

Meeting Agenda

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| Meeting Title: | Evolution of Pilbara Network Rules Working Group |
| Workstream | Workstream 2 (HTR Workstream) |
| Date: | 7 August 2025 |
| Time: | 10:30am – 12:30pm |
| Location: | Online, via TEAMS |

| Item | Item | Responsibility | Type | Duration |
|------|--|---------------------|------------|-----------|
| 1 | Welcome and Agenda <ul style="list-style-type: none"> Conflicts of interest Competition Law | Chair | Noting | 1 min |
| 2 | Meeting Apologies and Attendance | Chair | Noting | 2 min |
| 3 | Minutes of Meeting 2025_07_10 (published 25 July 2025) | Chair | Noting | 2 min |
| 4 | HTR Implementation: <ul style="list-style-type: none"> a) Update on rule drafting b) Updates from item leads | Chair / Issue Leads | Discussion | 1h 30 min |
| 5 | New Issues for HTR List | Chair | Discussion | 20 min |
| 6 | Next steps | Chair | Noting | 5 min |
| | Next meeting: Wednesday 10 September 2025 | | | |

Competition and Consumer Law Obligations

Members of the PAC's Evolution of the Pilbara Network Rules Working Group (**Members**) note their obligations under the *Competition and Consumer Act 2010 (CCA)*.

If a Member has a concern regarding the competition law implications of any issue being discussed at any meeting, please bring the matter to the immediate attention of the Chairperson.

Part IV of the CCA (titled "Restrictive Trade Practices") contains several prohibitions (rules) targeting anti-competitive conduct. These include:

- (a) **cartel conduct**: cartel conduct is an arrangement or understanding between competitors to fix prices; restrict the supply or acquisition of goods or services by parties to the arrangement; allocate customers or territories; and or rig bids.
- (b) **concerted practices**: a concerted practice can be conceived of as involving cooperation between competitors which has the purpose, effect or likely effect of substantially lessening competition, in particular, sharing Competitively Sensitive Information with competitors such as future pricing intentions and this end:
 - a concerted practice, according to the ACCC, involves a lower threshold between parties than a contract arrangement or understanding; and accordingly; and
 - a forum like the EPNRWG is capable being a place where such cooperation could occur.
- (c) **anti-competitive contracts, arrangements understandings**: any contract, arrangement or understanding which has the purpose, effect or likely effect of substantially lessening competition.
- (d) **anti-competitive conduct (market power)**: any conduct by a company with market power which has the purpose, effect or likely effect of substantially lessening competition.
- (e) **collective boycotts**: where a group of competitors agree not to acquire goods or services from, or not to supply goods or services to, a business with whom the group is negotiating, unless the business accepts the terms and conditions offered by the group.

A contravention of the CCA could result in a significant fine (up to \$500,000 for individuals and more than \$10 million for companies). Cartel conduct may also result in criminal sanctions, including gaol terms for individuals.

Sensitive Information means and includes:

- (a) commercially sensitive information belonging to a Member's organisation or business (in this document such bodies are referred to as an Industry Stakeholder); and
- (b) information which, if disclosed, would breach an Industry Stakeholder's obligations of confidence to third parties, be against laws or regulations (including competition laws), would waive legal professional privilege, or cause unreasonable prejudice to the Coordinator of Energy or the State of Western Australia).

Guiding Principle – what not to discuss

In any circumstance in which Industry Stakeholders are or are likely to be in competition with one another a Member must not discuss or exchange with any of the other Members information that is not otherwise in the public domain about commercially sensitive matters, including without limitation the following:

- (a) the rates or prices (including any discounts or rebates) for the goods produced or the services produced by the Industry Stakeholders that are paid by or offered to third parties;
- (b) the confidential details regarding a customer or supplier of an Industry Stakeholder;
- (c) any strategies employed by an Industry Stakeholder to further any business that is or is likely to be in competition with a business of another Industry Stakeholder, (including, without limitation, any strategy related to an Industry Stakeholder's approach to bilateral contracting or bidding in the energy or ancillary/essential system services markets);
- (d) the prices paid or offered to be paid (including any aspects of a transaction) by an Industry Stakeholder to acquire goods or services from third parties; and
- (e) the confidential particulars of a third party supplier of goods or services to an Industry Stakeholder, including any circumstances in which an Industry Stakeholder has refused to or would refuse to acquire goods or services from a third party supplier or class of third party supplier.

