Standard Development Roadmap

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Development Steps Completed:

1. The Standards Committee approved the SAR for posting on November 21, 2006.
2. SAR posted for comments on November 29, 2006.
3. The Standards Committee appointed a SAR Drafting Team on January 11, 2007.
4. SAR Drafting Team responds to comments, revises SAR and posts for comments on February 7, 2007.
5. SAR Drafting Team responds to comments on April 20, 2007.
6. Standards Committee approves development of Standard on April 10, 2007.
7. The Standards Committee appointed the Standard Drafting Team on April 10, 2007.
8. The Standards Drafting Team posted draft performance characteristics for comment on July 2, 2008.
9. Standards Drafting Team responds to comments, revises standard, and posts for comments on April 15, 2009.

Proposed Action Plan and Description of Current Draft:

This is the second ballot period of the proposed standard.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. TBD	

A. Introduction

1. Title: **Automatic Underfrequency Load Shedding**

2. Number: PRC-006-1

3. Purpose: To establish design and documentation requirements for automatic underfrequency load shedding (UFLS) programs to arrest declining frequency, assist recovery of frequency following underfrequency events and provide last resort system preservation measures.

4. Applicability:

4.1. Planning Coordinators

4.2. UFLS entities shall mean all entities that are responsible for the ownership, operation, or control of UFLS equipment as required by the UFLS program established by the Planning Coordinators. Such entities may include one or more of the following:

4.2.1 Transmission Owners

4.2.2 Distribution Providers

4.3 Transmission Owners that own Elements identified in the UFLS program established by the Planning Coordinators.

5. (Proposed) Effective Date:

5.1. The standard, with the exception of Requirement R4, Parts 4.1 through 4.6, is effective the first day of the first calendar quarter one year after applicable regulatory approvals.

5.2. Parts 4.1 through 4.6 of Requirement R4 shall become effective and enforceable one year following the receipt of generation data as required in PRC-024-1, but no sooner than one year following the first day of the first calendar quarter after applicable regulatory approvals of PRC-006-1.

B. Requirements

R1. Each Planning Coordinator shall develop and document criteria, including consideration of historical events and system studies, to select portions of the Bulk Electric System (BES), including interconnected portions of the BES in adjacent Planning Coordinator areas and Regional Entity areas that may form islands. *[VRF: Medium][Time Horizon: Long-term Planning]*

R2. Each Planning Coordinator shall identify one or more islands to serve as a basis for designing its UFLS program including: *[VRF: Medium][Time Horizon: Long-term Planning]*

2.1. Those islands selected by applying the criteria in Requirement R1, and

2.2. Any portions of the BES designed to detach from the Interconnection (planned islands) as a result of the operation of a relay scheme or Special Protection System, and

2.3. A single island that includes all portions of the BES in either the Regional Entity area or the Interconnection in which the Planning Coordinator's area resides. If a Planning Coordinator's area resides in multiple Regional Entity areas, each of those Regional Entity areas shall be identified as an island

R3. Each Planning Coordinator shall develop a UFLS program, including a schedule for implementation by UFLS entities within its area that meets the following performance characteristics in simulations of underfrequency conditions resulting from an imbalance

scenario, where an imbalance = [(load — actual generation output) / (load)], of up to 25 percent within the identified island(s). *[VRF: High][Time Horizon: Long-term Planning]*

3.1. Frequency shall remain above the Underfrequency Performance Characteristic curve in PRC-006-1 - Attachment 1, either for 60 seconds or until a steady-state condition between 59.3 Hz and 60.7 Hz is reached, and

3.2. Frequency shall remain below the Overfrequency Performance Characteristic curve in PRC-006-1 - Attachment 2, either for 60 seconds or until a steady-state condition between 59.3 Hz and 60.7 Hz is reached, and

3.3. Volts per Hz (V/Hz) shall not exceed 1.18 per unit for longer than two seconds cumulatively per simulated event, and shall not exceed 1.10 per unit for longer than 45 seconds cumulatively per simulated event at each generator bus and generator step-up transformer high-side bus associated with each of the following:

3.3.1. Individual generating units greater than 20 MVA (gross nameplate rating) directly connected to the BES

3.3.2. Generating plants/facilities greater than 75 MVA (gross aggregate nameplate rating) directly connected to the BES

3.3.3. Facilities consisting of one or more units connected to the BES at a common bus with total generation above 75 MVA gross nameplate rating.

R4. Each Planning Coordinator shall conduct and document a UFLS design assessment at least once every five years that determines through dynamic simulation whether the UFLS program design meets the performance characteristics in Requirement R3 for each island identified in Requirement R2. The simulation shall model each of the following: *[VRF: High][Time Horizon: Long-term Planning]*

4.1. Underfrequency trip settings of individual generating units greater than 20 MVA (gross nameplate rating) directly connected to the BES that trip above the Generator Underfrequency Trip Modeling curve in PRC-006-1 - Attachment 1.

4.2. Underfrequency trip settings of generating plants/facilities greater than 75 MVA (gross aggregate nameplate rating) directly connected to the BES that trip above the Generator Underfrequency Trip Modeling curve in PRC-006-1 - Attachment 1.

4.3. Underfrequency trip settings of any facility consisting of one or more units connected to the BES at a common bus with total generation above 75 MVA (gross nameplate rating) that trip above the Generator Underfrequency Trip Modeling curve in PRC-006-1 - Attachment 1.

4.4. Overfrequency trip settings of individual generating units greater than 20 MVA (gross nameplate rating) directly connected to the BES that trip below the Generator Overfrequency Trip Modeling curve in PRC-006-1 — Attachment 2.

4.5. Overfrequency trip settings of generating plants/facilities greater than 75 MVA (gross aggregate nameplate rating) directly connected to the BES that trip below the Generator Overfrequency Trip Modeling curve in PRC-006-1 — Attachment 2.

