C. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

In Québec, "Compliance Enforcement Authority" means the Régie de l'énergie in its roles of monitoring and enforcing compliance with respect to the Reliability Standard and to this appendix.

1.2. Evidence Retention

No specific provisions.

1.3. Compliance Monitoring and Assessment Program

The Régie de l'énergie establishes the monitoring processes used to evaluate data or information for the purpose of determining compliance or non-compliance with the Reliability Standard and with this appendix.

Violation Severity Levels

No specific provisions.

D. Regional Variances

No specific provisions.

Violation Severity Levels

No specific provisions.

E. Associated Documents

No specific provisions.

PRC-024 — Attachment 1

No specific provisions.

PRC-024 — Attachment 2

No specific provisions.

PRC-024 – Attachment 2A

Specific provision regarding boundary details:

It is acceptable to use a measurement of the Root Mean Square (RMS) value of the overvoltage or undervoltage (phase-to-phase or phase-to-ground) provided or when it can be proven that the trip associated with these protections occurs only when this overvoltage or undervoltage is present simultaneously on the three phases.

Appendix PRC-029-1-QC-1
Specific provisions applicable in Québec for standard PRC-029-1 – Frequency and Voltage Ride-through Requirements for Inverter-based Resources

This appendix establishes specific provisions for the application of the standard in Québec. Provisions of the standard and of this appendix must be read jointly for comprehension and interpretation purposes. Where the standard and appendix differ, the appendix shall prevail.

A. Introduction

1. Title: No specific provisions.

2. Number: No specific provisions.

3. Purpose: No specific provisions.

4. Applicability: In the application of this standard, all reference to the term "Bulk Electric System" or "BES" shall be replaced by the terms "Main Transmission System" or "RTP" respectively.

4.1. Functional Entities:

No specific provisions.

4.2. Facilities:

4.2.1 No specific provisions.

4.2.2 Non-RTP Inverter-Based Resources that either have or contribute to an aggregate nameplate capacity of greater than or equal to 50 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 44 kV

5. Effective Date:

5.1. Adoption of the standard by the Régie de l'énergie: MM DD YYYY

5.2. Adoption of the appendix by the Régie de l'énergie: MM DD YYYY

5.3. Effective date of the standard and its appendix in Québec: MM DD YYYY

The facilities covered by standard PRC-029-1 must comply with the implementation dates indicated in the following table:

Appendix PRC-029-1-QC-1
Specific provisions applicable in Québec for standard PRC-029-1 – Frequency and Voltage Ride-through Requirements for Inverter-based Resources

Type of Inverter-Based Resources	Applicability	Date of enforcement in Québec
For requirement R1 to R3		
Capability-Based Elements		
RTP Inverter-Based Resources	Entities shall comply to design-related requirements R1, R2 and R3 for all their Non-RTP Inverter-Based Resources.	No later than the effective date of PRC-029-1
Non-RTP Inverter-Based Resources	Entities shall comply to design-related requirements R1, R2 and R3 for all their Non-RTP Inverter-Based Resources.	No later than three (3) calendar months following the effective date of PRC-029-1
Performance Based-Elements		
For all Inverter-Based Resources	Entities shall comply to operation-related requirements R1, R2 and R3 for all Inverter-Based Resources.	At the time of disturbance monitoring equipment installation for these *IBR*, in accordance with the implementation of the PRC-029-1 reliability standard
For requirement R4		
RTP Inverter-Based Resources	Entities shall comply to requirements R4 for all their RTP Inverter-Based Resources.	No later than the effective date of PRC-029-1
Non-RTP Inverter-Based Resources	Entities shall comply to requirements R4 for all their Non-RTP Inverter-Based Resources.	No later than three (3) calendar months following the effective date of PRC-029-1

Equipment and processes limitations related to requirement R4

A limited and documented exemption is acceptable for certain existing IBR with duly documented equipment limitations. These IBRs are:

> " … typically older IBR technologies whose hardware must be physically replaced and for which settings and configurations cannot be changed via software updates — and which may be unable to implement the performance requirements related to voltage ride-through."