Compliance Procedures for Meetings

If any of the matters listed above is raised for discussion, or information is sought to be exchanged in relation to the matter, the relevant Member must object to the matter being discussed. If, despite the objection, discussion of the relevant matter continues, then the relevant Member should advise the Chairperson and cease participation in the meeting/discussion and the relevant events must be recorded in the minutes for the meeting, including the time at which the relevant Member ceased to participate.



Agenda Item 4

HTR Implementation

This table provides the status of HTR Issues (as of 31 July 2025) provided by Issue Leads. Where materials have been provided by Issue Leads to support discussion at the working group meeting on 07 August 2025, a page number reference is provided.

Note. Where no status update has been received from Issue Leads, this is denoted by a dash (-), while 'no update' is used to reflect Issue Leads report.

| Issue ID | | Priority | Simple or Substantive | Lead | Support | Status | Page # |
|----------|-----|----------|-----------------------|------------|---|---|--------|
| I3 | I3 | High | Substantive | Noel (Rio) | David (HP); Lekshmi (BP), James (ISO); Njabulo and Bec (BHP) | • - | |
| | I36 | Moderate | Substantive | | | | |
| I4 | | High | Simple | David (HP) | Nik (APA); Njabulo and Bec (BHP); Noel (Rio), James (ISO) | • Has progressed to drafting (10 July 2025) | |
| I5 | I5 | High | Substantive | David (HP) | Nik (APA); Shervin and Scott (Woodside); Lekshmi (BP); James (ISO); Njabulo and Bec (BHP); Noel (Rio) | • - | |
| | I6 | High | Substantive | | | | |
| | I14 | High | Substantive | | | | |
| | I15 | High | Substantive | | | | |
| | I16 | High | Substantive | | | | |
| | I17 | High | Substantive | | | | |

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|-----|-----|----------|-------------|---------------|---|---|-----|
| | I19 | High | Substantive | | | | |
| | I34 | Moderate | Substantive | | | | |
| I7 | | High | Substantive | Nik (APA) | Njabulo and Bec (BHP); James (ISO); Noel (Rio); Lekshmi (BP) | • - | |
| I8 | I8 | High | Substantive | James (ISO) | David (HP); Noel (Rio); Njabulo and Bec (BHP), Nik (APA) | • - | |
| | I9 | High | Substantive | | | | |
| | I12 | High | Substantive | | | | |
| I10 | | High | Substantive | Njabulo (BHP) | Nik (APA); David (HP) | • Updated provided (see attached) | P.5 |
| I11 | | High | Substantive | Njabulo (BHP) | Nik (APA); David (HP) | | |
| I13 | I13 | High | Substantive | James (ISO) | David (HP); Njabulo and Bec (BHP), Nik (APA) | • - | |
| | I37 | Moderate | Substantive | | | | |
| I18 | | High | Simple | Lekshmi (BP) | Njabulo and Bec (BHP) | • Has progressed to drafting (10 July 2025) | |
| I22 | | Moderate | Simple | David (HP) | Njabulo and Bec (BHP); Noel (Rio); Nik (APA) | • Has progressed to drafting (10 July 2025) | |
| I23 | | Moderate | Simple | David (HP) | Nik (APA); Njabulo and Bec (BHP) | • Has progressed to drafting (10 July 2025) | |
| I24 | I24 | Moderate | Simple | David (HP) | Lekshmi (BP); Njabulo and Bec (BHP); Noel (Rio); Nik (APA); James (ISO) | • Has progressed to drafting (10 July 2025) | |
| | I25 | Moderate | Simple | | | | |
| I26 | | Moderate | Simple | David (HP) | Njabulo and Bec (BHP); Nik (APA) | • - | |

