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Summary of September 28 Meeting

At the second workshop in the Incorporating updated standards: IEEE 1547-2018 workstream the discussion revolved around the near-term and mid-term items in IREC's Decision Matrix, based on their BATRIES Toolkit. The near-term items were initially presented in the August 31 workshop. The following are highlights of the discussion as recorded by Staff. If you believe anything is missing or in error please reach out to Ted Drennan.

Near-term Issues

The discussion started with the near-term issues. Workshop participants were asked if there were any other issues listed in the mid- or long-term lists that should be examined instead as a near-term issue. Parties did not raise anything additional. The following will break down the discussion by each topic listed in the decision matrix.

Adoption Timeline

This first issue discussed was the Adoption Timeline, with the associated decisions shown in the table below. Parties did not raise objections to the compliance date being April 1, 2023 or later for DO 1a. There could be issues with availability of inverters that are compliant with the IEEE 1547-2018 standards, thus a later date may be appropriate.

DO 1b examines the appropriate date for interconnection customers to comply with the requirements. Here the consensus position was to use the application submittal date, with the understanding that the application needed to be complete.

The final issue, DO 1c, is timed to match with the decision in 1a.

Do parties agree with that these are the consensus choices? If not, please provide alternative selections, with the reasoning behind the choice. Do parties have a date in mind that would work in DO 1a-2? Staff would propose July 1, 2023 – should equipment not be available the Commission could order a new date for compliance. We can reassess closer to the end of 2022.

What to consider?	Decision Option (DO) Description	Utilize?
Consider equipment availability, the use of UL 1741 SA certification in the interim (if needed), and whether naming a date certain is necessary before certified equipment is	**DO 1a-1:** Comply with IEEE 1547-2018 beginning [some date before April 1, 2023].	☐

widely available. Compliance requirements are usually based on the interconnection application submission date. Some projects have long interconnection review and lead times and may not be installed long after the application date. A mechanism to require some of those projects with earlier application dates to be 1547-2018 compliant once installed could be beneficial for grid support. Installed MW with 1547-2018 compliance could be increased if compliance is based on installation date, but this may be challenging for developers from a planning perspective, as they may have to specify equipment that is not yet certified for 1547-2018. This issue may be mitigated if UL 1741 SA inverters are utilized, which can have similar features as those required by UL 1741 SB/1547-2018. Also consider how an interim adoption period will be implemented, allowing for 1547-2018 compliance before the deadline. Widely available UL 1741 SB certified equipment is expected on the market by around April 1, 2023. More information is available on IREC's research on equipment availability.[1] [MTGS II]	**DO 1a-2:** Comply with IEEE 1547-2018 beginning ~April 1st, 2023 or a later date.	☒
	DO 1a-3: Comply with IEEE 1547-2018 when the equipment is readily available (TBD by Commission action).	☐
	DO 1b-1: Base compliance date on application submission.	☒
	DO 1b-2: Base compliance date on installation (may be useful for larger projects with long lead times).	☐
	DO 1b-3: Differentiate compliance date mechanism between smaller and larger projects.	☐
	DO 1c-1: Allow interim compliance with IEEE 1547-2018 beginning immediately.	☐
	DO 1c-2: Define another interim compliance pathway.	☒

Abnormal operating performance category

Discussion around abnormal operating performance category focused on the differences between Category II and Category III ride through capabilities for inverter-based DERs. IREC's proposal is to use Category III, parties did not seem to object to this approach. The updated Category III standards are wider than those included in the IEEE 1547 – 2003 standards.

Staff would like to know if there are any parties who object to the use of Category III Ride-Through Capabilities going forward, and to the underlying rationale for the objection.

What to consider?	Decision Option (DO) Description	Utilize?
Consider input from transmission operators or regional reliability coordinator when assigning ride-through categories, plus local distribution utility protection practice. Since there can be conflict between distribution utility desires and bulk system reliability, 1547-2018 designates oversight of this selection to the Authority Governing Interconnection Requirements – often the Public Utilities Commission. [MTGS V.A]	**DO 2-1:** IEEE 1547-2018 Category III Ride-Through capabilities must be supported for inverter-based DER. Rotating DER must meet Category I Ride-Through capabilities, at minimum.	☒
	DO 2-2: IEEE 1547-2018 Category II Ride-Through capabilities must be supported by inverter-based DER, at minimum. Rotating DER must meet Category I Ride-Through capabilities, at minimum.	☐

[1] https://irecusa.org/blog/regulatory-engagement/new-research-sheds-light-on-when-key-smart-inverters-will-be-available/

Normal operating performance category

For the normal operating performance category, stakeholders did not raise objections to requiring inverter based DERs meeting the more stringent Category B requirements for reactive power.

