

**Reliability Standard Audit Worksheet[[1]](#footnote-1)**

# BAL-001-TRE-2 – Primary Frequency Response in the ERCOT Region

***This section to be completed by the Compliance Enforcement Authority.***

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| **Audit ID:** |  |
| **Registered Entity:** |  |
| **NCR Number:** |  |
| **MRRE Group Name** |  |
| **MRRE Group ID Number** |  |
| **Compliance Enforcement Authority:** | **Texas Reliability Entity, Inc. (Texas RE)** |
| **Compliance Assessment Date(s)[[2]](#footnote-2):** |  |
| **Compliance Monitoring Method:** |  |
| **Team Leader:** |  |

# **Applicability of Requirements**

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|  | **BA** | **DP** | **GO** | **GOP** | **PA/PC** | **RC** | **RP** | **RSG** | **TO** | **TOP** | **TP** | **TSP** |
| **R1** | X |  |  |  |  |  |  |  |  |  |  |  |
| **R2** | X |  |  |  |  |  |  |  |  |  |  |  |
| **R3** | X |  |  |  |  |  |  |  |  |  |  |  |
| **R4** | X |  |  |  |  |  |  |  |  |  |  |  |
| **R5** | X |  |  |  |  |  |  |  |  |  |  |  |
| **R6** |  |  | X |  |  |  |  |  |  |  |  |  |
| **R7** |  |  | X |  |  |  |  |  |  |  |  |  |
| **R8** |  |  |  | X |  |  |  |  |  |  |  |  |
| **R9** |  |  | X |  |  |  |  |  |  |  |  |  |
| **R10** |  |  | X |  |  |  |  |  |  |  |  |  |

**Exemptions:**

4.2.1 Existing generating facilities regulated by the U.S. Nuclear Regulatory Commission prior to the Effective Date are exempt from Standard BAL-001-TRE-2.

4.2.2 Generating units/generating facilities while operating in synchronous condenser mode are exempt from Standard BAL-001-TRE-2.

4.2.3 Any generators that are not required by the Balancing Authority to provide primary frequency response are exempt from this standard.

**Legend:**

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| Text with blue background: | Fixed text – do not edit |
| Text entry area with Green background: | Entity-supplied information |
| Text entry area with white background: | Auditor-supplied information |

Findings

**(This section to be completed by the Compliance Enforcement Authority)**

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| **Req.** | **Finding** | **Summary and Documentation** | **Functions Monitored** |
| **R1** |  |  |  |
| **R2** |  |  |  |
| **R3** |  |  |  |
| **R4** |  |  |  |
| **R5** |  |  |  |
| **R6** |  |  |  |
| **R7** |  |  |  |
| **R8** |  |  |  |
| **R9** |  |  |  |
| **R10** |  |  |  |

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| **Req.** | **Areas of Concern** |
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| **Req.** | **Recommendations** |
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| **Req.** | **Positive Observations** |
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Subject Matter Experts

Identify the Subject Matter Expert(s) responsible for this Reliability Standard.

**Registered Entity Response (Required; Insert additional rows if needed):**

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| **SME Name** | **Title** | **Organization** | **Requirement(s)** |
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R1 Supporting Evidence and Documentation

**R1.** The Balancing Authority shall identify Frequency Measurable Events (FMEs), and within 14 calendar days after each FME the Balancing Authority shall notify the Compliance Enforcement Authority and make FME information (time of FME (t(0)), pre-perturbation average frequency, postperturbation average frequency) publicly available.

**M1.** The Balancing Authority shall have evidence it reported each FME to the Compliance Enforcement Authority and that it made FME information publicly available within 14 calendar days after the FME as required in Requirement R1.

**Registered Entity Response (Required):**

**Question:** Has the Balancing Authority identified any Frequency Measurable Events (FMEs)?

[Note: A separate spreadsheet or other document may be used. If so, provide the document reference below.]

**Question:** If the answer to the question is yes, provide the information required in the table below.

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| **Date and Time of Event** | **Event Description** | **Date and Time Event Reported** |
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**Registered Entity Response (Required):**

**Compliance Narrative:**

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Registered Entity Evidence (Required):

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| **The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.** | | | | | |
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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to BAL-001-TRE-2, R1

***This section to be completed by the Compliance Enforcement Authority***

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|  | (R1) Verify the Balancing Authority has evidence it reported each FME to the Compliance Enforcement Authority within 14 calendar days (emails, notifications, etc.) |
|  | (R1) Verify the Balancing Authority made the FME information publicly available within 14 calendar days (notifications, postings, etc.) |
| **Note to Auditor:** | |

R2 Supporting Evidence and Documentation

**R2.** The Balancing Authority shall calculate the Primary Frequency Response of each generating unit/generating facility in accordance with this standard and the Primary Frequency Response Reference Document.1 This calculation shall provide a 12-month rolling average of initial and sustained Primary Frequency Response performance. This calculation shall be completed each month for the preceding 12 calendar months.

