

White Paper: BPS-Connected Inverter-Based Resource Priorities

NERC Inverter-Based Resource Performance Task Force (IRPTF)

June 2020

Background

The NERC Inverter-Based Resource Performance Task Force ([IRPTF](#)) consists of a diverse set of industry experts who are collectively leading efforts to ensure reliable operation of the bulk power system (BPS) with increasing penetrations of BPS-connected inverter-based resources. Figure 1 shows the breadth of industry expertise participating on IRPTF, bringing together a wide range of industry members to address emerging reliability risks in this area. Notably, the IRPTF has published or supported publication of the following:

- [Disturbance Report](#): Blue Cut Fire Disturbance
- [Disturbance Report](#): Canyon 2 Fire Disturbance
- [Disturbance Report](#): Palmdale Roost and Angeles Forest Disturbances
- [Reliability Guideline](#): BPS-Connected Inverter-Based Resource Performance
- [Reliability Guideline](#): Improvements to Interconnection Requirements for BPS-Connected Inverter-Based Resources
- [Technical Report](#): BPS-Connected Inverter-Based Resource Modeling and Studies
- [White Paper](#): IRPTF Review of NERC Reliability Standards
- [White Paper](#): Fast Frequency Response Concepts and BPS Reliability Needs

The IRPTF has continued to refine its priorities, focusing on key topics that industry experts and NERC have identified as potential BPS reliability risks either in the near-term or longer-term time horizons. In this regard, IRPTF conducted a survey of priorities in June 2020 and is documenting the outcome of this survey in this short white paper.

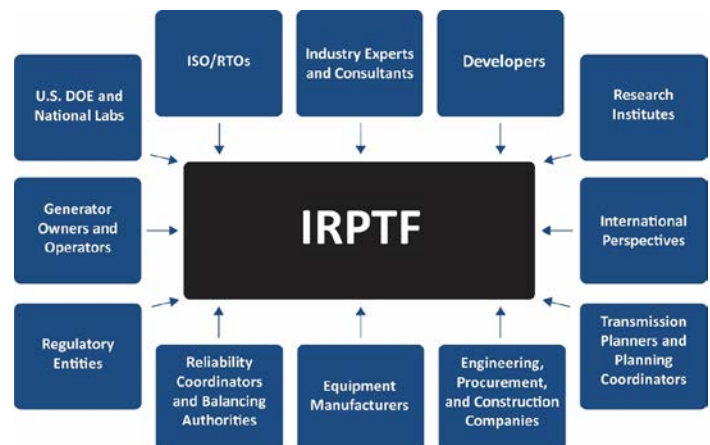


Figure 1: IRPTF Membership

IRPTF Survey Results

The NERC IRPTF conducted a survey of its own membership to prioritize and further develop its work plan. The survey consisted of two questions:

1. Please list your recommended priority ranking for each existing or possible future IRPTF work task.
2. Please list any other topics not listed above that you believe IRPTF should be covering and provide your recommended priority (high, medium, low).

The survey included responses from over 75 team members across a wide range of organizations and areas of expertise.

Question 1: Priority of Existing or Possible Future IRPTF Tasks

Question 1 included ten items of existing or possible future tasks for IRPTF to address, based on brainstorming that occurred at a recent IRPTF meeting. Figure 2 shows the survey results (high ranking equates to higher priority), and the priority ranking of each item is as follows:

1. Reliability Guideline: BESS and Hybrid Plant Performance, Modeling, and Studies (existing)
2. Reliability Guideline: EMT Modeling and Simulation (existing)
3. Follow-Up and Tracking: Positive Sequence Modeling Issues (existing)
4. Technical Report: Energy Transition to High IBR Penetrations (existing)
5. White Paper: TP/PC Stability Criteria in High IBR Penetrations (possible future)
6. Technical Report: BPS Protection System Impacts from Increasing Penetrations of IBRs (existing)
7. White Paper: Grid Forming Technology (possible future)
8. White Paper: Frequently Asked Questions for Newly Interconnecting BPS-Connected Inverter-Based Resources (possible future)
9. White Paper: Technical Challenges with the Existing BES Definition Criteria (possible future)
10. White Paper: Utilizing Overbuilt IBRs for Frequency Response (possible future)

The top four priorities are already existing IRPTF work products that are already underway; this solidifies that the IRPTF work plan is well aligned with a broader spectrum of topics being considered by industry. In addition, five out of the top 6 are existing work products. Similarly, both the white papers on TP/PC stability criteria and grid forming are being covered (in some manner) by the energy transition technical report. It may be worthwhile for IRPTF to dive deeper into those topics specifically with separate work products.

