

## Meeting Notes

### Underfrequency Load Shedding SDT — Project 2007-01

September 1, 2009 | 8 a.m.–5 p.m. Eastern

September 2, 2009 | 8 a.m.–5 p.m. Eastern

Montreal, QC

#### 1. Administrative

##### Roll Call

Stephanie Monzon welcomed the members and guests of the Standard Drafting Team for Project 2007-01 Underfrequency Load Shedding (see Roster — **Attachment 1a**).

- Philip Tatro — National Grid (Chair)
- Paul Attaway — Georgia Transmission Corporation
- Brian Bartos — Bandera Electric Cooperative
- Jonathan Glidewell — Southern Company Transmission Co.
- Gary Keenan — Northwest Power Pool Corporation
- Robert W. Millard — ReliabilityFirst Corporation
- Steven Myers — Electric Reliability Council of Texas, Inc.
- Mak Nagle — Southwest Power Pool
- Robert J. O'Keefe — American Electric Power
- Brian Evans Mongeon — Utility Services, LLC
- Tony Rodrigues — PacifiCorp
- Si Truc Phan — TransEnergie
- Scott Berry — Indiana Municipal Power Agency
- Frank Gaffney — Florida Municipal Power Agency
- Stephanie Monzon — NERC

##### Observers

- Anthony Jablonski — ReliabilityFirst Corporation
- Pete Heidrich — FRCC
- Steve Wadas — Nebraska Public Power District
- Carol Gerou — Midwest Reliability Organization
- Eric Mortenson — Commonwealth Edison
- Scott Sells — FERC Staff
- Laura Zotter — ERCOT
- Jill Loewer — Utility Services, LLC

- Kal Ayoub — FERC Staff

### **NERC Antitrust Compliance Guidelines**

Stephanie Monzon reviewed the NERC Antitrust Compliance Guidelines.

## **2. Review Meeting Agenda**

Phil added to the agenda the Variance for Hydro-Quebec. Carol added that MRO will need a Variance to the standard. Stephanie indicated that this request needs to be reviewed by the Standards Committee and this drafting team will need to better understand the request to come up with a recommendation. The Variance for HQ will be discussed during the review of the standard.

## **3. Review of Draft Standard**

The team will review and revise the draft standard in preparation for the next posting. By the close of the meeting the team will have a set of revised requirements.

### **a) FERC Staff Comments**

The team reviewed the comments made by FERC staff in the May 7, 2009. See the separate word document with the May 7, 2009 notes and team responses.

### **b) Applicability**

- i) The team revisited the issue of applicability, specifically, the issue of removing TO from the applicability. Brian Evans Mongeon discussed a few of the issues with removing TOs from the standard and proposed one possible solution that requires the group of PCs to come up with the appropriate entities for implementation of the program. Steve Myers also proposed a different solution by making the applicability either TOs or DPs.
- ii) The team reviewed the existing applicability and removed the note made on June 10 but wanted to keep the record: (June 10, 2009 — the team conducted an informal poll and determined that the majority of the team feels that eliminating the TO from applicability is appropriate because the concern driving to include the TO with the qualifier was to fix a registration issue — those TOs with end use load that are not registered as Distribution Providers. However, the TO might have to remain in the applicability if the TO is to provide data in requirement R9).
- iii) The team discussed the issues with applicability and determined that while the team initially did not object to deleting DP the team did not reach unanimous agreement (unanimous agreement is not required — only majority) to remove the TO from the draft standard. As a result, the team kept both entities in the standard as follows:

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

Stephanie indicated that standards should not give consideration to contracts and agreements in place but should focus on the reliability objective and assign tasks and requirements to the entities as described in the function model.

**c) Industry Comments**

The team considered the comments received on the second posting and revised the standard accordingly.

**d) Variances for MRO, WECC, and HQ**

- i) MRO indicated that they will need a variance for Requirement 4.4 (all sub components) and WECC indicated that they may need a Variance for the voltz/Hz requirement.
- ii) HQ will need a Variance for the requirement that is to become the reference to the curve.

