

Harmonizing IBR Interconnection Requirements in the West

Industry Advisory Group

Meeting # 7

Finalizing the Template Facility
Interconnection Requirements for
IEEE 2800-2022

November 13, 2025



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

Review and finalize template FIR document and IEEE 2800-2022 requirements



Interactive Discussion and Q&A

Open discussion and review of survey results



Closing and Next Steps

Confirming upcoming meeting dates and schedule
Preview of next meeting topics and expected deliverables



Implementing IEEE 2800-2022 and Incorporating the Template FIRs

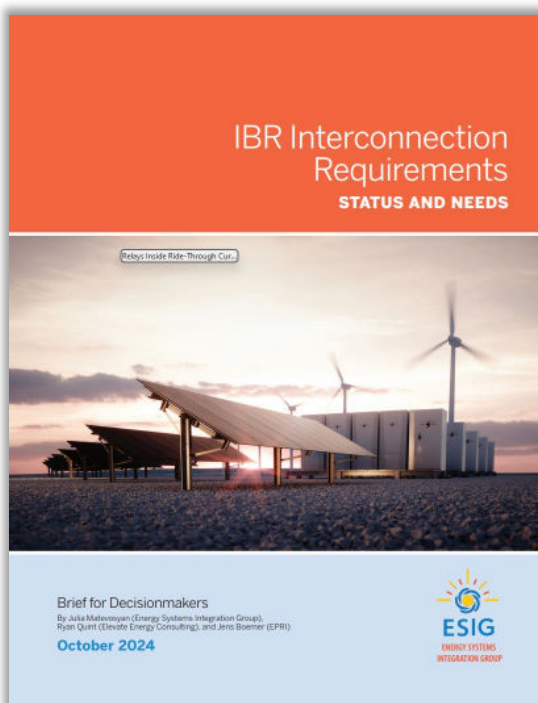
Ryan D. Quint, PhD, PE, *President and CEO*

Kyle Thomas, PE, VP, *Engineering and Compliance Services*

November 13, 2025

ESIG IBR Interconnection Requirements Brief

IEEE 2800-2022 Adoption Strategies



General Reference

Cite IEEE 2800 in Full

“Point to standard in existing requirements”

- ✓ Minimal effort to adopt
- × **Limited system-specific details***
- × Lacks clarity and specificity
- × **Leaves gaps in implementation and understanding**

Detailed Reference

Cite IEEE 2800 Clauses

“Point to specific clauses in existing requirements”

- ✓ Targeted enhancements
- ✓ Allows phased approach
- × **Limited system-specific details***

Hybrid Integration

Organic Integration

“Point to specific clauses and add clarifying language in existing requirements”

- ✓ Targeted enhancements
- ✓ Allows phased approach
- ✓ Allows adaptation and additional requirements
- ✓ **System-specific and clear**
- ✓ Enables conformity language additions

Detailed Spec

Recreate Specs of IEEE 2800

“Recreate requirements language entirely”

- ✓ Targeted enhancements
- ✓ Allows phased approach
- ✓ Allows adaptation and tailored solution for specific rules framework
- ✓ Enables conformity language
- × **Significant work and duplication for AGIR**
- × **Copyright concerns**

* Industry practice has tended not to provide the necessary AGIR-specific details (i.e., functional settings) needed for complete adoption of IEEE 2800-2022.

