

### **Definitions of Terms Used in Standard**

*This section includes all newly defined or revised terms used in the proposed standard. Terms already defined in the Reliability Standards Glossary of Terms are not repeated here. New or revised definitions listed below become approved when the proposed standard is approved. When the standard becomes NERC approved and effective, these defined terms will be removed from the individual standard and added to the Glossary.*

**Design Plan:** The collection of the system assumptions and performance criteria that are the basis for the UFLS program in a Planning Coordinator's area. The design plan includes consideration of such items as the minimum desired frequency, the range of island load versus generation balance, system inertia, and maximum desired overshoot frequency.

**Functional Design Specification:** The particular UFLS program design details that are to be implemented by Distribution Providers. The design details include such elements as the number of load shedding steps, the trigger frequency at each step, the percentage of total Distribution Provider load to be shed at each step, and the maximum time delay associated with each step.

## A. Introduction

1. **Title:** Automatic Underfrequency Load Shedding Requirements

2. **Number:** PRC-006-MRO-01

3. **Purpose:**

The purpose of this standard is to develop, coordinate, implement and document Automatic Underfrequency Load Shedding (UFLS) requirements. The UFLS program is to provide last resort system preservation measures to assist in the recovery of frequency to acceptable levels following underfrequency events by restoring reasonable balance between load and generation.

4. **Applicability:**

4.1. Planning Coordinator (PC)

4.2. Distribution Provider (DP)

4.3. Transmission Owner (TO)

4.4. Generator Owner (GO)

5. **Effective Date:** 1<sup>st</sup> day of the 1<sup>st</sup> quarter one year following last appropriate Regulatory Approval.

### Implementation plan timeframes

(This text was included for convenience in the comment version of the standard, but will be removed in the ballot version of the standard.)

R1 – Complete a Design Plan within 1 year after applicable Regulatory Approval, unless granted an extension by the MRO

R2, R3 – Develop and distribute the initial Functional Design Specifications within 1 year after completion of the Design Plan, unless granted an extension by the MRO.

R5 – Implement the assigned Functional Design Specifications within 1 year after the Functional Design Specifications are received, unless granted an extension by the MRO.

R11, R12 – Complete and distribute an initial UFLS program assessment report within 2 years of all its Functional Design Specifications being implemented, unless granted an extension by the MRO.

## B. Requirements

**R1.** Each Planning Coordinator shall have a Design Plan for its area and provide its Design Plan to its adjacent Planning Coordinators. Each Planning Coordinator shall provide comments on its adjacent PC's Design Plan and should achieve concurrence on each other's Design Plan. The Design Plan shall consider the following elements: *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

- Reasonable number of step blocks and associated frequency set points
  - Suitable minimum percentage of total connected forecasted annual peak hour Load assigned to trip in its area and appropriate percentage of connected forecast load for each step block
  - Proper intentional and total tripping time delays
  - Generation off nominal frequency protection
  - Undervoltage inhibit settings
  - Appropriate types of off-nominal frequency relays
  - Fitting Exemption criteria
  - Tie tripping schemes, if applicable
  - Islanding schemes, if applicable
  - Automatic load restoration schemes, if applicable
  - Any other schemes that are a part of, or may impact, the UFLS programs, if applicable
- R2.** Each Planning Coordinator shall have a UFLS program Functional Design Specification for each of the Distribution Providers in its area. The Functional Design Specification shall include but not be limited to the following elements: *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*
- Number of step blocks and associated frequency set points
  - Minimum percentage of total connected forecasted annual peak hour Load assigned to trip in its area and the percentage of connected forecast load for each step block
  - Intentional and total tripping time delays
- R3.** Each Planning Coordinator shall distribute a Functional Design Specification to each Distribution Provider in its area and provide all of the Functional Design Specifications to each of its adjacent Planning Coordinators. Each Planning Coordinator should provide comments on its adjacent PC's Functional Design Specification. *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*
- R4.** Each Distribution Provider shall review and if necessary revise its portion of the UFLS program each calendar year and within 15 months of the last evaluation of its UFLS program in accordance with its assigned Functional Design Specification(s). *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*
- The annual review shall include the following:
- Updating of the UFLS program load data to reflect the next year's forecast peak hour Loads
  - Consideration of the characteristics and criticality of the end use Loads that are connected to its facilities, if provided by the associated Load Serving Entities