To ensure compliance with requirement R4, only IBR in operation on the effective date of standard PRC-029-1 can be considered for a potential exemption.
Furthermore, only IBR that are unable to meet ride-through voltage disturbance requirements due to technical limitations preventing modification of their coordinated protection and control settings may be eligible for a potential exemption.

B. Requirements and Measures

R1. Each Generator Owner shall ensure the design and operation is such that each IBR meets or exceeds Ride-through requirements, in accordance with the "must Ride-through[1] zone" as specified in Attachment 1, except in the following conditions:
Violation Risk Factor: High] [Time Horizon: Operations Assessment] No specific provisions

- No specific provisions ;
- No specific provisions ;
- No specific provisions ; or
- The Volts per Hz (V/Hz) at the high-side of the main power transformer exceed 1.2 per unit for longer than 45 seconds or exceed 1.32 per unit for longer than 2 seconds.

C. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

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1.2. Evidence Retention

No specific provisions.

1.3. Compliance Monitoring and Enforcement Program:

No specific provisions.

Violation Severity Levels

No specific provisions.

D. Regional Variances

No specific provisions.

E. Interpretations

No specific provisions.

F. Associated Documents

No specific provisions.

G. References

No specific provision

[1] This operating region includes any no-trip band associated with the loss of synchronisation of the phase-locked loop.

Attachment 1 : Voltage Ride-Through Criteria

Table 1: Voltage Ride-through Requirements for all IBR[2]

Voltage (p.u.)[3]	Operation Region	Minimum Ride-Through Time (sec)
> 1,40	Mandatory Operation Region[4]	0,033
> 1,25	Mandatory Operation Region	0,1
> 1,20	Mandatory Operation Region	2
≥ 1,15	Mandatory Operation Region	30
> 1,10	Mandatory Operation Region	300
≤ 1,1 and ≥ 0,90	Mandatory Operation Region	Continuous
< 0,90	Mandatory Operation Region	30
< 0,85	Mandatory Operation Region	2,0
< 0,75	Mandatory Operation Region	1,0
< 0,25	Mandatory Operation Region	3,4*V (p.u.) + 0,15[5]
< 0,10	Permissive Operating Region	3,4*V (p.u.) + 0,15[4]

1. Table 1 applies to every type of IBR, including, but not limited to the following facilities:

a. IBR, regardless of their energy resource, interconnecting via a dedicated VSC HVDC transmission facility.

b. Other IBR or hybrid IBR consisting of photovoltaic (PV) and BESS, including type 3 and type 4 wind IBR or hybrid IBR that include wind, unless connected via a dedicated Voltage Source Converter - High Voltage Direct Current (VSC-HVDC) transmission facility.

2. Table 2 does not apply in Quebec since Table 1 includes all other IBR mentioned.

3. No specific provisions.

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[2] Refer to bullet #1 of Attachment 1.
[3] Refer to bullet #4 of Attachment 1.
[4] Temporary blocking is permitted if it is initiated by an overvoltage whose root-mean-square (RMS) value exceeds 1.4 p.u., measured phase-to-ground at the IBR facility (SERMO), which may occur on one or more phases, and only after a minimum duration of 0.022 seconds.
[5] To recover from a potential circuit breaker failure on the transmission system, an additional Ride-Through requirement of 150 ms shall apply, in addition to the duration determined by the aforementioned equation, for a residual voltage between 0.25 p.u. and 0 p.u. affecting only a single phase, thereby resulting in a total Ride-Through duration of 300 ms at 0 p.u.

Attachment 2: Frequency Ride-Through Criteria

Table 3 : Frequency Ride-through Capability Requirements

System Frequency (Hz)	Minimum Ride-Through Time (sec)
> 61,7	May trip
> 61,5	90
> 60,6	660
≤ 60,6 and ≥ 59,4	Continuous
< 59,4	660
< 58,5	90
< 57,5	10
< 57,0	2
< 56,5	0,35
< 55,5	May trip

1. No specific provisions.

2. No specific provisions. Furthermore, issuing a trip command with no intentional delay is permitted, provided that the frequency measurement is reliable and immune to angle jumps and transient phenomena.

3. No specific provisions.

4. No specific provisions.

5. No specific provisions.