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Dear ~~Mr Rowe~~ Lyndon

Proposed Amendments to Codes – Generator Performance Standards

This submission responds to the Utilities Commission's (**Commission**) draft decision, *Power and Water Corporation's Proposed Amendments to Codes - Generator Performance Standards* dated 4 December 2019 (**Draft Decision**).

Power and Water's submission is provided to the Commission early in order to formally communicate our response to the Draft Decision and help inform stakeholders who are considering the Draft Decision, by sharing our understanding of the practical implications of some of the Commission's proposals and offering some alternative suggestions. Prior to 29 January we will provide updated codes that incorporate both the Commission's and Power and Water's proposed changes and may also provide a further submission if required.

Power and Water acknowledges the rigor and effort of the Commission in developing the Draft Decision. We welcome the Commission's material support for the proposed generator performance standards (**GPS**) in order to facilitate the transition to a renewable energy future and appreciate the drafting improvements proposed. Where we believe that the proposed changes may be enhanced to provide an improved outcome, we provide our views in this submission.

As outlined in our initial submission, Power and Water believe that facilitating and embracing renewable energy is critical to meeting the future demands of the NT power systems. Power and Water expects over 60MW of solar generation to be connected to the Darwin-Katherine System within 12 months, which represents up to 60% of our daytime system load. As the Commission acknowledges, 'do nothing' is not an option in relation to the GPS for the Territory.

Appropriate GPS enable generators to connect and sell their energy, while ensuring the power system remains secure and reliable. The GPS also seeks to ensure that those who drive risks and costs to the system are commercially incentivised to minimise them, which results in the lowest cost outcomes for consumers. The proposed GPS addresses the challenge of facilitating the anticipated high penetration of renewables, while keeping the lights on, and with a least cost/no regrets approach.

Our proposed changes to those set out in Commission' Draft Decision fall broadly into the following categories.

System security

Given the challenges that divergence from the National Electricity Market (**NEM**) or Western Australian Electricity Market requirements can create for generator proponents, we proposed new standards based on the equivalent National Electricity Rules (**NER**) Chapter 5 Schedule 5.2 requirements, with the only exceptions being where adoption in the NT would prevent System Control having the necessary levers of predictability and dispatchability to ensure power system security in the Northern Territory power systems. We have identified proposed changes where this aspect can be enhanced with further information provided in Attachment A.

Early adoption of NER provisions

In some areas, the Commission has proposed changes that would adopt more of the NER arrangements through the Network Technical Code (**NTC**) than Power and Water currently have the technical information or systems to deliver (or to deliver with sufficient confidence). In addition to this, adopting an isolated NER obligation can be problematic if it relies on supporting provisions and definitions that are not yet applicable or meaningful in the Northern Territory market context.

Allocation of responsibilities and costs

As in the NEM, a connecting generator should provide us with accurate engineering studies and models to support the proposed access standards. Generators should have practical and financial incentives to ensure the quality of the information they provide to us, and which supports accurate power system models. We identify enhancements to proposed changes in Attachment A.

Expectations of negotiated access standards

Power and Water has sought to allow for technological innovation and competition to drive the transformation of the Northern Territory power systems, providing for a consistent set of requirements for major generation plant within the Northern Territory industry.

The NTC and Northern Territory NER framework provides for negotiated access standards, but only where they will not adversely affect power system security or the quality of supply for other network users. A generator proponent must propose and justify a standard that is as close as practicable to the corresponding automatic access standard, having regard to listed matters.

We highlight in this submission where the proposed changes – or their proposed location within the NTC - could directly or indirectly be detrimental to the integrity of this process or create unrealistic expectations for negotiated outcomes.

Operationalising the new code

Power and Water acknowledges the significant body of work required of us once the GPS changes are made. This work includes developing and documenting procedures and guidance materials (some previously anticipated and already underway, and some additional); and developing new systems and procedures to meet our new obligations. In some areas, we request flexibility to transition as quickly as is practical, or to adopt an interim solution.

Should you require any clarification or further information on matters raised in our submission, please contact Jodi Triggs by email on jodi.triggs@powerwater.com.au.

Yours sincerely

Djuna Pollard
A/Chief Executive
10 January 2020

Attachment A – Amendments to Network Technical Code

This attachment sets out Power and Water's position on the Commission's proposed amendments to the Network Technical Code (**NTC**). It addresses each clause discussed by the Commission, following the order in its Draft Decision.

Where we include extracts from the NTC below, we use green highlighting to indicate changes proposed by the Commission. Any Code text with grey highlighting or in revision mode is wording proposed by Power and Water for the reasons set out in this submission.

Power and Water's original application for GPS-related code changes and this submission are guided by our statutory obligations as the power system controller and network operator, and by the following principles, drawn from the Utilities Commission Act:

- ***Protect the interests of consumers*** – i.e. with respect to reliability and quality of services and supply in regulated industries. Our primary focus is keeping the lights on while facilitating increased connection of asynchronous renewable energy and storage technologies.
- ***Promote economic efficiency*** - GPS should support the lowest total cost of reliably providing energy whilst facilitating the connection of asynchronous renewable energy technologies. Consider cost trade-offs between GPS, ancillary services and network investment. Allocate risks to those best able to manage them at least cost.
- ***Ensure consumers benefit from competition and efficiency*** – GPS should facilitate renewable generation entry in a manner that minimises the total cost of reliably providing energy whilst facilitating a greater share of renewable generation.
- ***Facilitate entry into relevant markets*** - Provide certainty to potential investors by taking a long term, 'no regrets' view to establish a framework for the future with clear obligations, stable GPS, transparency about the technical challenges in the NT system, and timely implementation.
- ***Promote competitive and fair market conduct*** - The GPS should be technology agnostic as far as practicable, so as not to create market power for one generator over another based on different technology; and not raise the costs of subsequent renewable generators based on the treatment of first entrants.
- ***Prevent misuse of monopoly or market power*** – Design grandfathering and transitional arrangements for existing and inflight renewable proponents to reduce risks of becoming a source of market power.

1. Italicised terms and new definitions

Power and Water agrees with the Commission's proposals for the use and definitions of terms included throughout its Draft Decision with the exception of:

General corrections

We have corrected formatting and text to use consistent italicised defined terms throughout the Code, and corrected minor errors in referencing. Omitted headings or placeholders stating 'Deleted' have been reinstated.

Use of NT NER definitions

Generally, where a term is defined in the NT NER and that definition is suitable for the NTC, it is adopted in this Code because of the operation of Attachment 1 paragraph (c). That clause states that "an italicised word or phrase defined in the NT NER has the meaning given in the NT NER unless redefined in the table below".

Terms that need not be defined

The Commission proposed that the terms 'plant standard' and 'dispatch instruction' be defined.

Each of these terms is defined in the NT NER, but the NT NER definitions and associated rules do not yet apply in the NT, and do not align with current arrangements in the NT.

Power and Water believes that these terms have a clear plain English meaning within the contexts in which they occur in the NTC. Therefore, we recommend that they are not defined.