4.6. Overfrequency trip settings of any facility consisting of one or more units connected to the BES at a common bus with total generation above 75 MVA (gross nameplate rating) that trip below the Generator Overfrequency Trip Modeling curve in PRC-006-1 — Attachment 2.

4.7. Any automatic Load restoration that impacts frequency stabilization and operates within the duration of the simulations run for the assessment.

R5. Each Planning Coordinator shall coordinate its UFLS program design with all other affected Planning Coordinators for each island identified by any one Planning Coordinator that encompasses all or a portion of its Planning Coordinator area through the following action(s): *[VRF: Medium][Time Horizon: Long-term Planning]*

5.1. Conduct a UFLS design assessment for each island modeling all UFLS programs in the island

5.2. In the event the UFLS design assessment in Requirement R5, Part 5.1 fails to meet Requirement R3, identify modifications to the UFLS program(s) to meet Requirement R3 and report the recommended modifications to UFLS program(s) to the affected Planning Coordinator(s) and the ERO

R6. Each Planning Coordinator shall maintain a UFLS database containing data necessary to model its UFLS program for use in event analyses and assessments of the UFLS program at least once each calendar year, with no more than 15 months between maintenance activities. *[VRF: Lower][Time Horizon: Long-term Planning]*

R7. Each Planning Coordinator shall provide its UFLS database containing data necessary to model its UFLS program to other Planning Coordinators within its Interconnection within 30 calendar days of a request. *[VRF: Lower][Time Horizon: Long-term Planning]*

R8. Each UFLS entity shall provide data to its Planning Coordinator(s) according to the format and schedule specified by the Planning Coordinator(s) to support maintenance of each Planning Coordinator's UFLS database. [VRF: Lower Time Horizon: Long-term Planning]

R9. Each UFLS entity shall provide automatic tripping of Load in accordance with the UFLS program design and schedule for application determined by its Planning Coordinator(s) in each Planning Coordinator area in which it owns assets. *[VRF: High][Time Horizon: Long-term Planning]*

R10. Each Transmission Owner shall provide automatic switching of capacitor banks, Transmission Lines, and reactors to control over-voltage as a result of underfrequency load shedding in accordance with the UFLS program and schedule for application determined by the Planning Coordinator(s) in each Planning Coordinator area in which it owns transmission. *[VRF: High][Time Horizon: Long-term Planning]*

R11. Each Planning Coordinator, in whose area a BES islanding event results in system frequency excursions below the initializing set points of the UFLS program, shall conduct and document an assessment of the event within one year of event actuation to evaluate: *[VRF: Medium][Time Horizon: Operations Assessment]*

11.1. The performance of the UFLS equipment,

11.2. The effectiveness of the UFLS program.

R12. Each Planning Coordinator, in whose islanding event assessment (per R11) UFLS program deficiencies are identified, shall conduct and document a UFLS design assessment to consider the identified deficiencies within two years of event actuation. *[VRF: Medium][Time Horizon: Operations Assessment]*

R13. Each Planning Coordinator, in whose area a BES islanding event affecting multiple Planning Coordinator areas and resulting in system frequency excursions below the initializing set points of the UFLS program, shall coordinate with the other affected Planning Coordinators on the

event assessment through the following action(s): *[VRF: Medium][Time Horizon: Operations Assessment]*

13.1. Conduct a UFLS event assessment for each island modeling all UFLS programs in the island

13.2. In the event the UFLS event assessment in Requirement R13, Part 13.1 fails to coordinate with the event assessment of other Planning Coordinator(s), each Planning Coordinator shall identify differences in the assessments that likely resulted in the differences in the event assessment results and report these differences to the affected Planning Coordinators and the ERO.

R14. Each Planning Coordinator shall respond to written comments submitted by UFLS entities within its Planning Coordinator area following a comment period and before finalizing its UFLS program, indicating in the written response to comments whether changes will be made or reasons why changes will not be made to the following *[VRF: Low][Time Horizon: Long-term Planning]*:

14.1. UFLS program, including a schedule for implementation

14.2. UFLS design assessment

14.3. Format and schedule of UFLS data submittal

C. Measures

M1. Each Planning Coordinator shall have evidence such as reports, or other documentation of its criteria to select portions of the Bulk Electric System that may form islands including how system studies and historical events were considered to develop the criteria per Requirement R1.

M2. Each Planning Coordinator shall have evidence such as reports, memorandums, e-mails, or other documentation supporting its identification of an island(s) as a basis for designing a UFLS program that meet the criteria in Requirement R2 Parts 2.1 through 2.3.

M3. Each Planning Coordinator shall have evidence such as reports, program plans, or other documentation of its UFLS program including the implementation schedule that meet the criteria in Requirement R3 Parts 3.1 through 3.3.

M4. Each Planning Coordinator shall have dated evidence such as reports, dynamic simulation models and results, or other dated documentation of its UFLS design assessment that demonstrates it meets Requirement R4 Parts 4.1 through 4.7.

M5. Each Planning Coordinator shall have dated evidence such as reports, dynamic simulation models and results, or other dated documentation demonstrating its UFLS design assessment; including, if necessary to meet the performance characteristics in Requirement R3, modifications to the UFLS program(s) and supporting documentation such as memorandums, letters, or other dated documentation that it notified the other affected Planning Coordinators and the ERO of any necessary design changes, for any islands identified by a Planning Coordinator that encompass all or a portion of its Planning Coordinator area per Requirement R5.

M6. Each Planning Coordinator shall have dated evidence such as a UFLS database, data requests, data input forms, or other dated documentation to show that it annually maintained a UFLS database for use in event analyses and assessments of the UFLS program per Requirement R6.

M7. Each Planning Coordinator shall have dated evidence such as letters, memorandums, e-mails or other dated documentation that it provided their UFLS database to other Planning Coordinators within their Interconnection within 30 calendar days of a request per Requirement R7.

