



Market Rule Amendment Proposal

PART 1 – MARKET RULE INFORMATION

Identification No.:	MR-00444-R00		
Subject:	Reliability-Related Information		
Title:	Connection-related reliability information		
Nature of Proposal:	<input checked="" type="checkbox"/> Alteration	<input checked="" type="checkbox"/> Deletion	<input type="checkbox"/> Addition
Chapter:	4, 5, 11	Appendix:	Appendix 4.5A, 4.5, 4.6, 4.7, 4.8, 4.9 Appendix 7.4
Sections:	Chapter 4: 6.1.6.2, 6.6.2, 7.1.3, 7.1.4, 7.1.5. Chapter 5: 3.3.1, 3.3.2 Appendix 7.4; 1.1.1		
Sub-sections proposed for amending:	Various		

PART 2 – PROPOSAL HISTORY

Version	Reason for Issuing	Version Date
1.0	Draft for Technical Panel Review and Comment	May 19, 2020
2.0	Publish for Stakeholder Review and Comment	May 28, 2020
3.0	Submitted for Technical Panel Vote	June 16, 2020
4.0	Recommended by Technical Panel; Submitted for IESO Board Approval	June 23, 2020
5.0	Approved by IESO Board	August 26, 2020
Approved Amendment Publication Date:	August 27, 2020	
Approved Amendment Effective Date:	September 21, 2020	

PART 3 – EXPLANATION FOR PROPOSED AMENDMENT

Provide a brief description of the following:

- 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

Appendices 4.5A, 4.6, 4.7, 4.8 and 4.9 of Chapter 4 contain tables that are no longer needed. The information required since these tables were written has changed, and market participants are now required to submit this information through Online IESO. As such, these appendices can be removed. However, their removal will require changes to the defined term *reliability-related information* which refers to these appendices. Given the limited use of this defined term and the potential for conflict with sections of chapter 5, this defined term will now be renamed and redefined. Additional changes, that the IESO does not believe are material, will also be made to market manual 11, part 11.3: Reliability Information Catalogue, to reflect the removal of these Appendices, and to Chapter 5 to provide consistency between the rules and the manual.

Background

The following appendices of Chapter 4 contain tables outlining information to be provided by market participants (MPs)

- 4.5A- Generic Information (e.g. thermal ratings, relay information)
- 4.6- Generation Facilities (generation unit data, characteristics)
- 4.7- Facilities of Connected Wholesale Customers and Distributors Connected to the IESO controlled grid (e.g. load shape, motor loads)
- 4.8- Network Impact Information: Ancillary Services Providers (characteristics required to participate in ancillary services)
- 4.9 Transmission Facilities (e.g. circuit breakers)

These tables are to be removed. The information referred to through the above appendices is now collected via Online IESO as part of market registration. It may also be required during the connection assessment process. The specific data required can be found in LST-48 “Register Facility Help File” which can be found [here](#).

The term *reliability-related information* is defined as follows;
Reliability-related information means information described in Appendices 4.1 to 4.9 of Chapter 4;

The removal of appendices 4.5A through to 4.9 will require a change to this defined term. In addition, Section 3.3 of Chapter 5 shares the same name, reliability-related information, but refers to a broader set of information required for reliability, and not just the connection assessment information referred to in the defined term. Changing the name of the term to more accurately reflect the content of the data required would reduce the potential for confusion with section 3.3 of Chapter 5.

Section 3.3.2 of Chapter 5 refers to a *catalogue of reliability-related information*. This Market Manual contains several references to the appendices that will be removed, and so will require updating. Additionally, the consistency between the market manual and market rules could be improved when referring to the direction of information flows. Specifically, the market manual is structured around two sections; reliability information provided by the IESO and reliability information required by the IESO. The opportunity exists now to revise the market rules to be consistent with the market manual and improve the clarity on the direction of the information flows.

Discussion

Chapter 4 Appendix

- Replace appendices 4.5A to 4.9 inclusive with [Intentionally Left Blank] so as to retain the numbering sequence.

Chapter 11;

- Rename the defined term *reliability-related information* to *connection-related reliability information* and replace the reference to the appendices with a reference to the connection assessment and market registration processes. Appendices 4.1 to 4.4 serve a related but separate purpose than those stipulated by section 2.2.5 of Chapter 7 and 6.1.6.2 of Chapter 4. As such they remain in the market rules, but not as part of the (re)defined term.

Chapter 4;

- Replace the reference to Appendices 4.5A to 4.9 with the newly defined term *connection-related reliability information* in the following sections;
 - o 6.1.6.2
 - o 7.1.3
 - o 7.1.4
 - o 7.1.5

Chapter 7, appendix

- Section 1.1.1; replace the reference to appendices 4.5A and 4.9 of chapter 4 with the newly defined term *connection-related reliability information*.

