AEMC

REVIEW

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Review of the national framework for transmission reliability

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About the AEMC

The Council of Australian Governments (COAG), through its then Ministerial Council on Energy (MCE), established the Australian Energy Market Commission (AEMC) in July 2005. In June 2011, COAG established the Standing Council on Energy and Resources (SCER) to replace the MCE. The AEMC has two main functions. We make and amend the national electricity, gas and energy retail rules, and we conduct independent reviews of the energy markets for the SCER.

Executive summary

Reliability refers to the extent to which customers have a continuous supply of electricity. Transmission networks facilitate the supply of electricity to end use customers within each jurisdiction of the National Electricity Market (NEM). The level of reliability that transmission networks are required to provide affects the level of investment that networks undertake. This ultimately feeds through to the electricity prices paid by customers.

As monopoly services, the price charged for transmission services is regulated. The regulation of reliability complements this price and revenue regulation to balance against an incentive for networks to reduce reliability levels in order to increase their profits. In the absence of reliability regulation, transmission businesses may have a tendency to underinvest in reliability in comparison to the level of reliability valued by customers.

As it would not be cost effective or feasible to remove all potential supply interruptions faced by customers, determining the level of reliability in transmission networks requires trading-off the costs of investing in and maintaining the network against reliability outcomes. There is scope to improve the efficiency of network investment in the NEM through applying a transparent, economic framework which informs this trade-off by:

(a) understanding how the costs of building and operating the network vary with different reliability outcomes; and

(b) using the costs to customers of interruptions to their supply of electricity to guide the setting of the reliability standard.

The Australian Energy Market Commission (AEMC or Commission) has developed such a framework for setting and regulating transmission reliability in the NEM. This will promote greater efficiency, transparency, and community consultation in how reliability standards are set. This final report sets out the AEMC's recommended framework for transmission reliability in the NEM and the next steps for its implementation.

This final report sets out the benefits the framework can deliver, explains how the framework will be applied, and describes the possible different roles played by key participants in the process. Many of the aspects of the proposed framework are similar to those proposed by the Commission to be applied in determining the reliability standards for distribution networks. However differences between the characteristics of transmission and distribution networks have led to some differences in these frameworks. As it is difficult to observe and measure the output performance of transmission networks, we have recommended differences in the compliance obligations and expression of reliability standards for transmission and distribution networks.

In developing the framework for transmission reliability, the Commission has taken as given the current ex ante incentive based approach to regulating transmission network service providers (TNSPs), as set out in the current National Electricity Rules (NER). It is important that the proposed framework is consistent with and complements the existing regulatory approach.

We also consider, given current expectations of network augmentation investment and demand growth, that this is an opportune time to reform existing regulatory arrangements for network reliability. Changing the arrangements in such circumstances is unlikely to result in significant shifts in reliability performance or cost in the short term but would allow the framework to be introduced and adapted under relatively stable network conditions.

While the potential for efficiency savings might be limited in the short run, given the current level of installed capacity relative to demand, implementing the framework now will deliver robust and efficient regulatory arrangements for the future. This will reduce the risks of inefficient network investments over the longer term.

Framework for transmission reliability

The AEMC's recommended framework includes:

- an economic assessment process to inform the setting of reliability standards, based on a probabilistic approach. This will involve:
  - evaluating the way network costs vary with different levels of reliability;
  - undertaking a probabilistic assessment of expected unserved energy where the impacts of a supply interruption, in terms of its duration, the type of the load lost, and the probability of its occurrence are evaluated. The unserved energy is then valued using estimates of the value of customer reliability (VCR); and
  - comparing the expected costs of investment and operation against the value that customers place on reliability.
- a transparent and public process for setting reliability standards which requires the assessment and considerations used in setting reliability standards to be published;
- setting standards prior to the revenue determination and investment appraisal processes;
- decision making on reliability standards by a body which is independent of the TNSPs;
- for each connection point, the standard would, at a minimum, include a required level of network capability informed by the economic assessment process, plus a

requirement relating to when supply would need to be restored following an interruption. The required level of network capability would be expressed in terms of network redundancy;

- the flexibility for the standard setter to include additional parameters including output based measures, in order to make the standard more consistent with customer preferences;
- consistent with current arrangements, the ability for jurisdictional ministers to be responsible for determining the appropriate level of reliability. The framework also has the option for ministers to delegate responsibility to the Australian Energy Regulator (AER) or a jurisdictional body, where that body is independent of the body that plans and makes investment decisions;
- the ability for jurisdictional ministers to specify additional reliability requirements for areas of economic or social importance;
- greater opportunities to consult with customers and consider community preferences;
- obligations under the NER for TNSPs to comply with their transmission reliability standards each year; and
- national reporting and auditing of transmission reliability performance and planning.

The Commission's recommended framework sets out an approach to regulating reliability at connection points within each transmission network. The recommended framework presumes that additional factors related to the integrity of the operation of the electricity system (such as frequency, system stability, voltage, and protection systems and fault clearance times) will continue to be managed in accordance with the prescribed requirements under schedule 5 of the NER.

To implement the framework, we recommend that work commences on developing a national template for the expression of transmission reliability standards. This template would provide guidance on the appropriate range of input and output measures for transmission and contain common definitions and measurement methodologies for these measures. This template, in addition to the VCRs which are currently being developed by the Australian Energy Market Operator (AEMO), can be used in the near term by jurisdictions to set standards ahead of the full implementation of the framework.

These initial steps would allow improvement to the existing jurisdictional arrangements for setting transmission reliability standards by enabling a transparent assessment of the trade-off between the costs of reliability and the level of reliability delivered, and a comparison between the reliability standard adopted and the value customers place on reliability. This will also facilitate benchmarking of reliability performance across the NEM.

The Commission has amended some aspects of the framework after considering submissions received on its consultation paper. These include:

- keeping the level of allowed expenditure relating to the reliability standards unchanged during a regulatory control period where the standards are changed; and

- a five yearly audit requirement.

These changes will support efficient reliability outcomes and enable the expected costs of the framework to be proportionate to its benefits.

Comparison with the recommended framework for distribution reliability

The AEMC was requested by the Standing Council on Energy and Resources (SCER) to develop a framework for distribution reliability in parallel with the transmission framework. The AEMC's final report on its recommended framework for distribution reliability was submitted to SCER on 13 September 2013 and published on 27 September 2013.

Many of the elements relating to the responsibilities and steps involved in setting the reliability standards for transmission reliability are the same as those recommended for distribution. However our recommended framework for transmission also recognises the inherent different characteristics of transmission and distribution systems. Transmission reliability relates to whether the network is adequate to transport power to demand centres and whether it can withstand various contingencies in a secure manner without serious consequences. Distribution reliability relates to meeting customers' demand while maintaining acceptable levels of quality and continuity of supply.

Reliability standards for the transmission system also differ from those of the distribution system due to differences in the cause and magnitude of disruptions, and the consequences that flow from any disruptions which may be widespread. Transmission networks are designed to provide sufficient redundancy to ensure that the number of supply interruptions is low, because of the potential widespread impact of transmission failures. Given these characteristics, prolonged under-investment in transmission networks may not translate to short term observable reductions in reliability outcomes.

For these reasons we consider that the expression of reliability standards in the form of levels of network capability is appropriate, rather than standards solely based on actual output performance. We also recommend that TNSPs are required to achieve their reliability standards each year. This differs from the recommended framework for distribution reliability where DNSPs would be incentivised to meet their reliability standards rather than using compliance obligations.

Given the level of regional interconnection in the NEM, investments in the transmission network in one jurisdiction can have flow-on consequences for transmission networks in other jurisdictions. Consequently, there is a greater

justification for consistency across the NEM in the framework for transmission reliability than for distribution reliability. Our recommended framework recognises this and requires that NEM wide impacts are taken into consideration in the economic assessment process for setting reliability standards.

Benefits of the framework

The adoption of the framework will deliver three key benefits for customers, including:

- economically determined reliability standards so that customers, as a group, pay for a level of reliability consistent with their preferences;
- transparency around the reliability standard setting process to facilitate stakeholder understanding and enable customers to contribute to the process of determining the appropriate level of reliability; and
- consistency in how reliability performance is reported to improve understanding and facilitate benchmarking.

Economically determined standards

The framework will deliver a more economically efficient, transparent, and robust process for setting transmission reliability standards. It involves assessing the way that the cost of operation and investments in networks change reliability levels, and selecting a reliability standard on the basis of equating the cost of investment and operation with the value placed on reliability by customers. The efficient level of transmission reliability will be determined by selecting the reliability scenario which maximises the value of customer benefits given the costs of providing that level of reliability.

In considering the benefits of reliability, the impact and probability of interruptions under different reliability scenarios will be assessed, reflecting different levels of network redundancy and output measures. There are a considerable number of uncertain factors in transmission systems, and therefore the use of a probabilistic approach in the economic assessment will provide investment planning solutions which are closer to customer preferences.

All stakeholders agreed with the need for an economic assessment process where the benefits of reliability for customers and the probability of interruptions are taken into consideration. This will lead to more efficient investments by TNSPs and electricity prices which are more consistent with the value placed on reliability by customers.

The expression of the reliability standard in terms of network redundancy (N-x) does not imply that the standard can only be met by undertaking network investment. Demand-side options and local generation in combination with the existing network can also be used to deliver the required level of network capability. The incentive properties of the regulatory regime, combined with the regulatory investment test requirements, mean that TNSPs can be expected to select the most efficient means to meeting the reliability standards they face.

Transparency

The explicit and transparent consideration of the value placed on reliability by customers, along with a number of opportunities for stakeholder consultation during the standard setting process, are also likely to improve the potential that reliability standards reflect the preferences of customers within each transmission network.

Setting reliability standards ahead of the need to invest would provide transparency and certainty to market participants and customers regarding the level of reliability they can expect to receive. It would also increase accountability in relation to the reliability levels provided by TNSPs.

Consistency

Consistency in the expression of transmission reliability standards across the NEM and the information from the economic assessment process would allow the AER to better benchmark performance and improve its ability to determine revenues that are consistent with the efficient delivery of a TNSP's reliability standards. It would also allow stakeholders to compare and identify trends and innovations in the performance of TNSPs, which may assist in driving further efficiencies.

More efficient reliability outcomes for customers will be delivered through implementation of the AEMC's recommended framework. This will be delivered by implementing an effective framework for setting, delivering, and reporting on transmission reliability standards which includes greater consideration of the value customers place on reliability. The framework would not result in a single harmonised level of reliability applied across the NEM.

Applying the framework

The framework will also establish a process for developing estimates of VCR through making this the AER's responsibility. The framework recognises the limitations of depending solely on VCR measures. Firstly, the VCR cannot be observed directly but must be estimated through survey based approaches. Secondly, VCR estimates may not be a precise reflection of all customer preferences or the full benefit that the community places on reliability. For example, customers may place additional value on avoiding extended interruptions which, although unlikely to occur, would have major disruption costs. Given the importance of transmission networks, it is particularly important that such events are appropriately taken into consideration when setting standards.

Furthermore, given the technical characteristics of transmission networks it is impossible to supply each customer with a level of reliability which is consistent with their individual preferences. This is because common parts of the network serve a number of different customers. As a result, all customers supplied at the same transmission connection point will receive the same level of reliability. This ultimately means that determining the level of reliability that TNSPs must provide to customers involves trading off the reliability preferences of different customers in the same supply area.