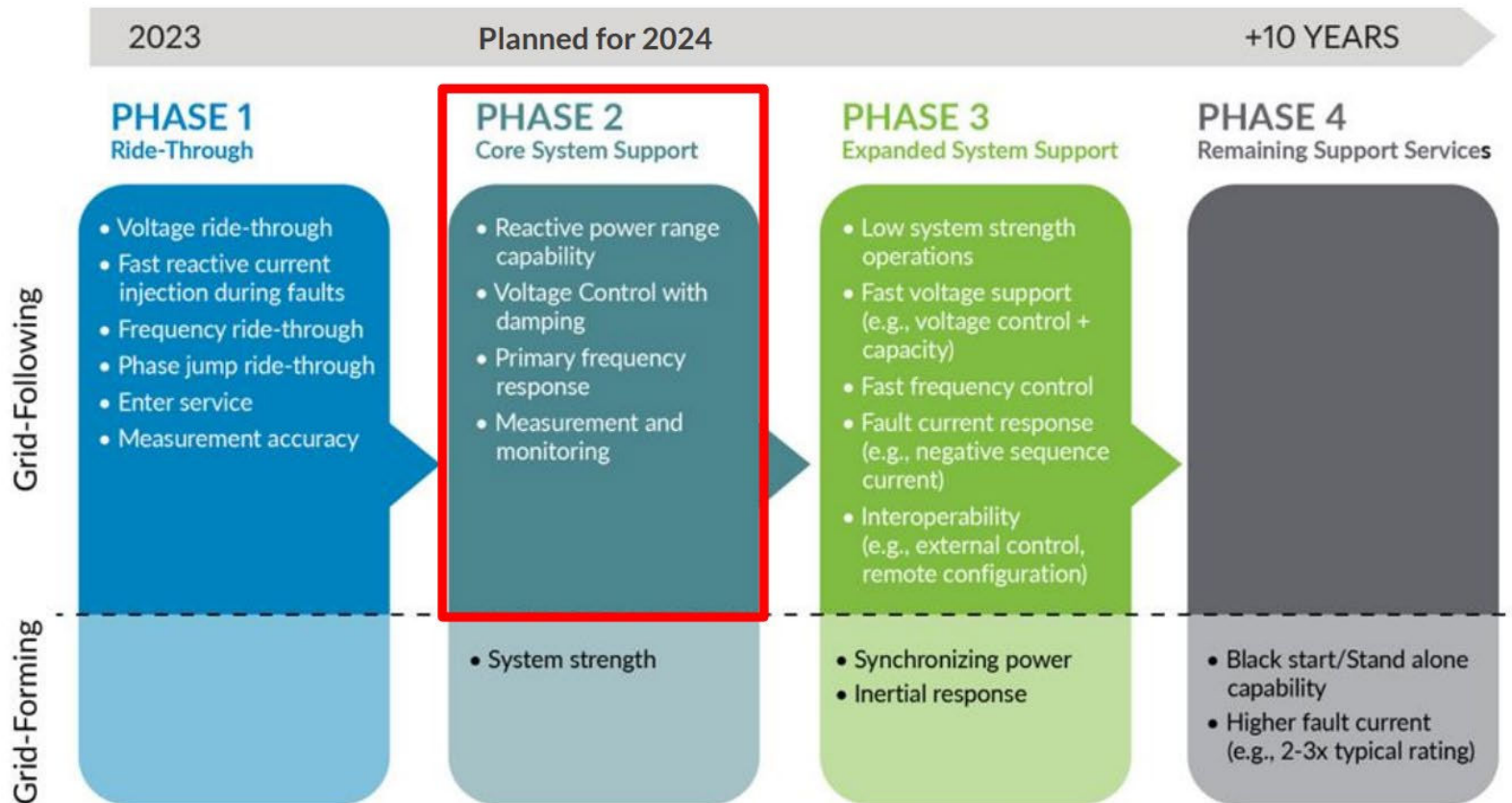
Notes: Green text indicates advantages of the adoption method, yellow text indicates limitations, and red text indicates gaps. More important advantages, limitations, and gaps are in bold. AGIR = Authority Governing Interconnection Requirements.

Source: Elevate Energy Consulting.

[ESIG Brief: IBR Interconnection Requirements](#)

MISO Efforts for IEEE 2800 Adoption

IBR performance requirements were identified as a key solution to ensuring system stability, and four main phases were proposed in the Attributes roadmap



Attributes Roadmap Publication: <https://cdn.misoenergy.org/2023%20Attributes%20Roadmap631174.pdf>

DOE i2X FIRST Initiative

ESIG | DOE i2X Forum for the Implementation of Reliability Standards for Transmission

RETURN TO I2X
SEASON 2 PAGE

ESIG with support from Elevate Energy Consulting, and in collaboration with Berkeley Lab and EPRI, is supporting the U.S. Department of Energy (DOE) initiative to facilitate the Forum for the Implementation of Reliability Standards for Transmission (FIRST) as part of the DOE's Interconnection Innovation e-Xchange (i2X).

