
Project QC-2017-03

Standard PRC-006-3 – Automatic Underfrequency Load Shedding

1. Assessment of relevance

Automatic underfrequency load shedding (UFLS) programs are designed to arrest sudden frequency decays, assist recovery of frequency following underfrequency events and provide last resort Bulk Electric System (BES) preservation measures.

Standard PRC-006-3 establishes design, documentation and assessment requirements for such programs. The Standard contains a technically valid method for achieving its reliability objective by establishing a clear, unambiguous framework regarding what is required and who must comply with the reliability standard.

PRC-006-3 differs slightly from PRC-006-2. The Québec variant of PRC-006-3 clarifies the technical specification regarding the underfrequency load shedding threshold following an incident. The frequency stabilization threshold was changed to 59.0 Hz, compared to its earlier value of 59.3 Hz. The 59.3-Hz threshold resulted in frequent load shedding having no beneficial effect on Québec Interconnection reliability, hence the change.

The Québec Interconnection thus has unique characteristics with respect to generating facilities and protection systems. A simulation of underfrequency conditions based on an imbalance scenario with an imbalance of up to 25% within identified islands is ill-suited to the Québec power system.

The 25% rule has thus been replaced by extreme contingencies affecting imbalance (load vs. actual generation output) not covered by the emergency plan.

Those contingencies are as follows:

- Loss of the entire capability of a generating station;
- Loss of all transmission circuits emanating from a generating station, switching station, substation or DC terminal;
- Loss of all transmission circuits on a common right-of-way;
- Three-phase fault with failure of a circuit breaker to operate and correct operation of a breaker failure protection system and its associated breakers;
- Three-phase fault on a circuit breaker, with normal fault clearing;
- The operation or partial operation of an SPS for an event or condition for which it was not intended to operate.

To take into account the unique characteristics of generating facilities and protection systems in the Québec power system, the Planning Coordinator must develop an UFLS plan that meets PRC-006-3 criteria when underfrequency conditions resulting from each of the above extreme contingencies are simulated.

The main changes in the new version are summarized below.

Main changes in PRC-006-3 vs. PRC-006-2

PRC-006-2	PRC-006-3
UFLS threshold: 59.3 Hz	Changed to 59.0 Hz
Imbalance of up to 25% during underfrequency conditions	Series of extreme contingencies not covered by RAS
Requirements D.A.3.1 and D.A.3.2	Increase from 30 to 60 seconds in the time specified for the frequency to remain above the underfrequency performance characteristic
Requirements D.A.3.3.1, D.A.3.3.2 and D.A.3.3.3	Removal of the three requirements
Requirements D.A.3.3, D.A.4.1 and D.A.4.2	Reference made to the “Québec BES”, meaning the main transmission system (RTP)
Requirements D.D.A.4.1 and D.A.4.2	Removal of a capacity of 50 MVA or more directly connected to the RTP

All of these changes are an integral part of the Québec Appendix to PRC-006-2, filed on December 18, 2016 as part of Application R-3957-2015. PRC-006-3 reflects these changes.

In its decision D-2017-110¹, the Régie stated that it could not adopt the PRC-006-2 standard until NERC and NPCC had issued a favorable opinion for the replacement of the Québec variant with the one filed in the Québec appendix. On May 3rd and August 10th, the NPCC and NERC Board of Directors respectively adopted² the PRC-006-3 standard, with an effective date of October 1st, 2017. The Québec variant of the PRC-006-3 standard contains the specific provisions found in the appendix of the PRC-006-2 standard. Given NERC and NPCC’s validation of this particular specific provision, the Coordinator considers that a quick adoption of the PRC-006-3 standard is now warranted.

Since the specific provision has been validated by NERC and NPCC, the Coordinator requests prompt adoption of Standard PRC-006-3.

2. Prerequisites to adoption

The coming into effect is subject to the adoption of Standard PRC-024-2.

3. Modifications to other standards or to glossary definitions

3.1. Standards or requirements to retire on the effective date

None

3.2. New definitions to add to glossary

None

3.3. Definitions to remove from the glossary

None

¹ [Decision 2017-110](#), paragraph 219 and 220

² [NERC filling order](#), page 1

4. Applicability

Requirement	Functions covered		
	Planning Coordinator	UFLS entities	Transmission Owners
R1	X		
R2	X		
R3	X		
R4	X		
R5	X		
R6	X		
R7	X		
R8		X	
R9		X	
R10			X
R11	X		
R12	X		
R13	X		
R14	X		
R15	X		

The UFLS entities subject to the Standard are those that own, operate or control the UFLS equipment required under the UFLS program established by the Planning Coordinator.

The Transmission Owners subject to the Standard are only those that possess elements designated in the UFLS program established by the Planning Coordinator.

5. Specific provisions for Québec (Québec Appendix)

None

6. Proposed effective dates

The table below presents the proposed dates for phasing in PRC-006-3. Compliance with requirements D.A.4.1 and D.A.4.2, applicable specifically to the Québec Interconnection, depends on receiving the trip settings provided by Generator Owners in accordance with Standard PRC-024-2. The phasing in of PRC-006-3 thus depends on that of PRC-024-2, to be filed in a future project.

Requirement	Proposed effective date in Québec
R1 and R2, D.A.3, D.A.4.3 and R5 to R16	April 1 st , 2018
D.A.4.1 and D.A.4.2 (Regional variance for the Québec Interconnection)	First day of first calendar quarter 1 year after trip settings provided by Generator Owners in Québec are available, in accordance with PRC-024-2 and its attachment

For information purposes, the table below reproduces the effective dates proposed by the Reliability Coordinator for PRC-024-1, to be filed in a future project.

Standard PRC-024-2	Facilities covered (%)	Proposed effective date in Québec
All requirements	At least 40%	October 1 st 2018
	At least 60%	October 1 st 2019
	At least 80%	October 1 st 2020
	100%	October 1 st 2021

7. Preliminary impact assessment

	Low	Moderate	High
Implementation of the standard		X	
Enforcement of the standard		X	
Compliance monitoring		X	

Definitions:

Low:	Normal industry practice that only requires minor adjustments to existing processes or practices.
Moderate:	Change that requires the allocation of some physical, human or financial resources to implement, enforce and monitor compliance with the proposed standard.
High:	Change that requires the allocation of significant physical, human or financial resources to plan, implement, enforce and monitor compliance with the proposed standard.