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Australia's energy infrastructure partner

Port Hedland Solar Farm: Exemption from 3.2.5.2(f) of the Harmonised Technical Rules

Draft Decision

28 February 2025

1. Summary

ADEWAP Pty Ltd in its capacity as a Registered Network Service Provider (**NSP**) has received an exemption request from an Access Applicant (also ADEWAP Pty Ltd in its capacity as a generator) under part 64(1) of the Pilbara Network Rules for an exemption from clause 3.2.5.2(f) of the Harmonised Technical Rules.

The Access Applicant is seeking connection for the Port Hedland Solar Farm connected at 33 kV within APA's existing Port Hedland Power Station.

The NSP has reviewed the Access Applicant's request and consulted with the ISO. The NSP is satisfied the exemption is reasonably granted in accordance with Good Electricity Industry Practice (**GEIP**) and would not adversely impact Security, Reliability or the Pilbara Electricity Objective.

The NSP is seeking submissions in relation to the exemption request under an Expedited Consultation Process.

2. Exemption request

Clause 3.2.5.2(f) of the Harmonised Technical Rules relates to protection requirements for generation facilities that are used to manage the risk of a generating unit re-energising a de-energised power system.

Clause 3.2.5.2(f) states:

> "If a *generating unit* is connected to the *distribution system*, the generator must provide a circuit breaker close inhibit interlock with the feeder circuit breaker at the *NSP's substation* in accordance with the requirements agreed between the *generator* and the *NSP* in accordance with *GEIP*.
>
> {Note: This interlock is required in addition to the islanding protection specified in subclause 3.2.5.2(d) (3) on account of the potential safety hazard if a deenergised distribution feeder was energised by an embedded generating unit.}"

The Access Applicant has provided the Technical Note provided in Appendix A that outlines the problem statement and basis for requesting for an exemption from 3.2.5.2(f) of the Harmonised Technical Rules.

3. Consultation with ISO

The NSP and the Access Applicant are part of a Vertically-Integrated NSP. As such, in accordance with section 64(3) of the Pilbara Network Rules, the NSP has consulted with the ISO regarding the Access Applicant's request for exemption and is awaiting advice.

In accordance with section 64(6) of the Pilbara Network Rules, the ISO must advise the NSP:

a) Whether the exemption is or is not likely to cause or contribute to any adverse impact on Security, Reliability or the Pilbara Electricity Objective, and
b) Whether the exemption is or is not consistent with the constrained access regime in Subchapter 9.1 of the Pilbara Network Rules; and
c) of any conditions the ISO recommends be placed on the exemption.

The NSP will give consideration to the advice received from the ISO in making its final decision.

4. Draft decision

The NSP is satisfied the exemption is reasonably granted in accordance with **GEIP**. The safety hazard intended to be managed through compliance with clause 3.2.5.2(f) of the Harmonised Technical Rules has been adequately managed through the design of the solar farm.

The NSP notes the intention of the clause appears to be management of a safety risk arising with overhead 33 kV distribution feeders in populated areas which would be unacceptable without feeder circuit breakers. The same level of risk does not arise in the design submitted by the Access Applicant.

The proposed exemption, if granted, will not have any effect on the Registered NSPs and Network Users of its Network or any Network in the Power System.

The advantages of requiring the Access Applicant to include feeder circuit breakers in the design to comply with clause 3.2.5.2(f) of the Harmonised Technical Rules exceed the disadvantages associated with requiring compliance.

The NSP's draft decision is to grant the exemption for an indefinite period. No conditions are proposed for the exemption.

5. Request for submissions

The NSP invites written submissions on the Access Applicant's request and its Draft decision to approve the exemption.

Submission must be provided by 5:00pm WST on 24 March 2025. Any submissions not marked as confidential will be published on APA's website.