Making these trade-offs involves exercising judgement. The framework allows jurisdictional ministers the ability to exercise these judgements in an informed and transparent manner. Economic assessments on the quantitative trade-off between cost and reliability will be provided to the jurisdictional minister or their delegated standard setter to inform this exercise of judgement.

There are a number of options for various bodies to perform the required steps of the framework. This is consistent with the terms of reference for this review and the Council of Australian Government's (CoAG's) decision in December 2012 for jurisdictions to have the opportunity to transfer responsibility for applying the framework to the AER.

Implementing the framework

The full implementation of the framework for transmission reliability is likely to require a number of changes to the NER, jurisdictional legislation, as well as the National Electricity Law and the Australian Energy Market Agreement. A plan which sets out the stages for the implementation of the framework has been included in this final report.

There is the opportunity to capture some of the benefits in the near term through establishing key elements of the framework. Therefore, we have set out an interim stage, which can be undertaken to improve the existing arrangements for setting, delivering, and reporting on transmission reliability standards and outcomes ahead of the necessary changes to NEM legislative arrangements for the full implementation of the framework. This is similar to the interim stage proposed in the distribution reliability framework final report.

This interim stage would include a rule change to require AEMO to work with industry and jurisdictional governments to develop a common approach for expressing transmission reliability standards.

Enhancing the approaches for expressing transmission reliability standards, supported by measures of the VCR being developed by AEMO, will allow existing jurisdictional arrangements to be improved in the short term. With these tools, jurisdictions will be able to better compare the costs of reliability against the benefits to consumers and allow both the AER and customers to have a fuller understanding of reliability performance in the NEM. We recommend that SCER proceeds with the interim stage in conjunction with the interim stage proposed in the distribution final report.

Jurisdictions could choose to build on the interim stage and start to apply a transparent economic assessment process for setting transmission reliability standards as recommended in this report. This will allow customers to benefit from a more open and efficient process for setting reliability standards before the framework is fully implemented.

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1 Features of the framework for transmission reliability

This chapter sets out a summary of the features of the Australian Energy Market Commission's (AEMC or Commission) recommended framework for transmission reliability. It also outlines the main changes that have been made to the framework following the AEMC's consultation paper and details of the next steps for the implementation of the framework.

We consider that our framework will promote the National Electricity Objective (NEO), consistent with the Standing Council on Energy and Resources' (SCER) terms of reference. In particular, the framework would:

- provide for an independent economic assessment process based on a probabilistic approach to inform the setting of transmission reliability standards, which would provide for more efficient network investment and pricing outcomes for customers;
- improve customer consultation and consideration of community needs during the standard setting process, which would provide for customer preferences to be more explicitly taken into account in the setting of reliability standards; and
- provide greater consistency in how transmission reliability standards are expressed and reported on across the National Electricity Market (NEM), to allow the Australian Energy Regulator (AER) to more effectively compare the performance of transmission network service providers (TNSPs) and set efficient revenue allowances.

Further detail on each of the features of the framework, as well as the Commission's reasoning, is set out in chapters 3 to 6.

In developing the framework, we have reviewed how transmission reliability standards are determined and regulated in New Zealand, the USA (Pennsylvania-Maryland-New Jersey), the United Kingdom, and Nordic markets.[1] We found that a number of the key elements of the recommended framework are consistent with the current practice in these markets, including:

- the setting of reliability standards in advance of investment planning and project appraisals;
- the expression of reliability measures using a measure of network redundancy (N-x) plus restoration times, and potentially combined with additional measures;
- the scope for delegation by elected representatives to a separate body which determines the standards; and

1 See Appendix C of this final report for a comparison table.

- the requirement for TNSPs to report regularly on their performance against their reliability standards.

We consider that current market conditions provide a good opportunity to reform the transmission reliability arrangements. Stable network conditions will enable TNSPs and jurisdictions to adapt to the new reforms without the risk of significant disruption of reliability performance for customers. Implementing the framework now will deliver robust and efficient regulatory arrangements for the future and reduce the risks of inefficient network investments over the longer term.

This chapter also sets out our recommendations for implementing the framework, including an interim stage which establishes tools to improve existing arrangements. Measures of the value of customer reliability (VCR), supported by common definitions for transmission reliability standards through the development of a national reference standard template, will allow existing jurisdictional arrangements to be improved in the short term.

Need to regulate reliability for transmission networks

Reliability refers to the extent to which customers have a continuous supply of electricity. Transmission networks facilitate the supply of electricity to end use customers within each jurisdiction of the NEM.

The level of investment and maintenance expenditure undertaken by TNSPs will affect both the level of reliability that the transmission network provides and ultimately the prices paid by customers for transmission services.

As monopoly services, the price charged for transmission services is regulated. The regulation of reliability complements this price and revenue regulation to balance against an incentive for networks to reduce reliability levels in order to increase their profits. In the absence of reliability regulation, transmission business may have a tendency to underinvest in reliability in comparison to the level of reliability valued by customers.

Conversely, in the absence of clear reliability standards, there may be over-investment in the network, resulting in a level of reliability in excess of that valued by customers. In this circumstance, the prices faced by customers will be above efficient levels. Effective regulation of reliability is therefore essential to protect customers and to provide for reliability outcomes which are consistent with customer preferences.

1.1 The meaning of reliability in transmission networks

The level of reliability required of transmission networks affects the level of investment that transmission businesses need to undertake. However, transmission networks also play a key role in maintaining the overall security of the power system. While an outage in the distribution network can result in an interruption to supply for a number of customers, an outage in the transmission network can have flow-on consequences for the operating integrity of other transmission assets and can compromise the secure

operation of the electricity system, thereby increasing the risk of widespread losses of supply and damage to equipment.

Therefore, while providing a reliable supply of electricity to customers acts to drive investment in both transmission and distribution networks, there are additional factors beyond reliability that drive investment in transmission networks. This range of factors is set out in schedule 5 of the NER, which describes the planning, design and operating criteria that must be applied by network service providers (NSPs) to the networks they own, operate or control. This includes requirements relating to frequency, system stability, power transfer capability, voltage, credible contingency events, load shedding, and protection systems and fault clearance times.

These standards establish the transmission planning and operating requirements to keep the bulk-power system stable, with sufficient power transfer capability and free from overloads, high and low voltages, cascading outages and system separations. It is important to recognise that an economic evaluation of different levels of reliability in transmission networks has implications for a range of other factors beyond providing a reliable supply of electricity at individual connection points.

The Commission's recommended framework sets out an approach to regulating reliability at connection points within the transmission networks. The recommended framework presumes that additional factors related to the integrity of the operation of the electricity system will continue to be managed in accordance with the prescribed requirements under schedule 5 of the NER and therefore have not been considered as part of this review.

We also note that there is a clear relationship between the security of a transmission network and the level of reliability in that network. The ability of a transmission network to reliably supply connected customers is affected by the requirement to maintain the power system in a secure operating state. That is, the transmission system needs to be operated such that it can continue to operate satisfactorily following a range a contingencies such as faults or outages of network elements. In some instances, it may be necessary to limit the capability of the transmission network to supply connected loads in order to maintain the network in a secure operating state. Therefore, the standard setter would need to take this relationship between security and reliability into consideration when determining the appropriate level of the transmission reliability standard.

1.2 Comparison with the framework for distribution reliability

The AEMC has also been requested by the Standing Council on Energy and Resources (SCER) to develop a framework for distribution reliability in parallel with the transmission framework. The Commission's recommended framework for distribution reliability, which was outlined in a final report published on 27 September 2013, shares a number of common features with the framework for transmission reliability. Most of the common arrangements relate to the steps and responsibilities involved in setting reliability standards. A consistent approach in these areas will reduce the implementation costs of establishing the national frameworks and better facilitate

consultation with customers. It will also allow customers to more easily understand how levels of reliability required of both the transmission and distribution networks are determined.

However, our recommended framework for transmission also recognises the inherent different characteristics of transmission and distribution systems. Transmission reliability relates to whether the network is adequate to transport power from generation sites to demand centres and whether it can withstand various contingencies in a secure manner without serious consequences. In contrast, distribution reliability relates to meeting customers demand while maintaining acceptable levels of quality and continuity of supply.

Reliability standards for the transmission system also differ from those of the distribution system due to differences in the cause and magnitude of disruptions, and the consequences that flow from any disruptions, which may be widespread. Transmission networks are designed to provide sufficient redundancy to ensure that the number of supply interruptions is low, because of the potential widespread impact of transmission failures. Given these characteristics, prolonged under-investment in transmission networks may not translate to short term observable reductions in reliability outcomes.

These differences between the characteristics of transmission and distribution networks have led to the following key differences in the recommended frameworks:

- the expression of reliability standards in the form of levels of network capability is more appropriate for transmission. For distribution it is more appropriate to base standards solely on actual output performance;

- given the difficulty in monitoring actual reliability performance and the nature of transmission interruptions, we recommend that TNSPs are required to achieve their reliability standards each year. This differs from the recommended framework for distribution reliability where compliance every year is not required and DNSPs are instead incentivised to meet their reliability targets; and

- the opportunity for standards to be revised during the regulatory period should be permitted for transmission standards, but not for distribution. Given the compliance obligation on TNSPs to achieve their reliability standards, the ability to change the standard mid-period reduces the risks faced by TNSPs, when there is a material change in circumstances. It is also in the interest of customers, as they would otherwise have to pay for inefficient investments, following the end of the regulatory period. A similar risk does not exist under the distribution framework.

The regulation of reliability in transmission networks lends itself to a national approach more so than for distribution networks. Given the level of regional interconnection in the NEM, the regulation of reliability in transmission networks on a national basis may be more beneficial for customers. Investments in the transmission network in one jurisdiction can have flow-on consequences for transmission networks in another jurisdiction.

Consequently, there is a greater justification for consistency across the NEM in the framework for transmission reliability than in distribution networks. Our recommended framework recognises this and requires that NEM wide impacts are taken into consideration in the economic assessment process for setting reliability standards.

1.3 Expression of transmission reliability standards

Transmission reliability standards would be set for each connection point in a TNSP's network. At a minimum, for each connection point, a transmission reliability standard would contain two measures:

(a) a required level of network capability to be informed by an economic assessment process and expressed in terms of network redundancy (N-x); and

(b) a requirement relating to when supply would need to be restored following an interruption to supply at the connection point.

This approach takes into account the nature of transmission networks. Transmission networks are built to be highly reliable to safeguard against the widespread impacts of a supply interruption due to a failure of a transmission network element. These characteristics of transmission networks means that standards based solely on actual performance will not adequately capture the full dimensions of reliability for a transmission network. Given this, we consider that standards expressed in relation to network capability and restoration times are more appropriate when setting required transmission reliability levels.

The expression of the standard in terms of network redundancy does not however imply that the standard can only be met by undertaking network investment. Demand-side participation and local generation in combination with the existing network can also be used to deliver the required level of network capability.

In addition to these minimum requirements, the standard setter may select additional standards, including output based measures. The list of possible additional measures will be set out in the national reference standard template for transmission.

Transmission reliability standards would be set ex-ante; that is, transmission reliability standards would be set prior to the commencement of the revenue determination process and a TNSP's decision to invest. The Commission considers that setting standards ex-ante promotes transparency and accountability and fosters a greater degree of credibility in the transmission reliability standards. Setting standards prior to the revenue determination and investment appraisals is consistent with existing jurisdictional practices, except for Victoria.

