 20 MVA; and (iii) that is designated by the *IESO* for the purposes of section 7.3.1 of this Chapter as being required to provide such data in order to enable the *IESO* to maintain the *reliability* of the *IESO-controlled grid*.

TYPE	SCADA INFORMATION REQUIREMENTS
Major electricity storage facility	Monitored Quantities 1. Active Power (MW) and Reactive Power (MX) injected or withdrawn a) The standard requirement for active and reactive power is the provision of *net MW* and *net MX* or *gross MX*. *Gross MW* and *gross MX* or *net MX* are also to be provided, if designated by the *IESO* as required for: (i) determination of operating *security limits*; (ii) to maintain *reliable* operation of the *IESO-controlled grid*; (iii) for compliance monitoring purposes; or (iv) if provision of only the standard requirement values as defined above would have a negative impact on other *market participants* through reduced operating *security limits*. b) For *electricity storage units* with an *electricity storage unit size* greater than or equal to 100 MVA, the standard requirement as defined in part a) for each *electricity storage unit* shall be provided, and *gross MW* and *gross MX* or *net MX* for each *electricity storage unit* shall be provided if designated by the *IESO* as required using the criteria listed above in part a). c) For *electricity storage units* with an *electricity storage unit size* of less than 100 MVA:

TYPE	SCADA INFORMATION REQUIREMENTS
	(i) for a group of *electricity storage units* if those *electricity storage units* are similar in size and operating characteristics, the standard requirement as defined in part a) shall be provided as a total for these *electricity storage units*, and total *gross MW* and *gross MX* shall be provided if designated by the *IESO* as required using the criteria listed above in part a); or (ii) if designated by the *IESO* as required for determination of operating *security limits* or to maintain reliable operation of the *IESO-controlled grid* or for compliance monitoring purposes, the standard requirement as defined in part a) for each *electricity storage unit* shall be provided, and *gross MW* and *gross MX* or *net MX* for each *electricity storage unit* shall be provided if designated by the *IESO* as required using the criteria listed above in part a). d) For *electricity storage facilities* that have been aggregated pursuant to Chapter 7 section 2.3: (i) the standard requirement as defined in part a) shall be provided as an aggregated total, and an aggregated total *gross MW* and *gross MX* or *net MX* shall be provided if designated by the *IESO* as required using the criteria listed above in part a); or (ii) if so designated by the *IESO* as required for determination of operating *security limits* or to maintain *reliable* operation of the *IESO-controlled grid* or for dispatch compliance monitoring purposes, the standard requirement as defined in part a) for each *electricity storage unit* shall be provided, and *gross MW* and *gross MX* or *net MX* for each *electricity storage unit* shall be provided if designated by the *IESO* as required using the criteria listed above in part a). 2. State of Charge and Charge Limit a) For each *electricity storage unit* or *electricity storage facility*, the *state of charge* of the applicable *electricity storage unit* or *electricity storage facility* b) For each *electricity storage unit* or *electricity storage facility*, the economic maximum charge limit and the economic minimum charge limit expressed in MWh as per the applicable *market manual*. 3. Base point a) For each *electricity storage unit* or *electricity storage facility* associated with a *resource* providing *regulation*, the basepoint, if applicable, of the *electricity storage unit* expressed in MW, according to the applicable *market manual*. 4. Dynamic Maximum and Minimum Power