Changes proposed to Commission definitions
We have modified the definition of system strength impact assessment guidelines, in line with our proposed transitional arrangement in clause 3.3.16(a1).

2. *Clause by clause comments*

NTC Clause 3.3 preamble and Clause 3.3.1 – Outline of Requirements

The Commission did not propose any changes to the amendments proposed by Power and Water. We note and accept this position.

NTC Clause 3.3.2 – Application of Settings

The Commission did not propose any changes to the amendments proposed by Power and Water. We note and accept this position.

NTC Clause 3.3.3 – Technical Matters to be Co-ordinated

The Commission did not propose any changes to the amendments proposed by Power and Water. We note and accept this position.

NTC Clause 3.3.4 Provision of Information

The Commission proposed changes to sub-paragraph (b) to clarify that both Root Mean Square (RMS) and Electromagnetic Transient (EMT) models are to be provided if requested by Power and Water.

Power and Water accepts the Commission's reasoning and supports the Commission's proposed drafting changes to paragraph (b). Power and Water also suggests further changes to better achieve the Code objectives.

In addition to the Commission's amendments to paragraph (b), Power and Water seeks further amendments to clause 3.3.4 in order to:

- clarify that models are to be provided in both encrypted and unencrypted forms, and should be provided with a releasable user guide
- incorporate within this 'Provision of Information' clause the Commission's proposed amendments to clause 3.3.5(i) and (j) that relate to 'Network Modelling Information'
- create a head of power for Generator Modelling Guidelines and Generator Modelling Change Management Requirements
- strengthen provisions relating to sharing, confidentiality and use of information
- provide sub-headings for clarity.

In relation to the releasable user guide, we note that there is useful guidance material available from AEMO in its Guideline for Preparation of a Releasable User Guide.

Power and Water's proposed changes are set out in the box below.

3.3.4 Provision of information

Data to be provided by Generators

(a) A *Generator* shall provide the data specified in clause **Error! Reference source not found.**.

(b) The *Generator* shall provide all other data reasonably required by the *Network Operator*. This data shall include, without limitation, full Electromagnetic Transient (EMT) and Root Mean Square (RMS) models (and all model parameters) of:

(1) the generating *units*;

(2) the excitation *control systems*;

(3) turbine / engine governor systems; ~~and~~

(4) power system stabilisers; and

(5) inverter control systems;

to enable the *Network Operator* to conduct dynamic simulations.

(c) These models shall be in a form which is compatible with the power system analysis software used by the *Network Operator* (currently PSS/E from Siemens PTI and PowerFactory) and shall be inherently stable. These models shall be provided in both encrypted and unencrypted form and be supported by a separate releasable user guide for both the RMS and EMT models.

(d) Details of the kinds of data that may be required are included in Attachment 3 of this *Code*, specifically:

(1) Schedule S3.1 - Generating unit design data;

(2) Schedule S3.2 - Generating unit setting data;

(3) Schedule S3.5 - Network and plant technical data; and

(4) Schedule S3.6 - Network plant and apparatus setting data.

(e) Data provided by a *Generator* under this clause 3.3.4 may be shared by the *Network Operator* with other *Generators*, for the purposes of this *Code*, subject to the restrictions set out in the remainder of clause 3.3.4.

(f) The *Network Operator* may develop and publish Generator Modelling Guidelines and Generator Modelling Change Management Requirements for the purposes of this *Code*.

Network modelling information for connection applicants

(g) A *connection applicant* for a new or modified *generating unit* or *generating system* seeking *connection* to the network, may request from the *Network Operator*:

(1) information that is reasonably required by the connection applicant to carry out power system simulation studies (including load flow and dynamic simulations) for planning and operational purposes; and

(2) operation and maintenance procedures and practices for network operation, sufficient to enable the *connection applicant* to carry out power system modelling under normal, outage and emergency conditions.

(h) If the *Network Operator* holds information requested under paragraph (g), the *Network Operator* must provide the requested information to the *connection applicant* as soon as practicable, subject to the following requirements:

(1) If the *Network Operator* holds and is required under this paragraph (h) to provide a releasable user guide that the *Network Operator* received from a *Generator*, the *Network*

Operator must provide the releasable user guide to the *connection applicant* in an unaltered form.

(2) If the *Network Operator* holds and is required under this paragraph (h) to provide a form of the model source code that the *Network Operator* received from a *Generator* or from any other source, the *Network Operator* must provide that information:

(i) only in the form of, at the *Network Operator's* discretion:

~~(A) compiled information (such as, for example compiled Fortran code in object code or dynamic link library (DLL form);~~

(BA) encrypted information; or

(~~C~~B) a secured format agreed by the provider of the model source code,

unless the *Network Operator* has the written consent of the person who provided the information to the *Network Operator* to provide it in another form; and

(ii) in a form that can be interpreted by a software simulation product nominated by the *Network Operator*.

Confidentiality and use of information

(i) Any information provided by the *Network Operator* under paragraph (h) to a *connection applicant* must be treated as *confidential information*.

(k) A *connection applicant* who receives information under paragraph (h) may only use that information for the purpose of designing its *generating unit* or *generating system* and *connection* to the network, may only disclose such information to its employees and its external engineering advisers for use for such purpose and must not otherwise disclose or use the information

(l) A *connection applicant* who receives information under paragraph (h) must ensure any employees and engineering advisers to whom it discloses the information keep it confidential and only use it for the purpose referred to in paragraph (k).

NTC Clause 3.3.5 – Technical Requirements

Power and Water accepts the Commission reasoning but proposes alternative drafting changes.

Firstly, please note our proposal outlined in the section above to move the Commission's 'Network Modelling Information' provisions into clause 3.3.4.

For those matters that relate specifically to negotiated access standards, we note the Commission's proposed incorporation of NT NER clauses 5.3.4A (e) to (i) – provisions that are not currently activated in the NT – to provide obligations on Power and Water when responding to any proposed negotiated access standard.

Though we agree that the additional paragraphs 3.3.5 (d) to (h) add clarity for generator connection applicants, we are concerned at this time with the 30-day requirement to respond to proposed negotiated standards. At least initially, this may not be possible given that:

- the proposed GPS are new and represent a significant change for the NT, and
- there is uncertainty regarding the volume and nature of proposed negotiated standards to be considered by Power and Water.

We also note that the activated NT NER clause 5.3.6 (a) (2) places a 4 month maximum timeline to make an offer to connect for an embedded generator connection application.

Therefore, during this period following commencement of NT NER clauses 5.3.4A, and the proposed introduction of a response time limit on the Network Operator, we request that the proposed NTC 3.3.5 (d) be amended as marked up in the Box below.

(d) Within ~~30 business days~~ a timeframe to meet the requirements of clause 5.3.6 of the NT NER, following the later of:

(1) receipt of a proposed *negotiated access standard*; and

(2) receipt of all information required to be provided by the connection applicant,

the *Network Operator* must accept or reject a proposed *negotiated access standard*.

(e) The *Network Operator* must reject the proposed *negotiated access standard* where in the *Network Operator's* reasonable opinion, one or more of the requirements at subparagraphs (a)(1) and (a)(2) are not met.

