Harmonizing IBR Interconnection Requirements in the West

Industry Advisory Group

Meeting # 5

IEEE 2800-2022 Clause 7

September 25, 2025

WIRAB
Western Interconnection Regional Advisory Body

Meeting Logistics

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Materials & Follow-Up

Slides and materials will be shared after the meeting and available on the webpage

Contact information will be provided at the end for follow-up questions or comments

Outline

Introductions and Background	Overview
Technical Overview	Explore draft FIR template document and IEEE 2800-2022 requirements
Interactive Discussion and Q&A	Open Discussion and Slido Polls
Closing and Next Steps	Confirming upcoming meeting dates and schedule Preview of next meeting topics and expected deliverables

Slido Question

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Review of Template FIRs

Clauses 5 and 6 (Recap and Catch-Up from Last Meeting)

Ryan D. Quint, PhD, PE, *President and CEO*
Kyle Thomas, PE, VP, *Engineering and Compliance Services*

September 25, 2025

Template FIR Review – Clause 5

Clause 5.1: Reactive Power Capability

The RPA for Clause 5 shall be the [select POM or POI].

The IBR plant shall provide reactive power support when the primary energy source is available and not available, and during the transition between these availability states. Reactive power capability during resource active power unavailability shall be reported to [INSERT TRANSMISSION PROVIDER NAME] by the IBR owner and shall be enabled by default when the IBR plant is connected to the [INSERT TRANSMISSION PROVIDER NAME] system.

[INSERT TRANSMISSION PROVIDER NAME] will provide a voltage schedule to the IBR owner. The IBR plant shall operate on automatic voltage control to maintain voltage within the defined ranges provided.

The following table replaces Table 4 of IEEE 2800-2022 regarding RPA voltage ranges.

TS Nominal Voltage at [RPA LOCATION]	V1	V2	V3	V4	V5
115 kV or 69kV	0.90	0.99	1.03	1.05	1.10
230 kV (including 345kV)	0.90	1.00	1.04	1.05	1.10
500 kV	0.9	1.02	1.06	1.10	1.10

Implementation Note: Update the table above with operational voltage schedules. Ensure that that the per unit values in the table align with operational expectations by system operators. For example, 500 kV systems may be operated at, for example, 525 kV. Thus, select per unit values that align with operational practices.

*This template language requires the IBR owner to provide reactive power and voltage support **at zero active power output**, enabled by default

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Template FIR Review – Clause 5

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Implementation Note: Update the table above with operational voltage schedules. Ensure that that the per unit values in the table align with operational expectations by system operators. For example, 500 kV systems may be operated at, for example, 525 kV. Thus, select per unit values that align with operational practices.

*Work through this ***capability*** table of RPA voltage ranges with transmission planning and operations teams. Ensure alignment with voltage schedules and NERC VAR-001 compliance documentation. Be clear what the base values for the per unitized quantities are.

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Template FIR Review – Clause 5

Clause 5.2.1 General (Voltage and Reactive Power Control Modes)

IBR plants, unless otherwise specified by [INSERT TRANSMISSION PROVIDER NAME], shall operate in RPA voltage control mode. [INSERT TRANSMISSION PROVIDER NAME] will communicate any modifications to voltage control mode and an acceptable implementation time, if needed.

Clause 5.2.2 Voltage control (Voltage and Reactive Power Control Modes)

[INSERT TRANSMISSION PROVIDER NAME] will specify the RPA voltage set point to the IBR owner. The RPA set point may include a range of acceptable voltages.

The IBR plant shall be configured with a default voltage droop setting of [insert value between 0 and 0.3] per unit voltage change for 1.0 per unit reactive power on the ICR base, unless otherwise specified by [INSERT TRANSMISSION PROVIDER NAME]. [INSERT TRANSMISSION PROVIDER NAME] may provide different voltage droop settings to the IBR plant owner at any time based on system studies. The IBR owner shall configure the IBR plant with these modified settings, if provided, within 30 days. The RPA voltage control settings may be adjusted locally or remotely.

The IBR plant shall provide acceptable dynamic performance for a short circuit ratio (SCR) of [insert value] or higher.

Implementation Note: Typical minimum short circuit values are around 3.

The maximum step response time for Table 5 of IEEE 2800-2022 shall be [insert value between 1 and 30 seconds] seconds. [INSERT TRANSMISSION PROVIDER NAME] may specify a different step response time based on system studies, if needed.

Implementation Note: This time may be specified as any value within the range of 1 and 30 seconds. Generally, IBRs should respond relatively quickly to small disturbance voltage events. IBR plant voltage controls should be tuned to meet the maximum step response time without exceeding any overshoot requirements (e.g., 5% of set point) or minimum damping ratio requirement specified in IEEE 2800-2022. Thus, maximum step response time of, say, 5 seconds is adequate unless unique weak grid or other stability concerns are encountered during system studies.