Chapter 5

- Revise sections 3.3.1 and 3.3.2 to refer to information provided to market participants from the IESO and information required by the IESO from market participants.

Changes to Market Manual 11, Part 11.3; will replace references to Appendices 4.5A to 4.9 with the LST-48 "Register Facility Help File".

PART 4 – PROPOSED AMENDMENT

Chapter 11

connection-related reliability-related information means any information provided or requested described in Appendices 4.1 to 4.4 4.9 of Chapter 4 and pursuant to section 2.2.5 of Chapter 7 and/or section 6.1.6.2 of Chapter 4.

Appendix 4.5A – ~~Generic Information~~ [Intentionally left blank]

Submission Date		
Identification	Identifier	
	Facility identifier	
Service Dates	Initial in-service:	
	Permanent in-service:	
	Permanent out-of-service:	
Protection System Description (all transmitters to provide, also generators and connected wholesale customers upon request)	<p>A functional description of all protective schemes shall be provided to allow a detailed analysis of all credible contingencies. These descriptions shall include, but are not limited to, the following:</p> <ul style="list-style-type: none"> Operating times for protection components (e.g. primary relaying, auxiliary relaying, communication); General models for normal and delayed (breaker failure) fault clearing, and Exceptions to the general model (e.g. LEO, HIROP). <p>For all recognized contingencies, the functional description must enable fault clearing times at all terminals to be determined for both normal and delayed clearing.</p>	
Thermal Ratings	<ul style="list-style-type: none"> For the purposes of making a connection application under section 6.1.6 of Chapter 4, a <i>connection applicant</i> shall provide the <i>IESO</i> with the transmission equipment thermal ratings as specified in Appendix 4.9; Prior to placing any new or modified <i>connected facility</i> in service, a <i>market participant</i>, including <i>transmitters</i>, <i>generators</i> and <i>connected wholesale customers</i>, that own and operate transmission equipment associated with that <i>connected facility</i> shall provide the <i>IESO</i> with the equipment thermal ratings as specified in Appendix 4.4. 	
Relay Information	Settings and characteristics to enable relay margin analysis of credible contingencies	
Detailed Single-Line	A detailed single-line diagram showing equipment and protection and telemetry points	
Test Results	Copies of all commission tests to all power system components	

Market participants and connection applicants also must provide nameplate data for equipment directly connected to the *IESO* controlled grid upon request.

Appendix 4.6 – ~~Generation Facilities~~ [Intentionally left blank]

~~Part A – Generation Facilities (Direct Connected and Embedded where Designated)~~

Unit Data	Identifier							
	Manufacturer							
	Serial Number							
	Type (e.g. salient pole, round rotor, induction)							
	Frequency (Hz)							
	NERC Unit type (e.g. Candu, Steam Turbine, Hydraulic Turbine, Wind Turbine)							
	NERC Status							
	NERC Cooling Water Source							
	NERC Fuel Type (primary, alternate)							
	NERC Fuel Transportation (primary, alternate)							
	Maximum Continuous Rating – (summer MCR, winter MCR)							
	Capability above MCR (MW), sustainability per event (hrs)							
	Description of other restriction when operating above MCR (e.g. hours/year)							
	NERC primary fuel heat rate at full load (BTU/kWhr)							
	Rated capability (MVA)							
	Rated voltage (kV)							
	Power Factor							
	Total rotational inertia of generator and turbine (s)							
	Unsaturated reactances in pu on machine base (Xo required only if unit transformer provides a zero sequence path)							
	Xd	X'd	X''d	Xq	X'q	Xl	X2	Xo
	Unsaturated open circuit time constants (s)							
	T'do		T''do		T'qo		T''qo	
	Speed (RPM)							
	Station load (MW, MVAR)							
	Minimum power (MW)							
	Normal loading and unloading ramp rates (MW/min)							
	Emergency loading and unloading ramp rates (MW/min)							
	Armature (Ra) and field resistance (Rfd*) (Ω)							
	Saturation at rated voltage (S1.0) and 20% above (S1.2)							
	Rotational inertia for generator without turbine (s) (upon request only)							
	Damping							
	Base field current (A)							
	Base field voltage (volts)							
Losses at 1.0 and 0.9 power factor (MW)								
Characteristics	Open circuit saturation curve							
	Short circuit curve							
	V-curves							
	Capability curve							

*Field resistance for hydraulic units should be specified at 75°C and at 100°C for thermal units.