(f) If the *Network Operator* rejects a proposed *negotiated access standard*, the *Network Operator* must, at the same time:

(1) subject to obligations in respect of *confidential information*, provide to the connection applicant:

(i) where the basis for the *Network Operator's* rejection is lack of evidence from the connection applicant, details of the additional evidence of the type referred to in paragraph (c) the *Network Operator* requires to continue assessing the proposed *negotiated access standard*;

(ii) detailed reasons in writing for the rejection, including the extent to which each of the matters identified at subparagraphs (a)(1) and (a)(2) contributed to the *Network Operator's* decision to reject the proposed *negotiated access standard*; and

(2) advise the connection applicant of a *negotiated access standard* that the *Network Operator* considers meets the requirements of subparagraphs (a)(1), and (a)(2).

(g) The connection applicant may in relation to a proposed *negotiated access standard* advised by the *Network Operator* in accordance with subparagraph (f)(2):

(1) accept the proposed *negotiated access standard*;

(2) reject the proposed *negotiated access standard*;

(3) propose an alternative *negotiated access standard* to be further evaluated in accordance with the criteria in paragraph (b); or

(4) elect to adopt the relevant *automatic access standard* or a corresponding plant standard.

(h) An *automatic access standard* or if the procedures in this clause 3.3.5 have been followed a *negotiated access standard*, that forms part of the terms and conditions of a *connection agreement*, is taken to be the performance standard applicable to the connected plant for the relevant technical requirement.

NTC Clause 3.3.5.1 – Reactive Power Capability

The Commission has proposed new sub paragraphs (d) and (e), as set out in the Box below.

Power and Water questions the ability of the proposed drafting changes to achieve the stated objectives.

The matters listed in the Commission's draft paragraph (d) should be options that may underpin a generator's proposed negotiated access standards, to be considered, accepted or rejected by the Network Operator in accordance with 3.3.5 (a) to (h). The options should not be specified within the provisions of 3.3.5.1 to 3.3.17, which each describe an automatic access standard.

Proposed options are not necessary - The proposed provisions do not need to be expressly included in the NTC, in order for a generator to propose these options – or any other viable options - in seeking a negotiated access standard. The Commission's content may be interpreted as restricting possible negotiated options.

Responsibility and cost ambiguity - Also, the proposed location of the provisions within clause 3.3.5.1, as well as the words themselves, create an *incorrect* impression that:

- the proposed options form part of the automatic access standard for reactive power capability, and/or
- despite having entered a connection agreement that applies either the automatic standard, or a negotiated alternative standard, the generator can subsequently unilaterally vary its performance obligations.

That is problematic.

The provision would introduce ambiguity into the responsibilities and funding as between generator and Network Operator. This would undermine certainty, and shift costs.

We have practical concerns about how the provision of any deficit in reactive power by the Network Operator (for the Generator) interacts with the principle of shallow connection costs for generators and the prescribed network and associated revenue allowances. The starting point from a regulatory perspective is that our regulated costs do not extend beyond the generator connection point.

Therefore, Power and Water requests that the proposed paragraphs (d) and (e) be deleted.

If, however, the Commission is to retain such a provision, Power and Water believes that:

- It should be moved to the beginning of clause 3.3.5, which introduces the concept of negotiated standards.
- The words should be made more generic, to accommodate the breadth of options that might exist in the future.
- As a minimum, the edits highlighted below are requested.

"(?) If the *generating system* is not capable of the level of performance established under clause 3.3.5.1(a) the Generator, depending on what is reasonable in the circumstances, may request a *negotiated access standard* in accordance with clause 3.3.5(a) to (h), based on solutions including (without limitation)~~must~~:

(1) ~~pay compensation to~~ reaching a commercial arrangement with *the Network Operator* for the provision of the deficit of reactive power (supply and absorption) from within the network;

(2) installing additional equipment connecting at the *generating system's connection point* or another location, to provide the deficit of *reactive power* (supply and absorption), and such equipment is deemed to be part of the *generating system*;

(3) reaching a commercial arrangement with a *User* to provide the deficit of *reactive power* (supply and absorption); or

(4) if the inability to meet the performance level only occurs for particular operating conditions, agreeing to and documenting as part of the proposed *negotiated access standard*, operational arrangements by which the plant can achieve an agreed level of performance for those operating conditions.

NTC Clause 3.3.5.2 – Quality of Electricity Generated

Power and Water accepts the Commission reasoning and supports the Commission's proposed drafting changes.

*NTC Clause 2.4.1 Voltage fluctuations

The Commission proposed a new sub-paragraph (c) regarding how the Network Operator is to allocate emission limits.

Power and Water accepts the Commission's reasoning and supports the Commission's proposed drafting changes.

*NTC Clause 2.4.2 Harmonic distortion

The Commission proposed a new sub-paragraph (c) regarding how the Network Operator is to allocate emission limits.

Power and Water accepts the Commission's reasoning and supports the Commission's proposed drafting changes.

We also support the proposed inclusion of similar wording in:

2.4.2.1 Harmonic voltage distortion, sub-paragraph (d)

2.4.2.2 Non-integer harmonic distortion, sub-paragraph (d)

NTC Clause 3.3.5.3 – Generating Unit Response to Frequency Disturbance

Power and Water accepts the Commission's reasoning and supports the Commission's proposed drafting changes.

NTC Clause 3.3.5.4 – Generating System Response to Voltage Disturbances

Power and Water accepts the Commission's reasoning and supports the Commission's proposed drafting changes and suggested definition for **Normal Voltage** to be added to Attachment 1 of the NTC. We further propose adding the following definition for **Nominal Voltage** for completeness.

nominal voltage	The design *voltage* level, nominated for a particular location on the *power system*, such that power lines and circuits that are electrically *connected* other than through transformers have the same *nominal voltage* regardless of operating *voltage*.

NTC Clause 3.3.5.5 - Generating System Response to Disturbances following Contingency Events

Power and Water accepts the UC reasoning, but we have concerns that as drafted, there remains some ambiguity of interpretation and unacceptable risks for the NT. We propose further amendments to address these issues.

Following a review of the concerns outlined by the Commission, we have:

- Improved the wording of the clause to be in less ambiguous language; and
- Provided an alternative proposal for cumulative time thresholds.

<u>Improved wording</u>

We acknowledge the Commission's concerns regarding ambiguity "GHD advise that a worst case interpretation may require generators to ride through 15 faults resulting in near zero voltage at the connection point for 5 minutes...". Consequently, we have sought to provide greater clarity in this clause particularly around the original wording of "up to" in terms of interpretation. We have replaced these words which clarify that it is expected that the ride through capability for a 5 minute rolling window is no more than 15 disturbances or less as defined in the set of limiting event scenarios (eg 3 phase fault events).