Staff would like to verify this is the correct understanding; stakeholders should provide reasoning behind their proposal.

What to consider?	Decision Option (DO) Description	Utilize?
The selection of A or B will impact the use of voltage regulation controls. Some DER types cannot meet the full scale of reactive power support. Consider specifying category assignment based on technology type. [MTGS V.A]	**DO 3-1:** Inverter-based DER shall meet reactive power requirements of 1547-2018 Category B. Rotating DER must meet Category A and may meet Category B.	☒
	DO 3-2: All DER types (Inverter-based and rotating) shall meet reactive power requirements with 1547-2018 Category A.	☐

Alternative performance category

For the alternative performance category the discussion touched on the time requirements for designing an alternate process for DERs that cannot meet the standards proposed above. Conversely, an alternative approach could offer more transparency for DERs that fail the requirements. From the discussion, it appears parties are comfortable with leaving the process undefined at this point.

Staff would like to know if stakeholders are fine with an undefined process, or would like a defined process. If the latter, Staff requests stakeholders also provide a process proposal.

What to consider?	Decision Option (DO) Description	Utilize?
If a technology that cannot meet the specified Abnormal or Normal Operating Performance Category, a defined process may be useful for determining that the technology can safely interconnect without unduly impacting grid support requirements.	**DO 4-1:** Define process for how exceptions to these category assignments are handled (e.g., for an inverter-based technology that cannot meet Category III capabilities).	☐
	DO 4-2: Leave process undefined for how exceptions to these category assignments are handled.	☒

Voltage trip settings & ranges

For voltage trip settings and ranges, the options were to go with the default settings as included in the IEEE-1547 standards, or select non-default settings. Parties did not offer an alternate to the default settings at the workshop.

If parties would like something other than use of the default settings they should offer a proposal for settings that would prefer, along with an explanation.

What to consider?	Decision Option (DO) Description	Utilize?
Consider local distribution utility protection practices and make sure appropriate trip settings are selected. As desired, select default settings or settings within the adjustable range. Trip settings should not hinder ride-through capability required at the transmission level.	**DO 5-1:** Align default settings with 1547.	☒
	DO 5-2: Select other default settings within 1547 ranges of adjustment.	☐

Frequency trip settings & ranges

For frequency trip settings and ranges, the options again were to go with the default settings as included in the IEEE-1547 standards, or select non-default settings. Here as above, stakeholders did not offer an alternate to the default settings at the workshop.

If stakeholders would like something other than use of the default settings they should offer a proposal for settings that would prefer, along with an explanation.

What to consider?	Decision Option (DO) Description	Utilize?
Ensure that the under/over frequency trip settings are coordinated between the utility and transmission operator. As desired, select default settings or settings within the adjustable range. Trip settings should not hinder ride-through capability required at the transmission level.	**DO 6-1:** Align default settings with 1547.	☒
	DO 6-2: Select other default settings within 1547 ranges of adjustment.	☐

Frequency droop[2] Settings

Once again, this time for frequency droop settings, the options were to go with the default IEEE-1547 settings, or select non-default settings. Again, there were no alternative settings proposed.

If parties would like something other than use of the default settings they should offer a proposal for settings that would prefer, along with an explanation.

What to consider?	Decision Option (DO) Description	Utilize?
This capability is required for all DERs (with some limitations on Category I types) during the under/over frequency conditions. Consider using default settings or adjust within ranges of allowable settings. Consider input from transmission operators or regional reliability coordinator. [MTGS V.A]	**DO 7-1:** Align default settings with 1547.	☒
	DO 7-2: Select other default settings within 1547 ranges of adjustment.	☐

Voltage regulation modes by reactive power[3]

Decision eight in the matrix examined the approach for dealing with voltage regulation modes by reactive power. This question included a robust discussion. Utilities were leaning towards a more individualized approach here. This could be utility-specific, or more likely, resource-specific. There are examples of different approaches by states. The three major California utilities use the same volt-var settings, while in Minnesota they may vary, with each utility submitting their own technical manual to the commission for approval.

