IEEE SA
STANDARDS ASSOCIATION

IEEE P2800—Standard for Interconnection and Interoperability of Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems

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July 2021

General Information for the Interested Public - https://sagroups.ieee.org/2800/

*Also Chair of the sponsoring ED&PG Wind and Solar Plant Interconnection Working Group (Link to Website)

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Acknowledgements and disclaimers

General disclaimer:

The views presented in this presentation are the personal views of the individuals presenting it and shall not be considered the official position of the IEEE Standards Association or any of its committees and shall not be considered to be, nor be relied upon as, a formal position of IEEE, in accordance with IEEE Standards Association Standards Board Bylaws 5.2.1.6.

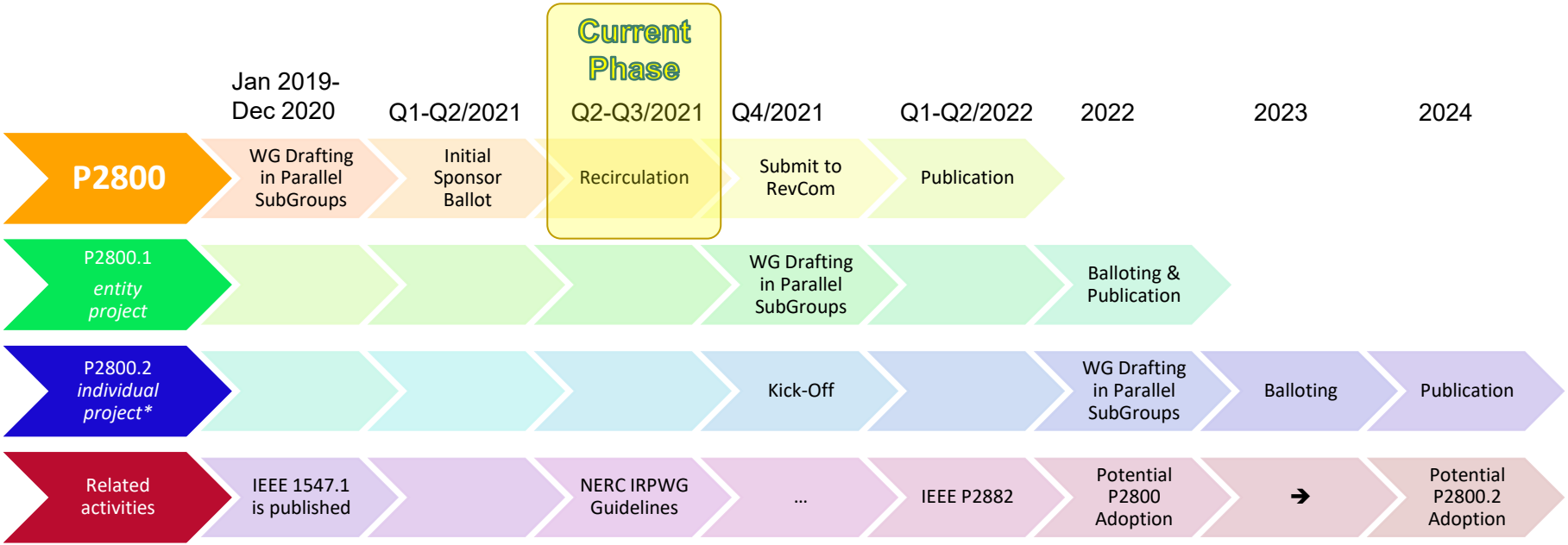
Draft standard disclaimer:

P2800 is an unapproved draft of a proposed IEEE Standard. As such, the document is subject to change, any draft requirements and figures shown in this presentation may change.

For those working group members whose effort on the standard was partially or fully supported by the U.S. DOE's National Renewable Energy Laboratory, the following statement applies:

This work was supported in part by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Solar Energy Technologies Office and Wind Energy Technologies Office. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government.

Anticipated Timeline, and What Comes Next?



*Project authorization request (PAR) approved by NesCom on May 21, 2021 (https://development.standards.ieee.org/myproject-web/app#viewpar/12623/9133); contact andy.hoke@nrel.gov and sign up for P2882 Working Group and Task/Project on IEEE SA myProject at https://development.standards.ieee.org/myproject-web/app#interests

As soon as IEEE P2800 has been successfully balloted, the drafting of conformance procedures will commence in projects like IEEE P2800.1, P2800.x, and P2882.

Next Deliverables, Milestones & Meetings

Deliverable	Important Dates
Milestone: WG and Sponsor Approve WG Draft 5.1	January 2021
Mandatory Editorial Coordination (MEC) Draft 5.2	February 1 – March 8, 2021
Ballot Group Formation	February 1 – March 8, 2021, balanced outcome with 466 subject matter experts
Comment Resolution Group (CRG) Formation	February 8 – March 8, 2021, received 38 self-nominations
Stakeholder Webinars	Webinars for national and international stakeholders • Objective was to raise awareness for the open ballot group formation • Reviewed i) purpose and scope of standard and ii) key draft requirements • Provided step-by-step instructions for how to join the ballot group February 2021: refer to https://sagroups.ieee.org/2800/resources/ for slide decks & recordings
Milestone: SA Initial Ballot of Draft 6.0 (successful)	March 10 – April 10, 2021 with 79% response rate (>75% was required) 84% approval rate (>75% was required) | 1,407 comments received (659 are "must be satisfied")
Comment Resolution Group meets weekly	CRG resolved SA Initial Ballot comments
Public Review closed	May 9, 2021 (search for "2800" at https://publicreview.standards.ieee.org)
CRG Comment Resolutions and Draft 6.1 Completed	**June 9, 2021**
WG Approval of Recirculation Draft (Draft 6.1)	June 9, 2021
Recirculation 1 (successful)	June 10 – July 9, 2021, with 86% response rate (>75% is required) 89% approval rate (>75% is required) | 406 comments received (235 are "must be satisfied")
Recirculation 1 - Comment Resolution	July – August/September 2021* July 21, 2021: CRG call, then SubGroup leads resolving SA Recirculation 1 comments, subsequent CRG calls TBD
CRG Comment Resolutions and Draft 6.2 Completed	**August/September 2021***
Recirculation 2	September 2021* (14 days + comment resolution)
Recirculation 3	November 2021* (5 days + comment resolution)
Milestone: Submission to RevCom	Dec 11, 2021 or Feb / Mar / May 2022?*
Milestone: Publication	Q1 or Q2 of 2022*

IEEE-SA Sponsor Ballot & Public Review

- IEEE SA Ballot Group invitation was sent to >2,500 subject matter experts within IEEE societies and their committees
- Formed a **balanced ballot group** with **466 balloters**
  - **Initial ballot** ended on April 10, 2021, draft was available to balloters on myProject at https://development.standards.ieee.org/myproject-web/app#myballots, **79% response rate** (>75% was required)
  - **Public review ended on May 9, 2021**, search for "2800" at https://publicreview.standards.ieee.org/
- More information is available on the P2800 website at https://sagroups.ieee.org/2800/members/
- Important **Milestones**:

Milestone:	84% approval rate (>75% was required)
SA Initial Ballot closed	1,407 comments received (659 are "must be satisfied")
Recirculation 1	June 10 – July 9, 2021, **89% approval rate** (>75% is required) 406 comments received (235 are "must be satisfied")
Recirculation 2	September 2021*
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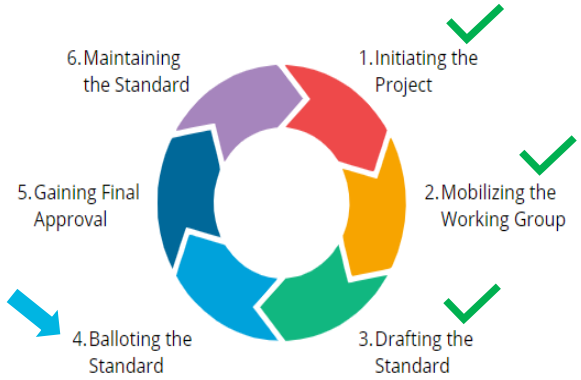

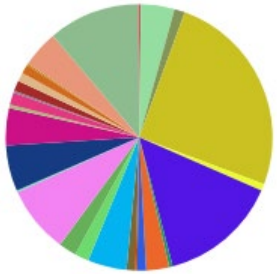

466 Balloters

TOP 10 Balloter Groups (n=466)
1. Consulting (25%)
2. General Interest (14%)
3. Other (11%)
4. Producer – System / Manufacturer (8%)
5. Research (6%)
6. Service Provider – Design Services (5%)
7. Producer – Component (5%)
8. User – Industrial (5%)
9. Academic – Researcher (4%)
10. Government (3%)

