EPNR Working Group - HTR Workstream Workbook

Issue ID		Description of Issue	Consultation Proposals (29 November 2024)
I3	I3	Definition of contingency events versus credible contingency events and how this may flow on to pre-contingent events. The definition of credible contingency events currently doesn't align with the AEMC definition which relates credible to things like weather conditions and present threats.	Align the PNR and HTR to have a common definition of credible and non-credible contingency events, adopting the definition in line with AEMC.
	I36	Requirements for generation to ride through multiple consecutive power system disturbances including minimum number of disturbances rode through within a specific period.	
I4		Consider requirements to update voltage and frequency standards in accordance with proposed legislative changes to voltage and frequency requirements.	Update the HTR to reflect the new voltage setting to a nominal voltage of 230V with upper limit of 254V and lower limit of 207V. There may be some non-distribution network areas where this may not apply.
I5	I5	Wholistic review of power system ride through requirements, and performance and restoration for major disturbances, including review of the target frequency recovery times under Section 2.2.1 (25 minutes at 48 Hz) may have adverse impacts on system security.	Investigations and power system studies to be done with the following scope: • Review critical fault clearing times; • Review generator ride through requirements; • Review system islanding scheme and settings; • Rate of response; and • Review of frequency operating standards. • Allocating responsibility and identifying funding will be necessary to deliver this modelling scope.
	I6	Frequency variations - do we need to lower the single contingency event limit due to increasing penetration of renewables / less system inertia e.g. NT has 47 Hz.	
	I15	Currently requirement is for up to 4 Hz per second. This requirement has been updated in the WEM Rules.	
	I16	Wholistic review of power system ride through requirements, and performance and restoration for major disturbances, including: - Review Section 3.3.3.3(f) - Absorption of reactive power is helpful under some circumstances and may be required for longer periods. Review clause in context of new operating environment. - Most OEMs struggle to achieve the requirement for any pre-fault absorption of reactive power to be terminated within 200 ms after clearing of the fault. Further, from a system perspective, it would not be optimal if all generators stop absorbing after 200 ms. - The WEM Rules have changed this clause (as did the proposed updated to the WP TR).	
	I17	Consider continuous uninterrupted operation requirements in section 3.3.3.3(h). It may not be prudent for the system if all generators follow this requirement simultaneously. Whilst a small system like NWIS might benefit from it, this needs to be confirmed with further studies. Also need to define the fault clearance time to comply to this requirement. This clause has been changed in the WEM Rules. Further, we note that some wind generators have not been able to meet this requirement.	
	I19	The identified rate of response is difficult for some OEMs of non-dispatchable generating units to achieve – the current requirement is achieving 90% within 2 seconds and new output to be sustained for no more than 10 seconds. The minimum requirement of WEM rules (12.6) states asynchronous machines to meet 60% of the freq response in 6 seconds and 90% by 15 seconds. Related clauses in the WEM Rules to consider are: – A12.6.3.2 which provides more achievable requirements than the current Pilbara HTR. – A provision for negotiating the standard is requested.	
	I34	ROCOF and include df/dt for under frequency load shedding and/or under frequency islanding. Determine if df/dt is used for islanding only, or if it can apply to ufls too.	
I7		Consider requirements for NSPs to specify NWIS power system strength requirements and complete necessary assessments as renewable penetrations increases to ensure power system security.	Develop a framework for the management of system strength within the NWIS, leveraging the work undertaken by the SWIS PSSR Standards Working Group.
I8	I8	Consider wholistic review of the treatment of Battery Energy Storage Systems and inverter based generating units, including clarity on which sections of the rules apply for these generating units.	In the medium term, amend HTR Clause 3.3 to address specific areas where the applicable technical standard not defined for dispatchable, non-synchronous generation. • HTR 3.7(b) allows NSP and ISO to define technical performance standards for BESS, with respect to injects, by leveraging clause 3.3; and • fixing gaps in clause 3.3 will allow 3.7 to continue to operate appropriately. In the long term, rewrite section 3.7 to include comprehensive requirements for inverter-based storage facilities. Provide definitions in the HTR for "grid forming", "grid-following" and for the unique characteristics of grid-forming technology such as "synthetic inertia".