A national reference standard template for transmission would be developed by the Australian Energy Market Operator (AEMO) in accordance with guidance in the NER and with public consultation. The national reference standard template for transmission would:

- identify the range of input and output measures that standard setters could choose to express transmission reliability standards;

- provide consistent definitions of these measures, including exclusions, as well as methodologies to report on these measures; and

- provide guidance on how the potential additional standards could complement the minimum standard.

TNSPs would be required to report their performance against their standards in a manner that is consistent with the definitions set out in the national reference standard template for transmission.

1.4 Structure of the standard setting process

The standard setting process[2] under the framework for transmission reliability would involve three main stages:

1. a process for the selection of a range of feasible reliability scenarios for the next revenue determination period;

2. an economic assessment process to assess the costs and benefits of each reliability scenario, based on a probabilistic approach; and

3. a process to select and publish the reliability standards for each TNSP.

Each of these stages is discussed in further detail below in Figure 1.1 and would involve different responsibilities for a range of participants. A more detailed version of this figure has been published on the AEMC website.

A reliability scenario represents a potential level of reliability that could be achieved by the TNSP over the next regulatory period. Therefore each scenario would consist of a different level of N-x standards for each connection point in the network plus a expected time for restoration of supply following an interruption. Additional output measures for each connection point may be included in the reliability scenario at the discretion of the standard setter.

The principal roles under the framework would include:

- **Standard setter –** Responsible for selecting the reliability scenarios to be economically assessed and setting reliability standards. This role may be retained by the jurisdictional minister or delegated by the minister to the AER or a jurisdictional body.

2 For the remainder of this paper, where we refer to "the standard setting process", this refers to the setting of transmission reliability standards under the national framework.

- **Economic adviser –** Responsible for providing advice to the standard setter and undertaking an economic assessment of the costs and reliability impact for each reliability scenario, based on information obtained from the TNSPs. The jurisdictional minister would decide who performs this role but it may be delegated to an appropriate jurisdictional government body, jurisdictional regulator, the AER, or any other body independent of the TNSPs.

- **Compliance monitor –** Monitors the reported reliability performance and the results of audits which assess the effectiveness of TNSPs' plans and internal systems to meet their reliability standards.

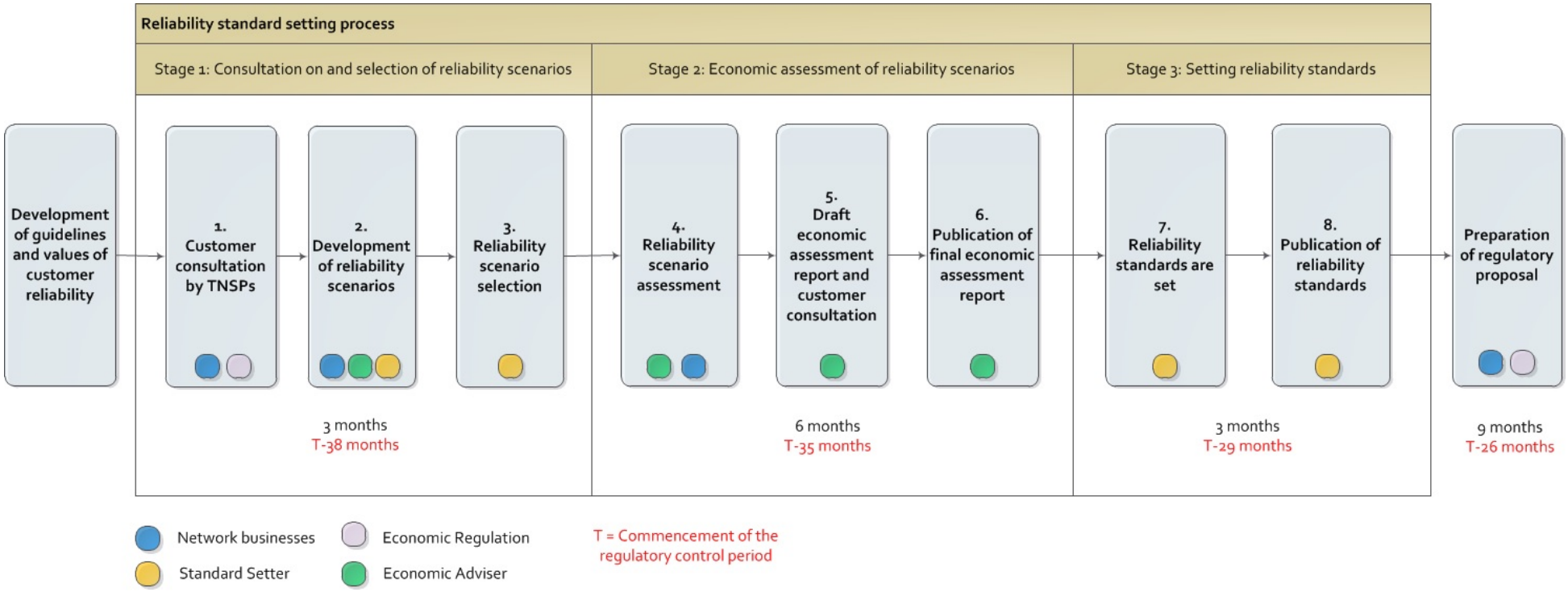
Existing jurisdictional arrangements differ in how these roles are performed. For South Australia and Tasmania, the current role of the standard setter is undertaken by the jurisdictional regulator. Standard setting powers are conferred on these jurisdictional regulators under jurisdictional legislation at the authority of the minister. In New South Wales and Queensland, the form and level of the standards are within the control of the minister. In Victoria, transmission reliability is determined by AEMO as a function of economic assessments based on sector specific VCRs.

The majority of NEM jurisdictions do not currently incorporate a full economic assessment of reliability. The exception is Victoria where AEMO undertakes a project-by-project comparison of the efficient costs of network augmentation with the value placed on reliability by customers. South Australia and Tasmania have used variations of customer value of reliability in the development of reliability standards. However, there is no consistent framework developed for the application of these measures.

All NEM jurisdictions require TNSPs to undertake some form of reliability reporting. Jurisdictional reliability reporting is undertaken on an annual basis in most jurisdictions and may, according to the individual jurisdiction, involve the preparation by the TNSP of a network development and planning report or a report on achieved performance against reliability standards or both. Jurisdictions differ in the definitions and methodologies used for measuring reliability performance.

Further detail on the regulation of reliability in NEM jurisdictions, and how the existing jurisdictional arrangements would change under the Commission's framework, is provided in chapter 7.

Figure 1.1 Proposed process flow for setting reliability standards



The steps during the proposed standard setting process would include:

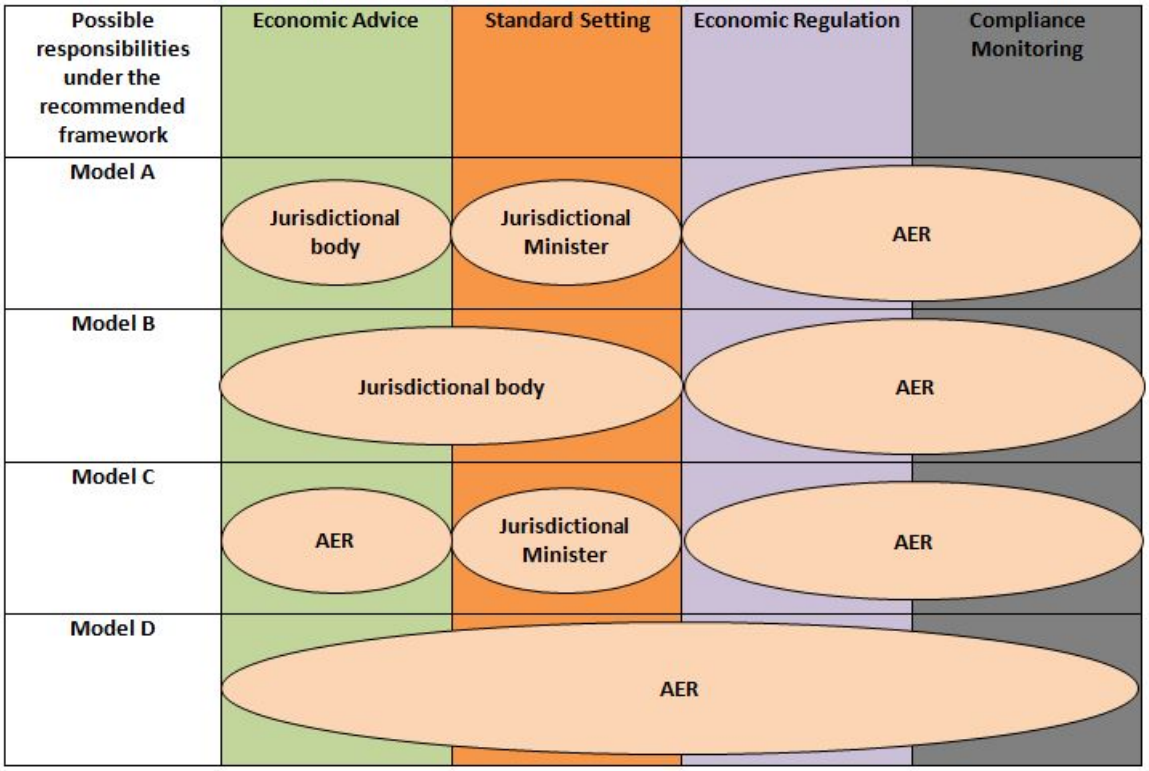
- customer consultation;
- selecting the reliability scenarios to be economically assessed. This would be performed by the standard setter;[3]
- the economic adviser assessing how the cost of network investment and operation affects expected reliability, and estimating the costs and customer benefit of achieving different reliability scenarios based on data obtained from the TNSPs;
- undertaking an economic assessment of the costs and benefits of each reliability scenario, based on a probabilistic approach, which would be performed by the economic adviser on behalf of the standard setter, and publishing the results of the economic assessment;
- setting the reliability standards that will apply to each TNSP, which would be performed by the standard setter with its decisions made public;
- determining revenues for TNSPs which are consistent with the efficient delivery of their reliability standards over the next regulatory control period, which would be performed by the AER in its capacity as the economic regulator; and
- monitoring and reporting on the compliance of TNSPs against their standards. We have recommended that the AER would undertake this role.

Further explanation on how each of these steps is performed is set out in the remaining chapters of this final report.

Jurisdictional ministers would be responsible for setting transmission reliability standards, but would be able to delegate this role to the AER or a jurisdictional body. Therefore, under the framework, a number of these responsibilities could be performed by the same body. The possible models for how these responsibilities could be allocated are set out below in Figure 1.2.

3 Each reliability scenario would include an N-x standard and expected time for restoration of supply at each connection point. The format of reliability scenarios is discussed further in chapter 4.

Figure 1.2 Possible responsibilities under the framework



Where a jurisdictional minister has delegated responsibility for setting standards to the AER or a jurisdictional body, the standard setter and economic adviser roles would be performed by the same body. As a result, this body would be responsible for undertaking the economic assessment of the costs and benefits of each scenario, as well as determining the range of reliability scenarios to be economically assessed and the reliability standards that will apply to each TNSP.

In delegating responsibility for setting standards, jurisdictional ministers would be able to provide instructions on how the reliability standards are set. For instance, this could include a requirement to not lower reliability in certain areas of high economic or social importance.