Submission should be emailed to: nwisnetworkaccesseng@apa.com.au

Appendix A: Technical note from Access Applicant

Title		Port Hedland Solar Farm – HTR Clause 3.2.5.2(f)			
Document No		PHSF-APA-EL-MEM-003			
Rev	**Date**	**Status**	**Originated**	**Checked**	**Approved**
Rev 1	12/02/2025	IFU	**NW**	**KB**	**KB**

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1 EXECUTIVE SUMMARY

This Technical Note addresses the compliance of the Hedland Solar Farm against HTR Clause 3.2.5.2(f). This clause applies to the risk of a generating unit re-energising a de-energised power system.

The applicant has identified the underlying risks this clause intends to address, and in this Technical Note presents the engineering controls and safe design measures to address these risks. With these risk controls in place, the applicant proposes that the Port Hedland Solar Farm has been designed and constructed so the inverters cannot re-energise a de-energised power system and if this happened it would not be a safety hazard.

2 PROBLEM STATEMENT

There is a potential safety hazard if a generating unit is permitted to re-energise (black start) a de-energised portion of the power system, unless the generating unit is appropriately designed for this purpose and the controller of the facility is permitted to do so.

The Port Hedland Solar Farm is not designed/constructed to be able to provide black start capability, however if it was possible, it could lead to:

1. Production of electricity that is materially outside the voltage and frequency requirements of the HTR, potentially leading to:
    A. Electrical equipment damage due to:
        1. Overvoltage (e.g. insulation failure, electronic component failures etc)
        2. Undervoltage (e.g. high currents leading to overheating, burnout, motor stalling etc)
    B. Process disturbances (where mechanical systems such as pumps, conveyors, fans etc rely on a nominal speed relative to 50Hz).
2. Insufficient power system fault level, leading to loss of electrical fault detection capabilities, potentially leading to:
    A. Increased risk of electric shock to people and/or livestock during earth fault as duration of elevated step/touch voltages is increased.
    B. Electrical equipment damage due to sustained overcurrent.
3. Unexpected sources of power within the power system leading to an electric shock hazard.

Managing these risks is covered in HTR Clauses 3.2.5.2(d)(3) & 3.2.5.2(f). These clauses relate to preventing a generating unit from energising a de-energised portion of the power system and thereby avoiding the detrimental consequences listed above. Clause 3.2.5.2(f), extract below, is intended (via the note below the clause) to apply to an embedded generating unit connected to a distribution feeder and includes a requirement of a “circuit breaker close inhibit interlock”.

> (f) If a *generating unit* is *connected* to the *distribution system,* the *generator* must provide a circuit breaker close inhibit interlock with the feeder circuit breaker at the *NSP's substation* in accordance with the requirements agreed between the *generator* and the *NSP* in accordance with *GEIP*.
>
> {Note: This interlock is required in addition to the islanding *protection* specified in subclause 3.2.5.2(d) (3) on account of the potential safety hazard if a deenergised *distribution feeder* was energised by an *embedded generating unit*.}

Although the Port Hedland Solar Farm is not connected to a distribution feeder, the applicant has been advised that they must comply with Clause 3.2.5.2(f) and provide a “circuit breaker close inhibit interlock”. It is understood that the reason compliance with Clause 3.2.5.2(f) is required, is because the nominal voltage at the point of connection is 33kV and if the same facility was

connected to a part of the network operating at greater than 33kV, compliance to this clause is not required.

The clause is not clear on which equipment or how an interlock is to be achieved. One interpretation is that there must be an interlocking scheme that prevents the generating unit circuit breaker being closed unless the distribution feeder circuit breaker is closed, in addition to the power system voltage/frequency being within normal range. The NSP has advised that ISO believes that in this context the clause, when speaking about the 'generating unit circuit breaker', refers to the 33 kV solar farm collector feeders. Therefore, the circuit breakers at the PoC ought to fulfil the interlock requirement. The 'feeder circuit breaker' in this context would mean the 33 kV switchboard's incomer and bus tie circuit breakers.

The requirement to have an additional engineering control (interlock) may be considered valid for distribution feeders, noting that there is public access to the (often uninsulated) electrical distribution infrastructure with the risk of personnel either deliberately or unintentionally contacting potentially energised conductors. Contact (copper theft, car accident etc) may result in the NSP distribution feeder circuit breaker opening (potentially auto reclosing) before locking out to de-energise the feeder.

