IPART

Independent Pricing and Regulatory Tribunal
New South Wales

Electricity Transmission Reliability Compliance

From 1 July 2018

Draft Report
Energy Networks Regulation

August 2017

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The Tribunal members for this review are:

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Mr Ed Willett

Ms Deborah Cope

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Invitation for submissions

IPART invites written comment on this document and encourages all interested parties to provide submissions addressing the matters discussed.

Submissions are due by 12 September 2017

We would prefer to receive them electronically via our online submission form <www.ipart.nsw.gov.au/Home/Consumer_Information/Lodge_a_submission>.

You can also send comments by mail to:

Electricity Transmission Reliability Compliance
Independent Pricing and Regulatory Tribunal
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Late submissions may not be accepted at the discretion of the Tribunal. Our normal practice is to make submissions publicly available on our website <www.ipart.nsw.gov.au> as soon as possible after the closing date for submissions. If you wish to view copies of submissions but do not have access to the website, you can make alternative arrangements by telephoning one of the staff members listed on the previous page.

We may choose not to publish a submission—for example, if it contains confidential or commercially sensitive information. If your submission contains information that you do not wish to be publicly disclosed, please indicate this clearly at the time of making the submission. IPART will then make every effort to protect that information, but it could be disclosed under the *Government Information (Public Access) Act 2009* (NSW) or the *Independent Pricing and Regulatory Tribunal Act 1992* (NSW), or where otherwise required by law.

If you would like further information on making a submission, IPART's submission policy is available on our website.

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1 Introduction

The Independent Pricing and Regulatory Tribunal (IPART) monitors compliance with safety and reliability obligations placed on electricity network operators in NSW. We also monitor compliance with licence conditions for gas and electricity networks.

IPART is reviewing the approach to assessing compliance with the reliability standard for electricity transmission in NSW. In November 2016, we made recommendations to the Minister for Industry, Resources and Energy setting out a new reliability standard for the Transmission Network Service Provider (TNSP) – TransGrid.[1] [2] On 1 June 2017, the Minister adopted our recommended reliability standard. We are consulting on our proposed approach to assessing compliance. The reliability standard requires TransGrid to ensure that the transmission system is designed such that, for each bulk supply point (BSP),[3] the system:

- achieves the required level of redundancy (that is, it specifies the number of back-up arrangements that must be in place to support continued supply of electricity in the event that part of the transmission network fails), and
- does not exceed the specified allowance for expected unserved energy (ie, an expected amount of energy that cannot be supplied, taking into account the probability of supply outages attributable to credible contingency events, expected outage duration, and forecast load).

The reliability standard does not prescribe how TransGrid must meet it. Instead it explicitly provides for TransGrid to determine the combination of network and non-network solutions it uses to meet the reliability standard.

We released an Issues Paper in June 2017 to allow stakeholders to consult with us on how IPART will assess compliance with the reliability standard. This draft report summarises the submissions we received on our Issues Paper and our responses. Stakeholders have another opportunity to provide us with submissions by 12 September 2017. We will release our final report by the end of September 2017.

The reliability standard is provided in Appendix A.

1.1 What is IPART reviewing?

The reliability standard is a planning standard. We are undertaking consultation with TransGrid and other stakeholders on our approach to assessing compliance with the reliability standard. In our Issues Paper we proposed that in assessing compliance with the

1 IPART, Electricity transmission reliability standards - Energy - Supplementary Final Report, November 2016.

2 NSW Electricity Networks Operations Pty Limited (ACN 609 169 959) as trustee for the NSW Electricity Networks Operations Trust.

3 A BSP is a location where supply is provided to DNSPs or directly connected customers. Generally, the locations are the busbar(s) at TransGrid's substations but sometimes the locations are where connections are made to TransGrid's transmission lines or cables (including 'tee' connections).

reliability standard, we will review whether TransGrid has designed the transmission system for each BSP to achieve the prescribed level of redundancy and not to exceed the prescribed allowance for expected unserved energy.

The allowance for expected unserved energy in the reliability standard is based on both the probability of asset failures occurring and the impact of those failures on supply given the demand at each BSP. As a result, to assess compliance with the reliability standard, we would require TransGrid to provide a range of information, eg, life cycle equipment failure rates, load profiles and maximum demand.

For BSPs where TransGrid postpones network augmentations to meet the expected unserved energy, or the level of redundancy specified in the reliability standard, TransGrid can apply for an exemption if it can demonstrate the net benefit of doing so is greater than the net benefit of meeting the level of redundancy or allowance for expected unserved energy prescribed in the reliability standard.

As part of our Issues Paper, we have consulted on the approach we propose to use to assess compliance, the frequency and timing of compliance assessments, and which inputs would be used by IPART to assess compliance.

1.2 What is IPART's compliance role?

We are undertaking this review of compliance as IPART is the safety and reliability regulator for the NSW electricity networks. Condition 3(a) of the *Transmission Operator's Licence under the Electricity Supply Act 1995 (NSW)* (Licence) requires that TransGrid must ensure that it and all other network operators of its transmission system comply with any reliability and performance standards issued by the Minister.

IPART has a number of powers for gathering information to monitor whether TransGrid complies with the reliability standard. They include the following:

- Condition 15 of its Licence requires TransGrid to furnish such information as IPART may determine, to enable IPART to ascertain whether or not the Licence Holder is complying with the Licence conditions.
- IPART publishes a Reporting Manual that outlines the reporting requirements for all electricity network operators (including TransGrid) to provide IPART with sufficient information to exercise its regulatory functions. It is a Licence condition that TransGrid complies with a Reporting Manual issued by IPART.
- IPART publishes an Audit Guideline that outlines the audit process. It is a Licence condition that TransGrid complies with any Audit Guideline issued by IPART.
- Clause 7 of the reliability standard requires TransGrid to comply with any request notified to it by IPART for information that IPART reasonably considers to be necessary or convenient for monitoring TransGrid's compliance with the reliability standard.

Our proposed approach to monitoring compliance is set out in the draft versions of our Reporting Manual and Audit Guideline (Appendices B and C).

1.3 How can stakeholders provide input to the review?

For this review, we released an Issues Paper in June 2017 and invited stakeholder submissions. We received four submissions, from TransGrid, Ausgrid, Essential Energy and Gary Blaschke (a member of the public). All submissions are available on IPART's website. This Draft Report is the second step in our public consultation.