	I9	Reference to grid forming and grid following inverter technology may be helpful, with specific regard to the differences in the technical performance between the differing technologies. A definition here may be helpful as there doesn't appear to be a clear definition on what is grid forming, grid following, or what has virtual synchronous generator performance.	
	I12	Requirements for storage devices to provide network support services (frequency and voltage support) when operating in load/charging mode to enhance power system security/flexibility. Currently the HTR requires storage devices to act as consumer equipment when withdrawing power from the network.	

I10		Additional requirements for dynamic performance on asynchronous inverter connected generation e.g. damping capability for reactive power and active power control systems for inverter connected generation.	Realign the rules to the increasing penetration of inverter-based generation in NWIS.
I11		Additional requirements for inverter connected generation response to power system disturbances, such as required magnitude of reactive current injection/absorption to support the power system during and post power system disturbances.	Review HTR clause 3.3.3.3(g) and consider including quantifiable measures of reactive current injection/absorption during fault or post fault.
I13	I13	Definition and use of 'energisation' vs 'commercial operations' is inconsistent throughout the HTR and PNR. Clarity is required about the process and what actions are required from each party at which stage. Inclusion of data to be submitted with connection applications (See Horizon Power Tech Rules Sections 3.3.2, 3.4.3, 3.6.5, and Attachments 3-10).	Add a new definition to PNR and HTR for "commercial operation". Move the HTR definition of "energisation" to the PNR, amend definition in the HTR to point to PNR definition. Substitute the current PNR references to "energisation" with "commercial operation". Add a new PNR rule dealing with process to obtain authorisation for energisation for the purposes of testing and commissioning.
	I37	Inclusion of Testing requirements and test details for connection of Generating Units (See Horizon Power Tech Rules Attachment 11). Dispatchable and non-dispatchable generator testing and compliance requirements and R2 model validation. What are the non-dispatchable unit testing requirements, and how does this differ to dispatchable units.	Generator testing requirements should be included in an HTR attachment. The requirements should cover minimum standards as well as special tests required by the NSP. The requirements do not need to cover microgrids. Tests for battery storage, IBR and non-dispatchable generation should draw on rules from other jurisdictions.
I14		Renewable generation could comply, but the requirement of 460 ms ride through is overly onerous. We suggest this is revisited system wide to test suitability given it is inconsistent with other countries. The interpretation of the wording should be clarified as it is not clear if this a requirement or optional (Western Power historically tested compliance with this an equivalent clause with some flexibility in the interpretation).	Conduct a pre-requisite engineering and power system analysis on fault clearance times and choose the preferred option of the analysis outcome. Options are to retain status quo, or to redefine UVRT magnitude, duration, and envelope shape.
I18		This is currently 0.05 Hz. The point at which the dead band is measured is unclear in the current drafting and needs to be updated. The WEM Rules have been revised to be +/-0.025 Hz around 50.0 Hz (refer to A12.6.1.9).	Redefine the dead band of a generating unit to be less than or equal to ±0.025 Hz around 50 Hz, unless an adjustable dead band is agreed to in the access contract.
I22		Consider requirements regarding disturbance monitoring and synchrophasors.	• Update HTR Section3.3.4.1 (d)(3)(a) to include synchrophasor as an acceptable measured value as determined by the relevant NSP. • Make remote monitoring compulsory • Develop a procedure to define data formats, data exchange protocols, and allow ISO access to synchrophasor data • Check proposed wording for WEM/SWIS to ensure alignment where possible.
I23		Consider update to Figure 3.3 noting the four-quadrant capability of inverters.	Update the clause3.3.3.1(c)(4) and Figure 3.3 of the HTR to cater for battery energy storage units. This should align with the outcomes of holistic review of treatment of BESS and inverter-based generation.