*RPA voltage control mode is the default in IEEE 2800-2022.
*Be clear on what the RPA voltage setpoint and range of acceptable voltages is.
*Make sure to coordinate droop settings with this specification.
*Note the calculation of droop in the language used in the standard.
*Flexibility to change these settings is added in the template.
*A minimum SCR of 3 is established for adhering to these voltage control settings.
*Be sure to specify the maximum step response time, aligned with grid needs. Consider running exploratory studies to determine appropriate value.

(Team share their perspectives on step response time, for reference for others.)

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Template FIR Review – Clause 6

CLAUSE 6: ACTIVE POWER-FREQUENCY RESPONSE REQUIREMENTS

[INSERT TRANSMISSION PROVIDER NAME] adopts Clause 6 of IEEE 2800-2022 with the following exceptions and modifications:

Clause 6.1.1: PFR Capability

IBR plants shall have PFR capabilities enabled at all times during operations, including response to underfrequency disturbances (by active power increase) and overfrequency disturbances (by active power decrease). Response to over/underfrequency conditions shall be limited by available active power and minimum power output limits.

IBR plants are not required to provide response to underfrequency disturbances when operating at maximum available active power; however, if not operating at maximum available active power, the IBR plant shall respond with active power increase for underfrequency conditions as defined by the control capabilities in IEEE 2800-2022.

PFR dynamic response shall not be limited or interfered with by any other IBR plant controllers or ramp rate limiters.

Hybrid IBR plants that include storage, and therefore have the capability of absorbing active power when providing PFR, shall not limit PFR provision to active power equal to zero. IBR plants are required to have PFR enabled and operating within contractual and equipment limits.

Active power for providing PFR should not be limited to the IBR continuous rating (ICR). IBR plants may temporarily exceed the ICR to provide PFR, defined by the IBR plant PFR controls, up to the IBR short-term rating (ISR) at the RPA and respecting any defined [POM or POI] limits.

*Not a lot of transmission-specified specs in Clause 6.
*Clause 6 pertains to frequency response, which is operationally standard by default in IEEE 2800-2022.
*No obligation for headroom, but must operate up to available active power and must respond if not dispatched to maximum available power.
*Requirement for hybrid plants not to limit PFR to 0 MW minimum.
*Explicitly states that PFR should not be limited to ICR; IBR plant may temporarily exceed ICR to provide PFR up to the ISR.

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Review of Template FIRs

Clause 7

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- Default RPA for the IBR plant is the POM
- Specific requirements apply to IBR units at their POCs

- *Exception:* For a voltage disturbance that reduces the *applicable voltage* at the RPA to less than 50% of nominal, the *IBR plant* shall be considered compliant with this standard if the post-disturbance apparent current of the *IBR plant* is not less than 90% of the pre-disturbance apparent current.[86]

  Exception: The *IBR plant* shall satisfy requirements of this clause unless tripping of the *IBR plant* is required to clear faults either internal to the *IBR plant*, on the *interconnection system* (*IBR tie line*) or any portion of the TS which may provide sole connectivity between the *IBR plant* and the TS.

- Except for 500 kV system nominal voltage, the *continuous operation region* is when the *applicable voltage* is ≥ 0.9 per unit and ≤ 1.05 per unit. For 500 kV system nominal voltage, the *continuous operation region* is when the *applicable voltage* is ≥ 0.9 per unit and ≤ 1.10 per unit.[87] The nominal *transmission system* voltage may be different from standard nominal system voltages specified in ANSI C84.1. The *TS owner* shall specify the nominal voltage to be used as a base value to calculate per unit values in Table 11 and Table 12, as well as the *continuous operation region*. For example, the *TS owner* may specify a nominal voltage of 525 kV with a *continuous operation region* when *applicable voltage* is ≥ 0.9 per unit and ≤ 1.05 per unit at 525 kV voltage base.

In IEEE 2800-2022, the entire plant does not need to ride through to be considered compliant

Pay attention to base voltages used for per unitizing the tables, particularly 500 kV systems.

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IEEE 2800-2022 Clause 7.2 Voltage

- The *IBR plant* shall ride through a voltage disturbance event wherein the *applicable voltage* exceeds or is less than the voltage range representing the *continuous operation region*, except for voltage magnitude deviations more severe than the voltage thresholds and persisting for greater than the associated durations as specified in either Table 11 and Table 12. The applicability of Table 11 and Table 12 for this requirement shall be determined during the *IBR plant* design evaluation as specified in Clause 12. The specified duration in Table 11 and Table 12 is cumulative over one or multiple disturbances within a 10-s time period (window) except when applicable voltage is greater than 1.05 per unit and less than or equal to 1.10 per unit, in which case the specified duration is cumulative over one or multiple disturbances within a 3600-s time period (window). These requirements are subject to consecutive voltage deviation ride-through capability requirements specified in 7.2.2.4. The *TS owner* may specify different voltage magnitudes and respective ride-through durations.[88]

In IEEE 2800-2022, ride-through is over a 10-s cumulative window which may differ from NERC PRC-029.