Alternative proposal for cumulative time thresholds

Power and Water understand the intent of the Commission's proposed introduction of clauses (d)(8) and (9) to provide guidance to generators regarding cumulative time requirements. Power and Water excluded clauses (d)(8) and (9) in the proposed standard due to the difficulty in trying to assign sensible parameters to characterise equivalent numbers applicable to the NT power systems. We note that the Commission acknowledge on page 27 of the Draft Decision that due to high levels of lightning activity it may be appropriate for the cumulative time thresholds to be varied to that from the NEM.

In reviewing this clause in totality (which is now a straight adoption of the NER) with the proposed cumulative time thresholds proposed by the Commission, our concern is that the thresholds are likely to increase the risk of system black events during severe weather events.

We considered the following when assessing possible alternative parameters for this clause:

- Inherent electrical weakness of the NT power systems that tend to cause deeper and further reaching voltage disturbances during contingency events than the NEM.
- As acknowledged by the Commission the northern areas of the NT are prone to a higher level of lightning and severe storm events than most of the NEM.
- Alignment of capabilities to the design / system standards that currently exist in the NT, in particular reference to existing clauses NTC 2.9.4 Figure 5, NTC 16.2.6 and NTC 17.1 (a). These clauses deal with the outer limits for fault clearing times, post clearing time transient voltage dips and planning criteria for voltage sag and swell. Although the values are for single events and maximum levels we feel they are appropriate for consideration as an automatic standard.
- The importance of minimising the risk of cascading generator trips during severe weather events to avoid system black scenarios similar to the South Australia experience in 2016.
- The likely characterisation of event scenarios over a rolling 5 minute window.
- The degree of flexibility in meeting the automatic standard whilst removing ambiguous wording and replacing with affirmative statements.
- The ability of generator suppliers to maintain continuous uninterrupted operation in the context of other relevant NTC clauses with principally "off the shelf" products.
- The inferred ability of existing generators to meet the current NTC system design and planning criteria in terms of fault clearing times and transient voltage dip criteria.

We propose separate cumulative time thresholds for both less than 80% and 90% of normal voltage based on the following reasoning.

Less than 80% normal voltage

We provide the following worked example that is considered credible. For the example below, transmission uses the fault clearance times from NTC 2.9.4 in table 5 (ie 132 and 66kV), distribution uses the times in table 6 (ie 33kV and below) and Transient Voltage Dip (TVD) criteria based on NTC 16.2.6:

Worked example of a credible 15 event scenario:

Disturbance	Calculation	Result
6 deep transmission faults	(clearance time + TVD criteria): (150 + 400) milliseconds x 6	3,300 milliseconds
3 transmission faults	fault clearance time: 150 milliseconds x 3	450 milliseconds
1 transmission circuit breaker fail event	time + TVD: 450+400 milliseconds	950 milliseconds
5 distribution faults	fault clearance time: 1160 x 5 milliseconds	5,800 milliseconds
	TOTAL CUMULATIVE TIME	**10,000 milliseconds**

Note that this is not a worst case scenario, as can be demonstrated by the following example.

Worst case 15 event scenario:

Disturbance	Calculation	Result
1 distribution circuit breaker fail event	(clearance time + TVD criteria): (1500 + 400) milliseconds	1,900 milliseconds
14 distribution faults	(clearance time + TVD criteria): (14 x 1160) + (14 x 400) milliseconds	21,840 milliseconds
	TOTAL CUMULATIVE TIME	**23,740 milliseconds**

Less than 90% normal voltage

In order to align this requirement with the existing NTC clause 17.1 (a) that describes expected durations of voltage sag and swell (voltage outside the 90-110% system normal range) as part of the Network Planning Criteria, we propose to set the cumulative time threshold to 1 minute (ie 60,000 milliseconds). As a cross check the proposed NTC 3.3.5.4 (a) (7) is 10 seconds between 80-90% of normal voltage. This means that after six events in a rolling 5 minute window that the cumulative threshold would be reached which is considered a reasonable cap.

By taking the above into consideration we propose the following changes:

- Altering the lead-in paragraph to incorporate the subclause (d) (5) regarding the possibility of zero time gaps between successive disturbances.
- Altering the lead-in paragraph to remove ambiguity particularly the concern about interpretation that up to 15 events at zero voltage may be required.
- Altering (d) (1) to clarify that no more than six deep disturbances would be required in a rolling 5 minute window.
- Clarified that more than one circuit breaker fail event would not be required in a rolling 5 minute window.
- Clarified that more than 15 disturbances would not be required in a rolling 5 minute window.

- Added cumulative time thresholds for voltages less than 80% and 90% that are based on a scenario involving 15 total disturbances across both the transmission and distribution network in a 5 minute period that align with existing provisions in the NTC.

The changes proposed attempt to remove ambiguity identified by the Commission's consultants in their review and provide relevant cumulative time thresholds for the regulated power systems in the Northern Territory.

The resultant proposed changes to this clause are as follows:

Clause 3.3.5.5

(a) In this clause 3.3.5.5 a fault includes a fault of the relevant type having a metallic conducting path.

(b) The *automatic access standard* is:

(1) for a *generating system* and each of its *generating units*, the requirements of paragraphs (c) and (d);

(2) for a generating system comprised solely of synchronous generating units, the requirements of paragraph (e);

(3) for a *generating system* comprised solely of asynchronous generating units, the requirements of paragraphs (f) to (i); and

(4) for a *generating system* comprised of synchronous *generating units* and asynchronous *generating units*:

(i) for that part of the *generating system* comprised of *synchronous generating units*, the requirements of paragraph (e); and

(ii) for that part of the *generating system* comprised of asynchronous *generating units*, the requirements of paragraphs (f) to (i).

All generating systems

(c) A *generating system* and each of its *generating units* must remain in *continuous uninterrupted operation* for any disturbance caused by:

(1) a *credible contingency event*;

(2) a three phase fault in a transmission system cleared by all relevant primary protection systems;

(3) a two phase to ground, phase to phase or phase to ground fault in a transmission system cleared in:

(i) the longest time expected to be taken for a relevant *breaker fail protection* system to clear the fault; or

(ii) if a *protection system* referred to in subparagraph (i) is not installed, the greater of the time specified in clause 2.9.4 Figure 5 (or if none is specified, 450 milliseconds) and the longest time expected to be taken for all relevant primary *protection systems* to clear the fault; or

(4) a three phase, two phase to ground, phase to phase or phase to ground fault in a *distribution network* cleared in:

(i) the longest time expected to be taken for the *breaker fail protection* system to clear the fault; or

(ii) if a *protection system* referred to in subparagraph (i) is not installed, the greater of 1500 milliseconds and the longest time expected to be taken for all relevant primary *protection systems* to clear the fault,

provided that the event is not one that would disconnect the *generating unit* from the *power system* by removing *network* elements from service.