Consensus =

- ≥75% Quorum
- ≥75% Approval
  - *WG Chair's goal is ≥90%!*

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* Tentative dates

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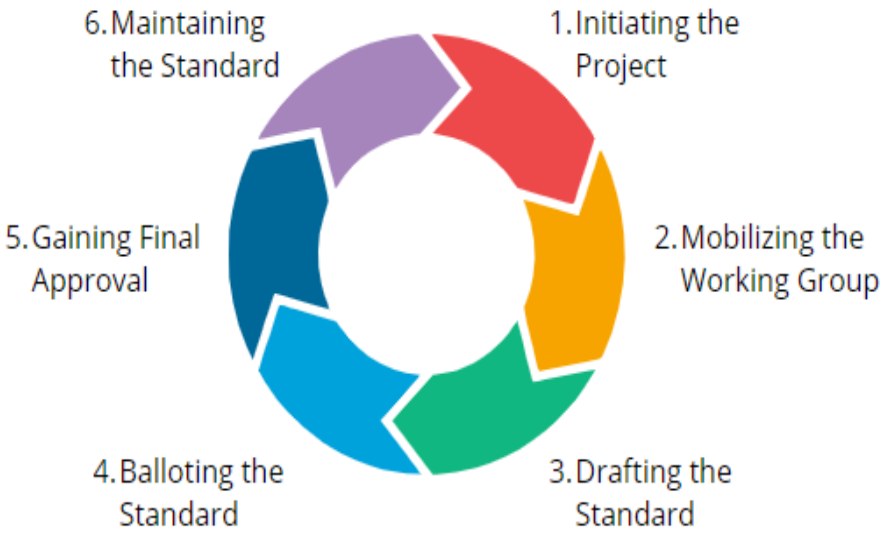
Standards Development Lifecycle



This presentation provides an overview of Stage 4 of the standards development lifecycle –Balloting the Standard

Public Review Process Overview

A 60 day Public Review period begins automatically with the opening of the SA Ballot

The IEEE SA Public Review process provides an opportunity for any interested party to submit comments on any eligible initial ballot draft, and obtain responses from the IEEE Working Group.

All comments received from the Public Review period shall be considered and responded to. Public Review comments do not have votes associated with them.

- Consensus is not based on Public Review comments
- Working Group/Comment Resolution Group will identify in their response if they have determined that they will make a change in the draft
- If responses identify a change to the draft, the Public Review commenter can request a revised draft
- Each public review commenter receives only their responses
- As normally required, changes to the draft must be recirculated in a SA Ballot recirculation
- All Public Review comments and responses shall be submitted to RevCom

IEEE SA Ballot consensus: Response & approval rate

IEEE SA Ballot Consensus is achieved when:

- At least *75% of the ballot group* voted (Response rate)
- The number of *Approve votes is 75%* or more *of the total Approve and Do Not Approve* (with Comments) votes. (Approval Rate)
- Fewer than *30% of the ballot group* voted Abstain

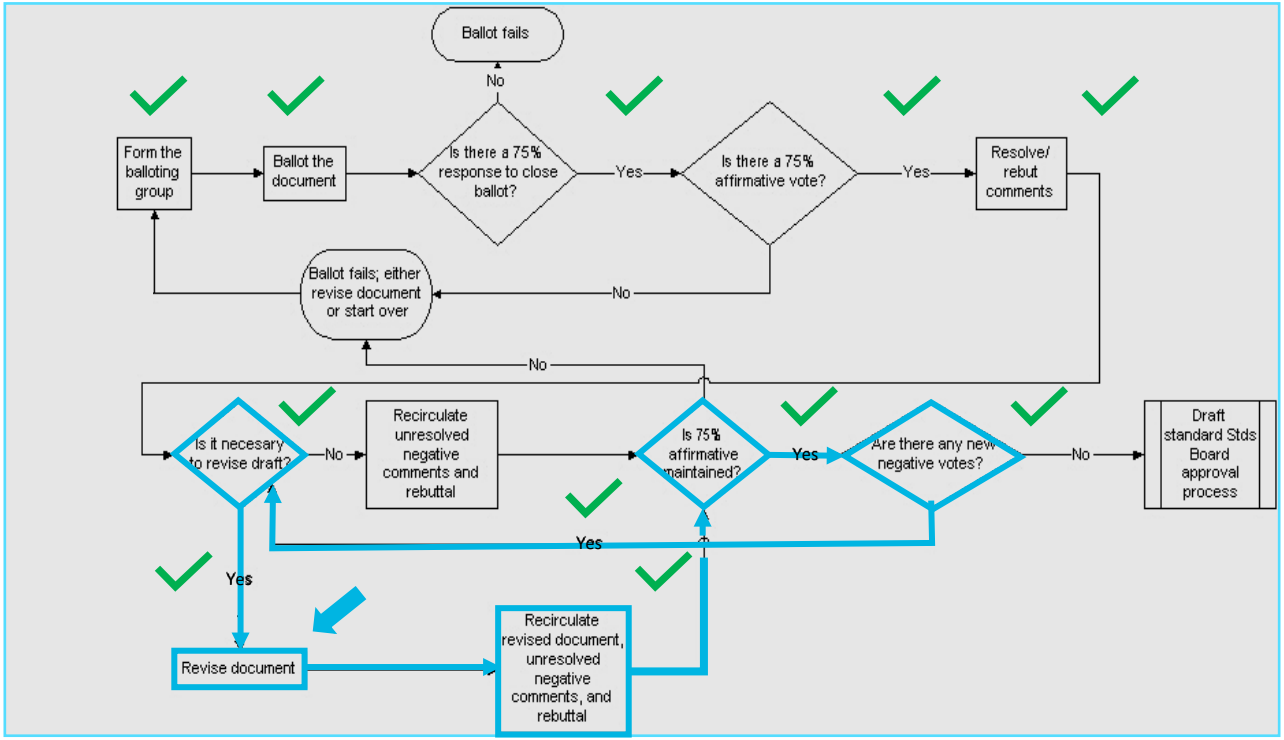
Response Rate:

- If the response rate is not met:
  - The ballot can be extended by the Program Manager (PM)
  - WG Officers and PM can work together to reach out to those that have not responded
- The response rate must be met in order to continue with the balloting process.

Approval Rate:

- If the approval rate is not met, the entire draft is open for comments on the next ballot (recirculation). ← ***not the case for P2800!***
- ***During a recirculation ballot, SA balloting group members shall have an opportunity to cast votes or change their previously cast votes.***

Balloting Flow chart



Please see section 6.10 of the myProject user guide for steps on how to Ballot

SA Ballot Next Steps - Recirculation Overview

When is a recirculation ballot required?

- All unresolved Do Not Approve votes with comments shall be recirculated to the Standards Association balloting group.
- All substantive changes made since the last ballot of the proposed standard shall be identified and recirculated to the Standards Association balloting group. ***If there are significant changes made to the draft you may consider opening:***
  - ***The entire draft for comments on the next ballot recirculation***
  - ***The recirculation for a longer period of time***

Recirculation ballot(s):

- Minimum of 10 days
- During a recirculation ballot, SA balloting group members shall have an ***opportunity to cast votes*** or ***change*** their ***previously cast votes***
- Once the ***proposed standard has achieved 75% approval***, comments in recirculation ballot(s) shall be based on: ***← this is the case for P2800!***
  - Only on the changed portions of the draft
  - Portions affected by the changes
  - Portions subject to unresolved comments associated with Do Not Approve votes.

SA Ballot – Comment Resolution Guidelines

- The Comment Resolution Group will review and consider ***all comments*** that are received by the close of the ballot. This includes comments received outside of the myProject system and mandatory coordination comments.
- Evidence of Consideration
  - Comments that advocate changes in the proposed standard, whether technical or editorial, may be ***accepted***, ***revised***, or ***rejected***.
- Until the proposed standard has achieved 75% approval, comments can be based on any portion of the proposed standard
- Comments not based on the proposed standard may be rejected and deemed out-of-scope of the standards balloting process by the Standards Committee.

Comments received by the WG after the close of the ballot

- ***Shall be acknowledged and may be considered***
- ***The Standards Committee shall acknowledge the receipt of these late comments***
- ***Take action as the Standards Committee deems appropriate.***

❖ For more information, see the IEEE SASB Operations Manual Clause 5.4.3.3 - Comments in the ballot

Additional Resources

The SA Balloting Process

https://standards.ieee.org/develop/balloting-standard/balloting.html

RevCom Ballot and Comment Resolution Process Guidelines

https://standards.ieee.org/content/dam/ieee-standards/standards/web/governance/revcom/guidelines.pdf

RevCom Comment Resolution Preparation Guidelines

https://standards.ieee.org/content/dam/ieee-standards/standards/web/governance/revcom/Comment_Resolution_Preparation_Guidelines.pdf

IEEE SA Standards Working Group Chair Fundamentals Course, Module 10 “Balloting Your Standard”

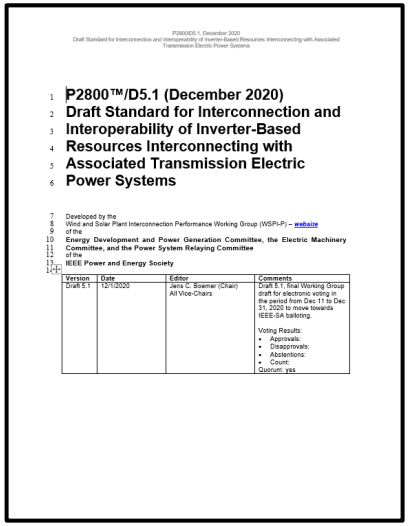
Summary of IEEE P2800 Draft Standard

- The draft standard harmonizes Interconnection Requirements for Large Solar, Wind and Storage Plants

- It is a consensus-based draft developed by over ~175 Working Group participants from utilities, system operators, transmission planners, & OEMs over 2 years

- You can further influence the draft standard by

  1) ***reviewing resolutions*** *of your comments and by* ***voting in the 2nd recirculation****, expected to begin in August/September 2021*
  2) *supporting* ***adoption*** *of the standard*