This review continues extensive work that was undertaken by IPART during 2015 and 2016 to determine the recommended reliability standard. As a result of this work, we have been able to draw on our experience and develop a preliminary view on the approach to assessing compliance. This approach was presented in our Issues Paper in June 2017. This draft report outlines our draft decision, reached after considering stakeholder submissions.

We invite all interested stakeholders to make submissions in response to our draft decision by 12 September 2017. Details on how to make a submission are provided on page iii at the front of this report.

We will release our final decisions by the end of September 2017. Table 1.1 provides an indicative timetable for the review. We will update this timetable on our website as the review progresses.

Table 1.1 Indicative timetable for this review

Milestone	Indicative date
Draft Report released	22 August 2017
Submissions on this report due	12 September 2017
Final Report/decisions released	29 September 2017

1.4 How is this paper structured?

The rest of this report is structured as follows:

- Chapter 2 outlines our proposed method to assess compliance.
- Chapter 3 outlines our proposed process in relation to TransGrid's reporting obligations.
- Chapter 4 outlines our proposed process in relation to audits.

1.5 List of issues for stakeholder comment

This report sets out our draft decisions on several issues. Stakeholders may address all or some of these issues and are also free to raise and discuss any other issues relevant to the review. A full list of issues we seek comment on is provided below:

1 Do you agree with IPART's proposed method to assess compliance as shown in Boxes 2.1 and 2.2? 9

2 Do you have any comments specifically on our proposed Reporting Manual? 11

3 Do you have any comments specifically on our proposed Audit Guideline? 13

2 IPART's method to assess compliance

During consultation on our Issues Paper stakeholders raised questions regarding the inputs and calculations used to establish compliance with clause 4 of the reliability standard. TransGrid and Ausgrid raised some questions about our method to assess compliance. Essential Energy submitted that it broadly supported our method. In response to these submissions we have made a number of minor changes to the method we will use to monitor compliance. These issues are discussed below and our compliance method is summarised in Boxes 2.1 and 2.2. We did not receive any specific submissions on assessing compliance with clauses 3, 5 and 6 of the reliability standard. The Reporting Manual and Audit Guideline explain how we intend to assess compliance with these clauses (Appendices B and C).

Our draft decision is that we propose to make some adjustments to our method to assess compliance in response to the submissions we have received:

- change the metrics input to the method in relation to estimation of asset restoration times
- change the calculations within the method in relation to estimation of annual Expected Unserved Energy (EUE)
- change the calculations within the method in relation to the use of more granular load duration curves, and
- require additional information on restoration times

These changes are outlined in this Chapter and so are our reasons for not changing other items stakeholders commented on.

Box 2.1 Calculating annual EUE

At each BSP, the minutes of expected unserved energy would be the MWh of expected unserved energy per year multiplied by 60 (to get MW minutes) divided by the average annual demand at that BSP expressed in MW:

(1) EUE (min) = EUE (MWh) * 60 / avg demand (MW)

To simplify the following equations use the notation "tx" to denote transformer. The term "FR" is the failure rate: the expected average number of failures per year per transformer or line. For lines, this rate will depend on the length. The term "TTR" is time to restore a failed asset into service, which might involve replacement.

The MWh of EUE per year is the sum of EUE across four different asset failure scenarios:

1. A single transformer fails.
2. A single line fails.
3. A period of time in which two transformers at the same BSP are out of service.
4. A period of time in which two lines at the same BSP are out of service.

Dual failure scenarios will not be applicable to BSPs where there is only one transformer or one line. The single transformer failure scenario will not be applicable to BSPs that do not have any transformers. In those cases, the relevant terms in the sum below will be zero.

(2) EUE (MWh) = EUE (1 tx fails) + EUE (2 tx fail) + EUE (1 line fails) + EUE (2 lines fail)

The four terms in equation (2) can be evaluated using equations (3) to (6):

(3) EUE (1 line fails) = L * FR 1st line * TTR 1st line

(4) EUE (2 lines fail) = M * FR 1st line * FR 2nd line * TTR 1st line * TTR 2nd line /8760

(5) EUE (1 tx fails) = N * FR 1st tx * TTR 1st tx

(6) EUE (2 tx fail) = O * FR 1st tx * FR 2nd tx * TTR 1st tx * TTR 2nd tx /8760

The number 8760 = 24 * 365, which is the number of hours in a typical year.

The variables L, M, N, and O each represent the average MW of demand that would fail to be served if the failure mode in question applied for the entire year.

(7) L = peak demand (MW) * F(single line failure)

(8) M = peak demand (MW) * F(double line failure)

(9) N = peak demand (MW) * F(single tx failure)

(10) O = peak demand (MW) * F(double tx failure)

The function F(*) represents the fraction of the year for which demand exceeds the maximum that could be supplied under the specified failure condition. During that part of the year, supply would be interrupted if the failure condition applied. The function is estimated through a look-up to a logistic curve expressing the Load Duration information for the BSP. The input to the look-up is based on the maximum feasible supply when the failure condition applies.

Box 2.2 Estimating annual EUE for grouped BSPs

The reliability standard sets an expected unserved energy allowance for some individual BSPs as if they were a group. For example, Canberra and Williamsdale 132 kV substations are treated as though they are a single BSP. The five Inner Sydney BSPs: Beaconsfield, Haymarket, Rookwood Rd, Sydney North and Sydney South are also grouped together.

The minimum EUE for a group is calculated as follows:

(11) Group minimum EUE = sum [EUE (MWh_b)] * 60 / sum [MD_b * LF_b]

The sums are over all BSPs in the group. The subscript "b" refers to the summation index—one value per BSP. MD is the annual maximum demand in MW, and LF is the load factor (average demand/maximum demand) for each BSP.

2.1 Metrics used as inputs into and calculations within the method

Stakeholders provided comment on several inputs used in the method. We have accepted their proposed changes for the estimation of annual EUE and the load curves but did not make any changes in relation to the failure rates and the nature of outages included in the method. We also propose to collect additional information on asset restoration times.

2.1.1 Estimation of annual EUE

TransGrid identified that the equations used to estimate annual EUE for dual failures do not accurately reflect the process of restoring those failures. TransGrid has proposed amended calculations accordingly.

IPART has accepted TransGrid's proposed changes to the calculations. These changes better reflect the annual EUE by accounting for the different restoration times for the two different types of failures. The proposed methods by which EUE is estimated are presented in Boxes 2.1 and 2.2 above.