I24	I24	Clarify treatment of ambient temperatures in the context of Section 3.3.3.1. Clarify distinction of using 'nameplate' vs 'derated capacity' when determining which set of generator compliance rules should apply.	Clause 3.3.3.1 (reactive power) must be updated to provide clarity on ambient temperature, using a method similar to WEM where NSPs will determine the ambient temperature based on 1% probability of exceedance.
	I25	The temperature dependency is a critical factor in the Pilbara that is not adequately considered in the Pilbara HTR. The higher temperatures in the Pilbara will affect the generator's ability to comply with maximum output requirements (or the maximum output that can be expected). Reactive power related requirements are linked to temperature, whereas historical versions of the rules including the current Pilbara HTR have not linked active power to temperature. This issue should be resolved in the Pilbara HTR to allow the network operator to have a more realistic understanding of what the generation is able to and expected to achieve. In the WEM, wind farms struggle to meet the reactive power capability requirements at 40 degrees (for example A12.2.3.2). However, WEM Rules are more realistic where consideration of temperature is concerned. Of note: – Reactive power capability in clause 3.3.3.1 on possible map with locations and ambient temperature. – Active power capability might need to be de-rated for the wind and solar farms above certain temperatures. This may be a gap in the existing Pilbara HTR as we were unable to identify the relevant clause. – Recommend a review of clauses that refer to "ambient temperature" in addition to the above to ensure suitability.	
I26		Inclusion of Monitoring and Control Requirements (See Horizon Power Tech Rules Section 3.3.4).	• Update clause 3.5 to require mandatory monitoring and control capability of distributed energy resources. • Undertake a general review of clauses 3.3.4 and 3.4.9 of the HTR to consider RME/RCE requirements.
I27		Consider requirements for pole slip protection, e.g. where Critical Fault Clearance time issues exist.	Update the HTR to provide the minimum and recommended protection elements for majority of generating units.
I28		Review of fault level management on the system: - Consider minimum fault rating requirements for Transmission plant at significant network nodes, and fault level management. - Consider potential requirements for limitations on maximum fault levels on the system and consider providing guidance on the calculation of fault levels. Define credible versus ultimate case.	• Develop table of minimum fault withstand ratings for new plant (based on review of available plant, and possibly Horizon Power Technical Rules Tables A13.1, A13.2, A13.3) and include in the HTR. • Establish a procedure or update an existing procedure to introduce the requirement for NSPs to assess fault levels as part of new connections and system changes. • Include in the HTR a note which requires maximum fault levels at any point will not exceed the minimum fault withstand ratings
I29		Consider requirements adequacy of black start requirements/arrangements.	Add a drafter's note to the PNR giving system restart as an example where it may be impractical to maintain the system inside the Technical Envelope, with the following considerations: • System restart plans in the Pilbara rely on fracturing the power system at points of interconnection • Adequate synchronisation points between registered networks are essential • Explore a requirement in the PNR or HTR mandating at least one network synchronisation point

I30		Connection Point Compliance parameters and definition (including negotiated vs ideal rules - with particular consideration for brownfield plant vs greenfield). Consider if any updates required to facilitate or improved the treatment of Connection Point Compliance measures.	Amend PNR requirement which requires non-compliance in order to qualify for CPC status. (also see section 6.3).
I31		Resolve responsibilities for determination of power transfer limits.	NSPs will continue to be responsible for determining power transfer limit as they are best placed to determine this since they are responsible for networks and could understand overall network constraints the best.