Table 11—Voltage ride-through requirements at the RPA for IBR plants with auxiliary equipment that cause ride-through limitations[89]

Applicable voltage (p.u.) at the RPA	Operating mode/response	Minimum ride-through time (s) (design criteria)
V > 1.20	May ride-through or may trip	NA
V > 1.10	Mandatory operation	1.0
V > 1.05	Continuous operation[90]	1800
V < 0.90	Mandatory operation	3.00
V < 0.70	Mandatory operation	2.50
V < 0.50	Mandatory operation	1.20
V < 0.25	Mandatory operation	0.16
V < 0.10	Permissive operation[91]	0.16

Table 12—Voltage ride-through requirements at the RPA for IBR plants without auxiliary equipment that cause ride-through limitations

Applicable voltage (p.u.) at the RPA	Operating mode/response	Minimum ride-through time (s) (design criteria)
V > 1.20	May ride-through or may trip	NA
V > 1.10	Mandatory operation	1.0
V > 1.05	Continuous operation[90]	1800
V < 0.90	Mandatory operation	6.00
V < 0.70	Mandatory operation	3.00
V < 0.50	Mandatory operation	1.20
V < 0.25	Mandatory operation	0.32
V < 0.10	Permissive operation[91]	0.32

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- **7.2.2.2 Voltage disturbances within continuous operation region**

Voltage disturbances of any duration, for which the *applicable voltage* as specified in 4.3 remains within the *continuous operation region,* shall not cause the *IBR plant* to trip from the TS. The *IBR plant* shall remain in operation during any such disturbance, and shall continue to deliver pre-disturbance level of active power or *available active power,* whichever is less. Changes of active power are permitted in response to control commands in accordance with 4.6 or in response to other control settings. Temporary deviations of active power output are permitted as agreed upon between the *IBR owner* and the *TS operator*.

If the *IBR plant* cannot deliver both active and reactive power due to its current limit (or apparent power limit), when the *applicable voltage* is below 95%, then preference shall be given to active or reactive power according to requirements specified by the *TS operator*.

Exception: If required for self-protection, the *IBR plant* may trip if the negative sequence component of the *applicable voltages* is greater than 3% of the nominal voltage for greater than 10 s, OR greater than 2% of the nominal voltage for 300 s, provided that the voltage unbalance is neither caused nor aggravated by unbalanced currents of the *IBR plant*. The *IBR plant* may also trip for negative sequence component of the *applicable voltage* exceeding 6.7%[92] of the nominal voltage for a duration determined by the *TS owner* based on feasible shunt or series fault scenarios,[93] provided that the voltage unbalance is neither caused nor aggravated by unbalanced currents of the *IBR plant*. Additionally, when the duration of the negative sequence component of the *applicable voltage* is greater than the specified time limit, the *IBR plant* shall remain in operation for as long as possible, and tripping shall be the last resort.

Reasonable changes in active power allowed but should generally be "continue to deliver pre-disturbance level of active power or available power". More reasonable than NERC PRC-029.

Decision needed here. Generally reactive power; although this should not occur during continuous operation region (i.e., this is not a ride-through event).

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IEEE 2800-2022 Clause 7.2 Voltage

- **7.2.2.3 Low- and high-voltage ride-through within the mandatory operation region**

7.2.2.3.1 General

Refer to 4.3 for *applicable voltages* for low- and high-voltage ride-through capability.

7.2.2.3.2 Low- and high-voltage ride-through capability

When the *IBR unit* enters a ride-through mode, the response of the *IBR plant* is dominated by the response of *IBR units* and any *supplemental IBR devices*. The ride-through mode is also widely referred to as fault ride-through mode. The *IBR unit* shall have capability to select operation in either *active current priority mode* or *reactive current priority mode* during a high- or low-voltage ride-through events. By default, the *IBR unit* shall operate in *reactive current priority mode* during high- and low-voltage ride-through events. If requested by the *TS owner*, and mutually agreed with the *IBR owner*, the *IBR unit* may operate in *active current priority mode*[94] for both the high and low-voltage ride-through events.

The *IBR unit* shall be capable to separately set the required level of reactive current injection or dynamically provide reactive current for a voltage deviation during low, and during high-voltage ride-through modes of operation. For example, for a given voltage deviation, the *TS owner* may prefer a large amount of reactive current injection at cost of active current[95] during low-voltage ride-through operation. However, for the same voltage deviation during high-voltage ride-through operation, the *TS owner* may prefer no or limited reduction in active current.[96]

IBR units shall be capable of meeting the performance specifications defined in Table 13. Detailed studies (either during the interconnection process or periodic planning assessments by the *TS owner*) may identify a need for modifications to these performance specifications.

The plant controller shall not prohibit or prevent controls of *IBR units* and any *supplemental IBR devices* to meet ride-through performance requirements.

Decision point of active or reactive current priority mode during ride-through. Generally for interconnected grids, reactive power priority is selected.

