

UFLS Standard Drafting Team Response to Paragraph 81 and Independent Expert Review Project Recommendations for PRC-006-1

Project 2008-02: Underfrequency Load Shedding (UFLS)

Part I. Executive Summary

As part of this project, the UFLS standard drafting team (SDT) reviewed five requirements contained in PRC-006-1 to consider whether the requirements should be retired as a result of the Paragraph 81¹ and Independent Expert Review Project (IERP)² recommendations. Specifically, the UFLS team reviewed Requirements R6, R7, R8, R10 and R14. For the reasons outlined below, the team determined that these requirements are necessary and/or support reliability objectives, and they should not be retired.

Part II addresses Requirements R7 and R8, which were recommended for retirement as a part of Phase 2 of the Paragraph 81 work. Part III addresses Requirements R6, R10 and R14, which were recommended for retirement by the IERP.

Part II. Paragraph 81 Recommendations (Requirements R7 and R8)

A. PRC-006-1, Requirement R7:

“Each Planning Coordinator shall provide its UFLS database containing data necessary to model its UFLS program to other Planning Coordinators within its Interconnection within 30 calendar days of a request.”

Paragraph 81 Recommendation for Requirement R7

The Paragraph 81 team found that Requirement R7 *does* support NERC Reliability Principle No. 3.³ However, it was recommended as a Phase 2 candidate for retirement because, “[t]here should be a clear expectation for PCs to share data necessary to determine their UFLS program parameters.”

UFLS Drafting Team Conclusion Regarding Requirement R7

The UFLS drafting team concluded that Requirement R7 should not be retired because it serves a purpose in support of the reliability of the Bulk-Power System (BPS). Before specifically addressing Requirement R7, it is important to outline the entire framework of PRC-006-1, within which R7 is applied. The PRC-006-1 standard establishes common performance characteristics that all UFLS programs must meet. It does

¹ Project 2013-02: Paragraph 81 [[Link to Paragraph 81 project page](#)]

² [Link to Independent Expert Review Project Final Report](#)

³ Reliability Principle No. 3: Information necessary for the planning operation of interconnected bulk power systems shall be made available to those entities responsible for planning and operating the systems reliably. [Link to NERC Reliability Principles.](#)

not set mandatory continent-wide UFLS program parameters, such as setting program specific load shedding frequency thresholds, step sizes, and time delays.⁴ As outlined by the *Project 2007-1-Underfrequency Load Shedding* drafting team, this is because prescribing specific program parameters for the entire continent is unnecessary for reliability and hinders flexibility necessary to adapt UFLS designs to system characteristics specific to interconnections and regions.⁵ A uniform set of prescribed UFLS program parameters may not provide adequate system performance for all possible electrical islands that may form during a disturbance due to differences in system characteristics present in the four interconnections or even within different regions in the Eastern Interconnection.⁶ The *Project 2007-1* drafting team concluded that UFLS programs with differing design specifications can be successfully coordinated if they are designed to achieve the same system performance characteristics, even across interconnected regions, and that there is not one best way to design a UFLS program.⁷ In light of these observations, the *Project 2007-1* drafting team determined that most effective and efficient method to achieve the desired reliability goal is to establish common performance characteristics, because prescribing uniform UFLS program parameters would require most, if not all, entities to modify their UFLS equipment for little or no added reliability benefit.⁸

Given the approach of establishing common performance characteristics, PRC-006-1 contains requirements to ensure that the Planning Coordinators and UFLS entities support the exchange of information necessary to design and assess performance of UFLS programs. This is achieved through Requirements R6 through R8, which establish requirements to maintain a UFLS database and share data necessary to maintain that database.⁹ Under Requirement R6, each Planning Coordinator is required to maintain a UFLS database containing data necessary to model its UFLS program for use in event analyses and assessments of the UFLS program, at least once each calendar year, with no more than 15 months between maintenance activities. Requirement R7 requires that each Planning Coordinator provide its UFLS database to other Planning Coordinators within its Interconnection within 30 calendar days of a request. Where identified islands include portions of two or more Planning Coordinator areas, UFLS assessments will need to include the UFLS data applicable to each of those areas. This requirement ensures the necessary sharing of that data between Planning Coordinators.¹⁰ Requirement R8 requires that each UFLS entity provide its data to its Planning Coordinator(s) according to the format and schedule specified by the Planning Coordinator(s) to support maintenance of each Planning Coordinator UFLS database.

⁴ See, *Petition of the North American Electric Reliability Corporation for Approval of Proposed New Reliability Standards and Implementation Plans related to Underfrequency Load-Shedding*, Docket No. RM11-20-000 (March 31, 2011) at 8. (“NERC Petition”)

⁵ See, NERC Petition, at 8.

