Proposed Amendments to the Technical Rules Submitted by Western Power

Issues Paper

February 2016

Economic Regulation Authority
WESTERN AUSTRALIA

This document is available from the Economic Regulation Authority's website at www.erawa.com.au. For further information, contact:

Economic Regulation Authority
Perth, Western Australia
Phone: (08) 6557 7900

Contents

Invitation to make submissions

On 6 November 2015, Western Power submitted proposed amendments to the Technical Rules for the South West interconnected network to the Economic Regulation Authority (**Authority**). Western Power has proposed a number of amendments to its Technical Rules in order to accommodate emerging technologies, with particular regard to the facilitation of connecting embedded generation to the distribution network.[1] Western Power's proposal is made under section 12.50 of the *Electricity Networks Access Code 2004* (**the Code**).

The purpose of this issues paper is to assist interested parties in making submissions in relation to the proposed amendments. These submissions will assist the Authority in making its determination.

Interested parties are invited to make submissions by 4.00 pm (WST) on Friday, 11 March 2016 and should be marked to the attention of the Assistant Director Electricity.

Submissions should be made via the portal on the ERA website.

CONFIDENTIALITY

In general, all submissions from interested parties will be treated as being in the public domain and placed on the Authority's website. Where an interested party wishes to make a submission in confidence, it should clearly indicate the parts of the submission for which confidentiality is claimed, and specify in reasonable detail the basis for the claim. Any claim of confidentiality will be considered in accordance with the provisions of *Electricity Networks Access Code 2004*, sections 14.12 to 14.15.

The publication of a submission on the Authority's website shall not be taken as indicating that the Authority has knowledge either actual or constructive of the contents of a particular submission and, in particular, whether the submission in whole or part contains information of a confidential nature and no duty of confidence will arise for the Authority.

GENERAL ENQUIRIES
Elizabeth Walters
Economic Regulation Authority
Phone: 61 8 6557 7900
records@erawa.com.au

MEDIA ENQUIRIES
Tracy Wealleans
Economic Regulation Authority
Phone: 0428 859 826
tracy.wealleans@erawa.com.au

[1] Western Power, *Submission to the Economic Regulation Authority for amendments to the Technical Rules*, November, 2015, p. 5. https://www.erawa.com.au/cproot/13980/2/WP%20Submission%20for%20Technical%20Rules%20amendments%202015.PDF

Please note an addendum was published on 18 December 2015. https://www.erawa.com.au/cproot/13996/2/WP%20Technical%20Rules%20Amendment%202015%20-%20Submission%20Addendum%20November%202015.pdf

Introduction

Western Power has proposed a number of amendments to its Technical Rules in order to accommodate emerging technologies, with particular regard to the facilitation of connecting embedded generation to the distribution network.[2] Western Power's proposal is made under section 12.50 of the *Electricity Networks Access Code 2004* (**the Code**).

Technical Rules consist of the standards, procedures and planning criteria governing the construction and operation of an electricity network, and are required under the Access Code for all covered networks. They set out the minimum standards for the facilities, loads and generators which connect to the network in order to ensure the safety of all network users.

The Authority first approved and published Western Power's Technical Rules on 26 April 2007 which became effective from 1 July 2007. As required by the Code, the Authority commenced a review of the Technical Rules in October 2008 which was completed in August 2011. Following on from the review, revisions to the Technical Rules were approved by the Authority on 10 November 2011 and took effect from 23 December 2011.

Regulatory Requirements

Under Section 12.50 of the Code, a service provider may submit to the Authority a proposal to amend the Technical Rules at any time.

The Authority may reject the proposal if in its opinion, the proposal is misconceived or lacking in substance or has been made on trivial or vexatious grounds.

As soon as practicable, the Authority must consider whether the proposed amendments are consistent with Chapter 12 of the Code and the Code objective, having regard to any exemptions granted under sections 12.34 and 12.41, and then either approve or not approve the proposed amendments by publishing a notice of its decision, and if the decision was to approve the proposed amendments, the date on which the amendments commence.

Under section 12.54, the Authority must consult the public in accordance with Appendix 7 if it considers the proposed amendments to the Technical Rules to be substantial, and must approve the proposed amendment only if it considers that the amendment will not have a material adverse effect on the service provider or a user.