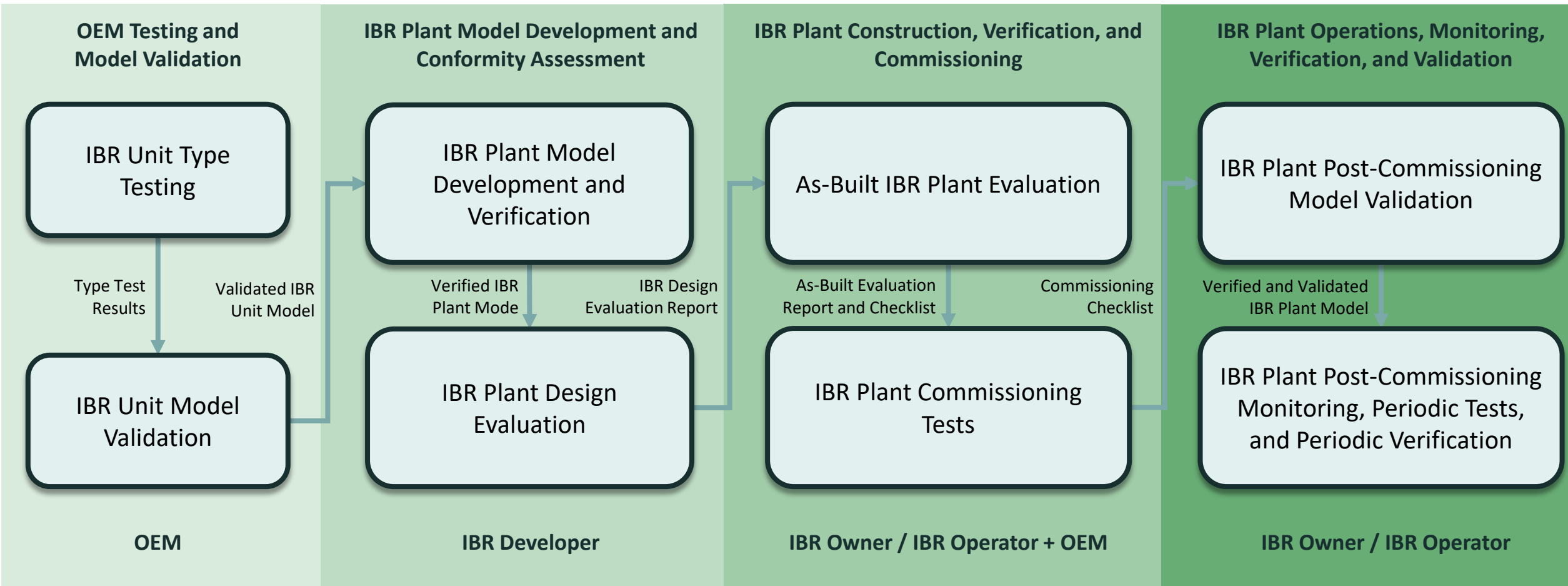
To ensure the reliable and secure operation of clean energy resources connected to the electric grid, interconnection standards need to address inverter-based generator capabilities, expected performance, cybersecurity requirements, and other relevant issues. Some of these standards, such as Institute of Electrical and Electronics Engineers (IEEE)-2800, have been developed, but still need to be widely adopted and implemented. Other standards, as well as procedures for assessing and verifying plant conformity with them, have yet to be developed.

The U.S. Department of Energy (DOE) Interconnection Innovation e-Xchange (i2X) Forum for the Implementation of Reliability Standards for Transmission (FIRST) facilitates the adoption of new and recently updated standards relevant for interconnected clean energy resources like solar and wind energy. The Forum convenes industry stakeholders to enable easier and more harmonized implementation of these interconnection standards.

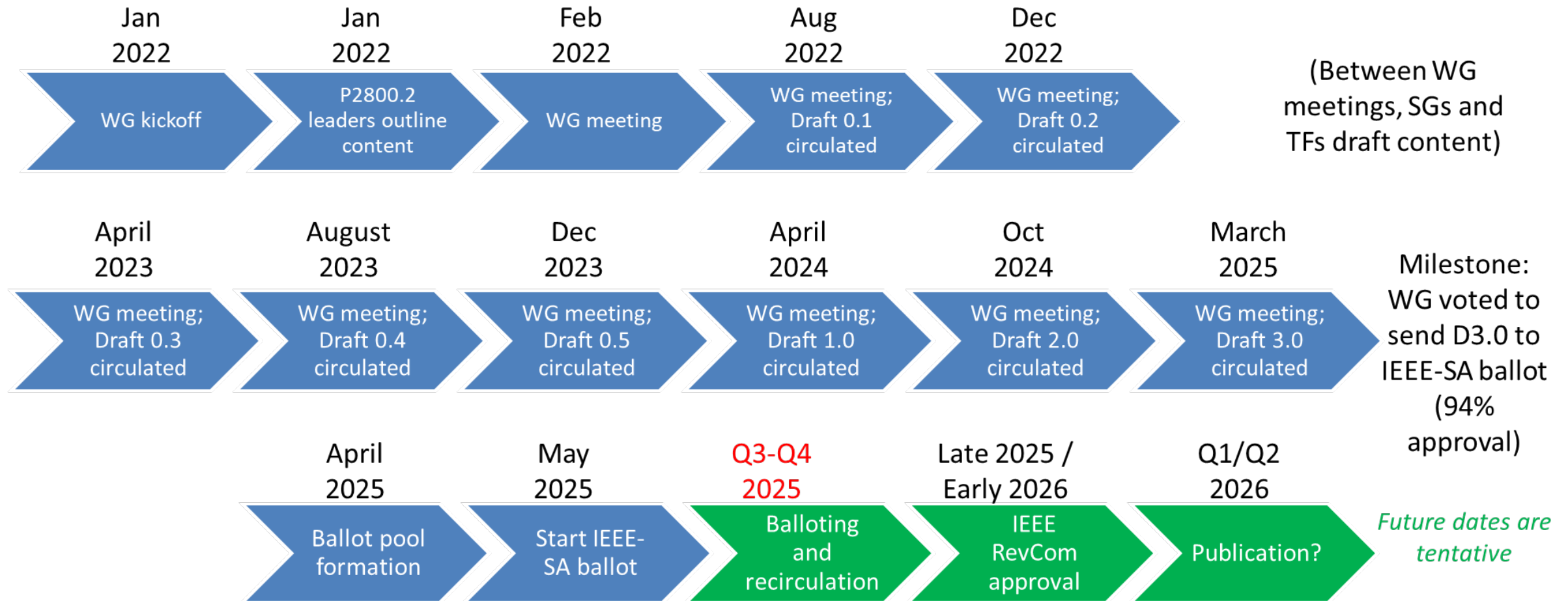
i2X FIRST addresses the solutions related to interconnection standards (4.2 to 4.9) identified in the [DOE Transmission Interconnection Roadmap](#). i2X FIRST covers practices outlined in the draft of IEEE P2800.2 and best practices from early adopters of the IEEE 2800 standard. Additionally, ongoing North American Electric Reliability Corporation (NERC) standard revision efforts related to Federal Energy Regulatory Commission (FERC) Order 901 are discussed to ensure alignment with IEEE 2800 adoption. Feedback gained through i2X FIRST will help shape new standards development processes.