2.1.2 Use of more granular load duration curves

TransGrid identified that load duration curves used to determine the allowable EUE are coarse, and have the potential to misrepresent the performance of assets. TransGrid proposed that more granular load duration curves should be used to allow more accurate input information for assessing compliance with the allowable EUE.

IPART has accepted this proposed change since it may provide more accurate outputs.

2.1.3 Lifecycle average failure rate

TransGrid and Ausgrid raised concerns with using the lifecycle average failure rate when determining compliance with clause 4 of the reliability standard, as it does not account for increasing failure rates at the end of an asset's life. IPART proposes not to change this requirement and therefore continue to use the lifecycle average failure rate.

The lifecycle average failure rate was originally proposed as a means to ensure the smoothed lifetime performance of an asset is assessed, rather than short-term failure rates that can fluctuate. Our approach ensures that the more predictable lifetime performance of an asset is used as a trigger for action, rather than short-term fluctuations. The prospect of exceeding the EUE is then a driver to identify options to plan the network to meet the reliability standard, it is not a driver of asset replacement.

Following further consultation with TransGrid and Ausgrid, IPART has decided to maintain the use of the lifecycle average failure rate when determining compliance with the EUE requirements of the Licence. This maintains consistency with the process by which the EUE in the reliability standard was calculated, allowing a like for like comparison when determining compliance.

2.1.4 Exclusion of semi-forced outages

The original proposal for assessing compliance excluded semi-forced outages from contributing to the allowable EUE. IPART proposes not to change this requirement and therefore continue to exclude semi-forced outages from the compliance assessment.

A semi-forced outage is where the imminent failure of an asset is identified, with an immediate outage required to allow maintenance and prevent an actual failure from occurring. TransGrid and Ausgrid raised concerns about the exclusion of semi-forced outages in the EUE allowance in the reliability standard. This concern arises from TransGrid's inability to prevent an occurrence of unserved energy in a semi-forced outage scenario. This may make an asset non-compliant with the allowable EUE. Further consultation with TransGrid and Ausgrid has indicated that the impact of semi-forced outages may not be material to an asset's compliance with the allowable EUE.

IPART will continue to consult with relevant stakeholders regarding the impact of semi-forced outages for the purpose of future reviews of allowable EUE.

2.1.5 Estimation of asset restoration times

The estimation of asset restoration times is an important variable in calculating EUE. Essential Energy's submission provided items they would like to be used as evidence of the reasonableness of asset restoration times. These items are:

1. staff availability (the ability to secure staff to undertake restorations)
2. depot proximity (how close staff and equipment are to the assets to restore them), and
3. evidence of any third party agreements that are in place for responding to regional and remote BSPs.

IPART supports the inclusion of items 1 and 2 into the compliance model but these items do not have to be reported on an annual basis as part of TransGrid's compliance reporting. The information should be available for potential audits.

IPART agrees with the inclusion of item 3 and will maintain this requirement for assessing compliance with the reliability standard.

2.2 Potential modifications to the reliability standard

In our Issues Paper we consulted on whether IPART or the Minister should approve a method for the purpose of assessing compliance. Part of this consultation included changing the reliability standard to include the following definition: *Annual expected unserved energy method means the document of that title approved from time to time and published on the Tribunal's website*.[4]

Our draft decision is that IPART or the Minister do not need to approve a method for the purpose of assessing compliance. We will not recommend a change to the reliability standard and IPART will not approve a method. Instead, we will state in the Reporting Manual that we will assess compliance using the method available on our website. We believe that this will provide enough guidance for TransGrid for the submission of their annual compliance report. The method is detailed in Boxes 2.1 and 2.2 and the process is explained in Chapter 3 and Appendix B of this report.

1 Do you agree with IPART's proposed method to assess compliance as shown in Boxes 2.1 and 2.2?

[4] *Transmission reliability standard compliance – From 1 July 2018 – Issues Paper*

3 IPART's process to assess compliance – Reporting Manual requirements

Our draft decision is that TransGrid compliance with clause 4 of the reliability standard will be assessed using the method available on our website and hence we have specified in the Reporting Manual that it report its EUE for each BSP using that method. We do not use our method to assess compliance with clause 3, the redundancy level, at each BSP.

This Chapter explains how we intend to assess TransGrid's compliance with the reliability standard and what information TransGrid will be required to submit to IPART annually.

The information TransGrid is required to submit is set out in our Reporting Manual (Appendix B). The Reporting Manual contains guidance for the preparation of TransGrid's annual compliance reports.

In its submission to our Issues Paper, TransGrid broadly agreed with our proposed approach that it will submit an annual compliance report to demonstrate that its transmission system has been designed to achieve the level of redundancy and EUE at each BSP as specified in the reliability standard. It also agreed that it will submit a plan to IPART under clauses 5 and/or 6 of the reliability standard, for BSPs where it does not forecast to meet clauses 3 and/or 4 of the reliability standard.

3.1 How we will assess compliance

The method used by IPART to assess compliance is the method set out in Boxes 2.1 and 2.2 of this document.

Our Reporting Manual describes TransGrid's reporting obligations in more detail and sets out the information IPART will use to assess compliance with the reliability standard.

TransGrid will be compliant with the reliability standard if it can demonstrate that the transmission system is designed (see Chapter 4) such that each BSP:

1. meets the redundancy category specified in the reliability standard, and
2. does not exceed the annual allowance for expected unserved energy specified in the reliability standard, where the annual expected unserved energy is to be calculated using the method available on IPART's website.

As an alternative to complying with (1) (clause 3 of the Standard), TransGrid can seek and obtain IPART's written approval in respect of a plan or plans under clause 5(a) of the reliability standard and implement the plan or plans to IPART's satisfaction.

As an alternative to complying with (2), (clause 4 of the Standard), TransGrid can seek and obtain IPART's written approval in respect of a plan or plans under clause 6(a) of the reliability standard and implement the plan or plans to IPART's satisfaction.

As part of these approval processes, TransGrid has to use the Regulatory investment test for transmission (RIT-T) to demonstrate that not meeting the reliability standard would provide a net economic benefit. We may liaise with the Australian Energy Regulator in relation to the application of this test.

We understand that TransGrid may use assets owned by other network operators or non-network solutions at some BSPs. For shared assets, we would expect TransGrid to provide evidence of any such agreement, eg, in the form of signed minutes of joint planning meetings between TransGrid and the other network operator.