The Authority will engage directly with stakeholders to seek their views on the proposed amendments. To assist its review, the Authority has appointed an independent technical consultant to provide technical advice and assistance.

Western Power's Proposal

As noted above, a review of the Technical Rules was completed in August 2011. To enable the review to be completed, a number of issues raised by the Public Utilities Office (PUO),

[2] Western Power, *Submission to the Economic Regulation Authority for amendments to the Technical Rules*, November, 2015, p. 5.

Verve (now Synergy) and by the Clean Energy Council relatively late in the process were set aside to be dealt with at a future date.

Western Power has incorporated responses to these outstanding matters in its submission. A summary of the outstanding issues, together with Western Power's responses is included in Appendix 1 of this issues paper.

The amendments to the Technical Rules proposed by Western Power include:

- amending the limit for Direct Current (DC) injection from zero to 0.5 per cent of the connection point rating (per phase);
- removing out of date references to Australian Safety Standard AS 4777 (2005);
- amending the current definitions of a number of terns relating to connection points; and
- the correction of a number of typographical errors in the current Technical Rules.

A summary of Western Power's proposed amendments is set out below.

Clause 3.2.1 - DC Injection

Western Power has proposed to amend the limit for the amount of direct current that can be injected into the distribution system by low voltage connections from zero to the lower of either 0.5 per cent of the connection point rating (per phase), or 5mA. The proposed limit of 5mA has been recommended because it is very difficult to achieve measurement uncertainties of less than 4 per cent.

The clause most impacted by Western Power's proposed change to the Technical Rules is clause 3.2.1 (c)(3) Power System Performance Standards, Harmonics:

> A User must not inject into the transmission or distribution system any DC component of current produced by its own equipment."

Also impacted by this proposed amendment are Attachments 9 and 12, and the Glossary of the Technical Rules. These sections of the Technical Rules will be changed if Western Power's proposed amendments are approved.

DC Injection Limit

Excessive levels of DC injected into the network may result in corrosion, increased harmonic distortion, and reduced efficiency in the operation of devices reliant on magnetic cores. For these reasons, the current limit for the injection of DC current into the distribution network is zero.

However, Western Power has detected that there are currently many types of loads at connection points which inject various levels of direct current into the distribution network.

Applicants seeking to connect solar PV inverters at ratings greater than 30 kVA are currently restricted from connecting to the network due to the existing provisions in the Technical Rules, which specify that the limit for the amount of direct current that can be injected into the distribution system is zero. Western Power considers that this zero-limit imposes additional expenses on customers who wish to connect to the low voltage network because it requires modifications to inverters and connection points in order to make them compliant with the Technical Rules.

By updating clause 3.2.1 to allow for the injection of a small amount of direct current into the network, Western Power hopes to remove barriers to entry for the increasing number of customers with photovoltaic systems who wish to connect to its network.

Definition – DC Injection

Western Power proposes to include a definition for the term DC injection in the Glossary for the Technical Rules:

> "DC injection: a phenomenon where direct current (DC) is superimposed over the alternating current (AC) power system at a network connection point."

Attachment 9 – Load Characteristics at Connection Point

Attachment 9 of the Technical Rules contains the estimated parameters of load groups for characteristics such as harmonic content and responses to frequency and voltage variations.[3]

Western Power has proposed an amendment to align Attachment 9 with the proposed changes to the limit for DC injection to the network. This amendment consists of the addition of DC injection levels to the section entitled "for all types of load".

Attachment 12 – Testing and Commissioning of Small Power Stations Connected to the Distribution System

Western Power has also proposed an amendment to Attachment 12 of the Technical Rules, which deals with the testing and commissioning of small power stations connected to the distribution system. The amendment proposed by Western Power is to include an additional clause under "A12.2 Certification", which specifies that the Generator must provide certification to Western Power that allowable DC injection levels are not exceeded at the connection point.

Specific Areas for Consideration

Western Power issued a temporary DC injection exemption in November 2014 to address the issues outlined above. However, given the growing number of users with solar PV

[3] Western Power, *Technical Rules for the South West Interconnected Network*, 23 December, 2011, p. 149.

inverters, Western Power considers amending the Technical Rules would better meet users' requirements and remove the need for an exemption process.