<https://www.esig.energy/i2x-first-season-1/>
<https://www.esig.energy/i2x-first-forum/>
[Register for Season 2](#)

IEEE P2800.2 IBR Plant Conformity Assessment

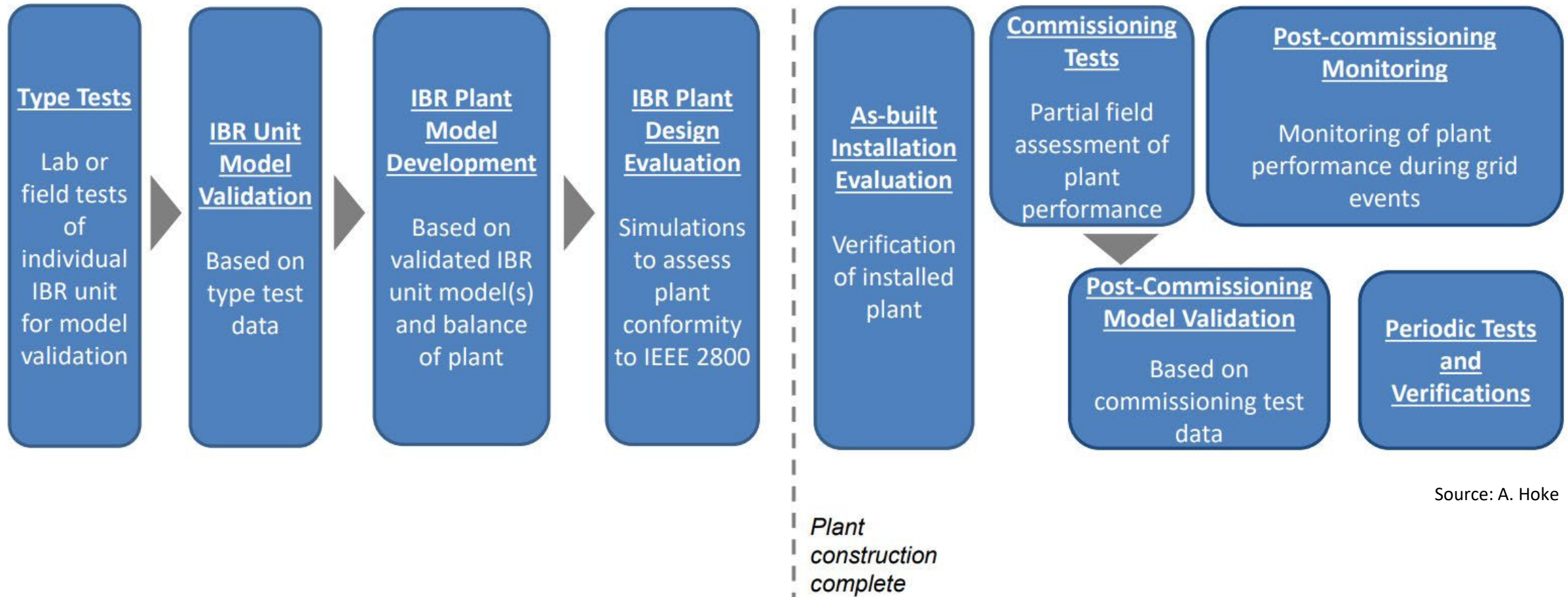