For BSPs where non-network solutions are used, TransGrid should be able to provide IPART with the relevant third-party agreements in force.

IPART can also, at its discretion, audit annual reports on TransGrid's compliance with the reliability standard. The audit process is set out in Chapter 4 of this report and the Audit Guideline (Appendix C).

2 Do you have any comments specifically on our proposed process to assess compliance, as detailed by the information in the Reporting Manual?

4 IPART's process to assess compliance – Audit Guideline requirements

TransGrid submitted that it agrees with the audit process outlined in our Issues Paper. Our draft decision is that we will use the same process for audits of TransGrid's compliance with the reliability standard as we do in our other energy compliance functions.

IPART audits compliance reports, where audits are not prescribed by legislation, using a risk-based approach. This means that audits are requested on a regular basis, but only if IPART considers that the risk of non-compliance is high enough to justify an audit.

Our Audit Guideline explains the process of an audit of TransGrid's compliance with the reliability standard. Additionally, the Audit Guideline provides the criteria against which the systems relating to transmission reliability compliance are assessed. Full details of the proposed Audit Guideline are provided in Appendix C.

4.1 Our audit process

When we require TransGrid to undertake an audit, we will inform it in writing and provide the scope. It would have to engage a suitably qualified auditor to independently assess compliance with the reliability standard. IPART would approve the suitability of the auditor on each occasion unless the auditor is pre-approved on our audit panel. IPART also would approve the proposal of the audit.

The annual audit would sample a sufficient number of BSPs covering a range of redundancy requirements (N, N-1 and N-2) and location types (suburban, regional and remote locations). The information provided should be sufficient for the auditor to provide an opinion.

The criteria are designed to ensure that TransGrid achieves the requirements of their Licence in relation to the reliability standard. That is, TransGrid has designed their network to achieve:

- the level of redundancy at each BSP as specified in the reliability standard, and
- the EUE at each BSP as specified in the reliability standard.

Clauses 3 and 4 of the reliability standard require the Licence holder to "ensure that the transmission system is designed such that" it meets the levels of redundancy and expected unserved energy allowances prescribed in clause 8. For the avoidance of any doubt, that means that the existing physical assets must be designed to meet those requirements; it is not sufficient that there is a plan on paper for the transmission system to meet those requirements. This clarification is included in the Audit Guideline.

Alternatively, if any plans have been submitted to IPART under clauses 5 and 6 of the reliability standard, then the audit will test whether the plans have been prepared in accordance with the reliability standard, that they have been approved by IPART, and that they have been properly implemented.

Independent audits are an important part of IPART's electricity network compliance framework. Broadly, we would expect that the scope of an audit would focus on:

- Whether the transmission system has been designed to achieve the level of redundancy specified in the reliability standard. To do this, we would expect that the auditor would confirm that the necessary assets (including shared assets) and non-network solutions are/were operated in a manner consistent with network/circuit diagrams provided as part of the annual compliance report for the reliability standard.
- Whether TransGrid has network management strategies or non-network solutions in place to achieve the restoration and repair times that are used as inputs to the estimates of expected unserved energy at each BSP.

3 Do you have any comments specifically on our proposed process to assess compliance, as detailed by the information in the Audit Guideline?

Appendices

A Reliability Standard

Don Harwin MLC
Minister for Resources, Minister for Energy and Utilities,
Minister for the Arts, Vice-President of the Executive Council

Electricity Supply Act 1995

NSW Electricity Transmission Reliability and Performance Standard 2017

I, Don Harwin, Minister for Energy and Utilities, hereby issue the *NSW Electricity Transmission Reliability and Performance Standard 2017* set out in Schedule 1 to apply from 1 July 2018.

The *NSW Electricity Transmission Reliability and Performance Standard 2017* is issued:

(a) for the purposes of clause 3 of the transmission operator's licence issued to NSW Electricity Network Operations Pty Ltd (TransGrid)(ACN 609 169 959) under the *Electricity Supply Act 1995.*

(b) pursuant to clause 7 (2)(b) of the *Electricity Supply (Safety and Network Management) Regulation 2014*, to notify the transmission network operator, TransGrid that the *NSW Electricity Transmission Reliability and Performance Standard 2017* must be included in the content of TransGrid's safety management system.

Signed by:

The Hon Don Harwin MLC

Minister for Energy and Utilities

Date: 1.6.17

Schedule 1

NSW Electricity Transmission Reliability and Performance Standard 2017

1. Status of this standard

(a) This standard is a reliability and performance standard issued by the Minister for the purposes of clause 3(a) of the Licence.

(b) This standard may be cited as the Transmission Reliability and Performance Standard 2016 No. 1.

2. Interpretation

(a) In this standard, where the terms below are italicised they have the corresponding meanings set out below.

Expected unserved energy means the expected amount of energy that cannot be supplied, taking into account the probability and expected impact (including expected outage duration and forecast load) of the following:

(i) failure of a single *system element*;

(ii) double transformer failure, or failure of equivalent *system elements*; and

(iii) double line failure, or failure of equivalent *system elements*.

Inner Sydney means the inner metropolitan transmission system, which is that part of the *transmission system* constituted by:

(i) cables 41 and 42;

(ii) the 330/132kV substations at Rookwood Road, Beaconsfield, Haymarket, Sydney North and Sydney South;

(iii) any future associated 330kV cables and 330/132kV substations; and

(iv) any of Ausgrid's 132k transmission network that links any of the above.

Level of redundancy means:

(i) for category 1 bulk supply points, a supply interruption may occur following the outage of a single system element;

(ii) for category 2 bulk supply points, a non-zero amount of load must be supplied following the outage of a single system element; and

(iii) for category 3 bulk supply points, a non-zero amount of load must be supplied following the outage of a single system element. In addition, for Inner Sydney, a non-zero amount of load must be supplied following the simultaneous outage of a single 330 kV cable and any 132 kV feeder or 330/132 kV transformer.

Licence means the Transmission Operator's Licence under the *Electricity Supply Act 1995* granted to NSW Electricity Networks Operations Pty Limited (ACN 609 169 959) as trustee for the NSW Electricity Networks Operations Trust dated 7 December 2015, or a licence that replaces it.

Licence Holder has the same meaning as under the *Licence*.

Minister has the same meaning as under the *Licence*.

RIT-T means the *Regulatory investment test for transmission and application guidelines 2010* published by the Australian Energy Regulator, or any replacement of that document from time to time.