Issue 1 DC Injection limit

Submissions are invited from interested parties on the following:

1) Whether the proposed amendments meet the requirements of stakeholders.
2) Whether the proposed amendment will materially impact the safety and reliability of the Western Power network.
3) Whether the proposed amendment will be effective in removing barriers to entry for connection to Western Power's network.

AS 4777 Date Amendments

Western Power proposes to remove references to the applicable year of Australian Safety Standard AS 4777 (2005 in the current Technical Rules), and replace them simply with references to AS 4777 in order to avoid the requirement to update the Technical Rules each time the standard is amended.

Western Power states that if this amendment is not made, then only those inverters certified under AS 4777 2005 will be compliant under clause 3.7 and Attachment 12 of the Technical rules.

Western Power submits that while there is a low risk that changes to AS 4777 may be made that are unacceptable to the Western Power network, it is within Western Power's power to not approve connections until any identifiable issues are resolved.

Western Power notes it has consulted with Technical Rules stakeholders who are also involved in the periodic amendments to AS 4777, who have confirmed that the adoption of updates to the standard should be made automatically rather than require a separate update to the Technical Rules.

Issue 2 AS 4777 Date Amendments

Submissions are invited from interested parties on Western Power's proposed amendment to replace references to the applicable year of AS 4777 with references to just AS 4777, especially with regard to the impact that this change may have on the safety and reliability of the Western Power network.

Clarification of Definitions

Western Power proposes to amend the definition of a number of terms used throughout the Technical rules. The terms to which the amendment of definitions has been proposed are:

- Connection Point;

- Connection Assets; and
- Point of Common Coupling.

The amended definition for the term Connection Point has been proposed to accommodate the dual nature of the term with respect to its contractual meaning and its physical nature.

For contractual purposes, the proposed definition of the term Connection Point is:

> "a point on the network identified in, or to be identified in, a contract for services as an entry point or an exit point or a bi-directional point".

For references to a physical location, the proposed definition for the term Connection Point is:

> A point on the network on which network assets (owned by Western Power) are connected to assets owned by another person'.

Western Power has also proposed the addition of the following terms and their respective definitions to the glossary of the Technical Rules:

- Bi-directional point: "A single connection point at which electricity is transferred into and out of the network"
- Entry point: "A single connection point at which electricity is more likely to be transferred into the network than out of the network"
- Exit point: "A single connection point at which electricity is more likely to be transferred out of the network than into the network"

Western Power notes its consultation with users of the Technical Rules identified numerous cases where there was uncertainty regarding the location of their connection point.

Western Power has proposed to amend the definition of the term Connection Assets for a connection point to:

> 'All of the network assets that are used only in order to transfer electricity to or from the connection point.'

Western Power has identified the requirement to amend the definition of the term Connection Assets through the assessment of recent requests for exemptions from the Technical Rules. Western Power submits that the current definition is confusing and is inconsistent with the definition in the Access Code.

For the term Point of Common Coupling, Western Power has proposed to amend the definition to:

> "The point on the WPN at which Western Power requires compliance with the Technical Rules clauses 2.3.3(a) and 2.3.4(a). Under normal circumstances this compliance is required at the connection point but Western Power may, at its sole discretion allow the "point of common coupling" to be at a point on the network upstream from the connection point, where it is reasonable to do so in accordance with good electricity industry practice."

Issue 3 Clarification of Definitions

Submissions are invited from interested parties on the following:

1) Whether Western Power's proposed amendments to the definitions of the terms "connection point", "connection assets" and "point of common coupling" will address the uncertainty associated with these terms with reference to the Technical Rules.

2) Western Power's proposal to include definitions of the terms "bi-directional point", "entry point", and "exit point" in its glossary.

Corrections to Typographical Errors

Western Power has identified a number of typographical errors in the Technical Rules document since its publication in 2011. Western Power proposes the following amendments to resolve these errors:

- Section 2.2.11 Long Term Voltage Stability (b) – correct the spelling of the word "contingency".
- Section 3.3.1 General (e)(5) – correct the spelling of the word "rectify"
- Section 3.3.3.1 Detailed Technical Requirements Requiring Ongoing Verification –
  - (b) – correct the spelling of the word "requirements"
  - (f) – correct the spelling of the word "facility"
  - (g) – correct the spelling of the word "compliance"
- 3.6.1 Overview –
  - the addition of 10kVA single phase energy systems to energy systems which are not covered by clause 3.6.1, which addresses small generation units connected to lo the low voltage system via inverters;
  - specification that 30 kVA three phase energy systems are not subject to clause 3.6.1; and
  - the addition of the word "concerns" to the end of the second point in the list of issues addressed by clause 3.6, so that the sentence now says, "resulting in safety and security of supply concerns".
- 3.6.10.3 Islanding Protection (c) – correct the spelling of the word "physically"
- 3.6.12 Failure of Generator's Protection equipment – remove the second consecutive instance of the word "the" from a sentence.
- 5.7.1 User's Advice (a)-
  - correct the spelling of the word "operation"
  - correct the spelling of the word "affect"
- Attachment 5 Submission Requirements for Electrical Plant Protection, pg 164 - correct the spelling of the word "diagrammatic"

- Attachment 12 Testing and Commissioning of Small Power Stations Connected to the Distribution System
  - (A12.1) – replace the word “specifies” with the word “lists”.
  - (A12.2) – the specification that certification by a chartered professional engineer must be by the National Professional Engineers’ Register or equivalent.

Appendix 1 - 2011 Review of Technical Rules: Outstanding Matters

Public Utilities Office

The Public Utilities Office (**PUO**) raised concerns regarding the definitions of the terms "consumer", "generators", and "users", and noted that there was a discrepancy in the definitions of these terms between the Code and the Technical Rules that may cause confusion or result in unintended consequences for users or the network.

In its submission, Western Power has advised that in consultation with the PUO, it determined that amendments to these terms would have a materially adverse effect on the Service Provider (Western Power) and users, and would result in significant costs to both.

Western Power considers that the definitions of these terms in the Technical Rules have not caused any issues to date, and that better alignment between the Code and the Technical Rules could be dealt with in the future.

The PUO also made a number of comments in relation to the elements that constitute either a generating system, a generating unit, or a power system. The PUO queried whether an individual inverter along with its associated string of panels if located amongst a string of inverters may be regarded as a generating unit, and if so, whether in such a case the entire set of inverters and panels constitute a generating system or a power system.

The PUO submitted that any facility making use of a photovoltaic system should be assessed against the same set of rules whether an application was submitted for the inverter capacity in its entirety or applications for each inverter and string of panels were made in sequence.

Western Power considers that the current definitions in the Technical Rules are applied with respect to how the systems present at the connection point.

Western Power submitted that it assesses applications with respect to a number of characteristics of the existing system as well as on the additional components to which an application might apply. Western Power advised that it conducts these checks in order to circumvent the use of sequencing strategies such as those described in the PUO's submission.

Verve (now Synergy)

Verve submitted that the one-minute period after which small inverters are synchronised to switch back on following a trip due to a voltage disturbance is undesirable due to the risk that a brown-out might cause +100MW of solar generation to trip and then switch back on one minute later.

Verve considered that it would be better to program different inverters with different reconnection times so that solar power comes back on in a more progressive manner, and doesn't force substation transformers to change taps due to the short term voltage change that occurs while the inverters are off.

In its submission, Western Power has advised that the issue of solar inverters reconnecting after one minute as a group is dealt with in AS 4777, which relates to inverter requirements.

AS 4777 specifies that following a supply interruption, the reconnection of inverters once the network recovers, should be ramped.

Western Power considers that as this issue is addressed within the Australian Safety Standards, it is not a matter to be dealt with in the Technical Rules.

Western Power further advised that the AS 4777 committee decided that a soft start approach was an appropriate method of addressing the matter of restarting inverters connected to the network, whereby after a system restart, inverter systems will come back on line with a ramping up connection which will be controlled and synchronised with the re-energisation of local distribution network elements.

Clean Energy Council (CEC)

The Clean Energy Council suggested that the ride through capability (for a generator) should be provided depending on the voltage level at which the generator connection is made.

In its submission, Western Power did not consider that there is a need to amend the Technical Rules to require that ride through capabilities are provided, as it has no record of any feedback that not having this information has caused any issues or network problems to date.

Western Power noted that it may consider making an amendment of the nature suggested by the CEC when making future amendments to the Technical Rules if required.

Issue 4 2011 Review of Technical Rules Outstanding Matters

Submissions are invited from interested parties on whether Western Power's responses, as set out in its submission, adequately deal with the matters raised.