

Project 2008-02 Undervoltage Load Shedding

Mapping Document

This mapping document shows translation of the requirements of PRC-010-0 – Assessment of the Design and Effectiveness of UVLS Program, PRC-020-1 – Under-Voltage Load Shedding Program Database, PRC-021-1 – Under-Voltage Load Shedding Program Data, PRC-022-1 – Under-Voltage Load Shedding Program Performance, and specific requirements from EOP-003-2 – Load Shedding Plans to the requirements of PRC-010-1 – Undervoltage Load Shedding.

Project 2008-02 – Undervoltage Load Shedding (PRC-010-1) retires Reliability Standards PRC-010-0, PRC-020-1, PRC-021-1, and PRC-022-1. Project 2009-03 – Emergency Operations (EOP-011-1), which is following a concurrent development timeline with Project 2008-02, retires EOP-003-2, Requirements R2, R4, and R7. The reliability objectives of those three requirements is reflected in PRC-010-1, and the respective translations are illustrated in the mapping documents for both projects.

The drafting team has established the applicability of PRC-010-1 to its proposed new NERC Glossary term “Undervoltage Load Shedding Program (UVLS Program).” This term explicitly excludes centrally controlled undervoltage-based load shedding because its design and characteristics are commensurate with those of a Special Protection System (SPS) or Remedial Action Scheme (RAS) with respect to reliability requirement-related needs. As such, centrally controlled undervoltage-based load shedding should be subject to SPS or RAS-related standards. This clarification is being facilitated by way of a conforming revision to the definition of the term “Remedial Action Scheme” by concurrent Project 2010-05.2 – Special Protection Systems (Phase 2 of Protection Systems). This project is also subsequently revising the SPS or RAS-related Reliability Standards.

In addition, the requirements for PRC-010-1 apply to UVLS Program development and assessment and not to equipment. As PRC-022-1 addresses UVLS equipment Misoperations, the UVLS drafting team’s intention is for PRC-004 to address Misoperations of UVLS Program equipment. A change to make PRC-004 explicitly applicable to UVLS Program equipment will be addressed once PRC-004-3 – Protection System Misoperation Identification and Correction is completed under Project 2010-05.1 – Misoperations (Phase 1 of Protection Systems).

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Standard: PRC-010-0 – Assessment of the Design and Effectiveness of UVLS Program		
Requirement in Approved Standard	Translation to New Standard or Other Action	Proposed Language in PRC-010-1 or Comments
<p>R1. The Load-Serving Entity, Transmission Owner, Transmission Operator, and Distribution Provider that owns or operates a UVLS program shall periodically (at least every five years or as required by changes in system conditions) conduct and document an assessment of the effectiveness of the UVLS program. This assessment shall be conducted with the associated Transmission Planner(s) and Planning Authority(ies).</p> <p>R1.1. This assessment shall include, but is not limited to:</p> <p>R1.1.1. Coordination of the UVLS programs with other protection and control systems in the Region and with other Regional Reliability Organizations, as appropriate.</p> <p>R1.1.2. Simulations that demonstrate that the UVLS programs performance is consistent with Reliability Standards TPL-001-0, TPL-002-0, TPL-003-0 and TPL-004-0.</p> <p>R1.1.3. A review of the voltage set points and timing.</p>	<p>PRC-010-0 R1 maps to PRC-010-1 R3. Applicability changed to Planning Coordinator or Transmission Planner since the Planning Coordinator or Transmission Planner is responsible for the program design.</p> <p>PRC-010-0 R1.1.1 maps to PRC-010-1 R3, part 3.2.</p> <p>PRC-010-0 R1.1.2 and R1.1.3 are inherently embedded in PRC-010-1 R3 (comprehensive assessment). The specific items listed in R1.1.2 and R1.1.3 are described in PRC-010-1’s Guidelines and Technical Basis.</p>	<p>R3. Each Planning Coordinator or Transmission Planner shall perform a comprehensive assessment to evaluate the effectiveness of each of its UVLS Programs at least once every 60 calendar months. The assessment shall include, but is not limited to, studies and analyses that evaluate whether:</p> <p>3.1. The UVLS Program resolves the identified undervoltage issues for which the UVLS Program is designed.</p> <p>3.2. The UVLS Program is integrated through coordination with generator voltage ride-through capabilities and other protection and control systems, including, but not limited to, transmission line protection, auto-reclosing, Remedial Action Schemes, and other undervoltage-based load shedding programs.</p>