P2800/D5.1, December 2020
Draft Standard for Interconnection and Interoperability of Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems

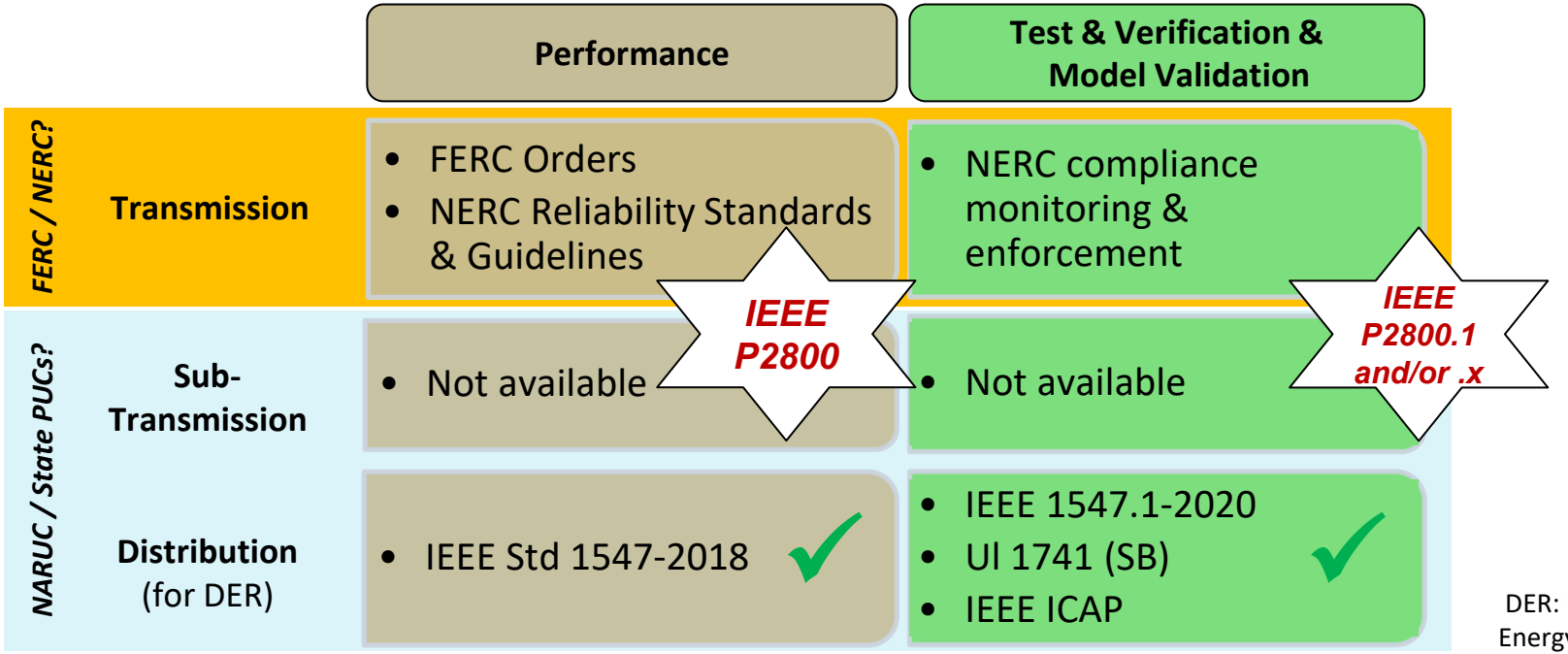
P2800™/D5.1 (December 2020)
Draft Standard for Interconnection and Interoperability of Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems

Developed by the
Wind and Solar Plant Interconnection Performance Working Group (WSPI-P) – website
of the
Energy Development and Power Generation Committee, the Electric Machinery Committee, and the Power System Relaying Committee
of the
IEEE Power and Energy Society

Version	Date	Editor	Comments
Draft 5.1	12/1/2020	Jens C. Boemer (Chair) All Vice-Chairs	Draft 5.1, final Working Group draft for electronic voting in the period from Dec 11 to Dec 31, 2020 to move towards IEEE-SA balloting. Voting Results: • Approvals: • Disapprovals: • Abstentions: • Count: Quorum: yes

More Info at https://sagroups.ieee.org/2800/

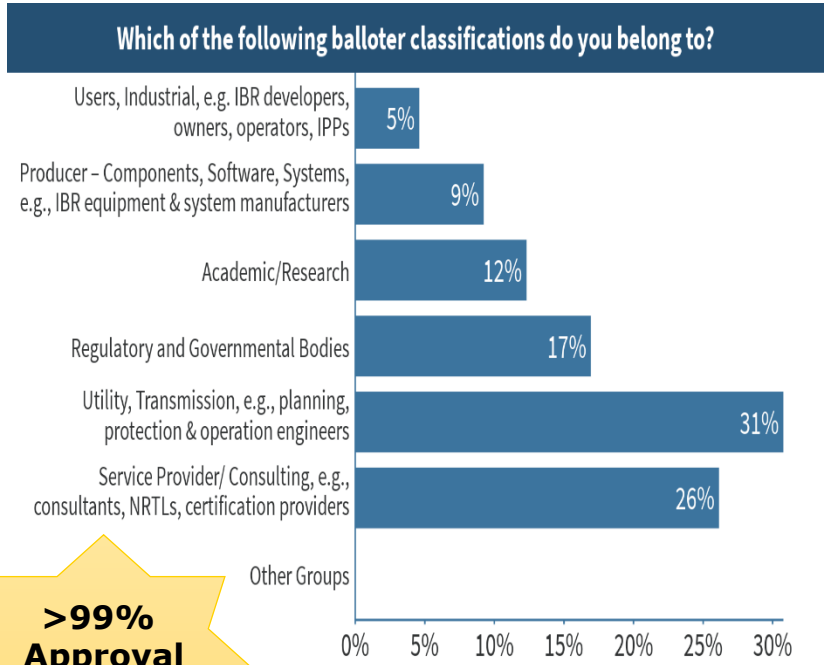
IEEE P2800 Objective: Complementing North American Reliability Standards



DER: Distributed Energy Resources

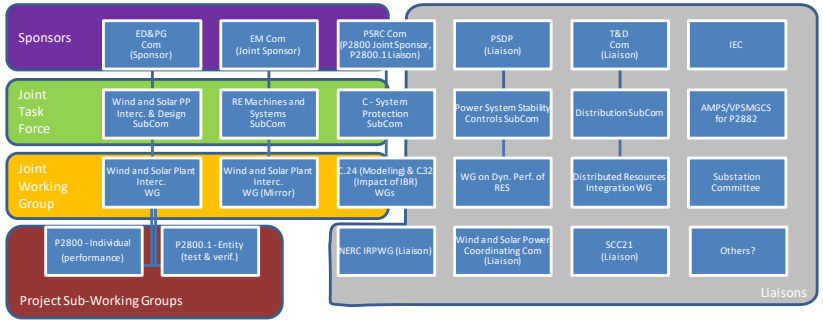
When adopted by the appropriate authority (e.g., Transmission Owners, NERC, FERC), IEEE standards become mandatory

Approximately 300 Interested Parties and 175+ WG Members



>99% Approval

Broad Collaboration & Coordination



- IEEE/PES/EDPG Main Sponsor
- IEEE/PES/EMC & PSRC Joint Sponsors
- HVDC-VSC Subject Matter Experts
- IEEE/PES/Substations Committee SMEs
- IEEE/PES/Analytic Methods for Power Systems (AMPS) SMEs
- NERC Inverter-Based Resources Performance WG SMEs

IEEE P2800 Leadership Team

Role	Name	Affiliation	Stakeholder Group	Liaison
Chair	Jens C. Boemer	EPRI, NREL	Academic/Research	EDP&G, SCC21
Vice-Chair	Bob Cummings	NERC	Regulatory and Governmental Bodies	NERC IRPTF
Vice-Chair	Mahesh Morjaria	REPlantSolutions, FirstSolar	Users, Industrial	NERC IRPTF
Vice-Chair	Babak Enayati	NationalGrid	Stakeholders represented in IEEE Power & Energy Society	T&D, SCC21, PES GovBrd
Vice-Chair	Ross Guttromson	SANDIA National Lab	Academic/Research	DOE
Vice-Chair	Chenhui Niu	State Grid Corporation of China	Stakeholders represented in IEEE P2800.1 Working Group	IEEE P2800.1, IEC SC8A
Vice-Chair	Manish Patel	Southern Company	Utility, Transmission	PSRC, IRPTF
Secretary & Treasurer	Diwakar Tewari	Leidos	Service Provider/ Consulting	EDP&G
Past Vice-Chair	Kevin Collins	FirstSolar	Users, Industrial	NERC IRPTF
Past Secretary	Wes Baker	EPRI	Academic/Research	Electric Machinery

The Type of Involvement Matters…

- Identify experts in your organization to **join the IEEE P2800 Working Group** and one or several of its 11 sub-groups.
- Provide experts with time to attend meetings and conference calls and to **contribute draft language.**
- Encourage experts to **actively engage in meetings and conference calls**, to not remain silent, and to speak up.