The AER or jurisdictional body would be required to set reliability standards on the basis of the reliability scenario with the highest net economic benefits, as identified through the economic assessment process.

Where a jurisdictional minister retains responsibility for setting standards, they will be informed by an economic adviser. This means that the minister will have appropriate information on the trade-offs between cost and reliability for the selected reliability scenarios, as well as the level of reliability that would be implied solely on the basis of

equating costs with estimates of the VCR. The economic adviser would be independent from the TNSPs.[4]

Jurisdictional ministers would be able to consider additional factors which may not be fully accounted for in the economic assessment process in setting reliability standards. This could include factors such as the risk aversion of customers or the potential for high impact low probability events, which are difficult to quantify in estimates of the VCR.[5]

The standard setting process would be supported by the development of guidelines by the AER, which would set out the details of the standard setting process, the key assumptions to be used during the economic assessment process, how TNSPs undertake the process of customer consultation, and details on the requirements for undertaking audits. This would provide consistency in how the standard setting process is run across the NEM.

VCRs would also need to be developed as they will be used to assess the potential customer impact of reliability scenarios during the standard setting process. VCRs will have to be determined at appropriate levels to reflect the range and geographic locations of customers in each transmission network.

As a result, separate VCRs would be developed for each customer type in each NEM jurisdiction. It is recommended that the AER would be responsible for developing VCRs for each jurisdiction, as this would be consistent with its roles as the economic regulator including designing the Service Target Performance Incentive Scheme (STPIS) and monitoring the regulatory investment test assessments.

VCRs would be updated every five years and escalated annually. The AER would also be responsible for the methodology used to determine VCRs and also the escalation method, but would be required to use AEMO's national VCR methodology, which is currently being finalised, as a starting point. This would allow the AER to improve the methodology over time using the experience gained through repeated application. This will allow customer preferences to be more accurately revealed over time. Measures of VCRs currently being developed by AEMO could be used initially until the AER considers that these need to be re-estimated.

1.5 Customer consultation and selection of reliability scenarios

The standard setting process would commence with the customer consultation process by the relevant TNSP. This process would be used to determine which areas of reliability are particularly important to customers within each TNSP's network. These

4 This could include any body appointed by the jurisdictional minister which is independent and without financial interest in the standard setting process. For instance, this could be a jurisdictional government body, jurisdictional regulator, AER or any other body.

5 As a result of considering additional factors, there is the potential that jurisdictional ministers could select a scenario with net costs.

views would be used in the development of reliability scenarios in consultation between the TNSP, economic adviser, and the standard setter. A reliability scenario represents a potential level of reliability that could be provided and its impacts would be modelled. Each reliability scenario would consist of levels of network redundancy (N-x) for each connection point in the network plus expected times for restoration of supply following an interruption. Additional output measures for each connection point may be included in the reliability scenario at the discretion of the standard setter.

The reliability scenarios to be assessed would be ultimately determined by the standard setter. Each reliability scenario selected would be assessed under the economic assessment process, using a probabilistic approach, to determine its costs and benefits. The standard setter would be required to select one of the reliability scenarios at the end of the standard setting process in determining the reliability standards that will apply at each connection point for that TNSP.

Customer consultation at the commencement of the standard setting process would facilitate the development of reliability scenarios which reflect the preferences of customers and are considered in a transparent manner. Determining reliability scenarios on a consultative basis with each TNSP would also result in the scenarios being both technically and financially feasible. This will assist in promoting efficient and effective investments by TNSPs.

To help inform the selection of reliability scenarios, the standard setter would be required to calculate a baseline reference case. The baseline reference case would assess the level of reliability based solely upon the estimates of value of customer reliability and current levels of expected unserved energy. The baseline would be determined by:

- Calculating the level of expected unserved energy that would arise if no further investments were undertaken over the next regulatory period.
- The value of expected unserved energy would then be determined by multiplying the VCR by the level of expected unserved energy. This value of expected unserved energy would represent the potential benefits to customers of possible reliability improvements based solely on the VCR.
- Investments equal to that value of expected unserved energy would be identified.
- The resulting level of reliability that would occur if those investments were undertaken would represent the baseline reference case.

Given the discrete nature of network costs, calculating the baseline case may not result in a level of network capability that could be reflected in a network redundancy (N-x) expression. However the baseline could still be useful to inform on the appropriate range of reliability scenarios to be modelled in the economic assessment process.

1.6 Economic assessment of reliability scenarios

Under the economic assessment process the costs and benefits of each reliability scenario would be assessed by the economic adviser. The benefits of each reliability scenario would be based upon the value of expected unserved energy. This would require an assessment of the probability of an interruption occurring, the expected duration of an outage and the composition of the load expected to be affected. The benefits would also reflect any inter-regional impacts of the network investment needed to meet each reliability scenario.

The steps involved in the economic assessment process are:

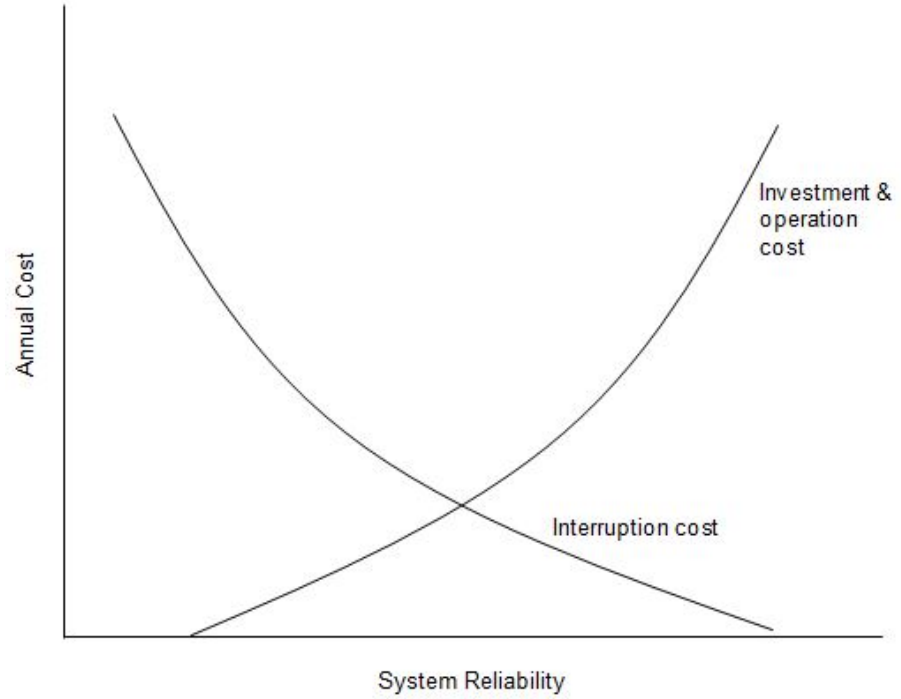
- assessing how the costs of building and operating the network vary with different reliability scenarios;
- estimating the costs of interruptions, based on the probability of load lost, the expected duration, the nature of the load affected, and the associated value of customer reliability; and
- using the costs to customers of interruptions to their supply of electricity to identify the reliability standard which delivers the maximum net benefit to customers.

Further details on the inputs required to undertake the economic assessment process are set out in Box 1.1. Figure 1.3 illustrates the trade-off between costs and levels of reliability that is assessed through the steps of the economic assessment process.

- The upward sloping curve is derived from the first step of the process and represents how network costs vary with respect to the levels of reliability. Typically, the costs of building and maintaining the network increase as the level of reliability increases.
- The downward sloping curve is derived from the second step of the process and represents how the costs to customers vary with respect to the level of reliability. Typically the cost to customers reduces as they are faced with fewer or shorter interruptions to their supply.

The economic assessment process would evaluate this trade-off for each reliability scenario using estimates of network costs provided by the TNSPs and estimates of the VCR.

Figure 1.3 Trade-off between costs and levels of reliability



TNSPs would be required to submit information to the economic adviser to enable it to perform this assessment of each scenario. The economic adviser would assess whether the information provided by the TNSP represented a reasonable forecast of the expected changes in costs and reliability performance. However, the economic assessment process would not be a substitute for the AER's later revenue determination process, and the economic adviser would not be approving specific projects as the means of meeting the reliability standard.

It is important that the standard setter is basing its decisions on the best information available on the costs and benefits of reliability improvements. There would be an onus on the economic adviser to estimate the efficient cost of each reliability scenario for use in the economic assessment process. The economic adviser would use the information available at that time with input from the TNSPs.

The economic adviser would prepare a draft report on the costs and benefits of each scenario for public consultation, before publishing a final report. This information would then be used by the standard setter to make an informed decision on the appropriate trade-off between cost and reliability in the relevant transmission network.

An independent economic assessment process would increase transparency around the costs and benefits of each reliability scenario, which would lead to a more efficient level of reliability being set and more efficient pricing outcomes for customers. It would also allow the value placed on reliability by customers to be explicitly considered, which improves the likelihood that customer preferences will be reflected in the standards which are set.

The number of reliability scenarios needed to be tested under the economic assessment process will depend upon the circumstances at the time. Once the standard setter is confident that reliability levels reflect the preferences of customers then there will be less need to assess multiple scenarios.

The level of assessment which is undertaken will depend on:

1. the extent of changes in customer preferences and the costs of investment and operations since standards were last set; and

2. whether the jurisdictional minister considers that additional factors not captured by the VCR must be taken into account.

As a result, unless there are significant changes in these factors from one regulatory control period to the next, the need for step changes in reliability standards may reduce once the standard setting process has been run once or twice for each TNSP.

This could result in the standard setting process involving more of a review of the level of the existing reliability standards, rather than a full assessment of a range of alternative reliability scenarios for each connection point. Therefore, as the number of scenarios and level of assessment required will depend on the circumstances of each network, the costs of applying the framework will be proportionate.

Box 1.1 Inputs to the economic assessment process

The economic assessment process would involve evaluating expected levels of unserved energy using the probability of equipment failures, expected outage duration, and forecast loads for the range of reliability scenarios. The level of expected unserved energy would then by multiplied by the relevant VCR, and compared against the expected changes in network costs.

Table 1.1 sets out the inputs to the economic assessment process and the relevant sources for obtaining information.

Table 1.1 Inputs to the economic assessment process

Input	Source
VCR	Estimates provided initially through AEMO's review. The AER would be responsible for developing future estimates
Levels of unserved energy	Economic adviser to determine based on estimates of forecast loads and the probability of equipment failures provided by the TNSP consistent with the standard setting guidelines
Costs of network investment and operations and demand-side participation (DSP) options	Economic adviser to determine based on estimates provided by the TNSP consistent with the standard setting guidelines

The Commission notes that some stakeholders have referred to "probabilistic planning approaches" when referring to economic assessments which are undertaken on a project by project basis.[6] However, it is possible to incorporate probabilistic approaches when setting standards on an ex-ante basis.

The Commission's recommended framework would require the economic adviser to consider the level of expected unserved energy that would arise under each reliability scenario, which would require a probabilistic assessment. Under this assessment the impacts of a supply interruption, in terms of its duration and type of load lost, and the probability of its occurrence are evaluated.

In contrast to the current project by project approach used in Victoria, this probabilistic assessment process would be used to set reliability standards prior to the decision to invest. We have recommended this approach because it is consistent with the ex-ante incentive framework for setting network revenues set out in the current rules. It also provides greater accountability and transparency in the standards that are set.