Utilities noted that a standard volt/var approach could potentially aggregate issues on some feeders. This in turn could actually lead to higher costs for interconnection customers, as additional system upgrades could be necessary.

[2] Per IEEE 1547-2018, this function cannot be disabled.

[3] The voltage support functions by reactive power (constant power factor, volt-var, watt-var, constant var) are mutually exclusive. By default, these functions are deactivated – meaning certified equipment will come out of the box to operate at unity power factor.

Staff would like to hear more fully from stakeholders on recommendations for this issue. A better understanding of which options would work best, and why. Along with that, which decisions are unworkable, and why. Do the recommendations change based on resource size, location, composition of loads on feeders, or other factors? Please provide detailed information.

What to consider?	Decision Option (DO) Description	Utilize?
If desired, consider activating a non-unity power factor, volt-var, watt-var, or constant var function. See PNNL research on autonomously adjusting V_{ref}[4]. Also, consider statewide (or similar) default settings for such mode. [MTGS V.B, VI]	DO 8a-1: Adjustable constant power factor is activated.	☐
	DO 8a-2: Utilize volt-var without autonomously adjusting Vref.	☒
	DO 8a-3: Utilize volt-var with autonomously adjusting Vref.	☐
	DO 8a-4: Watt-var is activated.	☐
	DO 8a-5: Constant var[5] is activated.	☐
	DO 8b-1: Align default settings with 1547.	☒
	DO 8b-2: Select other default settings within 1547 ranges of adjustment.	☐
	DO 8c-1: Specify process for selecting settings on site-by-site basis.	☐
	DO 8c-2: Leave process for selecting settings on site-by-site undefined.	☐

Voltage regulation modes by active power[6]

The voltage regulations by active power decision is only applicable to inverter-based resources. There was limited discussion, but one suggestion was to consider site-specific volt-watt requirements. It was noted that having volt-watt activated today could lead to resources with functionality that would be beneficial going forward as there will be more resources with the functionality widely deployed going forward.

Staff would like to hear from parties as too their choice for this issue, and the rationale.

What to consider?	Decision Option (DO) Description	Utilize?
If desired, consider statewide (or similar) activation of volt-watt function (with default setting). Notably, the utilization of volt-watt will require changes to the interconnection applications forms (online portals) to allow an applicant to specify how volt-watt is implemented. [MTGS V.B, VI]	**DO 9-1:** Volt-watt[7] is activated with default 1547 settings.	☒
	DO 9-2: Volt-watt is activated with non-default settings.	☐
	DO 9-3: Volt-watt is not activated.	☐

Interconnection Rule

Due to overlap with the Screens, Study Methods, and Modern Configurations workstream, there was limited discussion of Decision 10. This will be considered more fully in that workstream.

[4] McDermott T.E., and S.R. Abate., Adaptive Voltage Regulation for Solar Power Inverters on Distribution Systems, In IEEE 46th Photovoltaic Specialists Conference (PVSC 2019), June 16-21, 2019, Chicago, IL, 0716-0723, IEEE, doi:10.1109/PVSC40753.2019.8981277

[5] Note: constant var mode is only required for normal performance Category B.

[6] The voltage support by active power (volt-watt) is deactivated by default – if desired, consider statewide (or similar) default setting for volt-watt.

[7] Note: volt-watt mode is only required for normal performance Category B.

What to consider?	Decision Option (DO) Description	Utilize?
Update the interconnection rule to be inclusive of IEEE 1547-2018. To be clear which version of a standard applies and when it takes effect, it is recommended that standards be dated (and with edition number, if applicable), and that the implementation date is made clear either within the rule or by Commission order. In addition to implementing adoption of the standard within the rule, requirements or references to other standards that are now addressed by IEEE 1547 should be updated to be inclusive of 1547's requirements. Note that this latter issue is reflected in DO 10c, and no alternatives are offered.	**DO 10a-1:** Change 1547 date and title in standards references.	☒
	DO 10a-2: Leave 1547 standard reference undated.	☐
	DO 10b-1: Define timeline for adoption of new requirements in line with IEEE 1547-2018 per DO 1.	☒
	DO 10b-2: Leave timeline for adoption open dependent on, e.g., Commission order (in line with DO 1a-3).	☐
Update the interconnection rule to be inclusive of IEEE 1547-2018. To be clear which version of a standard applies and when it takes effect, it is recommended that standards be dated (and with edition number, if applicable), and that the implementation date is made clear either within the rule or by Commission order. In addition to implementing adoption of the standard within the rule, requirements or references to other standards that are now addressed by IEEE 1547 should be updated to be inclusive of 1547's requirements. Note that this latter issue is reflected in DO 10c, and no alternatives are offered.	**DO 10c-1:** Update applicable power quality or other references (such as IEEE 519 or IEEE 1453 in SGIP's Supplemental Review Voltage and Power Quality Screen) to IEEE 1547-2018.	☒

