IEEE P2800

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

Working Group Meeting (Post-Meeting Slide Deck)
May 22-23, 2019, NERC, Atlanta, GA

Jens C. Boemer, WG Chair*
Kevin Collins, Bob Cummings, Babak Enayati, Ross Guttromson,
Manish Patel, Chenhui Niu, Vice-Chairs
Wes Baker, Secretary

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

May 24, 2019

Welcome 270 Interested Parties

AEP	DNV GL	ESC Eng. Inc.	MEPPI	PEACE®	SouthernCo	Opal-RT	GridLab
AMSC	DOE	FERC	MISO	PJM	Tesla	LADWP	Entergy
AWEA	Dominion	First Solar	National Grid	Power Grid Eng. LLC	TVA	FuelCell Energy	Shell
Beckwith Electric	Duke Energy	GE	NERC	S&C Electric Co.	University of Auburn	Xanthus Consulting	…
Bernhard Ernst Energy Consulting	Electrotek Concepts	Hydro One	NextEra Energy	SANDIA	University of North Carolina	Seminole Electric Cooperative	
Brush Electric Machines, Ltd.	Enercon	Hydro Quebec	NREL	Sargent Lundy	WES Consulting, LLC	INL	
China State Grid	ESIG	Invenergy LLC	NV Energy	Seattle City Light	Western Energy Board	NYISO	
Cinch, Inc.	EnerNex	IREQ	Open Access Technology Intrntl.	Siemens	Wichita University	SCS Transmission Planning	
ComEd	EPRI	ISO New England Inc.	Outback Power	SMA	XcelEnergy	Avista	
ComRent	ERCOT	Leidos Engineering	Pacific Corp	Southern	XM Columbia	The University of Alabama	

Stakeholder Groups Represented in P2800

Key Stakeholder Groups

- Users, Industrial, e.g. IBR developers, owners, operators, IPPs

- Producer – Components, Software, Systems, e.g., IBR equipment & system manufacturers

- Academic/Research

- Regulatory and Governmental Bodies

- Utility, Transmission, e.g., planning, protection & operation engineers

- Service Provider/ Consulting, e.g., consultants, NRTLs, certification providers

Other Groups

- Utility, Distribution

- IBR installers

- IBR aggregators

- Non-governmental Organization (NGO) / Advocacy Group

- Standards Developing Organization

- General Interest

Facility safety and emergency procedures

- Emergency exits

- Assembly location

- Defibrillator location

- Dial 911 in emergency

Meeting Goals

1. Convene Working Group and report on progress to date

2. Leadership team to <u>listen</u> to WG feedback and concerns on Sub-Working Group Scopes

3. SubGroup logistics: engagement, schedule & co-leads

4. Level set on expectations, clarify purpose, and use of strawman to expedite drafting

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IEEE SA Rules, Standards Classification & Language

Guidelines for IEEE WG meetings

- All IEEE-SA standards meetings shall be conducted **in compliance with all applicable laws**, including **antitrust** and **competition** laws.

  - Don't discuss the interpretation, validity, or essentiality of **patents/patent claims**.
  - Don't discuss specific **license rates, terms, or conditions**.
    - Relative costs of different technical approaches that include relative costs of patent licensing terms may be discussed in standards development meetings.
      - Technical considerations remain the primary focus
  - Don't discuss or engage in the fixing of **product prices, allocation of customers, or division of sales markets**.
  - Don't discuss the status or **substance of ongoing or threatened litigation**.
  - **Don't be silent** if inappropriate topics are discussed … do formally object.

- For more details, see **IEEE-SA Standards Board Operations Manual**, clause 5.3.10 and Antitrust and Competition Policy: What You Need to Know at http://standards.ieee.org/develop/policies/antitrust.pdf

Participants have a duty to inform the IEEE

- Participants shall **inform the IEEE** (or cause the IEEE to be informed) of the **identity of *each* holder** of any **potential Essential Patent Claims**
  - that are **potentially essential to implementation of the proposed standard(s)**
  - of which they are personally aware if the claims are owned or controlled by the participant or the entity the participant is from, employed by, or otherwise represents

- Participants should inform the IEEE (or cause the IEEE to be informed) of the identity of *any other* holders of potential Essential Patent Claims

- **Early identification** of holders of potential Essential Patent Claims is **encouraged**

Ways to inform IEEE

- Cause an **LOA to be submitted** to the IEEE-SA (patcom@ieee.org); or

- Provide the **chair of this group** with the identity of the holder(s) of any and all such claims as soon as possible; or

- **Speak up now** and respond to this Call for Potentially Essential Patents

- If anyone in this meeting is personally aware of the holder of **any patent** claims that are **potentially essential to implementation of the proposed standard(s)** under consideration by this group and that are not already the subject of an Accepted Letter of Assurance, **please respond at this time** by providing relevant information to the WG Chair

Patent-related information

The patent policy and the procedures used to execute that policy are documented in the:

- *IEEE-SA Standards Board Bylaws*
  (http://standards.ieee.org/develop/policies/bylaws/sect6-7.html#6)
- *IEEE-SA Standards Board Operations Manual*
  (http://standards.ieee.org/develop/policies/opman/sect6.html#6.3)

Material about the patent policy is available at
http://standards.ieee.org/about/sasb/patcom/materials.html

If you have questions, contact the IEEE-SA Standards Board Patent Committee Administrator at patcom@ieee.org

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Resources

- **Training Videos**
  - How to Run an Individual Working Group
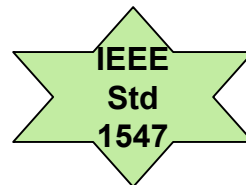 - How to Run an Entity Working Group

- **Bylaws and Procedures**
  - IEEE-SA Standards Board Bylaws
    -http://standards.ieee.org/develop/policies/bylaws/

  - IEEE-SA Standards Board Operations Manual
    -http://standards.ieee.org/develop/policies/opman/

  - IEEE Baseline Operational Procedures
    http://standards.ieee.org/about/sasb/audcom/bops.html

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IEEE Standards Classification & Language

IEEE P2800

IEEE Std 1547

IEEE Std 1547.1

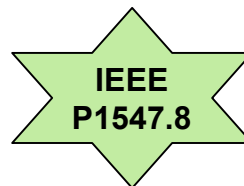**Standards**
documents specifying mandatory requirements (*shall*)
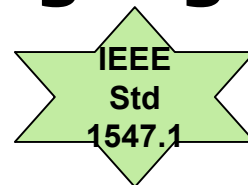
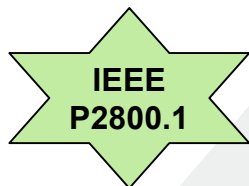**Recommended Practices**
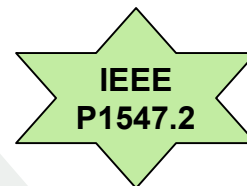documents in which procedures and positions preferred by the IEEE are presented (*should*)