M8. Each UFLS Entity shall have dated evidence such as responses to data requests, spreadsheets, letters or other dated documentation that it provided data to its Planning Coordinator according to the format and schedule specified by the Planning Coordinator to support maintenance of the UFLS database per Requirement R8.

M9. Each UFLS Entity shall have dated evidence such as spreadsheets summarizing feeder load armed with UFLS relays, spreadsheets with UFLS relay settings, or other dated documentation that it provided automatic tripping of load in accordance with the UFLS program design and schedule for application per Requirement R9.

M10. Each Transmission Owner shall have dated evidence such as relay settings, tripping logic or other dated documentation that it provided automatic switching of capacitor banks, Transmission Lines, and reactors in order to control over-voltage as a result of underfrequency load shedding in accordance with the UFLS program and schedule for application per Requirement R10.

M11. Each Planning Coordinator shall have dated evidence such as reports, data gathered from an historical event, or other dated documentation to show that it conducted an event assessment of the performance of the UFLS equipment and the effectiveness of the UFLS program per Requirement R11.

M12. If UFLS program deficiencies are identified in R11, each Planning Coordinator shall have dated evidence that it conducted a UFLS design assessment per Requirements R12 and R4.

M13. Each Planning Coordinator shall have dated evidence such as reports, dynamic simulation models and results, or other dated documentation demonstrating its UFLS event assessment; including, if necessary supporting dated documentation such as memorandums, letters and other dated documentation identifying differences in event assessments between Planning Coordinators, to demonstrate that event assessments of multiple Planning Coordinators in an affected island are coordinated or to show the reasons why the assessment results are different per Requirement R13.

M14. Each Planning Coordinator shall have dated evidence of responses, such as e-mails and letters, to written comments submitted by UFLS entities within its Planning Coordinator area following a comment period and before finalizing its UFLS program per Requirement R14.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

Regional Entity

1.2. Data Retention

Each Planning Coordinator and UFLS entity shall keep data or evidence to show compliance as identified below unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation:

- Each Planning Coordinator shall retain the current evidence of Requirements R1, R2, R3, R4, R5, R12, and R14, Measures M1, M2, M3, M4, M5, M12, and M14 as well as any evidence necessary to show compliance since the last compliance audit.

- Each Planning Coordinator shall retain the current evidence of UFLS database update in accordance with Requirement R6, Measure M6, and evidence of the prior year's UFLS database update.
- Each Planning Coordinator shall retain evidence of any UFLS database transmittal to another Planning Coordinator since the last compliance audit in accordance with Requirement R7, Measure M7.
- Each UFLS entity shall retain evidence of UFLS data transmittal to the Planning Coordinator(s) since the last compliance audit in accordance with Requirement R8, Measure M8.
- Each UFLS entity shall retain the current evidence of adherence with the UFLS program in accordance with Requirement R9, Measure M9, and evidence of adherence since the last compliance audit.
- Transmission Owner shall retain the current evidence of adherence with the UFLS program in accordance with Requirement R10, Measure M10, and evidence of adherence since the last compliance audit.
- Each Planning Coordinator shall retain evidence of Requirements R11 and R13, Measures M11 and M13, for 6 calendar years.

If a Planning Coordinator or UFLS entity is found non-compliant, it shall keep information related to the non-compliance until found compliant or for the retention period specified above, whichever is longer.

The Compliance Enforcement Authority shall keep the last audit records and all requested and submitted subsequent audit records.

1.3. Compliance Monitoring and Assessment Processes

- Compliance Audit
- Self-Certification
- Spot Checking
- Compliance Violation Investigation
- Self-Reporting
- Complaint

1.4. Additional Compliance Information

Not applicable.

2. Violation Severity Levels

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	N/A	The Planning Coordinator developed and documented criteria but failed to include the consideration of historical events, to select portions of the BES, including interconnected portions of the BES in adjacent Planning Coordinator areas and Regional Entity areas, that may form islands OR The Planning Coordinator developed and documented criteria but failed to include the consideration of system studies, to select portions of the BES, including interconnected portions of the BES in adjacent Planning Coordinator areas and Regional Entity areas, that may form islands	The Planning Coordinator developed and documented criteria but failed to include the consideration of historical events and system studies, to select portions of the BES, including interconnected portions of the BES in adjacent Planning Coordinator areas and Regional Entity areas, that may form islands	The Planning Coordinator failed to develop and document criteria to select portions of the BES, including interconnected portions of the BES in adjacent Planning Coordinator areas and Regional Entity areas, that may form islands
R2	N/A	The Planning Coordinator identified an island(s) to serve as a basis for designing its UFLS program but failed to include one (1) of the parts as specified in Requirement R2, Parts 2.1, 2.2, or 2.3	The Planning Coordinator identified an island(s) to serve as a basis for designing its UFLS program but failed to include two (2) of the parts as specified in Requirement R2, Parts 2.1, 2.2, or 2.3	The Planning Coordinator identified an island(s) to serve as a basis for designing its UFLS program but failed to include all of the parts as specified in Requirement R2, Parts 2.1, 2.2, or 2.3 OR The Planning Coordinator failed to identify any island(s) to serve as a basis for designing its UFLS program.
R3	N/A	The Planning Coordinator developed a UFLS program, including a schedule for implementation by	The Planning Coordinator developed a UFLS program including a schedule for implementation by	The Planning Coordinator developed a UFLS program including a schedule for implementation by