System element means:

(i) a transmission circuit (a line or a cable);

(ii) a transformer;

(iii) a component of physical infrastructure other than a transmission circuit or transformer; or

(iv) network support arrangements, backup supply capability, or other measure that provides supply capacity.

Transmission system has the same meaning as under the *Licence*.

~~***Tribunal*** has the same meaning as under the *Electricity Supply Act 1995*.~~

(b) Headings and notes which appear in this standard are intend as an aide to usage only, and do not form part of this standard.

(c) References to clauses in this standard are references to clauses of this standard, unless this standard expressly provides otherwise.

3. Requirement to design for a specified *level of redundancy* for each bulk supply point

Subject to clause 5(a) below, the *Licence Holder* must ensure that the *transmission system* is designed such that, for each bulk supply point listed in the table in clause 8, the *transmission system* achieves the *level of redundancy* category specified for that bulk supply point in the table in clause 8.

4. Requirement to design for a level of expected unserved energy for each bulk supply point

Subject to clause 6(a) below, the *Licence Holder* must ensure that the *transmission system* is designed such that the annual *expected unserved energy* in respect of a bulk supply point listed in the table in clause 8 does not exceed the allowance for *expected unserved energy* specified for that bulk supply point in the table in clause 8.

5. Flexibility in planning for the level of redundancy

(a) The *Licence Holder* is not required to comply with clause 3 above in respect of a bulk supply point listed in the table in clause 8 provided that:

(i) the *Licence Holder* has developed and submitted to the *Tribunal* a plan regarding measures for altering the reliability of the supply capacity of the bulk supply point;

(ii) that plan provides a greater net-benefit, using the cost-benefit methodology defined in the *RIT-T*, than the net-benefit of complying with clause 3 above; and

(iii) the *Tribunal* has advised the *Licence Holder* in writing that it is satisfied that the plan submitted under clause 5(a)(i) above would, if implemented, be likely to provide a greater net-benefit than would be provided by the *Licence Holder* complying with clause 3 above in relation to the bulk supply point.

(b) The *Licence Holder* must implement the plan within a time specified by the *Tribunal* to the *Licence Holder*, and such implementation must be to the reasonable satisfaction of the *Tribunal*.

(c) For the avoidance of any doubt:

(i) the *Licence Holder* may submit, from time to time, a proposed replacement for a plan referred to in clause 5(a); and

(ii) clause 5(a) applies to such a plan in the same way that it would apply to the first plan submitted under that clause in relation to a bulk supply point.

(d) Where the *Tribunal* has expressed satisfaction in writing under clause 5(a)(iii) about a plan that relates to a bulk supply point or bulk supply points listed in the table in clause 8, the *Licence Holder* may advise the *Tribunal* in writing that it has elected not to implement the plan. If the *Licence Holder* so advises the *Tribunal* of such an election:

(i) the *Licence Holder* is not required to implement the plan in question, despite clause 5(b);

(ii) despite clause 5(a), the *Licence Holder* must comply with clause 3 in respect of the bulk supply point or bulk supply points to which the plan in question relates; and

(iii) the *Licence Holder's* election not to implement the plan may not be reversed, unless the Tribunal provides its written consent for the reversal.

6. Flexibility in planning for the level of expected unserved energy

(a) The *Licence Holder* is not required to comply with clause 4 above in respect of a bulk supply point listed in the table in clause 8 provided that:

(i) the *Licence Holder* has developed and submitted to the *Tribunal* a plan regarding measures for altering the reliability of the supply capacity of the bulk supply point;

(ii) that plan provides a greater net-benefit, using the cost-benefit methodology defined in the *RIT-T*, than the net-benefit of complying with clause 4 above; and

(iii) the Tribunal has advised the *Licence Holder* in writing that it is satisfied that the plan submitted under clause 6(a)(i) above would, if implemented:

(A) be likely to provide a greater net-benefit than would be provided by the *Licence Holder* complying with clause 4 above in relation to the bulk supply point; and

(B) not result in a material reduction in the level of *expected unserved energy* at any bulk supply point.

(b) The *Licence Holder* must implement the plan within a time specified by the *Tribunal* to the *Licence Holder*, and such implementation must be to the reasonable satisfaction of the *Tribunal*.

(c) For the avoidance of any doubt:

(i) the *Licence Holder* may submit, from time to time, a proposed replacement for a plan referred to in clause 6(a); and

(ii) clause 6(a) applies to such a plan in the same way that it would apply to the first plan submitted under that clause in relation to a bulk supply point.

(d) Where the *Tribunal* has expressed satisfaction in writing under clause 6(a)(iii) about a plan that relates to a bulk supply point or bulk supply points listed in the table in clause 8, the *Licence Holder* may advise the *Tribunal* in writing that it has elected not to implement the plan. If the *Licence Holder* so advises the *Tribunal* of such an election:

(i) the *Licence Holder* is not required to implement the plan in question, despite clause 6(b);

(ii) despite clause 6(a), the *Licence Holder* must comply with clause 4 in respect of the bulk supply point or bulk supply points to which the plan in question relates; and

(iii) the *Licence Holder's* election not to implement the plan may not be reversed, unless the *Tribunal* provides its written consent for the reversal.

7. Requirement to provide information to the Tribunal

(a) The *Licence Holder* must comply with any request notified to the *Licence Holder* by the *Tribunal* for information that the *Tribunal* reasonably considers to be necessary or convenient for the *Tribunal* in monitoring the *Licence Holder's* compliance with this standard.

(b) The *Licence Holder* must comply with a request under clause 7(a) within a reasonable timeframe notified to the *Licence Holder* by the *Tribunal*.

(c) If reasonably requested to do so by the *Tribunal*, the *Licence Holder* must commission an audit of its compliance with this standard (or specified aspects of this standard). Such an audit must be conducted:

(i) by an auditor approved by the *Tribunal* in writing;

(ii) at the expense of the *Licence Holder*; and

(iii) such that a report on the audit by the auditor is provided to the *Tribunal* within a reasonable timeframe notified to the *Licence Holder* by the *Tribunal*.