IEEE P1547.8

Guides
documents that furnish information – e.g., provide alternative approaches for good practice, suggestions stated but no clear-cut recommendations are made (*may*)

IEEE P2800.1

IEEE P1547.2

Methods for Standards Development

Individual Method (e.g., IEEE P2800)

- Participants are individual technical experts, requires an IEEE SA individual membership
- Individuals represent themselves
- **Each individual participant has 1 vote**
- Ballot groups are made up of a minimum of 10 individuals
- Ballot group participants must be IEEE-SA individual members

Entity (Corporate) Method (e.g., IEEE P2800.1)

- Participants are "entities," i.e., companies, universities, government bodies, etc.
- Designated representative and alternate represent the entity, see IEEE SA corporate membership
- **Each entity has 1 vote** ("Basic members can observe" and "Advanced members can vote")
- Requires 3 entities to commit to participation at project initiation
- Entity sends representatives to meetings
- List of IEEE SA corporate members

IEEE SA Balloting Rules

Consensus =

- ≥75% Quorum

- ≥75% Approval

  –*WG Chair's goal is ≥90%!*

IEEE P2800 Leadership Team

Role	Name	Affiliation	Stakeholder Group	Liaison
Chair	Jens C. Boemer	EPRI	Academic/Research	EDP&G, SCC21
Secretary	Wesley Baker	Power Grid Eng.	Service Provider/ Consulting	EMC, IRPTF
Vice-Chair	Bob Cummings	NERC	Regulatory and Governmental Bodies	NERC IRPTF
Vice-Chair	Kevin Collins	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
Treasurer	TBD	TBD	TBD	TBD

Introductions

Name, Employer, Affiliation

Please keep it short!

Previous Meetings' Minutes

- Please approve the minutes from the WG kick-off meeting on 1/14/19 by voting on iMeetCentral here.

- Please approve the minutes (post-conference call slide deck) from the WG conference call on 5/16/19 by voting on iMeetCentral here.

Review and Approval of Agenda

Refer to Word document.

Logistics (10 min)

- Listservers / Mailing lists

- WG membership criteria

- File sharing / iMeetCentral workspace

- How to be notified of the Initial Sponsor Ballot (2020 timeframe) and Vote on Ballot?

- SubGroup participation & leadership

IEEE P2800 Working Group	Mailing List	stds-p2800@listserv.ieee.org
	Collaborative Workspace for WG Members (only)	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
II. General Requirements	Bob Cummings	stds-p2800-sg2@listserv.ieee.org
III. Active Power – Frequency Control	Kevin Collins	stds-p2800-sg3@listserv.ieee.org
IV. Reactive Power – Voltage Control	Wes Baker	stds-p2800-sg4@listserv.ieee.org
V. Low Short-Circuit Power	Ross Guttromson	stds-p2800-sg5@listserv.ieee.org
VI. Power Quality	Ross Guttromson	stds-p2800-sg6@listserv.ieee.org
VII. Ride-Through *Capability* Requirements	Bob Cummings	stds-p2800-sg7@listserv.ieee.org
VIII. Ride-Through *Performance* Requirements	Manish Patel	stds-p2800-sg8@listserv.ieee.org
IX. IBR Protection	Babak Enayati	stds-p2800-sg9@listserv.ieee.org
X. Modeling & Validation, Measurement Data, and Performance Monitoring	Manish Patel	stds-p2800-sg10@listserv.ieee.org
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.

Instructions for Mailing Lists

Instructions for Mailing Lists

Sending an E-mail to All Listserv Members

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.

Managing Your IEEE Listserv Account

To manage your IEEE listserv account, send an e-mail with the appropriate command(s) in the body of the e-mail to **listserv@listserv.ieee.org**. The END command informs listserv to stop reading commands, so if you string commands together, only include END once at the end of the string.

Note:(* = asterisk = wildcard = all lists)

To change your e-mail address on this listserv list:
    Change stds-p2800 [Your New e-mail Address]   ← replace red part with the name of any of the Sub-WGs mailing lists
    End

To change your e-mail address on all IEEE lists:
    Change * [Your New e-mail Address]
    End

To remove your e-mail address from this listserv list:
    Signoff stds-p2800   ← replace red part with the name of any of the Sub-WGs mailing lists
    End

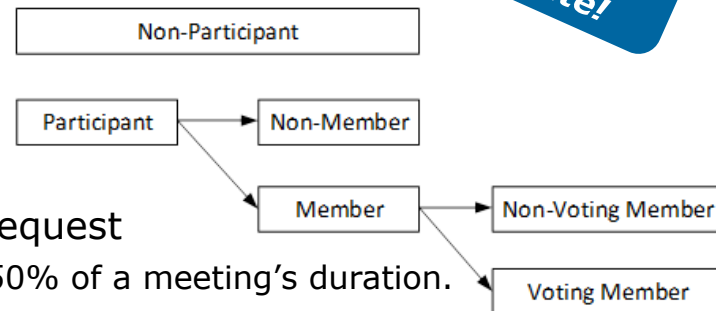To remove your e-mail address from all IEEE lists:
    Signoff *
    End

IEEE STANDARDS ASSOCIATION

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WG membership criteria
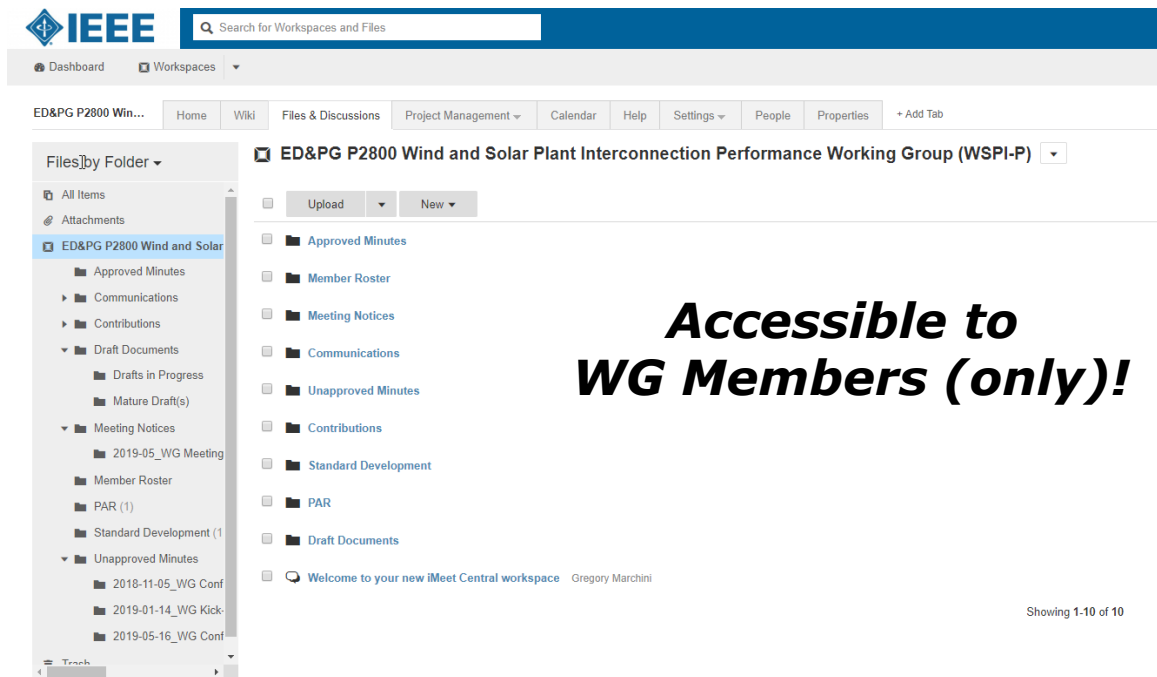
- **Policies & Procedures: Clause 4.0 Working Group Membership**
  - Working Group membership is by individual
  - Membership was granted automatically to those attending the kick-off meeting
  - Membership shall be ***granted after attending two consecutive WG meetings or WG calls***, at request
    - Attendance credit is granted to those who attend at least 50% of a meeting's duration.
    - Attendance via teleconferencing shall count towards the attendance requirements
  - Voting member status is maintained through consistent participation at meetings and through Working Group votes
    - may be revoked if a Working Group member misses two consecutive meetings
    - A member who lost voting privileges shall have them reinstated by attendance at two consecutive meetings of the Working Group and upon request for member status
    - Working Group Chair can decide in cases of personal hardship
  - Roster / <u>public list</u> includes <u>name</u>, email address, <u>affiliation</u>, and membership status