- R5.** Each Distribution Provider shall implement its assigned UFLS program Functional Design Specification prior to the next forecast peak Load season, unless granted an extension or exemption by its Planning Coordinator. *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*
- R6.** Each Generator Owner with automatic underfrequency protection relays installed in the MRO footprint shall have relay trip settings that are equal to or slower than the minimum tripping time delays in the following table: *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

Table 1	
Frequency (Hz)	Minimum Time Delay (Sec)
> 59.5	Automatic tripping not permitted
≤59.5 to > 59.3	2,700
≤59.3 to > 59.0	300
<59.0 to > 58.4	80
≤58.4 to > 58.0	30
≤58.0 to > 57.6	7.5
≤57.6	0

- R6.1.** If a generator must be tripped for its own protection outside the specifications in the above Table 1, then the Generator Owner shall arrange for additional automatic Load shedding to be installed by mutual agreement with an acceptable Distribution Provider, unless the Generator Owner is granted an exception by its Planning Coordinator. The additional automatic Load shedding shall be within the same area and implemented at the same frequency and time delay as the generator would be expected to trip. The amount of additional Load that is to be tripped shall be agreed upon by the Distribution Provider, Generation Owner, and Planning Coordinator.
- R7.** Each Distribution Provider that has an assigned Functional Design Specification(s) shall provide new and updated UFLS data to the associated Planning Coordinator(s) within 60 days after being requested by its Planning Coordinator. *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*
- R8.** Each Distribution Provider and Transmission Owner shall provide to its Planning Coordinator(s) the applicable data of reactive power devices controlled in association with, but separate from, the UFLS program, as well as the applicable of other schemes that may impact the UFLS programs in the MRO footprint, prior to placing them in service. *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*
- R9.** Each Generator Owner shall provide to its Planning Coordinator(s) the applicable data of the off-nominal frequency relay settings of its generating units and the settings and time delays of other protective schemes that may impact the UFLS

program(s) in the MRO footprint prior to placing them in service. *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

- R10.** Each Planning Coordinator shall review and if necessary revise its UFLS program database every calendar year and within 15 months of the last review. *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

The database shall include:

- UFLS program data
- Generator unit off-frequency data
- Island information, if applicable
- Reactive power device information, if applicable
- System tripping schemes, if applicable

- R11.** Each Planning Coordinator shall review the UFLS program data for its area and perform an assessment of the expected performance of the UFLS program and related reactive power device tripping schemes or protective schemes in its area at least every five calendar years. *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

- R12.** Each Planning Coordinator shall have a report of its required UFLS program assessments and provide its assessment reports to at least the associated Distribution Providers, associated Transmission Planners, and its adjacent Planning Coordinators. *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

### **C. Measures**

- M1.** Each Planning Coordinator shall have documentation of the Design Plan for its area and evidence that it provided its Design Plan to its adjacent Planning Coordinators, as well as provided comments on its adjacent Planning Coordinators' Design Plans as required in R1.
- M2.** Each Planning Coordinator shall have a Functional Design Specification for each Distribution Provider in its area as required in R2.
- M3.** Each Planning Coordinator shall have evidence that it distributed a Functional Design Specification to each of its Distribution Providers, as well as all of the Function Design Specifications to each of its adjacent Planning Coordinators as required in R3.
- M4.** Each Distribution Provider shall have evidence that it reviewed its load data according to the schedule and if necessary revised its portion of the UFLS program as required in R4.
- M5.** Each Distribution Provider shall have evidence as required in R5 that either 1) it implemented its assigned UFLS program functional design specification or 2) it was granted an extension or exemption from its Planning Coordinator.