To meet the safety objective, it is understood that the interlocking scheme needs to be robust and fail safe. The “close inhibit interlock” signal would be generated by the NSP in the associated zone substation and transmitted to the embedding generating unit through various schemes including hardwired wired signalling, radio communication link etc. To be robust and fail safe, the signal would be a “close permissive” (true when closure is permitted) and the communications link verified as healthy.

3 RISK ASSESSMENT

The Port Hedland Solar Farm Point of Connection circuit breakers include anti-islanding functions that trip the circuit breakers when the voltage or frequency move outside defined values. The protection relays performing the anti-islanding function include the following engineering controls to prevent the inverters from attempting to connect to and re-energise a de-energised power system:

i. The anti-islanding element remains active until the 33kV Substation busbar voltage and frequency have returned to within the defined trip values.
ii. The anti-islanding trip signal is latched within the protection relay and requires a local manual reset by the NSP before the circuit breaker can be closed.
iii. Closing control of the PoC circuit breakers is by the NSP only – the generating facility can only issue an open command to the circuit breakers.

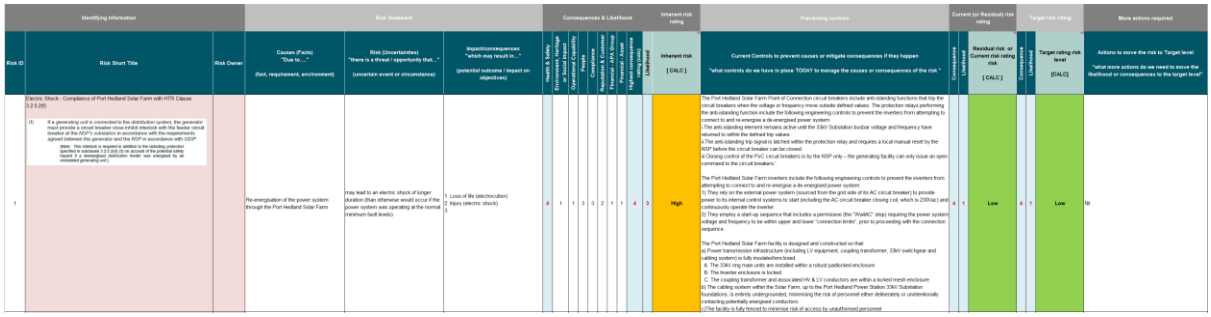
The Port Hedland Solar Farm inverters include the following engineering controls to prevent the inverters from attempting to connect to and re-energise a de-energised power system:

1. The inverters rely on the external power system (sourced from the grid side of its AC circuit breaker) to provide power to its internal control systems to start (including the AC circuit breaker closing coil, which is 230Vac) and continuously operate the inverter.
2. The inverters employ a start-up sequence that includes a permissive (the “WaitAC” step) requiring the power system voltage and frequency to be within upper and lower “connection limits”, prior to proceeding with the connection sequence.

The Port Hedland Solar Farm facility is designed and constructed so that:

a) Power transmission infrastructure (including LV equipment, coupling transformer, 33kV switchgear and cabling system) is fully insulated/enclosed.
    a. The 33kV ring main units are installed within a robust padlocked enclosure
    b. The Inverter enclosure is locked
    c. The coupling transformer and associated HV & LV conductors are within a locked mesh enclosure.
b) The cabling system within the Solar Farm, up to the Port Hedland Power Station 33kV Substation foundations, is entirely undergrounded, minimising the risk of personnel either deliberately or unintentionally contacting potentially energised conductors.
c) The facility is fully fenced to minimise risk of access by unauthorised personnel

Below is a risk assessment showing that the residual risk with the existing risk controls.



4 DEROGATION REQUEST

The applicant proposes that with the above risk controls in place – of engineering controls and safe design – the Port Hedland Solar Farm has been designed and constructed in a manner that the inverters cannot re-energise a de-energised power system, without the specific "…circuit breaker close inhibit interlock with the feeder circuit breaker…". As such, the applicant requests a derogation to Clause 3.2.5.2(f).

