Alberta Reliability Standard
Automatic Underfrequency Load Shedding
PRC-006-AB-5

A. Introduction

1. Title: Automatic Underfrequency Load Shedding

2. Number: PRC-006-AB-5

3. Purpose: To establish design and documentation requirements for automatic **underfrequency load shedding** programs to arrest declining frequency, assist recovery of frequency following underfrequency events, and provide last resort system preservation measures.

4. Applicability:

4.1. Functional Entities:

4.1.1. the **ISO**;

4.1.2. the **legal owner** of a **transmission facility** that has responsibility in an **underfrequency load shedding** program the **ISO** establishes;

4.1.3. the **legal owner** of an **electric distribution system** that has responsibility in an **underfrequency load shedding** program the **ISO** establishes; and

4.1.4. a **market participant** that has responsibility in an **underfrequency load shedding** program the **ISO** establishes.

The entities identified in 4.1.2, 4.1.3, and 4.1.4 above are collectively referred to as "UFLS entities" in this **reliability standard**. For requirements in this **reliability standard** where a specific entity or subset of entities are the applicable entity or entities, the entity or entities are specified explicitly.

5. Effective Date: The later of (i) July 1, 2028, and (ii) the first **day** of the second calendar quarter following **Commission** approval.

B. Requirements and Measures

R1. [Intentionally left blank.]

D.B.1 The **ISO** must participate in a joint regional review with the other planning coordinators that develops and documents criteria, including consideration of historical events and system studies, to select portions of the **bulk electric system** that may form islands. *[Alberta Risk Rating: Medium] [Time Horizon: Long-term Planning]*

M1. [Intentionally left blank.]

M.D.B.1. The **ISO** must have evidence such as reports, or other documentation of its criteria, developed as part of the joint regional review with other planning coordinators to select portions of the **bulk electric system** that may form islands including how system studies and historical events were considered to develop the criteria per Requirement D.B.1.

R2. [Intentionally left blank.]

2.1. [Intentionally left blank.]

2.2. [Intentionally left blank.]

2.3. [Intentionally left blank.]

D.B.2. The **ISO** must identify one or more islands from the regional review (per D.B.1) to serve as a basis for designing a **western interconnection**-wide coordinated **underfrequency load shedding** program including: *[Alberta Risk Rating: Medium] [Time Horizon: Long-term Planning]*

D.B.2.1. Those islands selected by applying the criteria in Requirement D.B.1, and

D.B.2.2. Any portions of the **bulk electric system** designed to detach from the **western interconnection** (planned islands) as a result of the operation of a relay scheme or **remedial action scheme**.

M2. [Intentionally left blank.]

M.D.B.2. The **ISO** must have evidence such as reports, memorandums, e-mails, or other documentation supporting its identification of an island(s), from the regional review (per D.B.1), as a basis for designing a **western interconnection**-wide coordinated **underfrequency load shedding** program meeting the criteria in Requirement D.B.2 Parts D.B.2.1 and D.B.2.2.

R3. [Intentionally left blank.]

3.1. [Intentionally left blank.]

3.2. [Intentionally left blank.]

3.3. [Intentionally left blank.]

D.B.3. The **ISO** must adopt an **underfrequency load shedding** program,

(a) coordinated across the **western interconnection**; and

(b) modified as appropriate for Alberta, including notification to the UFLS entities of the adopted **underfrequency load shedding** program and a schedule for implementation within Alberta. *[Alberta Risk Rating: High] [Time Horizon: Long-term Planning]*

D.B.3.1. [Intentionally left blank.]

D.B.3.2. [Intentionally left blank.]

D.B.3.3. [Intentionally left blank.]

D.B.3.3.1. [Intentionally left blank.]

D.B.3.3.2. [Intentionally left blank.]

D.B.3.3.3. [Intentionally left blank.]

M3. [Intentionally Left Blank.]