Productivity Commission proposed approach for setting transmission reliability

The AEMC notes the report published by the Productivity Commission in June 2013 which set out a proposed approach for a national framework for transmission reliability.[7]

Under the Productivity Commission's approach, AEMO would undertake all transmission planning centrally across the NEM and determine the level of reliability that should be provided using economic cost benefit assessments that incorporate VCR estimates and demand forecasts from TNSPs to develop a reliability standard at each connection point. The standards would be expressed in an N-x format or in other ways such as the probability-weighted quantity of electricity at risk.

The Productivity Commission's approach involves the setting of reliability standards at each connection point based on economic cost benefit assessments of the level of reliability that corresponds to the VCR, and is therefore different to the existing approach used in Victoria where there are no reliability standards and each project is assessed individually as to whether it provides a net economic benefit.

The AEMC also notes the Productivity Commission's proposal that major transmission investments to meet reliability standards would be assessed on a project by project basis for revenue allowances.

There are a number of common features between AEMC's framework and the Productivity Commission's proposed approach to the regulation of transmission reliability. Specifically, reliability standards should be set:

6 For example, see the submission on the consultation paper from the Victorian Department of State Development, Business and Innovation.

7 Productivity Commission, *Electricity Network Regulatory Frameworks*, 26 June 2013, pp. 581-625.

- with reference to the trade-off between the value placed on reliability by customers and the costs of investing in and maintaining transmission networks;
- before the investment planning process;
- through a transparent public consultation process, which includes close consultation with TNSPs and other key stakeholders, including DNSPs; and
- through a consistent approach to expressing and setting reliability standards at each connection point.

However, the AEMC considers that the Productivity Commission's approach is likely to be insufficient to provide adequate accountability and levels of reliability that reflect all the preferences of customers. This is because:

- VCR estimates may not be a precise reflection of all customer preferences or the full benefit that the community places on reliability. The AEMC does not consider that reliability settings can be determined mechanistically based solely on VCR and cost inputs. Determining the appropriate level of reliability involves exercising judgement. Economic assessments on the quantitative trade-off between cost and reliability will be provided to the jurisdictional minister or their delegated standard setter to inform the exercise of judgement.
- The Productivity Commission's proposal would blur accountability for investment decision making. At least some part of the power to make specific investment decisions would be moved from transmission businesses to the AER and AEMO. A principle of good governance is that risks should be allocated to the party that is best able to manage those risks.

  Further, the body that sets reliability standards should be independent from the body that must apply the standard when making planning, investment, and operational decisions. The Productivity Commission's proposal would have the effect of making AEMO both standard setter and (at least in part) implementer of the standard. Under the AEMC's recommended framework, jurisdictions would have the ability to adopt the national framework, but retain responsibility for applying it, thereby maintaining accountability on the jurisdiction to provide a level of reliability that reflects the expectations of the community.
- Under the Productivity Commission's proposed approach, the AER's determination of allowable revenue on a project by project basis for projects above a certain threshold would not be consistent with the existing ex-ante regulation framework in the NEM.

1.7 Setting reliability standards

After considering the economic adviser's report, the standard setter will determine the level of reliability standards which will apply to the relevant TNSPs. In doing so, the standard setter will consider whether it is appropriate for the TNSP to transition to the

standards it has determined where there is a step change in the required level of reliability.

Where a jurisdictional minister retains responsibility for setting standards, they would have discretion to set the reliability standards at any level that they considered to be appropriate to meet the needs and expectations of customers within their jurisdiction. The jurisdictional minister may publicly disclose the reasons for this selection.

1.8 Links to the revenue determination process

There would be two main links between the standard setting process and the revenue determination process. The first link would be that the customer consultation process to commence the standard setting process would be aligned with a TNSP's customer consultation process on the development of its regulatory proposal for the next regulatory control period. There would be administrative benefits associated with merging these two consultation processes.

The second link is that the reliability standards determined through the standard setting process would be used by TNSPs in forecasting the expenditure they require to meet these standards in their regulatory proposal. TNSPs would also be required to explain any differences between the cost forecasts they submitted during the standard setting process and those they submit during the revenue determination process. The AER would also have access to the costs forecasts submitted by TNSPs during the standard setting process, and the final cost forecasts used by the economic adviser. This would assist the AER in determining the revenues and prices consistent with the efficient delivery of a TNSP's reliability standards.

The framework would allow the standard setter to change the reliability standards within a regulatory control period if it considers that there is a material change in the costs or benefits of meeting the reliability standards and that a continuation of the existing standards would not be in the interests of customers.

The relevant TNSP or the economic adviser may request the standard setter to consider a change to the reliability standards. Alternatively, the standard setter could initiate its own review of the standards. A TNSP would only be able to seek an update where it can demonstrate that there has been a change in the input assumptions used during the standard setting process beyond the range of sensitivities that had been considered during this process.

An update could be sought for either an increase or decrease in the level of a TNSP's reliability standards.

Where a standard setter has decided to update a TNSP's reliability standards, the TNSP would not be able to seek any changes in its revenue allowance from the AER as a result of this decision. While updates to standards could occur within a regulatory control period, corresponding changes in revenue to reflect any changes in standards could not be made during the regulatory control period. This would also mean that TNSPs would not be able to seek any changes in allowed revenue under the cost pass

through provisions in the NER for reliability changes. Given that expenditure incentives are set by the AER at the start of the regulatory period, it is appropriate that the TNSP has the flexibility to respond to those incentives and consider how best to adapt its expenditure over the remainder of the period to the updated standards.

1.9 Compliance obligations and performance reporting

Under the framework, TNSPs would be required to comply with their reliability standards in every year. Compliance with reliability standards would form an obligation under the NER and would be subject to monitoring and enforcement by the AER.

To support these compliance obligations, TNSPs would be required to set out their plans for meeting their transmission reliability standards for each connection point as part of their public Annual Planning Reports.

TNSPs would also be required to undertake audits, conducted by an independent auditor on a five-yearly basis, to demonstrate that they have undertaken adequate planning and have systems and procedures in place to meet their reliability standards. This represents a change to the approach in the consultation paper which proposed that independent audits would be undertaken on an annual basis.

TNSPs would be required to publicly report on their performance against their reliability standards each year. The AER would be required to include this information in its annual benchmarking report on the efficiencies of TNSPs, which would minimise the administrative burden of this reporting for the AER, TNSPs, and other stakeholders.

As it is difficult to directly observe supply interruptions on transmission networks, assessing a TNSP's compliance with its reliability standards may be difficult if based on actual performance data alone. Performance data may not provide an accurate reflection of the underlying reality of a TNSP's network. To address these issues, a combination of actual data and simulation data could be used to assess a TNSP's performance. Chapter 6 provides a further discussion on methods that could be used to measure transmission reliability performance and compliance.

The TNSP can also be subject to incentives for reliability performance under the AER transmission STPIS. Under the NER, the AER has sufficient flexibility to adjust the operation of the transmission STPIS to be consistent with the reliability standards set under the recommended framework. We consider that this would complement the recommended framework and support these compliance obligations.

1.10 Changes to the framework following the Commission's consultation paper

The framework for transmission reliability set out in this paper is broadly similar to the framework that was set out in the Commission's July 2013 consultation paper. The main changes include:

- bringing forward the standard setting process by three months, so that TNSPs have nine months rather than six months to prepare their regulatory proposals following the setting of their reliability standards and any additional measures (chapter 4);

- the decision to include a mechanism to update transmission reliability standards but not allow an adjustment to the associated expenditure allowances within a regulatory control period (chapter 5); and

- a requirement on TNSPs to undertake an independent audit of the plans they have in place to meet their reliability standards every five years, instead of the annual requirement that was previously proposed (chapter 6).

Further details on the reasoning for these changes to the framework are set out in the relevant chapters of this paper.

1.11 Implementation of the framework

The full implementation of the framework for transmission reliability is likely to require a number of changes to the NER, jurisdictional legislation, as well as the National Electricity Law (NEL) and the Australian Energy Market Agreement (AEMA).

There is the opportunity to capture some of the benefits in the near term through establishing key elements of the framework. Therefore we have set out an interim stage which can be undertaken to improve the existing arrangements for setting, delivering, and reporting on transmission reliability standards and outcomes ahead of the necessary changes to NEM legislative arrangements for the full implementation of the framework. This is similar to the interim stage proposed in the distribution reliability framework final report.

The steps of the interim stage are:

- SCER would submit a rule change request to the AEMC. This rule change request would set out AEMO's responsibilities and the process and considerations that it must take into account when developing the national reference standard template.

- SCER would make the AER responsible for VCR measures after the completion of AEMO's VCR review.

- Following the AEMC's completion of SCER's rule change request, AEMO would develop and publish the template for use in jurisdictional arrangements.

- Jurisdictions would incorporate VCR measures and the template into existing arrangements.

We recommend that SCER make AEMO responsible for developing the national reference standard template for transmission. Developing the national reference standard template will require AEMO to work closely with industry and jurisdictional

governments. AEMO would need to develop the template in a manner which can be adopted by jurisdictions and easily incorporated into their existing arrangements.

AEMO could develop this template in connection with its national transmission planning functions under the NEL. However, as the NEL does not specifically contemplate AEMO providing advice based on terms of reference developed by SCER there may be limits on SCER's ability to prescribe the basis on which AEMO undertakes this work. Therefore, SCER would need to submit a rule change request to the AEMC, which would set out how AEMO should develop the national reference standard template.

The template will improve approaches to expressing transmission reliability standards through identifying the appropriate range of input and output measures for transmission, develop common definitions and measurement methodologies for these measures, and provide advice on how to select the appropriate combination of measures to better reflect customer preferences. Therefore the template will facilitate applying economically derived standards. It will also allow the reliability performance of TNSPs across the NEM to be compared, which will promote better regulation and benchmarking by the AER.

Following the finalisation of AEMO's estimation of VCRs in early 2014, the AER will need to consider how the VCR measures can be updated and incorporated into the existing jurisdictional reliability arrangements. The AER would also consider the timing for when VCR measures need to be re-estimated and assess whether AEMO's methodology needs to be updated. This task was included as part of the interim stage recommended for the distribution reliability framework.

Customers could benefit from a more transparent and efficient process for setting reliability standards before the framework is fully implemented. For these reasons, we recommend that SCER proceeds with the interim stage. SCER could do this in conjunction with the interim stage recommended for distribution reliability.

We note that the application of the national template and the use of the VCR to value expected unserved energy will not constrain the ability of jurisdictional governments to determine the appropriate level of reliability standards for TNSPs operating in their jurisdiction.

Jurisdictions could choose to build on these tools established in the interim stage and employ a transparent economic assessment process in setting transmission reliability standards. This could be done by applying the standard setting process recommended in this report.

If SCER agrees to adopt the framework, the next stage would be to request the AEMC to develop a detailed implementation plan. We have set out a four-stage process to implement the full framework:

- Stage 1 - Require AEMC to develop a detailed implementation plan setting out the legislative changes to implement the framework.

- Stage 2 - The Council of Australian Governments (CoAG), SCER, AEMC and jurisdictions to implement the various legislative changes.
- Stage 3 - Develop the other components necessary for the application of the framework (such as jurisdictions making decisions on delegations, and the AER developing the guidelines for the standard setting process).
- Stage 4 - Apply the framework prior to the commencement of a TNSP's regulatory control period.

