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NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

# PRC-010-1 Frequently Asked Questions

Project 2008-02 Undervoltage Load Shedding  
September 24, 2014

**RELIABILITY | ACCOUNTABILITY**



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# Table of Contents

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Table of Contents.....	2
Introduction.....	3
Frequently Asked Questions.....	4
Purpose of Standard Revision.....	4
Coordination with Project 2009-03 Emergency Operations.....	5
“UVLS Program” Definition.....	5
Applicability.....	6
Requirements R1, R3, R4, and R5.....	7
Requirements R6, R7, and R8.....	8
Attachment A – Drafting Team Members.....	10

## Introduction

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Over the course of the development of PRC-010-1, the Project 2008-02 Undervoltage Load Shedding (UVLS) Standard Drafting Team (drafting team) conducted two informal comment periods and multiple outreach sessions with industry. In addition to providing individual responses to the second informal comment period that was conducted in March 2014, the drafting team has also developed this Frequently Asked Questions (FAQ) document to succinctly address common comment themes with respect to drafting team approach and intent.

All comments submitted during the two informal comment periods and the responses provided for the March 17–April 16, 2014 informal comment period may be reviewed on the [project page](#).

If you have any further concerns you would like to discuss with the drafting team, you can contact the Standards Developer, [Erika Chanzas Katherine Street](#), at 404-446-~~97022583~~ or at [erika.chanzas@nerc.net](mailto:erika.chanzas@nerc.net), [katherine.street@nerc.net](mailto:katherine.street@nerc.net).



## Frequently Asked Questions

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To succinctly address common comment themes that require drafting team response on Project 2008-02 UVLS (proposed PRC-010-1), the drafting team provides the following discussion in the construct of an FAQ format.

### Purpose of Standard Revision

#### *1) What is the basis for a revision of the existing UVLS standards?*

The initial input into a revision of the existing UVLS standards is FERC [Order No. 693](#), Paragraph 1509, which directed the ERO to develop a modification of PRC-010-0 that “requires that an integrated and coordinated approach be included in all protection systems on the Bulk-Power System, including generators and transmission lines, generators’ low voltage ride through capabilities, and UFLS and UVLS programs.” In addition, [The Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations](#) (“August 14 Blackout Report”) showed that proper coordination would have mitigated effects if UVLS was used as a tool.

Additional inputs included 1) recommendations from the NERC System Protection and Control Subcommittee (SPCS) in its December 2010 [Technical Review of UVLS-Related Standards](#) to combine the four existing UVLS standards, revise the applicability to entities responsible for UVLS program design, implementation, and coordination, specifically include a requirement for assessment of coordination between UVLS programs and all other protection systems, and differentiate post-event validation of UVLS program design from verifying correct operation of UVLS equipment; 2) the existing UVLS standards were not in the current results-based format; 3) the preceding revision of the underfrequency load shedding (UFLS) standards had similar types of requirements and had been completed under the construct of a consolidation; and 4) the Independent Expert Review Panel recommendations, which included an evaluation of the existing standards’ applicability and level of specificity.

The drafting team agrees that a lack of coordination among protection systems is a key risk to reliability. As part of the revision to address this, the drafting team also agreed that an evaluation and consolidation of the existing UVLS standards was necessary to meet current Reliability Standard development initiatives and to provide clear, comprehensive requirements to address the application and coordination of UVLS.

#### *2) UVLS programs are not mandatory—is compliance for an optional tool necessary?*

The drafting team asserts that a key takeaway from the August 14 Blackout Report is that coordination of UVLS with other protection systems could have mitigated the effects if UVLS was used as a tool. Although the use of UVLS is not mandatory, if it is determined that this system preservation measure is necessary to support reliability and a UVLS program is installed, the program needs to be properly coordinated, implemented, and assessed due to the inherent associated reliability risks. As such, there needs to be a level of performance required to properly protect system reliability. Of note, PRC-010-1 applies only to the proposed defined term “UVLS Program,” which limits the standard’s applicability to only those undervoltage-based load shedding programs whose performance has an impact on system reliability.