EXCITATION SYSTEM MODEL

A block diagram suitable for stability studies or an IEEE standard model type with all in-service parameter values for the exciter. Models for stabilizers, under-excitation limiters, and over-excitation limiters shall be provided where applicable.	For each unit 10 MVA or larger
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GOVERNOR AND PRIME MOVER SYSTEM MODEL

A block diagram suitable for stability studies or an IEEE standard model type with all in-service parameters values for the governor and prime mover (turbine). More detailed models would be required if off-nominal frequency or shaft torsional studies are required.	For each unit 10 MVA or larger
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Part B Embedded Generation Facilities

For each unit	Type (e.g. salient pole, round rotor, induction)	
	Rated capability (MVA)	
	Rated voltage (kV)	
	Rated power factor	
	Maximum continuous rating (MW)	
	Maximum capability under emergency conditions (MW)	
	Fuel Type	
	Emergency Ramp Rate (MW/minute)	

Part C Variable Generation (Directly Connected)

Wind Farm (WF) or Solar Farm (SF) Facilities

Wind Turbine/ PV Inverter			Type 1	Type 2
	Manufacturer			
	Model			
	Technology			
	Rated Voltage			
	Rated MVA			
	Rated MW			
	Qmax (MVar)			
	Qmin(MVar)			
	Xd''/Id''(pu)			
	Reactive Capability Curve		Please Attach File	Please Attach File
	Voltage Protection		Please Attach File	Please Attach File
	Frequency Protection		Please Attach File	Please Attach File
	GSU Transformer			
Voltage Ratio				
MVA				
R(%)				
X(%)				

Collector System	ID	Total MW	# of Type 1	# of Type 2	Equivalent Positive-Sequence Impedance*			Equivalent Zero-Sequence Impedance**		
					R1	X1	B1	R0	X0	R0
					C1					
C2										
C3										

*Reduction approach is based on equal loss criteria.

** Optional upon request.

Functional description of voltage control system	Please Attach File
Functional description of frequency control system	Please Attach File
Parameters for WF/SF dynamic model	Please Attach File
Block diagram for WF/SF dynamic model (if user defined)	Please Attach File
Source code for WF/SF dynamic model (if user defined)	Please Attach File

Appendix 4.7 – Facilities of Connected Wholesale Customers and Distributors Connected to the IESO-controlled Grid

[Intentionally left blank]

Load Schedule	Date		Peak Load	Power Factor	Load Factor				
	Commissioning		MW	%	%				
	Initial		MW	%	%				
	Ultimate		MW	%	%				
Nature of Load	Composition (e.g. % industrial, % commercial, % residential)								
	Requirement for dual supply								
	Description of unusual sensitivity to voltage or frequency fluctuations								
	Description of unusual consequences of power outages								
Power Quality Upon request	Harmonics (frequency, magnitude)								
	Flicker (voltage change, frequency)								
	Phase Imbalance (%)								
	Variable Speed Drives		Demand (kVA)	Description					
	Welding Equipment		Demand (kVA)	Description					
	Static Converters		Demand (kVA)	Description					
	Furnace		Demand (kVA)	Description					
	Other discontinuous or harmonic rich load		Demand (kVA)	Description					
	Capacitors		Demand (kVA)	Description					
	Generators		Total Size (kVA)		Description				
Load Shape	November to April (Winter) Maximum Demand				May to October (Summer) Maximum Demand				
	Weekday		Weekend		Weekday		Weekend		
	Hours (EST)	MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
	00:00-04:00								
	04:00-08:00								
	08:00-12:00								
	12:00-16:00								
	16:00-20:00								
20:00-24:00									
Motors ≥ 500 HP	Type (e.g. squirrel cage, wound rotor, synchronous)								
	Rated capability (MVA or HP)								
	Power factor								
	Starting method (e.g. full-voltage, resistive, reduced-voltage, delta-wye)								
	Starts per day								
Induction Motors	Identifier								

$\geq 25,000$ HP or ≥ 500 HP per request	Rated capability (MVA or HP)								
	Rated torque (per unit on machine base)								
	Rated slip (per unit on machine base)								
	Starting torque (per unit on machine base)								
	Starting current (per unit on machine base)								
	Starting power factor								
	Peak torque (per unit on machine base)								
Locked rotor current (per unit on machine base)									
Synchronous Motors ≥ 500 HP	Identifier								
	Rated capability (MVA or HP)								
	X''_d (unsaturated subtransient reactance in per unit on machine base)								
	For each synchronous motor ≥ 5000 HP								
	Rotational inertia constant H of motor and load (s)								
	Unsaturated reactances (per unit on machine base)								
	X_d	X'_d	X''_d	X_q	X'_q	X''_q	X_l	X_2	X_0
	Unsaturated open-circuit time constants (s)								
	T'_{do}	T''_{do}	T'_{qo}	T''_{qo}					
	Armature resistance (Ra) (per unit on machine base)								
Saturation at rated voltage (S1.0) and 20% above (S1.2)									