2 The review

2.1 Purpose of this paper

This paper sets out the design of the Australian Energy Market Commission's (AEMC or Commission) recommended framework for expressing, setting, and reporting on transmission reliability in the National Electricity Market (NEM). It also sets out a plan for the implementation of this framework. The Standing Council on Energy and Resources (SCER) will consider the recommended framework and decide whether it should be adopted and further progressed.

In parallel to this work, the AEMC was also requested by SCER to develop a framework for distribution reliability in the NEM. The AEMC's final report on its recommended framework for distribution reliability was published on 27 September 2013.

A substantially common set of arrangements has been developed for the distribution and transmission reliability frameworks as there are many similar issues to be resolved. High level consistency in the reliability frameworks will also minimise the regulatory costs of implementing these frameworks, as well as facilitate joint planning between distribution network service providers (DNSPs) and transmission network service provider (TNSP). We note that SCER has also requested there be consistency in the reliability frameworks for transmission and distribution to the greatest extent appropriate in its terms of reference for this review.[8]

2.2 Terms of reference for the review

The AEMC received terms of reference from SCER to undertake this review in February 2013. Under these terms of reference the AEMC is required to:

- develop a nationally consistent approach for expressing transmission reliability outcomes, building on the approach agreed to by SCER in its response to the AEMC's previous Review of Transmission Reliability Standards;
- develop a nationally consistent approach for establishing transmission reliability settings, which takes into account the trade-off between the cost of investing in and maintaining transmission networks and the value placed on reliability by customers and that accounts for local conditions;
- assess the costs and benefits of the above approaches in line with the National Electricity Objective (NEO), with particular focus on assessing the outcomes delivered by different approaches with regard to the balance between customers' willingness to pay and the costs of delivering different reliability outcomes;

8 SCER, Terms of reference: National Electricity Network Reliability Framework and Methodology, February 2013, p. 3.

- with the Australian Energy Market Operator (AEMO), and in consultation with jurisdictions, develop an appropriate mechanism for measuring and updating the value customers place on reliability, which takes into account an appropriate range of customer types and geographical and demographic differences;

- consider options to take into account local circumstances which may require different levels of reliability;

- develop a consistent approach to reporting on transmission reliability across the NEM, with any weightings and assumptions applied to different network elements made explicit;

- advise on appropriate changes to institutional arrangements for setting and applying transmission reliability levels, either by jurisdictions or by the Australian Energy Regulator (AER), and how these arrangements should operate in conjunction with an integrated national transmission planning system; and

- ensure that any proposed framework and methodology makes explicit the opportunity for jurisdictions to transfer responsibility for applying the framework to the AER.

2.3 Benefits of a national approach to transmission reliability

Given the level of regional interconnection in the NEM, investments in the transmission network in one jurisdiction can have flow-on consequences for transmission networks in another jurisdiction, including impacts on system stability. Consequently, there is a greater justification for consistency across the NEM in the framework for transmission reliability than for distribution reliability.

The development of a best practice framework for transmission reliability will provide for a more economically efficient, transparent, and robust methodology for setting reliability standards. This will allow the trade-off between the cost of investing in networks and the value placed on reliability by customers to be considered by a body which is independent of the TNSP. This will improve the potential for investments only to proceed where the benefits to customers outweigh the costs of the investment. This will lead to more efficient investments by TNSPs, and in turn, more efficient pricing outcomes for customers.

Greater transparency and consumer engagement in relation to how reliability standards are set and the level of reliability that TNSPs are required to provide will increase the accountability of standard setters and TNSPs to provide a level of reliability that reflects the preferences of customers. Clear reliability standards, which are specified prior to a TNSP's decision to invest, will provide stakeholders with a degree of certainty regarding likely reliability levels at each connection point. This would assist customers, generators, and market participants to make more efficient investment and locational decisions.

The development and application of a consistent framework will also allow for more accurate comparisons of reliability levels and enable the reliability performance of TNSPs to be assessed across jurisdictions. Currently, the levels of reliability for transmission networks are set and regulated in each jurisdiction. This makes it difficult for customers, market participants, regulators, and governments to compare and evaluate reliability levels and performance across the NEM. Consistency in how reliability levels are expressed and reported on will allow benchmarking to be undertaken. This would promote more efficient network investment and assist the AER in determining the revenues and prices which are consistent with the efficient delivery of a TNSP's reliability standards.

2.4 Approach to developing the framework for transmission reliability

Network reliability remains one of the areas of the electricity market which is still a jurisdictional responsibility. The development of an effective and transparent national framework for regulating transmission reliability has a number of challenges which the Commission has had to address. Some of these challenges have included:

- existing jurisdictional differences in regulating transmission reliability levels, which has resulted in differences in how TNSPs plan their networks;
- the difficulty of directly observing the reliability outcomes from transmission networks, as interruptions to supply are rare on transmission networks. This has required alternative approaches to expressing transmission reliability standards and reporting on performance to be considered;
- the difficulties around accurately assessing the likely change in network investment under different reliability levels when considering the trade-off between cost and reliability. This is because determining the change in investment is subject to a number of assumptions, such as likely labour and material costs, amongst others;
- the lumpy nature of transmission investments. TNSPs generally undertake a small number of large investments because it is difficult to expand the network in small increments. This means that more granular changes in transmission reliability standards may have a limited impact on changes in network investment, although in some circumstances non-network solutions can be used to make more incremental changes. This has implications for the type and range of reliability standards which are appropriate for transmission networks;
- the reliability and consistency of existing measures of the value placed on reliability by customers, as the value of customer reliability (VCR) has only been estimated a limited number of times in Australia;
- the difficulty of accurately representing the range of customer views within each network using aggregated measures of the VCR. Aggregated measures of the VCR are needed when assessing the trade-off between cost and reliability because common parts of the network serve a number of different customers. As

a result, all customers supplied through the same part of the network will receive the same level of reliability. This ultimately means that determining the level of reliability that TNSPs must provide involves trading off the reliability preferences of different customers in the same supply area;

- quantifying the potential costs and benefits of high impact, low probability events, which occur rarely but have widespread costs, such as city wide interruptions; and

- the need to provide additional mechanisms to consider the costs and benefits of providing transmission reliability, as not all costs and benefits (eg the risks of city wide interruptions) can be adequately assessed through existing quantitative methods for economic assessments.

Further discussion in relation to how the Commission has sought to address these challenges under our recommended framework is outlined in chapters 3 to 6 of this paper. In particular, the Commission has provided a number of opportunities for customer consultation and has also provided the ability for jurisdictional ministers to take into account additional factors, beyond those assessed under economic assessments, to enable customer preferences to be considered in the setting of standards.

In light of these challenges, the Commission has approached the development of its advice with regard to a number of factors. These factors include:

- previous work undertaken by the AEMC to develop national frameworks for transmission reliability;

- existing jurisdictional frameworks for regulating transmission reliability;

- submissions received from stakeholders during the review and discussions held with stakeholders;

- related work undertaken by other bodies;

- how transmission reliability standards are set and regulated in other countries;

- the need to provide for high level consistency between the frameworks which are developed for distribution and transmission reliability, where appropriate;

- the need to enable either jurisdictions or the AER to be responsible for applying the framework;

- the NEO and the principles for the development of the national framework, which are discussed below;

- the implications of the framework for how TNSPs plan and undertake investments needed to meet their reliability standards; and

- the impact of the framework on the broader regulatory frameworks and institutional arrangements that are currently in place.

In providing its advice the Commission has sought to develop a framework for transmission reliability which can be consistently applied across all NEM jurisdictions. While the AEMC has been required to design the framework so that standards can be set by jurisdictions or the AER, the Commission has sought to limit the variation possible in the application of the framework to preserve its national approach.

2.5 Principles for the review

The following principles have been used in the development of the recommended framework for transmission reliability. We note that these principles are consistent with those used to develop the AEMC's framework for distribution reliability.

1. **Transparency:** The process for setting reliability standards must be open and transparent. The standards themselves should also be transparent.

   Stakeholders shall have the ability to provide input on proposed changes to standards. The process and reasons for setting reliability standards should be clearly explained and the consequences for not meeting the standards should be clearly defined.

2. **Fit for purpose and reflective of customer preferences:** The framework shall allow standards to differ across networks according to the value placed on reliability by customers and the costs of providing different levels of reliability.

   Customer preferences must be taken into account in determining the types of standards which are set, the level of the standards, and any other key reliability obligations placed on TNSPs.

3. **Economic efficiency:** Reliability standards are set using an economic assessment process based on a probabilistic approach that compares the value placed on reliability by customers and the costs of undertaking and maintaining investments needed to meet the standards.

4. **Governance:** Reliability standards must be set by a body which is separate from the TNSP that must apply the standard. The framework should allow standards to be determined through a consultative process between the standard setter, TNSP, and stakeholders.

   TNSPs must be held accountable for meeting their standards and the consequences for not meeting standards should be enforced.

5. **Effectiveness:** The framework should allow investments to proceed in a timely manner and limit the potential for inefficient investments. The framework will allow standards to be met through innovative and efficient means and should not be biased towards network solutions where non-network options can provide a comparable level of reliability.

The frameworks will allow joint planning to be undertaken between NSPs to meet their respective reliability standards and targets.

In addition to these principles, we have also had regard to the NEO in developing our advice, as required under the National Electricity Law (NEL) and SCER's terms of reference.[9]

2.6 Related projects

There are a number of related projects that have served as precursors to, or are being conducted in parallel, with this review. These related projects are briefly summarised below.

2.6.1 AEMC Review of Transmission Reliability Standards

In November 2010, the AEMC published an Updated Final Report on its Review of Transmission Reliability Standards. The Updated Final Report built on previous work undertaken by the AEMC and AEMC Reliability Panel over 2007 and 2008 to develop a national framework for transmission reliability. Under the proposed national framework, transmission reliability standards would be economically derived using a customer value of reliability and be capable of being expressed on a N-x basis using a common national template.

In November 2011, SCER formally responded to the AEMC's Review of Transmission Reliability Standards and broadly supported the proposed framework the AEMC had recommended. SCER requested the AEMC develop an implementation plan for the framework and provide further detail on the proposed design of the framework.[10]

As noted above, the AEMC has been requested by SCER to build on the recommendations made under the AEMC's Review of Transmission Reliability Standards and SCER's response, in undertaking this review.

2.6.2 AEMO Review of the Value of Customer Reliability

In March 2013, AEMO commenced work on its Review of the Value of Customer Reliability. AEMO was requested to undertake the review by SCER, following SCER's response to the AEMC's 2010 Review of the Effectiveness of NEM Security and Reliability Arrangements in Light of Extreme Weather Events.

Under the review, AEMO is considering the existing methodologies to measure the VCR and will then commission surveying to develop VCRs for use across the NEM. In

9 Under section 32 of the NEL, the AEMC must have regard to the NEO in performing or exercising any function or power under the NEL, Regulations or the NER.

10 Ministerial Council on Energy, 'Transmission Reliability Standards Review: Ministerial Council on Energy response to the Australian Energy Market Commission Final Report', 22 November 2011.

June 2013, AEMO published a paper which indicated that it intended to use a choice modelling approach. This methodology will be used to develop VCR figures for four different customer types. The VCRs for each customer type will then be used to develop VCRs for each transmission connection point in the NEM. AEMO will publish its final VCR figures in March 2014.

