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 third posting of the proposed standard

Future Development Plan:

Anticipated Actions	Anticipated Date
1. TBD	

A. Introduction

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

2. **Number:** PRC-006-011

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

4. **Applicability:**

   1.1.4.1. 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 with end-use Load connected to their Facilities where such end use load is not part of a Distribution Provider's load that own Elements identified in the UFLS program established by the Planning Coordinators.

2. **(Proposed) Effective Date:** TBD

5. **(Proposed) Effective Date:** The standard is effective the first day of the first calendar quarter one year after applicable regulatory approvals (or the standard otherwise becomes effective the first day of the first calendar quarter one year after NERC Board of Trustees adoption in those jurisdictions where regulatory approval is not required).

B. Requirements

R1. Each Planning Coordinator shall join a group consisting of all the Planning Coordinators within the region for each of the regions in which it performs the Planning Coordinator function.

R2. Each group of Planning Coordinators shall design an underfrequency load shedding program for consistent application across the region.

R3.**R1.** Each group of Planning Coordinators shall develop and document criteria, consideringincluding 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 footprints and Regional Entity footprints that may form islands. *[VRF: Lower][Time Horizon: Long-term Planning]*

R3. Each group of Planning CoordinatorsCoordinator shall develop a procedure for coordinating with groups of Planning Coordinators in neighboring regions within an interconnection to identify and reach agreement onone or more islands between its region and neighboring regions within the interconnection. The procedure shall identify

how the neighboring entities will assist in the UFLS assessments and document concurrence of assessment results.

R5. **R2.** Each group of Planning Coordinators shall identify an island(s) to serve as a basis for designing a its UFLS program. The identified island(s) shall include: including: *[VRF: Medium][Time Horizon: Long-term Planning]*

- **2.1.** Those islands selected by applying the criteria in Requirement R3, if any. R1, and
- **2.2.** Any portions of the BES that are designed to be detached detach from the interconnection Interconnection (planned islands) as a result of the operation of a relay scheme. or Special Protection System, and
- Interregional islands agreed on by the Planning Coordinators.
- Any other islands necessary to ensure that all portions of the region's BES are included in at least one island.

2.3. Each group of Planning Coordinators shall specify the technical design parameters of the underfrequency load shedding program required to meet A single island that includes all portions of the BES in either the Regional Entity footprint or the Interconnection in which the Planning Coordinator's footprint resides. If a Planning Coordinator's footprint resides in multiple Regional Entity footprints, each of those Regional Entity footprints shall be identified as an island

R6. **R3.** Each Planning Coordinator shall develop a UFLS program, including a schedule for implementation by UFLS entities within its footprint 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. Arrest frequency decline at no less than 58.0 Hz.

3.1. Frequency shall not remain below 58.2 Hz for greater than four seconds cumulatively per simulated event above the Underfrequency Performance Characteristic curve in PRC-006-1 - Attachment 1, and

R6.2.3.2. Frequency shall not remain below 58.5 Hz for greater than ten seconds cumulatively per simulated event the Overfrequency Performance Characteristic curve in PRC-006-1 - Attachment 2, and shall not remain below 59.3 Hz for greater than 30 seconds, cumulatively per simulated event.

3.3. Frequency overshoot resulting from operation of UFLS relays shall not exceed 61.8 Hz for any duration and shall not exceed 60.7 Hz for greater than 30 seconds, cumulatively per simulated event.

R6.4.3.3. Control voltage during and following UFLS operations such that the per unit Volts per Hz (V/Hz) does shall not exceed 1.18 per unit for longer than two seconds cumulatively per simulated event, and does 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 any:each of the following:

R6.4.1.3.3.1. Individual generating unitunits greater than 20 MVA (gross nameplate rating) and directly connected to the BES.

R6.4.2.3.3.2. Generating plant/facilityplants/facilities greater than 75 MVA (gross aggregate nameplate rating) and 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.

R7.R4. Each group of Planning CoordinatorsCoordinator 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 R6.R3 for each island identified in Requirement R2. The simulation shall include;model each of the following: *[VRF: High][Time Horizon: Long-term Planning]*

3.5. Modeling the trip settings of any generators that trip at or above 58.0 Hz.

3.6. Modeling the trip settings of any generators that trip at or below 61.8 Hz.

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 any 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.