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Standard: PRC-010-0 – Assessment of the Design and Effectiveness of UVLS Program		
Requirement in Approved Standard	Translation to New Standard or Other Action	Proposed Language in PRC-010-1 or Comments
R2. The Load-Serving Entity, Transmission Owner, Transmission Operator, and Distribution Provider that owns or operates a UVLS program shall provide documentation of its current UVLS program assessment to its Regional Reliability Organization and NERC on request (30 calendar days).	FERC-approved retirement of Requirement R2 in Order No. 788 issued November 21, 2013 in FERC Docket No. RM13-8-000.	N/A

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Standard: PRC-020-1 – Under-Voltage Load Shedding Program Database		
Requirement in Approved Standard	Translation to New Standard or Other Action	Proposed Language in PRC-010-1 or Comments
<p>R1. The Regional Reliability Organization shall establish, maintain and annually update a database for UVLS programs implemented by entities within the region to mitigate the risk of voltage collapse or voltage instability in the BES. This database shall include the following items:</p> <p>R1.1. Owner and operator of the UVLS program.</p> <p>R1.2. Size and location of customer load, or percent of connected load, to be interrupted.</p> <p>R1.3. Corresponding voltage set points and overall scheme clearing times.</p> <p>R1.4. Time delay from initiation to trip signal.</p> <p>R1.5. Breaker operating times.</p> <p>R1.6. Any other schemes that are part of or impact the UVLS programs such as related generation protection, islanding schemes, automatic load restoration schemes, UFLS and Special Protection Systems.</p>	<p>PRC-020-1 R1 maps to PRC-010-1 R6. Applicability changed from the Regional Reliability Organization to the Planning Coordinator since the Planning Coordinator is responsible for maintaining information about programs in its area (and requirements can no longer be applicable to Regional Reliability Organizations).</p> <p>PRC-020-1 R1.1– R1.6 are inherently embedded in PRC-010-1 R6. The specific items listed in R1.1–R1.6 are described in PRC-010-1’s Guidelines and Technical Basis.</p>	<p>R6. Each Planning Coordinator that has a UVLS Program in its area shall update a database containing data necessary to model its UVLS Program for use in event analyses and assessments of the UVLS Program at least once each calendar year.</p>

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Standard: PRC-020-1 – Under-Voltage Load Shedding Program Database		
Requirement in Approved Standard	Translation to New Standard or Other Action	Proposed Language in PRC-010-1 or Comments
<p>R2. The Regional Reliability Organization shall provide the information in its UVLS database to the Planning Authority, the Transmission Planner, or other Regional Reliability Organizations and to NERC within 30 calendar days of a request.</p>	<p>PRC-020-1 R2 maps to PRC-010-1 R8. Applicability changed from the Regional Reliability Organization to the Planning Coordinator since the Planning Coordinator is responsible for maintaining information about programs in its area (and requirements are no longer applicable to Regional Reliability Organizations).</p> <p>Eliminated specificity to the Regional Reliability Organization as a receiving entity by replacing it with “other functional entities with a reliability need.”</p> <p>Eliminated NERC as a receiving entity since the ERO Rules of Procedures, Section 401:3. Data Access, provide the ability for NERC to obtain this information.</p>	<p>R8. Each Planning Coordinator that has a UVLS Program in its area shall provide its UVLS Program database to other Planning Coordinators and Transmission Planners within its Interconnection, and other functional entities with a reliability need, within 30 calendar days of a written request.</p>