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|---------|-----|----------|----------------------------|------------------------------|---|---|------|
| I27 | | Moderate | Simple | Nik (APA) | David (HP); James (ISO); Njabulo and Bec (BHP); Noel (Rio) | <ul style="list-style-type: none">- | |
| I28 | | High | Substantive | David (HP) | Noel (Rio); James (ISO); Njabulo and Bec (BHP), Nik (APA) | <ul style="list-style-type: none">- | |
| I29 | | High | Substantive (study likely) | Peter (ISO) | David (HP); Njabulo and Bec (BHP) | <ul style="list-style-type: none">Has progressed to drafting (10 July 2025) | |
| I30 | | High | Substantive | Shervin and Scott (Woodside) | David (HP); Noel (Rio); Njabulo and Bec (BHP), Nik (APA), James (ISO) | <ul style="list-style-type: none">Has progressed to drafting (10 July 2025) | P.10 |
| I32 | I32 | Moderate | Substantive (study likely) | James (ISO) | Noel (Rio); David (HP); Njabulo and Bec (BHP), Nik (APA) | <ul style="list-style-type: none">Has progressed to drafting (10 July 2025) | |
| | I33 | Moderate | Substantive (study likely) | James (ISO) | | <ul style="list-style-type: none">Has progressed to drafting (10 July 2025) | |
| I35 | | Moderate | Substantive | Njabulo (BHP) | Nik (APA) | <ul style="list-style-type: none">- | |
| I38 | | Moderate | Substantive | Njabulo (BHP) | Shervin and Scott (Woodside) | <ul style="list-style-type: none">- | P.11 |
| I40 | | Low | Simple | David (HP) | Njabulo and Bec (BHP) | <ul style="list-style-type: none">Has progressed to drafting (10 July 2025) | |
| I41 | I41 | Low | Simple | James (ISO) | Noel (Rio); Njabulo and Bec (BHP), Nik (APA) | <ul style="list-style-type: none">Has progressed to drafting (10 July 2025) | |
| | I42 | Low | Simple | | | <ul style="list-style-type: none">Has progressed to drafting (10 July 2025) | |
| I44 | | Low | Simple | Noel (Rio) | James (ISO); David (HP); Nik (APA); Njabulo and Bec (BHP) | <ul style="list-style-type: none">- | |
| I2025.1 | | Moderate | | Peter (ISO) | Nik (APA), Matthew (Rio) | <ul style="list-style-type: none">- | |



Department of
**Energy and Economic
Diversification**

**Energy
Policy WA**

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|---------|----------|--|-------------|-------------------------|---|--|
| I2025.2 | High | | Nik (APA) | Peter (ISO), David (HP) | <ul style="list-style-type: none">- | |
| I2025.3 | Moderate | | Peter (ISO) | - | <ul style="list-style-type: none">Has progressed to drafting (10 July 2025) | |
| I2025.4 | High | | Peter (ISO) | - | <ul style="list-style-type: none">- | |
| I2025.5 | Moderate | | Peter (ISO) | - | <ul style="list-style-type: none">- | |
| I2025.6 | High | | Peter (ISO) | - | <ul style="list-style-type: none">- | |