**2.1** The performance of a combined cycle facility will be determined using an expected performance droop of 5.78%.

**2.2** The calculation results shall be submitted to the Compliance Enforcement Authority and made available to the Generator Owner by the end of the month in which they were completed.

**2.3** If a generating unit/generating facility has not participated in a minimum of (8) eight FMEs in a 12-month period, its performance shall be based on a rolling eight FME average response.

**M2.** The Balancing Authority shall have evidence it calculated and reported the rolling average initial and sustained Primary Frequency Response performance of each generating unit/generating facility monthly as required in Requirement R2.

1The Primary Frequency Response Reference Document contains the calculations that the Balancing Authority will use to determine Primary Frequency Response performance of generating units/generating facilities. This reference document is a Texas RE-controlled document that is subject to revision by the Texas RE Board of Directors.

**Registered Entity Response (Required):**

**Compliance Narrative:**

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Registered Entity Evidence (Required):

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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to BAL-001-TRE-2, R2

***This section to be completed by the Compliance Enforcement Authority***

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|  | (R2) Verify the Balancing Authority has evidence it calculated, the rolling average initial and sustained Primary Frequency Response performance of each generating unit/generating facility monthly as required |
|  | (2.2) Verify the Balancing Authority has evidence it made information available to the Generator Owner as required |
|  | (2.2) Verify the Balancing Authority submitted information to the Compliance Enforcement Authority |
| **Note to Auditor:** | |

R3 Supporting Evidence and Documentation

**R3.** The Balancing Authority shall determine the Interconnection minimum Frequency Response (IMFR) in December of each year for the following year, and make the IMFR, the methodology for calculation and the criteria for determination of the IMFR publicly available.

**M3.** The Balancing Authority shall demonstrate that the IMFR was determined in December of each year per Requirement R3. The Balancing Authority shall demonstrate that the IMFR, the methodology for calculation and the criteria for determination of the IMFR are publicly available.

**Registered Entity Response (Required):**

**Compliance Narrative:**

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Registered Entity Evidence (Required):

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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to BAL-001-TRE-2, R3

***This section to be completed by the Compliance Enforcement Authority***

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|  | (R3) Verify the Balancing Authority demonstrated that the IMFR was determined in December of each year |
|  | (R3) Verify the IMFR, the methodology for calculation and the criteria for determination of the IMFR, was made publicly available |
| **Note to Auditor:** | |

R4 Supporting Evidence and Documentation

**R4.** After each calendar month in which one or more FMEs occurs, the Balancing Authority shall determine and make publicly available the Interconnection’s combined Frequency Response performance for a rolling average of the last six (6) FMEs by the end of the following calendar month.

**M4.** The Balancing Authority shall provide evidence that the rolling average of the Interconnection’s combined Frequency Response performance for the last six (6) FMEs was calculated and made public per Requirement R4.

**Registered Entity Response (Required):**

**Compliance Narrative:**

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Registered Entity Evidence (Required):

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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to BAL-001-TRE-2, R4

***This section to be completed by the Compliance Enforcement Authority***

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|  | (R4) Verify the Balancing Authority provided evidence that the rolling average of the Interconnection’s combined Frequency Response performance for the last six (6) FMEs was calculated and made public (e.g. notifications, postings, etc.) by the end of the following calendar month after each calendar month in which one or more FMEs occurs |
| **Note to Auditor:** | |

R5 Supporting Evidence and Documentation

**R5.** Following any FME that causes the Interconnection’s six-FME rolling average combined Frequency Response performance to be less than the IMFR, the Balancing Authority shall direct any necessary actions to improve Frequency Response, which may include, but are not limited to, directing adjustment of Governor deadband and/or droop settings.

**M5.** The Balancing Authority shall provide evidence that actions were taken to improve the Interconnection’s Frequency Response if the Interconnection’s six-FME rolling average combined Frequency Response performance was less than the IMFR, per Requirement R5.

