Harmonizing IBR Interconnection Requirements in the West

Industry Advisory Group

Meeting # 4

IEEE 2800-2022 Clauses 1–6

August 28, 2025

WIRAB
Western Interconnection Regional Advisory Body

Meeting Logistics

Please Introduce Yourself in the Chat

- Name
- Organization / Company
- Role or Title

Recording

This meeting is being recorded and **may be posted publicly**. By participating, you consent to your name, voice, and image being part of the recording.

How to Participate

Use the **"Raise Hand"** feature to ask questions or provide input

Feel free to use the **chat** for comments or clarifying questions

We will be using **Slido** later in the meeting to solicit feedback

Audio Etiquette

Everyone came into the meeting muted

Please **mute yourself** when not speaking

If joining by phone, please identify yourself in the chat

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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Join Code: 4386968

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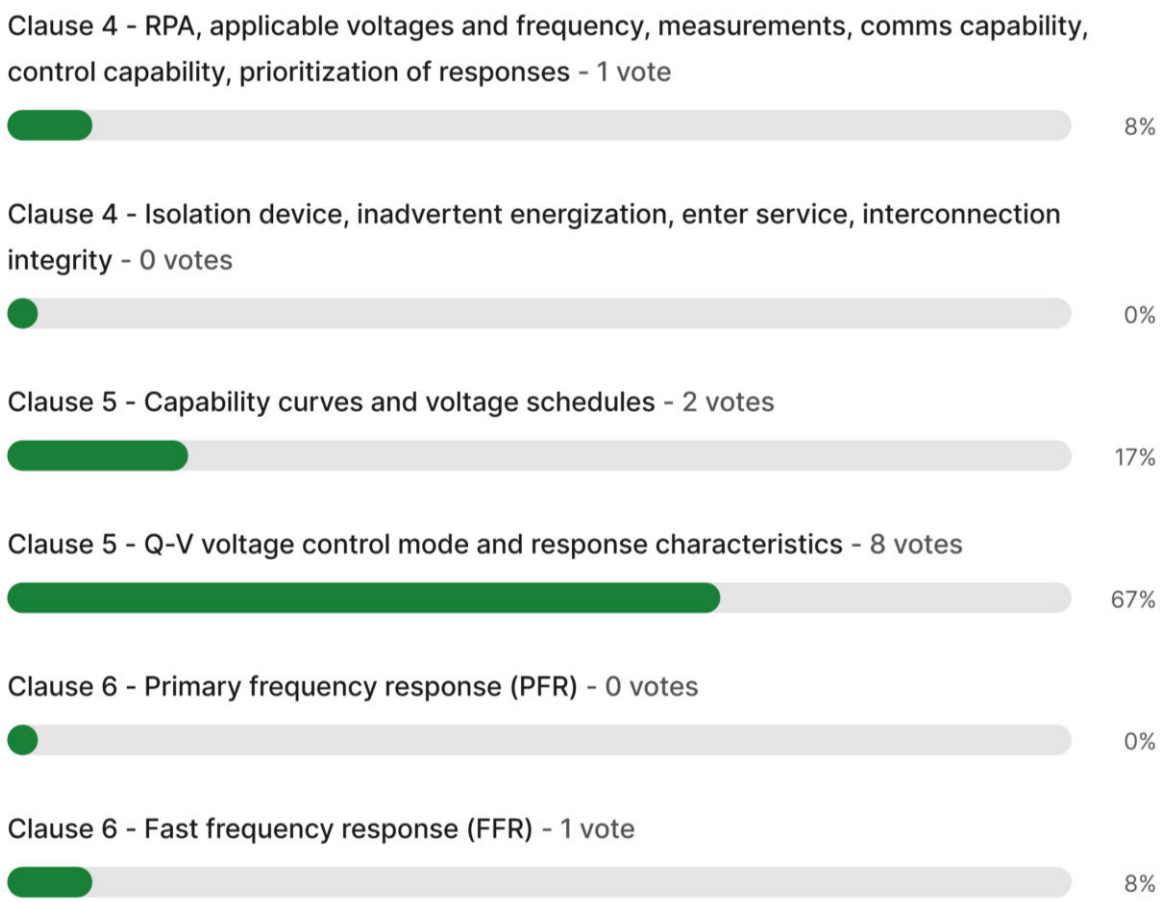
Review of Template FIRs