R7.3.4.7. Any automatic load Load restoration that is designed to assist in stabilizingimpacts frequency stabilization and operates within the duration of the simulations run for the assessment.

R5. Each group ofEach Planning Coordinator shall reach concurrence with all other affected Planning Coordinators on UFLS design assessment results before design assessment completion for any islands identified by any one Planning Coordinator that encompass more than one Planning Coordinator footprint. *[VRF: Medium][Time Horizon: Long-term Planning]*

R8.**R6.** Each Planning Coordinator shall create and annually maintain a UFLS database containing relay information provided by their Transmission Owners and Distribution Providers for for use in UFLS assessments and event analyses. and assessments of the UFLS program. *[VRF: Lower][Time Horizon: Long-term Planning]*

R7. Each Transmission Owner and Distribution ProviderEach Planning Coordinator shall provide its UFLS database to other Planning Coordinators within its Interconnection within 30 calendar days of a request. *[VRF: Lower][Time Horizon: Long-term Planning]*

R9.**R8.** Each UFLS entity shall provide data to its group of Planning Coordinators Coordinator(s) according to the format and schedule and format specified by the group of Planning Coordinators Coordinator(s) to support maintenance of the database. each Planning Coordinator's UFLS database. [VRF: Lower Time Horizon: Long-term Planning]

R9. Each Transmission Owner and Distribution ProviderUFLS entity shall provide load automatic tripping of Load in accordance with the UFLS program designeddesign and schedule for application determined by the group ofits Planning Coordinator(s) in each Planning Coordinator footprint in which it owns assets. *[VRF: High][Time Horizon: Long-term Planning]*

R10. Each Transmission Owner shall provide automatic switching of Elements in accordance with the UFLS program and schedule for application determined by the Planning Coordinator(s) in each Planning Coordinator footprint in which it owns transmission. *[VRF: High][Time Horizon: Long-term Planning]*

R11. Each Planning Coordinator, in whose footprint 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 footprint a BES islanding event affecting multiple Planning Coordinator footprints and resulting in system frequency excursions

below the initializing set points of the UFLS program of UFLS actuated loss of load occurs, shall reach concurrence with the other affected Planning Coordinators on the event assessment results before event assessment completion. *[VRF: Medium][Time Horizon: Operations Assessment]*

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 including the criteria itself.

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 including the criteria itself.

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.

~~R10.~~**M5.** Each Planning Coordinator shall have dated evidence such as memorandums, letters, or other dated documentation that it reached concurrence with the other affected Planning Coordinators ~~for each region in which it operates~~on design assessment results for any islands identified by a Planning Coordinator that encompass more than one Planning Coordinator footprint per Requirement R5 and identifies the affected Planning Coordinators.

~~M1.~~**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.

~~M2.~~**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.

~~M3.~~**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.

~~M4.~~**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.

~~M5.~~M10. Each Transmission Owner shall have dated evidence such as relay settings, tripping logic or other dated documentation that it provided automatic switching of Facilities in accordance with the UFLS program and schedule for application per Requirement R10.

~~M6.~~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.

~~M7.~~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.

~~M8.~~M13. Each Planning Coordinator shall dated have evidence such as letters, memorandums, or other dated documentation showing that each affected Planning Coordinator reached concurrence on the event assessment results per Requirement R13.

~~C.~~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 and R12, Measures M1, M2, M3, M4, M5 and M12 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 footprints and Regional Entity footprints, 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 footprints and Regional Entity footprints, 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 footprints and Regional Entity footprints, 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 footprints and Regional Entity footprints, 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 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 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 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.

