

Orange and Rockland Comments:

- The document only comments on Wye-gnd-Wye-gnd generator step-up (GSU) transformers. It should be expanded to include other GSU transformer configurations for thoroughness.
- The power factor section refers to "...terminals of the generator", but shouldn't it be measured at the "reference point of applicability (RPA)" as per IEEE 1547-2018 4.1?
- Is the section at the bottom of page 23 that references IEEE-1547.1-2020 correct? I thought it should reference IEEE 1547-2018, which is the standard. The IEEE 1547.1 is the guide for testing that inverters comply with the requirements of the standard.

Comment Response- Over time and as the industry and NPCC learn more about other GSU transformer configurations we will add them to the document, if there is a sufficient number which may affect DER integration. As NPCC continues to revise and create future versions of the document, I would encourage O & R to provide us with further information on this matter.

References to the correct versions of IEEE 1547 have been corrected and the Power Factor section has been revised.

Thank you for your comments.

IESO Comments:

The IESO respectfully submits the following feedback in response to the July 1, 2020 NPCC Request for comment on Version 2 of the NPCC Guidance Document, 'Distributed Energy Resources (DER) Considerations to Optimize and Enhance System Resilience and Reliability'

Generally, the Guidance document meets its objective of being an information resource for NPCC members. However, we believe it could be made more helpful to users by organizing its contents into separate topics or issues with appropriate headings, and within each topic, creating sub-sections such as Technical Description, Key Considerations, Member Practices and NPCC Guidance, Resources etc. All sections should be numbered for ease of reference and a Table of Contents should be included. These formatting changes would enable users to find information easily, and to quickly hone in on a specific topic of interest.

Comment Response- The document currently has a Table of Context that in the view of the working group sufficiently organizes and breaks down content and allows easy access. If in the next version IESO has continued interest in further breakdown of this document into marked subsections, we can add them at that time.

The IESO offers the following specific feedback on the content of the document;

In the executive summary section, there is reference to NPCC filling a role in identifying additional areas where the region may provide information and services to promote reliable deployment of DER. Specifically of interest was the idea of NPCC facilitating the coordination between State and Provincial Government Regulatory Authorities, and distribution utilities. While the IESO in principle supports NPCC playing this role, due to jurisdictional concerns, we do not agree with the inclusion of Provincial Government Regulatory Authorities.

Comment Response- IEEE mentions the importance of working with the Authorities Governing Interconnection Requests (“AGIR”) which are the local regulators. Also NERC has tasked the regions with increasing coordination activities with local state and provincial regulators. NPCC began conducting these activities in the second quarter of 2020. The role being referred to is strictly an informational one.

In the ‘Introduction and Objective’ section, the document states;

“A consistent defined term for what type of generating, demand or storage resources are included in DER is not broadly accepted by industry stakeholders. Also, DER is not currently a term that is defined by NERC.

For the purpose of this NPCC guidance document, DER refers to:

Any non-BPS connected real or reactive power resources (generating units, multiple generating units at a single location, distributed generation installations, battery storage systems, etc.) located within the boundary of any distribution utility’s service territory, regardless of capacity, allowing individual DER to be captured if they are not aggregated. Some DER technologies are more intermittent in their production characteristics than resources which operate based on a controllable fuel input.”

NERC is presently developing a ‘DER Definition Document’ through SPIDERWG, which is referenced in the appendix of this document. While this guideline suggests there are no broadly accepted definitions, the IESO suggests that the document acknowledge the NERC draft document, as to not develop contradictory definitions within NPCC documents compared with NERC documents. The NERC document is available here, on the [SPIDERWG landing page](#). Should NPCC choose to maintain the above “working definition,” we suggest removing the final sentence commencing with “Some DER technologies...” and possibly include it in the discussion of DER characteristics, since it seems misplaced. Additionally, the IESO would request additional clarity around what is meant by the term “captured” as it pertains to this definition.