(d) At least 90 days before entering into any contract for the construction of a new bulk supply point intended to form part of the *transmission* system (or within a different timeframe proposed by the *Licence Holder* and agreed to in writing by the *Tribunal*), the *Licence Holder* must submit a proposal regarding the new bulk supply point to the *Tribunal*. The proposal must:

(i) propose a *level of redundancy* category that this standard should specify for the new bulk supply point;

(ii) propose a level of *expected unserved energy* that this standard should specify for the new bulk supply point; and

(iii) set out reasons justifying the *level of redundancy* category and level of *expected unserved energy* proposed.

8. Table of values

	Redundancy category	Unserved energy allowance, maximum minutes per year at average demand
1. Inner Sydney		
Beaconsfield West 132 kV	3	0.6[a]
Haymarket 132 kV	3	
Rookwood Road 132 kV	3	
Sydney North 132 kV	3	
Sydney South 132 kV	3	
2.Other bulk supply points		
Albury 132 kV	2	14
ANM 132 kV	2	6
Armidale 66 kV	2	7
Beryl 66 kV	2	5
Boambee South 132 kV	2	18
Canberra 132 kV and Williamsdale 132 kV	2	3
Coffs Harbour 66 kV	2	10
Coleambally 132 kV	2	32
Cooma 66 kV	2	28
Cooma 132 kV	2	11
Cowra 66 kV	2	25
Dapto 132 kV	2	4
Darlington Point 132 kV	2	4
Deniliquin 66 kV	2	19
Finley 66 kV	2	12
Forbes 66 kV	2	19
Gadara (132 kV & 11 kV)	2	13
Glen Innes 66 kV	2	43
Griffith 33 kV	2	12
Gunnedah 66 kV	2	19
Holroyd 132 kV	2	24
Ingleburn 66 kV	2	5
Inverell 66 kV	2	40
Kempsey 33 kV	2	24
Koolkhan 66 kV	2	19

Liddell 330 kV	2	2
Lismore 132 kV	2	4
Liverpool 132 kV	2	5
Macarthur 132 kV and 66 kV	2	3
Macksville 132 kV	2	23
Manildra 132 kV	2	6
Moree 66 kV	2	5
Mount Piper 66 kV	2	19
Munmorah 132 kV	2	20
Murrumburrah 66 kV	2	19
Muswellbrook 132 kV	2	3
Nambucca 66 kV	2	65
Narrabri 66 kV	2	5
Newcastle 132 kV	2	2
Orange North 132 kV / Orange 132 kV and	2	7
Panorama 66 kV	2	5
Parkes 132 kV	2	9
Parkes 66 kV	2	51
Port Macquarie 33 kV	2	14
Queanbeyan 66 kV	2	4
Raleigh 132 kV	2	32
Regentville 132 kV	2	13
Stroud 132 kV	2	21
Sydney East 132 kV	2	2
Sydney West 132 kV	2	1
Tamworth 66 kV	2	4
Taree 66 kV and 33 kV	2	15
Tenterfield 22 kV	2	79
Tomago 132 Note 3	2	13
Tomago 330 kV	2	14
Tuggerah 132 kV	2	13
Tumut 66 kV	2	13
Vales Pt 132 kV	2	3
Vineyard 132 kV	2	1
Wagga 66 kV	2	33
Wagga North 132 kV	2	5
Wallerawang 132 kV	2	26
Wallerawang 66 kV	2	31

Waratah West 132 kV	2	3
Wellington 132 kV	2	6
Yanco 33 kV	2	41
Balranald 22 kV	1	115
Broken Hill 22 kV and Broken Hill 220 kV	1	10
Casino 132 kV	1	7
Dorrigo 132 kV	1	41
Hawks Nest 132 kV	1	42
Herons Creek	1	17
Ilford 132 kV	1	14
Marulan 132 kV	1	10
Molong 66 kV	1	46
Morven 132 kV	1	33
Mudgee 132 kV	1	14
Munyang 33 kV	1	14
Murrumbateman 132 kV	1	49
Snowy Adit 132 kV	1	52
Wagga North 66 kV	1	42
Wellington Town	1	21
Yass 66 kV	1	22

[a] Applies across all the Inner Sydney

B Reporting Manual

IPART

Independent Pricing and Regulatory Tribunal
New South Wales

Electricity Networks Reporting Manual – Transmission reliability standard

Draft Reporting Manual
Energy Network Regulation

August 2017

ISBN 978-1-76049-118-5

The Tribunal members for this review are:

Dr Peter J Boxall AO, Chair

Ms Deborah Cope

Mr Ed Willett

Inquiries regarding this document should be directed to a staff member:

Christine Allen	(02) 9290 8412
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1 Compliance with transmission reliability standard

Reporting requirements outlined in this document apply to TransGrid[1] only.

TransGrid is required, under condition 3 of its operating licence, to comply with any transmission reliability and performance standard issued by the Minister. The *NSW Electricity Transmission Reliability and Performance Standard 2017* (Standard) was issued by the Minister for Energy and Utilities on 1 June 2017, to apply from 1 July 2018.

Condition 11 of the Transmission Operator's Licence under the *Electricity Supply Act 1995* (NSW), requires TransGrid to prepare and submit reports in accordance with any applicable Reporting Manuals issued by IPART. The reporting requirements outlined in this Reporting Manual will assist IPART to determine whether or not the licence holder is complying with the Standard.

From time to time, IPART might request further information from TransGrid to assist in determining compliance or for another purpose.

1.1 Annual reports

TransGrid is required to report on its compliance with the Standard annually. Annual reports should include the information set out below.

1.1.1 Information regarding compliance with clause 3 of the Standard – level of redundancy

For each bulk supply point, TransGrid is required to:

- report on the level of redundancy achieved in respect of that bulk supply point, and
- provide a network/circuit diagram depicting how that level of redundancy is achieved.

For a bulk supply point where non-network solutions are relevant to the level of redundancy achieved, TransGrid is required to provide evidence of how the non-network solutions contribute to achieving the level of redundancy, such as any relevant third-party agreements.

1 NSW Electricity Networks Operations Pty Limited (ACN 609 169 959) as trustee for the NSW Electricity Networks Operations Trust.

1.1.2 Information regarding compliance with clause 4 of the Standard – expected unserved energy

TransGrid is required to report its levels of expected unserved energy for each of its bulk supply points. IPART assesses TransGrid's compliance using the methodology available on our website.