## Coordination with Project 2009-03 Emergency Operations

### *3) EOP-003-2 has potentially redundant requirements with proposed PRC-010-1—how is this being addressed?*

As part of its five-year review, Project 2009-03 Emergency Operations (EOP) identified EOP-003-2, Requirements R2, R4, and R7 as being more properly covered by Project 2008-02 UVLS. Now that both projects are in formal development, they are strategically coordinating to move in lockstep from a timing perspective to address these requirements. Project 2009-03 EOP, which is proposing to revise and consolidate EOP-001-2.1b, EOP-002-3, and EOP-003-2 to create EOP-011-1, will retire the noted EOP-003-2 requirements (among other revisions), and the Project 2008-02 UVLS Mapping Document will show how PRC-010-1 encompasses the retired content accordingly. Slated to have aligning effective dates, both EOP-011-1 and PRC-010-1 will be posted and balloted separately but concurrently, so that industry stakeholders will be able to clearly evaluate the transition. Please see the posted Project 2008-02 UVLS Project Coordination Plan for more information.

## “UVLS Program” Definition

### *4) Why is the introduction of the new NERC Glossary term “UVLS Program” necessary?*

The drafting team found it necessary to introduce the term “UVLS Program” because different types of UVLS systems need to be treated appropriately with respect to reliability requirements. Therefore, the term establishes which UVLS systems PRC-010-1 will apply to: “automatic load shedding program[s], consisting of distributed relays and controls, used to mitigate undervoltage conditions impacting the Bulk Electric System (BES), leading to voltage instability, voltage collapse, or Cascading.”

The definition is meant to inherently exclude locally-applied relays that are designed to protect a contained area or, in other words, are not designed to mitigate wide-area voltage collapse. This exclusion is not explicit in these terms in the definition’s enforceable language since the meaning and measurement of “local” or “wide-area” varies greatly on a continent-wide basis and could potentially be interpreted differently by auditors and the applicable functional entities. Therefore, the definition as written is meant to provide flexibility for the Planning Coordinator or Transmission Planner to determine if a UVLS system falls under the defined term with respect to its impact on the reliability of the BES (voltage instability, voltage collapse, or Cascading). To further support the intended exclusion, further discussion and an example are provided on page 18 of the standard document in the Guidelines and Technical Basis section.

The definition does explicitly note that the term excludes centrally controlled undervoltage-based load shedding. This type of load shedding is excluded because the drafting team asserts that the design and characteristics of centrally controlled undervoltage-based load shedding are commensurate with those of a Special Protection System (SPS) or Remedial Action Scheme (RAS) and should therefore be subject to SPS or RAS-related Reliability Standards. See page 18 of the standard document in the Guidelines and Technical Basis section for further discussion.

### *5) If the definition excludes certain types of UVLS, does this preclude an “integrated” approach (FERC Order No. 693, Paragraph 1509)?*

The defined term “UVLS Program” clarifies which UVLS systems are subject to the requirements in PRC-010-1. The resulting exclusions from PRC-010-1 do not preclude an “integrated” approach because the standard requires that

an entity coordinate with all other protection and control systems as necessary, which may include other types of UVLS (i.e., locally-applied UVLS relays and centrally controlled undervoltage-based load shedding).

***6) Where will centrally controlled undervoltage-based load shedding be covered?***

As explained immediately above, the requirements of PRC-010-1 are applicable to the proposed new NERC Glossary term “UVLS Program,” which excludes centrally controlled undervoltage-based load shedding because its design and characteristics are commensurate with those of an SPS or RAS. However, the current NERC Glossary definition of “Special Protection System” excludes UVLS. Therefore, Project 2010-05.2 Special Protection Systems (Phase 2 of Protection Systems), which is currently revising the NERC Glossary definition of “Special Protection System” and proposing the single term “Remedial Action Scheme,” will also revise the definition of this term to exclude UVLS Programs, therefore including centrally controlled undervoltage-based shedding.

Consequently, the introduction of the term “UVLS Program” and the conforming revision to the term “Remedial Action Scheme” will explicitly clarify that RAS-related standards are applicable to centrally controlled undervoltage-based load shedding. The implementation plan for the revised definition of “Remedial Action Scheme” will address entities that will have newly identified RAS resulting from the application of the defined term.