Comment Response- What constitutes DER remains under discussion. While NERC has used a conceptual definition, there is not broad agreement across the industry of what the definition of DER should be. There has been discussion that NERC should develop a definition and put it through the Standards Development Process but this has not been initiated at this time. In addition, FERC released Order 2222 as it relates to DER

participating in the wholesale markets in the US. In this order there is information on what the FERC believes should be included as part of DER. NPCC will continue to monitor how this develops and try to align the NPCC documents with what the industry accepts.

In the section NPCC Interconnection Guidance, where PRC-024-2 is mentioned, we recommend including a footnote referring to the recent approval of PRC-024-3 in the US which is expected to become effective in two years' time. Alternatively, this could be mentioned in the Voltage Response section, in the penultimate paragraph before "Quebec Interconnection"

Comment Response- Footnote added

IEEE 1547.1-2020 is referenced continually throughout the document. Since this standard will likely only apply to new facilities on a go-forward basis, we believe it will be helpful to highlight in the section on 'Interconnection Guidance', the various NPCC members' approaches for mitigating the potential negative impacts of those facilities that were installed in compliance with earlier versions of IEEE 1547, e.g. surveying to determine the capabilities of DER and where setting changes are feasible; grand- fathering; etc.

Comment Response- The purpose of the document is to reliably integrate DER and in the Executive Summary section it states "The document outlines both existing DER deployment practices and strategies as well as how a future with increased penetration of DER and internet controllable devices could be reliably coordinated." The document is meant to be forward looking. NERC has a number of initiatives underway at the SPIDERWG level to address modeling and planning of DER with legacy inverters already in place.

In the 'Energy Storage Systems for DER' section the document references "Figure 3". Please provide some context to explain why the inverter capability is dependent on the time of day?

Comment Response- Some additional explanation added.

Within the 'DER Recommendations' section, the document provides a series of recommendations to be implemented within the region going forward. In the interest of ensuring the effective usage of NPCC member resources, the IESO requests that the document specifically identifying applicable roles for each recommendation.

Finally, below are a few editorial comments:

In the final paragraph of "Introduction and Objective,"

- Correct the typo "proovide"
- Insert "activities" or "initiatives" or equivalent after "North American wide"

In the Frequency Support section, after Distribution Provider,

- Change "transmit" to "transmits"

- In the final paragraph, change “rang” to “range” and update the reference to the NPCC regional standard.

In the SCADA communications section,

- Please clarify what is meant by “when working on a feeder in emergent or planned outage situations.” Should this be “emergency”?

In Appendix E, State and Provincial AGIR Information, on page 42,

- Replace “As noted above, the Ontario Energy Board” with “The Ontario Energy Board”

Comment Response- Corrections made, thank you for your comments

National Grid Comments:

Executive Summary (page 5, 3rd paragraph): Please consider if it is necessary to include, “...installed on the distribution system...” in regard to DER.

As Distributed Energy Resources (DER) *installed on the distribution system*, continue to replace traditional industry generation resources the resource fuel mix and operational characteristics of the system will change. DER will necessitate changes to how the system is planned and operated. The North American Electric Reliability Corporation (NERC) Reliability Standards are not applicable to equipment on the distribution systems unless such equipment has a direct impact on the “reliable operation”³ of the BPS, such as Automatic Underfrequency Load Shedding (UFLS). However, as penetration of DER increases, planning and operating assessments used to assure reliable operation of the BPS will need to accurately represent how DER interacts with the BPS.

Comment Response- Comment accepted

WECC Comments:

Page 8 on the first paragraph:

Comment from WECC staff suggests NPCC may want to touch on the safety considerations as well. The local distribution company still needs to be able to ensure that these DERs don’t cause safety issues for distribution line workers.

Comment Response- A statement was added to mention safety considerations however this is beyond the scope of the Regional Entity.

Data availability is also a challenge in some locations, maybe the NPCC footprint has access to the data.