The review by AEMO interacts with both the distribution and transmission workstreams of the AEMC's review as SCER has requested that reliability levels under the national frameworks for distribution and transmission reliability be set with reference to the value placed on reliability by customers. As a result, the successful implementation of these frameworks will in part depend on the availability of sufficiently granular and regularly updated VCRs.

2.6.3 AEMO Economic Planning Study Report

In November 2012, AEMO published a report summarising its high level study on the impact of adopting an economic cost benefit approach to transmission network investment across the NEM. AEMO's study included a sample of seven projects across the NEM and provides information about the possible benefits of moving away from planning standards that require a fixed level of reliability.

AEMO's study interacts with this review as SCER has requested that transmission reliability settings be based on an economic assessment, which examines the trade-off between the cost of investment and the value placed on reliability.

2.6.4 Productivity Commission Inquiry on Electricity Network Regulation

The Productivity Commission was requested to undertake an inquiry into electricity network frameworks by the Commonwealth Treasurer in January 2012. The Productivity Commission's final report was published in late June 2013 and included a proposed approach for a national framework for transmission reliability.[11]

Under the Productivity Commission's proposed approach, AEMO would centrally undertake all transmission planning across the NEM and determine the level of reliability that should be provided using economic cost benefit assessments to develop a reliability standard at each connection point.

The Commonwealth Government released its response to the Productivity Commission's final report with the publication of the report in late June 2013.[12] The response noted the Productivity Commission's proposed approach for transmission reliability and that the AEMC is developing a national framework and methodology for setting transmission reliability standards under this review.

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11 Productivity Commission, Final report, Inquiry into electricity network regulation, April 2013. Available at www.pc.gov.au.

12 Australian Government, The Australian Government Response to the Productivity Commission Inquiry Report: Electricity Network Regulatory Frameworks, June 2013.

The Commonwealth Government also noted its support for: a consistent and transparent process for setting reliability requirements; economically derived reliability requirements; the need for reliability levels to reflect the value placed on reliability by customers and location specific factors; and the need for the body setting standards to be independent from the business which is subject to those standards.[13]

The AEMC's consideration of the Productivity Commission's proposed approach to transmission reliability is discussed in section 4.3.3.

2.7 Structure of this paper

The remainder of this paper is structured as follows:

- Chapter 3 discusses the expression of transmission reliability standards under the framework;
- Chapter 4 sets out a summary of the standard setting process;
- Chapter 5 outlines the interactions between the standard setting process and the revenue determination process, including the process for updating transmission reliability standards within a regulatory control period;
- Chapter 6 discusses the compliance and reporting obligations under the framework;
- Chapter 7 outlines the implementation considerations for the framework;
- Appendix A sets out a summary of submissions on the consultation paper and the Commission's responses to these submissions;
- Appendix B sets out a draft request for advice for AEMO to develop a national reference template to commence the interim stage of the framework's implementation; and
- Appendix C contains a table comparing features of the AEMC's framework with New Zealand, USA (PJM), United Kingdom and Nordic approaches to transmission reliability.

13 Ibid, pp. 33-34.

3 Expression of transmission reliability standards

This chapter sets out the recommended approach and supporting reasons relating to how transmission reliability standards would be expressed under the national framework. Furthermore, this chapter discusses the merits of setting transmission reliability standards prior to the revenue determination and network investment processes. Finally, this chapter presents the rationale and considerations for having a national reference standard template for transmission reliability.

3.1 Expression of transmission reliability standards

3.1.1 Recommended approach

Transmission reliability standards will be set for each connection point in a TNSP's network. At a minimum, for each connection point, a transmission reliability standard will contain two measures:

(a) a required level of network capability informed by an economic assessment process to be expressed in terms of network redundancy/N-x standard;[14] and

(b) a requirement relating to when supply would need to be restored following planned and unplanned interruptions at a connection point.

In addition to these minimum requirements, the standard setter can select additional standards, including output based measures. The list of possible additional measures will be set out in the national reference standard template for transmission.

The level of a transmission reliability standard at a connection point, based on minimum requirements and including any additional measures, would be determined on an economic basis, using a probabilistic approach.

Interactions with other transmission planning standards

It is important to recognise that transmission reliability standards at connection points, along with other transmission planning standards relating to the security and quality of the electricity supply, work in a complementary and coordinated manner to safeguard the integrity of the power system. These transmission planning standards are set out in schedule 5 of the NER and include requirements relating to frequency, system stability, voltage, protection systems, and fault clearance times. The Commission's recommended approach relating to transmission reliability at connection

14 When we refer to N-x input standards the 'N' typically refers to the normal operating state of the transmission network and the 'x' refers to the number of network elements that can be out of service while still maintaining reliability of supply. For example, 'N-1' means that one network element may be out of service and yet still maintain reliability while 'N-0' means that no network elements may be out of service to maintain reliability. This implies that an 'N-1' standard is at a higher level of redundancy compared to a 'N-0' standard.

points presumes that the other planning standards will continue to be managed in accordance with the prescribed requirements under schedule 5 of the NER.

3.1.2 Reasoning for the recommended approach

Transmission reliability standards can either be expressed in terms of input measures or output measures.[15] Input measures refer to those measures of reliability that relate to the performance of transmission network elements (lines, transformers etc) that a TNSP can observe and measure, but may not be directly observable to customers. Examples of input standards include measures of network redundancy or measures of transmission circuit availability.

In contrast, output measures refer to those measures of reliability of supply that a customer receives from the transmission network and can be directly observed by a customer. Examples of output measures include average frequency or duration of interruptions or maximum load lost during an unplanned outage.

At a minimum, we recommend that the reliability standard for transmission networks be expressed in terms of network redundancy (as a N-x standard) coupled with expected restoration times for supply interruptions. This approach takes into account the nature of transmission networks and the aspects of reliability which are important for customers.

Transmission networks are built to be highly reliable to safeguard against the widespread impacts of a supply interruption due to a failure of a transmission network element. This is because of the importance of the operation of the transmission network in ensuring the overall security of the system, and the widespread consequences of any failure of the transmission system. One of the main aims of transmission network planning is to ensure that, following the loss of the most critical transmission element, including at times of peak demand, the security of the power system can be maintained.

The high level of redundancy in transmission networks means that it can be difficult to observe the under-performance of the transmission network. These characteristics of transmission networks means that standards based solely on actual performance will not adequately capture the full dimensions of reliability for a transmission network. Prolonged under-investment in transmission networks may not translate to short term observable reductions in reliability outcomes. As a result, input based measures are more appropriate when setting required transmission reliability levels.

Our recommended approach for expressing standards in transmission contrasts with that in distribution due to the differing characteristics between transmission and distribution networks. In distribution, we recommended, as a minimum, that

15 For a complete discussion of input and output measures please refer to a report prepared for the AEMC by Parsons Brinckerhoff titled 'Approaches for the flexible expression of electricity transmission reliability standards' available at www.aemc.gov.au.

distribution reliability targets be expressed as output based measures. In distribution networks there is a lower level of redundancy and there is a greater ability to observe under-performance. These characteristics of distribution networks lend to standards being expressed as output based measures. However, as stated above, given the nature of transmission networks, we consider that measures relating to the capability of network elements are more appropriate.

Inclusion of supply restoration times

We recommend that as a minimum requirement the standard includes restoration times following a supply interruption for each connection point. The inclusion of restoration times provides a further dimension to the reliability standard that captures what customers value. That is when a supply interruption would be restored. The requirement would apply to both planned and unplanned interruptions, with the standard setter determining the expected times for both types of interruptions.

This combination of measures allows the standard setter more flexibility when setting the level of the N-x standard. This is because the standard setter is able to consider the appropriate combination of the network capability and expected time to restore which best captures the efficient trade-off between the costs of network reliability and the benefits to the community. This recognises that, given the discrete nature of transmission investment, setting standards solely on a network redundancy (N-x) basis may not provide a sufficiently precise reflection of the value customers place on reliability.

Restoration times are also needed to calculate the level of expected unserved energy. This will be used in the economic assessment process when calculating the potential benefits to customers from investments in reliability.

This combination of network capability and expected restoration times could also allow TNSPs to have more flexibility in how they make investment decisions to meet the standard. Consequently, we consider that expressing transmission reliability standards in this form would promote more efficient network expenditure decisions. This approach is applied in South Australia where transmission reliability standards are expressed using N-x standards with an expected restoration time. For example, in South Australia reliability standards for some connections points are expressed as:

- N line, restore N equivalent line capacity as soon as practicable and within two days of the commencement of the interruption. N-1 transformer, restore N-1 equivalent transformer capacity as soon as practicable and restore N equivalent transformer capacity within eight days of the commencement of the interruption.[16]

16 South Australia Electricity Transmission Code as of 1 July 2013, available at www.escosa.sa.gov.au

Expression of standards promoting efficient network investment

Under our framework, a transmission reliability standard for a connection point, expressed in an N-x form with restoration times as a minimum requirement, would be set on an economic basis. An economically derived N-x standard means that the level of the standard would be subject to an economic cost-benefit assessment, involving the evaluation of a set of reliability scenarios and using a probabilistic approach.

The N-x standard would be derived using the value customers place on reliability as measured by the VCR and the cost of expected unserved energy. The cost of expected unserved energy would be calculated on the basis of the probability of interruptions, the expected duration of those interruptions, and the extent and nature of load affected. A detailed explanation of this economic assessment process is provided in chapter 4. The AER and Grid Australia expressed support in setting N-x input standards derived through an economic cost-benefit assessment.[17]

The Commission's recommended approach of economically derived N-x standards incorporates probabilistic analysis and therefore contrasts with those jurisdictions that currently apply a deterministic N-x approach. A deterministic N-x approach involves the evaluation of the outcomes of a predetermined set of contingencies without reference to their probability of occurrence. However, probabilistic assessments consider both the impact of a supply interruption, in terms of duration and load served, and the probability of its occurrence.

Our economically derived N-x standard incorporates probabilistic assessments through the economic cost-benefit process conducted by the economic adviser. Specifically, the calculation of expected unserved energy uses the impact of a contingency in terms of load not served combined with its probability of occurrence and time of restoration. This expected unserved energy is then multiplied by the VCR to quantify the benefits of a particular level of reliability. These benefits are then compared against the cost of meeting that level of reliability as part of the economic cost-benefit assessment. In this way, the advantages of probabilistic analysis are included as an integral part of the Commission's proposed framework.

AEMO, the Energy Users Association of Australia (EUAA) and the Major Energy Users (MEU) have expressed concerns that a N-x expression for transmission reliability standards would create bias towards building transmission assets and increases the risk of stranding assets or over-investment.[18] Both the MEU and EUAA oppose the use of deterministic input standards, even with an economic cost- benefit assessment.

This is because in the MEU and EUAA's views it leads to over-investment and reduces the ability for TNSPs to respond to changes in demand or to non-network solutions.[19] The EUAA describes this arrangement as a "non-sequitur".[20]

17 See submissions on the consultation paper from: AER, p. 2; Grid Australia, p. 2.

18 See submissions on the consultation paper from: AEMO, p. 3; MEU, p. 21; EUAA, pp. 2-4.

19 See submissions on the consultation paper from: MEU, p. 21; EUAA, p. 3.

AEMO considers that a N-x standard creates a presumption in favour of network solutions over non-network alternatives. This is because it would be more straight-forward for a TNSP to demonstrate that a network investment meets a N-x standard than to demonstrate that a non-network solution meets a N-x standard.[21]

The Commission notes that the description of the proposed framework as one that uses deterministic inputs is incorrect. As discussed above, the proposed framework is based on probabilistic rather than deterministic assessment.