P2800 Leadership Call for Active Involvement of

IEEE POWER & ENERGY SOCIETY
ENERGY DEVELOPMENT AND POWER GENERATION COMMITTEE
IEEE P2800 Working Group

To Interested Parties:
Executives and Subject Matter Experts of
Transmission Planning and Operating Entities

January 2020

To Whom It May Concern,

I am writing to you on behalf of the working group leadership team of IEEE P2800, *Draft Standard for Interconnection and*

IEEE POWER & ENERGY SOCIETY
ENERGY DEVELOPMENT AND POWER GENERATION COMMITTEE
IEEE P2800 Working Group

To Interested Parties:
Executives and Technical Experts of
Inverter-Based Resources OEMs and Renewable Plant Developers (Wind, Solar PV, Energy Storage and Hybrid)

February 2020

To Whom It May Concern,

I am writing to you on behalf of the working group leadership team of IEEE P2800, *Draft Standard for Interconnection and Interoperability of Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems*, to ask for **additional support and active participation in IEEE P2800 activities from technical experts within your organizations**.

Based on the leadership provided by the NERC Inverter-Based Resources Performance Task Force (IRPTF) over the past few years, IEEE P2800 aims to establish ambitious, fair, and transparent technical minimum requirements for inverter-based resources (IBR) connected to transmission and networked sub-transmission systems relating to their performance, functional capabilities, and interoperability.

- ***Transmission Planning & Ops Entities, January 2020 (on iMeet here)***
- **IBR OEMs and Renewable Plant Developers, February 2020 (on iMeet here)**

Status Quo -- Solar, Wind & Storage Interconnection Requirements

- Diverse & different requirements across various jurisdictions

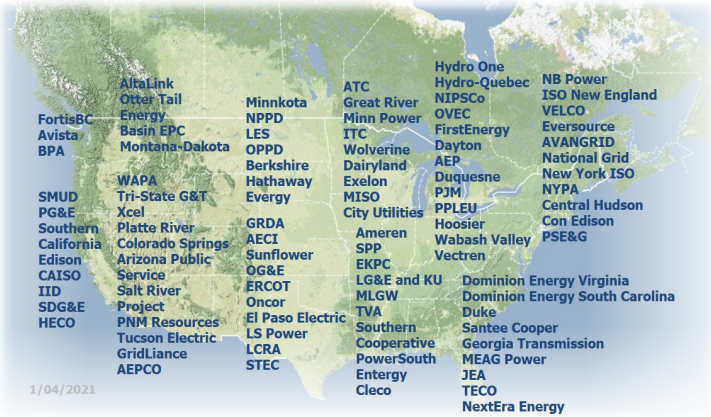
  …requires more effort and time to address

- Inverter-based resources (IBR) are different from synchronous generators

  …higher (and sometimes lower) capability

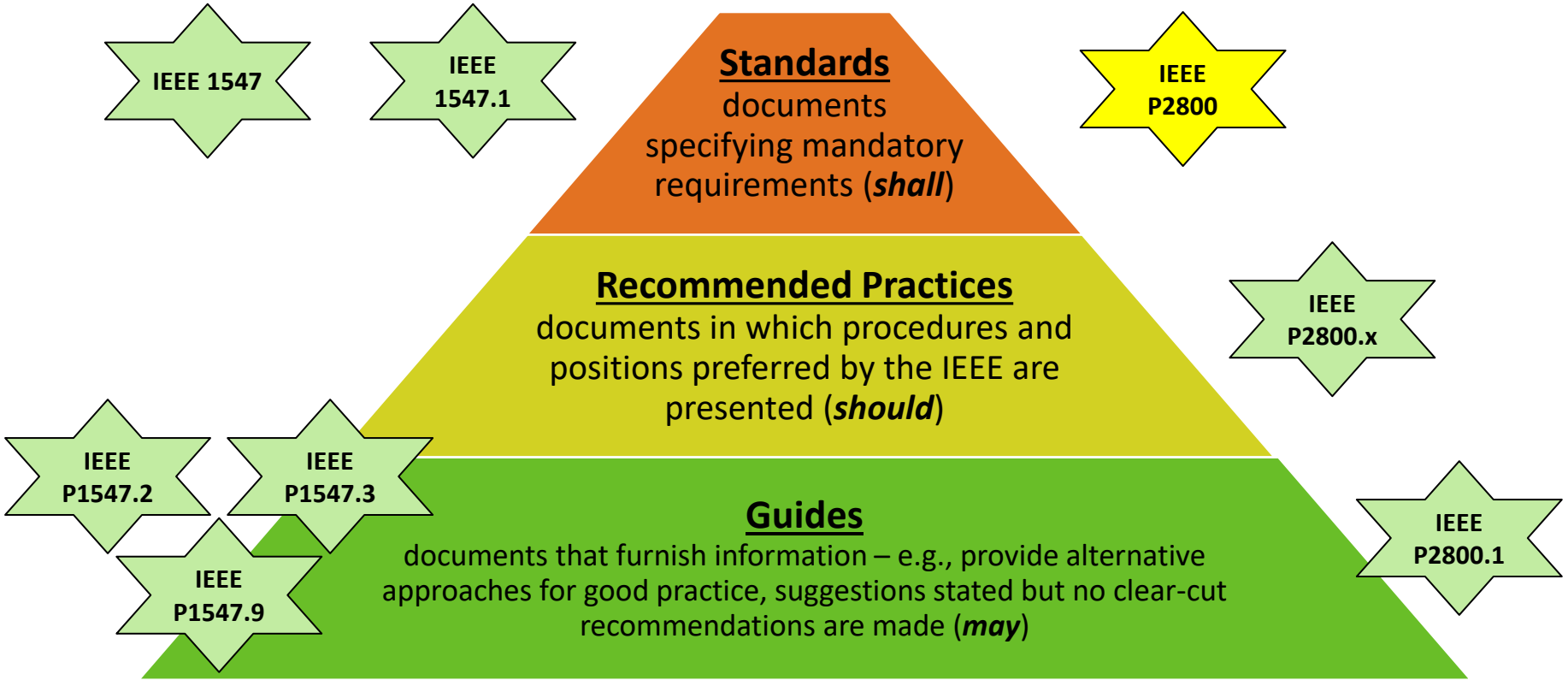
- Requirements may not be balanced

  …some too stringent & not taking advantage of new capability



Source: https://www.natf.net/

IEEE Standards Classification and Consensus Building



What to expect from IEEE P2800?

- **Provides Value**
  - widely-accepted, unified technical minimum requirements for IBR
  - simplification and speed-up of technical interconnection negotiations
  - flexibility for IBR plant developers ➔ not an equipment design standard
- **Specifies**
  - performance and functional capabilities *and not* utilization & services
  - functional default settings and ranges of available settings
  - performance monitoring and model validation
  - type of tests, plant-level evaluations, and other verifications means, but not detailed procedures (➔ *IEEE P2800.1 and/or P2800.x*)
- **Scope**
  - Limited to all transmission and sub-transmission connected, large-scale wind, solar, energy storage and HVDC-VSC

Scope and Language of P2800 Requirements

Important Terms

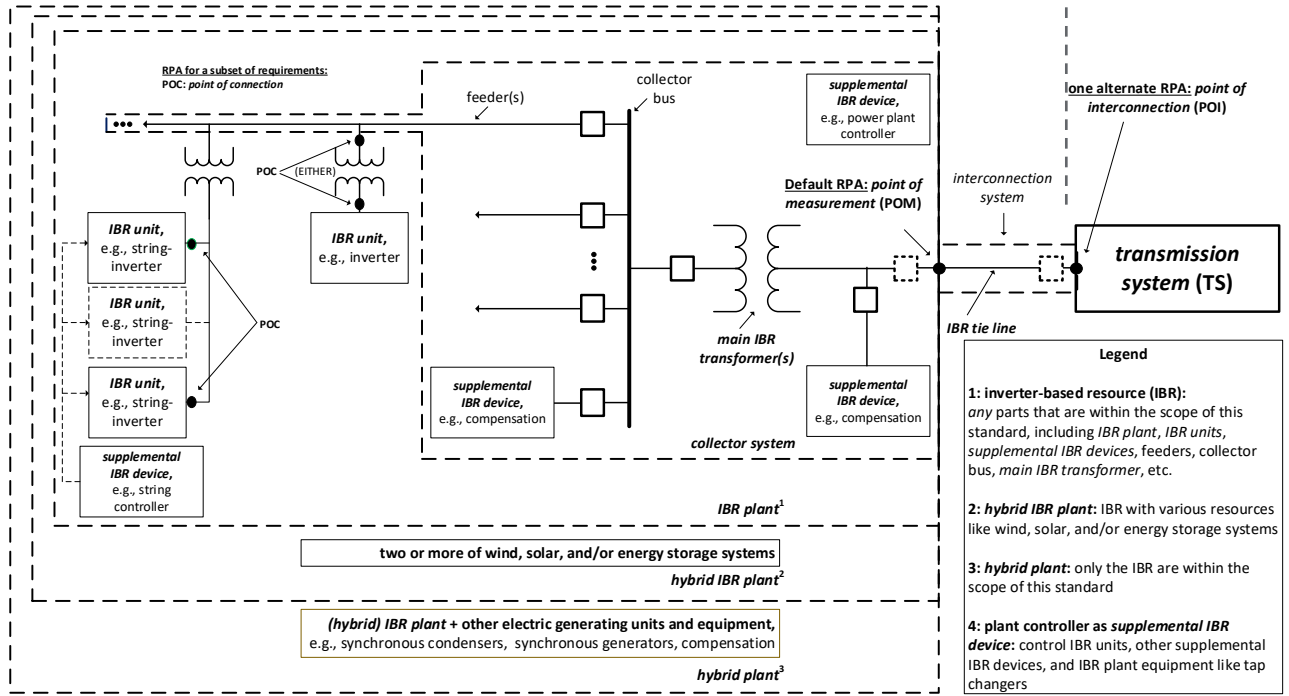
- ***point of connection*** **(POC)**
  - *IBR unit* terminals
- ***point of measurement*** **(POM)**
  - *IBR plant*
- ***point of interconnection*** **(POI)**
  - *interconnection system*
  - *IBR tie line*
- ***transmission system*** **(TS)**
  - Transmission
  - Sub-transmission
- ***supplemental IBR device***
  - Compensation
  - Plant controller
  - Etc.