Table 13—Voltage ride-through performance requirements

Parameter	Type III WTGs	All other IBR units
Step response time[b, c, d]	NA[a]	≤ 2.5 cycles
Settling time[b, c, d]	≤ 6 cycles	≤ 4 cycles
Settling band	−2.5%/+10% of *IBR unit maximum current*	−2.5%/+10% of *IBR unit maximum current*

[a] The initial response from the type III WTG is driven by machine characteristics and not the control system. DC component, if present, has an impact on response, which is driven by machine parameters and time of fault occurrence. Even though the control system takes an action, it cannot control machine's natural response. As such, defining response time for type III WTGs is not necessary.

[b] System conditions may require a slower response time, or *IBR units* may not be able to meet response times noted in this table for certain system conditions. If so, greater response time and *settling time* are allowed with mutual agreement between an *IBR owner* and the *TS owner*.

[c] The DFT with a one-cycle moving average window is used to derive phasor quantities such as active, reactive, positive-sequence, negative-sequence currents, etc. The time delay required for the DFT measurements is included in the *step response time* and *settling time* specified in this table.

[d] The specified *step response time* and *settling time* applies to both 50 Hz and 60 Hz systems.

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- For balanced faults, an *IBR unit* shall inject reactive current dependent on *IBR unit* terminal (POC) voltage. The difference between reactive current injection during a fault and a pre-fault reactive current output is an incremental positive-sequence reactive current (ΔIR-1). The incremental positive-sequence reactive current shall not be negative.[104] During a fault condition, i.e., operating in a low-voltage ride-through mode, priority shall be given to reactive current injection with any residual capacity being supplied as active current unless the *IBR unit* is specified to operate in *active current priority mode* by the *TS owner*.[105]

  For unbalanced faults, in addition to increased positive-sequence reactive current, the *IBR unit* shall inject negative sequence current:

  — Dependent on *IBR unit* terminal (POC) negative sequence voltage and

  — That leads the *IBR unit* terminal (POC) negative sequence voltage by an allowable range as specified below:

    — 90 degrees to 100 degrees[106] for full converter-based *IBR units*

    — 90 degrees to 150 degrees for type III WTGs[107]

  Assuming pre-fault negative sequence current output is zero or negligible, the negative sequence reactive current injection during a fault is an incremental negative sequence reactive current (ΔIR-2). If the *IBR unit*'s total current limit is reached, either ΔIR-1, or ΔIR-2, or both may be reduced with a preference of equal reduction in both currents. Additionally, the incremental positive-sequence reactive current (ΔIR-1) injection shall not be reduced below incremental negative sequence reactive current (ΔIR-2). In case of type III WTGs, the ΔIR-1 and ΔIR-2 injection during a fault is driven by machine parameters and control dynamics and may not be controllable in a manner described above.

Reactive power priority is default (as mentioned) and describes performance.

Describes positive and negative sequence current injection behavior. No decisions to be made by transmission entity.

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- This standard intentionally does not specify magnitude of incremental positive and negative sequence reactive current injection during a fault condition. It is impractical to specify a value or range of values that meets the needs for all *IBR plant* interconnections. The *TS owner* should consider specifying required magnitude of incremental positive and negative sequence reactive currents during faults per respective system needs. The commonly used approach is to specify a relationship between voltage change at *IBR unit* terminals (POC) and required incremental reactive current.[108] At minimum, the *IBR unit* shall be capable of following:

[108] For example, K-factor as specified in the German VDE-AR-N 4120 [B110] and VDE-AR-N 4130 [B111].

K factor (commonly used) is allowed. Generally should be no less than 2 and may require modifications as system conditions change.

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IEEE 2800-2022 Clause 7.2 Voltage

7.2.2.4 Consecutive voltage deviations ride-through capability[109]

The *IBR plant* shall ride through multiple excursions outside of the *continuous operation region* with exception of the conditions and situations specified below, for which the *IBR plant* may trip to protect equipment integrity from the cumulative effects of successive voltage deviations:

- The *IBR plant* may trip for disturbances for which the cumulative duration of voltage deviations within the applicable time window specified in 7.2.2.1 (i.e., 10 s or 3600 s) exceeds (i.e., undervoltages less than or overvoltages greater than) the ride-through durations specified in Table 11 or Table 12, as applicable.
- The *IBR plant* may trip for more than four deviations of the *applicable voltage* at the RPA outside of the *continuous operation region* within any 10-s period.
- The *IBR plant* may trip for more than six deviations of the *applicable voltage* at the RPA outside of the *continuous operation region* within any 120-s period.
- The *IBR plant* may trip for more than ten deviations of the *applicable voltage* at the RPA outside of the *continuous operation region* within any 30-min (1800-s) period.
- The *IBR plant* may trip for any voltage deviation outside of *continuous operation region* that follows the end of a previous deviation by less than 20 cycles of the system fundamental frequency.
- The *IBR plant* may trip for more than two individual deviations of the *applicable voltage* at the RPA below 50% of the nominal voltage (inclusive of zero voltage) within any 10-s period.
- The *IBR plant* may trip for more than three individual deviations of the *applicable voltage* at the RPA below 50% of the nominal voltage (inclusive of zero voltage) within any 120-s period.
- For WTG-based *IBR plants*, individual *IBR units* (WTGs) may trip to self-protect for consecutive voltage deviations that result in stimulation of mechanical resonances exceeding equipment limits.