The items prioritized here will help IRPTF focus specifically on the highest priority topics in the near-term while balancing all higher priority topics as well.

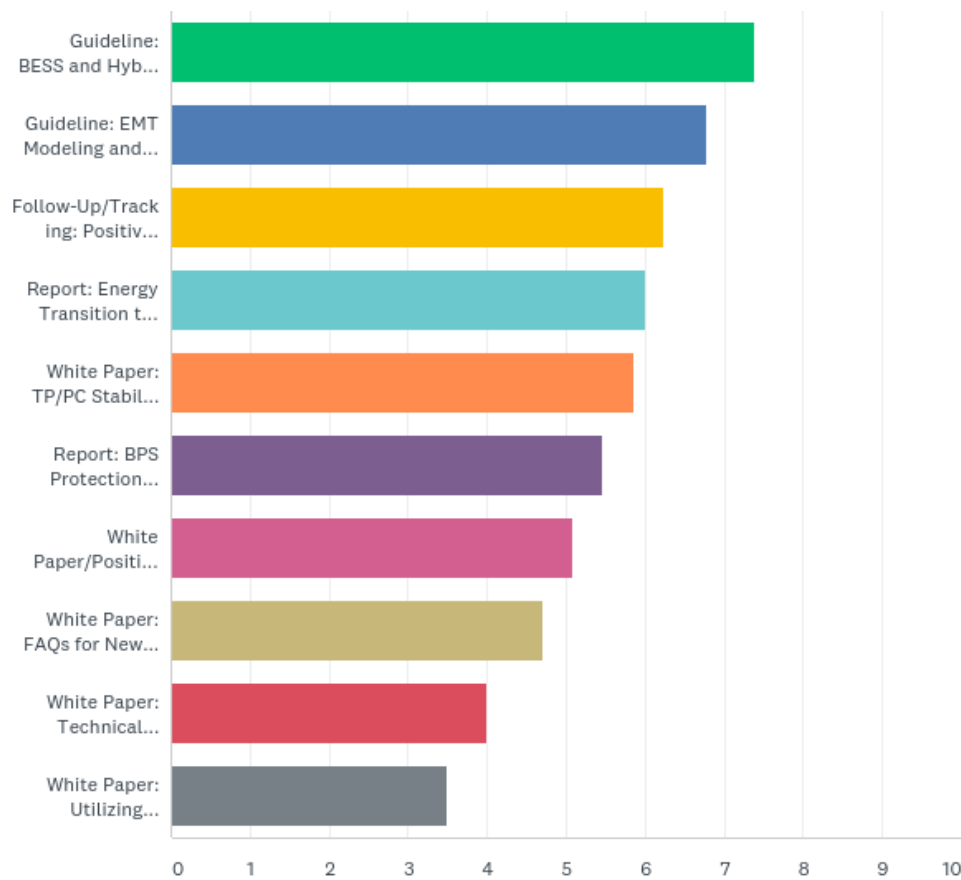


Figure 2: Results of Prioritization of IRPTF Work Tasks

Question 2: Other Topics Not Listed

Question 2 was an open-ended question regarding any additional topics that should be considered by IRPTF in the future. The following items are listed in terms of the number of responses received and priority of those responses:

1. Recommended performance of power oscillation damping controls for inverter-based resources and recommended ways to develop interconnection requirements around these controls
2. Modeling, screening studies, and detailed simulation methods for studying potential risks of subsynchronous control interactions and subsynchronous resonance with increasing penetrations of inverter-based resources
3. Guidance around inverter-based resource commissioning and model development/validation during and after plant commissioning
4. More detailed guidance and case studies regarding modeling, studies, and performance requirements in areas of low short-circuit strength
5. Standardized inverter controls and capabilities

6. New simulations methods (e.g., hybrid simulations or co-simulations) that combine positive sequence simulations with short-circuit and electromagnetic transient simulation tools
7. Cybersecurity implications of growing levels of inverter-based resources on the BPS
8. Inverter-based resource modeling for short-circuit studies, and considerations for short-circuit related standards requirements where advanced modeling practices are needed (e.g., PRC-026-1)
9. Additional specifications for criteria or requirements such as sub-transient versus transient performance requirements, protection of synchronous generation during ramping periods, and minimum reserve requirements with increasing penetrations of inverter-based resources
10. Impacts of new distribution-connected technologies (i.e., Internet of Things, electric vehicles) and growing distributed energy resource penetrations combined with growing penetrations of BPS-connected inverter-based resources
11. System model validation for past disturbances such as the Blue Cut Fire, Canyon 2 Fire, or Palmdale Roost disturbances