- M6.** Each Generator Owner shall have evidence as required in R6 that: 1) its automatic underfrequency protection relay trip settings meet the minimum tripping time delays in Table 1; 2) it has an exemption from its Planning Coordinator; or 3) it obtained acceptable additional Load shedding.
- M7.** Each Distribution Provider that has assigned a Functional Design Specification(s) shall have evidence that it provided new and updated UFLS data as required in R7.
- M8.** Each Distribution Provider and Transmission Owner shall have evidence that it provided details of controlled reactive power devices, as well as any other applicable schemes prior to placing them in service as required in R8.
- M9.** Each Generator Owner shall have evidence that it provided details of off-nominal frequency relay settings and setting and time delays of other protective relay or schemes as required in R9.
- M10.** Each Planning Coordinator shall have evidence that it reviewed and if necessary revised its UFLS program database as required in R10.
- M11.** Each Planning Coordinator shall have evidence that it reviewed the UFLS program data in its area and performed an assessment of the expected performance of the UFLS programs as required in R11.
- M12.** Each Planning Coordinator shall have evidence that it provided its UFLS program assessment report(s) to the noted entities as required in R12.

## **D. Compliance**

### **1. Compliance Monitoring Process**

#### **1.1. Compliance Enforcement Authority**

Compliance monitor: MRO

#### **1.2. Compliance Monitoring Period and Reset Timeframe**

One or more of the following methods will be used to assess compliance:

- Self-certification (Conducted annually according to schedule.)
- Spot Check Audits (Conducted anytime with up to 30 days notice given to prepare.)
- Periodic Audit (Conducted once every three years according to schedule.)
- Compliance Violation Investigations
- The Performance-Reset Period shall be 12 months from the last finding of noncompliance.
- Self Report

#### **1.3. Data Retention**

All documentation is to be retained that demonstrates compliance with the Requirements and Measures since the last Compliance Audit. Current plan is available at all times.

If an entity is found non-compliant the entity keeps information related to the noncompliance until found compliant or for two years plus the current year, whichever is longer.

Evidence used as part of a Compliance Violation Investigation is retained by the entity being investigated for one year from the date that the investigation is closed, as determined by the Compliance Monitor.

The Compliance Monitor keeps the last periodic audit report and all requested and submitted subsequent compliance records.

**1.4. Additional Compliance Information**

None

**2. Violation Severity Levels**

<b>R #</b>	<b>Lower VSL</b>	<b>Moderate VSL</b>	<b>High VSL</b>	<b>Severe VSL</b>
<b>R1</b>	The documented Design Plan did not consider one or two of the required elements.	The documented Design Plan did not consider three or four of the required elements. OR Provided its Design Plan to some, but not all, of its adjacent Planning Coordinators. OR Provided comments back to some, but not all, of its adjacent Planning Coordinators	The documented Design Plan did not consider five or more of the required elements. OR Did not provide its Design Plan to any of its adjacent Planning Coordinators OR Did not provide any comments back to its adjacent Planning Coordinators.	Do not have a documented Design Plan.
<b>R2</b>		Have documented Functional Design Specifications, but they do not include all of the required elements.	Have a Functional Design Specification for some, but not all, of its Distribution Providers.	Do not have any Functional Design Specifications for its Distribution Providers.
<b>R3</b>		Distributed the Functional Design Specifications to its Distribution Providers, but not to its adjacent Planning Coordinators.	Distributed the Functional Design Specifications to some, but not all, of the Distribution Providers and Planning Coordinators.	Did not distribute the Functional Design Specification to any effected Distribution Providers and Planning Coordinators.