Non-Participant

Participant	→	Non-Member

Member	→	Non-Voting Member
	→	Voting Member

File Sharing / iMeetCentral Workspace

Includes

- Meeting Agendas
- Meeting Minutes
- Standard Drafts
- SubGroup Docs
- File Sharing

Access: WG members only

Copyright regulations:

- Preferably links to papers/reports
- Post documents only after requesting copyright release for the purpose of this standard

Accessible to WG Members (only)!

https://ieee-sa.imeetcentral.com/p2800-wspi-p/

How to be notified of the Initial Sponsor Ballot (2020 timeframe) and Vote on Ballot?

- Any IEEE and IEEE SA member can sign up to receive P2800 or P2800.1 Working Group updates in myProject
- Any individual IEEE SA member can sign up for the P2800 project but only entity members can sign up for the P2800.1 project
- Only IEEE SA members can vote on ballots.

1. On the **myProject**™ Home Screen, select "**Manage Activity Profile**".
2. On the "Manage Activity Profile" Page, **enter "WSPI" into the Search line** and click "Search".
3. **Check the boxes next to the activity you are interested in** (Sponsor, Working Group, Project). Check both the respective working group(s) and project(s).
4. Click "**CONTINUE**"
5. Confirm your interest area and enter your affiliation information.
6. Select from the list or type in your company/organization.
7. Click "**CONTINUE**"

SubGroup participation & leadership

- SubGroups will start their work in next 1-3 weeks.

- Start with 1 hr calls, every other week (some exceptions).

- Participants to determine personal engagement level
  - Follower by e-mail
  - Verbal contributor
  - Written contributor
  - Facilitator
  - Co-lead

➢ Please contact your SubGroup Lead if you have any questions.

SubGroup participation & leadership

1. SubGroup Leads have information of interested parties that expressed their interest to be a Co-Lead or Facilitator but the scope of SubGroup may have changed since
   - If a participant is not interested in a lead role any more, please inform your SubGroup Lead
   - If you have not shared your interest yet, you may let your SubGroup Lead know

2. SubGroup Lead identifies preferred Co-Leads and Facilitators and makes recommendation to Officers

3. Officers discuss proposed Co-Leads and Facilitators and make a decision within the first 3-5 SubGroup meetings

4. SubGroup Lead then nominates the individuals and announces these to the SubGroup

Review of P2800 Scope & Timeline

Existing North American Standards for Inverter-Based Generating Resources and Gaps

		Performance	Test & Verification & Model Validation
BES[1]	**BPS**[3]	• FERC Orders • NERC Reliability Standards & Guidelines	• NERC compliance monitoring & enforcement
		• Not available *IEEE P2800*	• Not available *IEEE P2800.1*
DER[2]		• IEEE Std 1547-2018 ✔	• IEEE P1547.1 • UI 1741 (SA) • IEEE ICAP *In ballot!*

[1] NERC definition of Bulk Electric System: ≥100 kV with gross individual / aggregate nameplate rating greater than 20 MVA / 75 MVA

[2] DER connected at typical (radial) primary and secondary voltage levels

[3] transmission and meshed sub-transmission

IEEE standards are voluntary industry standards and must be adopted by the appropriate authority to become mandatory.

What to expect from IEEE P2800?

- Specify performance and functional *capabilities.*

- Specify functional *default settings.*
- Specify functional *ranges of allowable settings.*

- Specify modeling data, and measurement data for performance monitoring and validation.
- Specify required tests and verifications, but not their detailed procedures (➔ P2800.1)

Clarifications from Informal Kick-Off Call

- Voluntary standard, requires reference by responsible parties', e.g., interconnection requirements / agreements
  - Candidate parties are transmission owners, state regulators, NERC, and FERC

- Technical minimum requirements, intention is that responsible parties can specify additional requirements
  - Some participants see a risk that it may be regarded as exhaustive requirements
  - May want to consider tiered requirements by use of "performance categories"

- Only "inverter-based" resources, e.g., wind power, solar photovoltaic, energy storage
  - Some participants suggested renaming to "inverter-coupled"
  - "Type 3" wind turbines (doubly-fed induction generators) are in scope

- Applicable to transmission and meshed sub-transmission grids (broad BPS definition)
  - May need different set of requirements for transmission and sub-transmission