IEEE P2800.2 Publication Timeline



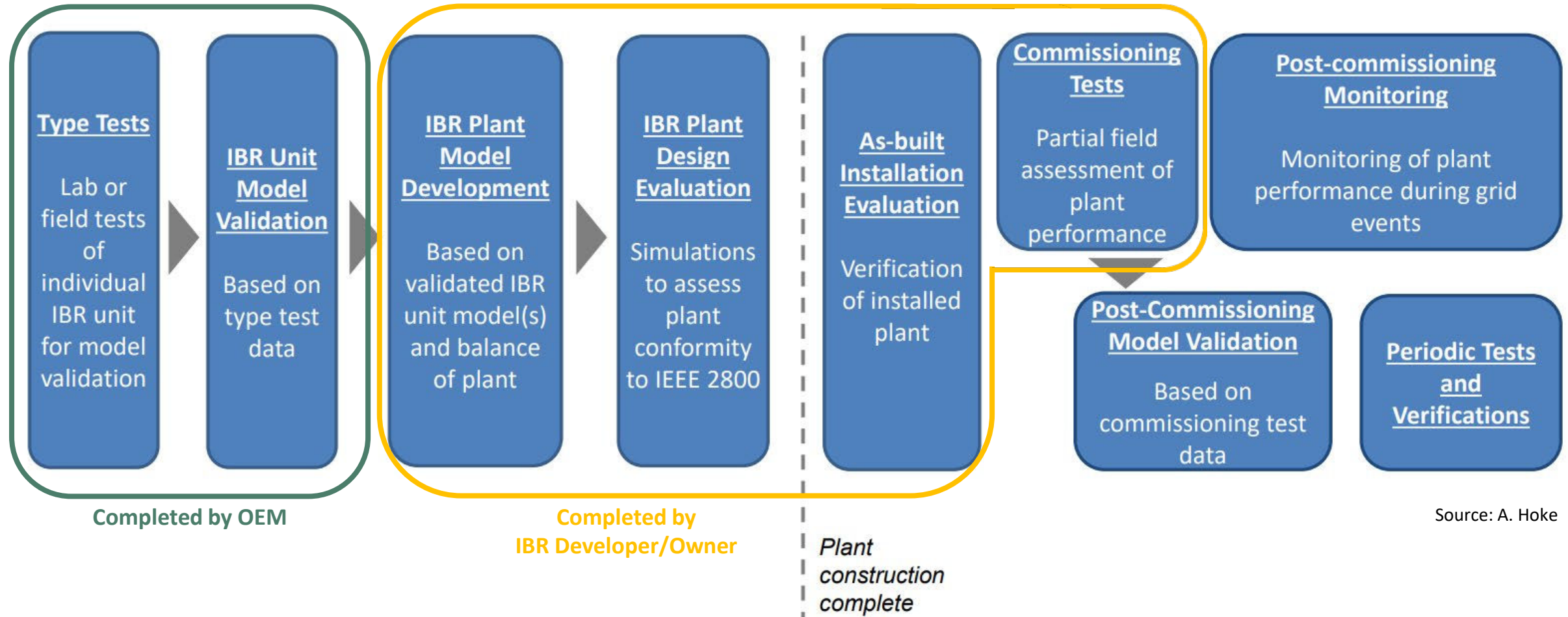
Source: IEEE

IEEE P2800.2 Conformity Assessment Steps



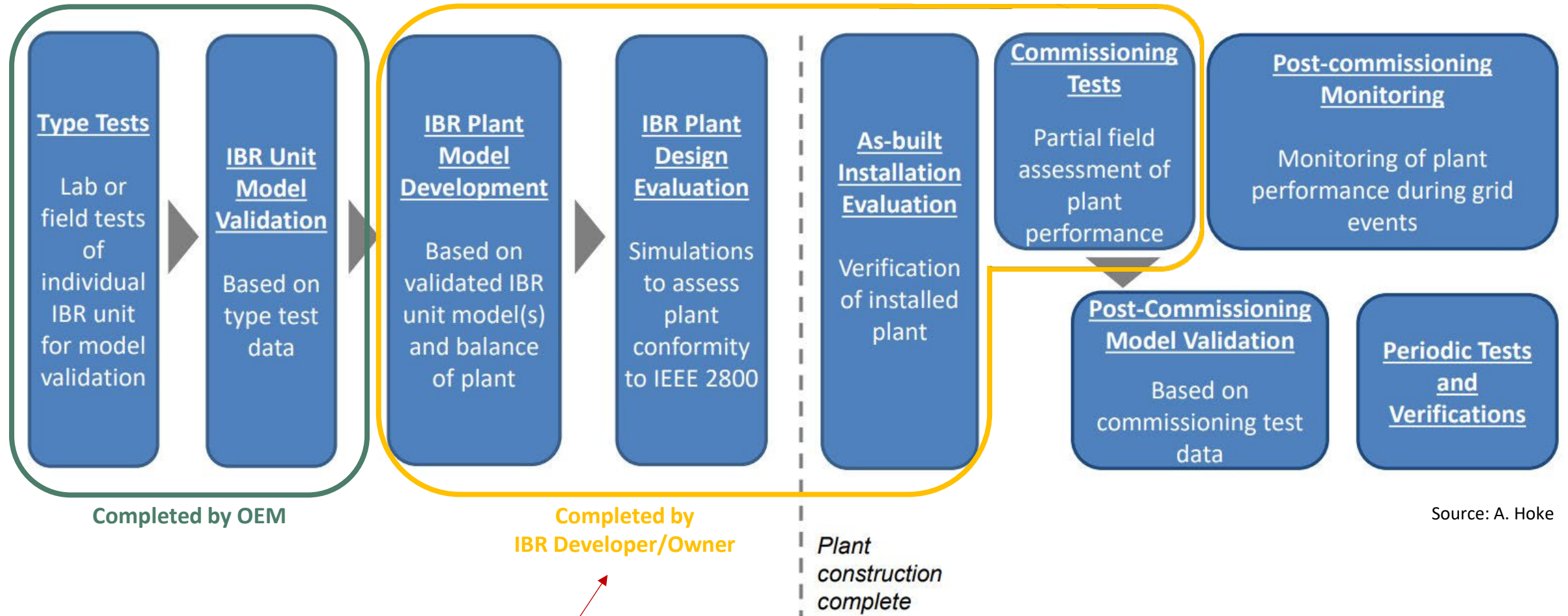
Source: A. Hoke

IEEE P2800.2 Conformity Assessment Steps