MEETING AGENDA AND MINUTES

| Name of Meeting | Location | Date / Time | Written by |
|--|----------|---------------------------|---------------|
| Issue 10 & Issue 11 | Online | 21-07-2025 1:00-2:30pm | Njabulo Mlilo |
| Attendees | | Distribution | |
| Njabulo Mlilo - BHP | | | |
| Nik Walker - APA | | | |
| Guy Tan – Horizon Power | | | |
| Peter Van Den Dolder – Pilbara ISOCo | | | |
| Neil Gibbney – Pilbara ISOCo | | | |
| Apologies | | | |
| David Stephens – Horizon Power | | | |
| Agenda | | | |
| <ul style="list-style-type: none">• I10 Inverter Dynamic Performance – Oscillation Damping• I11 Inverter Dynamic Performance – Reactive current injection/absorption during fault & recovery period | | | |
| Meeting Minutes | | | |
| <h2>Issue 10 Inverter Dynamic Performance – Oscillation Damping</h2> <h3>Background/context</h3> <ul style="list-style-type: none">(a) HTR damping clause 2.2.8 wording synchronous generator technology centric.(b) Grid following inverter connected generation does not have concept of rotor angle stability.(c) Inverter connected generation can be a source of power system oscillations putting power system security at risk, hence there need to be requirements governing their performance. <h3>Options</h3> <ol style="list-style-type: none">1. Do nothing<ul style="list-style-type: none">a. The clause 2.2.8 lacks comprehensive clarity with treatment of inverter connected generation.2. Include new requirements in HTR.<ul style="list-style-type: none">a. Rules need to align with reality on the ground – increasing penetration of inverter-based generation in NWIS.b. Any performance measures applied to inverter-based generation need to be appropriate for NWIS specific network conditions.c. May require guidelines to define what good looks like and how that would be assessed.d. Clauses for damping in the rules should be technology agnostic to accommodate emerging technologies.e. Definition of rotor angle stability needs to be clarified further in the rules.f. Damping ratio requirements specification would require justification via studies – part of this work may feed into the studies stream. <h3>Recommended option</h3> <ol style="list-style-type: none">2. Include new requirements in HTR. <h3>Recommended implementation actions</h3> <ol style="list-style-type: none">1. Update HTR clause 2.2.8 to be technology agnostic. In its current form, clause 2.2.8 requirements are specific to rotating generators. Definition of rotor angle stability needs to be clarified further or expanded in HTR.2. It is noted here that whilst HTR Chapter 2 clauses primarily apply to NSPs from an obligations perspective, the HTR clauses in Chapter 3 should include general obligations for all generating systems to ensure that their connection to the power network does not degrade power system damping.3. It is recommended to include a normative section/clause that describes broad criteria of what good looks like from a power system oscillation damping perspective.4. Consideration should be given to include control system capability requirements for the new inverter generation connections relating to oscillation damping. The control system damping capability even though not used in the early connections, can future proof the network to enable re-tuning the control systems when | | | |

the grid becomes weaker and oscillations become more problematic. It is recommended to include a clause similar to WEM Rules A12.4.2.13.

5. Include damping ratio requirements specification into the studies scope of work, develop and justify NWIS specific damping requirements criteria for inclusion into the HTR.

Issue 11 Inverter Dynamic Performance – Reactive current injection/absorption during fault & recovery period

Background/context

2. HTR clause 3.3.3.3(f) requires non-synchronous generation to terminate pre-fault absorption within 200msec, and are permitted to resume absorption 60 sec after post fault voltages stabilise. This clause does not fully utilise inverter connected generation capability to support voltage recovery during & post fault recovery period.
3. HTR clause 3.3.3.3(g) requires generation to have capability to deliver reactive power post fault sufficient to ensure connection point voltage is within the range for continuous uninterrupted operation, however, it does not quantify performance requirement for reactive current injection/absorption magnitudes to support this requirement.

Options

1. **Do nothing.**
 - a. Network may fail to utilize and take advantage of full capability of inverter connected generation to support network voltage recovery during and post fault period.
 - b. Clause 3.3.3.3(f) may create a pervasive situation where a capable generator does not fully support the network security even though it has the capacity and can still be deemed compliant.
2. **Include new requirements in HTR**
 - a. Review HTR clause 3.3.3.3(f) for relevance to NWIS.
 - b. Review how this clause has been applied in NWIS for inverter-based generation.
 - c. Review clauses 3.3.3.3(f) against other markets and see how it is treated and if there are lessons to be learnt.
 - d. Review HTR clause 3.3.3.3(g) and consider including quantifiable measures of reactive current injection/absorption during fault and post fault.
 - I. Define voltage support principles for all generators and define requirements that maximize capability/strength usage for various technologies e.g. grid forming, grid following, synchronous generators. Principles may include tunable functionality that can be customized for different locations throughout NWIS.
 - II. Principles to be supported by power system studies to define required performance.