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
		UFLS entities within its area, but failed to meet one (1) of the performance characteristic in Requirement R3, Parts 3.1, 3.2, or 3.3 in simulations of underfrequency conditions	UFLS entities within its area, but failed to meet two (2) of the performance characteristic in Requirement R3, Parts 3.1, 3.2, or 3.3 in simulations of underfrequency conditions	UFLS entities within its area, but failed to meet all the performance characteristic in Requirement R3, Parts 3.1, 3.2, and 3.3 in simulations of underfrequency conditions OR The Planning Coordinator failed to develop a UFLS program.
R4	The Planning Coordinator conducted and documented a UFLS assessment at least once every five years that determines through dynamic simulation whether the UFLS program design meets the performance characteristics in Requirement R3 for each island identified in Requirement R2 but the simulation failed to include one (1) of the items as specified in Requirement R4, Parts 4.1 through 4.7.	The Planning Coordinator conducted and documented a UFLS assessment at least once every five years that determines through dynamic simulation whether the UFLS program design meets the performance characteristics in Requirement R3 for each island identified in Requirement R2 but the simulation failed to include two (2) of the items as specified in Requirement R4, Parts 4.1 through 4.7.	The Planning Coordinator conducted and documented a UFLS assessment at least once every five years that determines through dynamic simulation whether the UFLS program design meets the performance characteristics in Requirement R3 for each island identified in Requirement R2 but the simulation failed to include three (3) of the items as specified in Requirement R4, Parts 4.1 through 4.7.	The Planning Coordinator conducted and documented a UFLS assessment at least once every five years that determines through dynamic simulation whether the UFLS program design meets the performance characteristics in Requirement R3 but simulation failed to include four (4) or more of the items as specified in Requirement R4, Parts 4.1 through 4.7. OR The Planning Coordinator failed to conduct and document a UFLS assessment at least once every five years that determines through dynamic simulation whether the UFLS program design meets the performance characteristics in Requirement R3 for each island identified in Requirement R2
R5	N/A	N/A	N/A	The Planning Coordinator failed to conduct and document a UFLS assessment for any island identified by any one Planning Coordinator that encompasses all or a portion of its

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
				Planning Coordinator area. OR The Planning Coordinator failed to notify all other affected Planning Coordinators and the ERO of UFLS design changes necessary to meet the performance characteristics in Requirement R3 for any island identified by any one Planning Coordinator that encompasses all or a portion of its Planning Coordinator area.
R6	N/A	N/A	N/A	The Planning Coordinator failed to annually maintain a UFLS database for use in event analyses and assessments of the UFLS program.
R7	The Planning Coordinator provided its UFLS database to other Planning Coordinators more than 30 calendar days and up to and including 40 calendar days following the request.	The Planning Coordinator provided its UFLS database to other Planning Coordinators more than 40 calendar days but less than and including 50 calendar days following the request.	The Planning Coordinator provided its UFLS database to other Planning Coordinators more than 50 calendar days but less than and including 60 calendar days following the request.	The Planning Coordinator provided its UFLS database to other Planning Coordinators more than 60 calendar days following the request. OR The Planning Coordinator failed to provide its UFLS database to other Planning Coordinators.
R8	The UFLS entity provided data to its Planning Coordinator(s) more than 5 calendar days but less than or equal to 10 calendar days following the schedule specified by the Planning Coordinator(s) to support maintenance of each Planning Coordinator's UFLS database.	The UFLS entity provided data to its Planning Coordinator(s) more than 10 calendar days but less than or equal to 15 calendar days following the schedule specified by the Planning Coordinator(s) to support maintenance of each Planning Coordinator's UFLS database.	The UFLS entity provided data to its Planning Coordinator(s) more than 15 calendar days but less than or equal to 20 calendar days following the schedule specified by the Planning Coordinator(s) to support maintenance of each Planning Coordinator's UFLS database.	The UFLS entity provided data to its Planning Coordinator(s) more than 20 calendar days following the schedule specified by the Planning Coordinator(s) to support maintenance of each Planning Coordinator's UFLS database. OR

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
		OR The UFLS entity provided data to its Planning Coordinator(s) but the data was not according to the format specified by the Planning Coordinator(s) to support maintenance of each Planning Coordinator's UFLS database.		The UFLS entity failed to provide data to its Planning Coordinator(s) to support maintenance of each Planning Coordinator's UFLS database.
R9	The UFLS entity provided less than 100% but more than (and including) 95% of automatic tripping of Load in accordance with the UFLS program design and schedule for application determined by the Planning Coordinator(s) area in which it owns assets.	The UFLS entity provided less than 95% but more than (and including) 90% of automatic tripping of Load in accordance with the UFLS program design and schedule for application determined by the Planning Coordinator(s) area in which it owns assets.	The UFLS entity provided less than 90% but more than (and including) 85% of automatic tripping of Load in accordance with the UFLS program design and schedule for application determined by the Planning Coordinator(s) area in which it owns assets.	The UFLS entity provided less than 85% of automatic tripping of Load in accordance with the UFLS program design and schedule for application determined by the Planning Coordinator(s) area in which it owns assets.
R10	The Transmission Owner provided less than 100% but more than (and including) 95% automatic switching of Elements in accordance with the UFLS program and schedule for application determined by the Planning Coordinator(s) in each Planning Coordinator area in which it owns transmission	The Transmission Owner provided less than 95% but more than (and including) 90% automatic switching of Elements in accordance with the UFLS program and schedule for application determined by the Planning Coordinator(s) in each Planning Coordinator area in which it owns transmission	The Transmission Owner provided less than 90% but more than (and including) 85% automatic switching of Elements in accordance with the UFLS program and schedule for application determined by the Planning Coordinator(s) in each Planning Coordinator area in which it owns transmission	The Transmission Owner provided less than 85% automatic switching of Elements in accordance with the UFLS program and schedule for application determined by the Planning Coordinator(s) in each Planning Coordinator area in which it owns transmission
R11	The Planning Coordinator, in whose area a BES islanding event resulting in system frequency excursions below the initializing set points of the UFLS program, conducted and documented an assessment of the event within one year of event actuation.	The Planning Coordinator, in whose area a BES islanding event resulting in system frequency excursions below the initializing set points of the UFLS program, conducted and documented an assessment of the event and evaluated the parts as specified in Requirement R11, Parts 11.1 and 11.2 greater than one year	The Planning Coordinator, in whose area a BES islanding event resulting in system frequency excursions below the initializing set points of the UFLS program, conducted and documented an assessment of the event and evaluated the parts as specified in Requirement R11, Parts 11.1 and 11.2 greater than 13	The Planning Coordinator, in whose area a BES islanding event resulting in system frequency excursions below the initializing set points of the UFLS program, conducted and documented an assessment of the event and evaluated the parts as specified in Requirement R11, Parts 11.1 and 11.2 greater than 14