<p><b>R4</b></p>	<p>No review or revision of the UFLS program was performed in the next calendar year and within 16 months, but was performed within 18 months, of the last review.</p>	<p>No review or revision of the UFLS program was performed in the next calendar year and within 19 months, but was performed within 20 months, of the last review.</p> <p><b>OR</b> The review included the consideration of some, but not all of the characteristics and critically of the end use Load that was provided by the Load Serving Entities.</p>	<p>No review or revision of the UFLS program was performed in the next calendar year and within 21 months, but was performed within 22 months, of the last review.</p> <p><b>OR</b> The review did not include consideration of the characteristics or criticality of the end use Load.</p> <p><b>OR</b> The review included updating the UFLS program load data BUT failed to reflect the next year’s projected peak hour Loads.</p>	<p>No review or revision of the UFLS program was performed in the next calendar year and within 24 months of the last review.</p>
<p><b>R5</b></p>			<p>Provided evidence that it implemented its assigned UFLS program Functional Design Specification, BUT it was lacking, inaccurate, misleading, or not provided as requested.</p>	<p>Did not provide any evidence that it implemented its assigned UFLS program Functional Design Specification and does not have an extension or exemption from its Planning Coordinator.</p>
<p><b>R6</b></p>			<p>Provided evidence that it complies with Table 1 and/or R6.1, BUT the evidence was lacking, inaccurate, misleading, or not provided as requested.</p>	<p>Did not provide evidence that it complies with Table 1 and/or R6.1. and does not have an extension or exemption from its Planning Coordinator.</p>

<b>R7</b>	New and updated data was provided more than 60 days, but less than 90 days after being requested.	New and updated data was provided more than 90 days, but less than 120 days after being requested.	New and updated data was provided more than 120 days, but less than 150 days after being requested. OR New and updated UFLS data were provided, but were lacking, inaccurate, misleading, or not provided as requested.	Did not provide the requested UFLS over 150 days after it was requested.
<b>R8</b>			Applicable data for any planned applicable reactive power devices or system protection schemes, that may impact the UFLS programs were provided, but it were lacking, inaccurate, misleading, or not provided as requested on time.	Did not provide applicable data for any planned applicable reactive power devices, system protection schemes, and/or that may impact the UFLS programs.
<b>R9</b>		Provided the applicable off-nominal frequency relay setting, but did not provide them prior to being placed in service.	Applicable data off-nominal frequency relay settings and time delays or other protective schemes that may impact the UFLS were provided, but were lacking, inaccurate, misleading, or not provided as requested.	No applicable data off-nominal frequency relay settings were provided.

<b>R10</b>	No review or revision of the UFLS database was performed in the next calendar year and within 16 months, but was performed within 18 months, of the last review.	No review or revision of the UFLS database was performed in the next calendar year and within 19 months, but was performed within 20 months, of the last review.	No review or revision of the UFLS database was performed in the next calendar year and within 19 months, but was performed within 22 months, of the last review.	No review or revision of the UFLS database was performed in the next calendar year and within 24 months of the last review.
<b>R11</b>	No review of the data and assessment of the UFLS program were performed within five calendar years, BUT were performed within six years of the last review and assessment.	No review was performed in a Planning Coordinator’s area of BOTH the UFLS program data AND the assessment of the UFLS programs associated with the data within the last six calendar years.	No review was performed in a Planning Coordinator’s area of BOTH the UFLS program data AND the assessment of the UFLS programs associated with the data within the last seven calendar years.	No review was performed in a Planning Coordinator’s area of BOTH the UFLS program data AND the assessment of the UFLS programs associated with the data within the last eight or more calendar years.
<b>R12</b>		Have a UFLS program assessment report, BUT it was provided to some, but not all, of the Distribution Providers, Transmission Planers and adjacent Planning Coordinators.	Have a UFLS program assessment report, BUT it was not provided to any of its Distribution Providers, Transmission Planners, or adjacent Planning Coordinators.	Do not have a UFLS program assessment report.

**Version History**

<b>Version</b>	<b>Date</b>	<b>Action</b>	<b>Change Tracking</b>