Clauses 1 thru 6

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

August 28, 2025

Slido Feedback from Last Meeting



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IEEE 2800-2022 Clauses 1–3

Contents

Key points:

- General background, scope, purpose, general remarks, references, definitions, etc.
- No major decision points or system-specific clarifications

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Template FIR Review – Front Matter

(Review Template FIR Front Matter Sections)

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Template FIR Review – Clause 4

CLAUSE 4: GENERAL INTERCONNECTION TECHNICAL SPECIFICATIONS AND PERFORMANCE REQUIREMENTS

[INSERT TRANSMISSION PROVIDER NAME] adopts Clause 4 of IEEE 2800-2022 with the following clarifications and modifications.

Clause 4.2: Reference Point of Applicability

The default Reference Point of Applicability (RPA) used in IEEE 2800-2022 is defined as the [select Point of Measurement (POM) or Point of Interconnection (POI)] for each IBR plant, aligning with WECC Regional Standards including VAR-001. Any instance where a different RPA is specified for specific clauses of IEEE 2800-2022 will be explicitly defined herein; otherwise, the default RPA of the [select POM or POI] shall be used.

For requirements in IEEE 2800-2022 that apply to an IBR unit, the respective subclause specifies the Point of Connection (POC) as the RPA in those instances.

[INSERT TRANSMISSION PROVIDER NAME] reserves the right to change the RPA designation(s) for each IBR plant on a case-by-case basis, as needed.

Clause 4.3: Applicable Voltages and Frequency Nominal

Nominal system frequency is 60 Hz and nominal voltage levels at the RPA are: [list all nominal voltage classes (e.g., 500 kV, 230 kV, 115 kV, 69 kV, etc.)]. For 500 kV nominal system voltage, the base value for per unitized voltage is [525 kV] operating voltage.

Clause 4.5: Operational Measurement and Communication Capability

Refer to the generator interconnection agreement and other Facility Interconnection Requirements sections for details regarding communication protocols and data to be exchanged between the IBR plant. Testing and verification of these capabilities shall be part of the IBR plant commissioning process.

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Template FIR Review – Clause 4

Clause 4.10: Enter Service

[INSERT TRANSMISSION PROVIDER NAME] adopts the requirements for IBR plants to enter service as defined in Clause 4.10 of IEEE 2800-2022 and its sub-clauses. The table below replaces Table 3 of IEEE 2800-2022 for enter service criteria for IBR plants.

Enter service criteria		Default settings
Permit service	When enabled	Disabled
Applicable voltage within range	Minimum value	[Enter value – e.g., 0.95 pu]
	Maximum value	[Enter value – e.g., 1.05 pu (operating voltage)]
Applicable frequency within range	Minimum value	[Enter value – e.g., 59.4 Hz]
	Maximum value	[Enter value – e.g., 60.12 Hz]

Footnote a. For any IBR plant connected to a weak grid, the default minimum voltage value to enter service shall be [Enter value – e.g., 0.98 pu]. [INSERT TRANSMISSION PROVIDER NAME] will inform the IBR owner of this modified requirement, if applicable.

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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

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.

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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.