Tentative Timeline With Strech Goals
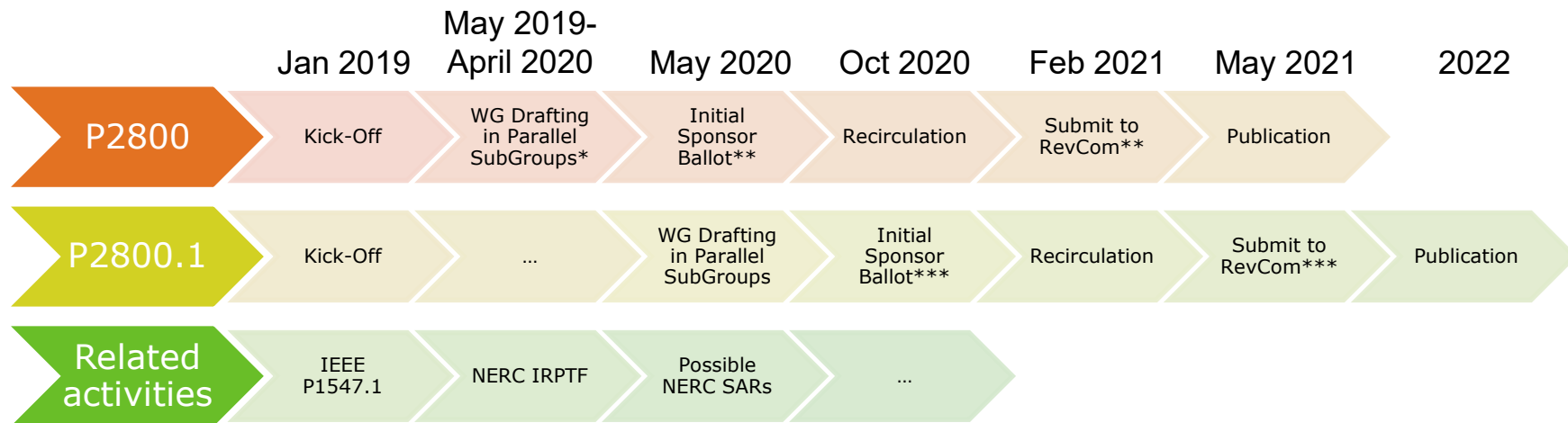
	Jan 2019	May 2019-April 2020	May 2020	Oct 2020	Feb 2021	May 2021	2022
P2800	Kick-Off	WG Drafting in Parallel SubGroups*	Initial Sponsor Ballot**	Recirculation	Submit to RevCom**	Publication	
P2800.1	Kick-Off	…	WG Drafting in Parallel SubGroups	Initial Sponsor Ballot***	Recirculation	Submit to RevCom***	Publication
Related activities	IEEE P1547.1	NERC IRPTF	Possible NERC SARs	…			

*   Please contact the SubGroup leads and sign up for their Mailing Lists to engage.
**   The P2800 PAR states June 2021 for Initial Sponsor Ballot and October 2022 for submission to RevCom.
*** The P2800.1 PAR states Dec 2021 for Initial Sponsor Ballot and October 2022 for submission to RevCom.

The ability to meet this tentative timeline may be subject to strong commitments of Working Group leadership team, i.e., support/funding.

Recap of officer activities (5 min)

- Mailing lists
- File sharing
- WG meeting preparations
- Tentative SubGroup schedules
- Scope documents
- Strawman

Presentation of the Strawman

Available on iMeetCentral at https://ieee-sa.imeetcentral.com/p/ZgAAAAAtInP

P2800 Strawman Overview

- **Intent**
  - Suggested framework and starting point for the P2800 Working Group
  - Subject to change by consensus of the Working Group
- **Content**
  - Derived from IEEE Std 1547™-2018 and NERC IRPTF guideline
    - Content clearly not applicable to transmission and sub-transmission deleted
    - Synchronous generator related content deleted
  - Appendix A of NERC Reliability Guideline– BPS-Connected IBR Performance
  - Comments from P2800 Chair and Vice-Chairs
  - Sub-Group Scope Guidance

Example – Scope Guidance

1. Overview

P2800 Officer's Scope Guidance – Sub-Group 1- Overall Document

The SubGroup responsible for the overall document, includes responsibility for its scope, structure (ToC), front matter (overview & abstract), normative references, definitions and acronyms, and informative annexes, e.g., the bibliography.

The SubGroup should discuss and provide guidance to the working group whether and to what extent the following requirements may be within the scope of the standard:

1. Scoping for Low Short-Circuit Power, coordinate with SubGroup V (Ross)

2. Scoping for HVDC and FACTS

3. Scoping for interoperability

4. Scoping for cyber security

5. Study requirements and informative annex on applicable study type/models, coordinate with SubGroup X (Manish) and SubGroup XI (Chenhui)

6. Applicability to IBR plant level ("black box") and/or IBR units as well? (coordinate with all SubGroups)

1.1 General

The global increase in penetration levels of inverter-based resources 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

Example – Chair/Vice-Chair comments

3.1 **Definitions**

applicable voltage: Electrical quantities that determine the performance of a IBR System

NOTE—*Applicable voltages* are used as a synonym for *applicable frequency,* which can be derived from the *applicable voltages.*

transmission electric power system (TEPS): A TEPS that is connected to a IBR System. TEPS is used in this standard for transmission and sub-transmission networks unless specific requirements for each are different.

NOTE—Typically, a *TEPS* has primary access to public rights-of-way, priority crossing of property boundaries, etc., and is subject to regulatory oversight. See Figure 2.

transmission electric power system operator (TEPS operator): The entity responsible for designing, building, operating, and maintaining the *TEPS*.

authority governing interconnection requirements (AGIR): A cognizant and responsible entity that defines, codifies, communicates, administers, and enforces the policies and procedures for allowing electrical interconnection of IBR to the *TEPS*. This may be a regulatory agency, public utility commission,

Boemer, Jens
3.1: Harmonized terminology and general concepts

These should not be changed, unless there is a clear need for char

Kevin Collins
Ross commented - I agree one is derived from the other, but they not the same thing and should be identified individually. Suggest deleting this comment

Example – Suggested Content

P2800 Editior's Note - the following paragraphs are derived from the NERC IBR Reliability Guideline App A and are suggested for inclusion in the appropriate sub-clauses of Clause 5)

1. *Inverter-based resources shall operate in a closed-loop, automatic voltage control mode to maintain voltage at the RPA to within the specified voltage schedule provided by the TEPS. Operator requirements.*

1.1. *A single IBR connected to a bus on the TEPS shall operate in Voltage Control mode that ensures no steady-state error between nominal value and steady-state output (e.g., a PI controller). Reactive droop control mode may be used, if required to achieve stable operation.*

1.2. *Multiple IBR and non-IBR connected to the same bus on the TEPS may use reactive droop control. Reactive droop shall be based on any scheduled voltage set point within the high and low schedule limits, specified by the TEPS operator, such that the entire capability of the IBR from 100% of required leading to lagging reactive power capability is available across the normal performance voltage range.*

2. *IBR shall utilize the continuous dynamic reactive power capability of IBR units and/or supplementary devices to achieve the power factor requirements at the RPA (for this requirement, the RPA is the point of measurement (POM) at the high side of the IBR substation).*

General discussion

General discussion

- Reference Point of Applicability

- AOB

What is the RPA for P2800? (for discussion)