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
		but less than or equal to 13 months of actuation.	months but less than or equal to 14 months of actuation. OR The Planning Coordinator, in whose area an islanding event resulting in system frequency excursions below the initializing set points of the UFLS program, shall conduct and document an assessment of the event within one year of event actuation but failed to evaluate one (1) of the parts as specified in Requirement R11, Parts11.1 or 11.2.	months of actuation. OR The Planning Coordinator, in whose area an islanding event resulting in system frequency excursions below the initializing set points of the UFLS program, failed to conduct and document an assessment of the event and evaluated the parts as specified in Requirement R11, Parts 11.1 and 11.2. OR The Planning Coordinator, in whose area an islanding event resulting in system frequency excursions below the initializing set points of the UFLS program, shall conduct and document an assessment of the event within one year of event actuation but failed to evaluate all of the parts as specified in Requirement R11, Parts 11.1 and 11.2.
R12	N/A	The Planning Coordinator, in which UFLS program deficiencies were identified per Requirement R11, conducted and documented a UFLS design assessment to consider the identified deficiencies greater than two years but less than or equal to 25 months of event actuation.	The Planning Coordinator, in which UFLS program deficiencies were identified per Requirement R11, conducted and documented a UFLS design assessment to consider the identified deficiencies greater than 25 months but less than or equal to 26 months of event actuation.	The Planning Coordinator, in which UFLS program deficiencies were identified per Requirement R11, conducted and documented a UFLS design assessment to consider the identified deficiencies greater than 26 months of event actuation. OR The Planning Coordinator, in which UFLS program deficiencies were identified per Requirement R11, failed to conduct and document a

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
				UFLS design assessment to consider the identified deficiencies.
R13	N/A	N/A	N/A	The Planning Coordinator, in whose area a BES islanding event affecting multiple Planning Coordinator areas and resulting in system frequency excursions below the initializing set points of the UFLS program, failed to conduct and document a UFLS assessment. OR The Planning Coordinator, in whose area a BES islanding event affecting multiple Planning Coordinator areas and resulting in system frequency excursions below the initializing set points of the UFLS program, failed to notify all other affected Planning Coordinators and the ERO of differences between UFLS event assessment and reasons for those differences.
R14	The Planning Coordinator did not respond to all the written comments but to more than 90% of the written comments submitted by UFLS entities within its Planning Coordinator area following a comment period and before finalizing its UFLS program.	The Planning Coordinator responded to 90% or less but more than 80% of the written comments submitted by UFLS entities within its Planning Coordinator area following a comment period and before finalizing its UFLS program.	The Planning Coordinator responded to 80% or less but more than 70% of the written comments submitted by UFLS entities within its Planning Coordinator area following a comment period and before finalizing its UFLS program.	The Planning Coordinator responded to 70% or less of the written comments submitted by UFLS entities within its Planning Coordinator area following a comment period and before finalizing its UFLS program.

E. Regional Variances

The following Interconnection-wide variance shall be applicable in the Quebec Interconnection and replaces, in their entirety, Requirements R3 and R4 and the violation severity levels associated with Requirements R3 and R4.

E3. Each Planning Coordinator shall develop a UFLS program, including a schedule for implementation by UFLS entities within its area, that meets the following performance characteristics in simulations of underfrequency conditions resulting from an imbalance scenario, where an imbalance = [(load — actual generation output) / (load)], of up to 25 percent within the identified island(s). *[VRF: High][Time Horizon: Long-term Planning]*

E3.1 Frequency shall remain above the Underfrequency Performance Characteristic curve in PRC-006-1 - Attachment 1A, and

E3.2 Frequency shall remain below the Overfrequency Performance Characteristic curve in PRC-006-1 - Attachment 2A, and

E3.3 Volts per Hz (V/Hz) shall not exceed 1.18 per unit for longer than two seconds cumulatively per simulated event, and shall not exceed 1.10 per unit for longer than 45 seconds cumulatively per simulated event at each generator bus and generator step-up transformer high-side bus associated with each of the following:

E3.3.1 Individual generating unit greater than 50 MVA (gross nameplate rating) directly connected to the BES

E3.3.2 Generating plants/facilities greater than 50 MVA (gross aggregate nameplate rating) directly connected to the BES

E3.3.3 Facilities consisting of one or more units connected to the BES at a common bus with total generation above 50 MVA gross nameplate rating.

E4. Each Planning Coordinator shall conduct and document a UFLS design assessment at least once every five years that determines through dynamic simulation whether the UFLS program design meets the performance characteristics in Requirement E3 for each island identified in Requirement R2. The simulation shall model each of the following; *[VRF: High][Time Horizon: Long-term Planning]*

E4.1 Underfrequency trip settings of individual generating units that are part of plants/facilities with a capacity of 50 MVA or more individually or cumulatively (gross nameplate rating), directly connected to the BES that trip above the Generator Underfrequency Trip Modeling curve in PRC-006-1 - Attachment 1A, and

E4.2 Overfrequency trip settings of individual generating units that are part of plants/facilities with a capacity of 50 MVA or more individually or cumulatively (gross nameplate rating), directly connected to the BES that trip below the Generator Overfrequency Trip Modeling curve in PRC-006-1 - Attachment 2A, and

