IEEE P2800 - Frequency Asked Questions (FAQs)

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General Questions	Answers
Where can I find general information about IEEE P2800?	General information about IEEE P2800 is available at http://sagroups.ieee.org/2800/.
I am interested in joining the ballot team. Where can I find information how to join?	To join the P2800 SA ballot group, please follow the instructions available on our website at http://sagroups.ieee.org/2800/wp-content/uploads/sites/336/2021/02/How-to-join-SA-Ballot-Feb3v1.pdf
Where can I find the draft copy of the standard?	If you join the ballot, you will be able to access a copy of the draft. Once the draft goes to ballot, it will also be sold as a draft on IEEE xplore.
When the draft P2800 will be available in myProject? Thanks.	The Initial Ballot draft of P2800 will become available to those who registered for the ballot group in early March.
Will ballot committee members get a copy of the final approved standard?	No a final copy of the approved standard will not be shared with the Ballot committee but it will be shared with WG members.
Is there a voltage limit for this standard? Say higher than 69kV	The short answer is, "No." Clause 1.4 (General remarks and limitations) includes a statement reading, "The criteria and requirements in this document are applicable to all inverter-based resource technologies interconnected to transmission systems (TSs) (i.e., both meshed and radial transmission and sub-transmission) voltage levels." The statement is followed by a footnote that clarifies, "For radial sub-transmission systems, this standard intentionally overlaps with potential application of IEEE 1547, in which case it will remain to the discretion of the authority governing interconnection requirements (AGIR) to decide which standard is applicable."
Is their a standard IEEE definition for Sub-Transmission? Some "Sub-Transmission" is just distribution (radial) at a bit higher voltage (e.g. 69kV). For this wouldn't IEEE 1547 2018 still be more appropriate.	Clause 1.4 (General remarks and limitations) includes a statement reading, "The criteria and requirements in this document are applicable to all inverter-based resource technologies interconnected to transmission systems (TSs) (i.e., both meshed and radial transmission and sub-transmission) voltage levels." The statement is followed by a footnote that clarifies, "For radial sub-transmission systems, this standard intentionally overlaps with potential application of IEEE 1547, in which case it will remain to the discretion of the authority governing interconnection requirements (AGIR) to decide which standard is applicable."
When the P2800 std is approved and published, when would the effective date, for use by regulatory entities, TSO's, etc.?	This will be decided by the responsible entity. Clause 1.4 (General remarks and limitations) currently includes a footnote stating, "The application of this standard may be limited to IBR plants for which an interconnection request is submitted after the date by which this standard is enforced by the responsible authority governing interconnection requirements (AGIR); this standard may not apply to IBR plants that are either already interconnected or for which an interconnection request had been submitted prior to the standard's enforcement date (grandfathering). Any substantial changes in an existing IBR plant, e.g., the "repowering" of a wind power plant, may require retrofitting that IBR plant to meet all of the requirements of this standard."
Once published, how would IEEE 2800 be enforced?	Utilities typically enforce interconnection standards, which can include references to IEEE standards. The utilities are typically regulated and therefore utility interconnection requirements need to be approved by those regulation entities. For transmission in North America, entities are often using the LGIP and SGIP process. Subtransmission system are often regulated by the ISO which requires utilities' interconnection requirements to be approved by the state PUC.
Would the standard become part of NERC enforceable compliance in North America?	All IEEE standards are "voluntary industry standards" by nature. Yet, a responsible entity like a transmission owner could adopt an IEEE standard by (simple!) reference in their IBR technical interconnection requirements (TIRs) or interconnection agreement. FERC may "adopt" IEEE P2800 in their LGIA and, as possibly applicable for IBR connected to meshed sub-transmission grids, also in their SGIA. NERC could either refer to to P2800 in a reliability guideline like this one: https://www.nerc.com/comm/OC_Reliability_Guidelines_DL/Reliability_Guideline_IBR_Interconnection_Requirements_Improvements.pdf At this point, it is not clear whether NERC and its stakeholders would refer to P2800 in a reliability standard like PRC-024 or other applicable standards.
Does IEEE P2800 apply to wind power plants?	P2800 is intended to apply to wind plants that use type III (doubly-fed generator, DFG) and type IV (full-rated power converter) wind turbine generators.

What is the approach of the P2800 panel on how to coordinate also with HVDC converters?	Clause 4.2.2 (RPA for dc-connected isolated IBR) specifies, "For isolated IBRs that are interconnected to an AC transmission system via a dedicated VSC-HVDC transmission facility, the VSC-HVDC transmission facility is considered as part of the IBR plant as shown in Figure 2 . As such, the RPA shall be located on the AC side of the VSC-HVDC transmission facility that interconnects with the TS."
Is P2800 limited to HVDC VSC only? If yes, why only limited to HVDC VSC, why not HVDC LCC also?	P2800 is limited to HVDC VSC because the VSC technology resembles the inverter technology used in wind, solar, and storage plants that are in the scope of P2800. The HVDC LLC technology may not be capable to meet the P2800 requirements.