**4. Compliance Elements**

The team did not have time to review the proposed compliance elements but scheduled a subsequent call (see schedule of calls below) to review the compliance elements.

**5. Plan for Third Posting**

The team discussed the plan to revise the following prior to the next posting:

- Implementation Plan
- Mapping Document
- Comment Form
- Response to Comments
  - Question 6
  - Question 7
  - Question 8

Stephanie and the team scheduled several conference calls and WebEx's to complete the various tasks prior to the third posting.

**6. Overall Schedule**

Stephanie reviewed the UFLS overall schedule. Stephanie opened the project plan and indicated that the third posting is scheduled to occur in October. This requires an aggressive plan made up of calls and meetings to finalize the responses to comments and the next version of the draft standard. See notes above — item number 5.

**7. Action Items**

Stephanie Monzon reviewed the actions that were open at the end of the meeting.

Action Items:	Status:	Assigned To:
<p>Stephanie will follow up with Gerry regarding the FERC direction to include the PRC-009 requirements into the draft standard. FERC did not support the team's argument that they could be covered under the NERC ROP data request.</p> <p>The team reviewed the requirements in PRC-009 in Montreal and felt that part of the requirement to perform the post-mortem was necessary to include in PRC-006-2.</p>	<p><b>Created 6/11/09</b></p> <p><b>Updated 9/2/09</b></p>	<p>Stephanie</p>
<p><b>Barry's Comments:</b></p> <p>The team will review Barry's comments and will review Stephanie's list of major issues (for Barry's comments) and will email additions to the list by <b>COB June 22, 2009</b>.</p>	<p><b>Closed</b></p>	<p>Team</p>
<p>The sub-teams will begin writing formal responses to the comments based on the discussion of issues at the June 10<sup>th</sup> meeting.</p> <p><b>Question 1 and 2:</b></p> <p>Bob and Carol will finalize the responses by June 19 — the team will review and discuss by exception on the July 7<sup>th</sup> meeting — <b>Complete</b></p> <p><b>Question 3:</b></p> <p>The team will discuss response to comments (not done at the June in person meeting). Jonathan will lead the discussion and identify the major issues for discussion. — <b>Complete</b></p> <p><b>Question 4:</b></p> <p>The team will discuss on the August 6<sup>th</sup> call – <b>Complete (on the July 20 call)</b></p> <p><b>Barry Francis:</b></p> <p>The team will discuss on the August 6<sup>th</sup> call – <b>Complete</b></p> <p><b>Question 5:</b></p> <p>The team will discuss on the August 24<sup>th</sup> - <b>Complete</b></p> <p><b>Question 6:</b></p> <p>August 24<sup>th</sup> call – the team did not discuss Question 6 responses. The team will discuss on conference calls after the meeting in Montreal.</p> <p><b>Question 7:</b></p> <p>By exception</p> <p><b>Question 8:</b></p> <p>August 24<sup>th</sup> call – the team did not discuss Question 6</p>		

Action Items:	Status:	Assigned To:
responses. The team will discuss on conference calls after the meeting in Montreal.		

## 8. Next Steps

Date	Location	Comments
August 6, 2009 from 9:30 a.m.–noon EST	Conference Call and WebEx	Barry Francis
August 24, 2009 from 1–3:30 p.m. EST	Conference Call and WebEx	Question 5, 6, 7 and 8
September 1–2, 2009 from 8 a.m.–5 p.m. (both days)	In person meeting — Montreal	Confirmed
September 8, 2009 from 9 a.m.–noon EST	Conference Call and WebEx	Question 6
September 9, 2009 from 1–3 p.m. EST	Conference Call	FERC Staff review of standard
September 11, 2009 from 12:30–2:30 p.m. EST	Conference Call and WebEx	Question 7 by exception and Question 8
September 14, 2009 from 1:30–4 p.m. EST	Conference Call and WebEx	Second Pass Review of Requirements
September 24, 2009 from 10 a.m.–noon EST	Conference Call and WebEx	Compliance Elements
September 25, 2009 from 9–11 a.m. EST	Conference Call and WebEx	Implementation Plan, Standard Final Pass
October 5, 2009 and October 6, 2009 — Two full days (8 a.m.–5 p.m.)	In person meeting FMPA Orlando, FL	Comment Form, Mapping Document, Remaining issues

## 9. Adjourn

The meeting adjourned at 4:45 p.m. EST.