1. Standard ("shall", "may")

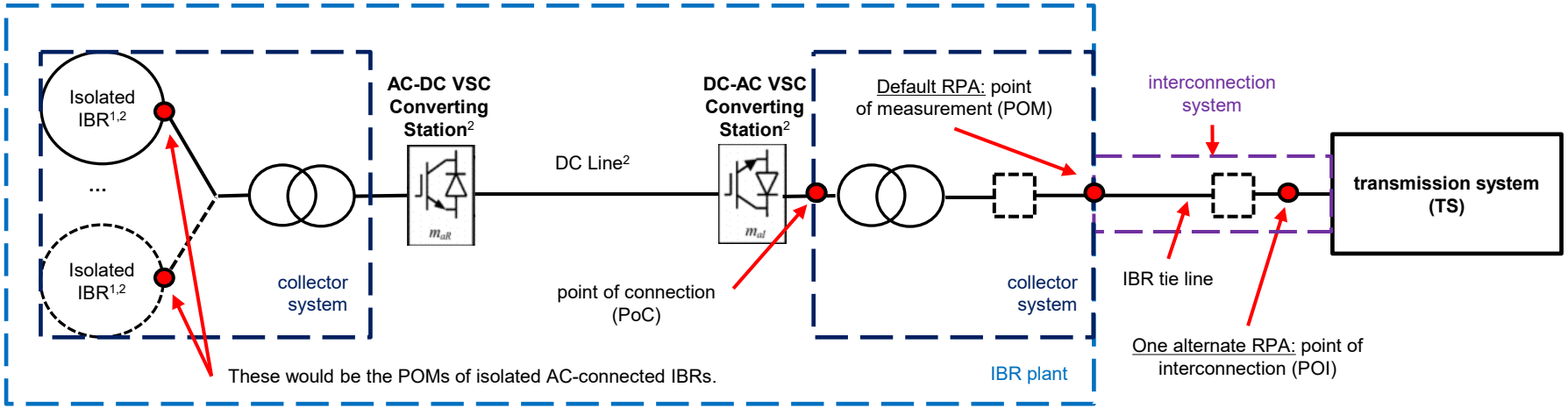
2. Standard ("should")[1]

3. Informative Appendix ("may")[1]

[1] if available, refer to existing IEEE documents



Scope and Language of P2800 Requirements



[1] Includes IBR units like type IV wind turbine generators

[2] May serve as a supplemental IBR device that is necessary for the IBR plant with HVDC-VSC to meet the requirements of this standard at the RPA

In Scope

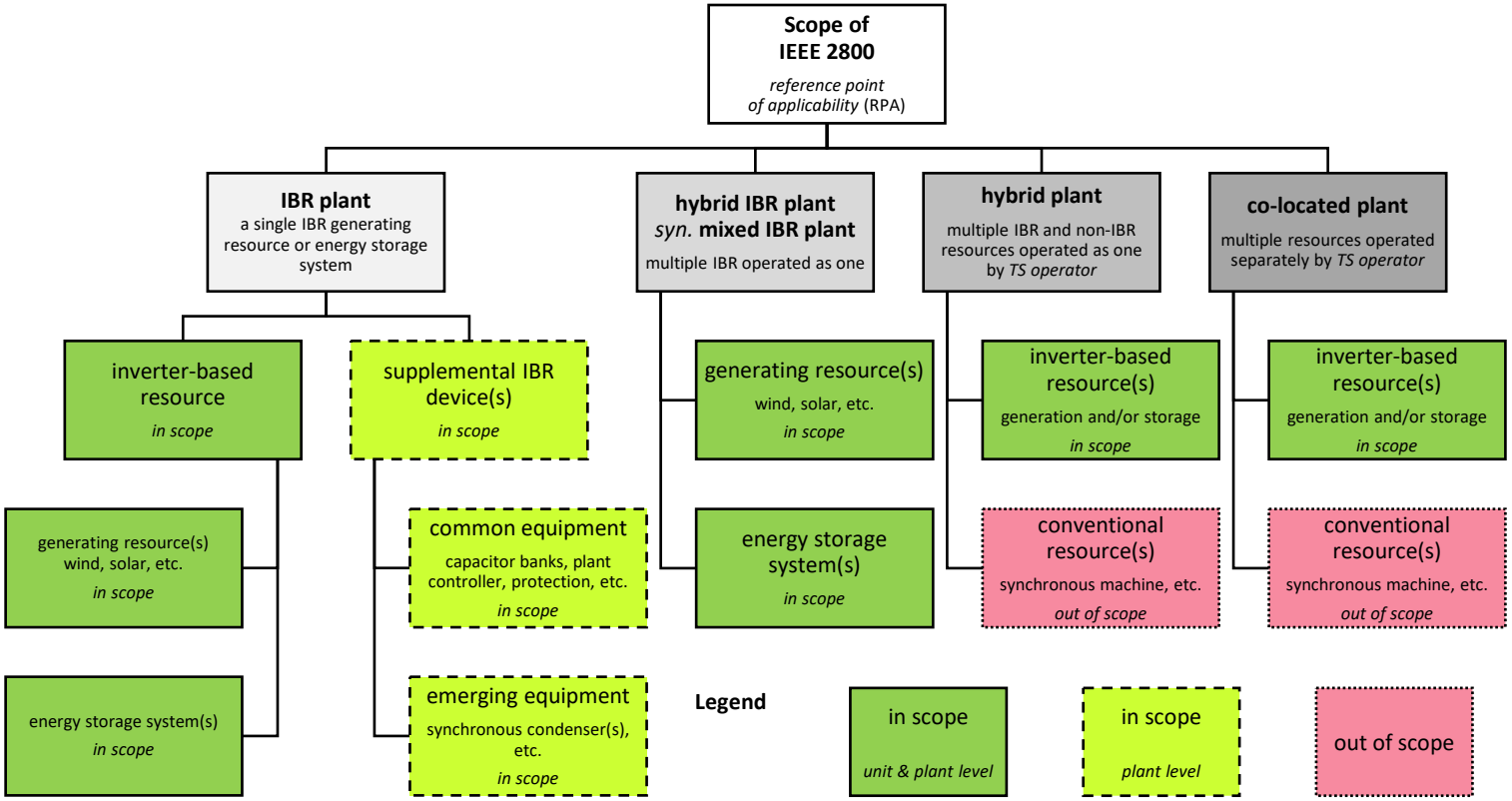
- "Shall" requirements for isolated IBR connected via dedicated HVDC-VSC link
- "May" requirements for non-IBR resources connected via dedicated HVDC-VSC link

Out of Scope

(no "shall" requirements, "may" at discretion of *TS owner*)

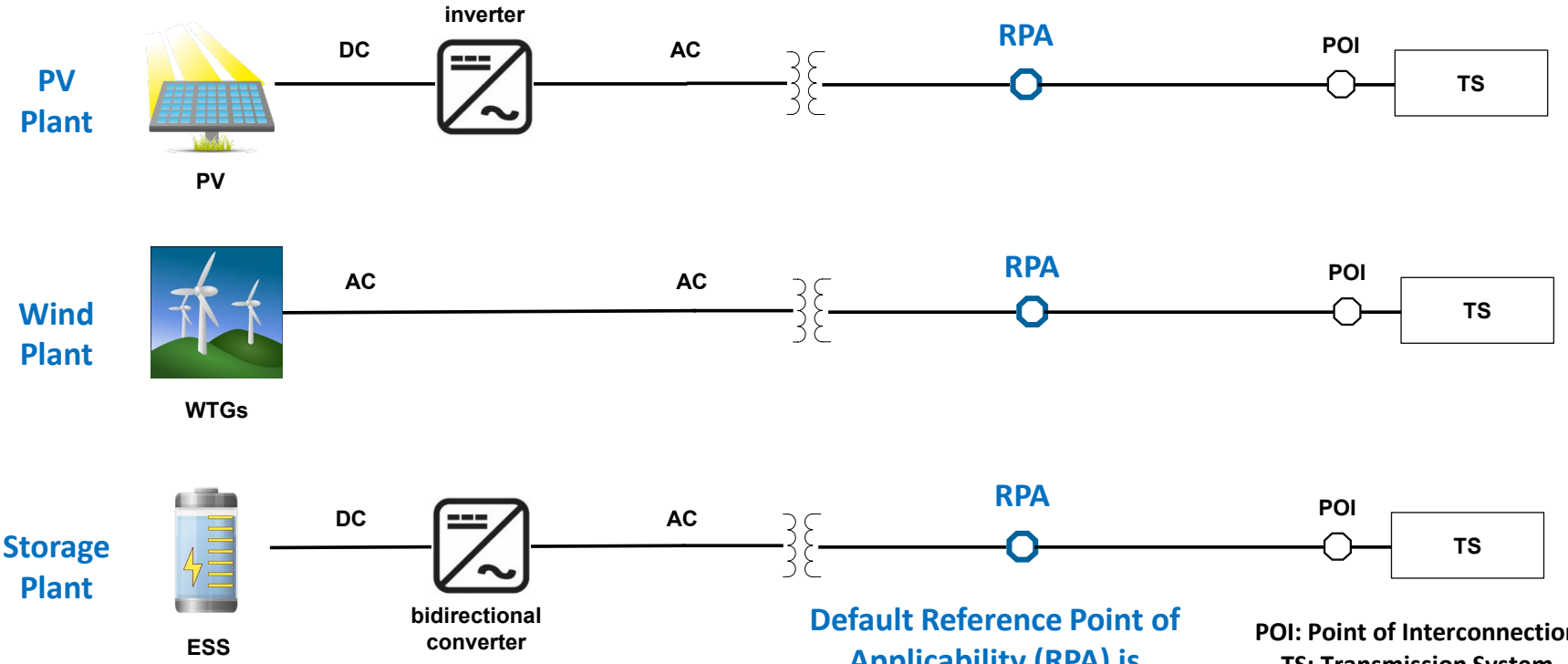
- Isolated non-IBR connected via dedicated HVDC-VSC link
  - Manitoba Hydro: Pole 3 at Dorsey
- HVDC-VSC that connect two points in a synchronous area
- Any interconnections involving HVDC-LLC