M.D.B.3. The **ISO** must have evidence such as reports, memorandums, e-mails, program plans, or other documentation of its adoption of an **underfrequency load shedding** program,

coordinated across the **western interconnection**, including the notification of the UFLS entities of implementation schedule.

R4. [Intentionally left blank.]

4.1. [Intentionally left blank.]

4.2. [Intentionally left blank.]

4.3. [Intentionally left blank.]

4.4. [Intentionally left blank.]

4.5. [Intentionally left blank.]

4.6. [Intentionally left blank.]

4.7. [Intentionally left blank.]

D.B.4. The **ISO** must participate in and document a coordinated **underfrequency load shedding** design assessment with the other planning coordinators in the **western interconnection** at least once every 5 years. *[Alberta Risk Rating: High] [Time Horizon: Long-term Planning]*

D.B.4.1. [Intentionally left blank.]

D.B.4.2. [Intentionally left blank.]

D.B.4.3. [Intentionally left blank.]

D.B.4.4. [Intentionally left blank.]

D.B.4.5. [Intentionally left blank.]

D.B.4.6. [Intentionally left blank.]

D.B.4.7. [Intentionally left blank.]

M4. [Intentionally left blank.]

M.D.B.4. The **ISO** must have dated evidence such as reports, dynamic simulation models and results, or other dated documentation of its participation in a coordinated **underfrequency load shedding** design assessment with the other planning coordinators.

R5. [Intentionally left blank.]

M5. [Intentionally left blank.]

R6. The **ISO** must maintain an **underfrequency load shedding** database containing data necessary to model its **underfrequency load shedding** program for use in event analyses and assessments of the **underfrequency load shedding** program at least once each calendar year, with no more than 15 **months** between maintenance activities. *[Alberta Risk Rating: Lower] [Time Horizon: Long-term Planning]*

M6. The **ISO** must have dated evidence such as an **underfrequency load shedding** database, data requests, data input forms, or other dated documentation to show that it maintained an **underfrequency load shedding** database for use in event analyses and assessments of the **underfrequency load shedding** program per Requirement R6 at least once each calendar year, with

no more than 15 **months** between maintenance activities.

R7. The **ISO** must provide its **underfrequency load shedding** database containing data necessary to model its **underfrequency load shedding** program to other planning coordinators within its **interconnection** within 30 **days** of a request. *[Alberta Risk Rating: Lower] [Time Horizon: Long-term Planning]*

M7. The **ISO** must have dated evidence such as letters, memorandums, e-mails or other dated documentation that it provided its **underfrequency load shedding** database to other planning coordinators within its **Interconnection** within 30 **days** of a request per Requirement R7.

R8. Each UFLS entity must provide data to the **ISO** according to the format and schedule specified by the **ISO** to support maintenance of the **ISO**'s **underfrequency load shedding** database. *[Alberta Risk Rating: Lower] [Time Horizon: Long-term Planning]*

M8. Each UFLS entity must have dated evidence such as responses to data requests, spreadsheets, letters or other dated documentation that it provided data to the **ISO** according to the format and schedule specified by the **ISO** to support maintenance of the **underfrequency load shedding** database per Requirement R8.

R9. Each UFLS entity must provide automatic tripping of load in accordance with the **underfrequency load shedding** program design and schedule for implementation, including any **corrective action plan**, as determined by the **ISO** in the **ISO**'s area in which the UFLS entity owns assets. *[Alberta Risk Rating: High] [Time Horizon: Long-term Planning]*

M9. Each UFLS entity must have dated evidence such as spreadsheets summarizing feeder load armed with **underfrequency load shedding** relays, spreadsheets with **underfrequency load shedding** relay settings, or other dated documentation that it provided automatic tripping of load in accordance with the **underfrequency load shedding** program design and schedule for implementation, including any **corrective action plan**, per Requirement R9.