I32	I32	Update Critical Fault Clearing Times at Dampier and Cape Lambert 33kV to reflect recent system changes and approved derogations.	Amend HTR Table 2.10 to modernise and simply MFCTs • Remove row for 33 kv HP-Rio tie lines • All 33 kv systems will be subject to MFCT of 300ms • If 'slower' clearing times can be justified by the host NSP, based on CFCT studies, the HTR should allow this to be accommodated. • If faster clearing times are needed for interconnectors, this can be implemented under HTR clause 2.6.5 "critical fault clearing lines"
	I33	Overall review of visit of maximum fault clearance times to ensure alignment. Currently there is misalignment between Western Power, Horizon Power and Rio Tinto technical rules.	
I35		Requirements on NSPs to enact special protection schemes to manage network congestion/instability as required to enhance system security. However, this shouldn't be the sole option to manage security issues – network augmentation and re-dispatch are other methods by which this can be achieved. Generators and loads to possess compliant control systems to facilitate operation of required network special protection schemes to be specified in connection agreements.	Introduce requirements into HTR around select non-credible events (similar to 'protected events' in the NEM). High consequence non-credible events should be brought in line with other NSP practices in Australia.
I38		Requirements for NSP to verify integrity of the UFLS scheme across the NWIS network via periodic tests and publish an annual performance report based test results and actual power system UFLS events, this will provide confidence to all customers of UFLS performance integrity and power system security.	Require periodic tests, annual publication of test results, and reporting on performance following contingency events.
I40		Overall review of referenced standards, noting that some standards have more recent versions than those referenced.	HTR explicitly states that the most recent version of all standards should be referenced to ensure compliance and accuracy. Remove any specific references to the applicable year, such that the most recent version always applies.
I41	I41	Better clarity required for definitions of distribution feeder / interconnector / tie (undefined but included in HTR Table 2.10).	• Add the definition of "interconnector" to clause 1.5 of the HTR which refers to the PNR definition. • Replace all instances of "tie line" with interconnector. • Update HTR Table 2.10 to make appropriate use of definition for "interconnector" and "distribution feeders" as applicable.
	I42	HTR 2.3.2e describes 'essential system services' to be put last for load shedding - however this is different to the defined essential system services ESS as defined in PNR. Similarly throughout the HTR "ancillary service" is used instead of "essential service" - the PNR and HTR should be aligned with this terminology to avoid confusion.	Replace the term of "ancillary services" with "essential services".
I43		Is accumulated synchronous time error still required? Has been removed from NEM.	No changes to the PNR or HTR since providers of FCESS in the NWIS often rely on the standard for accumulated synchronous time error to determine effectiveness of the service.
I44		Definition of "back-up protection systems" for tie lines. Does this mean main & backup, or does this mean duplicate main protection.	Establish a subclause in clause 2.6.2 of the HTR which specifically deals with requirements of disconnectors, making reference to the nature and the role of tie line in the broader system, availability requirements of the tie line, and technical requirements for system stability. The focus should be away from forming a separate island.
I45		Model guidelines and interaction of modelling guidelines with the HTR. How to ensure there are no mismatches in models.	Item closed with no change necessary.
I1		NSP to NSP connection arrangements in the HTR and accountabilities. Right now the Rules only reference NSP to Applicant, which results in confusion when it is NSP to NSP connections via tie lines.	
I2		Equipment ratings and the cost of consumed ratings - how are costs managed when upgrades are necessary; whether the last project pays.	
I20		Improve definition of metering obligations for managing EBAS obligations.	
I21		How ESS costs are to be allocated (noting at the PAC Meeting 29.02.2024, the ISO advised that nominations would be called for a separate working group to be formed on this issue).	

I46		The existing Pilbara HTR offers disconnection as the primary means of dealing with non-compliance. There would be benefit for all parties if negotiation mechanisms were provided for that allow for re-testing and rectification of non-compliance without disconnection. This would enable parties to identify the causes of any performance issues and work together to solve them and continue operation where this is within acceptable risk limits given the unique non-compliance or performance issues. Sections in the Horizon Power TR A11.6 relate to these mechanisms where testing is concerned. Further work at both the Pilbara HTR and the various NSP TRs could be needed to achieve more optimal outcomes.
I39		Align with SWIS / other network operators.