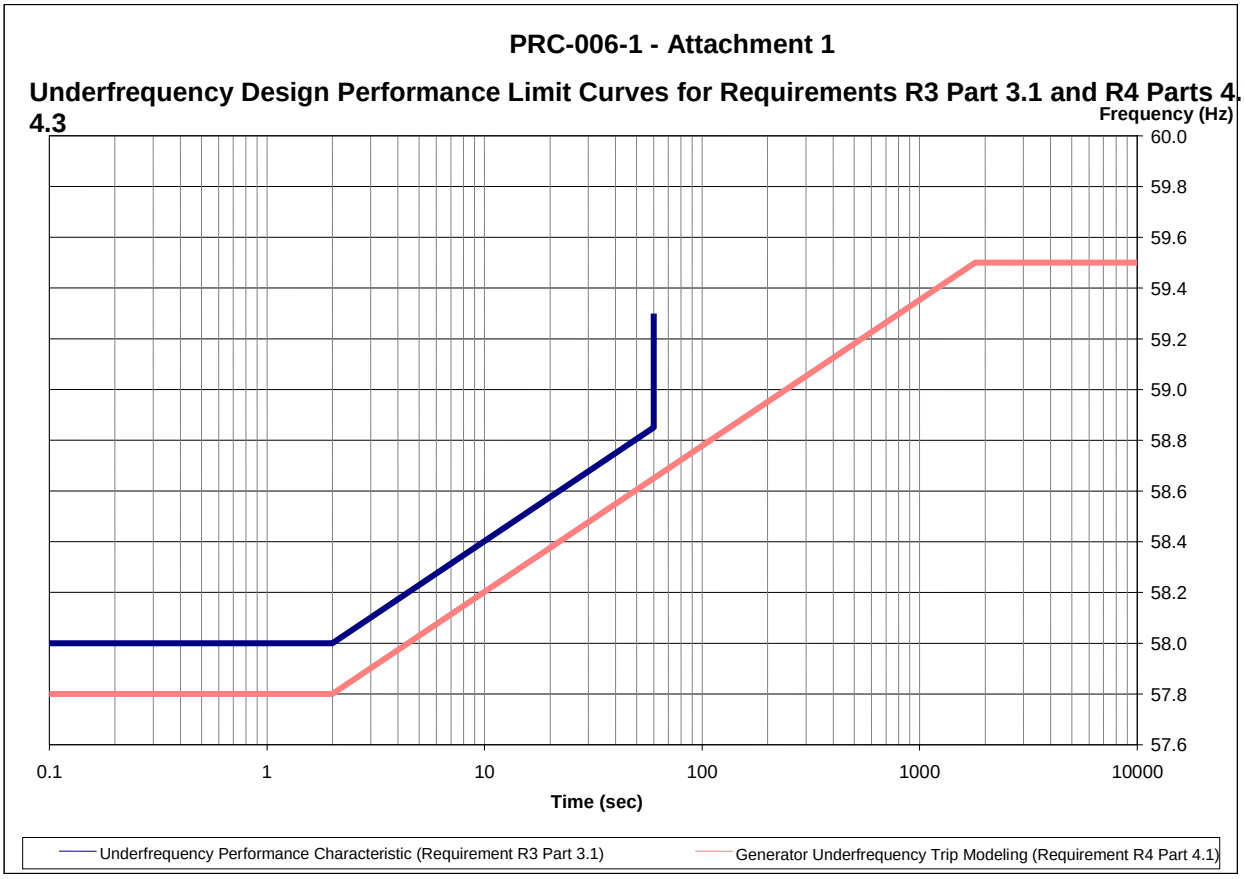
E4.3 Any automatic Load restoration that impacts frequency stabilization and operates within the duration of the simulations run for the assessment.