Individual voltage deviations begin when the *applicable voltage* at the RPA becomes less than the lower limit of the *continuous operation region* or greater than the upper limit of the *continuous operation region*. Individual deviations end when the rms magnitude of the *applicable voltage* at the RPA, for previous one-cycle period of the fundamental frequency, is within the *continuous operation region*.

The *TS owner/TS operator* should specify ride-through requirements for dynamic voltage oscillations that may be stimulated by a TS fault, opening of a line, or tripping of a generator and that may cause the *applicable voltage* to deviate outside the *continuous operation region* multiple times. The characteristic of dynamic voltage oscillation may be specified by one or more of the following:

- Upper and lower limits of the oscillating *applicable voltage*
- Frequency of oscillation in the synchronous reference frame
- Damping ratio of the oscillation

Somewhat controversial requirement, particularly for OEMs. Some flexibility may be warranted.

The consecutive voltage deviation ride-through capability of an isolated IBR interconnected to the TS via a VSC-HVDC transmission facility may be limited by the energy absorption capability and thermal design of the dc chopper in the VSC-HVDC line, as well as by the ability of fast control of active power production by the isolated IBR. Refer to Annex M for an explanation.

The *IBR owner* of isolated IBRs that are interconnected to an ac *transmission system* via a dedicated VSC-HVDC transmission facility shall inform the *TS owner/TS operator* of any limitations regarding the capability of the combined IBR facility to meet the consecutive voltage deviations ride-through capability requirements specified in this clause. *IBR owner* and *TS owner/TS operator* shall mutually agree on remedy measures, which may include one or more of the following:

- The dc chopper may be designed to absorb ICR for at least 2 s.
- New control methods of the offshore ac-dc converter station that enable fast reduction of active power production from isolated IBRs (e.g., WTGs) by changing the offshore ac network voltage.
- Other means not specified.

As applicable, exception from specified consecutive voltage deviations ride-through capability shall be permitted with mutual agreement between the *IBR owner* and *TS owner/TS operator*.

Carve-outs for VSC-HVDC connected IBRs – point of contention in FERC Order 909 (PRC-029 approval).

TS owner/operator should consider this but may not be all that necessary.

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- The active power recovery time shall be configurable within a range between 1.0 s and 10 s. The default active power recovery time is 1 s; however, in weak grids, in order to reduce oscillatory behavior of the *IBR plant* upon fault recovery and maintain system stability, it may be desirable to reduce the average rate of active power recovery in consultation with the *TS owner*. Any modification of the recovery time from the default value shall be based on a mutual agreement between the *IBR owner* and the *TS owner*. The time to restore active power output shall be a target time with a tolerance that is the greater of ± 0.2 s or ± 10% of configured active power recovery time in seconds and shall not be interpreted as a maximum time.

Active power recovery during restore output after a VRT event is 1 second. This is generally an industry-accepted dynamic recovery time for active power; however, studies may determine that a faster or slower time may be needed.

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IEEE 2800-2022 Clause 7.2 Voltage

7.2.3 Transient overvoltage ride-through requirements

The *IBR plant* shall ride through transient overvoltage that do not exceed the fundamental-frequency overvoltage ride-through requirements specified in 7.2.2.1 and for which the greater of individual phase-to-phase or phase-to-ground instantaneous voltage magnitudes do not exceed the cumulative durations (minimum time) specified in Table 14. The interpretation of cumulative duration in the context of instantaneous voltage magnitudes is illustrated in the informative Figure 11. The cumulative duration shall only include the sum of durations for which the instantaneous voltage exceeds the respective threshold over a 1-min time window.[110]

The voltages in Table 14 shall be per unit of the nominal instantaneous peak voltage at the RPA. For example, in case of an *IBR plant* with RPA voltage of 230 kV phase-to-phase RMS, the phase-to-phase instantaneous peak voltage is 325.3 kV $\left(230\times\sqrt{2}\right)$ and the phase-to-ground instantaneous peak voltage is 187.8 kV $\left(\left(230/\sqrt{3}\right)\times\sqrt{2}\right)$.

Table 14—Transient overvoltage ride-through requirements at the RPA

Voltage[c] (p.u.) at the RPA	Minimum ride-through time (ms)[d] (design criteria)[b]
V > 1.80	See footnote[a]
V > 1.70	0.2
V > 1.60	1.0
V > 1.40	3.0
V > 1.20	15.0

[a] Appropriate surge protection shall be applied at the RPA as well as within the *IBR plant*, including *IBR unit* terminals (POC), as necessary.
[b] The minimum ride-through times specified in Table 14 apply to both 50 Hz and 60 Hz systems.
[c] Specified voltage magnitudes are the residual voltages with surge arresters applied.
[d] Cumulative time over a 1-min time window.