Recommended Option

2. Include new requirements in HTR

Recommended implementation actions

1. Revise Clause 3.3.3.3(f) to require the dynamic performance of generation systems to support the voltage stability needs of the network at any instant, i.e. absorb reactive power for high voltages and inject reactive power for low voltages
2. Requirement to stop reactive power absorption can be maintained only during the fault period, otherwise the generating systems should contribute to voltage control at all times in accordance with the approved voltage control philosophy and reactive power capability.
3. Post fault, no absorption till the voltages have recovered above a certain limit/level
4. Review HTR clause 3.3.3.3(g) and consider including quantifiable measures of reactive current injection/absorption during fault and post fault if appropriate. Note that any performance requirements that may be introduced should not contradict requirements of other voltage control and reactive power capability clauses. It is recommended to conduct a thorough review of other clauses if/when proposing quantities.

Actions

| Item | Discussion and Decisions | Action By | Due Date |
|------|-----------------------------|-----------|------------|
| 1 | Send summary to the group | N Mlilo | 22/07/2025 |
| 2 | Review and provide comments | All | 25/07/2025 |

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| Next Steps | | | |
| Send recommendations to the wider working group | | | |

Appendix – supporting/background information

ISSUE 10 – APPROACH TAKEN BY OTHERS

HTR Clause

2.2.8 Oscillatory rotor angle stability

System oscillations originating from system electro-mechanical characteristics, electromagnetic effect or non-linearity of system components, and triggered by any *small disturbance* or *large disturbance* in the *power system*, must remain within the *small disturbance rotor angle stability* criteria and the *power system* must return to a stable operating state following the disturbance. The *small disturbance rotor angle stability* criteria are:

- (a) The *damping ratio* of electromechanical oscillations must be at least 0.1.
- (b) For electro-mechanical oscillations as a result of a *small disturbance*, the *damping ratio* of the oscillation must be at least 0.5.
- (c) In addition to the requirements of subclause 2.2.8(a), the *halving time* of any electro-mechanical oscillations must not exceed 5 seconds.

WEM Rules – includes specific clause for non synchronous generation

Asynchronous Generating Systems

A12.4.2.13. A Generating System, comprised of **Asynchronous Generating Units**, must have a voltage and Reactive Power Control System that has **a power oscillation damping capability** with sufficient flexibility to enable damping performance to be maximised, with the stabilising circuit responsive and adjustable over a frequency range from 0.1 Hz to 2.5 Hz. Any power system stabiliser must have measurements of power system frequency and Active Power output of the Generating Unit as inputs.

NEM Rules approach

- (4) a *generating system*, other than one comprised of *synchronous generating units*, must have a *voltage control system* that:
 - (i) **[Deleted]**
 - (ii) **[Deleted]**
 - (iii) **[Deleted]**
 - (iv) **[Deleted]**
 - (v) with the *generating system connected to the power system*, has settling times for *active power*, *reactive power* and *voltage* due to a step change of *voltage* setpoint or *voltage* at the location agreed under clause subparagraph (2B)(i), of less than:
 - (A) 5.0 seconds for a 5% *voltage* disturbance with the *generating system connected to the power system*, from an operating point where the *voltage* disturbance would not cause any limiting device to operate; and
 - (B) 7.5 seconds for a 5% *voltage* disturbance with the *generating system connected to the power system*, when operating into any limiting device from an operating point where a *voltage* disturbance of 2.5% would just cause the limiting device to operate;
 - (vi) has *reactive power* rise time, for a 5% step change in the *voltage* setpoint, of less than 2 seconds; and
 - (vii) **has a power oscillation damping capability with sufficient flexibility to enable damping performance to be maximised:**
 - (A) with characteristics as described in paragraph (c); or
 - (B) where *AEMO* has published characteristics for a *generating system* other than one comprised of *synchronous generating units*, following consultation in accordance with the *Rules consultation procedures*, with characteristics as published by *AEMO*.