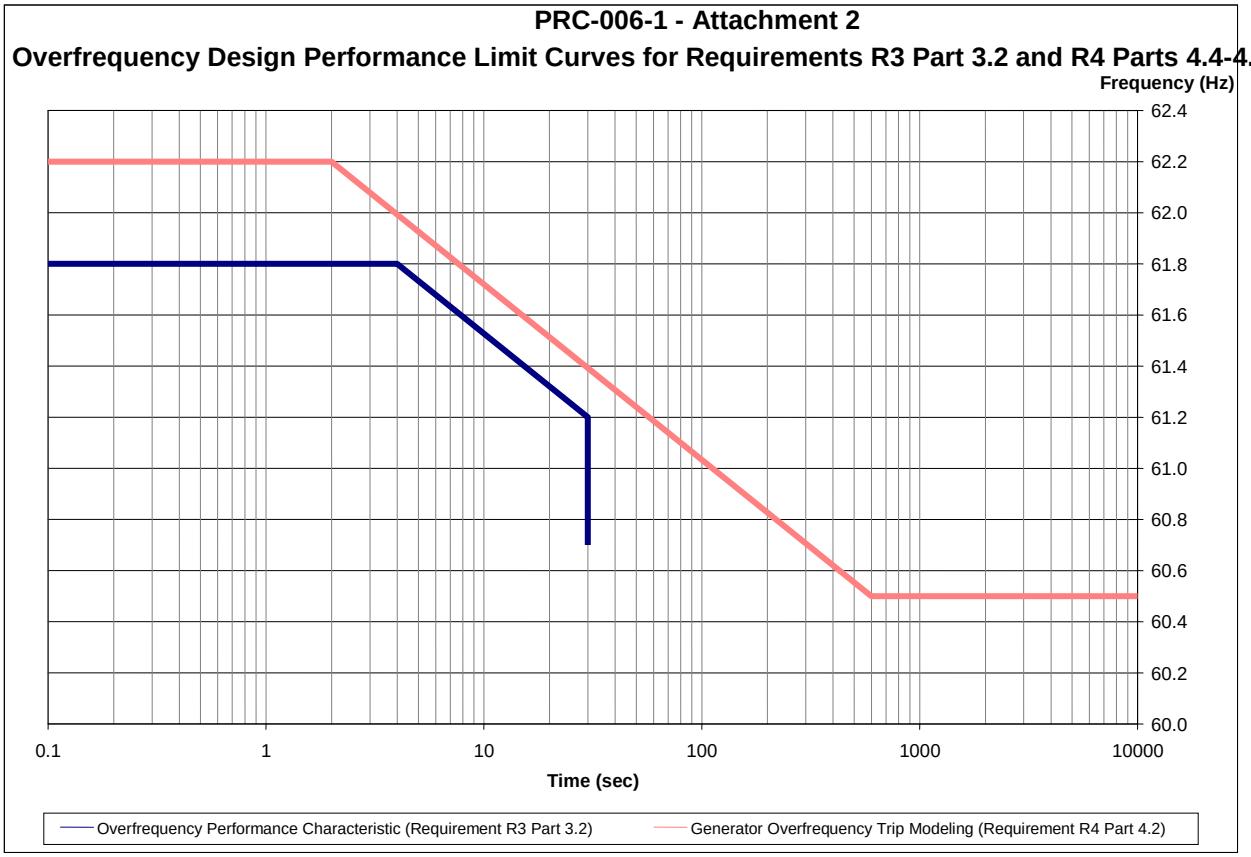
V #	Lower VSL	Moderate VSL	High VSL	Severe VSL
VE3	N/A	The Planning Coordinator developed a UFLS program, including a schedule for implementation by UFLS entities within its area, but failed to meet one (1) of the performance characteristic in Parts E3.1, E3.2, or E3.3 in simulations of underfrequency conditions	The Planning Coordinator developed a UFLS program including a schedule for implementation by UFLS entities within its area, but failed to meet two (2) of the performance characteristic in Parts E3.1, E3.2, or E3.3 in simulations of underfrequency conditions	The Planning Coordinator developed a UFLS program including a schedule for implementation by UFLS entities within its area, but failed to meet all the performance characteristic in Parts E3.1, E3.2, and E3.3 in simulations of underfrequency conditions OR The Planning Coordinator failed to develop a UFLS program.
VE4	N/A	The Planning Coordinator conducted and documented a UFLS assessment at least once every five years that determines through dynamic simulation whether the UFLS program design meets the performance characteristics in Requirement E3 but simulation failed to include one (1) of the items as specified in Parts E4.1, E4.2 or E4.3.	The Planning Coordinator conducted and documented a UFLS assessment at least once every five years that determines through dynamic simulation whether the UFLS program design meets the performance characteristics in Requirement E3 but simulation failed to include two (2) of the items as specified in Parts E4.1, E4.2 or E4.3.	The Planning Coordinator conducted and documented a UFLS assessment at least once every five years that determines through dynamic simulation whether the UFLS program design meets the performance characteristics in Requirement E3 but simulation failed to include all of the items as specified in Parts E4.1, E4.2 and E4.3. OR The Planning Coordinator failed to conduct and document a UFLS assessment at least once every five years that determines through dynamic simulation whether the UFLS program design meets the performance characteristics in Requirement E3