R10. Each **legal owner** of a **transmission facility** must provide automatic switching of its existing capacitor banks, transmission lines, and reactors to control over-voltage as a result of **underfrequency load shedding** if required by the **underfrequency load shedding** program and schedule for implementation, including any **corrective action plan**, as determined by the **ISO**. *[Alberta Risk Rating: High] [Time Horizon: Long-term Planning]*

M10. Each **legal owner** of a **transmission facility** must have dated evidence such as relay settings, tripping logic or other dated documentation that it provided automatic switching of its existing capacitor banks, transmission lines, and reactors in order to control over-voltage as a result of **underfrequency load shedding** if required by the **underfrequency load shedding** program and schedule for implementation, including any **corrective action plan**, per Requirement R10.

R11. [Intentionally left blank.]

11.1. [Intentionally left blank.]

11.2. [Intentionally left blank.]

D.B.11. The **ISO** must**,** if a **bulk electric system** islanding event in Alberta results in system frequency excursions below the initializing set points of the **underfrequency load shedding** program,

participate in and document a coordinated event assessment with all affected planning coordinators to conduct and document an assessment of the event within one year of event actuation to evaluate: *[Alberta Risk Rating: Medium] [Time Horizon: Operations Assessment]*

D.B.11.1. The performance of the **underfrequency load shedding** equipment,

D.B.11.2. The effectiveness of the **underfrequency load shedding** program.

M11. [Intentionally left blank.]

M.D.B.11. The **ISO** must have dated evidence such as reports, data gathered from a historical event, or other dated documentation to show that it participated in a coordinated event assessment of the performance of the **underfrequency load shedding** equipment and the effectiveness of the **underfrequency load shedding** program per Requirement D.B.11.

R12. [Intentionally left blank.]

D.B.12. The **ISO** must, if an islanding event assessment (per D.B.11) identifies deficiencies in the **underfrequency load shedding** program, participate in and document a coordinated **underfrequency load shedding** design assessment of the **underfrequency load shedding** program with all other planning coordinators in the **western interconnection** to consider the identified deficiencies within two years of event actuation. *[Alberta Risk Rating: Medium] [Time Horizon: Operations Assessment]*

M12. [Intentionally left blank.]

M.D.B.12. The **ISO** must have dated evidence such as reports, data gathered from a historical event, or other dated documentation to show that it participated in an **underfrequency load shedding** design assessment per Requirements D.B.12 and D.B.4 if **underfrequency load shedding** program deficiencies are identified in D.B.11.

R13. [Intentionally left blank.]

M13. [Intentionally left blank.]

R14. [Intentionally left blank.]

M14. [Intentionally left blank.]

R15. [Intentionally left blank.]

15.1. [Intentionally left blank.]

15.2. [Intentionally left blank.]

M15. [Intentionally left blank.]

C. Compliance

[Intentionally left blank.]

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D. Regional Variances

D.A. Regional Variance for the Quebec Interconnection

[Intentionally left blank.]

D.B. Regional Variance for the Western Electricity Coordinating Council

Requirements R1 through R5, and R11 through R15 have been replaced, in their entirety, by an **Interconnection**-wide variance applicable in the **western interconnection**.

E. Associated Documents

AESO Information Document ID#2021-002, *Alberta Underfrequency Load Shedding Program* and any amendments made from time to time

Version History

Version	Effective Date	Description of Changes
AB-5	The later of (i) July 1, 2028, and (ii) the first **day** of the second calendar quarter following **Commission** approval	Relates to FERC Order approving PRC-006-5 Docket No. RD21-1-000. 1) Use of "Planning Coordinator" (PC) was made specific to PCs providing services within the Western Interconnection, regardless of where the PC is located, 2) R7 was added, 3) non-substantive changes were made conforming the document and styles to the newest NERC conventions and templates.
AB-3	2022-01-01	Initial Release.

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PRC-006-5 – Attachment 1

Underfrequency Load Shedding Program
Design Performance and Modeling Curves for
Requirements R3 Parts 3.1-3.2 and R4 Parts 4.1-4.6

[Intentionally left blank.]

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Rationale

[Intentionally left blank.]