Scope and Language of P2800 Requirements



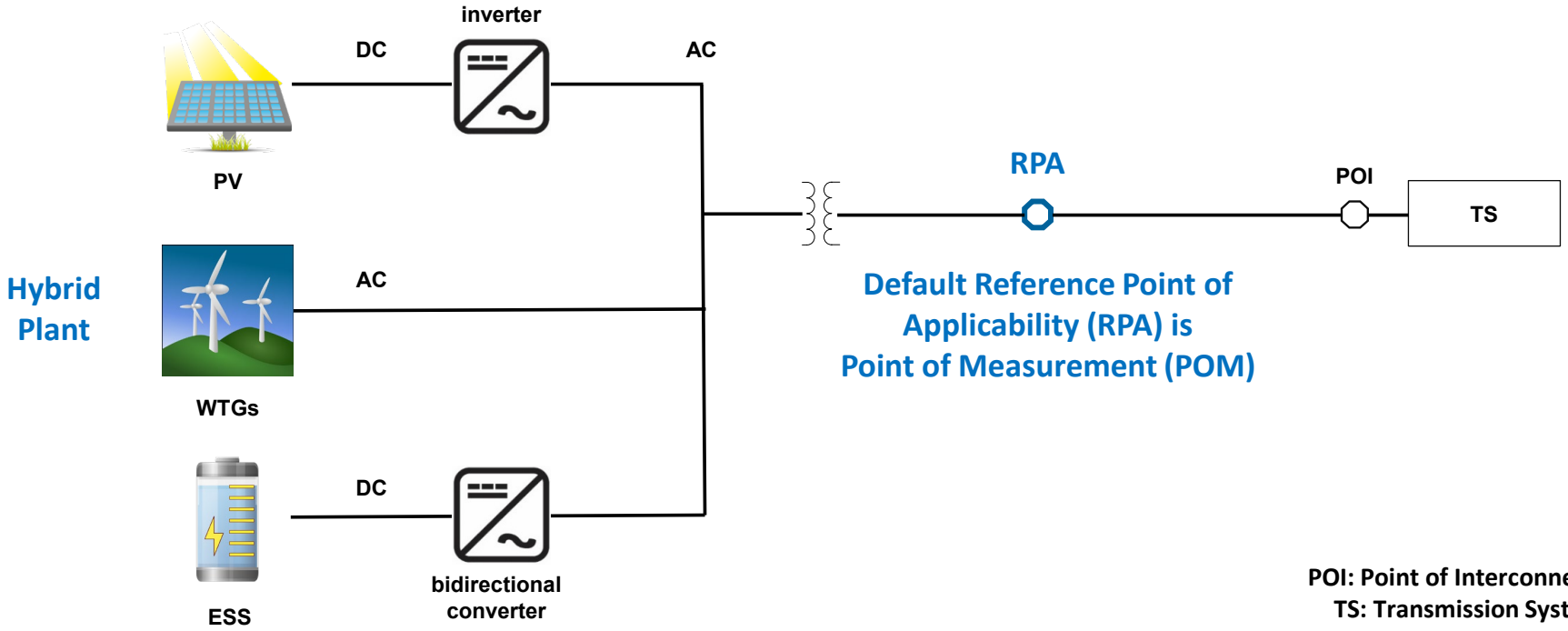
Examples for Inverter-Bases Resources (*IBR)* Plants

