OPERATIONS AND PLANNING

UNDER-FREQUENCY LOAD SHED PROCEDURE

NERC STANDARD PRC-006-2, PRC-006-SERC-01

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CERTIFICATION

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First Last – Manager/ Supervisor Date

Business Unit Ownership: Transmission Planning

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Review and Revision Requirements

The business unit designated with ownership of this document is responsible for drafting, reviewing, and revising this procedure for compliance with applicable NERC Reliability Standard requirements, and for coordinating with other impacted business units.

Any document signed and dated becomes the official authoritative document and indicates a complete and thorough review as required by the applicable NERC Reliability Standard requirements.

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Version History

Version	Date	Comments	Editor
0	08/16/2017	Original document	JAG

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APPLICABILITY OF REQUIREMENTS

AECI has registered with NERC/SERC as a BA, DP, GO, GOP, PA, RP, TO, TOP, TSP, and TP. Per the NERC Rules of Procedure Section 507, AECI is registered as a Joint Registration Organization (JRO) on behalf of its Member G&Ts and accepts responsibility for all NERC and SERC compliance. Specific applicability and responsibility for each NERC Reliability Standard requirement is documented in the *NERC/ SERC Compliance Plan*.

1. OVERVIEW

This document details AECI's design and documentation requirements for an automatic underfrequency load shedding (UFLS) program to arrest declining frequency, assist recovery of frequency following underfrequency events and provide last resort system preservation measures.

2. PROCEDURE

2.1. AECI has identified two islands to serve as a basis for designing its UFLS program. **[R2]**

- SERC Regional Island (with boundaries adjusted as described in 2.2)
- Delta Subregional Island (with boundaries adjusted as described in 2.3) **[SERC R1]**

These islands were identified by including consideration of historical events and system studies. **[R1]**

2.1.1. There have been no historical events where AECI's portion of the Bulk Electric System has become an island. **[R2.1]**

2.1.2. There have been no historical events where AECI's portion of the Bulk Electric System along with interconnected portions of the BES in adjacent Planning Coordinator areas or Regional Entity areas has become an island. **[R2.1]**

2.1.3. No results from system studies have indicated that AECI's portion of the Bulk Electric System would become an island. **[R2.1]**

2.1.4. No results from system studies have indicated that AECI's portion of the Bulk Electric System along with interconnected portions of the BES in adjacent Planning Coordinator areas or Regional Entity areas would become an island. **[R2.1]**

2.1.5. No portion of AECI's BES is designed to detach from the interconnection. **[R2.2]**

2.1.6. AECI does not reside in multiple Regional Entities, and therefore only identifies SERC as its Regional Entity Island. **[R2.3]**

2.2. AECI adjusts the boundaries of the SERC Island as follows: **[R2.3]**

2.2.1. Contiguity: Due to the nature of AECI's transmission system, removing certain non-SERC areas from the model cause portions of AECI to be islanded from the rest of AECI and SERC. These portions, though islanded, are parts of both AECI and SERC. Therefore, the following non-SERC areas need to be included in order to produce a contiguous regional island:

- GRDA
- SWPA
- EMDE
- ALTW

2.2.2. Suitability. Because AECI is on the edge of SERC, and that it coordinates with its neighbors so as not to construct duplicate facilities, removing certain non-SERC areas (other than those mentioned under contiguity above) result in extremely poor voltage support throughout AECI's transmission system.

This fact was verified in the 2007 SERC UFLS study. Therefore, the following non-SERC areas (in addition to those areas included under contiguity) that AECI is tied to that have footprints that overlap with the AECI footprint need to be included in order to produce an island more suitable for simulation:

- SPRM
- AEPW
- INDN
- MIPU
- KCPL

2.3. AECI adjusts the boundaries of the Delta Island as follows: **[SERC R1.1]**

2.3.1. The same contiguity and suitability boundary adjustments identified for the SERC Regional Entity Island apply to the Delta Island. In addition, certain non-Delta SERC members need to be added to the Delta Subregional island for the same reasons discussed under both Contiguity and Suitability under the SERC Regional Entity Island, as follows:

- CWLD
- AMMO

2.4. AECI's UFLS Scheme is as follows: **[SERC R2, R4, R5]**

Frequency	Peak Load Shed[1]	Load Shed Tolerance[2]	Total Clearing Time[3]
59.3 Hz	10%	-1.0% to +3%	6-32 Cycles
59.0 Hz	10%	-1.0% to +3%	6-32 Cycles
58.7 Hz	10%	-1.0% to +3%	6-32 Cycles
Total	30%	-1.0% to +5%	6-32 Cycles

[1]Percentage of load shed is based on previous coincident peak. **[SERC R4.1]**

[2]For example, at 59.3 Hz the percentage of load to be shed is specified as 10%. Therefore, the allowable range for the percentage of load shed at 59.3 Hz is 9 to 13%. **[SERC R4.2]**

[3]Total clearing time starts when the frequency reaches the setpoint and ends when the breaker opens.

2.4.1. AECI considers all loads within the AECI BA, whether member load or non-member load, to be load served from the AECI Planning Coordinator's transmission system. This creates two categories of loads that require accounting:

- AECI member load within the AECI BA
- Non-AECI member load within the AECI BA (Wanda, etc.)

NOTE: There is AECI member load outside the AECI BA (Akins, etc.). Based on the above definition, whichever Planning Coordinator's transmission system they reside on is the Planning Coordinator responsible for their UFLS scheme.

AECI can shed non-native load without a formal agreement or notification in place for the purposes of meeting the 30% load shed requirement.

2.4.2. AECI's UFLS program does not require automatic switching of its existing capacitor banks, Transmission Lines, and reactors to control over-voltage as a result of underfrequency load shedding. **[R10]**

2.4.3. To date, there have not been any changes to AECI's ULFS scheme. If changes are required to the AECI UFLS scheme, then the UFLS entities will be sent a notification and schedule for implementation at that time. **[R3]** The UFLS entities are defined as those that own or will own (for new relays) the subject UFLS equipment. **[A4.2]**

2.5. AECI's UFLS Program has been developed to meet the performance characteristics listed in R3.1, R3.2, and R3.3. **[R3]**

2.5.1. AECI annually assesses the UFLS Program implementation to ensure it meets the UFLS scheme by May 1 of each calendar year. **[SERC R4]**

2.5.2. At least once every five years, by participating in the SERC coordinated UFLS study, AECI determines through dynamic simulation whether the UFLS program design meets the performance characteristics in Requirement R3.

2.5.2.1. When performing design assessments specified in the NERC PRC standard on UFLS, AECI, by participating in the SERC coordinated study, conducts simulations of the UFLS scheme for an imbalance between load and generation of 13%, 22%, and 25% for all identified island(s) where such imbalance equals [(load minus actual generation output) / load]. **[SERC R3]**

2.5.2.2. The SERC coordinated quinquennial UFLS study is an independent UFLS design assessment that coordinates UFLS programs among Planning Coordinators. **[R5]**

2.6. AECI updates its UFLS database annually, as part of the annual ULFS Program implementation assessment. **[R6]**

Data includes: total AECI BA load (see 2.4.1 above), relay equipment used, breaker(s) associated with relay, relay time delay settings, reasonable estimate of breaker operating time, and generator data.

2.7. AECI's UFLS database containing data necessary to model AECI's UFLS program is available to other Planning Coordinators upon request. **[R7]**