(d) A *generating system* and each of its *generating units* must remain in *continuous uninterrupted operation* for a series of ~~up to 15~~ disturbances within any five minute period caused by any combination of the events described in paragraph (c) ~~where~~, without limitation on the time difference between successive disturbances, unless any of the following conditions are exceeded first:

(1) ~~up to~~ more than six of the disturbances cause the *voltage* at the *connection point* to drop below 50% of *normal voltage*;

(2) in parts of the *network* where three-phase automatic reclosure is permitted, ~~up to~~ more than two of the disturbances are three phase faults, and otherwise, ~~up to~~ more than one three phase fault where *voltage* at the *connection point* drops below 50% of *normal voltage*;

(3) ~~up to~~ more than one disturbance is cleared by a *breaker fail protection system* or similar backup *protection system*;

~~(4) up to one disturbance causes the *voltage* at the *connection point* to vary within the ranges under clause 3.3.5.4(a)(7) and (a)(8);~~

~~(5) the minimum clearance from the end of one disturbance and commencement of the next disturbance may be zero milliseconds; and~~

~~(6) all remaining disturbances are caused by faults other than three phase faults~~,

(4) there are more than 15 disturbances;

(5) the cumulative time that *voltage* at the *connection point* is lower than 80% of *normal voltage* exceeds 10,000 milliseconds;

(6) the cumulative time that *voltage* at the *connection point* is lower than 90% of *normal voltage* exceeds 60,000 milliseconds;

provided that none of the events would result in:

(7) the islanding of the generating system or cause a material reduction in power transfer capability by removing network elements from service.

~~(8) the cumulative time that voltage at the connection point is lower than 90% of normal voltage exceeding 1,800 milliseconds within any five minute period; or~~

~~(9) the time integral, within any five minute period, of the difference between 90% of normal voltage and the voltage at the connection point when the voltage at the connection point is lower than 90% of normal voltage exceeding 1 pu second.~~

Synchronous generating systems

(e) Subject to any changed *power system* conditions or *energy* source availability beyond the *Generator's* reasonable control, a *generating system* comprised of *synchronous generating units,* in respect of the types of fault described in subparagraphs (c)(2) to (4), must supply to or absorb from the *network*:

(1) to assist the maintenance of *power system voltages* during the fault, capacitive reactive current of at least the greater of its pre-disturbance reactive current and 4% of the maximum continuous current of the *generating system* including all operating synchronous *generating units* (in the absence of a disturbance) for each 1% reduction (from the level existing just prior to the fault) of *connection point voltage* during the fault;

(2) after clearance of the fault, *reactive power* sufficient to ensure that the *connection point* voltage is within the range for *continuous uninterrupted operation* under clause 3.3.5.4; and

(3) from 100 milliseconds after clearance of the fault, *active power* of at least 95% of the level existing just prior to the fault.

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:

(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 the *Network Operator* and *Power System Controller*; 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 the *Network Operator* and *Power System Controller*,

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 Operator* and *Power System Controller*, 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.

(g) For the purpose of paragraph (f):

(1) the *generating system* must commence a response when the *voltage* is in an under-voltage range of 85% to 90% or an over-voltage range of 110% to 115% of *normal voltage*. These ranges may be varied with the agreement of the *Network Operator* and *Power System Controller* (provided the magnitude of the range between the upper and lower bounds remains at Δ5%); and

(2) the reactive current response must have a rise time of no greater than 40 milliseconds and a settling time of no greater than 70 milliseconds and must be adequately damped.

(h) Despite paragraph (f), a *generating system* is not required to provide a capacitive reactive current response in accordance with subparagraph (f)(1)(i) where:

(1) the *generating system* is directly connected to the *power system* with no step-up or connection transformer; and

(2) voltage at the *connection point* is 5% or lower of *normal voltage*.

(i) Subject to paragraph (h), despite the amount of reactive current injected or absorbed during *voltage* disturbances, and subject to thermal limitations and *energy* source availability, a *generating system* must make available at all times:

(1) sufficient current to maintain rated apparent power of the *generating system* including all operating *generating units* (in the absence of a disturbance), for all *connection point* voltages

above 115% (or otherwise, above the over-voltage range agreed in accordance with subparagraph (g)(1)); and

(2) the maximum continuous current of the *generating system* including all operating *generating units* (in the absence of a disturbance) for all *connection point voltages* below 85% (or otherwise, below the under-voltage range agreed in accordance with subparagraph (g)(1)),

except that the *Network Operator* and *Power System Controller* may agree limits on active current injection where required to maintain *power system security* and/or the *quality of supply* to other *Network Users*.

General requirements - All generating systems

(j) The performance standard must include any operational arrangements to ensure the *generating system* including all operating *generating units* will meet its agreed performance levels under abnormal network or *generating system* conditions.

(k) When assessing multiple disturbances, a fault that is re-established following operation of automatic reclose equipment shall be counted as a separate disturbance.

Asynchronous generating systems

(l) For the purpose of paragraph (f):

(1) the reactive current contribution may be limited to the maximum continuous current of a *generating system*, including its operating asynchronous *generating units*;

(2) the reactive current contribution and *voltage* deviation described may be measured at a location other than the *connection point* (including within the relevant *generating system*) where agreed with the *Network Operator* and *Power System Controller*, in which case the level of injection and absorption will be assessed at that agreed location;

(3) the reactive current contribution required may be calculated using phase to phase, phase to ground or sequence components of *voltages*. The ratio of the negative sequence to positive sequence components of the reactive current contribution must be agreed with the *Network Operator* and *Power System Controller* for the types of disturbances listed in this clause 3.3.5.5; and

(4) the performance standards must record all conditions (which may include temperature) considered relevant by the *Network Operator* and *Power System Controller* under which the reactive current response is required.

Synchronous generating systems and units

(m) For a *generating system* comprised solely of synchronous *generating units*, the reactive current contribution may be limited to 250% of the maximum continuous current of the *generating system*.

(n) For a synchronous *generating unit* within a *generating system* (other than a *generating system* described in paragraph (m)), the reactive current contribution may be limited to 250% of the maximum continuous current of that synchronous *generating unit*.

NTC Clause 3.3.5.6 – Quality of Electricity Generated and Continuous Uninterrupted Operation

Power and Water accepts the Commission's reasoning and supports the Commission's proposed drafting changes.

NTC Clause 3.3.5.7 – Partial Load Rejection

Power and Water accepts the Commission's reasoning and supports the Commission's proposed drafting changes.

NTC Clause 3.3.5.8 - Protection of Generating Units from Power System Disturbances

Power and Water accepts the Commission's reasoning and supports the Commission's proposed drafting changes.

NTC Clause 3.3.5.9 - Protection Systems that Impact on Power System Security

The Commission did not propose any changes to the amendments proposed by Power and Water. We note and accept this position.

NTC Clause 3.3.5.10 – Protection to Trip Plant for Unstable Operation

Power and Water accepts the Commission's reasoning and supports the Commission's proposed drafting changes.

NTC Clause 3.3.5.11 – Frequency Control

Power and Water accepts the Commission's reasoning, but proposes alternative drafting changes to avoid unintended consequences.

Power and Water accepts all bar the inclusion of the words "subject to energy source availability" where it appears in (b)(1), and proposes a qualification for clarity where its appears in paragraph (b)(2).