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IEEE P2800.2 Conformity Assessment Steps



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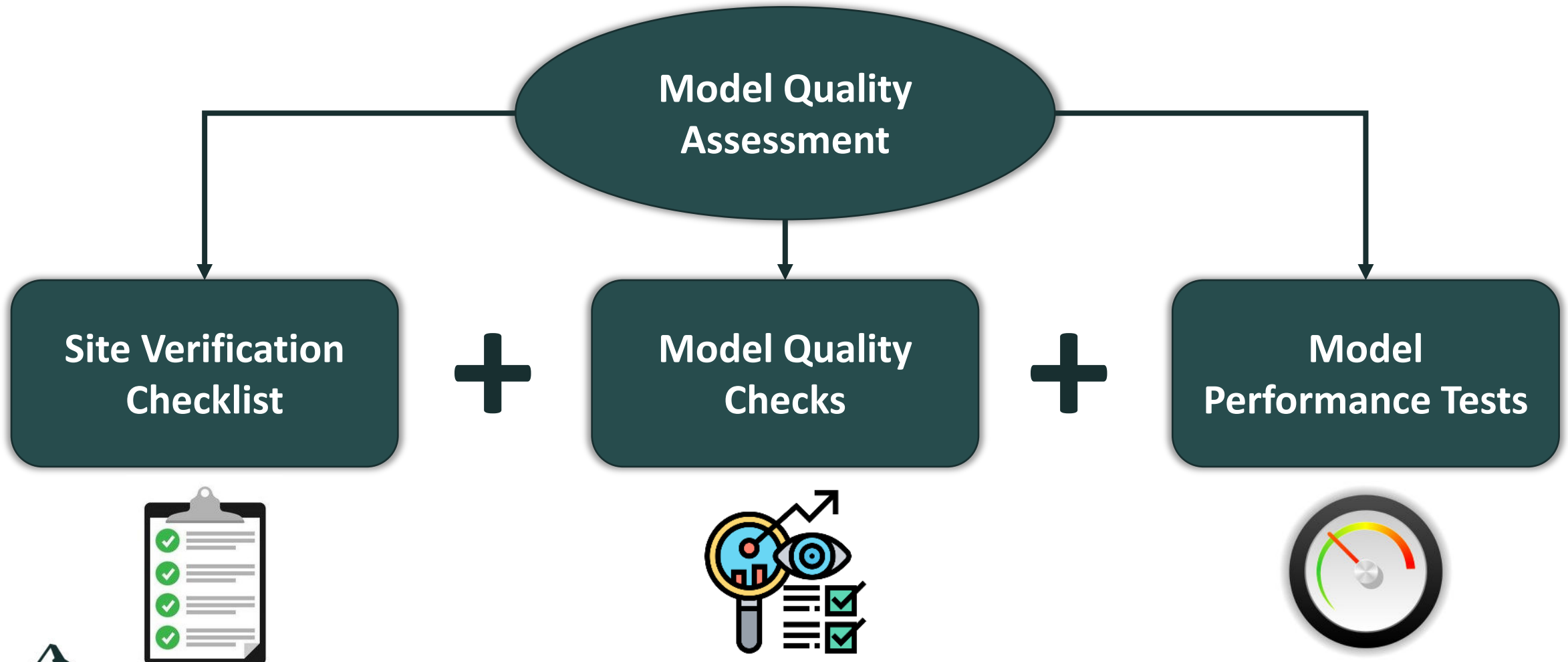
IBR Requirements Checklist