Controversial requirement OEMs are *trying* to meet. Hard to verify in 2800.2 test and verification procedures. Addressed with this statement in the template FIR:

Technical Exceptions to IEEE 2800-2022 Clauses

Technical exceptions to any clauses of IEEE 2800-2022 shall be presented by the IBR owner and will be considered by [INSERT TRANSMISSION PROVIDER NAME] on a case-by-case basis. Limited exceptions may be granted for specific requirements where a hardware or technological limitation exists. [INSERT TRANSMISSION PROVIDER NAME] reserves the right to allow or deny exceptions based on the information presented and circumstances for each interconnecting resource and associated technology.

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IEEE 2800-2022 Clause 7.3 Frequency

- Continuous operation region
- LFRT and HFRT capability and performance straightforward (see curve)

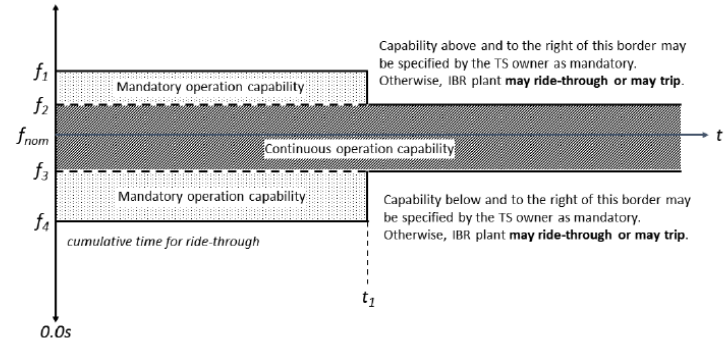

Figure 12—Frequency ride-through capability requirements for *IBR plant*

Table 15—Frequency ride-through capability for an *IBR plant* (see Figure 12)

Frequency range (Hz)	Percent from f_{nom}	Minimum time (s) (design criteria)	Operation
f_1, f_4	+3, −5	299.0 (t_1)	Mandatory operation
f_2, f_3	+2, −2	∞	Continuous operation

- **7.3.2.3.5 Rate of change of frequency (ROCOF) ride-through**

Within the *mandatory operation region* and *continuous operation region* (frequency range and corresponding cumulative duration, time), the *IBR plant* shall ride through and shall not trip for frequency excursions having an absolute rate of change of frequency (ROCOF) magnitude that is less than or equal to 5.0 Hz/s. As specified in 4.3, the ROCOF shall be the average rate of change of frequency over an averaging window of at least 0.1 s. Upon mutual agreement between the *TS operator* and the *IBR operator*, the *IBR plant* may be required to ride-through and not trip for higher ROCOF levels.

7.3.2.4 Voltage phase angle changes ride-through

The *IBR plant* shall ride through positive-sequence phase angle changes within a sub-cycle-to-cycle time frame of the *applicable voltage* of less than or equal to 25 electrical degrees.[116]

In addition, the *IBR plant* shall remain in operation for any change in the phase angle of individual phases caused by occurrence and clearance of unbalanced faults, provided that the positive-sequence angle change does not exceed the forestated criterion. Active and reactive current oscillations in the *post-disturbance period* that are positively damped shall be acceptable in response to phase angle changes. *Current blocking* in the *post-disturbance period* shall not be permitted.