R #		Lower VSL	Moderate VSL	High VSL	Severe VSL
R3		N/A	The Planning Coordinator developed a UFLS program, including a schedule for implementation by UFLS entities within its footprint, but failed to meet one (1) of the performance characteristic in Parts 3.1, 3.2, or 3.3 in simulations of underfrequency conditions	The Planning Coordinator developed a UFLS program including a schedule for implementation by UFLS entities within its footprint, but failed to meet two (2) of the performance characteristic in Parts 3.1, 3.2, or 3.3 in simulations of underfrequency conditions	The Planning Coordinator developed a UFLS program including a schedule for implementation by UFLS entities within its footprint, but failed to meet all the performance characteristic in 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 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 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 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 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

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
R5	N/A	N/A	**N/A**	The Planning Coordinator failed reach concurrence with all other affected Planning Coordinators on UFLS design assessment results before design assessment completion for any islands identified by any one Planning Coordinator that encompass more than one Planning Coordinator footprint.
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 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) footprint 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) footprint 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) footprint 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) footprint 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 footprint 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 footprint 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 footprint 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 footprint in which it owns transmission
R11	Each Planning Coordinator, in whose footprint a BES 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	The Planning Coordinator, in whose footprint 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	The Planning Coordinator, in whose footprint 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	The Planning Coordinator, in whose footprint 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

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
	year of event actuation to evaluate	11.1 and 11.2 greater than one year but less than or equal to 13 months of actuation.	11.1 and 11.2 greater than 13 months but less than or equal to 14 months of actuation. OR The Planning Coordinator, in whose footprint 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 11.1 or 11.2.	11.1 and 11.2 greater than 14 months of actuation. OR The Planning Coordinator, in whose footprint 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 11.1 and 11.2. OR The Planning Coordinator, in whose footprint 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 11.1 and 11.2.
R12	N/A	The Planning Coordinator, in which UFLS program deficiencies were identified per 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 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 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 R11, failed to conduct

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
				and document a UFLS design assessment to consider the identified deficiencies.
R13	N/A	N/A	N/A	The Planning Coordinator, in whose footprint a BES islanding event affecting multiple Planning Coordinator footprints and resulting in system frequency excursions below the initializing set points of the UFLS program, failed to reach concurrence with the other affected Planning Coordinators on the event assessment results before event assessment completion.

~~D.~~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 footprint, 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

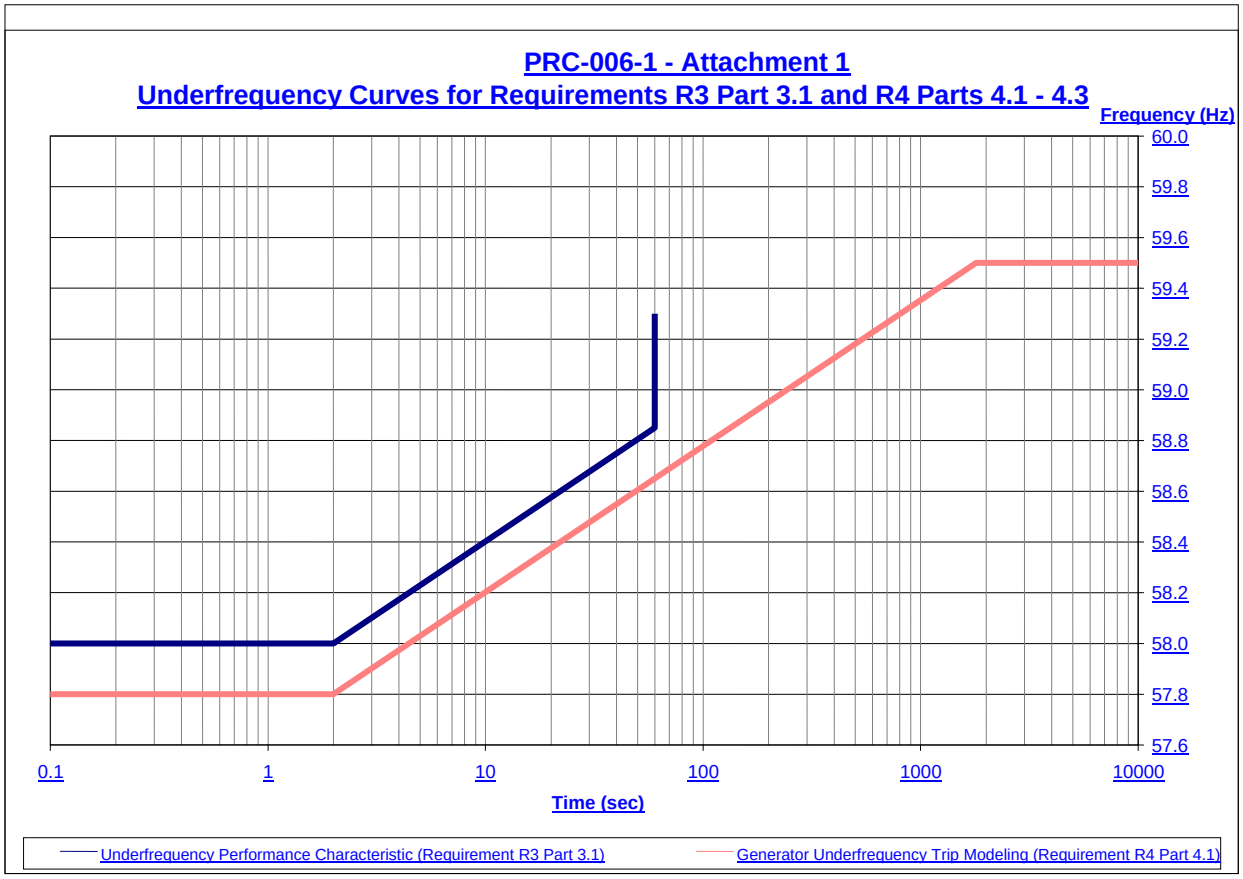
E4.3 Any automatic Load restoration that impacts frequency stabilization and operates within the duration of the simulations run for the assessment.