*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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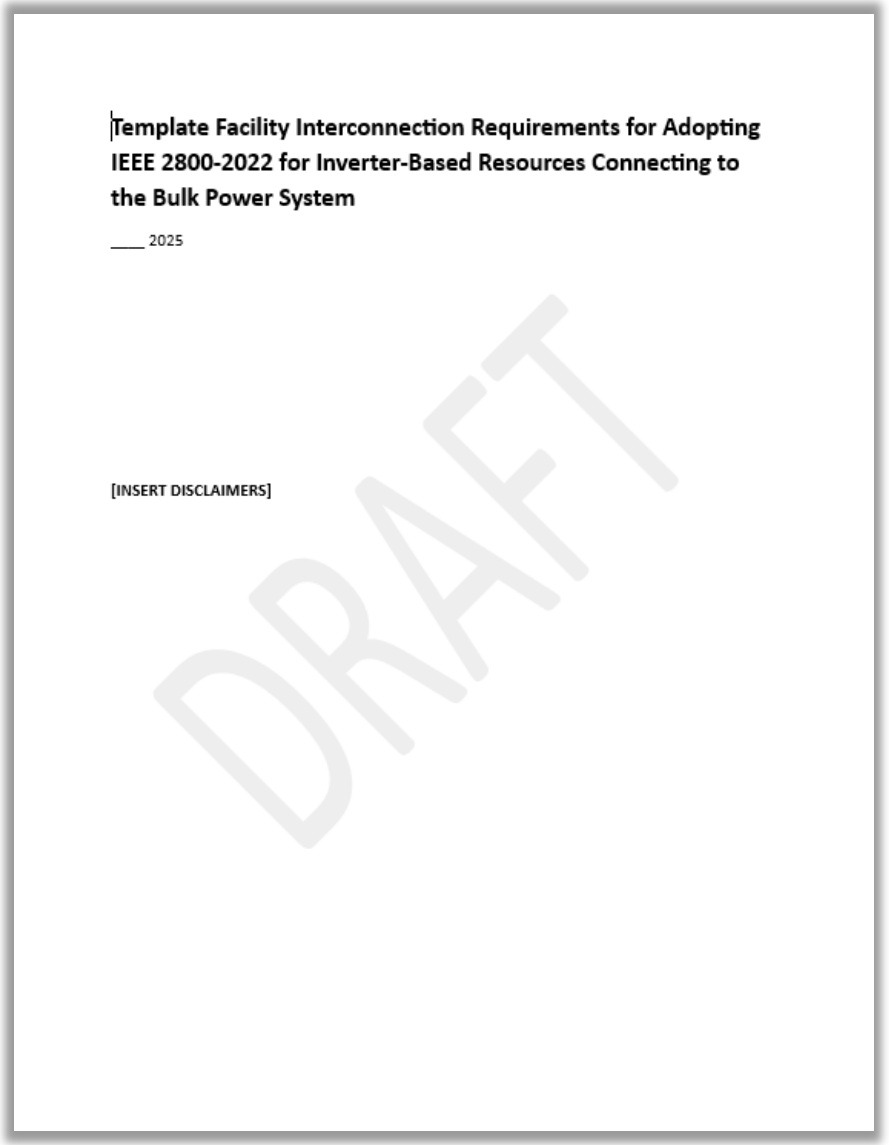
Next Meeting: Clause 7

- Clause 7 is “the big one” – focuses on IBR ride-through performance and dynamic response characteristics
- Lots of TS owner/operator-specified parameters and considerations



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Slido Question

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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

September 25, 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

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Slido Q1: What questions or topics of focus do you have regarding Clauses 4 thru 6 of IEEE 2800-2022?

What questions or topics of focus do you have regarding Clauses 4 thru 6 of IEEE 2800-2022?

Open text poll | 3 responses | 3 participants

Anonymous
I don't have a copy, since it's behind a paywall.

Anonymous
4 and 5

Anonymous
I've been busy the last few months and haven't read it.

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Slido Q2: Was this review helpful in better understanding IEEE 2800-2022 Clauses 4 thru 6 and how template FIRs could be implemented? Any constructive feedback to improve these discussions?

Was this review helpful in better understanding IEEE 2800-2022 Clauses 4 thru 6 and how template FIRs could be implemented? Any constructive feedback to improve these discussions?

Open text poll | 1 response | 1 participant

Anonymous

Yes, going through these has been helpful in understanding the clauses and the template is looking good.

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Slido Q3: Any specific questions or topics of focus you would like us to focus on regarding Clause 7 of IEEE 2800-2022 for next meeting?

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