Paragraph (b)(1) - Although Power and Water understands the Commission's intention, we believe that the wording "subject to energy availability" is not appropriate for this specific clause. Our reasoning is that this clause is simply to require that a generator does not respond in a manner that works against the restoration of power system frequency (e.g. raising output in response to a rise in frequency). Further, it is inconsistent with the equivalent clause in NER NT S5.2.5.11. We therefore recommend the removal of the proposed wording.

Paragraph (b)(2) - Although Power and Water
To avoid confusion (and the unintended introduction of semi-scheduled generation), Power and Water requests that 3.3.5.11(b)(2) be amended to read as follows:

> "subject to energy source availability as determined in capacity forecasts under clause 3.3.5.17, a generating system must be capable of operating in frequency response mode such that it automatically provides a proportional:"

NTC Clause 3.3.5.12 – Impact on Network Capability

Power and Water accepts the Commission reasoning and supports the Commission's proposed drafting changes

NTC Clause 3.3.5.13 - Voltage and Reactive Power Control

Power and Water accepts the Commission's reasoning and supports the proposed drafting changes, with two exceptions.

Non Registered Participants - In the new paragraph (b)(iii)(C), the Commission refers to adverse impacts on other 'Registered Participants'. However, the Registered Participant provisions in Chapter 2 of the NT NER are not yet operative in the NT.

Power and Water suggests that the term be substituted with 'Users', so that it reads:

3.3.5.13 (b)

(iii) ensuring that plant capabilities and control systems are sufficient such that:

A. power system oscillations, for the frequencies of oscillation of the *generating unit* against any other *generating unit*, are adequately damped;

B. operation of the *generating system* does not degrade the damping of any critical mode of oscillation of the *power system*; and

C. operation of the *generating system* does not cause instability (including hunting of tap-changing transformer control systems) that would adversely impact other ~~Registered Participants~~ *Users*.

Clause 3.3.5.13 (2) applies to all generating units - We request removal of the Commission's proposed additional word 'synchronous' in the first line of clause 3.3.5.13(b)(2), before 'generating unit'. Adding the word 'synchronous' contradicts the reference in the following sub clauses (ii) and (v) to non-synchronous generators and is therefore incorrect.

NTC Clause 3.3.5.14 – Active Power Control

Power and Water accepts the Commission's reasoning but proposes further related drafting changes.

The changes proposed below are to ensure that the proposed introductory reference to energy source availability does not undermine the requirement to maintain a scheduled generator outcome for the NT.

Power and Water understands and agrees with the intent of the wording proposed, but feels that the following points should be clear in regard to the interaction between this clause and NTC 3.3.5.17. The sequence intended is as follows:

- Generator provides a capacity forecast in accordance with 3.3.5.17.
- NTESMO incorporates the capacity forecast into its dispatch algorithm (SCTC).
- NTESMO issue dispatch target to generator (SCTC).
- Generator accurately follows the dispatch target (this clause 3.3.5.14)

The final outcome is that all generators are capable of being classified as scheduled. The issue of energy source availability is managed through the capacity forecasting requirement. We therefore propose the following clarifying additions to the clause.

Power and Water proposes revised drafting as set out below. Note that paragraphs (e) and (f) reflect changes made by the Commission's inclusion of new paragraph (f) in clause 3.3.5.17. Please note that changes proposed in this clause are linked with and dependent on corresponding changes proposed to clause 3.3.5.17.

Clause 3.3.5.14

(a) Subject to energy source availability as determined in capacity forecasts under clause 3.3.5.17, the active power control automatic access standard is a generating system must have an active power control system capable of:

(i) Maintaining and changing its active power output in accordance with its *dispatch* instructions to the accuracy specified in paragraph (f); and

(ii) Receiving and automatically responding to AGC signals as updated (nominal update rate of once per four seconds)

(b) Each control system used to satisfy the requirements of paragraph (a) must be adequately damped.

(c)	Settings may require alteration from time to time as advised by the *Network Operator* or *Power System Controller*. The cost of altering the settings and verifying subsequent performance shall be borne by the *User*, provided alterations are not made more than once in each 18 months for each *generating unit*. If more frequent changes are requested the person making that request shall pay all costs on that occasion.
(d)	A *generating system* must be capable of ramping its active power output linearly at a rate not slower than 5% of *nameplate rating* per minute.
(e)	~~Forecasts may differ from the firm offer, and actual capacity may differ from the dispatch capacity~~ *Active power* output of the generating system may differ from *dispatch* instructions as a result of actions to correct system *frequency* in accordance with other provisions of this *Code*.
(f)	The *active power* output of the *generating system* must be within +/-0.5% of the *dispatch* instructions subject to the firm offer in clause 3.3.5.17 and plant ramp rates.

NTC Clause 3.3.5.15 – Inertia and Contingency FCAS

Power and Water accepts the Commission's reasoning but proposes one further related drafting change. For the reasons set out above in relation to clause 3.3.5.14, Power and Water requests that the term 'subject to energy source availability' is linked to capacity forecasts under clause 3.3.5.17.

Clause 3.3.5.15

(a) The *inertia* and *contingency FCAS* automatic access standard is:

(1)	A *generating system* must have an adequate *inertia* and *contingency FCAS* capability as defined by the characteristic below. Subject to energy source availability as determined in capacity forecasts under clause 3.3.5.17, the *generating system* must be able to operate at a real power output that will deliver *inertia* and *contingency FCAS* capability within the adequate zone as shown. The required capability can be achieved by any combination of partially loaded *generating unit(s)*, and/or additional plant (e.g. *synchronous condensers*, energy storage system, etc.), to achieve the required capability.

NTC Clause 3.3.5.16 – System Strength

Power and Water accepts the Commission's reasoning but proposes further related drafting changes.

The Commission's Draft Decision requires Power and Water to develop system strength impact assessment guidelines. As a practical transitional arrangement, until the proposed NT guidelines can be developed and implemented by Power and Water, we propose to draw on the AEMO System Strength Impact Assessment Guidelines, to undertake assessments based on the process outlined in Appendix A of those guidelines. We propose a transitional provision clarifying this as set out below.

Also, we request deletion of the proposed requirement for a review to occur with every change to the AEMO Guidelines (which apply for interconnected systems in other jurisdictions). The standalone NT system will not be affected by every change that may occur, so the rigid review requirement should not be hard-wired in the Code.

Clause 3.3.5.16

(a)	The *Network Operator* must prepare *system strength impact assessment guidelines*. In preparing the first version of the guidelines, the *Network Operator* must review the AEMO System Strength Impact Assessment Guidelines v1.0 July 2018 and adopt those aspects of that document that are appropriate to apply in the Northern Territory together with any other provisions the *Network*

Operator considers appropriate. The *Network Operator* may amend the guidelines at any time ~~and must review the guidelines when any changes are made to the AEMO guidelines~~. The *Network Operator* must consult with *Users* before issuing or amending the guidelines.

(a1) Until the *Network Operator* has developed and published the first version of its *system strength impact assessment guidelines*, it may undertake assessments based on the relevant provisions OF AEMO's System Strength Impact Assessment Guidelines v1.0 July 2018.