In case of a Hybrid System, are there any specific standards for Microgrids which are applied?	P2800 does not include any requirements for a microgrid, or more specifically for an "intentional Area EPS island" . You may want to review Clause 8.2 (Intentional islanding) of IEEE 1547-2018 for some applicable requirements.)
As inverter manufacturer, i am not aware of the connection either in distribution system or transmission system will that be used? How far is it different between IEEE1547 and P2800	P2800 will require more stringent capabilities in general but also differs from 1547 in that it does not require any trip on voltage or frequency; it only allows trips outside the specified ride-through curves. It will be an OEM's decision i) how to design their inverters for a global market and ii) how to make them easily configurable to meet either 1547 or 2800 requirements. Please consider using this "Common File Format for Distributed Energy Resources Settings Exchange and Storage" available at https://www.epri.com/research/products/000000003002020201 . You may also want to become aware of https://dersettings.epri.com/ . Note that both sources are focused on distribution-connected resources (DER).
IEEE 1547 includes synchronous generators - why not 2800 to be consistent?	Different from IEEE 1547, the PAR for the scope of P2800 was intentionally limited inverter-based resources because of the following reasons: (1) interconnection requirements for bulk system connected synchronous generators already exist, including protection settings requirements specified in NERC PRC-024; (2) inverter-based resources have different capabilities compared to synchronous generators.
How does P2800 compare to existing synchronous generator transmission interconnection standards?	IEEE does not have any sync. gen. interconnection standards to date. IEEE has sync. gen. design standards for individual machines. Some NERC reliability standards like PRC-024 may impact sync. gen. design but are often less specific than an IEEE standards. Synchronous generators' response is based on physics that are well understood. IBRs' response, on the other hand, is largely based on control configurations. Thus, performance standards for IBRs tend to be more detailed than design standards for sync. gens. Or in other words: with IBR performance configuration "freedom" comes the need to "make decisions"; IEEE P2800 can help with the latter.
Will P2800 make inverter-based resources behave like synchronous generators?	Not necessarily. While the technical minimum capability requirements specified in the standard will raise the bar and require IBRs to perform as "good citizens" in the power system. One difference between IBR and sync. gen. is that the latter have been around for a century and the power system is all build on their specific capabilities ("good" and "bad"). With the emergence of IBRs, many transmission planners are unsure what performance to require and whether the technology is available cost-effectively. A standard like IEEE P2800 can close that information gap and be a technical reference for both parties to refer to. In that way, the standard can manage risks and expedite interconnection negotiations.
Does IEEE P2800 apply to synchronous machines, e.g., synchronous condensers?	In general, P2800 does not apply to synchronous machines. Where applicable, a synchronous condenser may be co-located with an IBR for grid stability reasons but P2800 requirements would then only apply to the IBR plant. However, where synchronous condensers are part of an IBR plant and are used as a "supplemental IBR device" to help the IBR plant meet P2800 requirements, they would then also need to conform to the applicable requirements. Refer to Clause 1.4 (General remarks and limitations), Clause 4.1.3 (Supplemental IBR devices) and Clause 12.2.2 (Type tests) for further information.
Is there an opportunity for curtailed inverter based resources to provide the specified services?	P2800 specifies only capability requirements. Whether or not to utilize these capabilities is outside the scope of the standard and may be subject to contractual or market agreements.
Can P2800 help reduce uncertainties of inverter response during faults?	Yes. Performance standards like IEEE P2800 and IEEE 1547 specify capabilities and performance requirements that reduce the uncertainties for how an inverter-based resource may respond to a fault or other grid event. The can help in the development and validation of models used in interconnection and system studies.
The presentation has been focused on USA. Is there a view to wider global adoption?	IEEE P2800 will be an international standard and has been drafted with leading global practices in mind. There are related IEC efforts but those have not reached the level of a "standard" yet, they are typically "technical guidelines" or "technical specifications". We expect P2800 to be applied outside the U.S. by entities that wish to catch up on forward-looking interconnection requirements, or that may be in need for widely accepted requirements. Please contact us if you have specific regions in mind where P2800 could be applied.

Technical Questions	Answers
Who is responsible for choosing whether the reference point of applicability (RPA) is the point of measurement (POM) and point of interconnection (POI).	Clause 4.2.1 (RPA for ac-connected IBR) states, "The interconnecting TS owner may adapt some or all performance requirements, as specified in this standard, and move their respective RPA to another location, including the point of interconnection (POI)."