Similar to the coordination effort with Project 2009-03 EOP explained above, Project 2008-02 UVLS and Project 2010-05.2 SPS are working together in lockstep from a timing perspective to ensure that the effective dates of the revised definition of “Remedial Action Scheme,” the proposed new term “UVLS Program,” proposed PRC-010-1, and all associated retirements align. Both the proposed revised definition of “Remedial Action Scheme” and PRC-010-1 will be posted and balloted separately but concurrently, so that industry stakeholders will be able to clearly evaluate the transition.

***7) Is the term “UVLS Program” inclusive of a collection of independent UVLS relays?***

No; multiple independent relays do not constitute a program. While the definition stipulates that a UVLS Program consists of distributed relays and controls, the definition specifies that it must be an automatic load shedding *program* that mitigates the specified conditions impacting the BES. By nature of this definition, this would include relays that are coordinated and act in concert for this purpose.

**Applicability**

***8) What is meant by the phrase “Planning Coordinator or Transmission Planner”?***

PRC-010-1 is applicable to both the Planning Coordinator and Transmission Planner because either may be responsible for designing and coordinating the program based on agreements, memorandums of understanding, or tariffs. The phrase “Planning Coordinator or Transmission Planner” provides the flexibility for applicability to the entity that will perform the action. The expectation is not that both parties will perform the action, but rather that the Planning Coordinator and Transmission Planner will engage in discussion to determine the appropriate responsible entity. In addition, the requirements containing this phrase have specific language to qualify the responsible entity. For example, Requirement R1 states: “Each Planning Coordinator or Transmission Planner *that is developing* a UVLS Program shall . . .” This language provides clarity that the applicable entity would be the one that is developing the program.

***9) Why is the Transmission Operator not included?***

While the Transmission Operator may be involved with UVLS Program activities, the drafting team did not identify any required performance for the Transmission Operator that was necessary to capture within PRC-010-1 since the Transmission Operator does not have the resources necessary to implement program specifications. If responsibilities are delegated to the Transmission Operator by the Transmission Owner, the Transmission Owner is still the accountable party.

To the extent that the Transmission Operator is required to have knowledge of system relays and protection systems, the drafting team notes that this requirement is covered under PRC-001. It is also noted that manual load shedding, for which the Transmission Operator is responsible, is not in the purview of PRC-010-1, as it is covered under current EOP-003-2 and will subsequently be covered by proposed EOP-011-1 (see Project 2009-03 Emergency Operations).

***10) What about UVLS schemes owned by Transmission Owners, Distribution Providers, or Transmission Operators that are not required by the planner?***

PRC-010-1 is applicable to its proposed defined term “UVLS Program.” The drafting team notes that, by its defining attributes, a UVLS Program would be required and developed by a Planning Coordinator or Transmission Planner. The nature of a UVLS scheme developed or required by a Transmission Owner, Distribution Provider, or Transmission Operator would not meet the attributes of the defined term and would therefore not have the design and characteristics necessary to be subject to the requirements of PRC-010-1.

**Requirements R1, R3, R4, and R5**

***11) What is required to evaluate the coordination referenced in Requirement R1, part 1.2?***

Requirement R1 requires each Planning Coordinator or Transmission Planner that develops a UVLS Program to evaluate the program’s viability and effectiveness prior to implementation. This evaluation should include studies and analyses used when developing the program that show implementation of the program resolves the identified undervoltage issues that led to its design. These studies and analyses should also show that the UVLS Program is integrated through coordination with generator voltage ride-through capabilities and other protection and control systems. As such, the requirement is meant to provide flexibility for an entity to make the proper determinations, including the considerations for coordination, with respect to program effectiveness based on system characteristics. For further guidance on and examples of coordination considerations, please see the portion of the Guidelines and Technical Basis section that addresses Requirement R1 on pages 19–20 of the standard document.

***12) Requirements R1, R3, and R4 seem to all require evaluations of program effectiveness—how are they different?***

Requirements R1, R3, and R4 do all require evaluations of program effectiveness, but they are each at distinct points in time.