(b) The system strength *automatic access standard* is a *generating system* must not cause an adverse impact on system strength as defined in the *system strength impact assessment guidelines* and following an assessment by the *Network Operator*.

Subject to paragraph (a),

(1) a *Network Operator* must undertake system strength *connection* works at the cost of the *connection applicant* if the full assessment undertaken in accordance with the AEMO system strength impact assessment guidelines indicates that the *connection applicant's* proposed new *connection* of a *generating system* or the *Generator*'s proposed alteration to a *generating system* will have an adverse system strength impact; or

(2) to the extent that the adverse system strength impact referred to in paragraph (a) is or will be avoided or remedied by a system strength remediation scheme agreed or determined under this clause and implemented by the *connection applicant* in accordance with its *connection agreement*.

(i) A *connection applicant* proposing to install *plant* as part of a system strength remediation scheme must include a description of the *plant*, the ratings of the proposed *plant* (in MVA) and other information (including models) reasonably required by the *Network Operator* and *Power System Controller* to assess the system strength remediation scheme.

NTC Clause 3.3.5.17 – Capacity Forecasting

Power and Water accepts the Commission's reasoning but proposes alternative drafting changes.

In line with the Commission's proposed drafting and intent, Power and Water suggests that further edits outlined below will make this clause clearer.

The Commission's proposal for clause (f) is appropriate to capture the impact of a disturbance on active power management, however the forecast should remain accurate whilst the dispatch of the plant is impacted by an event. As such, the underlying concept from the Commission's proposed paragraph (f) is now accommodated under clause 3.3.5.14 in our proposals above.

By clarifying this concept, it is apparent that adjustment to clause (b) (4) and its related terms are appropriate to directly (rather than indirectly as per previous drafts) tie the accuracy of the 'firm offer' against the ability of the generator to respond to dispatch instructions.

Power and Water also suggests that the System Controller is responsible for actions relating to dispatch of generating plant and is therefore the more suitable owner of the proposed procedure to manage non-compliance of generator forecasts.

Power and Water proposes revised drafting as set out below.

Please note that changes proposed in this clause are linked with and dependent on corresponding changes proposed to clause 3.3.5.14.

(a) In this clause 3.3.5.17, the following terms apply:

(1) 't' is time.

(2) 't=0' refers to the moment when a forecast is updated.

(3) 't=[numeral]' refers to the number of minutes elapsed since t=0.

(4) 'capacity' means the minimum capability of a generating system to deliver an active power output at a continuous steady level over the relevant 5 minute interval.

(5) 'firm offer' means the capacity forecast provided at t=0 for the interval commencing t=0 for 5 minutes

~~(6) 'dispatch capacity' means the capacity instructed to the Generator to be injected into the grid.~~

~~(7) 'actual capacity' means the minimum instantaneous power injected into the grid for the interval commencing t=0 for 5 minutes.~~

(b) The capacity forecasting automatic access standard is:

(1) Subject to paragraph (f), a Generator must supply to the Power System Controller a forward forecast of the capacity of its generating system.

(2) The forecast in 3.3.5.17(b)(1) must:

(i) include a 24 hour ahead forecast for capacity for every 5 minute interval, updated at 5 minute intervals; and

(ii) have an accuracy such that in any rolling 24 hour period, at least 90% of the non-zero forecasts for the intervals commencing from t=5 to t=30 do not exceed the firm offer for the time for which the forecast was made.

(3) For every forecast assessed in paragraph (2)(ii) above, that exceed the firm offer, the forecast must not exceed the firm offer by a margin greater than:

(i) 5% of the generating unit's nameplate rating; or

(ii) 1 MW,

whichever is the lesser.

(4) ~~The actual capacity must be within +/- 0.5% of the dispatch capacity.~~ The firm offer must be the capacity of the generating system for that interval and therefore the generating system must follow a *dispatch* instruction up to the firm offer in accordance with the requirements in clause 3.3.5.14.

Note: When issuing dispatch instructions, the System Controller will respect plant limits such as firm offers and ramp rates of plant.

(c) A *Generator* must provide forecasts to the *Power System Controller* in a format specified by the *Power System Controller*.

(d) The *generating system* owner will be required to report compliance against the above requirements in a format and timeframe determined by the *Power System Controller*.

(e) In the event of non-compliance with the *automatic access standard* by a Generator, the *Power System Controller* may adjust that Generator's subsequent forecasts and firm offers accordingly.

~~(f) Forecasts may differ from the firm offer, and actual capacity may differ from the dispatch capacity, as a result of actions to correct system frequency in accordance with other provisions of this *Code*.~~

(gf) The *System Controller* ~~*Network Operator*~~ must publish a procedure that specifies the process the *System Controller* ~~*Network Operator*~~ will use to detect any non-compliance with the capacity forecasting performance standard and the process that will be used to determine the action taken in response to any non-compliance with that performance standard. The procedure must be published by 30 March 2020.

NTC Clause 3.3.6 – Monitoring and Control requirements

The Commission did not propose any changes to the amendments proposed by Power and Water. We note and accept this position.

NTC Clause 3.3.7 – Power Station Auxiliary Supplies

The Commission did not propose any changes to the amendments proposed by Power and Water. We note and accept this position.

NTC Clause 3.3.8 – Fault Current

The Commission did not propose any changes to the amendments proposed by Power and Water. We note and accept this position.

NTC Clause 12 – Transitional Arrangements and Derogations from the Code

Power and Water disagrees with the Commission's proposed reasoning and changes here, and notes that they would shift costs of connection from generators to end users.

The Commission has proposed deleting each of the provisions that would enable Power and Water to recover its reasonable costs from a Generator User under clause 12.3.

Power and Water asks the Commission to reconsider this position as it is inconsistent with:

- existing provisions requiring documentation in clause 5.2.2(a) of the NT NER
- the principles and provisions that underpin:
  - the NER, and NT NER, and
  - the Commission's objectives for economic efficiency and protection of consumer interests - customers should not subsidise costs normally borne by a connecting generator
- inconsistency with the NT NER clause 5.3.9
- fairness, in terms of extensive consultation and notice to generators of the proposed changes.

Power and Water is also concerned that the Commission's proposed changes may undermine incentives for generators to minimise costs, for example, by offering considered workable proposals that reflect an appropriate level of due diligence by the connection applicant.

Clause 5.2.2(a) of the NT NER

For context, in defining GPS for existing plant, this clause 12 is intended to require as a minimum, compliance with NTC V3 and as far as possible without modification NTC V4. Our ability to require documentation of connection arrangements (including necessary GPS) before 1 July 2019 lies in NER NT 5.2.2. (a), which provides:

> *If requested to do so by a Transmission Network User, Distribution Network User, NTESMO or the AER, the Utilities Commission (in relation to a dedicated connection asset), a Network Service Provider and a Transmission Network User or Distribution Network User (as the case may be) must document the terms of any network connection arrangements made prior to 1July 2019 and the resulting document will then be deemed to be a connection agreement for the purposes of the Rules.*

Efficient cost allocation

The NER include throughout Chapter 5 the concept of network service providers and the system operator being able to recover their reasonable costs associated with a connection application, from the connection applicant.