Comment Response- SPIDERWG is developing guideline documents and also a SAR was submitted to revise MOD-032. NPCC will monitor these activities and if any regionally specific activities can be added to the document we will do so in a future revision.

Page 8 on the second paragraph:

Is there any need to think about EMT in addition to this co-simulation discussion? Depending on how complicated DER controls are.

On an interconnection wide level may also be worth considering something like the composite load model. It is complicated but not nearly as complicated as the co-simulation idea.

Comment Response- NPCC added some language referring to the composite load models which is used by some of the planners. EMT is an evolving topic and we will be monitoring this. SPIDERWG is also working this.

Page 8 on the last paragraph:

Collecting information on DER impacts seems to be a worthwhile objective; however, WECC wonders if there is enough of a common understanding of what is meant by “DER impacts” to obtain any valuable information from such a form? The DER Impact Form seems somewhat ambiguous and WECC wonders if it’s clear to the distribution companies what “DER impacts” mean and what needs to happen to trigger populating the form.

Comment Response- NPCC has presented this to the Region’s members to promote understanding of what the form and process are intended to accomplish. Further explanation may not be helpful here but as we continue to refine both the DER Guidance document and the form itself we will take this into consideration.

Who is expected to fill out the form? May want to consider the source of the data this form seeks. How is the root cause analysis carried out?

Comment Response- NPCC has this posted on its website and the expectation is any entity within the Region can fill it out. There is an associated process that would be carried out either by NPCC’s technical committees or, if not a Regional problem, it would be referred to NERC.

Page 9 on “DER ability to provide regulation and reserves”:
Does controllability fit into this same line of thought?

Comment Response- Yes, added a statement.

Page 9 on “Observability and situational awareness of DER”:
Assuming if this information is available in real-time, could it also be aggregated to improve planning processes. Would it be useful to add a bullet about data availability and verification?

Comment Response- Yes added a phrase

Page 9 on “DER on the System Restoration and Black Start Plans”:

DER can be used to supplement black start as well so that might also be considered

Comment Response- We believe this is sufficiently captured in the existing text.

Page 9 on NPCC Interconnection Guidance:

This section (the portion up to the Voltage Response section) contains a lot of different types of information. Suggest creating some structure within this section to better categorize the information presented so it is not in the form of a series of paragraphs.

Comment Response- This document will need continual update and suggest that in a future revision, WECC be actively involved in its revision and make suggestions at that time.

Page 11 on “The DER owner”:

Who is this referring to? Is this the homeowner in the case of rooftop solar? Should this be manufacturer?

Comment Response- In the context here it is meant to be the owning entity responsible for its operation. Clarification added

Page 11 on “The DER owner”:

Same question as above, who is DER owner referring to? Maybe manufacturer or installer would fit better.

Comment Response- Same as above

Page 12 on the third paragraph:

WECC comments that this is a positive note; recommending utility interconnection requirements reference latest IEEE 1547 Standard

Page 13 in the last paragraph the word “rang”:

Misspelling

Comment Response- Corrected

Page 14 first paragraph:

WECC staff was unsure of what was happening here. Is the generation facility also DER?

Comment Response- Clarification provided

Page 20 on “Automatic Underfrequency Load Shedding (UFLS) Programs”:

Just a positive comment; this a great discussion and valuable information when considering impacts of DER

Page 20 on “Some utilities, such as Duke Energy avoid choosing those distribution feeders for the UFLS program that have DER interconnected to them”:

That may work now, but it seems that some time down the road, most, if not all feeders, will eventually have DER. What will they do then?

Comment Response- DER continues to proliferate and as we see increasing amounts, how we plan and operate will change. Approaches used today will likely have to change in the future.

Page 21 in the “Resource Adequacy” paragraph:

This is true; would more detailed discussion be useful. Linking this information to the planning model has seemed to be a challenge.