TYPE	SCADA INFORMATION REQUIREMENTS
	a) For each *electricity storage unit* or *electricity storage facility*, the economic maximum power mode and economic minimum power mode, expressed in MW. 5. Voltage: a) For each *electricity storage unit*, unit terminal voltage, except if *electricity storage units* are connected to a common low voltage bus section, then the bus section voltage is adequate for those *electricity storage units*. 6. Equipment Status a) Voltage Control status and stabilizer status (if applicable) for each *electricity storage unit* with an *electricity storage unit size* > 100 MVA. When applicable, stabilizer status reporting is only required if it can be switched off by electricity storage participant personnel remotely or at the facility. b) AGC status for each *electricity storage unit* associated with a *resource* providing *regulation*. c) Voltage control status and stabilizer status (if applicable) for each *electricity storage unit* with an *electricity storage unit size* < 100 MVA if the status of this equipment is designated by the IESO as required for determination of operating security limits or to maintain reliable operation of the *IESO-controlled grid*. When applicable, stabilizer status reporting is only required if it can be switched on or off by market participant operating personnel remotely or at the *facility*. d) Synchronizing Breaker status for each *electricity storage unit*. Where a *electricity storage facility* is designed such that no low voltage synchronizing breaker is installed for each *electricity storage unit*, the status of the appropriate HV breaker(s) and disconnect switch(es) normally used to isolate the electricity storage unit must be provided. Where this results in access to the majority of breakers on a bus, the status of the remainder of the breakers shall be provided to complete the bus configuration. e) Where a *electricity storage facility* is designed such that there are disconnect switches in parallel, or directly in series, with the synchronizing breaker, the status of those switches is also required. f) *Remedial Action Scheme* status for each applicable *electricity storage unit*.
Significant electricity storage facility and minor	Monitored Quantities 1. Active Power (MW) and Reactive Power (MX) injected or withdrawn:

TYPE	SCADA INFORMATION REQUIREMENTS
electricity storage facility connected to IESO-controlled grid	a) The standard requirement for active and reactive power is the provision of *net MW* and *net MX* or *gross MX* facility. *Gross MW* and *gross MX* or *net MX* are also to be provided, if designated by the IESO as required for: (i) determination of operating security limits; (ii) to maintain reliable operation of the *IESO-controlled grid*; (iii) for compliance monitoring purposes; or (iv) if provision of only the standard requirement values as defined above would have a negative impact on other *market participants* through reduced operating security limits. b) For *electricity storage facilities* that have not been aggregated pursuant to Chapter 7 section 2.3: (i) for a group of *electricity storage units* if those *electricity storage units* are similar in size and operating characteristics, the standard requirement as defined in part a) shall be provided as a total for these electricity storage units, and total *gross MW* and *gross MX* or *net MX* shall be provided if designated by the IESO as required using the criteria listed above in part a); (ii) if designated by the IESO as required for determination of operating security limits or to maintain reliable operation of the IESO-controlled grid or for compliance monitoring purposes, the standard requirement as defined in part a) for each electricity storage unit shall be provided, and gross MW and gross or net MX for each electricity storage unit shall be provided if designated by the IESO as required using the criteria listed above in part a). c) For *electricity storage facilities* that have been aggregated pursuant to Chapter 7 section 2.3: (i) the standard requirement as defined in part a) shall be provided as an aggregated total, and an aggregated total *gross MW* and *gross MX* or *net MX* shall be provided if designated by the IESO as required using the criteria listed above in part a); or (ii) if so designated by the IESO as required for determination of operating security limits or to maintain reliable operation of the IESO-controlled grid or for dispatch compliance monitoring purposes, the standard requirement as defined in part a) for each electricity storage unit shall be provided, and *gross MW* and *gross MX* or *net MX* for each *electricity storage unit* shall be provided if designated by the IESO as required using the criteria listed above in part a). 2. Voltage:

TYPE	SCADA INFORMATION REQUIREMENTS
	a) For *electricity storage units* that are VAR dispatchable, unit terminal voltage, except if the electricity storage units are connected to a common low voltage bus section, then the bus section voltage is adequate for those electricity storage units. 3. State of Charge and Charge Limit a) For each *electricity storage unit* or *electricity storage facility*, the *state of charge* of the applicable *electricity storage unit* or *electricity storage facility* b) For each *electricity storage unit* or *electricity storage facility*, the economic maximum charge limit and the economic minimum charge limit expressed in MWh as per the applicable *market manual*. 4. Dynamic Maximum and Minimum Power a) For each *electricity storage unit* or *electricity storage facility*, the economic maximum power mode and economic minimum power mode, expressed in MW. 5. Base point a) For each *electricity storage unit* or *electricity storage facility* associated with a *resource* providing *regulation*, the basepoint, if applicable, of the storage unit expressed in MW, according to the applicable *market manual*. 6. Equipment Status a) Automatic Voltage Control and stabilizer status (if applicable) for each *electricity storage unit* if the status of this equipment is designated by the IESO as required for determination of operating security limits or to maintain reliable operation of the IESO-controlled grid. When applicable, stablizer status reporting is only required if it can be switched on or off by the *market participant* operating personnel remotely or at the facility. b) Synchronizing Breaker Status for each *electricity storage unit*. Where an *electricity storage facility* is designed such that no low voltage synchronizing breaker is installed for each *electricity storage unit*, the status of the appropriate HV breaker(s) and disconnect switch(es) normally used to isolate the *electricity storage unit* must be provided. Where this results in access to the majority of breakers on a bus, the status of the remainder of the breakers shall be provided to complete the bus configuration. Where an *electricity storage facility* is designed such that there are disconnect switches in parallel, or directly in series, with the synchronizing breaker, the status of those switches is also required.

TYPE	SCADA INFORMATION REQUIREMENTS
	c) *Remedial Action Scheme* status for each applicable *electricity storage unit*.
Self-scheduling electricity storage facility with a name-plate rating of less than 10 MW	Monitored Quantities 1. Active Power (MW) and Reactive Power (MX) injected or withdrawn: a) The standard requirement for active and reactive power is the provision of *net MW* and *net MX* or *gross MX*. *Gross MW* and *gross MX* or *net MX* are also to be provided, if designated by the IESO as required for: (i) determination of operating *security limits*; (ii) to maintain reliable operation of the *IESO-controlled grid*; (iii) for compliance monitoring purposes; or (iv) if provision of only the standard requirement values as defined above would have a negative impact on other *market participants* through reduced operating *security limits*. b) For *electricity storage facilities* that have not been aggregated pursuant to Chapter 7 section 2.3: (i) for a group of *electricity storage units* if those *electricity storage units* are similar in size and operating characteristics, the standard requirement as defined in part a) shall be provided as a total for these *electricity storage units*, and total *gross MW* and *gross MX* or *net MX* shall be provided if designated by the *IESO* as required using the criteria listed above in part a); (ii) if designated by the *IESO* as required for determination of operating *security limits* or to maintain reliable operation of the *IESO-controlled grid* or for compliance monitoring purposes, the standard requirement as defined in part a) for each *electricity storage unit* shall be provided, and *gross MW* and *gross MX* or *net MX* for each *electricity storage unit* shall be provided if designated by the *IESO* as required using the criteria listed above in part a). c) For *electricity storage facilities* that have been aggregated pursuant to Chapter 7 section 2.3: (i) the standard requirement as defined in part a) shall be provided as an aggregated total, and an aggregated total *gross MW* and *gross MX* or *net MX* shall be provided if designated by the IESO as required using the criteria listed above in part a); or (ii) if so designated by the *IESO* as required for determination of operating *security limits* or to maintain reliable operation of the *IESO-controlled grid* or for *dispatch* compliance monitoring