Source: Wes Baker
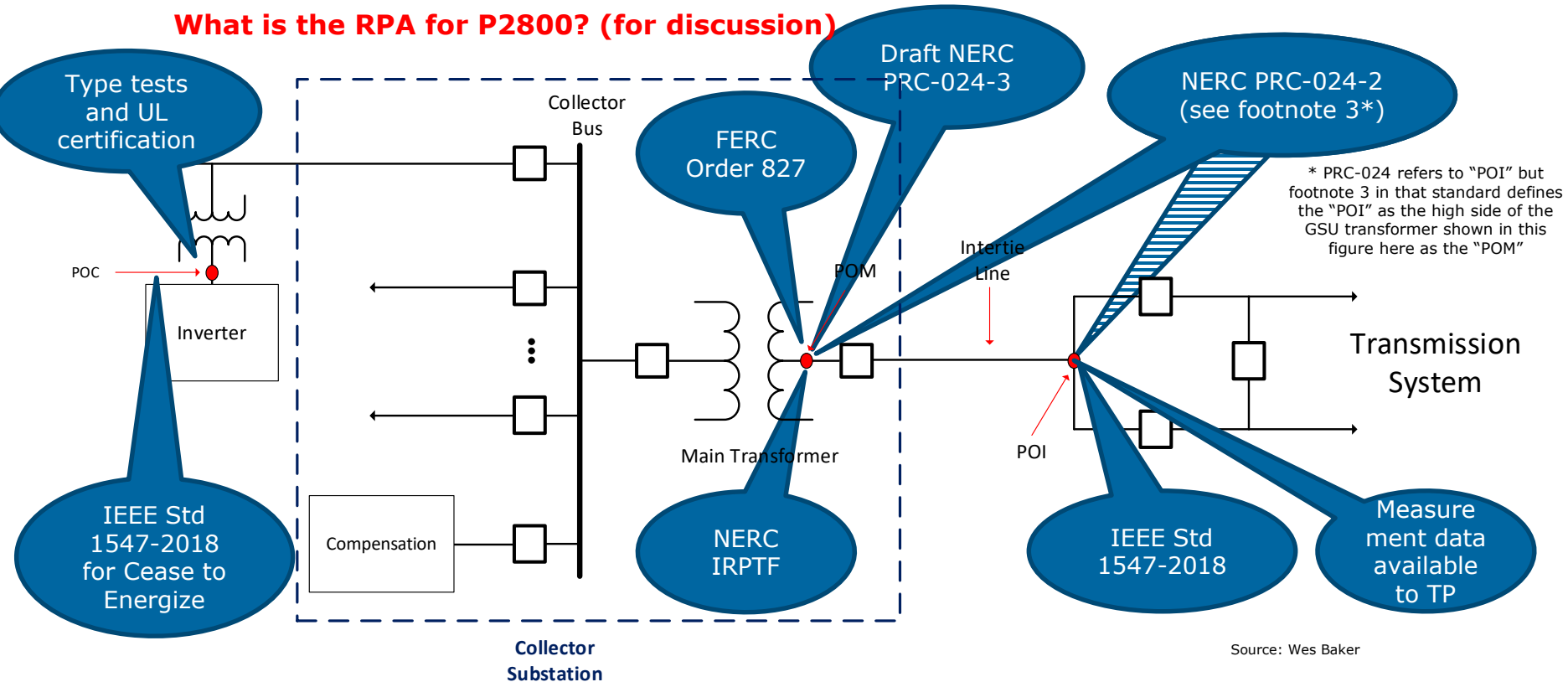
- **Reference Point of Applicability (RPA):** The location where the interconnection and interoperability performance requirements specified in this standard apply.
- **Point of Interconnection (POI):** The point of connection between the TEPS and the IBR Systems.
- **Point of Measurement (POM)**: The high-side of the generator substation transformer (per FERC Order 827).
- **Point of Connection (POC):** The point where an IBR unit is electrically connected to an IBR system.
- Note: IRPTF uses POM instead of POI unless referring to a specific NERC Reliability Standard that refers to POI (e.g. PRC-024-2).

Coordination

Coordination

- Report-out and coordination on P2800.1 activities, current and planned

- IEC coordination

Activities of IEC committees related to protection and control of DER interconnection

Dr. Murty V.V.S. Yalla

Chair, IEC Technical Committee (TC) 95

Measuring Relays and Protection Equipment

The following are the activities of various groups in IEC that deal with protection and control of aspects of DER interconnection:

1. IEC TC95 Measuring Relays and Protection Equipment
Chair: Murty Yalla (US), Secretary: Thierry Bardou (France)

Under TC95 Maintenance team 4 (MT4) the following standard was published:

IEC 60255-181-2019 Functional requirements for frequency protection

Date published: February 1, 2019 (Edition 1.0)
Convener of MT4: Murty Yalla (US), Project Leader: Philippe ALIBERT(France)

Scope: This part of IEC 60255 specifies the minimum requirements for functional and performance evaluation of frequency protection. This document also defines how to document and publish performance test results. This document covers the functions based on frequency measurement or rate of change of frequency measurements. This document also covers frequency protection where additional blocking elements are used. This document defines the influencing factors that affect the accuracy under steady state conditions and performance characteristics during dynamic conditions. The test methodologies for verifying performance characteristics and accuracy are also included in this document. **This functional document is applicable to frequency functions embedded in a protection relay but also to other physical devices which include frequency protection in their functionality (for example, trip units in a low-voltage circuit breaker or inverters associated with photovoltaic or storage systems).**

This document does not cover synchronizing or synchronism-check functions. This document does not specify the functional description of additional features often associated with frequency functions such as undervoltage blocking, df/dt or Δf/Δt supervision, current supervision or power supervision (f/P function). Only their influence on the frequency protection function is covered in this document. Frequency and rate of change of frequency measurement outputs provided by protection devices are not in the scope of this document. Additionally, this document does not explicitly cover the frequency relays based on current as the input energizing quantity but the principles covered by this document can be extended to provide guidance for these applications. The general requirements for measuring relays and protection equipment are defined in IEC 60255-1

IEC 60255-181

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

**Measuring relays and protection equipment –
Part 181: Functional requirements for frequency protection**

Relais de mesure et dispositifs de protection –
Partie 181: Exigences fonctionnelles relatives aux protections de fréquence

2. IEC TC8 System aspects of electrical energy supply

Under TC8 a new joint WG (JWG12) is formed in collaboration with

TC95 ---- Measuring Relays and Protection Equipment
TC85 ---- Measuring equipment for electrical and electromagnetic quantities
SC77A ---- EMC - Low frequency phenomena

It is working on the following Technical Specification:

IEC/TS 62786 Distributed energy resources connection with the grid --
Part 41: Requirements for frequency measurement used to control DER and loads, Convener:
Philippe ALIBERT (France), expected pub date June 2021

Today, an increasing number of DER is coupled via electronic power converters to the power system. Thus, the overall inertia of the power systems decreases as well. As a result, a sudden loss of generation or the disconnection of major loads are more likely to cause rapid and large frequency deviations. Those frequency deviations have to be managed by fast and reliable enough measurement and control methods. Defined requirements on power frequency and ROCOF measurement and analysis are therefore needed for a predictable control response that improve the interoperability of generating plants and dispatchable loads with the power system. The practical implementation of Network codes, developed all over the world, has highlighted the standardization gap this project is dealing with.