Comment Response- Future versions of this document will contain more detail on how resource adequacy will be conducted. The current LOLE of 1 day in 10 years will in all likelihood change. EPRI, NREL and others are studying what an appropriate resource adequacy study approach might look like.

Page 21 on the “The Energy Storage Association (ESA) anticipates at least 35 GW of new energy storage will be deployed in the United States by 2025.”:

Interesting information but this does give this document a shelf life?

Comment Response- Agree and NPCC will have to continually update this document as we learn more about DER and the reliability, security and safety associated with its deployment.

Page 22 on “Figure 3”:

This figure is a little difficult to read

Comment Response- Increased the size

Page 22 on “IEEE-1547.1-2020 has a communication port requirement.”:

Very positive the repeated reference throughout this document to comply with current version of IEEE 1547 Standard.

Page 22 on “DER owners”:

Scada equipment further complicates the idea DER owners.

Page 24 on “Obtain DER modeling data to be able to model”:

WECC suggests considering adding some discussion about being able to adapt as the technology advances and new options arise. Things like allowing utility control of the DER output.

Comment Response- Further clarifications and discussions have been added to the document. Thank you for your comments.

PSEG Commentes:

Page 10 on IEEE 1547.1-2020:

Incorrect reference. The title is correct, but that title is for IEEE 1547-2018. The standard number shown here is for the test standard that supports IEEE 1547-2018, but does not establish any default settings.

Page 10 on IEEE 1547.1-2020:

This is incorrect!! IEEE 1547.1-2020 does NOT replace IEEE 1547-2018. IEEE 1547.1 is a separate test standard that supports testing for compliance with IEEE 1547. There is an amendment of IEEE 1547-2018, which is designated as IEEE 1547a-2020 which makes a very few small changes to IEEE 1547-2018.

Page 11 on IEEE 1547.1-2020:

Wrong number - should be IEEE 1547-2018.

Page 11 on Guideline IEEE 1547.1-2020:

The hyperlink is correct, and it links to the NERC guidance document for applying IEEE 1547-2018. So just the text here is wrong, and should be Guideline IEEE 1547-2018.

Page 11:

This contradicts the requirements of IEEE 1547-2018, which sets more extensive requirements (phase-to-phase voltage measurement in addition to phase-to-ground, in most cases). Rather than duplicate inaccurately and inconsistently, simply just refer to the provisions of IEEE 1547-2018, which are quite detailed.

Page 12 on 1547.1-2020 at six different locations:

1547-2018. If a specific dated version is referenced, then the text should not say "most current version". If most current version is intended, just write IEEE 1547 (without year). Annex B of IEEE 1547.1-2020 is about test results reporting, and nothing about voltage trip settings. Clearly, what is meant here is IEEE 1547-2018.

Page 13 on 1547.1-2020 at four different locations:

1547-2018

Page 14 on 1547.1-2020 Clause 4.10.3:

There is NO Clause 4.10.3 in IEEE 1547.1-2020. This should be IEEE 1547-2018.

Page 15 on IEEE Std. 1547.1-2020 at two different locations:

IEEE 1547 (don't specify date if "current version" is specified) and IEEE 1547-2018.

Page 16 on Certification per UL 1741 SA as grid support utility interactive inverters:

UL-1741 SB will be completed soon, and this will be completely consistent with IEEE 1547-2018 (as amended by IEEE 1547a-2020) and the IEEE 1547.1-2020 test standard.

Page 16 on IEEE Std. 1547.1-2020:

this reference to IEEE 1547.1-2020 can be considered correct because this is the test standard, which defines certification requirements related to the performance requirements specified in IEEE 1547-2018.

Page 16 on IEEE Std. 1547.1-2018:

No such standard as IEEE 1547.1-2018. This should be IEEE 1547-2018, and "2nd edition" makes no sense.

