Bonneville Power Administration
Under Frequency Load Shedding and Under Voltage Load Shedding Interpretation
Dec. 12, 2007

Background:
Bonneville has been working internally to assess and evaluate its UFLS and UVLS Program. This relates to the following standards:

Standard	Name	Purpose	Requirements
PRC-007-0	Assuring Consistency with Regional UFLS Program Requirements	Provide last resort System preservation measures by implementing an Under Frequency Load Shedding (UFLS) program.	R1. The Transmission Owner and Distribution Provider, with a UFLS program (as required by its Regional Reliability Organization) shall ensure that its UFLS program is consistent with its Regional Reliability Organization's UFLS program requirements. R2. The Transmission Owner, Transmission Operator, Distribution Provider, and Load-Serving Entity that owns or operates a UFLS program (as required by its Regional Reliability Organization) shall provide, and annually update, its underfrequency data as necessary for its Regional Reliability Organization to maintain and update a UFLS program database. R3. The Transmission Owner and Distribution Provider that owns a UFLS program (as required by its Regional Reliability Organization) shall provide its documentation of that UFLS program to its Regional Reliability Organization on request (30 calendar days).
PRC-008-0	Underfrequency Load Shedding Equipment Maintenance Programs	Provide last resort System preservation measures by implementing an Under Frequency Load Shedding (UFLS) program.	R1. The Transmission Owner and Distribution Provider, with a UFLS program (as required by its Regional Reliability Organization) shall ensure that its UFLS program is consistent with its Regional Reliability Organization's UFLS program requirements. R2. The Transmission Owner, Transmission Operator, Distribution Provider, and Load-Serving Entity that owns or operates a UFLS program (as required by its Regional Reliability Organization) shall provide, and annually update, its underfrequency data as necessary for its Regional Reliability Organization to maintain and update a UFLS program database. R3. The Transmission Owner and Distribution Provider that owns a UFLS program (as required by its Regional Reliability Organization) shall provide its documentation of that UFLS program to its Regional Reliability Organization on request (30 calendar days).
PRC- 009-0	UFLS Performance Following an Underfrequency Event	Provide last resort System preservation measures by implementing an Under Frequency Load Shedding (UFLS) program.	R1. The Transmission Owner, Transmission Operator, Load-Serving Entity and Distribution Provider that owns or operates a UFLS program (as required by its Regional Reliability Organization) shall analyze and document its UFLS program performance in accordance with its Regional Reliability Organization's UFLS program. The analysis shall address the performance of UFLS equipment and program effectiveness following system events resulting in system frequency excursions below the initializing set points of the UFLS program. The analysis shall include, but not be limited to: R1.1. A description of the event including initiating conditions. R1.2. A review of the UFLS set points and tripping times. R1.3. A simulation of the event. R1.4. A summary of the findings. R2. The Transmission Owner, Transmission Operator, Load-Serving Entity, and Distribution Provider that owns or operates a UFLS program (as required by its Regional Reliability Organization) shall provide documentation of the analysis of the UFLS program to its Regional Reliability Organization and NERC on request 90 calendar days after the system event.
PRC- 010-0	Assessment of the Design and Effectiveness of UVLS Program	Provide System preservation measures in an attempt to prevent system voltage collapse or voltage instability by implementing an Undervoltage Load Shedding (UVLS) program.	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). R1.1. This assessment shall include, but is not limited to: 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. 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. R1.1.3. A review of the voltage set points and timing. 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).
PRC-011-0	UVLS System Maintenance and Testing	Provide system preservation measures in an attempt to prevent system voltage	R1. The Transmission Owner and Distribution Provider that owns a UVLS system shall have a UVLS equipment maintenance and testing program in place. This program shall include: R1.1. The UVLS system identification which shall include but is not limited to:

		collapse or voltage instability by implementing an Undervoltage Load Shedding (UVLS) program.	R1.1.1. Relays. R1.1.2. Instrument transformers. R1.1.3. Communications systems, where appropriate. R1.1.4. Batteries. R1.2. Documentation of maintenance and testing intervals and their basis. R1.3. Summary of testing procedure. R1.4. Schedule for system testing. R1.5. Schedule for system maintenance. R1.6. Date last tested/maintained. R2. The Transmission Owner and Distribution Provider that owns a UVLS system shall provide documentation of its UVLS equipment maintenance and testing program and the implementation of that UVLS equipment maintenance and testing program to its Regional Reliability Organization and NERC on request (within 30 calendar days).
PRC-021-1	Under-Voltage Load Shedding Program Data	Ensure data is provided to support the Regional database maintained for Under- Voltage Load Shedding (UVLS) programs that were implemented to mitigate the risk of voltage collapse or voltage instability in the Bulk Electric System (BES).	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: R1.1. Size and location of customer load, or percent of connected load, to be interrupted. R1.2. Corresponding voltage set points and overall scheme clearing times. R1.3. Time delay from initiation to trip signal. R1.4. Breaker operating times. 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. 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.
PRC-022-1	Under-Voltage Load Shedding Program Performance	Ensure that Under Voltage Load Shedding (UVLS) programs perform as intended to mitigate the risk of voltage collapse or voltage instability in the Bulk Electric System (BES).	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: R1.1. A description of the event including initiating conditions. R1.2. A review of the UVLS set points and tripping times. 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. R1.4. A summary of the findings. R1.5. For any Misoperation, a Corrective Action Plan to avoid future Misoperations of a similar nature. 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.

Applicability: Paraphrased from the Standards referenced above

Under Voltage Load Shedding applies to:
Load-Serving Entities, Distribution Providers, Transmission Owners and Transmission Operators, that own and/or operate UVLS programs.

Under Frequency Load Shedding applies to:
Load-Serving Entities, Distribution Providers, Transmission Owners and Transmission Operators required by its Regional Reliability Organization to own a UFLS program

Interpretation:

- BPA is the Program Owner for Under Frequency Load Shedding and Under Voltage Load Shedding Program in the BPA footprint unless otherwise agreed-to with our customers.
  - Note: some customers may also own their own UVLS program that is completely independent of BPA's Program. This recommendation does not affect that situation.

- As Program Owner, BPA will be responsible for compliance with the applicable mandatory standards listed above:
  - Note: Standard PRC-006 is applicable to the RRO and is currently not FERC approved, resulting in the absence of any mandatory technical standards for UFLS, other than BPA's own standards. When approved, it will provide the "definition of an acceptable UFLS program. This may lead to changes in this interpretation, BPA's program, and thus its involvement with customers.
  - Customers may define their own maintenance programs and intervals independent of BPA's maintenance program.
  - BPA will continue to monitor the development of PRC-006 to ensure that BPA can continue to be the Program owner and responsible entity under the standard(s).

- As the Program Owner, BPA will need specific information or data on a periodic basis about equipment, settings, maintenance and testing. The information BPA will need from each customer that participates in the BPA UFLS or UVLS Program will be variable and specific to that customer. This information or data will be defined through an agreement(s) or an existing contractual arrangement with that customer to assure NERC/WECC compliance requirements are met.

- BPA does not plan to do maintenance on customer-owned UFLS or UVLS equipment.