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Standard: PRC-021-1 – Under-Voltage Load Shedding Program Data		
Requirement in Approved Standard	Translation to New Standard or Other Action	Proposed Language in PRC-010-1 or Comments
<p>R1. Each Transmission Owner and Distribution Provider that owns a UVLS program to mitigate the risk of voltage collapse or voltage instability in the BES shall annually update its UVLS data to support the Regional UVLS program database. The following data shall be provided to the Regional Reliability Organization for each installed UVLS system:</p> <p>R1.1. Size and location of customer load, or percent of connected load, to be interrupted.</p> <p>R1.2. Corresponding voltage set points and overall scheme clearing times.</p> <p>R1.3. Time delay from initiation to trip signal.</p> <p>R1.4. Breaker operating times.</p> <p>R1.5. Any other schemes that are part of or impact the UVLS programs such as related generation protection, islanding schemes, automatic load restoration schemes, UFLS and Special Protection Systems.</p>	<p>PRC-021-1 R1 maps to PRC-010-1 R7. Replaced the Regional Reliability Organization with the Planning Coordinator as the receiving entity since the Planning Coordinator is assigned responsibility for maintaining the database.</p> <p>PRC-021-1 R1.1–R1.5 are inherently embedded in PRC-010-1 R7. The specific items listed in R1.1–R1.5 are described in PRC-010-1’s Guidelines and Technical Basis.</p>	<p>R7. Each UVLS entity shall provide data to its Planning Coordinator according to the format and schedule specified by the Planning Coordinator to support maintenance of a UVLS Program database.</p>

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Standard: PRC-021-1 – Under-Voltage Load Shedding Program Data		
Requirement in Approved Standard	Translation to New Standard or Other Action	Proposed Language in PRC-010-1 or Comments
<p>R2. Each Transmission Owner and Distribution Provider that owns a UVLS program shall provide its UVLS program data to the Regional Reliability Organization within 30 calendar days of a request.</p>	<p>PRC-021-1 R2 maps to PRC-010-1 R7. Replaced the Regional Reliability Organization with the Planning Coordinator as the receiving entity since the Planning Coordinator is assigned responsibility for maintaining the database.</p>	<p>R7. Each UVLS entity shall provide data to its Planning Coordinator according to the format and schedule specified by the Planning Coordinator to support maintenance of a UVLS Program database.</p>

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Standard: PRC-022-1 – Under-Voltage Load Shedding Program Performance		
Requirement in Approved Standard	Translation to New Standard or Other Action	Proposed Language in PRC-010-1 or Comments
<p>R1. Each Transmission Operator, Load-Serving Entity, and Distribution Provider that operates a UVLS program to mitigate the risk of voltage collapse or voltage instability in the BES shall analyze and document all UVLS operations and Misoperations. The analysis shall include:</p> <p>R1.1. A description of the event including initiating conditions.</p> <p>R1.2. A review of UVLS set points and tripping times.</p> <p>R1.3. A simulation of the event, if deemed appropriate by the Regional Reliability Organization. For most events, analysis of sequence of events may be sufficient and dynamic simulations may not be needed.</p> <p>R1.4. A summary of the findings.</p> <p>R1.5. For any Misoperation, a Corrective Action Plan to avoid future Misoperations of a similar nature.</p>	<p>PRC-022-1 R1 maps to PRC-010-1 R4 and R5. Applicability changed to Planning Coordinator or Transmission Planner since the Planning Coordinator or Transmission Planner is responsible for the program design.</p> <p>PRC-022-1 R1.1 and R1.4 are part of the measure for PRC-010-1 R4.</p> <p>PRC-022-1 R1.2 and R1.3 are inherently embedded in PRC-010-1 R4. The specific items listed in R1.2 and R1.3 are described in PRC-010-1’s Guidelines and Technical Basis.</p> <p>PRC-022-1 R1.5 is included as part of PRC-010-1 R5. Also see last paragraph of the second page of this mapping document.</p>	<p>R4. Each Planning Coordinator or Transmission Planner shall, within 12 calendar months of an event that resulted in a voltage excursion for which its UVLS Program was designed to operate, perform an assessment to evaluate whether its UVLS Program resolved the undervoltage issues associated with the event.</p> <p>R5. Each Planning Coordinator or Transmission Planner that identifies deficiencies in its UVLS Program during an assessment performed in either Requirement R3 or R4 shall develop a Corrective Action Plan to address the deficiencies and subsequently provide the Corrective Action Plan, including an implementation schedule, to UVLS entities within three calendar months of completing the assessment.</p>