Asynchronous Generating Systems

A12.9.2.5. Subject to any changed power system conditions or energy source availability beyond the operator of the Generation System's reasonable control, a Generating System comprised of Asynchronous Generating Units, for the faults referred to in clause A12.9.2.2, must have equipment capable of supplying to, or absorbing from, the Network:

- (a) to assist the maintenance of power system voltages during the fault:
 - (i) capacitive reactive current in addition to its pre-disturbance level of at least 4% of the Maximum Continuous Current of the Generating System including all operating Asynchronous Generating Units (in the absence of a disturbance) for each 1% reduction of voltage at the Connection Point below a specified threshold level within the under-voltage range of 85% to 90% of nominal voltage, except where a Generating System is directly connected to the SWIS with no step-up or connection

NEM Rules

Asynchronous generating systems

- (f) Subject to any changed *power system* conditions or energy source availability beyond the *Generator's* reasonable control, a *generating system* comprised of *asynchronous generating units*, in respect of the types of fault described in subparagraphs (c)(2) to (4), must have *facilities* capable of supplying to or absorbing from the *network*:
 - (1) to assist the maintenance of *power system voltages* during the fault:

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- (i) capacitive reactive current in addition to its pre-disturbance level of at least 4% of the maximum continuous current of the *generating system* including all operating *asynchronous generating units* (in the absence of a disturbance) for each 1% reduction of *voltage* at the *connection point* below the relevant range in which a reactive current response must commence, as identified in subparagraph (g)(1), with the *performance standards* to record the required response agreed with *AEMO* and the *Network Service Provider*; and
- (ii) inductive reactive current in addition to its pre-disturbance level of at least 6% of the maximum continuous current of the *generating system* including all operating *asynchronous generating units* (in the absence of a disturbance) for each 1% increase of *voltage* at the *connection point* above the relevant range in which a reactive current response must commence, as identified in subparagraph (g)(1), with the *performance standards* to record the required response agreed with *AEMO* and the *Network Service Provider*,
 during the disturbance and maintained until *connection point voltage* recovers to between 90% and 110% of *normal voltage*, or such other range agreed with the *Network Service Provider* and *AEMO*, except for *voltages* below the relevant threshold identified in paragraph (h); and
- (2) from 100 milliseconds after clearance of the fault, *active power* of at least 95% of the level existing just prior to the fault.

Issue 30: Connection Point Compliance

Note: Status update from the working group. Active discussion on some of these topics is ongoing. Recommendations may need to be adjusted once these conversations are concluded.

As provided by Ben Ahani (Woodside) to EPWA by email (30 July 2025)

Issue I30 “Connection Point Compliance”

- Connection Point Compliance parameters and definition (including negotiated vs ideal rules - with particular consideration for brownfield plant vs greenfield).
- Consider if any updates are required to facilitate or improve the treatment of Connection Point Compliance measures.

Issues identified:

- Regarding Issue 30, we suggest the following amendment to be considered by the PNR Working Group (subject to their confirmation), also noted that HTR won't be modified at this stage until process is complete for at least a couple of CPC facilities in future.

Recommendation:

- Modify PNR clause 274B (2) (a) (ii) to:

274B Application for Connection Point Compliance

...

(2) A Connection Applicant cannot give a notice under rule 274B(1), unless —

(a) when the Connection Applicant's Access Application was processed under Subchapter 9.2, the Host NSP or the ISO —

- (i) assessed for compliance with these rules (including the Harmonised Technical Rules) each component of the Equipment which the Access Application seeks to have Connected to the NWIS; and
- (ii) identified within the Equipment one or more Non-Compliant Components with the demonstration of Connection Applicant power system is still compliant at NSP connection point;

...

Issue 38: UFLS integrity and transparency

Note: Status update from the working group. Active discussion on some of these topics is ongoing. Recommendations may need to be adjusted once these conversations are concluded.

As provided by Ben Ahani (Woodside) to EPWA by email (30 July 2025)

Issue I38 “UFLS integrity and transparency”

- UFLS settings appear to take a set and forget approach at present. It is not clear that NSPs have full confidence that the scheme will operate as intended.

Status Update:

- Regarding *Issue 38*, we do not have any further comment in the proposed statement within the spreadsheet (as proposed 29 November 2024) based on the fact that the annual tests requirement has been amended to periodic tests (to be consistent with the existing plants operational requirements) and the annual publication of the test results may incorporate the repetition of the latest tests results completed not necessarily on annual basis.

Recommendation:

- Require periodic tests, annual publication of test results, and reporting on performance following contingency events.
 - Drafting Instructions scheduled for 10 September 2025 HTR meeting