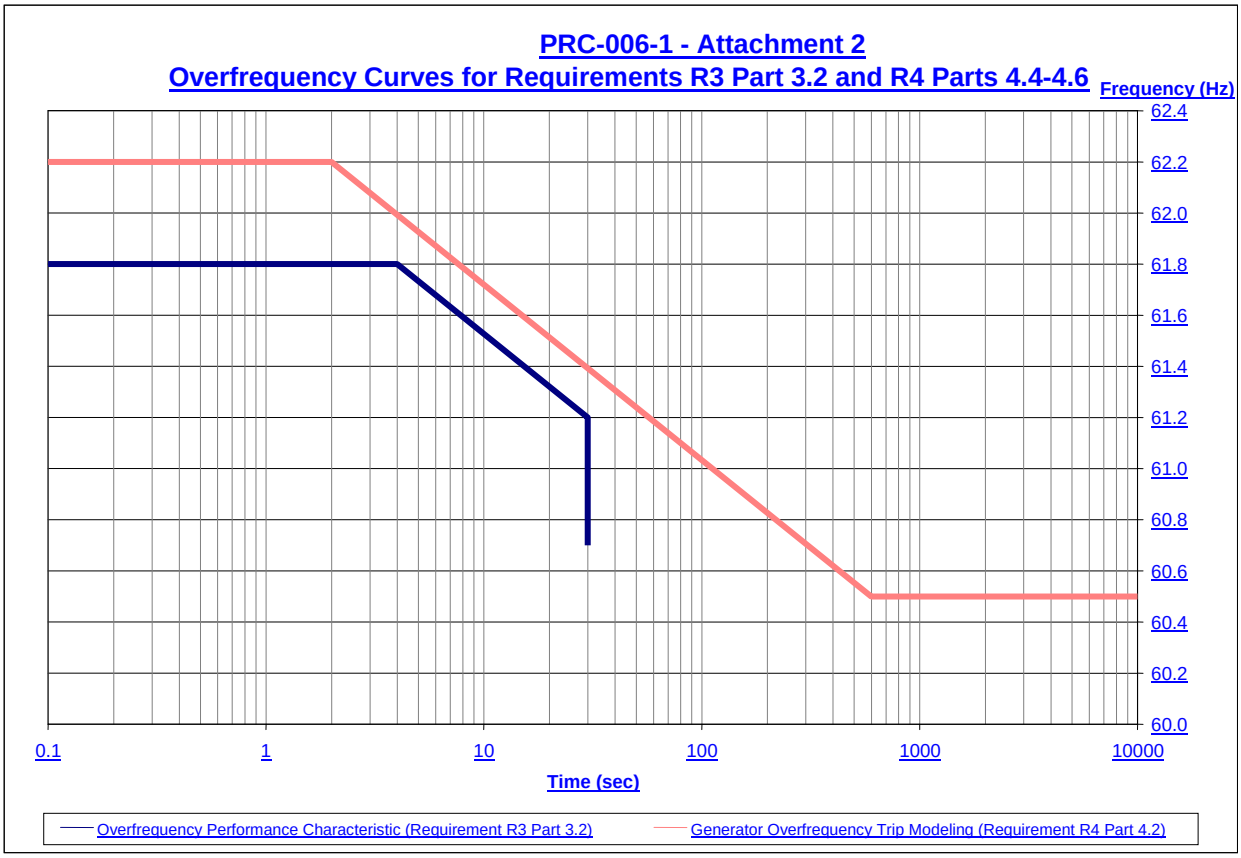
V #	Lower VSL	Moderate VSL	High VSL	Severe VSL
VE3	N/A	The Planning Coordinator developed a UFLS program, including a schedule for implementation by UFLS entities within its footprint, but failed to meet one (1) of the performance characteristic in Parts E3.1, E3.2, or E3.3 in simulations of underfrequency conditions	The Planning Coordinator developed a UFLS program including a schedule for implementation by UFLS entities within its footprint, 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 footprint, 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