Under Frequency Response, there are two categories – Fast frequency response and primary frequency response. Can you clarify how you make the distinction between the two? Some others seem to merge the two. Also, is secondary frequency response within the scope of the standard?	The current draft defines "fast frequency response" as, "fast frequency response: Active power injected to the grid in response to changes in measured or observed frequency during the arresting phase of a frequency excursion event to improve the frequency nadir or initial rate-of-change of frequency." The definition is intended to align with the NERC IRPWG definition in this white paper: https://www.nerc.com/comm/PC/InverterBased Resource Performance Task Force IRPT/Fast_Frequency_Response_Concepts_and_BPS_Reliability_Needs_White_Paper.pdf
How fast response to prefault power is expected after successful fault ride through for solar farms. Since today's solar pv farms have longer time response of around 5 seconds which has significant influence in the transmission system	The current draft requires "the IBR plant shall have capability to restore active current output to 100% of pre-disturbance level in 1.0 second"
Does the standard define how the droop and inertia control loops need to be developed?	No, the standard only specifies performance requirements of the plant but leaves room for plant developers and inverter OEMs to decide how to implement/design their equipment.
Hi does this standard cover the function requirements of an inverter to disconnect and resynchronize with Grid.	The requirements you are asking about are specified in Clause 4.10 (Enter service) and Clause 7.4 (Return to service after IBR plant trip).
What does it mean that P2800 includes "Validated Models" but not "model validation"?	The current draft requires that "validated models" be provided by the IBR plant owner/operator to the Transmission System owner/operator. But it does not specify the procedures or acceptance criteria. This may be addressed in other projects like P2800.1, P2800.x, and P2882.
Please say more about Phase jump ride through and how the standard applies	Review Clause 7.3.2.4 (Voltage phase angle changes ride-through). The current draft specifies that "The IBR plant shall ride through for positive-sequence phase angle changes within a sub-cycle-to-cycle time frame of the applicable voltage of less than or equal to 30 electrical degrees."
you mentioned that there was discussion about precedance between frequency response and reactive power, What was divided with regards to control action. Can't both be done at the same time like in synchronous generation.	Review Clause 4.7 (Prioritization of IBR Responses) currently specifies the following priority order: a) disabling permit service setting b) tripping due to self-protection of equipment, must not occur within the envelopes specified in the ride-through requirements c) IBR plant ride-through requirements d) active-power/frequency response requirements e) response to active power limit signal f) reactive power/voltage control functions
Does P2800 get into the operation of IBRs in low short circuit levels and any related capability requirements?	The Initial Ballot draft does not specify a minimum SCR but includes an informative Annex C (Inverter stability and system strength) that discusses system strength and select metrics in sub-clause C.2.
For LVRT, what if there is a dynamic transient and the PCC voltage swings back and forth below several LVRT levels? should the timing be reset when the voltage goes back over a level or is there a reset timing?	Informative Annex D (Illustration of voltage ride-through capability requirements) clarifies that the LVRT curves are specified as "voltage versus time curve: For a given voltage, the IBR plant shall not trip until the time duration at this voltage exceeds the specified minimum ride-through time duration." Given that P2800 does not require any voltage trip, the attendee's question may be irrelevant as long as the inverter and/or plant is designed with sufficient robustness to perform LVRT. Please review slides 23ff of the general information slide deck on our website to join the appropriate Sub-Working Groups that have addressed that matter: http://sagroups.ieee.org/2800/wp-content/uploads/sites/336/2021/01/IEEE-P2800_General-Information.pdf
How does frequency ride through compare with NERC standard?	The initial ballot draft requirements for frequency ride through meet or exceed applicable NERC standards like PRC-024.
Does this standard covers IBR transient immunity?	Yes. Refer to Clause 7.2.3 (Transient overvoltage ride-through requirements).
Why does the standard not specify harmonic voltage limits?	Harmonic current distortion limits are specified in Clause 8.3.1 (Harmonic current distortion). Harmonic voltage distortion limits or requirements are recommended to be established in a possible future revision of this standard; until then, they may be determined by other guidelines such as IEEE 519 or IEC TR 61000-3-6. An informative Annex E (Voltage Harmonics of Inverter-Based Resources) provides further information.

Does the current draft the applicable range of short circuit ratio in reactive power capability and voltage ride through?	The Initial Ballot draft does not specify a minimum SCR but includes an informative Annex C (Inverter stability and system strength) that discusses system strength and select metrics in sub-clause C.2.
Is there any reference short-circuit ratio (SCR) or WSCR (or a similar index) in the standard? For example a minimum acceptable value for interconection of an IBR?	The Initial Ballot draft does not specify a minimum SCR but includes an informative Annex C (Inverter stability and system strength) that discusses system strength and select metrics in sub-clause C.2.
Each inverter in an IBR plant may respond differently to a grid event; and sometimes even the same inverter may respond differently to similar grid events. How does P2800 address this issue?	Performance standards like IEEE P2800 and IEEE 1547 specify capabilities and performance requirements that reduce the uncertainties for how an inverter-based resource may respond to a fault or other grid event. The can help in the development and validation of models used in interconnection and system studies. As for P2800, Clause 12 (Test and verification requirements) specifies a framework to evaluate compliance with the standard. This framework relies on a combination of type tests, plant-level design evaluations, commissioning tests, and post-commissioning monitoring. The objective of Table 21 (Verification methods matrix) is to specify required verification steps that can help reduce the uncertainty of inverter response.