IBR developer provides adequate proof of all the following...

- ✓ All IBR plant documentation is compiled and accurate.
- ✓ IBR plant models are verified, with validated IBR unit and PPC models.
- ✓ IBR plant models pass quality checks.
- ✓ IBR plant models meet defined performance requirements.
- ✓ IBR plant models sufficiently match each other (benchmarked).
- ✓ A model quality and performance report is provided (standardized format).

TAKEAWAY: Established IBR requirements need to adequately address all these topics in a coordinated way.

Model Quality Assessment

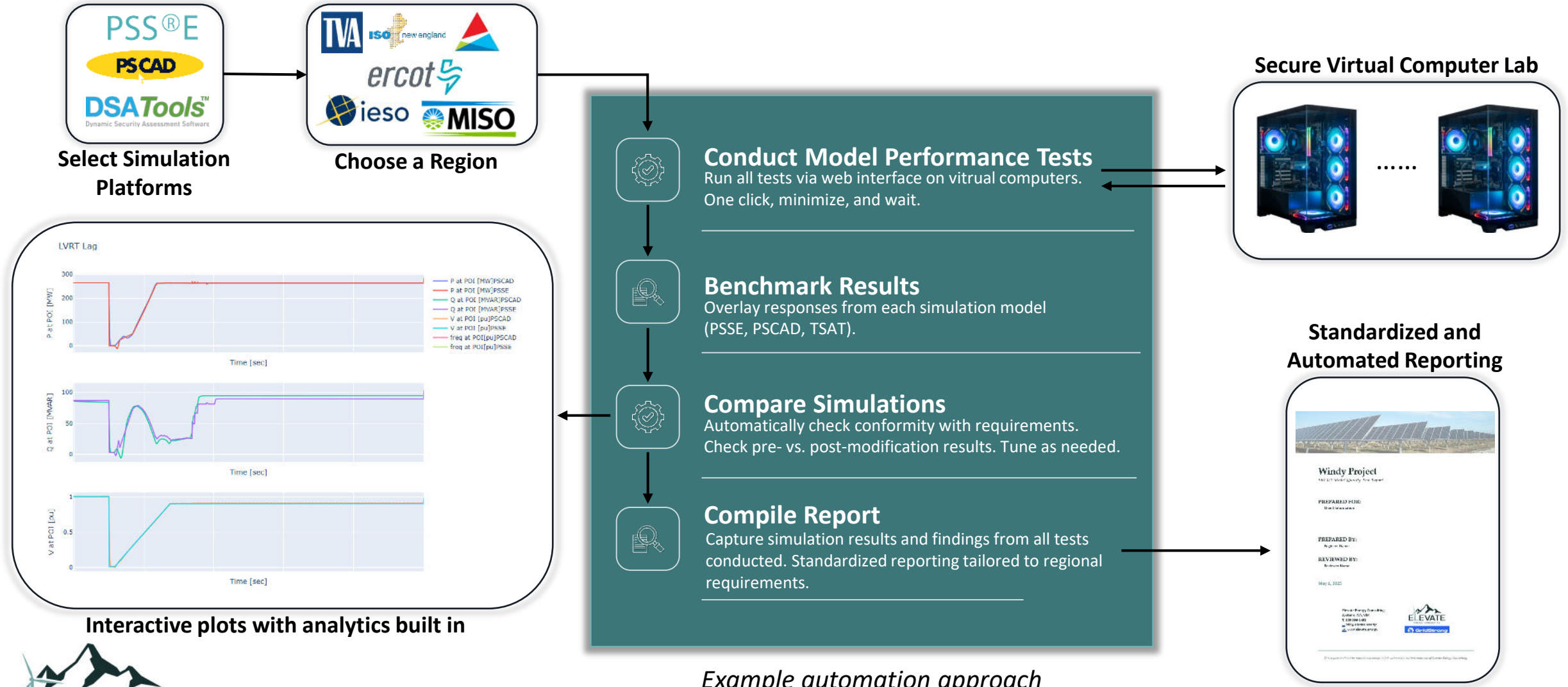


IBR Model Performance Tests

- ✓ Initialization and model functionality
- ✓ Balanced and unbalanced fault ride-through
- ✓ Small voltage and frequency disturbances
- ✓ Voltage control and reactive power capability
- ✓ High and low voltage and frequency ride-through
- ✓ Short circuit strength performance
- ✓ Protection verification

* Clause 7 of IEEE P2800.2 can serve as reference

Model Performance Test Automation



Example automation approach

Standardized Submittals

Appendix A: Template for Model Performance Attestation Report

This appendix provides information for submitting the model performance attestation in the template format.

A.1 Model Performance Attestation Report

Interconnection customer shall provide the required (and supplemental²⁰) test results for a complete model performance attestation report. A report shall be provided for a resource type operating individually, or a combination of resource types (e.g. solar PV plus BESS) operating in parallel.

- All test results shall include each resource type and combination where applicable and be presented in one document in PDF or Microsoft Word format.
- Each test result shall include four separate plots showing the frequency, voltage, active power, and reactive power at the point of interconnection (POI) of an IBR plant, as shown in Figure 12 for an example test (i.e., Test No. 4.1.7-1).
- Each test result shall include the three models (i.e., PSS®E standard library model, PSS®E UDM, and PSCAD™ model) overlaid on the same plot axis for tests in Section 4.1.
 - Interconnection customers entering the 2025 Annual Cluster Study are only required to submit results for either one of the following two models: PSS®E standard library model, or PSS®E UDM.
- These plots shall be repeated for each required test.
- The model performance attestation report is considered incomplete unless the results from all the required tests are included in the model submission package.

A.2 Template Result Format