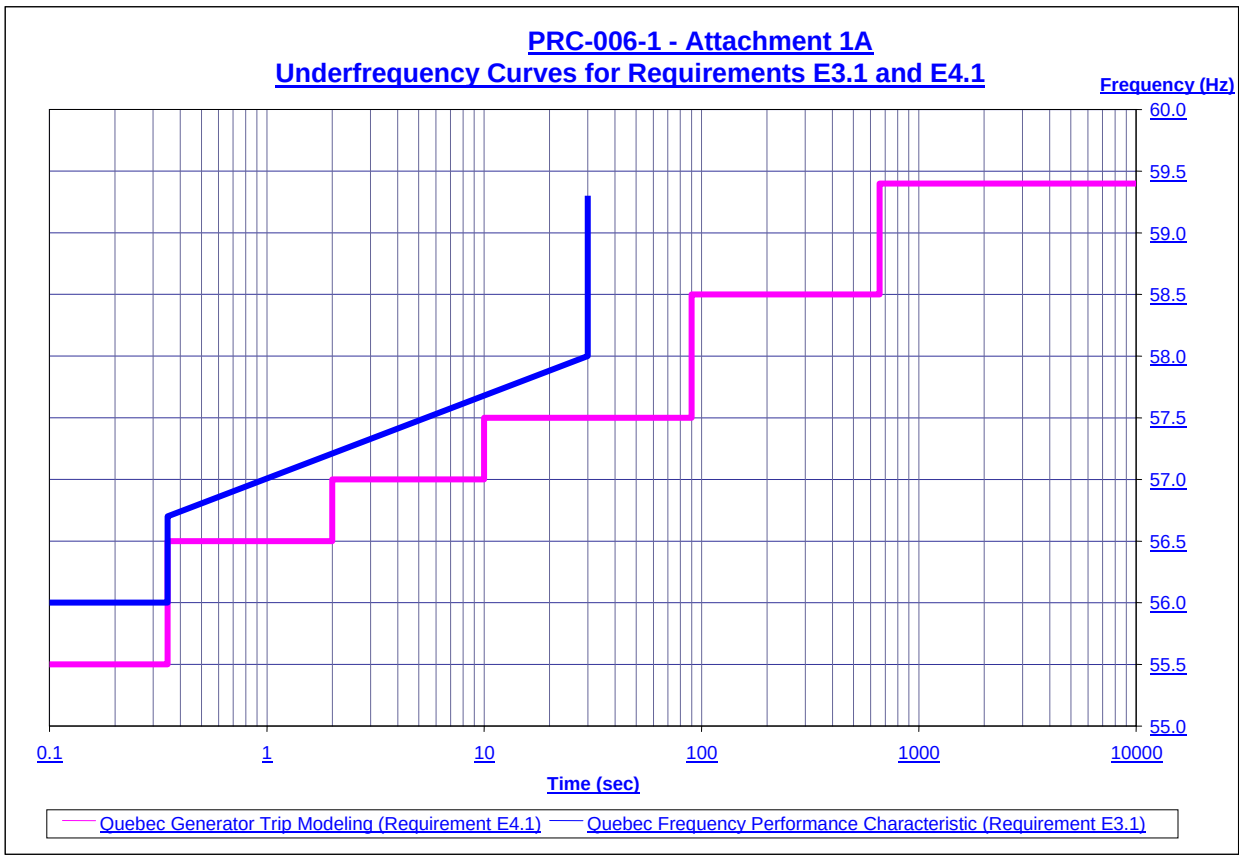
~~E.~~F. Associated Documents

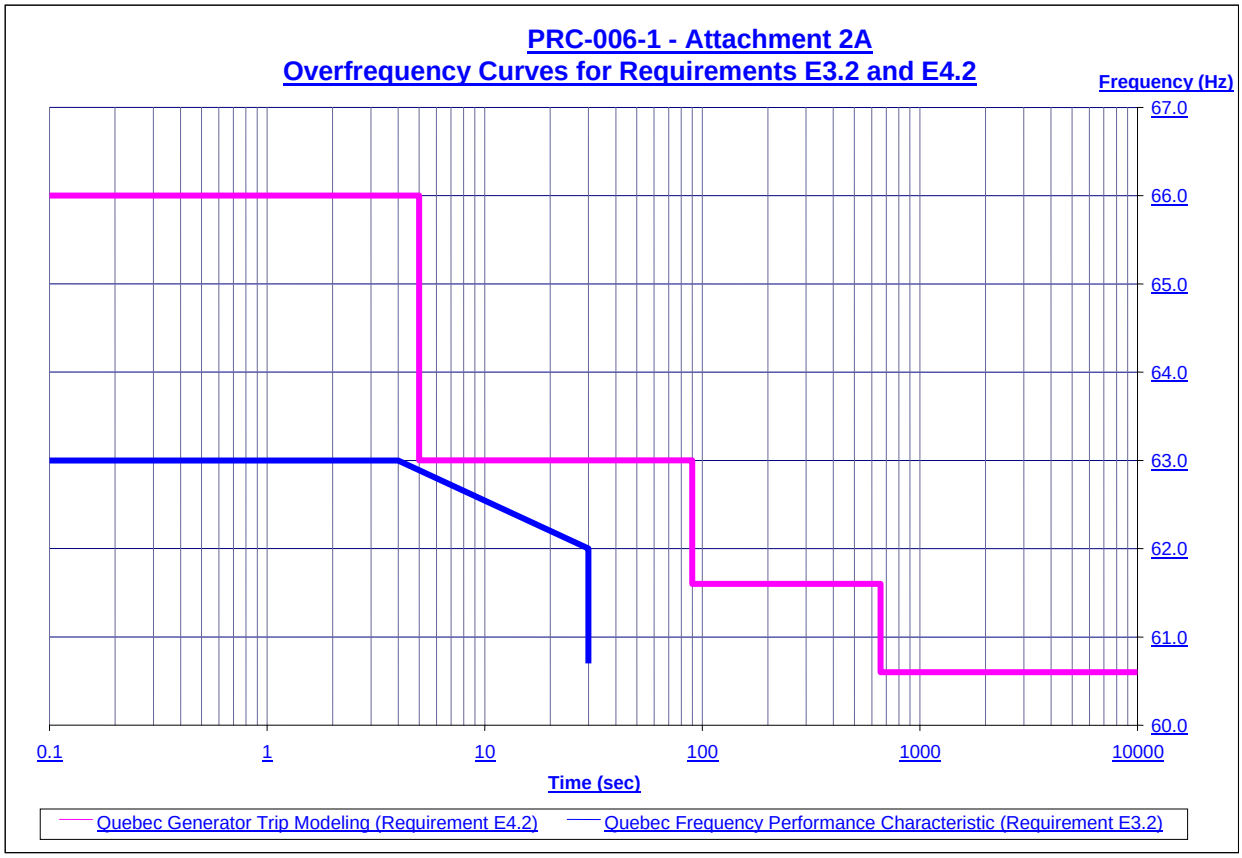
Version History

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 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 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)