**Registered Entity Response (Required):**

**Compliance Narrative:**

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Registered Entity Evidence (Required):

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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to BAL-001-TRE-2, R5

***This section to be completed by the Compliance Enforcement Authority***

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|  | (R5) Verify the Balancing Authority provided evidence (e.g. emails, notifications, postings, etc.) that directions were provided to improve the Interconnection’s Frequency Response if the Interconnection’s six-FME rolling average combined Frequency Response performance was less than the IMFR |
| **Note to Auditor:** | |

R6 Supporting Evidence and Documentation

**R6.** Each Generator Owner shall set its Governor parameters as follows:

**6.1** Limit Governor deadbands within those listed in Table 6.1, unless directed otherwise by the Balancing Authority.

Table 6.1 Governor Deadband Settings

|  |  |
| --- | --- |
| **Generator Type** | **Max. Deadband** |
| Steam and Hydro Turbines with  Mechanical Governors | +/- 0.034 Hz |
| All Other Generating  Units/Generating Facilities\* | +/- 0.017 Hz |

**6.2** Limit Governor droop settings such that they do not exceed those listed in Table 6.2, unless directed otherwise by the Balancing Authority.

Table 6.2 Governor Droop Settings

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| --- | --- |
| **Generator Type** | **Max. Droop**  **% Setting** |
| Hydro | 5% |
| Combustion Turbine (Simple Cycle and  Single-Shaft Combined Cycle) | 5% |
| Combustion Turbine (Combined Cycle) | 4% |
| Steam Turbine\* | 5% |
| Diesel | 5% |
| DC Tie Providing Ancillary Services | 5% |
| Variable Renewable (Non-Hydro) | 5% |

\* Requirements R6.1, R6.2, and R6.3 are not applicable to steam turbine(s) of a combined cycle resource.

**6.3** For digital and electronic Governors, once frequency deviation has exceeded the Governor deadband from 60.000 Hz, the Governor setting shall follow the slope derived from the formula below.



Where MWGCS is the maximum megawatt control range of the Governor control system. For mechanical Governors, droop will be proportional from the deadband by design.

**M6.** Each Generator Owner shall have evidence that it set its Governor parameters in accordance with Requirement R6. Examples of evidence include but are not limited to:

• Governor test reports

• Governor setting sheets

• Performance monitoring reports

**Registered Entity Response (Required):**

**Compliance Narrative:**

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Registered Entity Evidence (Required):

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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to BAL-001-TRE-2, R6

***This section to be completed by the Compliance Enforcement Authority***

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|  | (R6) Verify each Generator Owner set its Governor parameters in accordance with Requirement R6 |
|  | (R6) Verify that the Generator Owner, if directed by the Balancing Authority (e.g. emails, notifications, postings, etc), performed the adjustments to its Governor parameters |
| **Note to Auditor:**  Examples of evidence include but are not limited to:   * Governor test reports * Governor setting sheets * Performance monitoring reports | |

R7 Supporting Evidence and Documentation

**R7.** Each Generator Owner shall operate each generating unit/generating facility that is connected to the interconnected transmission system with the Governor in service and responsive to frequency when the generating unit/generating facility is online and released for dispatch, unless the Generator Owner has a valid reason for operating with the Governor not in service and the Generator Operator has been notified that the Governor is not in service.

**M7.** Each Generator Owner shall have evidence that it notified the Generator Operator as soon as practical each time it discovered a Governor not in service when the generating unit/generating facility was online and released for dispatch. Evidence may include but not be limited to: operator logs, voice logs, or electronic communications.

**Registered Entity Response (Required):**

**Compliance Narrative:**

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Registered Entity Evidence (Required):

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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to BAL-001-TRE-2, R7

***This section to be completed by the Compliance Enforcement Authority***

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|  | (R7) Verify each Generator Owner notified the Generator Operator as soon as practical each time the Generator Owner was operating without the Governor in service or the Governor was not responding to frequency when the generating unit/generating facility was online and released for dispatch |
| **Note to Auditor:**  Examples of evidence include but are not limited to:   * Operator logs * Voice logs * Electronic communications | |

R8 Supporting Evidence and Documentation

**R8.** Each Generator Operator shall notify the Balancing Authority as soon as practical but within 30 minutes of the discovery of a status change (in service, out of service) of a Governor.

**M8.** Each Generator Operator shall have evidence that it notified the Balancing Authority within 30 minutes of each discovery of a status change (in service, out of service) of a Governor.

**Registered Entity Response (Required):**

**Compliance Narrative:**

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Registered Entity Evidence (Required):

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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to BAL-001-TRE-2, R8

***This section to be completed by the Compliance Enforcement Authority***

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|  | (R8) Verify the Generator Operator notified the Balancing Authority within 30 minutes of notification from the Generator Owner of a status change (in service, out of service) of a Governor |
| **Note to Auditor:**  Examples of evidence include but are not limited to:   * Operator logs * Voice logs * Electronic communications | |

R9 Supporting Evidence and Documentation

**R9.** Each Generator Owner shall meet a minimum 12-month rolling average initial Primary Frequency Response performance of 0.75 on each generating unit/generating facility, based on participation in at least eight FMEs.