For a full history of Project 2007-1 Underfrequency Load Shedding, click here for the project page: [Link to project page](#)

⁶ See, NERC Petition, at 8.

⁷ See, NERC Petition, at 24.

⁸ See, NERC Petition, at 24.

⁹ See, NERC Petition, at 17.

¹⁰ See, NERC Petition, at 17.

As outlined above, because PRC-006-1 does not mandate a continent-wide UFLS program, it is essential that the various PCs coordinate and exchange data regarding their UFLS programs. It is important to point out that the P81 team found that Requirement R7 *does* support a reliability objective, and is based on the reliability principle that the information is necessary for the planning operation of the BPS and should be made available to those entities responsible for reliable system operation.¹¹ The UFLS SDT agrees. Notably, in reviewing Requirement R7, the P81 team determined that, “there should be a clear expectation for PCs to share data necessary to determine their UFLS program parameters,” *not* that the sharing of data among PCs is unnecessary or fails to support reliability. The requirement simply clarifies what is expected of the PCs and the time frame for action. For these reasons, the UFLS SDT believes that Requirement R7 should not be retired.

B. PRC-006-1, Requirement R8:

“Each UFLS entity shall provide data to its Planning Coordinator(s) according to the format and schedule specified by the Planning Coordinator(s) to support maintenance of each Planning Coordinator’s UFLS database.”

Paragraph 81 Recommendation for Requirement R8

The P81 team found that Requirement R8 *does* support NERC Reliability Principle No. 3.¹² However, the P81 team identified it as a candidate for Phase 2 retirement because, “[t]here should be a clear expectation for PCs to share data necessary to determine their UFLS program parameters.” Additionally, the P81 team noted that Requirement R8 should be applicable to Generator Owners in order to address a reliability gap. Specifically, “[G]enerator Owners need to be required to provide appropriate machine trip points and other data for analysis and coordination done under this standard.”

UFLS Drafting Team Conclusion Regarding Requirement R8

The UFLS drafting team concluded that Requirement R8 should not be retired because it serves a purpose in support of the reliability of the BPS. Additionally, the team determined the standard should not be amended to apply to Generator Owners.

Requirement R8 should not be retired

Requirement R8 should not be retired because it serves a purpose in support of reliability. Under Requirement R8, each UFLS entity provides data to its Planning Coordinator(s) according to the format and schedule specified by the Planning Coordinator(s) to support maintenance of the UFLS database.¹³ This requirement assigns responsibility to the Distribution Providers and Transmission Owners that have UFLS relays implemented as a part of the Planning Coordinator’s UFLS program to supply the data necessary to populate the applicable Planning Coordinator’s UFLS database. As outlined above, PCs must

¹¹ See, Reliability Principle No. 3, above.

¹² See, Reliability Principle No. 3, above.

¹³ NERC Petition, at 17, 25.

collect data and maintain the UFLS database with the information necessary design and assess performance of UFLS programs. Without Requirement R8, the PCs would not be provided with the UFLS data from the UFLS entities, and thus would not have the data necessary to conduct their design and performance assessments. Also, the SDT notes that the P81 recommendation to revise the applicability to include the Generator Owner contradicts the recommendation to retire Requirement R8. For these reasons, the UFLS SDT team believes Requirement R8 should not be retired.

Requirement R8 should not be revised to add applicability to Generator Owners

Requirement R8 should not be revised to add applicability to Generator Owners because it would create a redundancy, add unnecessary complexity, and possibly cause potential double violations of the standards. As outlined above, PRC-006-1 Requirement R3 establishes common performance characteristics that a PC's UFLS program must be designed to achieve. The performance characteristics specified (in R3.1 and R3.2) were coordinated with the generator trip setting boundaries specified in PRC-024-1 (Generator Frequency and Voltage Protective Relay Settings) so as to maintain consistent margins between the system frequency excursions allowed and generator trip settings.¹⁴ Additionally, PRC-024-1 Requirement R4 requires that Generator Owners provide trip settings to the Planning Coordinator or Transmission Planner within 60 calendar days of a written request. For these reasons, the requirement should not be revised to add applicability to Generator Owners.

Part III. IERP Recommendations (Requirements R6, R10 and R14)

A. PRC-006-1, Requirement R6:

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

IERP Recommendation for Requirement R6

The IERP recommended Requirement R6 for retirement on the grounds that it is administrative in nature and does not support a reliability objective. The IERP believed that, “[i]t is the actual study that provides for reliability.”