Requirement R1 requires evaluation of program effectiveness (by way of the qualifying parts) at the onset of program development, or during the initial planning stage, prior to implementation. Requirement R3 requires the



same objectives of an evaluation of effectiveness, but at the point of a mandatory periodic review (at least once every 60 calendar months). Requirement R4 addresses a UVLS Program's performance after an event (applicable voltage excursion) to evaluate whether the UVLS Program resolved the undervoltage issues associated with the event.

It is noted that, because of the separate activities of each requirement, UVLS Program deficiencies found as a result of the assessments performed in Requirement R3 or R4 would not be violations of Requirement R1.

***13) Requirement R4 would require the Planning Coordinator or Transmission Planner to review all voltage excursions—isn't this unduly burdensome?***

While Requirement R4 essentially requires the Planning Coordinator or Transmission Planner to review all voltage excursions to see if they fall below the initializing set points of the UVLS Program, the drafting team contends that it will be clearly evident if voltage falls below the UVLS threshold because either a) UVLS devices will operate; or b) the system will experience the adverse conditions the UVLS Program was installed to mitigate.

In addition, the drafting team acknowledges that the Planning Coordinator or Transmission Planner may not have the ability to know when voltage excursions are occurring since they are not operating entities. However, a process for the Transmission Operator, Transmission Owner, or Distribution Provider to notify the Transmission Planner or Planning Coordinator of such voltage excursion events is consistent with standard utility practice.

***14) PRC-022-1 required the analysis of UVLS Misoperations. How is this addressed in PRC-010-1?***

One of the recommendations in the SPCS report was to clearly differentiate between the post-event process of validating the effectiveness of the UVLS program design, its coordination with other protection and control systems, and the potential need to modify the program design (activities addressed in PRC-010-1) and the process of verifying correct operation of UVLS equipment (which should be covered in PRC-004).

Relative to a UVLS Program, PRC-010-1 Requirements R4 and R5 require event analysis and a Corrective Action Plan to address any identified program deficiencies. The UVLS drafting team maintains that verifying correct operation of UVLS equipment should be addressed in PRC-004 and is coordinating an applicability change to this standard with respect to the development timeline of Project 2010-05.1 Misoperations (Phase 1 of Protection Systems), which is in the later stages of development of PRC-004-3. Please see the posted PRC-010-1 Mapping Document and Project 2008-02 UVLS Project Coordination Plan for further information.

## **Requirements R6, R7, and R8**

***15) Do Requirements R6, R7, and R8 overlap with the requirements of MOD-032-1?***

While both MOD-032-1 and Requirements R6, R7, and R8 of PRC-010-1 address data requirements, MOD-032-1 establishes overarching modeling data requirements with respect to consistency in format and reporting procedures, whereas the PRC-010-1 requirements address the need to maintain and share data and databases for the purposes of studies for use in event analyses for UVLS Programs specifically. While Reliability Standards in general may have overlap in this manner, the activities in these requirements remain distinctly different.

*16) Requirements R6, R7, and R8 appear to be administrative—doesn't this conflict with Paragraph 81 criteria?*

Proper maintenance and timely sharing of UVLS Program data as required by Requirements R6, R7, and R8 is necessary to inform the Planning Coordinator or Transmission Planner's studies and analyses. While administrative tasks are required, the tasks have a core reliability-based need.

In addition, Requirements R6, R7, and R8 were written to emulate FERC-approved PRC-006-1 Automatic Underfrequency Load Shedding data requirements. While some of these analogous requirements in PRC-006-1 are listed as candidates for Phase 2 of the Paragraph 81 project, they are not yet approved as meeting the criteria; furthermore, the Independent Expert Review Panel has recommended that these Paragraph 81 candidates not be included for deletion, citing that "there should be a clear expectation for Planning Coordinators to share data necessary to determine their UFLS program parameters".

## Attachment A – Drafting Team Members

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Project 2008-02 UVLS Standard Drafting Team		
	Participant	Entity
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Member	Bill Harm	PJM Interconnection, LLC
Member	Sharma Kolluri	Entergy Corporation
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Member	Manish Patel	Southern Company Transmission
Member	Fabio Rodriguez	Duke Energy Florida
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