in scope



Example *hybrid IBR plant*, ac-coupled

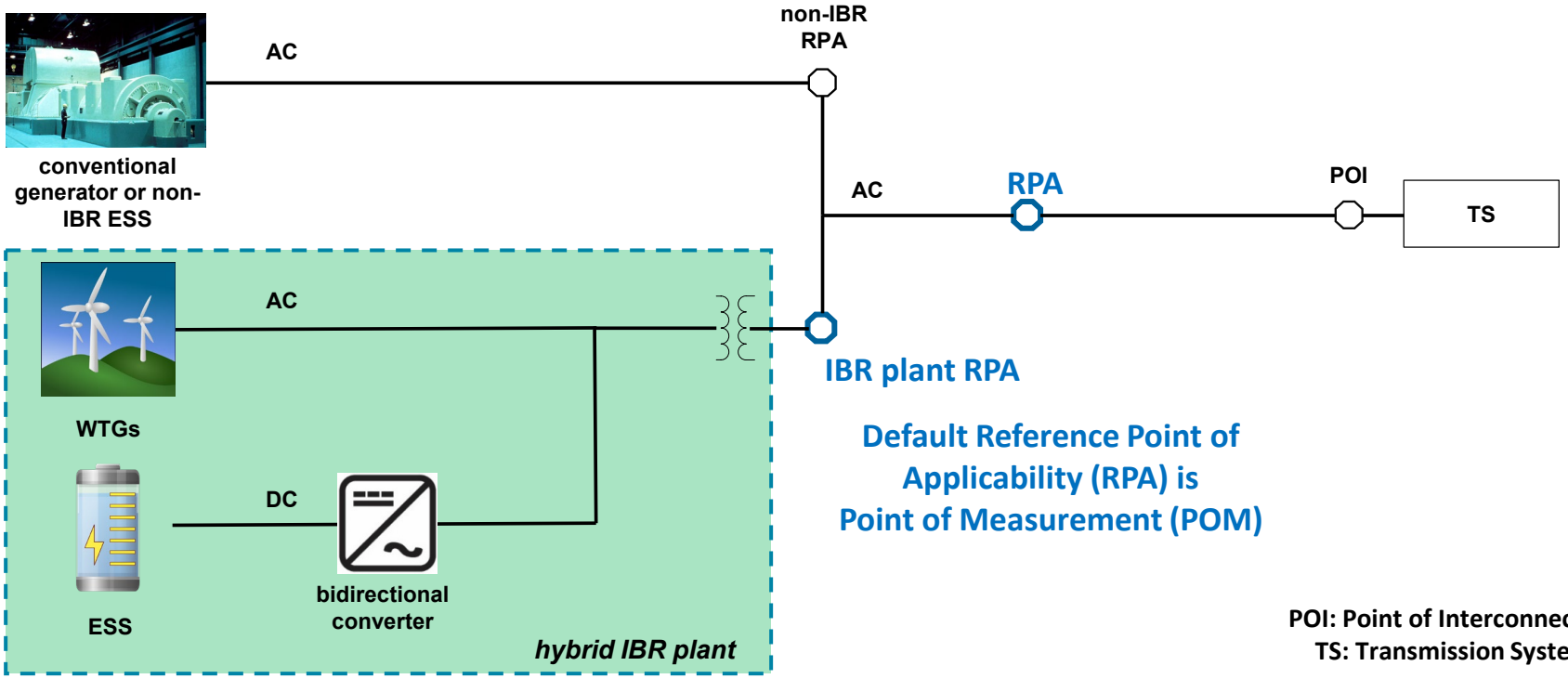
in scope



POI: Point of Interconnection
TS: Transmission System

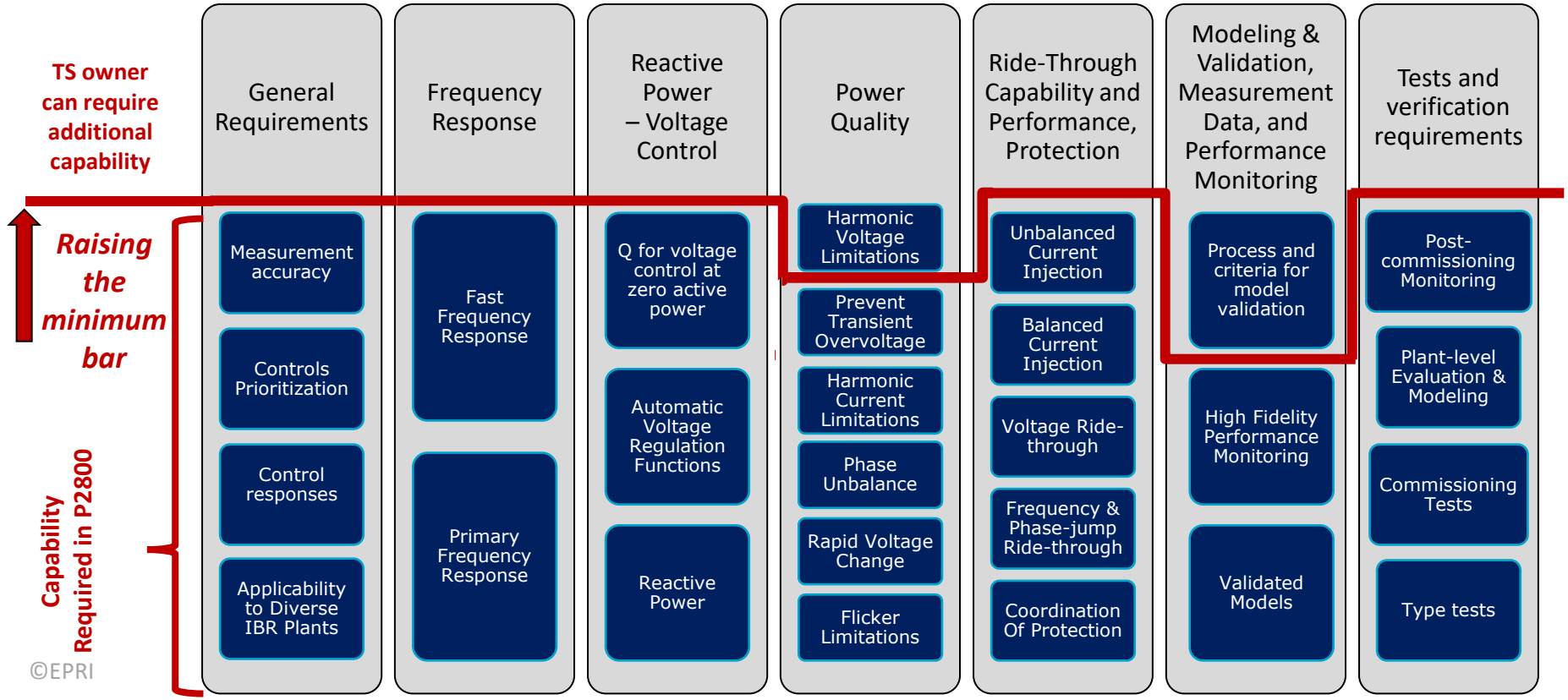
Example *hybrid plant*: operated as a single resource

in scope



POI: Point of Interconnection
TS: Transmission System

IEEE P2800 Technical Minimum Capability Requirements



Utilization of these capabilities is outside the purview of P2800

Comparison of P2800 Initial Ballot (Draft 6.1) with IEEE 1547-2018

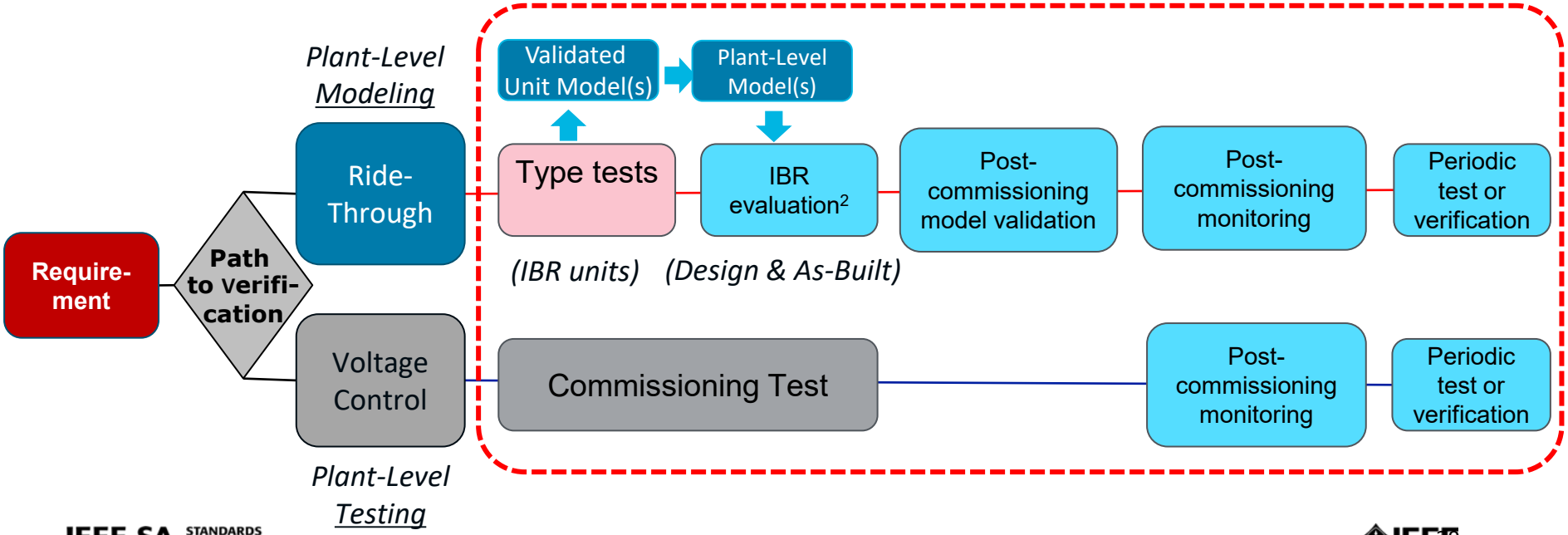
Legend: X Prohibited, √ Allowed by Mutual Agreement, ‡ Capability Required, (‡) Procedural Step Required as specified, Δ Test and Verification Defined

Function Set	Advanced Functions Capability	IEEE 1547-2018	IEEE P2800
General	Adjustability in Ranges of Allowable Settings	‡	‡
	Prioritization of Functions	‡	‡
Monitoring, Control, and Scheduling	Ramp Rate Control		
	Communication Interface	‡	‡
	Disable Permit Service (Remote Shut-Off, Remote Disconnect/Reconnect)	‡	‡
	Limit Active Power	‡	‡
	Monitor Key DER Data	‡	‡
	Remote Configurability	‡	‡
	Set Active Power		‡
	Scheduling Power Values and Models		√
Reactive Power & (Dynamic) Voltage Support	Constant Power Factor	‡	‡
	Voltage-Reactive Power (Volt-Var)	‡	‡
	Autonomously Adjustable Voltage Reference	‡	
	Capability at zero active power ("VArs at night")		‡
	Active Power-Reactive Power (Watt-Var)	‡	
	Constant Reactive Power	‡	‡
	Voltage-Active Power (Volt-Watt)	‡	
	Dynamic Voltage Support during VRT	√	‡
	Unbalanced Dynamic Voltage Support during VRT		‡

Function Set	Advanced Functions Capability	IEEE 1547-2018	IEEE P2800
Bulk System Reliability & Frequency Support	Frequency Ride-Through (FRT)	‡	‡
	Rate-of-Change-of-Frequency Ride-Through	‡	‡
	Voltage Ride-Through (VRT)	‡	‡
	Transient Overvoltage Ride-Through	‡	‡
	Consecutive Voltage Dip Ride-Through	‡	‡
	Voltage Phase Angle Jump Ride-Through	‡	‡
	Frequency-Watt	‡	‡
	Fast Frequency Response / Inertial Response	√	‡
	Return to Service (Enter Service)	‡	‡
	Black Start	√	√
Protection & Power Quality	Abnormal Frequency Trip	‡	√
	Abnormal Voltage Trip	‡	√
	Unintentional Islanding Detection and Trip	‡	√
	Limitation of DC Current Injection	‡	
	Limitation of Voltage Fluctuations	‡	‡
	Limitation of Current Distortion	‡	‡
	Limitation of Voltage Distortion		√
	Limitation of (Transient) Overvoltage	‡	‡
Test, Verification, Modeling & Measurements	Provision of Verified Models		(‡)
	Collection of Measurement Data	(‡)	(‡)
	Type Tests	(‡)	(‡)
	Production Tests	(‡)	
	Plant-Level Design Evaluation	(‡)	(‡)
	Commissioning Tests	(‡)	(‡)
	Model Validation		(‡)
	Performance Monitoring		(‡)
	Periodic Tests	(‡)	(‡)
	Periodic Verification	(‡)	(‡)

Clause 12 (Test and Verification) Framework

What's the requirement? → Where's the reference point of applicability (RPA)? → Required path to verification → Category of test and verification needed



Clause 12 (Test and Verification) Framework

Potential Benefits

- Raising the bar of existing plant-level capability and performance verification procedures.
- Reducing the uncertainty of plant-level performance.
  - The smaller the grid, the higher the impact of uncertainty.
- Improve the validity and accuracy of plant-level models and their parameterization.

Potential Challenges

- Does not replace engineering judgement and experience.
- Could create a false perception of modeling accuracy.
- Finding the right balance between standardization and flexibility.