UFLS Drafting Team Conclusion Regarding Requirement R6

Requirement R6 should not be retired because it serves a purpose in support of reliability. Requirement R6 requires each Planning Coordinator to maintain a UFLS database containing data necessary to model its UFLS program for use in event analyses and assessments of the UFLS program at least once each calendar year, with no more than 15 months between maintenance activities. This requirement assigns

¹⁴ See, NERC Petition, at 14-15, 70-71, 79-80.

responsibility to the Planning Coordinators to ensure that the necessary data will be maintained in a database. Should significant UFLS events occur, this requirement also serves to ensure data availability to conduct the event assessments required by Requirement R11; and, where identified islands include portions of two or more PC areas, the data can be shared with other PCs as needed to conduct an assessment for their respective areas. For these reasons, the UFLS SDT team believes Requirement R6 should not be retired.

B. PRC-006-1, Requirement R10:

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

IERP Recommendation for Requirement R10

The IERP recommended Requirement R10 for retirement on the grounds that it is more appropriate as a Guideline, because accountability is met under the TPL and VAR Reliability Standards. However, the IERP found that Requirement R10 *does* support Reliability Principle Nos. 1 and 4.¹⁵

UFLS Drafting Team Conclusion Regarding Requirement R10

The UFLS drafting team concluded that Requirement R10 should not be retired because it would create a gap causing a risk to reliability. Requirement R10 requires that each Transmission Owner provide automatic switching of its existing capacitor banks, Transmission Lines, and reactors to control overvoltage as a result of underfrequency load shedding if required by the UFLS program and schedule for application determined by the Planning Coordinator(s) in each Planning Coordinator area in which the Transmission Owner owns transmission. Similar to Requirement R9, if there are any other automatic switching actions besides load tripping specified in the UFLS program design, this requirement ensures that that switching capability is in place and ready to operate.¹⁶ Requirement R10 was added to address control of overvoltage conditions during underfrequency events (*e.g.*, the Western Interconnection has very long transmission corridors which can create an overvoltage condition when those lines are unloaded, such as during an underfrequency event).

¹⁵ [Link to NERC Reliability Principles](#)

Reliability Principle No. 1: Interconnected bulk power systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.

Reliability Principle No. 4: Plans for emergency operation and system restoration of interconnected bulk power systems shall be developed, coordinated, maintained, and implemented.

¹⁶ NERC Petition, at 17-18.

The IERP recommended retirement on the basis that accountability for controlling voltage is met under the TPL and VAR standards; however, the IERP did not point to any specific standard or requirement in support of that position. The UFLS SDT reviewed the existing TPL and VAR standards and determined that the specific actions required under Requirement R10 – specifically the switching of devices by Transmission Owners – is not covered elsewhere in the TPL or VAR standards. While the TPL and VAR families of standards address similar issues, Transmission Owners are not included as applicable entities under either family of standards, and Transmission Owners therefore are not compelled to provide automatic switching on their equipment or adherence to a schedule of application determined by the Planning Coordinator. For these reasons, the UFLS SDT team believes Requirement R10 should not be retired.

C. PRC-006-1, Requirement R14

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

- 14.1. UFLS program, including a schedule for implementation
- 14.2. UFLS design assessment
- 14.3. Format and schedule of UFLS data submittal”

IERP Recommendation for Requirement R14

The IERP recommended Requirement R14 for retirement on the grounds that it is administrative in nature and does not support a reliability objective.

UFLS Drafting Team Conclusion Regarding Requirement R14

The UFLS drafting team concluded that Requirement R14 should not be retired because it serves a purpose in support of reliability. Requirement R14 requires that the Planning Coordinator respond to written comments submitted by UFLS entities and Transmission Owners, within its Planning Coordinator area, following a comment period and before finalizing its UFLS program, including a schedule for implementation (R14.1) and the UFLS design assessment (R14.2). In its written response, the PC is to indicate whether changes will be made to the UFLS program as a result of the comments; or, if no changes will be made, the reason why. This requirement was added by the *Project 2007-1* drafting team in response to industry comments on the standard expressing concern that the UFLS entities and Transmission Owners should have a role in the process of defining the UFLS program and schedule for implementation.¹⁷ The *Project 2007-1* drafting team considered the role of the Planning Coordinator and the coordination activities that the Planning Coordinator performs to meet its obligations. The team agreed that it would be beneficial to involve explicitly the UFLS entities and the Transmission Owners in

¹⁷ NERC Petition, at 19-20, 78.

the process of defining the UFLS program and the schedule for implementation because these entities may provide information based on practical implementation experience that improves the overall effectiveness of the UFLS program. Additionally, Requirement R14 provides the opportunity for Planning Coordinators to consider input from smaller entities when developing the UFLS program. Some UFLS programs do make allowances regarding the practicality of smaller entities to implement the UFLS program parameters, and PRC-006-1 allows Planning Coordinators to continue this practice so long as the reliability objectives of this standard are met (*i.e.*, the UFLS program, including allowances for smaller entities, meets all of the performance characteristics embodied in this standard).¹⁸ For these reasons, the UFLS SDT team believes Requirement R14 should not be retired.

¹⁸ NERC Petition, at 27.