Figure 12 shows an example response of a generic IBR model during a HVRT test (Test No. 4.1.7-1) from the three models: PSS®E standard library model, PSS®E UDM, and PSCAD™ model. The IBR unit response meets the Pass Criteria performance requirements detailed in Section 4.1.7. The following details in an IBR unit model report for each test result are noted from the example:

Appendix B: Model Submittal Package Summary

The following table summarizes the items that shall be included in a model submittal package of an interconnection customer.

Item	File Extension	Description
PSS®E standard library model	.raw or .sav	Power flow models (version 35)
	.dyr	Dynamic models (version 35)
	.docx, or .pdf	Documentations
PSS®E UDM	.raw or .sav	Power flow models (version 35)
	.dyr	Dynamic models (version 35)
	.dll	Dynamic Link Library (version 35)
	.docx, or .pdf	Documentations
PSCAD™ model	.psex	Project case file
	Optional: .pswx, .pslx .f, .for, .f90, .c, .cpp, .o, .obj, .lib, .dll .par, .txt, etc.	Other files that may be necessary to run the case file (e.g., original source codes, compiled source codes, library files, parameter files, etc.)
	.docx, or .pdf	Documentations
Model Performance Attestation Report	.docx, or .pdf	Simulation test report
Model checklist	.docx, or .pdf	Checklist
Additional documents	.docx, .JPEG, .png, or .pdf	All files applicable to the current interconnection phase (e.g., OEM manuals, datasheets, screenshots, nameplate pictures, OEM attestations, type test, factory acceptance test, hardware-in-the-loop (HIL) test reports, etc.)

Pre-Commissioning Gap

- Significant gap currently for most of industry – transmissions-side review of approved IBR plant design, settings, etc., ahead of commissioning
- Commissioning steps and oversight for model and IBR plant verification checklists
- Trust that what will get commissioned matches models used in studies
 - EPC and OEM documentation and models
 - IBR unit and PPC designs versus capabilities versus as-left/as-planned
 - Monitoring, capabilities, configuration, controls, protections, settings, SCADA, etc.
- Dedicated and educated staff required on these steps – typically understaffed at the utility
- Simulation/modeling tests at ISO level, pre-commissioning checks at utility level (?)
- Example: Duke Energy on the forefront of innovation in terms of process
- *NERC SAR on this topic, standards drafting team has this on its to-do's...! (outside Milestone 3)*

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)	Final Review & Closeout
December 17, 2025 (1:00–2:00 p.m. MT)	Outreach and Industry Webinar (review of final deliverables)

Thank You!

Next Industry Advisory Group Meeting
(Industry Webinar)

December 17, 2025 at 1:00 PM MT

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