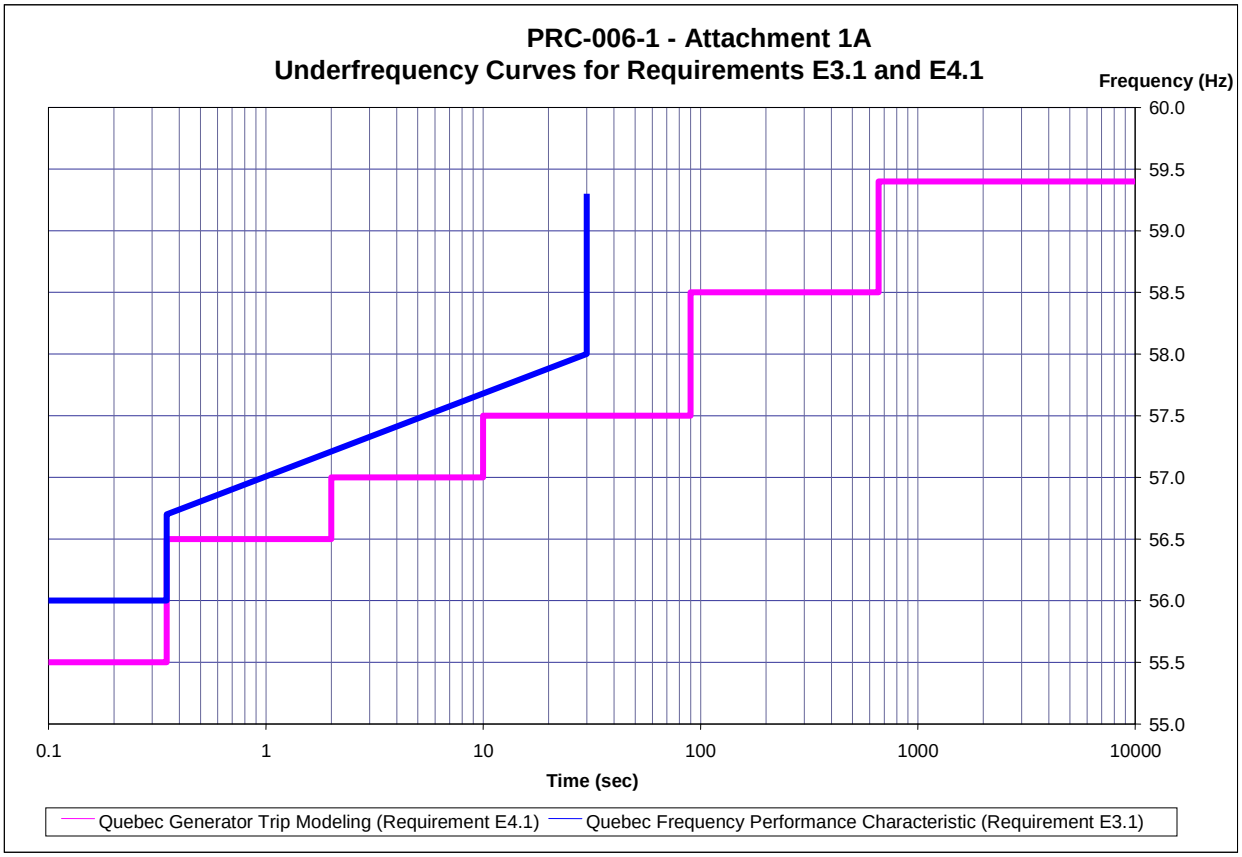
F. Associated Documents

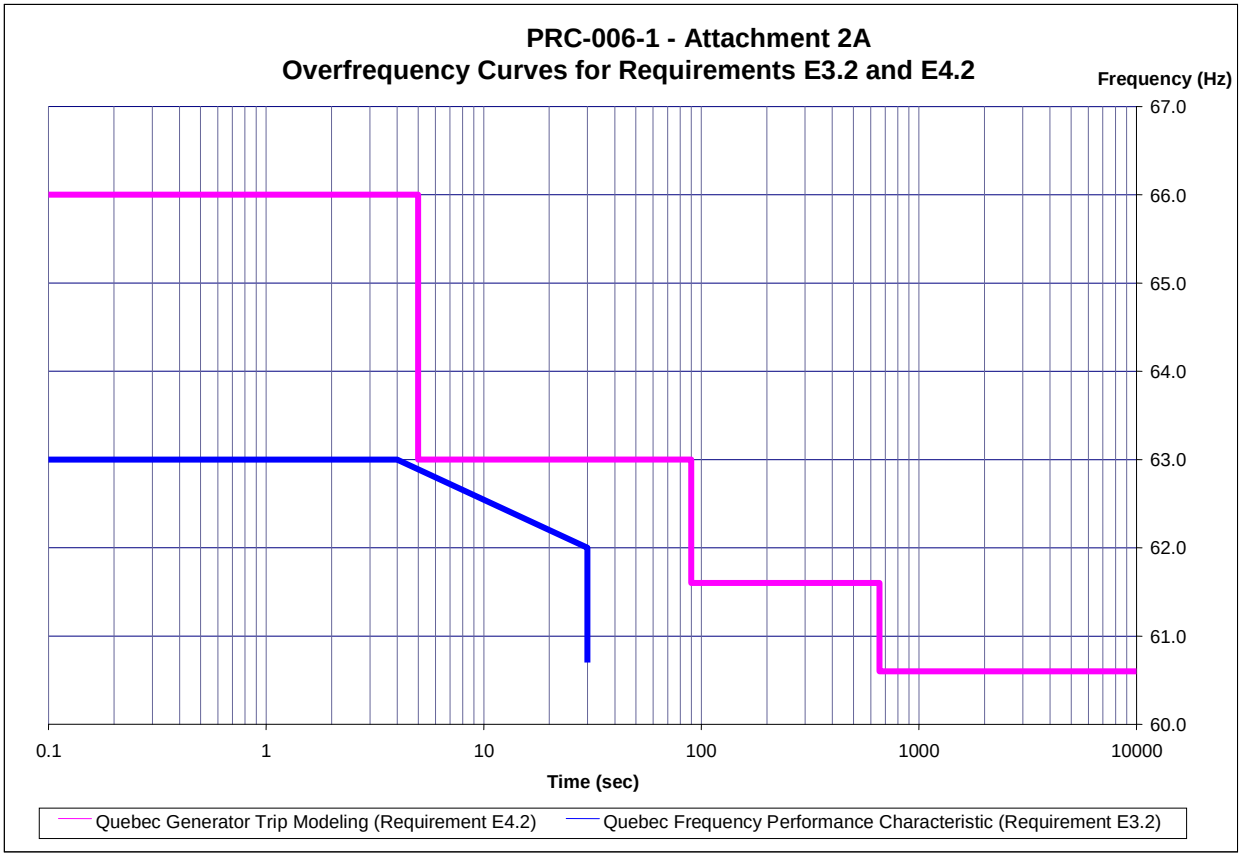
Version History

Version	Date	Action	Change Tracking
1		Complete revision, merging and updating PRC-006-0, PRC-007-0 and PRC-009-0	


PRC-006-1 - Attachment 1
Underfrequency Design Performance Limit Curves for Requirements R3 Part 3.1 and R4 Parts 4.1 - 4.3
Frequency (Hz)
60.0
59.8
59.6
59.4
59.2
59.0
58.8
58.6
58.4
58.2
58.0
57.8
57.6
0.1
1
10
100
1000
10000
Time (sec)
Underfrequency Performance Characteristic (Requirement R3 Part 3.1)
Generator Underfrequency Trip Modeling (Requirement R4 Part 4.1)


PRC-006-1 - Attachment 2
Overfrequency Design Performance Limit Curves for Requirements R3 Part 3.2 and R4 Parts 4.4-4.6
Frequency (Hz)
62.4
62.2
62.0
61.8
61.6
61.4
61.2
61.0
60.8
60.6
60.4
60.2
60.0
0.1
1
10
100
1000
10000
Time (sec)
Overfrequency Performance Characteristic (Requirement R3 Part 3.2)
Generator Overfrequency Trip Modeling (Requirement R4 Part 4.2)


PRC-006-1 - Attachment 1A
Underfrequency Curves for Requirements E3.1 and E4.1
Frequency (Hz)
60.0
59.5
59.0
58.5
58.0
57.5
57.0
56.5
56.0
55.5
55.0
0.1
1
10
100
1000
10000
Time (sec)
Quebec Generator Trip Modeling (Requirement E4.1)
Quebec Frequency Performance Characteristic (Requirement E3.1)


PRC-006-1 - Attachment 2A
Overfrequency Curves for Requirements E3.2 and E4.2
Frequency (Hz)
67.0
66.0
65.0
64.0
63.0
62.0
61.0
60.0
0.1
1
10
100
1000
10000
Time (sec)
Quebec Generator Trip Modeling (Requirement E4.2)
Quebec Frequency Performance Characteristic (Requirement E3.2)