For each bulk supply point, TransGrid is also required to report the numerical values of the inputs used to calculate the amount of unserved energy. The inputs are:

- opex capital ratio
- transformer cost multiplier
- line cost multiplier
- transformer life in years
- overhead line life in years
- underground cable life in years
- discount rate
- capital efficiency factor
- failures per transformer per annum
- failures per annum per 100km overhead line
- failures per annum per 100km underground cable
- coefficient for transformer cost function, coefficient*MVA^exp
- exponent for transformer cost function
- coefficient for line cost function, coefficient*MVA^exp
- exponent for line cost function
- cost multiplier underground cables
- maximum hours to replace/repair transformer
- maximum hours to repair overhead line
- maximum hours to repair cable
- relevant network/circuit diagrams

Evidence of agreement to share assets

Where the expected unserved energy calculation includes the usage of assets controlled by someone other than TransGrid, TransGrid should submit evidence of an agreement to use these assets and include the agreed availability.

For instance, such agreement could be signed meeting minutes of joint planning meetings between TransGrid and Ausgrid (or another network operator) or an exchange of letters. Evidence should be submitted to IPART as an attachment to the annual report.

Non-network solutions

For a bulk supply point where non-network solutions are relevant to the calculation of expected unserved energy, TransGrid is required to provide evidence of how the non-network solutions affect the level of expected unserved energy, such as any relevant third-party agreements.

1.1.3 Declaration of compliance

TransGrid must provide with its annual compliance report a declaration, signed by the chief executive officer and the chairman of the board of directors (or another director approved by

the board, other than the chief executive officer) that TransGrid has complied with its licence obligations except to the extent disclosed in its report (Appendix A).

The annual report must disclose all instances where TransGrid failed to comply with any obligations in the Standard, describing:

- the extent and nature of the non-compliance including whether and how many customers and/or other licence holders have been affected
- the reasons for non-compliance
- the actions taken, or proposed, to rectify the non-compliance and to prevent it reoccurring, and
- the actual/anticipated date of full compliance and the state of the remedial action as at 30 June of the reporting year.

The obligations in the Standard are listed in Appendix B.

1.1.4 Timing and lodgement

Reporting in accordance with this manual is required annually. The annual compliance report covering the previous financial year must be submitted to IPART no later than 31 August each year or at an alternate date approved by IPART. It must be included as part of TransGrid's annual licence compliance report.

Annual compliance reports should be lodged by email to energy@ipart.nsw.gov.au. Name and contact details (phone, email) of the primary contact should also be provided. An alternative contact for those times when the primary contact is unavailable should also be nominated.

1.2 Ad hoc information submissions to IPART

From time to time, IPART may request further information from TransGrid to assist in determining compliance or for another purpose. For instance, we may request the asset risk register to inform a review of the reliability standard. A separate information request would be issued and would include a reasonable timeframe for TransGrid to respond.

Clause 7 of the Standard requires TransGrid to comply with a request from IPART, within a reasonable timeframe nominated by IPART, for information which IPART considers to be necessary or convenient for monitoring compliance with the Standard.

1.3 Additional information on asset risk profiles

TransGrid must provide IPART with reports it requests from time to time containing information on annual asset failure rates and risk profiles for major asset classes.

Appendices

A Annual Compliance Report Pro-Forma

Annual Compliance Report for 20 -
Submitted by [name] ACN:

To: The Chief Executive Officer
Independent Pricing and Regulatory Tribunal of NSW
PO Box K35
Haymarket Post Shop NSW 1240

[*Name*] reports as follows:

1. This report documents compliance during [*financial year*] with all obligations to which [*name*] is subject by virtue of its Transmission Operator or Distribution Network Service Provider Licence.
2. This report has been prepared by [*name*] with all due care and skill in full knowledge of conditions to which it is subject and in compliance with IPART's [*current Electricity Network Reporting Manual*]/[*Transmission/Distribution Electricity Network Performance Report*].
3. Schedule A provides information on all obligations with which [*name*] did not fully comply during [*financial year*].
4. Other than the information provided in Schedule A, [*name*] has complied with all conditions to which it is subject.
5. This compliance report has been approved by the Chief Executive Officer (or equivalent) and the Chairman of the Board of Directors (or a duly authorised board member other than the CEO) of [*name*] on [*date*].

DATE: …….	DATE: ……...
Signed: …….	Signed: ……
Name: …….	Name: …….
Designation:……	Designation: ……..

B Summary of obligations in the transmission reliability standard

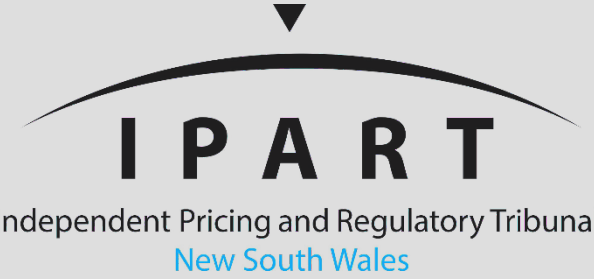
Table B.1 Minimum reporting requirement against the reliability standard

IPART Code	Condition number	Name of reporting requirement	Brief description of obligation in the Standard
RS1	3	System designed to achieve prescribed level of redundancy	The Licence Holder must ensure that the transmission system is designed such that, for each bulk supply point listed in the table in clause 8, the transmission system achieves the level of redundancy category specified for that bulk supply point in the table in clause 8, except to the extent that the Licence Holder is not required to comply with clause 3 of the Standard due to clause 5(a) of the Standard.
RS2	4	System designed so as not to exceed prescribed allowances for expected unserved energy	The Licence Holder must ensure that the transmission system is designed such that the annual expected unserved energy in respect of a bulk supply point listed in the table in clause 8 does not exceed the allowance for expected unserved energy specified for that bulk supply point in the table in clause 8, except to the extent that the Licence Holder is not required to comply with clause 4 of the Standard due to clause 6(a) of the Standard.
RS3	5(b)	Implementation of approved plans – level of redundancy	If the Tribunal has advised the Licence Holder in writing that it is satisfied that one or more plans submitted under clause 5(a)(i) would, if implemented, be likely to provide a greater net-benefit than would be provided by the Licence Holder complying with clause 3 in relation to the bulk supply point or points that are the subject of the plan or plans, and to the extent that clause 5(d)(i) does not apply to the plan or plans, the Licence Holder must implement the plan or plans within a time specified by the Tribunal and to the reasonable satisfaction of the Tribunal.
RS4	6(b)	Implementation of approved plans – expected unserved energy	If, in respect of one or more plans submitted under clause 6(a)(i), IPART has advised the Licence Holder in writing that it is satisfied of the matters set out in clause 6(a)(iii), and to the extent that clause 6(d)(i) does not apply to the plan or plans, the Licence Holder must implement the plan or plans within a time specified by IPART and to the reasonable satisfaction of IPART.
RS5	7(a) and 7(b)	Provide information to the Tribunal	The Licence Holder must comply with any request by IPART made under clause 7(a), within a reasonable timeframe notified to the Licence Holder by IPART.