See for example clause 5.2A.5(b), negotiating principles in 5.2A.6(b); 5.3.2(g); 5.3.3(C)(5)(i); 5.3.9(e), 5.3A.4(a) and (e)(ii)(2); 5.3A.10(d) and (e); 5.7.8(b).

End users impacts

Power and Water believes that the Commission's proposal is contrary to its objective and considerations outlined at page 8 of its Draft Decision. In particular, we are concerned at costs moving from a connecting generator to electricity users.

Fair and reasonable position

Power and Water has consulted widely on the proposed GPS changes for more than a year, alerting all prospective generators to the reasons and likely content.

For clarification clause 12.3 applies only to what we term 'in flight generators'. This means generators that have entered into a connection agreement with Power and Water but had not connected prior to 1 April 2019.

Though we acknowledge that a level of uncertainty has prevailed for affected generators, the counter argument is that early mover generators were made well aware that new GPS were being developed. In further communication via both the licensing process and early public consultation, they were advised that the NER provisions would be adopted wherever appropriate.

Creates inconsistency and ambiguity

The NT NER suggest that any re-negotiating connection agreements would in effect be the equivalent of NER NT clause 5.3.9 regarding modifying a generator, enabling Power and Water to recover its reasonable costs. As noted above, excluded these costs as proposed by the Commission would in effect result in them being funded by all other retail customers, which we believe is unreasonable.

For these reasons, Power and Water is strongly of the view that the deleted clauses should be reinstated

Clause 12.3 - Post 1 April 2019 plant and equipment

(a) This clause applies to a *Generator User* who has entered into a *connection agreement* with the *Network Operator* prior to Version 4 of this Code coming into effect but had not completed the *connection* of *plant and equipment* to the *electricity network* prior to 1 April 2019.

(b) Subject to this clause 12.3, such *Generator User* must ensure all *plant and equipment connected* to the *electricity network* pursuant to that *connection agreement* complies with the requirements of this *Code* including (subject to paragraph (c) below) the *automatic access standards.* However where a grace period for a technical requirement is specified in Schedule S4 a *Generator User* will not be regarded as in breach of this *Code* if:

- (i) within 30 days of commencement of version [4] of this *Code* it submits to the *Network Operator* a written communication confirming each *automatic access standard* that is met, and for each individual *automatic access standard* that is not met, a plan setting out the procedures, consistent with *good electricity industry practice*, which will be followed by the *Generator User* to ensure it complies with that technical requirement from the end of the applicable grace period; and
- (ii) it complies with that plan; and
- (iii) it ensures it complies with that technical requirement as soon as reasonably practicable and in any event from the end of the relevant applicable grace period.

(c) A plan submitted under clause 12.3(b):

- (i) may include a process for negotiating a *negotiated access standard*; and
- (ii) must include the testing and commissioning procedures which will be followed by the *Generator User* to establish it has achieved compliance with each relevant technical requirement.

(d) A *Generator User* must make such changes to a plan submitted under clause 12.3(b) as reasonably required by the *Network Operator*.

(e) A *Generator User* to whom this clause applies may request the *Network Operator* to agree with it a *negotiated access standard* in substitution for an *automatic access standard* and, if so, the *Network Operator* will negotiate in good faith with the *Generator User* to agree such *negotiated*

access standard in accordance with the criteria set out in clause 3.3.5. The *Generator User* must, at such times reasonably determined by the *Network Operator*, reimburse the *Network Operator* its reasonable costs of undertaking any such negotiations. Until such time as a *negotiated access standard* is agreed, any *connected plant* of the *Generator User* must, subject to clause 12.3(b), comply with the *automatic access standard*.

(f) Where this *Code* contemplates a matter being agreed between the *Network Operator* and the *Generator User* and such matter is not specified in the *connection agreement* then:

(i) the *Network Operator* may, as a condition to connecting the *plant* to the *electricity network* and permitting its commissioning, require that the *Network Operator* and the *Generator User* agree such matters and document them as an amendment to the connection agreement; or

(ii) if the *plant* is already *connected* and commissioned as at the time Version 4 of this *Code* comes into effect, the *Generating User* must, if required by the *Network Operator*, negotiate in good faith to agree and document such matters by an amendment to the *connection agreement* (and if such matters are not agreed within 4 months of the *Network Operator's* request then the matter may be referred for determination by the *Utilities Commission* under clause 1.6(b)).

(g) The *Generator User* must, at such times reasonably determined by the *Network Operator*, reimburse the *Network Operator* its reasonable costs of negotiating and documenting the matters referred to in clause 12.3(f).

(h) The *Generator User* must report the results of the tests conducted in accordance with a plan referred to in clause 12.3(b) to the *Network Operator* in such manner specified by the *Network Operator* acting reasonably. The *Generator User* must bear its own costs of undertaking such tests and must reimburse the *Network Operator*, at such times reasonably determined by the *Network Operator*, the *Network Operator's* reasonable costs of conducting and overseeing such tests.

Power and Water's further proposed amendments to NTC

In reformatting and reviewing the Code, Power and Water detected a number of minor corrections. For example, we have consistently italicised defined terms, corrected cross references, and also made the suggested changes below to improve consistency and clarity.

1. **Changes consequential on commencement of NT NER Chapter 7A** - Clause 3.2.1.8 - clause 10 and Attachment 4 and associated definitions in the Glossary have now been deleted, and clauses referring to these have been amended accordingly.
2. **Clause 3.2.1.8 -** Deleted the reference to clause 3.3.2.11, which has been deleted.
3. **Clause 3.3.4** – Added a new paragraph (f) head of power for Generator Modelling Guidelines and Generator Modelling Change Management Requirements (included in comments on 3.3.4 above).
4. **Note on Australian Standards** - At the beginning of section 1.2, add:

   Note - *Australian Standards* are defined in Attachment 1 as the most recent edition of a standard publication by Standards Australia. Historical standards referred to in this *Code* should be interpreted accordingly.
5. **Changes that mirror those in 3.3.5.3(a)** - We suggest the following amendments, for consistency and clarity.

2.2.2 *Frequency range under abnormal operating conditions*

(a) To cover for the loss of a *generating unit from* the *power system* two measures will be applied to arrest the fall in *frequency* following the loss of *generation* and to return the *frequency* to within normal operating levels as specified in clause 2.2.1:

(1) utilisation of available *spinning reserve* or C-FCAS as applicable in each regulated power system, under the *direction* of the *Power System Controller*; and

(2) *disconnection* of system *load* manually or by means of automatic *protection*.

(b) Under abnormal operating conditions, the *network frequency* may vary between 47 Hz and 52 Hz.

(b1) In the case of operation between 47 Hz and 52 Hz, the stabilisation time is 10 minutes, where stabilisation time means:

the longest time allowable for the *frequency* of the *power system* to remain outside the normal operating *frequency* band, for any condition (including an "island" condition) in the *frequency operating standards* that apply to each *region*.