IEC/TS 62898-3-1: Microgrids - Technical Requirements – Protection and Dynamic Control Convener: Dehua Zheng (China), CD stage, Expected publication date May 2020

1 Scope

The purpose of this technical specification is to provide guidelines for the specification of protection and dynamic control in microgrids. Protection and dynamic control in a microgrid is intended to guarantee the safe behaviour and stable operation of the microgrid under fault and disturbance conditions. This technical specification applies to AC microgrids with both single and three phase networks. This document covers 110 isolated microgrids and non-isolated microgrids with a single point of connection (POC) to the upstream distribution network. The technical specification defines the principles of protection and dynamic control for microgrids, general technical requirements, and specific technical requirements of fault protection and dynamic control. It includes new challenges in microgrid protection requirements, transient disturbance control and dynamic disturbance control requirements for microgrids. It focuses on the differences between conventional power system protection and new possible solutions for microgrid protection functions. Depending on specific situations, additional or stricter requirements can be defined by the microgrid operator in coordination with the distribution system operator (DSO).

This technical specification does not cover protection and dynamic control of virtual power plants (VPPs) and active distribution systems (ADSs).This technical specification does not cover the product requirements for measuring relays and protection equipment. This technical specification does not cover protection against electric shock in electrical installations which is covered by IEC 60364 series.

PROJECT NUMBER:	
IEC TS 62898-3-1 ED1	

DATE OF CIRCULATION:	CLOSING DATE FOR COMMENTS:
2019-01-18	**2019-04-12**

SUPERSEDES DOCUMENTS:
8B/17/CD,8B/23A/CC

IEC SC 8B : DECENTRALIZED ELECTRICAL ENERGY SYSTEMS

SECRETARIAT:	SECRETARY:
China	Mr Wenpeng LUAN

OF INTEREST TO THE FOLLOWING COMMITTEES:

TC 64,TC 95,TC 99

FUNCTIONS CONCERNED:

☐ EMC   ☐ ENVIRONMENT   ☐ QUALITY ASSURANCE   ☐ SAFETY

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Microgrids-Technical Requirements - Protection and Dynamic Control

NOTE FROM TC/SC OFFICERS:
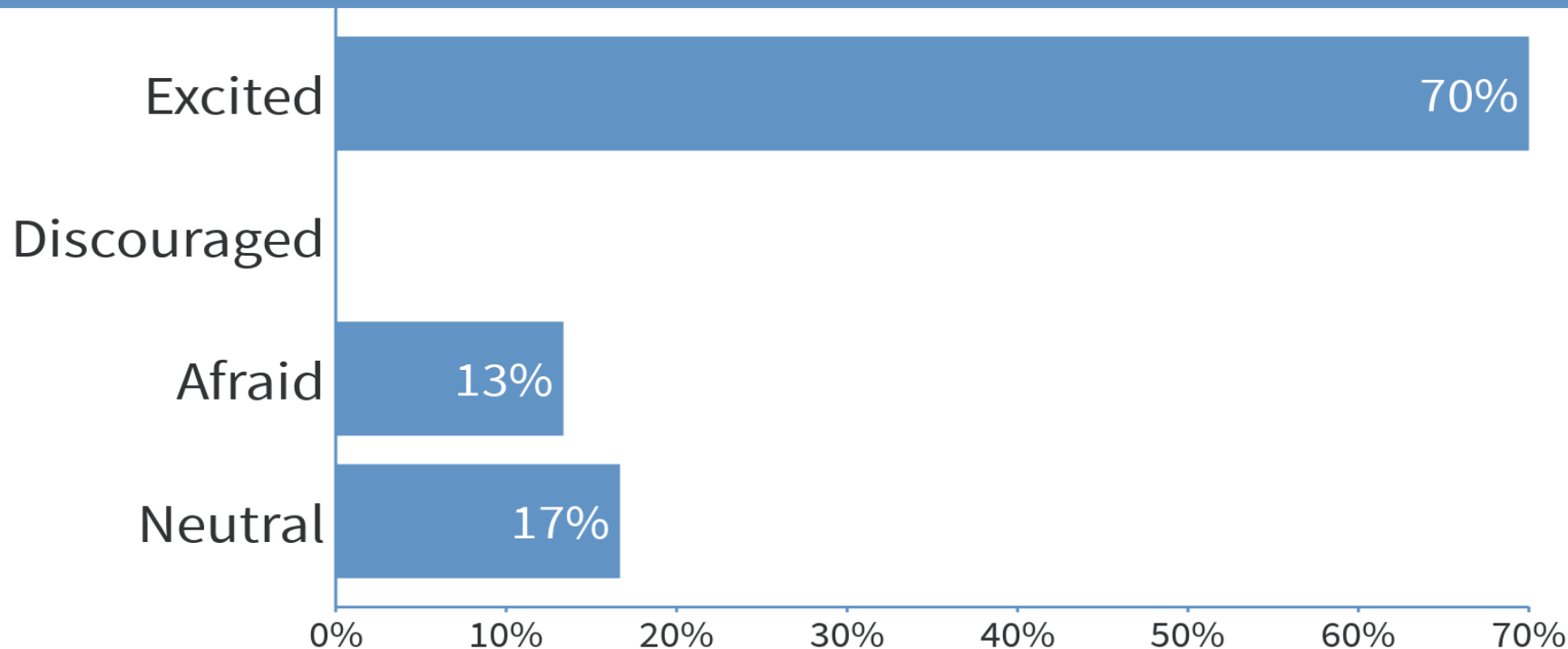
IEEE STANDARDS ASSOCIATION

Thank you!

Day 2

How do you feel about IEEE P2800 today?

Excited: 70%

Discouraged:

Afraid: 13%

Neutral: 17%

0% 10% 20% 30% 40% 50% 60% 70%

Total Results: 60

Overview of SubGroup scheduling

Logistics of Bi-weekly SubGroup
P2800 Mailing List at stds-p2800@listserv.ieee.org

P2800 SubGroup	Lead	Mailing List	iMeetCentral Folder	Mon	Tues	Wed	Thurs	Fri
I. Overall Document	Jens Boemer	stds-p2800-sg1@listserv.ieee.org	https://ieee-sa.imeetcentral.com/p/ZgAAAAAtIla				12 PM ET (even weeks)	
II. General Requirements	Bob Cummings	stds-p2800-sg2@listserv.ieee.org	https://ieee-sa.imeetcentral.com/p/ZgAAAAAtIlb					3 PM ET (odd weeks)
III. Active Power – Frequency Control	Kevin Collins	stds-p2800-sg3@listserv.ieee.org	https://ieee-sa.imeetcentral.com/p/ZgAAAAAtIlc				12 PM ET (odd weeks)	
IV. Reactive Power – Voltage Control	Wes Baker	stds-p2800-sg4@listserv.ieee.org	https://ieee-sa.imeetcentral.com/p/ZgAAAAAtIld		1 PM ET (odd weeks)			
V. Low Short-Circuit Power	Ross Guttromson	stds-p2800-sg5@listserv.ieee.org	https://ieee-sa.imeetcentral.com/p/ZgAAAAAtIle		11 AM ET (odd weeks)			
VI. Power Quality	Ross Guttromson	stds-p2800-sg6@listserv.ieee.org	https://ieee-sa.imeetcentral.com/p/ZgAAAAAtIlf		11 AM ET (even weeks)			