EXCITATION SYSTEM MODEL

A block diagram suitable for stability studies or an IEEE standard model type with all in-service parameter values for the exciter. Models for stabilizers, under-excitation limiters, and over-excitation limiters shall be provided where applicable.	For each synchronous motor 10 MVA or larger
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Appendix 4.8 – [Intentionally left blank] Network Impact Information: Ancillary Services Providers

Target In-Service Dates	Initial In-Service:					
	Permanent Station In-Service:					
Reactive Support Service and Voltage Control Service	VAR Source	Type	Minimum	Min Required	Maximum MX	Max Required
Black Start Capability	Minimum Number of Starts					
	Maximum Time on In-house Load (minutes)					
	Island Governing Capability					
	Interconnected Governing Capability					
	Maximum Reactive Capability (MVAR)					
	Minimum Reactive Capability (MVAR)					
Automatic Generation Control	Maximum Power (MW)					
	Minimum Power (MW)					
	Power Ramping Rate (MW/min)					
Operating Reserve	Starting Time (for Non-synchronized Reserve only)					
	Maximum Power (MW)					
	Minimum Power (MW)					
	Power Ramping Rate (MW/min)					

Appendix 4.9 – [Intentionally left blank]

Transmission Facilities

Shunt Capacitors	Identifier		
	Station		
	Manufacturer and serial number		
	Rated voltage (kV)		
	Rated capability (MVAR)		
	Discharge time (ms)		
	Current limiting reactor (ohms)		
	Synchronous closing unit		
	Bank arrangement (e.g. delta, wye, double-wye, etc)		
	Description of protection		
	Description of automatic switching		
Anticipated switching restrictions			
Circuit Breakers	Identifier		
	Station		
	Manufacturer and serial number		
	Rated voltage (kV)		
	Interrupting time (ms)		
	Interrupting media (e.g. air, oil, SF ₆)		
	Rated continuous current (A)		
Rated symmetrical short circuit capability (A)			
Shunt Reactors	Identifier		
	Station		
	Manufacturer and serial number		
	Rated voltage (kV)		
	Rated capability (MVAR)		
	Winding configuration (e.g. delta, wye)		
	Description of protection		
	Description of automatic switching		
Description of anticipated switching restrictions			

Transformers	Identifier						
	Station						
	Manufacturer and serial number						
	Construction (e.g. shell or core)						
	Configuration (e.g. 3 phase or three single phase)						
	Temperature rise (°C)						
	Cooling types (e.g. ONAN, ONAF, OFAF)						
	Associated Thermal Rating for each cooling type (MVA)						
	Winter (10°C) continuous, 15 minute and 10 day thermal ratings (A)						
	Summer (30°C) continuous, 15 minute, and 10 day thermal ratings (A)						
	Connection for each winding H, X, Y (e.g. wye, delta, zig-zag)						
	Rated voltage for each winding (kV)						
	Rated capability for each winding (MVA)						
	Impedance to ground for each winding H, X, Y (ohms)						
	Impedance Test Data (see IEEE-C57.12.90)	See IEEE-C57.12.90 for measurement techniques	Positive Sequence Impedance (%)	HX	HY	XY	
			R				
			X				
	Zero sequence data is required for transformers with 1 or 2 external neutrals		MVA				
		H winding energized all others open	Closed tertiary zero seq. impedance (%)	H	X	HX	XH
			R				
			X				
			MVA				
		HX winding energized X winding shorted	Open tertiary zero sequence impedance (%)	H	X	HX	XH
		R					
		X					
		MVA					
		In-service off-load tap (kV)					
	Off-load taps (kV)						
	On-load taps (kV) (max tap, min tap, number of steps)						
	Core and Excitation Losses (kW, kvar)						