## Meeting Notes

### Underfrequency Load shedding SDT — Project 2007-01

#### Meeting with FERC Staff

May 7, 2009 | 11 a.m.

#### 1. Attendees:

##### Drafting Team and NERC Staff:

- Si Phuc Tran
- Phil Tatro
- Bob Millard
- Brian Evans Mongeon
- Rob O'Keefe
- Jonathan Glidewell
- Tony Rodriguez
- Dave Taylor
- Stephanie Monzon
- Gerry Adamski
- Laurel Heacock

##### Observers:

- Barry Francis (BEPC)
- Danny Johnson
- Eric Ruscamp (Lincoln Electric)
- Gerry Dunbar (NPCC)
- Laura Elsenpeter (MRO)
- Dan Schoenecker (MRO)
- Terry Harbor

##### FERC Staff:

- Keith O'Neil
- Cynthia Pointer
- Ted Franks
- Bob Snow

## 2. Introductions

- a. The team began by explaining that the webinar slides for the Monday, May 11, 2009, webinar provided a good overview of the status of the UFLS project. The slides will be used as a guideline for the discussion with FERC.
- b. Please use the webinar slides to provide the overview and guideline for the discussion:  
<http://www.nerc.com/page.php?cid=6|83|187>

## 3. Review of Technical Requirements

- a. Phil Tatro stated that there has been enhanced coordination between this team and the Generator Verification SDT dealing with frequency set points. This interaction resulted in adding a 58.2 Hz step for no more than 4 seconds to the draft standard as a supplement to the existing performance requirement in Requirement R6. This discussion also resulted in a modification to the 59.5 Hz step to now state 59.3 Hz level.
- b. Over-frequency coordination with the Generator Verification SDT resulted in the change in maximum ceiling levels to 61.8 Hz from a previously proposed 61.0 Hz with 60.7 Hz setting for no more than 30 seconds. This step was previously proposed at 60.5 Hz. The team recognizes a need to better address the relationship between the teams on one point that will be addressed in the next version of the standard requirements.

## 4. FERC Discussion

- a. Major concerns for this standard are coordination, accounting for the variations in models, etc. Coordination is important so that nothing undesirable happens in real-time. The team can take whatever approach it deems appropriate. The team prefers to see that standards require “what” must be achieved, not necessarily “how” to achieve the requirements. Order 672 addressed the desire for “what” and this was reinforced by the fifteen factors listed in that Order. Leave the industry to determine the best “how” to implement the “what”.
- b. Coordination between this SDT and the Generator Verification SDT was to ensure that the UFLS tripping curve limit approaches but doesn’t cross over the generation tripping limit.
- c. Regarding the concern of how does the standard incorporate assessments that account for actual response, staff suggested the standard be drafted to require analysis following a system event and additional requirements to update the UFLS program. How is the feedback from real events factored in updating the program? Standard must ensure program design is updated based on analysis of events and not only five years. The following discussion covers item c and j:

- The team reviewed PRC-009 and determined that the standard does not require the feedback. It does, though, require the post-mortem analysis. The concept of feedback loop is not covered in existing standards.
- Brian brought up that it may be covered under EOP-004. The team looked at what is covered under the existing standard and thinks:
  1. the applicability would need to be expanded to include the Planning Coordinators (and possibly the DP)
  2. while the list of events includes over or under frequency events the analysis would need to include the items in PRC-009, specifically, **R1.2: A review of the UFLS set points and tripping times.**
- Frank G. suggested that the team could add it to the requirement for assessments in five years or within a year of an event. The event could be described by referencing what is described in EOP-004 (that should include a MW threshold). Jonathan indicated that in PRC-009 includes a broader description: “system events resulting in system frequency excursions below the initializing set points of the UFLS program” (which is practically every event). Brian M. will take the team’s discussion to the EOP-004 team but this SDT will not initiate modifications to EOP-004. By adding language to R7 the team feels that it has accounted for the feedback loop (minus any modeling changes that might be necessary which the team feels belongs in another standard – the modeling project).
- d. Staff supported listing users, owners, and operators of the system as enforceable and applicable entities, not RE s.
- e. Standards determine applicability based on technical need, registration does not drive technical need, e.g. applicable to units connected at 69 kV. Also, what about generation not connected at general BES levels and its impact on UFLS?
  - The team changed Requirement R6.4.1 from BES to 60 kV as a result of industry comments that indicated that impact to UFLS is not determined only by voltage but loss of MWs. In addition, the team considered Bob M.’s input that 60kV covers 99 percent utility generating capability. This number was established during an RFC review (during the development of their UFLS standard) 100kV does not include 4–6 percent of generating capability. This was the same result of an informal review by FRCC and WECC.
  - Frank brought up a concern with behind the meter generation. Phil indicated that Regions need to consider as distributed generation increases how to incorporate into the assessments.
  - Do units below 100kV impact UFLS? (6.4.1/6.4.2) team poll:
    1. Do Not

- a. FG (90 percent too low — 95 percent probably more appropriate)
- b. SB (95.5 is enough and 100kV would be appropriate to reach this)

2. Do

- a. GK
- b. PT
- c. JG
- d. TR
- e. BM

Abstain — BM and SP

Observers:

- f. SW — ok with 60 kV
- g. CG — thinks PC should determine what is included in the assessment
  - The team will take an action item to review 6.4.1 and 6.4.2 and come up with the appropriate threshold. The team agreed that they need to capture more than 90 percent of installed capacity but will come back to the requirement.
- f. Fundamental assumption built in — arrest frequency to drop load. This does not cover an important piece — how does one identify the proper response for a particular area? What are the criteria requirements for a particular area? How does the actual frequency response characteristic play into this standard? How is this coordination considered in the development of this standard? Balancing Authorities could be used as a resource to provide insight to system frequency response.
  - For actual response the Balancing Authorities do have frequency response insight. This standard is a planning standard and is concerned with making sure that modeling is appropriately capturing frequency response. The modeling discrepancies fall into modeling verification — belonging in an MOD standard.
- g. Applicable entities from existing standard (LSEs and TOPs) have been eliminated. The team needs to make sure that the requirements have not been eliminated but rather reassigned to other functional entities.
  - Requirements on the TOP were not appropriate to be assigned to TOPs (and already covered by TOs) and reassigned requirements on LSEs to DPs.
  - PRC-009 requirements — the team has decided to incorporate a piece into the draft standard but not directly mapped these requirements as there is no direct reliability need.

- h. Does the standard require cross-regional study opportunity where electrically cohesive islands span multiple regions or can the standard adequately study only a region irrespective of the electrical boundaries?
  - It is adequate to study islands that span multiple regions — it is included in R4 “and reach agreement on islands between its region and neighboring regions within the interconnection” and R5 “Interregional islands agreed on by the Planning Coordinators”.
- i. The use of the language “if any” in R5 might be a loophole even if only intended to recognize that some areas may not have practical historical data to draw upon.
  - The team voted to remove “if any” all agreed except Rob O. and Bob M. who were not in the room at the time the vote was conducted.
- j. How does taking out requirements from PRC-009 (data reporting requirements covered by the ROP) not lead to a gap in reliability? There is a reluctance to depend on the NERC ROP for replacing PRC-009 requirements since there is no clear enforcement mechanism.
- k. Emphasis on need for performance standards.