5 Hz/sec ROCOF ride-through requirement

25 degree phase jump ride-through requirement

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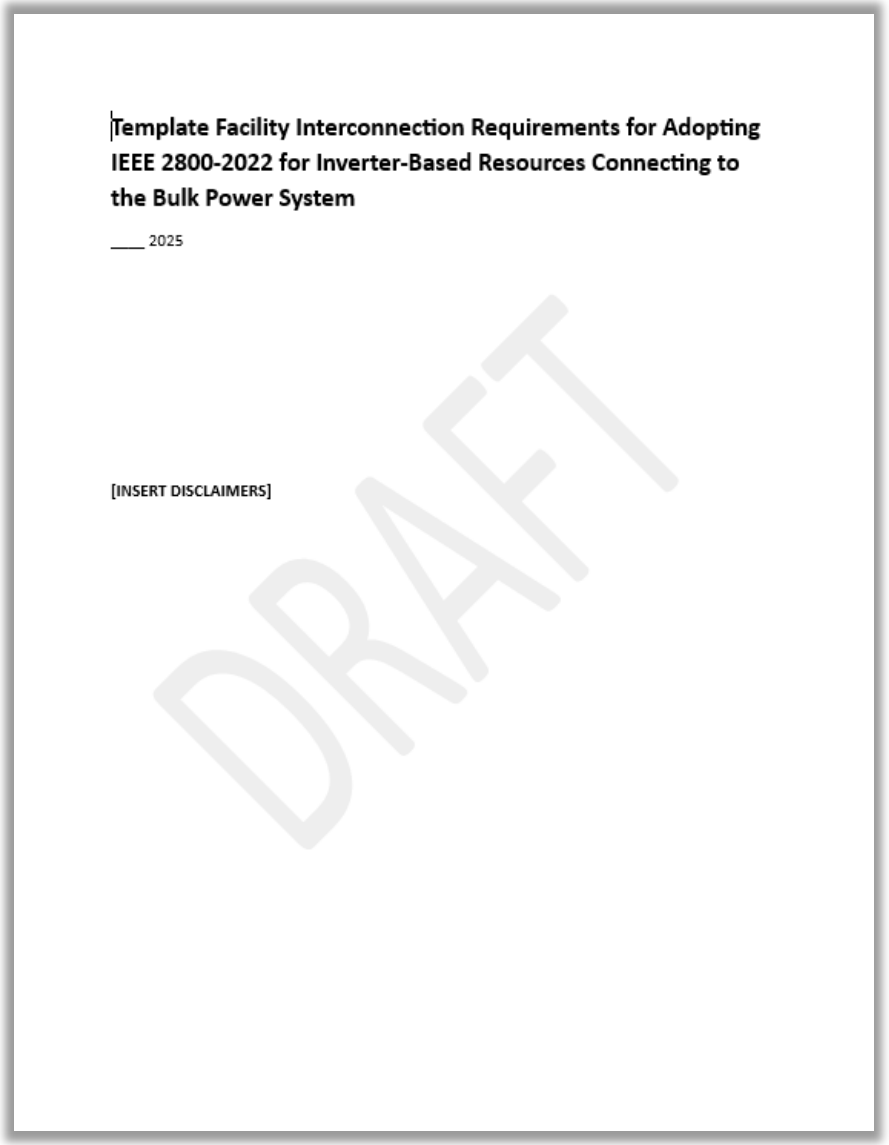
Next Meeting: Clauses 8–11

- Clause 8 – power quality
- Clause 9 – protection
- Clause 10 – modeling
- Clause 11 – monitoring



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Slido Question

Slido.com

Join Code: 25601706

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Industry Advisory Group Schedule

Date	Topics
✅ May 19, 2025 (3:00–4:00 p.m. MT)	Kickoff: Background, Goals, and Timeline
✅ June 26, 2025 (1:00–2:00 p.m. MT)	IEEE 2800 Overview & IBR Requirements Planning
✅ July 17, 2025 (9:30–10:30 a.m. MT)	IBR Requirements Enhancements – Industry Experience
✅ August 28, 2025 (1:00–2:00 p.m. MT)	Draft Template Review: General Interconnection Requirements
✅ September 25, 2025 (1:00–2:00 p.m. MT)	Draft Template Review: Technical Performance Requirements
October 23, 2025 (1:00–2:00 p.m. MT)	Draft Template Review: Model & Study Requirements
November 13, 2025 (1:00–2:00 p.m. MT)	Draft Template Review: SCADA, Monitoring, Compliance
December 17, 2025 (1:00–2:00 p.m. MT)	Final Review & Closeout

Thank You!

Next Industry Advisory Group Meeting

October 23, 2025 at 1:00 PM MT

Eric Baran, ebaran@westernenergyboard.org

Ryan Quint, ryan.quint@elevate.energy

Kyle Thomas, kyle.thomas@elevate.energy

Nick Giffin, nick.giffin@elevate.energy

WIRAB
Western Interconnection Regional Advisory Body

Slido Q1: Are there any areas related to Clause 5, 6, or 7 that deserve closer attention or clarity on today's call?

No responses.