Mid-term Issues

Following discussion on the near-term issues was a presentation on mid-term issues from IREC. Due to time constraints, not all of the items in the decision matrix were discussed. These will be part of the next workshop.

<u>Reference point of applicability</u>

Reference point of applicability (RPA) was the first topic discussed for the mid-term issues. The use of RPA in IEEE 1547 is to make it clear the physical location the requirements of the standards need to be met. This includes testing, evaluation, and commissioning. The RPA can be at the Point of Common Coupling (PCC) Point of Connection (PoC), a point in between the two, or at multiple points. The evaluation will take different paths depending on the location of the RPA.

For transparency, the RPA can be included as part of the application process. The interconnection customer would have a series of options to select on the application. Rules/forms will need to be updated to reflect the choice of the RPA.

Stakeholders raised questions on how the process envisioned in the IREC proposal would match with current practices. A flow chart will be prepared to help inform stakeholders, and will incorporate the RPA review/verification process necessary for the utility interconnecting the resource.

Enter service settings

Enter service settings consider what settings for voltage and frequency ranges, as well as delay and duration are preferred when a resource comes online, i.e. 'enters service'. There are default settings included in the IEEE 1547 standards. The question is if the default settings are appropriate, and further, are they appropriate for all resource sizes. Are resource under 500 kVa subject to the same constraints, or should there be further guidance.

Staff would like stakeholders to respond to these issues, including what is preferred, and why.

Utility required profile

The final mid-term item discussed was the utility required profile (URP). This would take the form of a standardized file with the default settings incorporated. EPRI has a URP database – the files developed here could match the format, and be uploaded to the EPRI database. This would allow developers to easily see requirements for the inverters, and input those as well. There was a question as to the status of EPRI's current file format/database with some Stakeholders wondering if there was more development needed before implementing requirements here.

Staff would like to hear further from stakeholders on the viability of use of the URP, is the use warranted, and is EPRI's approach ripe for use.

Next Steps

The following table identifies next steps for the next two workshops. Staff has identified the key areas where redline counter proposals or written justification of positions will be useful, but, as always, invited comment beyond these areas.

IEEE 1547 Workstream			
Description	Event Date	Workshop Topic	Pre-meeting deliverable
Workshop 3	October 25, 2022	Finalize discussion on near-term issues, further discussion on mid-term issues	Stakeholders requested to provide detailed response to questions above for voltage regulation modes by reactive power
Workshop 4	November 22, 2022	Discussion on near- and mid-term items as necessary, discussion of long-term issues	Stakeholders approached to mid-term issues not finalized at the October 25 workshop
Workshop 5	December 20, 2022	TBD – future workshop topics will be dependent on progress made in the prior meetings.	
Workshop 6	January 31, 2023		
Workshop 7	February 28, 2023		
Workshop 8	March 28, 2023		

Staff appreciates stakeholders taking the time to participate in these discussions. To make these productive as possible, similar to the discussion in the Screens, Study Methods, and Modern Configurations, *Staff would like to know, as early as practicable, if utility technical experts are unavailable to attend future workshops.* If necessary we will look to reschedule such meetings.

Also, as noted in the workshop, there were also concerns raised by stakeholders in the parallel workstream. Stakeholders who were not in the volunteer workgroup did not see proposals/redlines circulating within the workgroup. Going forward, Staff requests the workgroup circulate all redlines, comments, etc. to the Service List as listed on the OPUC UM 2111 webpage.

For any questions or concerns please contact:
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To receive meeting notices and agendas for this docket, send an email to puc.hearings@puc.oregon.gov, and ask to be added to the service list for Docket No. UM 2111. You will then receive emails with workshop details, when new documents have been added to the docket, or there is a change to the schedule.