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Standard: PRC-022-1 – Under-Voltage Load Shedding Program Performance		
Requirement in Approved Standard	Translation to New Standard or Other Action	Proposed Language in PRC-010-1 or Comments
R2. Each Transmission Operator, Load-Serving Entity, and Distribution Provider that operates a UVLS program shall provide documentation of its analysis of UVLS program performance to its Regional Reliability Organization within 90 calendar days of a request.	FERC-approved retirement of Requirement R2 in Order No. 788 issued November 21, 2013 in FERC Docket No. RM13-8-000.	N/A

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Standard: EOP-003-2 – Load Shedding Plans		
Requirement in Approved Standard	Translation to New Standard or Other Action	Proposed Language in PRC-010-1 or Comments
<p>R2. Each Transmission Operator shall establish plans for automatic load shedding for undervoltage conditions if the Transmission Operator or its associated Transmission Planner(s) or Planning Coordinator(s) determine that an under-voltage load shedding scheme is required.</p>	<p>EOP-003-2 R2 maps to PRC-010-1 R1. Applicability is changed to the Planning Coordinator or Transmission Planner because the Planning Coordinator or Transmission Planner is responsible for the program design.</p>	<p>R1. Each Planning Coordinator or Transmission Planner that is developing a UVLS Program shall evaluate its effectiveness and subsequently provide the UVLS Program’s specifications and implementation schedule to the UVLS entities responsible for implementing the UVLS Program. The evaluation shall include, but is not limited to, studies and analyses that show:</p> <p>1.1. The implementation of the UVLS Program resolves the identified undervoltage issues that led to its development and design.</p> <p>1.2. The UVLS Program is integrated through coordination with generator voltage ride-through capabilities and other protection and control systems, including, but not limited to, transmission line protection, auto-reclosing, Remedial Action Schemes, and other undervoltage-based load shedding programs.</p>

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Standard: EOP-003-2 – Load Shedding Plans		
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<p>R4. A Transmission Operator shall consider one or more of these factors in designing an automatic under voltage load shedding scheme: voltage level, rate of voltage decay, or power flow levels.</p>	<p>EOP-003-2 R4 is inherently embedded in PRC-010-1 R1, part 1.1. The specific items noted are described in PRC-010-1’s Guidelines and Technical Basis. Applicability is changed to the Planning Coordinator or Transmission Planner because the Planning Coordinator or Transmission Planner is responsible for the program design.</p>	<p>R1. Each Planning Coordinator or Transmission Planner that is developing a UVLS Program shall evaluate its effectiveness and subsequently provide the UVLS Program’s specifications and implementation schedule to the UVLS entities responsible for implementing the UVLS Program. The evaluation shall include, but is not limited to, studies and analyses that show:</p> <p>1.1. The implementation of the UVLS Program resolves the identified undervoltage issues that led to its development and design.</p> <p>1.2. The UVLS Program is integrated through coordination with generator voltage ride-through capabilities and other protection and control systems, including, but not limited to, transmission line protection, auto-reclosing, Remedial Action Schemes, and other undervoltage-based load shedding programs.</p>

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Standard: EOP-003-2 – Load Shedding Plans		
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<p>R7. The Transmission Operator shall coordinate automatic undervoltage load shedding throughout their areas with tripping of shunt capacitors, and other automatic actions that will occur under abnormal voltage, or power flow conditions.</p>	<p>EOP-003-2 R7 is inherently embedded in PRC-010-1 R1, part 1.2. The specific items noted are described in PRC-010-1's Guidelines and Technical Basis. Applicability is changed to the Planning Coordinator or Transmission Planner because the Planning Coordinator or Transmission Planner is responsible for the program design.</p>	<p>R1. Each Planning Coordinator or Transmission Planner that is developing a UVLS Program shall evaluate its effectiveness and subsequently provide the UVLS Program's specifications and implementation schedule to the UVLS entities responsible for implementing the UVLS Program. The evaluation shall include, but is not limited to, studies and analyses that show:</p> <p>1.1. The implementation of the UVLS Program resolves the identified undervoltage issues that led to its development and design.</p> <p>1.2. The UVLS Program is integrated through coordination with generator voltage ride-through capabilities and other protection and control systems, including, but not limited to, transmission line protection, auto-reclosing, Remedial Action Schemes, and other undervoltage-based load shedding programs.</p>