IPART Code	Condition number	Name of reporting requirement	Brief description of obligation in the Standard
RS6	7(c)	Audit compliance	If reasonably requested to do so by the Tribunal, the Licence Holder must commission an audit of its compliance with the Standard (or specified aspects of the Standard). The audit must be conducted: a) by an auditor approved by IPART in writing; b) at the expense of the Licence Holder; and c) such that a report on the audit by the auditor is provided to IPART within a reasonable timeframe notified to the Licence Holder by IPART.
RS7	7(d)	Planning for new bulk supply point	At least 90 days before entering into any contract for the construction of a new bulk supply point intended to form part of the transmission system (or within a different timeframe proposed by the Licence Holder and agreed to in writing by IPART), the Licence Holder must submit a proposal regarding the new bulk supply point to IPART. The proposal must: a) propose a level of redundancy category that this standard should specify for the new bulk supply point; b) propose a level of expected unserved energy that this standard should specify for the new bulk supply point; and c) set out reasons justifying the level of redundancy category and level of expected unserved energy proposed.

Note: TransGrid should also refer to the complete wording in the transmission reliability standard

C Audit Guideline



Electricity Networks Audit Guideline – Transmission reliability standard

Draft Audit Guideline
Energy Network Regulation

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ISBN 978-1-76049-119-2

The Tribunal members for this review are:

Dr Peter J Boxall AO, Chair

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Ms Deborah Cope

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1 Transmission reliability standard

Audit requirements outlined in this document apply to TransGrid[1] only

TransGrid is required, under condition 3 of its operating licence, to comply with any transmission reliability and performance standard issued by the Minister. The *NSW Electricity Transmission Reliability and Performance Standard 2017* (Standard) was issued by the Minister for Energy and Utilities on 1 June 2017, to apply from 1 July 2018.

1.1 Objective

The objective of this audit is to assess the network operator's compliance with the Standard.

1.2 Scope

The audit must be comprehensive in assessing the network operator's compliance in accordance with any particulars as may be requested by IPART from time to time.

TransGrid will be compliant with the Standard if it can demonstrate that the transmission system is designed such that each bulk supply point (BSP):

1. meets the redundancy category specified in the Standard, and
2. does not exceed the annual allowance for expected unserved energy specified in the Standard, where the annual expected unserved energy is to be calculated using the methodology available on IPART's website.

As an alternative to complying with (1) (clause 3 of the Standard), TransGrid can seek and obtain IPART's written approval in respect of a plan or plans under clause 5(a) of the Standard and implement the plan or plans to IPART's satisfaction. As an alternative to complying with (2) (clause 4 of the Standard), TransGrid can seek and obtain IPART's written approval in respect of a plan or plans under clause 6(a) of the Standard and implement the plan or plans to IPART's satisfaction.

1.3 Interpretation

Clauses 3 and 4 of the Standard require the licence holder to "ensure that the transmission system is designed such that" it meets the levels of redundancy and expected unserved energy allowances prescribed in clause 8. For the avoidance of any doubt, that means that the existing physical assets must be designed to meet those requirements; it is not sufficient that there is a plan on paper for the transmission system to meet those requirements.

1 NSW Electricity Networks Operations Pty Limited (ACN 609 169 959) as trustee for the NSW Electricity Networks Operations Trust.

1.4 Specific auditor expertise

The auditor must be approved by IPART. This can be achieved by the auditor being on our audit panel or being approved by IPART following a request from TransGrid. When assessing whether to approve the auditor, we will consider their auditing skills and experience as well as their qualifications and experience with network planning.

More information about obtaining auditor approval is included in a separate document - *Audit Guideline - Audit fundamentals, process and findings* available on IPART's website.

1.5 Audit timing

Audit timing will be at the discretion of IPART and will be included in any request to undertake an audit.

1.6 Criteria

The auditor will review audit evidence to test against the audit criteria listed in Table A.1 in appendix A, as it applies to the scope provided by IPART in its request.

Appendices

A Audit criteria for transmission reliability audits

Table A.1 Minimum audit criteria for audits of compliance with the reliability standard

Reference – the Reliability Standard	Minimum audit criteria	Auditor's comments	Audit Grade
Clause 3	The transmission system must be designed such that, for each bulk supply point listed in the table in clause 8, the transmission system achieves the level of redundancy category specified for that bulk supply point in the table in clause 8, except to the extent that the Licence Holder is not required to comply with clause 3 of the Standard due to clause 5(a) of the Standard.		
Clause 4	The *transmission* system must be designed such that the annual *expected unserved energy* in respect of a bulk supply point listed in the table in clause 8 does not exceed the allowance for *expected unserved energy* specified for that bulk supply point in the table in clause 8.		
Clause 4	The annual *expected unserved energy* has been calculated using a methodology consistent with IPART's methodology (as published on IPART's website).		
Clause 4	The inputs used by the Licence Holder in their methodology are correct and free of errors. See the full list in Table B.1 in IPART's *Electricity Networks Reporting Manual for the Transmission Reliability Standard.*		
Clause 5(b)	If IPART has advised the Licence Holder in writing that it is satisfied that one or more plans submitted under clause 5(a)(i) would, if implemented, be likely to provide a greater net-benefit than would be provided by the Licence Holder complying with clause 3 in relation to the bulk supply point or points that are the subject of the plan or plans, and to the extent that clause 5(d)(i) does not apply to the plan or plans, the Licence Holder must implement the plan or plans within a time specified by IPART and to the reasonable satisfaction of IPART.		

Reference – the Reliability Standard	Minimum audit criteria	Auditor's comments	Audit Grade
Clause 6(b)	If, in respect of one or more plans submitted under clause 6(a)(i), IPART has advised the Licence Holder in writing that it is satisfied of the matters set out in clause 6(a)(iii), and to the extent that clause 6(d)(i) does not apply to the plan or plans, the Licence Holder must implement the plan or plans within a time specified by IPART and to the reasonable satisfaction of IPART.		