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P2800 SubGroup	Lead	Mailing List	iMeetCentral Folder	Mon	Tues	Wed	Thurs	Fri
VII. Ride-Through Capability Requirements	Bob Cummings	stds-p2800-sg7@listserv.ieee.org	https://ieee-sa.imeetcentral.com/p/ZgAAAAAtIlg					3 PM ET (even weeks)
VIII. Ride-Through Performance Requirements	Manish Patel	stds-p2800-sg8@listserv.ieee.org	https://ieee-sa.imeetcentral.com/p/ZgAAAAAtIlh			1 PM ET (even weeks)		
IX. IBR Protection	Babak Enayati	stds-p2800-sg9@listserv.ieee.org	https://ieee-sa.imeetcentral.com/p/ZgAAAAAtIli				4 PM ET (odd weeks)	
X. Modeling & Validation, Measurement Data, and Performance Monitoring	Manish Patel	stds-p2800-sg10@listserv.ieee.org	https://ieee-sa.imeetcentral.com/p/ZgAAAAAtIlj			1 PM ET (odd weeks)		
XI. Tests and verification requirements	Chenhui Niu	stds-p2800-sg11@listserv.ieee.org	https://ieee-sa.imeetcentral.com/p/ZgAAAAAtIlk	Intentionally Delayed				

Logistics of SubGroup Conference Calls

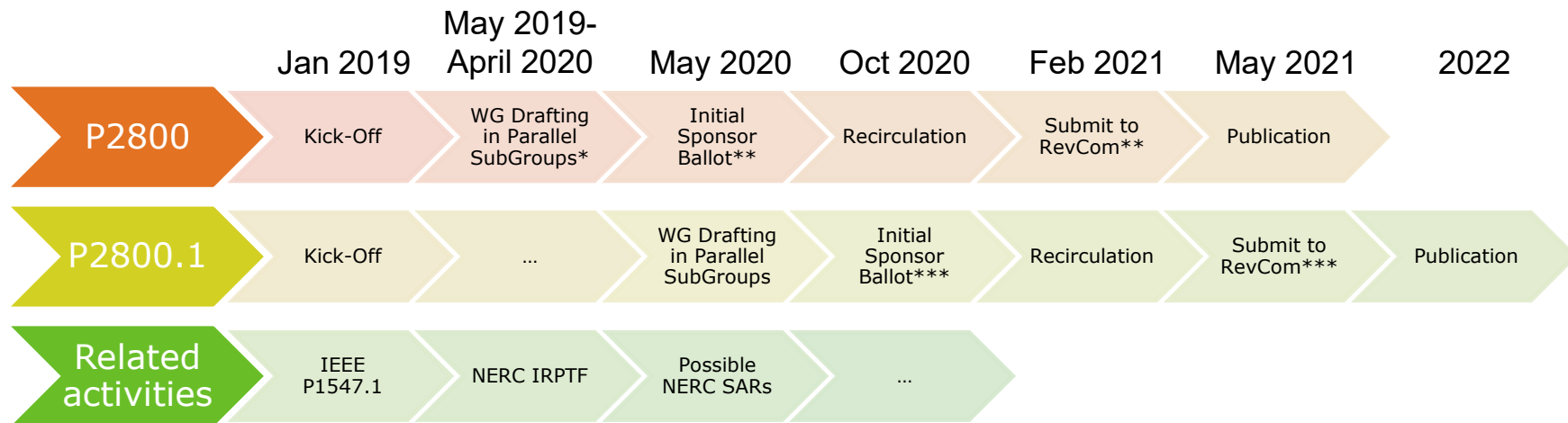# SubGroup participation & leadership

- SubGroups will start their work in next 1-3 weeks.

- Start with 1 hr calls, every other week (some exceptions).

- Participants to determine personal engagement level
  - Follower by e-mail
  - Verbal contributor
  - Written contributor
  - Facilitator
  - Co-lead

➢ Please contact your SubGroup Lead if you have any questions.

SubGroup participation & leadership

1. SubGroup Leads have information of interested parties that expressed their interest to be a Co-Lead or Facilitator but the scope of SubGroup may have changed since
   - If a participant is not interested in a lead role any more, please inform your SubGroup Lead
   - If you have not shared your interest yet, you may let your SubGroup Lead know

2. SubGroup Lead identifies preferred Co-Leads and Facilitators and makes recommendation to Officers

3. Officers discuss proposed Co-Leads and Facilitators and make a decision within the first 3-5 SubGroup meetings

4. SubGroup Lead then nominates the individuals and announces these to the SubGroup

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Tentative Schedule IEEE P2800

Tentative Timeline With Strech Goals

	Jan 2019	May 2019-April 2020	May 2020	Oct 2020	Feb 2021	May 2021	2022
P2800	Kick-Off	WG Drafting in Parallel SubGroups*	Initial Sponsor Ballot**	Recirculation	Submit to RevCom**	Publication	
P2800.1	Kick-Off	...	WG Drafting in Parallel SubGroups	Initial Sponsor Ballot***	Recirculation	Submit to RevCom***	Publication
Related activities	IEEE P1547.1	NERC IRPTF	Possible NERC SARs	...			

*   Please contact the SubGroup leads and sign up for their Mailing Lists to engage.
**   The P2800 PAR states June 2021 for Initial Sponsor Ballot and October 2022 for submission to RevCom.
*** The P2800.1 PAR states Dec 2021 for Initial Sponsor Ballot and October 2022 for submission to RevCom.

The ability to meet this tentative timeline may be subject to strong commitments of Working Group leadership team, i.e., support/funding.

Tentative Schedule IEEE P2800 - 2019

Deliverable	Due date for SubGroup submissions	Publication date
WG ConfCall (Informal Kick-Off)	11/5/2018	
WG Meeting (Kick-Off)	@IEEE JTCM, Orange County, CA, USA, January 2019	
Draft SubGroup Scopes		5/1/2019
WG ConfCall (Pre-WG Mtg)	5/16/2019	
WG Meeting	Atlanta, GA (NERC), May 22-23, 2019	
Draft 0 (Strawman)		5/23/2019
SubGroup Revisions to Scopes	6/30/2019	
Draft 1	8/31/2019	9/18/2019
WG Meeting	Salt Lake City, UT (WECC), September 25-26, 2019	
Draft 2	11/8/2019	11/27/2019
WG Meeting	Tempe, AZ (FirstSolar), December 4-5, 2019	
Draft 3	12/20/2019	1/6/2020

Tentative Schedule IEEE P2800 – 2020/21

Deliverable	Due date for SubGroup submissions	Publication date
WG Meeting	@IEEE JTCM, Jacksonville, FL, USA, January 12-16*, 2019	
Draft 4	3/xx/2020*	4/xx/2020*
WG Meeting	TBD, April* 2020 **	
WG Vote on Draft	TBD, April* 2020	
Initial Ballot	May 2020*	
Recirculation	October 2020*	
Submission to RevCom	February 2021*	
Publication	May 2021*	

* tentative/TBD

** State Grid Corporation of China has offered to host the IEEE P2800 Working Group in China for a joint meeting with the IEEE P2800.1 Working Group (including non-entity members). This may be combined with a 1-day knowledge transfer workshop prior to the Working Group meetings.