TYPE	SCADA INFORMATION REQUIREMENTS
	purposes, the standard requirement as defined in part a) for each *electricity storage unit* shall be provided, and *gross MW* and *gross MX* or *net MX* for each *electricity storage unit* shall be provided if designated by the *IESO* as required using the criteria listed above in part a). 2. Voltage: a) For *electricity storage unit*s that are VAR dispatchable, unit terminal voltage, except if the *electricity storage units* are connected to a common low voltage bus section, then the bus section voltage is adequate for those *electricity storage units*. 3. State of Charge and Charge Limit a) For each electricity storage unit or electricity storage facility, the state of charge of the applicable *electricity storage unit* or *electricity storage facility* b) For each *electricity storage unit* or *electricity storage facility* the economic maximum charge limit, the economic minimum charge limit expressed in MWh 4. Dynamic Maximum and Minimum Power a) For each *electricity storage unit*, the economic maximum power mode and economic minimum power mode, expressed in MW. 5. Base point a) For each *electricity storage unit* associated with a *resource*, providing *regulation* the basepoint of the applicable *electricity storage unit* expressed in MW according to the applicable *market manual*. 6. Equipment Status a) Automatic Voltage Control status and Stabilizer status (if applicable) for each *electricity storage unit* if the status of this equipment is designated by the *IESO* as required for determination of operating *security limits* or to maintain reliable operation of the *IESO-controlled grid*. When applicable, stablizer status reporting is only required if it can be switched on or off by *market participant* operating personnel remotely or at the *facility*. b) Synchronizing Breaker Status for each *electricity storage unit*. Where an *electricity storage facility* is designed such that no low voltage synchronizing breaker is installed for each *electricity storage unit*, the status of the appropriate HV breaker(s) and disconnect switch(es) normally used to isolate the *electricity storage unit* must be provided. Where this results in access to the majority of breakers

TYPE	SCADA INFORMATION REQUIREMENTS
	on a bus, the status of the remainder of the breakers shall be provided to complete the bus configuration. Where an *electricity storage facility* is designed such that there are disconnect switches in parallel, or directly in series, with the synchronizing breaker, the status of those switches is also required. c) *Remedial Action Scheme* status for each applicable *electricity storage unit*.
Small electricity storage facility	None
Minor electricity storage facility that is embedded in a distribution system and registered as a dispatchable electricity storage participant	Monitored Quantities 1. Total active power (MW) output of the individual *electricity storage unit* or of the aggregated resource. a) Unit status if the *facility* is comprised of a single *electricity storage unit*. b) Aggregated resource status if the *facility* is comprised of aggregated resources, i.e. if at least one unit of the aggregated resource is synchronized, the aggregated resource is synchronized or if no unit in the aggregated resource is synchronized, the aggregated resource is not synchronized. c) Reactive Power (MX) output, if requested by the *IESO* for reliable operation of the *IESO-controlled grid*, of individual *electricity storage units* or of the aggregated resource. d) Unit terminal voltage (kV) if requested by the IESO for reliable operation of the *IESO controlled grid* 2. State of Charge and Charge Limit a) For each electricity storage unit or electricity storage facility, the state of charge of the applicable electricity storage unit or electricity storage facility expressed as a percentage b) For each *electricity storage unit* or *electricity storage facility*, the economic maximum charge limit, the economic minimum charge limit expressed in MWh 3. Dynamic Maximum and Minimum Power a) For each *electricity storage unit* or *electricity storage facility*, the economic maximum power mode and economic minimum power mode, expressed in MW. 4. Base point

TYPE	SCADA INFORMATION REQUIREMENTS
	a) For each *electricity storage unit* or *electricity storage facility* associated with a *resource*, providing *regulation*, the basepoint, if applicable, of the *electricity storage unit* expressed in MW according to the applicable *market manual*.

Type	Synchrophasor Data Requirements
Electricity storage facility	For all three phases the voltage and current phasor measurements and frequency measurements, as further described in the applicable *market manual,* shall be required for each *electricity storage unit* as outlined below; 1. For all *electricity storage units* with a name-plate rating at greater than 20 MVA, measured from the *electricity storage facility* side of the *connection point* to the *IESO-controlled grid*. 2. For all *electricity storage units* connected to the *IESO-controlled grid* through a common *connection point* whose aggregate name-plate rating size is greater than 20 MVA, measured from the *electricity storage facility* side of the *connection point* to the *IESO-controlled grid* 3. For all *electricity storage units*, regardless of rated size, that are associated with, or have the potential to, impact an Interconnection Reliability Operating Limit, measured from the terminals defining the Interconnection Reliability Operating Limit. 4. Notwithstanding the foregoing, a *market participant* is not required to measure and provide such data when exempted from such requirement as determined in accordance with the applicable *market manual*.