### **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:**

<b>Anticipated Actions</b>	<b>Anticipated Date</b>
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 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 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

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Comment [sm1]: Propose that R2 be merged with R6

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Comment [pj2]: The SDT n ... [4]

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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. – Variance for HydroQ, MRO
- 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. Variance for MRO
- 4.3. 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. Variance for MRO
- 4.4. Control 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: Variance for MRO and WECC
  - 4.4.1. Individual generating unit greater than 20 MVA (gross nameplate rating) and connected at 60 kV 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 R4. The 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.
  - 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]

**Comment [sm4]:** if replaced by a curve (5.1) - Hydrdo would still require a Variance but WECC would be ok with what is proposed - MRO? if curve would replace 5.1, 5.2 ofc would replace 5.3

**Comment [sm5]:** need to discuss responses to Question 6

**Comment [sm6]:** 9/1 - the team conducted a poll and concluded that the team does not think that considering 90% of installed capacity is enough but should go beyond - the team needs to determine what voltage will provide appropriate "coverage" of installed capacity

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**Comment [sm7]:** 8/24 - suggest to move R7 before R6  
9/2 - the team agreed to keep this order to avoid referencing the ... [10]

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- 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][Time Horizon: Long-term Planning]
- R9.** Each Transmission Owner and Distribution Provider shall provide tripping of load 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]
- If program design changes are introduced by the group of Planning Coordinators as a result of assessment results, the PC's shall provide advance notice to the TO's and DPs prior to implementation of the new program design...(see addition to R4 added the term "implementation schedule")

**Comment [sm9]:** stephanie thinks we need to delete this part of the requirement

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**Comment [pjt10]:** The VRF should be revisited after consideration of requirements in the present PRC-009 and if R7 is reconsidered as to whether the assessment if of the program design or the program implementation.

**Comment [sm11]:** 9/2 - the team identified the need to have an implementation transition time in this requirement to account for changes in the program

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

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- 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

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**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

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

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Each group of Planning Coordinators shall develop have a procedure for coordinating with groups of Planning Coordinators in neighboring regions within an interconnection to identify and reach agreement on 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.

Page 2: [3] Deleted Stephanie Monzon 9/2/2009 9:27:00 AM

[VRF: Lower][Time Horizon: Long-term Planning]

Page 2: [4] Comment [pjt2] Tatro, Phil 9/2/2009 10:42:00 AM

The SDT needs to consider whether these bullets should be numbered. - 9/2 - agreed that they should be AND statements and agreed to add "and" to each statement to clarify the intent (will make sure this is consistent across the standard)

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[Substitute for R4 to be inserted after R7, removing R4 completely and also removing 3<sup>rd</sup> point under R5] The combined group of Planning Coordinators of adjacent interconnected regions shall conduct a UFLS assessment on any islands identified by any one region's group of Planning Coordinators that straddle the respective interconnected regions. The periodicity, objective, content and outcome of the assessment shall be in accordance with R7. [VRF: High][Time Horizon: Long-term Planning]

Page 2: [6] Comment [sm3] Stephanie Monzon 9/2/2009 10:42:00 AM

8/28 - Sub-team discussion that these should be numbers (AND statement) not bullets

Page 2: [7] Formatted Stephanie Monzon 9/2/2009 10:15:00 AM

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Page 2: [8] Deleted Stephanie Monzon 9/2/2009 9:17:00 AM

Interregional islands agreed on by the Planning Coordinators.

Page 2: [9] Deleted Stephanie Monzon 9/1/2009 4:22:00 PM

of the underfrequency load shedding program

Page 3: [10] Comment [sm7] Stephanie Monzon 9/2/2009 11:38:00 AM

8/24 - suggest to move R7 before R6

9/2 - the team agreed to keep this order to avoid referencing the next requirement

We will include the proposed PRC-024 curve as the criterion for determining which generator protections must be modeled.

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### **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:**

<b>Anticipated Actions</b>	<b>Anticipated Date</b>
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 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 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 =  $[(\text{load} - \text{actual generation output}) / (\text{load})]$  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. 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 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 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 .
  - 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][Time Horizon: Long-term Planning]
- R9.** Each Transmission Owner and Distribution Provider shall provide tripping of load 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 =  $[(\text{load} - \text{actual generation output}) / (\text{load})]$  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