**9.1** The initial Primary Frequency Response performance shall be the ratio of the Actual Primary Frequency Response to the Expected Primary Frequency Response during the initial measurement period following the FME.

**9.2** If a generating unit/generating facility has not participated in a minimum of eight FMEs in a 12-month period, performance shall be based on a rolling eight-FME average.

**9.3** A generating unit/generating facility’s initial Primary Frequency Response performance during an FME may be excluded from the rolling average calculation by the Balancing Authority due to a legitimate operating condition that prevented normal Primary Frequency Response performance. Examples of legitimate operating conditions that may support exclusion of FMEs include, but are not limited to:

• Operation at or near auxiliary equipment operating limits (such as boiler feed pumps, condensate pumps, pulverizers, and forced draft fans);

• Data telemetry failure. The Balancing Authority may request raw data from the Generator Owner as a substitute.

**M9.** Each Generator Owner shall have evidence that each of its generating units/generating facilities achieved a minimum rolling average of initial Primary Frequency Response performance level of at least 0.75 as described in Requirement R9. Each Generator Owner shall have documented evidence of any FMEs where the generating unit performance was excluded from the rolling average calculation.

**Registered Entity Response (Required):**

**Compliance Narrative:**

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Registered Entity Evidence (Required):

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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to BAL-001-TRE-2, R9

***This section to be completed by the Compliance Enforcement Authority***

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|  | (R9) Verify Generator Owner met a minimum 12-month rolling average initial Primary Frequency Response performance of 0.75 on each generating unit/generating facility, based on participation in at least eight FMEs |
| **Note to Auditor:**  Examples of evidence include but are not limited to:   * Reports based on R2 | |

R10 Supporting Evidence and Documentation

**R10.** Each Generator Owner shall meet a minimum 12-month rolling average sustained Primary Frequency Response performance of 0.75 on each generating unit/generating facility, based on participation in at least eight FMEs.

**10.1** The sustained Primary Frequency Response performance shall be the ratio of the Actual Primary Frequency Response to the Expected Primary Frequency Response during the sustained measurement period following the FME.

**10.2** If a generating unit/generating facility has not participated in a minimum of eight FMEs in a 12-month period, performance shall be based on a rolling eight- FME average.

**10.3** A generating unit/generating facility’s sustained Primary Frequency Response performance during an FME may be excluded from the rolling average calculation by the Balancing Authority due to a legitimate operating condition that prevented normal Primary Frequency Response performance. Examples of legitimate operating conditions that may support exclusion of FMEs include, but are not limited to:

• Operation at or near auxiliary equipment operating limits (such as boiler feed pumps, condensate pumps, pulverizers, and forced draft fans);

• Data telemetry failure. The Balancing Authority may request raw data from the Generator Owner as a substitute.

**M10.** Each Generator Owner shall have evidence that each of its generating units/generating facilities achieved a minimum rolling average of sustained Primary Frequency Response performance of at least 0.75 as described in Requirement R10. Each Generator Owner shall have documented evidence of any Frequency Measurable Events where generating unit performance was excluded from the rolling average calculation.

**Registered Entity Response (Required):**

**Compliance Narrative:**

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Registered Entity Evidence (Required):

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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to BAL-001-TRE-2, R10

***This section to be completed by the Compliance Enforcement Authority***

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|  | (R10) Verify each Generator Owner met a minimum 12-month rolling average sustained Primary Frequency Response performance of 0.75 on each generating unit/generating facility, based on participation in at least eight FMEs |
| **Note to Auditor:**  Examples of evidence include but are not limited to:   * Reports based on R2 | |

Additional Information:

Reliability Standard



The full text of BAL-001-TRE-2 may be found on the Texas RE Web Site (www.texasre.org) under “Standards.”

In addition to the Reliability Standard, there is an applicable Implementation Plan available on the Texas RE Web Site.

In addition to the Reliability Standard, there is background information available on the Texas RE Web Site.

Capitalized terms in the Reliability Standard refer to terms in the NERC Glossary, which may be found on the NERC Web Site.

Sampling Methodology

Sampling is essential for auditing compliance with Reliability Standards since it is not always possible

or practical to test 100% of either the equipment, documentation, or both, associated with the full suite of enforceable standards. The Sampling Methodology Guidelines and Criteria (see NERC website), or sample guidelines, provided by the Electric Reliability Organization help to establish a minimum sample set for monitoring and enforcement uses in audits of Reliability Standards.