Page 16 on IEEE 1547.1-2020:

IEEE 1547-2018

Page 18 on IEEE 1547.1-2020:

IEEE 1547-2018

Page 19 on IEEE 1547.1-2020:

IEEE 1547-2018

Page 19 on Power Quality:

Not relevant to BPS concerns. This is purely a distribution issue.

This is not consistent with IEEE 1547-2018, which requires DER to have adjustable power factor over a defined range.

Page 19 on Induction power generators:

This is not consistent with IEEE 1547-2018, which requires Category A DER to provide reactive power equal to 0.9 pf at rated output, and absorb reactive power to 0.95 pf at rated output.

Category B, which generally applies to all inverter DER, must provide any required pf from 0.9 leading to lagging.

Page 19 on Islanding:

This is not a BPS issue. This is a distribution issue. The impacts on the BPS are from measures to avoid islanding, such as over-sensitive relaying that trips for transmission events, or "active anti-islanding" schemes that are effectively power system de-stabilizers, and could potentially have adverse impact on BPS dynamic stability.

Page 20 on Effective Grounding for DER:

This is not a BPS related issue. This is purely a distribution issue. Information provided here is faulty anyhow; best to just delete. It is irrelevant to the scope of this document.

Page 21 on "It also allows low outputs of DER which may be outside the operational range of an inverter to be harvested for charging on-site storage allowing better utilization of the total resource."

This sentence doesn't make sense. If resource output is too low for an inverter to handle (and inverters can operate at a fraction of a percent of rated) then the charge controller cannot use this energy to charge the battery. What should be said, in substitution, is that with high dc/ac ratios (i.e., more PV capacity than the inverter's power capability), the excess generation can be stored, but only if the storage is dc-coupled and not ac coupled."

Page 22 on IEEE 1547.1-2020:

IEEE 1547-2018

Page 22 on “This ensures that the output remains visible to the system operator”.
No, it does not! The DER having a port is only part of what is needed to provide operator visibility. There also needs to be a communication means, which is neither specified nor required by IEEE 1547-2018, and an information system infrastructure to provide the information to the operator in a meaningful and useful way, such as a DERMS.

Page 22 on IEEE 1547.1-2020:
IEEE 1547-2018

Page 23 on Process and Risk Management Recommendation:
Add recommendation that distribution utilities do not apply protections that defeat the ride-through capability of DER for-BPS faults and disturbances. (Some distribution utilities have openly stated that they intentionally defeat ride through, others apply protections that inadvertently have this impact (e.g., sensitive phase overcurrent trip on synchronous generator DER)

Page 24 on IEEE 1547.1-2020 at two different places:
IEEE 1547-2018

Page 25 on “Delayed Voltage Recovery (FIDVR) or at 0.88 p.u.”
It should be noted that synchronized measurements performed by Southern Cal Edison show that FIDVR is more severe, and with much longer duration, at the distribution level compared to the delayed voltage recovery observed or modeled at the transmission level. Thus, margin to PRC-024 is important.

Page 25 on 1547.1-2020 Clause 6.5.1:
IEEE 1547-2018
Clause 6.5.1 of IEEE 1547.1-2020 defines the purpose of the configuration information test, and has nothing to do with frequency trip settings.

Page 25 on 1547.1-2020 Clause 6.5.2:
IEEE 1547-2018
There is no Clause 6.5.2.7 in IEEE 1547.1-2020

Page 25 on 1547.1-2020 Clause 4.10:
IEEE 1547-2018
There is no Clause 4.10 in IEEE 1547.1-2020

Page 30 on IEEE 1547.1-2020:
SPIDER has said NOTHING about IEEE 1547.1-2020!!. It appears that someone has made an erroneous global replacement of IEEE 1547-2018 with IEEE 1547.1-2020 throughout this document.

Page 30 on IEEE 1547.1-2020:
IEEE 1547-2018

Response to Comments- NPCC worked with PSEG and all corrections noted above have been made, Thank you for your comments