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 posting of the proposed standard (the first posting was proposed common continent-wide performance characteristics as a directive to the Regional Entities to develop regional standards) for a 30 day comment period, from April 15 – May 14, 2009.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Respond to comments on the second posting and post revised standard for a 30 day comment period.	July 7, 2009
2. Respond to comments on the draft of the proposed standard and implementation plan.	September 14, 2009
3. Obtain the Standards Committee's approval to move the standard forward to balloting.	September 16, 2009
4. Post the standard and implementation plan for a 30-day pre-ballot review.	October 1, 2009
5. Conduct an initial ballot for ten days.	November 15, 2009
6. Respond to comments submitted with the initial ballot.	November 30, 2009
7. Conduct a recirculation ballot for ten days.	December 15, 2009
8. BOT adoption.	

A. Introduction

1. **Title:** Automatic Underfrequency Load Shedding
2. **Number:** PRC-006-01
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.
4. **Applicability:**
   - **4.1.** Planning Coordinators
   - **4.2.** Distribution Providers that do not have an agreement with Transmission Owners to provide UFLS
   - **4.3.** Transmission Owners that have an agreement with Distribution Providers to provide UFLS
5. **(Proposed) Effective Date:** TBD

B. Requirements

R1. Each Planning Coordinator shall join a group consisting of all the Planning Coordinators within the region for each of the (Regional Entity boundary[sm1]) regions in which it performs the Planning Coordinator function. [VRF: Medium][Time Horizon: Long-term Planning]

R2. Each group of Planning Coordinators shall develop and document criteria, including consideration of historical events and system studies, to select portions of the Bulk Electric System (BES), including portions of adjacent interconnected regions, that may form islands. [VRF: Medium][Time Horizon: Long-term Planning]

R3. Each[pjt2] group of Planning Coordinators shall identify an island(s) as a basis for designing a UFLS program including: [VRF: Medium][Time Horizon: Long-term Planning]

- **3.1.** Those islands selected by applying the criteria in Requirement R2 and
- **3.2.** Any portions of the BES that are designed to be detached from the interconnection (planned islands) as a result of the operation of a relay scheme or special protection system (NOTE: as a result of comment made in Q8 by BPS) and
- **3.3.** Any other islands necessary to ensure that all portions of the region's BES are included in at least one island.

R4. Each group of Planning Coordinators shall develop a underfrequency load shedding program with an implementation schedule for application across the region including technical design parameters required to meet 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]

4.1. Arrest frequency decline at no less than 58.0 Hz. –

4.2. Frequency shall not remain below 58.2 Hz for greater than four seconds cumulatively per simulated event, and shall not remain below 58.5 Hz for greater than ten seconds cumulatively per simulated event, and shall not remain below 59.3 Hz for greater than 30 seconds, cumulatively per simulated event.

4.3. [sm3]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.

4.4. Control[sm4] voltage during and following UFLS operations such that the per unit Volts per Hz (V/Hz) does not exceed 1.18 for longer than two seconds cumulatively per simulated event, and does not exceed 1.10 for longer than 45 seconds cumulatively per simulated event at each generator bus and generator step-up transformer high-side bus associated with any:

4.4.1. Individual generating unit greater than 20 MVA (gross nameplate rating) and connected at 60 kV [sm5]and above.

4.4.2. Generating plant/facility greater than 75 MVA (gross aggregate nameplate rating) and directly connected at 60 kV and above.

R5. Each group of Planning Coordinators shall conduct a UFLS assessment at least once every five years or within one year of an actuation of UFLS resulting in 500 MW or greater of loss of load that determines through dynamic simulation whether the UFLS program design meets the performance characteristics in Requirement R4The simulation shall ; [VRF: High][Time Horizon: Long-term Planning]

5.1. Model the underfrequency trip settings of generators (same as generators in 4.4) that trip above the UFLS curve TBD [pjt6].

5.2. Model the overfrequency trip settings of generators (same as generators in 4.4) that trip at or below the UFLS curve TBD

5.3. Model any automatic load restoration that impacts frequency stabilization and operates within the duration of the simulations run for the assessment

R6. Each group of Planning Coordinators shall reach concurrence of assessment results with their adjacent region's group of Planning Coordinators of any islands identified by any one region's group of Planning Coordinators that straddle the respective interconnected regions. [VRF: High][Time Horizon: Long-term Planning]

R7. Each group of Planning Coordinators shall specify the content, format and schedule to create a database and annually maintain the database containing information for use in

event analyses and assessments of the UFLS program. [VRF: Lower][Time Horizon: Long-term Planning]

R8. Each Transmission Owner and Distribution Provider shall provide data to its group of Planning Coordinators according to the format and schedule specified by the group of Planning Coordinators to support maintenance of the database. [VRF: Lower][pjt7][Time Horizon: Long-term Planning]

R9. Each[sm8] Transmission Owner and Distribution Provider shall provide tripping of load, and switching of reactive power devices and transmission lines (NOTE: added as a result of a comment made in Question 8 from the MRO) in accordance with the UFLS program designed by the group of Planning Coordinators for each region in which it operates. [VRF: High][Time Horizon: Operations Planning]

C. Measures (TO BE REVISED BASED ON CHANGES TO REQUIREMENTS)

M1. The Planning Coordinator shall provide evidence that it joined a group consisting of all the Planning Coordinators within the region for each of the regions in which it performs the Planning Coordinator function such as roster of participants (including organization), meeting minutes with recorded attendees, agreements, etc.

M2. The Planning Coordinator shall provide evidence that their group of Planning Coordinators designed an underfrequency load shedding program for application across the region such as documentation of technical design parameters. [including participation in development of, or consent to, the technical parameters]

M3. The Planning Coordinator shall provide evidence that their group developed criteria as specified in Requirement R3.

M4. The Planning Coordinator shall provide evidence that their group developed a procedure as specified in Requirement R4.

M5. The Planning Coordinator shall provide evidence that their group identified islands as specified in Requirement R5.

M6. The Planning Coordinator shall provide evidence that their group developed a UFLS program that specifies the technical design parameters required to meet the performance characteristics in simulations as specified in Requirement R6 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). Evidence may include dynamic simulations, basis for load and generation capacity, including unit sizes and connection voltage.

M7. The Planning Coordinator shall provide evidence that their group conducted a UFLS assessment as specified in Requirement R7 such as dynamic simulation input data, and dynamic simulation results.

M8. The Planning Coordinator shall provide evidence that their group specified the content, created and annually maintained a UFLS database as specified in Requirement R8.

M9. The Transmission Owner and Distribution Provider shall provide evidence that they provided data to their respective group of Planning Coordinators as specified in Requirement R9 such as transmittal document and associated data.

M10. The Transmission Owner and Distribution Provider shall provide evidence of tripping of forecast load in accordance with the UFLS program designed by the group of Planning Coordinators for each region in which it operates such as relay records, setting sheets, and circuit forecast loading

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

Text

1.2. Compliance Monitoring Period and Reset Time Frame

Not applicable.

1.3. Data Retention

Text

1.4. Compliance Monitoring and Assessment Processes

Text

1.5. Additional Compliance Information

Text

2. Violation Severity Levels

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL

E. Regional Variances

None.

F. Associated Documents

Version History

Version	Date	Action	Change Tracking