Regulatory Language

On May 19, 2020, FERC issued a letter Order approving BAL-001-TRE-2 (<https://www.nerc.com/FilingsOrders/us/FERCOrdersRules/20200519-3053(34086198).pdf)>. Reliability Standard BAL-001-TRE-2 improvements include (1) clarifying performance requirements for steam turbines of combined cycle facilities; and (2) clarifying the responsible entity for addressing Frequency Measurable Event exclusion requests.

**Background**

The ERCOT Interconnection was initially given a waiver of BAL-001 R2 (Control Performance Standard CPS2). In FERC Order 693, NERC was directed to develop a Regional Standard as an alternate means of assuring frequency performance in the ERCOT Interconnection. NERC was explicitly directed to incorporate key elements of the existing Protocols, Section 5.9. This required governors to be in service and performing with an un-muted response to assure an Interconnection minimum Frequency Response to a Frequency Measurable Event (that starts at t(0)).

This regional standard provides requirements related to identifying Frequency Measureable Events, calculating the Primary Frequency Response of each resource in the Region, calculating the Interconnection minimum Frequency Response and monitoring the actual Frequency Response of the Interconnection, setting Governor deadband and droop parameters, and providing Primary Frequency Response performance requirements.

Under this standard, two Primary Frequency Response performance measures are calculated: “initial” and “sustained.” The initial PFR performance (R9) measures the actual response compared to the expected response in the period from 20 to 52 seconds after an FME starts. The sustained PFR performance (R10) measures the best actual response between 46 and 60 seconds after t(0) compared to the expected response based on the system frequency at a point 46 seconds after t(0).

In this regional standard the term “resource” is synonymous with “generating unit/generating facility”.

**Revision History**

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| --- | --- | --- | --- |
| **Version** | **Date** | **Reviewers** | **Revision Description** |
| 1 | October 2014 | Texas RE | New Document Release |
| 1.1 | April 2016 | W. Lewis | Revised after field trial to reflect new sustained PFR approach |
| 1.1 | 03/14/2017 | Keith Smith | Updated to new style NERC RSAW template |
| 1.1 | 03/15/2017 | W.Lewis | Created Texas RE Template; modified the Title Page table and the footer for use with the Package Creator |
| 2 | 05/29/2020 | C. Crews/K. Smith | Updated to reflect BAL-001-TRE-2 changes |
| 2.1 | 07/01/2021 | Curtis Crews | Removed “Draft” watermark on several pages |

1. NERC and Texas RE developed this Reliability Standard Audit Worksheet (RSAW) language in order to facilitate NERC’s and the Regional Entities’ assessment of a registered entity’s compliance with this Reliability Standard. The RSAW language is written to specific versions of each Reliability Standard. Entities using this RSAW should choose the version of the RSAW applicable to the Reliability Standard being assessed. While the information included in this RSAW provides some of the methodology that NERC and Texas RE has elected to use to assess compliance with the requirements of the Reliability Standard, this document should not be treated as a substitute for the Reliability Standard or viewed as additional Reliability Standard requirements. In all cases, the Regional Entity should rely on the language contained in the Reliability Standard itself, and not on the language contained in this RSAW, to determine compliance with the Reliability Standard. NERC’s Reliability Standards can be found on NERC’s website. Regional Standards can be found on the Region’s website. Additionally, Reliability Standards are updated frequently, and this RSAW may not necessarily be updated with the same frequency. Therefore, it is imperative that entities treat this RSAW as a reference document only, and not as a substitute or replacement for the Reliability Standard. It is the responsibility of the registered entity to verify its compliance with the latest approved version of the Reliability Standards, by the applicable governmental authority, relevant to its registration status.

   The RSAW language contained within this document provides a non‑exclusive list, for informational purposes only, of examples of the types of evidence a registered entity may produce or may be asked to produce to demonstrate compliance with the Reliability Standard. A registered entity’s adherence to the examples contained within this RSAW does not necessarily constitute compliance with the applicable Reliability Standard, and NERC and the Regional Entity using this RSAW reserves the right to request additional evidence from the registered entity that is not included in this RSAW. Additionally, this RSAW includes excerpts from FERC Orders and other regulatory references. The FERC Order cites are provided for ease of reference only, and this document does not necessarily include all applicable Order provisions. In the event of a discrepancy between FERC Orders, and the language included in this document, FERC Orders shall prevail. [↑](#footnote-ref-1)
2. Compliance Assessment Date(s): The date(s) the actual compliance assessment (on-site audit, off-site spot check, etc.) occurs. [↑](#footnote-ref-2)