Way forward

- IEEE Individual Projects
  P2800.2 (Recommended Practice) and
  P2882 (Guide)
- IEEE P2800.1 Entity Project

Related IEEE Standard Association activities

P2800.2: Recommended Practice for Test and Verification Procedures for Inverter-based Resources (IBRs) Interconnecting with Bulk Power Systems

- Type: recommended practice, individual project
- Sponsor(s): IEEE/PES/EDPG+EMC+PSRC+AMPS
- Tentative timeline: June 2023 (initial ballot), Dec 2023 (RevCom approval)
- Scope: recommends leading practices for test and verification procedures that should be used to confirm plant-level conformance of IBRs interconnecting with BPSs under IEEE Std 2800.
  - complements the IEEE 2800 test and verification framework with specifications for the equipment, conditions, tests, modeling methods, and other verification procedures
  - may specify design and as-built evaluations procedures for verification of plant-level capabilities and performance
  - may also specify verification procedures for IBR plant-level generic models applied for different time frames including S/C models, RMS models, and EMT models

P2882: Guide for Validation of Software Models of Renewable and Conventional Generators for Power System Studies

- Type: guide, individual project
- Sponsor(s): IEEE/PES/AMPS+EMC+EDPG
- Tentative timeline: Dec 2021 (initial ballot), Dec 2022 (RevCom approval)
- Scope: guidelines for the validation of software models for renewable and conventional generators used for power system studies.
  - … 'validation' is a procedure and set of acceptance criteria ... to confirm that the models perform well numerically and provide the intended response(s).
  - does not cover … validation of generator software models against field measurements and other types of site or factory tests

Logistics

IEEE P2800 Working Group

Website (public)	https://sagroups.ieee.org/2800/
Mailing List	stds-p2800@listserv.ieee.org
Collaborative Workspace for WG Members	https://ieee-sa.imeetcentral.com/p2800-wspi-p/

IEEE P2800 SubGroup	Lead (=Officer)	Mailing List
I. Overall Document	Jens C Boemer	stds-p2800-sg1@listserv.ieee.org
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III. Active Power – Frequency Control	Mahesh Morjaria	stds-p2800-sg3@listserv.ieee.org
IV. Reactive Power – Voltage Control	Mahesh Morjaria	stds-p2800-sg4@listserv.ieee.org
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VIII. Ride-Through *Performance* Requirements	Manish Patel	stds-p2800-sg8@listserv.ieee.org
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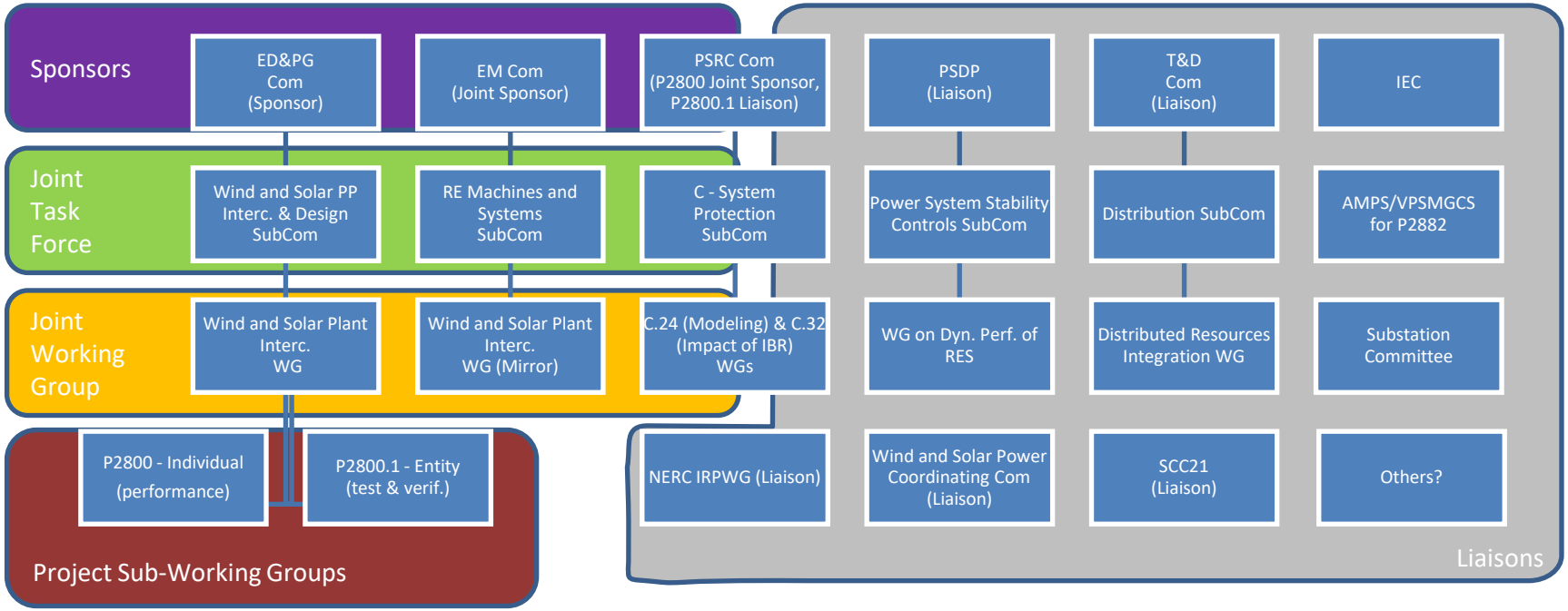
XI. Tests and verification requirements	Chenhui Niu	stds-p2800-sg11@listserv.ieee.org

- Mailing lists are open to all Interested Parties ("Participants"), not only to WG Members.

P2800 Joint Sponsorship & Coordination



Instructions for Mailing Lists

IEEE P2800 Working Group and Sub-WGs Listservs – Public Reflector Information

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NOTE: The IEEE P2800 Working Group public reflector is provided for the benefit of moving the work of the Working Group forward. Use of this reflectors is subject to the *IEEE E-mail Acceptable Use Practices*.

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To subscribe to the P2800 listservs, send an e-mail to listserv@listserv.ieee.org with the following command in the body of the e-mail:

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End

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Instructions for Mailing Lists

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To send a message to all of the people currently subscribed to the P2800 listserv, send an email to **stds-p2800@listserv.ieee.org**, which is called the **LIST** address. You must never try to send any command to that address, as it would be distributed to all the people who have subscribed. All commands used to manage your account must be sent to **listserv@listserv.ieee.org**, which is the **LISTSERV** address. It is important to understand the difference between the two.

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To change your e-mail address on all IEEE lists:
Change * [Your New e-mail Address]
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Signoff stds-p2800
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← replace red part with the name of any of the Sub-WGs mailing lists

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Overview of the Project Authorization Request

IEEE P2800: Standard for Interconnection and Interoperability of Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems

Need for the Project:

The global increase in penetration levels of inverter-based resources (IBR) is expected to significantly change the dynamic performance of the power grid. As the penetration levels of inverter-based resources increase and the technology of inverter-based resources evolves, specifications and **standards are needed to address the performance requirements of inverter-based resources**. Currently, there is no one single document of consensus performance requirements covering inverter-based resources interconnected with transmission and sub-transmission systems. Recent events in North America such as the Blue Cut Fire Disturbance as well as institutional challenges in North America that suggest the **inappropriate use of IEEE Std 1547™ for large-scale solar plants** underscore this need. This new standard is a first attempt to address this need and can help equipment manufacturers, project developers, transmission planners, and power grid operators **improve the quality of the inverter and facility performance to enhance the stability of the power grid over a transmission planning horizon**. The specified requirements are intended to strike a balance between state of the art versus forward-looking technology capabilities, while considering the uncertainties as to how a future bulk power system with high amounts of IBR may be planned and operated. Given that IEEE standards are voluntary industry standards, **enforcement of any of the requirements specified in this standard will require its adoption by the regional authority governing interconnection requirements (AGIR)**; an AGIR is a cognizant and responsible entity that defines, codifies, communicates, administers, and enforces the policies and procedures for allowing electrical interconnection of inverter-based resources interconnecting with associated transmission electric power systems.

IEEE P2800: Standard for Interconnection and Interoperability of Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems

Purpose: This standard **provides uniform technical minimum requirements** for the interconnection, capability, and performance of **inverter-based resources** interconnecting with transmission and sub-transmission systems.

Scope:

This standard establishes the required interconnection capability and performance criteria for inverter-based resources **interconnected with transmission and sub-transmission systems**. Included in this standard are performance requirements for reliable integration of inverter-based resources into the bulk power system, including, but not limited to, voltage and frequency **ride-through**, **active power control**, **reactive power control**, dynamic active power support under abnormal frequency conditions, **dynamic voltage support** under abnormal voltage conditions, **power quality**, **negative sequence current injection**, and system protection.

The standard shall also be applied to **isolated inverter-based resources** that are interconnected to an AC transmission system **via a dedicated voltage source converter high-voltage direct current (HVDC-VSC) transmission facilities**; in these cases, the standard shall apply to the combination of the isolated IBR and the HVDC-VSC facility and shall not apply to the isolated IBR unless they serve as a supplemental IBR device that is necessary for the IBR generating facility with HVDC-VSC to meet the requirements of this standard at the reference point of applicability.

Related activities: IEC initiative to develop a single framework for connecting and controlling renewables. Contact: Charlie Smith, Charlie@esig.energy , U.S. TA for SC 8A.