2019 Meetings

- Coordinated with NERC IRPTF Meeting Schedule
- Webex for remote participation is available & counts towards WG meeting attendance
- Striving for no registration fee, as facilities and catering may be provided in-kind

IEEE P2800	Location	Registration	NERC IRPTF
May 22-23, 2019*	Atlanta, GA (NERC)	via vtools	Tue/Wed, May 21-22, 2019
September 25-26, 2019*	Salt Lake City, UT (WECC)**	N/A yet	Tue/Wed, September 24-25, 2019
December 4-5, 2019*	Tempe, AZ (FirstSolar)	N/A yet	Tue/Wed, December 3-4, 2019

* Wednesday (1PM-5PM) and Thursday (8AM-5PM)
Important Note: The September meeting in Salt Lake City, UT is the same week as Solar Power International, a huge solar-related event in North America (https://www.solarpowerinternational.com/). WECC is anticipating that hotel costs will **SKYROCKET** very soon. Make your travel arrangements (at least book hotels) **NOW** to avoid very high rates. Use code "WECC". https://www.wecc.org/Administrative/Visitor%20Information.pdf

Thank you for your participation!

Contacts

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- Jens C Boemer,
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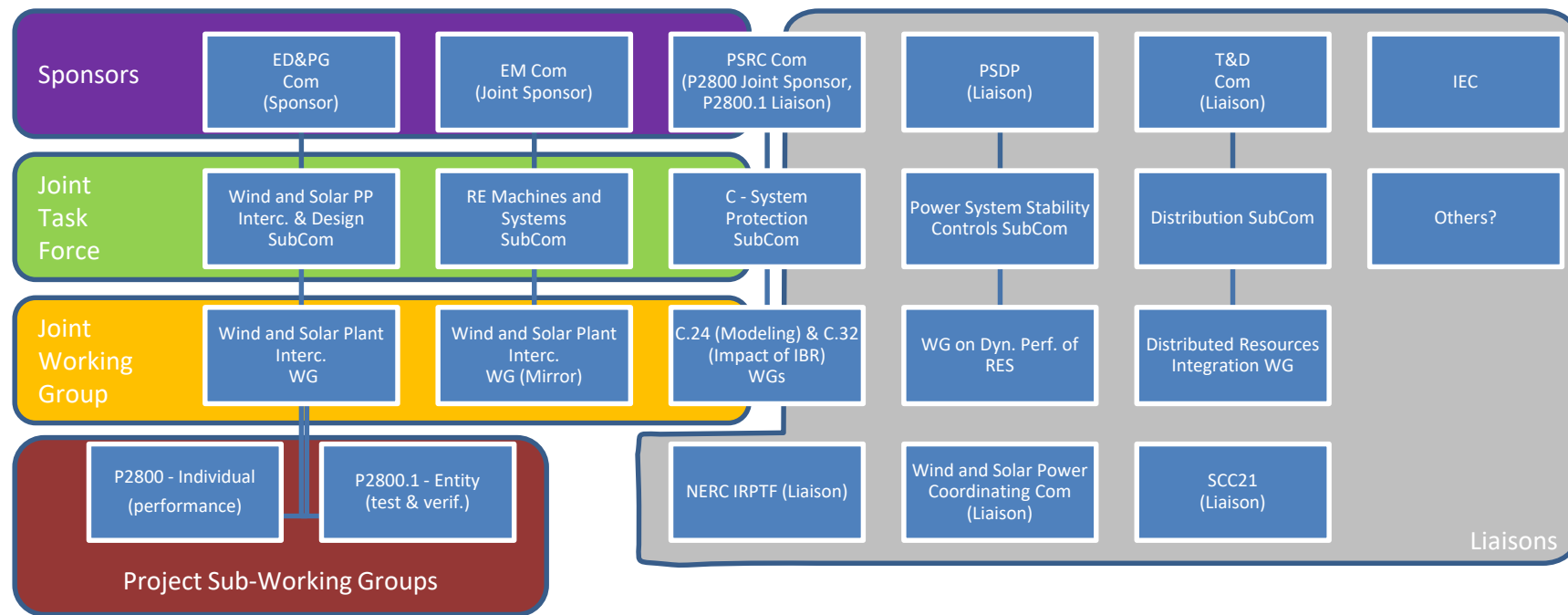
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BACKUP SLIDES

Overview of the Project Authorization Request

IEEE Project Authorization Requests

Project	Scope	Status	Lead	Joint Sponsors / Liaisons	Next Steps
P2800 - Standard for Interconnection and Interoperability of Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems Link on myProject	**Standard** on Performance (Individual Project)	Approved by NESCOM/SAS B on 9/27/18.	Chair: Dr. Jens Boemer +1.206.471.1180 j.c.boemer@ieee.org	EDP&G – Sponsor EMC – Joint Sponsor PSRC – Joint Sponsor PSDP – Liaison T&D – Liaison Others, see the figure below	Convene WG at 2019 IEEE PES JTCM in January 2019 **Initial Sponsor Ballot: June 2021** Submission to RevCom: October 2022
P2800.1 - Guide for Test and Verification Procedures for Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems Link on myProject	**Guide** on Testing (Entity Project)	Approved by NESCOM/SAS B on 9/27/18.	c/o China State Grid Dr. Chenhui Niu International Department NARI Group Cooperation +86 13451870987 niuchenhui@ sgepri.sgcc.com.cn	Same as for P2800, except that PSRC is a Liaison and not a Joint Sponsor	Convene WG at 2019 IEEE PES JTCM in January 2019 Initial Sponsor Ballot: **December 2021** Submission to RevCom: October 2022

Coordination Approach for BPS-Connected Inverter-Based Resources IEEE standards projects P2800 and P2800.1

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 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. The proposed new standard fulfills 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. This effort should be aimed to minimize the affected customers and to shorten the time of resynchronizing to the grid if the plant is separated from the grid. 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

Scope:

This standard establishes the recommended **interconnection capability and performance criteria** for inverter-based resources interconnected with transmission and networked sub-transmission systems. Included in this standard are recommendations on performance 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.

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.