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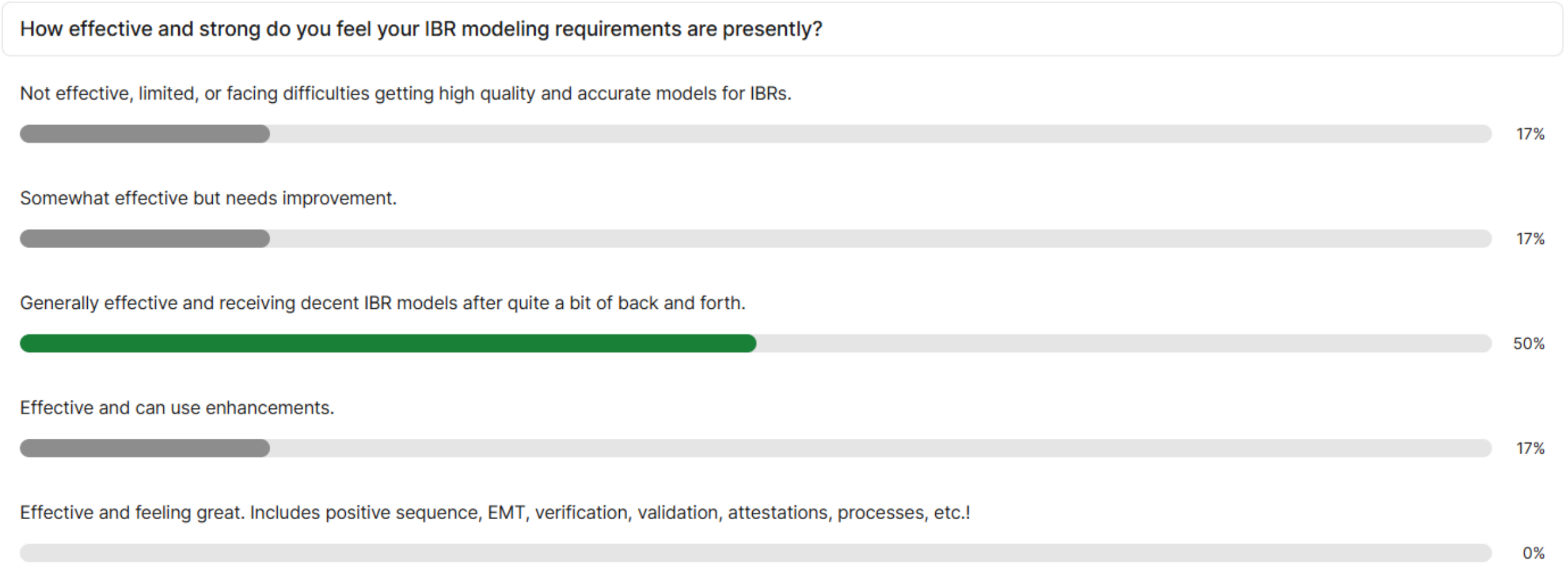
Slido Q2: How effective and strong do you feel your IBR modeling requirements are presently?



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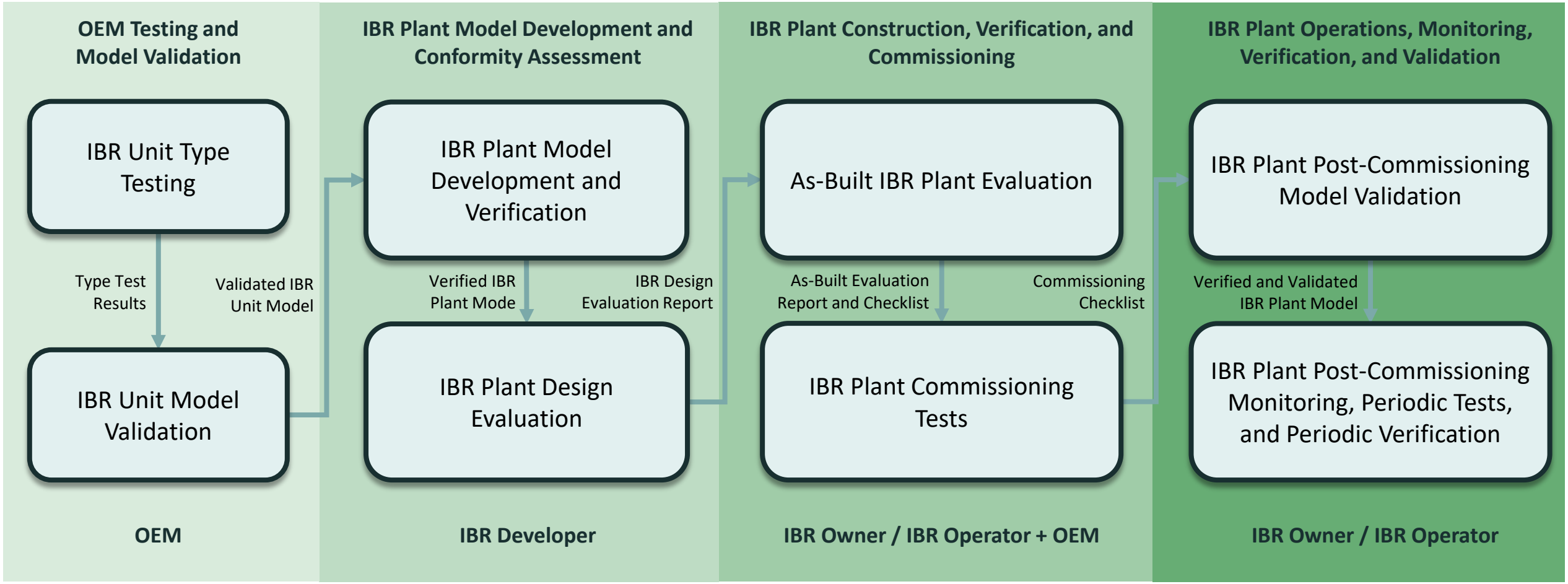
IEEE P2800.2 IBR Plant Performance Conformity Assessment



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