Overhead Circuits (For each section)	Identifier			
	Terminal station(s)			
	Voltage (kV)			
	Length (km)			
	Identifier(s) and length of circuit(s) on common towers			
	Positive sequence impedance (R, X, B)			
	Zero sequence impedance (Ro, Xo, Bo)			
	Winter (10°C) continuous and limited time* thermal ratings (A)			
Overhead Circuits (For each segment)	Identifier			
	Length (km)			
	Distance from the "from" terminal (km)			
	Ground resistivity (ohms)			
	Identifier and length of circuits sharing the same right of way			
	Mutual impedance to other circuits (Z_{mut})			
Underground Circuits	Identifier			
	Complete steady state and dynamic electrical and physical parameters of conductors, insulators and surrounding material			
Buses	Identifier			
	Station			
Surge Arresters	Identifier			
	Station			
	Manufacturer and serial number			
	Voltage rating (kV)			
	Type (e.g. ZnO, SiC)			
Switches	Class (e.g. secondary, distribution, intermediate, station)			
	Identifier			
	Station			
	Manufacturer and serial number			
	Voltage rating (kV)			
Wavetraps	Type (e.g. disconnect, interrupt)			
	Continuous current rating (amps)			
	Identifier			
	Station			
Current Transformers	Manufacturer and serial number			
	Continuous current rating (amps)			
	Identifier			
	Station			
DC Lines	Manufacturer and serial number			
	Identifier			
FACTS Devices	Complete steady state (loadflow) parameters and dynamic parameters			
	Identifier			
	Complete steady state (loadflow) parameters and dynamic parameters			

*Limited time thermal ratings shall be 15 minute ratings, unless mutually agreed by the IESO and market participant.

Chapter 4

6. Establishing or Modifying IESO-Controlled Grid Facilities and

Connections

6.1 General Requirements

6.1.6 A *connection applicant* shall:

- 6.1.6.1 file a *request for connection assessment* to obtain the assessment referred to in section 6.1.5 and the approval of the *IESO* in accordance with the provisions of sections 6.1.14 to 6.1.18; and
- 6.1.6.2 where applicable, obtain the approval of the *IESO* pursuant to section 6.1.22.

Without limiting the generality of sections 6.1.14 and 6.1.15, ~~the IESO shall define the form and content of information required for a *request for connection assessment*.; *each request for connection assessment shall meet the requirements of section 6.1.15 and shall be accompanied by the information referred to in Appendices 4.5A to 4.9, as may be applicable, or such portion of that information as the IESO may allow.* The ~~Such~~ *connection applicant* shall notify the *transmitter* of the filing of such request for *connection assessment*.~~

7.1 Provision of Information

- 7.1.3 Each *generator* whose *generation facility* is *connected* to the *IESO-controlled grid*, *connected wholesale customer* and *distributor* connected to the *IESO-controlled grid*, and *transmitter* shall provide to the *IESO* ~~the information described in Appendices 4.5A to 4.9;~~ *connection-related reliability information as applicable* prior to placing any *connected facility* into service.
- 7.1.4 Each *embedded generator* whose *embedded generation facility* includes a *generation unit* rated at greater than 10 MVA and that is designated by the *IESO* for the purposes of this section 7.1 shall provide to the *IESO* ~~the information described in Part A of Appendix 4.6~~ *connection-related reliability information* as may be requested by the *IESO*.
- 7.1.5 Each *embedded generator* that:
 - 7.1.5.1 participates in the *IESO-administered markets* and whose *embedded generation facility* includes a *generation unit* rated at 1 MW or higher;
 - 7.1.5.2 is a non-market participant and whose *embedded generation facility* includes a *generation unit* rated at 10 MVA or higher,

and that is not required to provide data pursuant to section 7.1.4, shall provide the *IESO* with *applicable connection-related reliability information*. ~~the data listed in Part B of Appendix 4.6.~~

Appendix 7.4 – Transmission Information Required for Scheduling and Dispatching

1.1 Transmission Information Required for Scheduling and Dispatching

- 1.1.1 Full *connection-related reliability information* and transmission system data is required to be provided and updated to the *IESO* in accordance with ~~Appendices Section 2.2.5 of Chapter 7 and Appendices 4.5A, 4.9 and Appendix 4.16~~ of Chapter 4.

Chapter 5

3.3 Reliability-Related Information

- 3.3.1 Within 90 days after the date of coming into force of this Chapter, the *IESO* shall *publish* a list of the categories of *reliability*-related information that it shall ~~make available~~ *provide* to *market participants*, the time periods within which such information will be provided, and the manner in which such information will be provided. Such information shall include, but not be limited to, information designed to:
- 3.3.2 Within 90 days after the date of coming into force of this Chapter, the *IESO* shall *publish* a catalogue of the *reliability*-related information that the *IESO* shall require ~~from be provided to it by~~ *market participants*, including the information referred to in section 14.1.3, the time periods within which such information will be provided and the manner in which such information will be provided. At the same time, the *IESO* shall *publish* initial monitoring indices that the *IESO* shall use in evaluating the information so provided.