The Commission does not consider that the expression of the reliability standard in terms of network redundancy would increase the risk of over-investment or creates a bias in favour of network investment over non-network options. Firstly, under the recommended framework, the N-x would be informed by probabilistic analysis and an economic cost-benefit assessment of reliability options to determine the efficient level of reliability. This assessment does not imply over-investment or bias to building assets. It also represents a probabilistic assessment, rather than a deterministic standard.[22]

Secondly, expression of the standard in terms of network redundancy in no way implies that the standard can only be met by undertaking network investment. Demand-side options and local generation in combination with the existing network can also be used to deliver the required level of network capability, by reducing load on the network. The framework therefore allows a TNSP to consider the most efficient option to meet the standard, whether that is a network or non-network solution. This is supported by expenditure incentives set by the AER and also obligations in the NER, such as the Regulatory Investment Test for Transmission (RIT-T).

Similarly, where there are reductions in demand this means that the TNSP may be able to meet the standard by undertaking less investment, and the expenditure incentives in the regulatory arrangements mean that they will have an incentive to do so. Expression of the reliability standard in an N-x form does not therefore reduce the ability for TNSP to respond to changes in demand, as it does not pre-determine the level and nature of investment required to meet the standard.

The MEU states further that reliance on input standards breaks the link between management accountability, investment decisions, service delivery, revenue determinations and performance incentive schemes.[23] The Commission disagrees with the MEU's views on this issue. The expression of the reliability standards under the Commission's proposed framework on the basis of network redundancy does not pre-determine the specific investments that the TNSP may choose to make to comply with those standards. Rather, they are part of the overall ex ante incentive framework

20 EUAA, Submission on the consultation paper, p. 3

21 AEMO, Submission on the consultation paper, p. 2.

22 The difference between probabilistic and deterministic approaches to setting standards is discussed further in Box 4.1.

23 Ibid.

for network regulation that promotes accountability and transparency, and provides incentives for TNSPs to adopt the most efficient means of meeting the obligations they face.

Flexibility to include additional parameters into the standard

In addition to the minimum requirements of network capability with restoration times, the standard setter may choose additional parameters to express a transmission reliability standard at a connection point. These additional parameters may include output based measures.

Submissions generally expressed support for the use of additional parameters to improve the granularity and economic efficiency of transmission reliability standards.[24] Alinta Energy expressed support for the use of N-x standards complemented by additional parameters.[25] Energy Networks Association supported this position and further stated that it would facilitate more effective benchmarking of the efficient costs of delivering reliability.[26]

However the MEU noted that it finds it difficult to see how additional measures will address the inherent inefficiency of using input standards.[27]

The Commission considers that the inclusion of additional measures could yield a range of benefits. These measures would allow the standard to capture more aspects of reliability which customers value. This would provide the TNSPs with greater flexibility to meet customers' needs at a given connection point.

In addition, the use of further output measures could provide a greater degree of granularity and flexibility on how to set the standard at a particular connection point. However, although more granular standards may better meet the preferences of customers, the 'lumpy' nature of many network costs may not be that sensitive to these granular changes. We note that the discrete nature of transmission investments places a limitation on the degree of granularity that can be achieved within transmission reliability standards. However, in some circumstances, demand-side participation (DSP) options can provide additional flexibility in meeting more granular reliability standards.

When determining the actual level of these additional parameters included in the standard, the standard setter will be informed by the economic assessment process. This is because these parameters will be included in the reliability scenarios modelled in the economic assessment process.

Guidance will be included in the national reference template on how additional measures would complement the minimum requirements in the standard. To inform

24 Grid Australia, Submission on the consultation paper, p.1.

25 Alinta Energy, Submission on the consultation paper, p. 2.

26 ENA, Submission on the consultation paper, p.19.

27 MEU, Submission on the consultation paper, p 22.

this, we commissioned Parsons Brinckerhoff to evaluate how input measures and output measures could be combined in a complementary manner

After assessing over 70 input and output measures against key principles such as economic efficiency, transparency, fit for purpose and administrative burden, Parsons Brinckerhoff developed a list of measures that could be included together in the standard while noting any issues with these combinations.[28] Box 3.1 provides a worked example of how input and output measures could be combined in a complementary manner.

Box 3.1 A worked example of combining additional measures with the minimum requirements

In this example, the connection point is an urban/CBD load that is a significant element of the NEM. At this connection point, input and output measures would need to be sensitive to the following attributes of reliability: the frequency and duration of outages and the volume of load that has not been supplied. To express the transmission reliability standard at this connection point, a list of potential input and output measures that meet principles of economic efficiency, transparency, fit for purpose and administrative burden would be considered. These include, SAIDI, SAIFI, transmission circuit availability and maximum load lost during an outage.

Parsons Brinckerhoff analysed these potential measure in regard to how they complement each other. Some measures may overlap with each other leading to overemphasis of a particular attribute of reliability while others may logically conflict. Applying this analysis to this example, the following input and output measures could be selected: N-1 (an input standard) and SAIDIs (a simulated output measure), energy not supplied during an unplanned outage (output measure), annual total of network constraint events (input measure).

The standard setter would need to have regard to certain considerations when combining these measures to appropriately express the transmission reliability standard at the connection point. In this example, there is an issue of overlap between SAIDIs and energy not supplied as they both measure the level of unserved energy following an outage.

Aspects of this flexible approach to the expression of transmission reliability standards have been applied in Queensland and Tasmania.[29] In Tasmania, Transend is subject to minimum network performance requirements to deliver a N-1 standard except that up to 25 MW of load may be lost or 300 MWh of energy may not be supplied following a credible contingency event.[30]

28 Parsons Brinckerhoff (2013) 'Approaches for the flexible expression of electricity transmission reliability standards' available at www.aemc.gov.au and published alongside this Final Report.

29 Grid Australia, Submission on the consultation paper, pp. 32-35.

30 Ibid p.35.

This could allow a suburban substation that supplies 50 MVA maximum demand to be supplied by two small transformers (eg 2 x 30 MVA) and if one fails then the required amount of load may be shed (up to 25 MW) so that the remaining transformer is not overloaded. The inclusion of the 25 MW maximum loss of load parameter (an output measure) in the N-1 standard allows some load at risk before additional capacity is required to restore the N-1 standard. This illustrates how the use of an output measure to complement the N-x standard may result in greater granularity or flexibility and lead to a more economically efficient outcome.

We have compared our proposed expression of transmission reliability with other international markets with highly developed transmission systems.[31] We found that Pennsylvania-Maryland-New Jersey (PJM), UK, Nordic and in New Zealand markets, all express their reliability standards in terms of network redundancy, using a 'N-x' criterion supplemented by other reliability performance measures. The AEMC's proposed expression of standards in this form is consistent with these jurisdictions.

3.2 Transmission reliability standards set ex-ante

3.2.1 Recommended approach

Transmission reliability standards would be set ex-ante. That is, standards would be set prior to the commencement of the revenue determination and project assessment processes.

3.2.2 Reasoning for the recommended approach

The Commission considers that setting standards ex ante will promote transparency and accountability and lead to a greater degree of credibility in transmission reliability standards. We have identified four benefits from having ex-ante standards:

- TNSPs can be better held accountable for the level of reliability that they must provide, as ex ante standards are consistent with the ex-ante expenditure incentive arrangements for setting revenues;
- setting standards before the investment process enables the transmission reliability standard setting process to be independent from the TNSP. This separation enhances the degree of credibility attached to the standard chosen;
- setting standards ahead of the need to invest allows stakeholders, particularly customers, to be aware of the level of reliability they can expect to receive; and

31 See appendix C for a detailed comparison of the key features of AEMC's recommended framework with New Zealand, USA (PJM), United Kingdom and Nordic markets.

- setting standards prior to the revenue determination process would support the AER's ability to determine an efficient expenditure allowance and does not lock in existing reliability levels.

Some stakeholders agreed with this approach. The EUAA agreed that the standard setting process should precede the revenue determination process.[32]

Setting standards prior to the revenue determination and investment appraisals is consistent with existing jurisdictional practices, except for Victoria. The approach in Victoria results in standards not being set prior to the commencement of the revenue determination process. Rather, the 'standards' in Victoria are effectively an out-working of the RIT-T conducted by AEMO. This process is described further in Box 3.2.

The Victorian Department of State Development, Business and Innovation stated that setting ex ante standards is not critically important to achieving efficient outcomes. Rather it considers that an incentive mechanism based on historical performance will progressively push reliability outcomes to an efficient level.[33] AEMO consider that where a revenue determination which is made prior to the decision to invest would still result in some uncertainty. This is because even if standards are determined in advance, a cost-benefit analysis would still be needed at the investment decision stage, which is similar to the cost-benefit analysis under the AEMO model in Victoria.[34] AEMO was therefore not convinced that an ex ante model was superior to their approach.[35]

Box 3.2 AEMO's approach to determining network investment in Victoria

In Victoria, under the NEL, AEMO has responsibility for planning and procuring augmentations to the transmission network. As a result, AEMO makes all investment decisions relating to network augmentations in Victoria.

In undertaking this role, AEMO conducts initial screening studies, based on N-x indicators, to identify emerging network limitations. Once an emerging network constraint is identified, AEMO then conducts a RIT-T on a set of options to manage the constraint and the option delivering the greatest expected net benefit is the preferred option. AEMO uses a VCR as part of its network investment planning process.

The costs of augmentations in Victoria are passed directly through to customers. There is no regulatory oversight of these expenditures by the AER. The AER is

32 EUAA, Submission on the consultation paper, p.6.

33 Victorian Department of State Development, Business and Innovation, Submission on the consultation paper, p. 2.

34 AEMO, Submission on the consultation paper, pp.7-8.

35 Ibid.

responsible for determining a revenue allowance for operational expenditure and replacements. AEMO recovers all costs of network augmentations through network charges in Victoria.

The Commission considers that relying solely on incentives to encourage the transition to the efficient level of reliability may not be sufficient for transmission given the nature of transmission reliability. That is, it is difficult to observe prolonged under-performance of the transmission network. For these reasons, as explained in chapter 6, we consider that TNSPs need to face compliance obligations to meet their reliability standards.

Reliability incentives tend to be set at the level of the VCR. The Commission expressed concerns in the distribution reliability framework final report that setting efficient incentives for reliability is very dependent upon the accuracy and stability of the VCR measure. There are a range of factors which are difficult to quantify under the VCR measure, such as high impact low probability events.[36] Furthermore, customer preferences towards reliability could change over time, meaning that the incentive would have to be re-calibrated.

The Commission also notes that the NER places a cap on the size of the incentive under the transmission STPIS which could limit its effectiveness to encourage TNSPs to transition to the efficient level of reliability.[37] Further information on the transmission STPIS can be found in Box 3.3. Taking these reasons into consideration, the Commission considers that it would not be efficient to solely depend upon incentives to deliver an efficient level of transmission reliability.

Box 3.3 Service Target Performance Incentive Scheme (STPIS) for Transmission

Under the NER, the AER is required to develop the STPIS for transmission networks. Any changes that the AER wishes to make to the design of the STPIS are to be subject to a process of consultation with stakeholders.

The AER has tailored the STPIS to achieve three main objectives: the maintenance of high levels of reliability (or improvements where efficient); to encourage TNSPs to manage their network to reduce the impact of outages on wholesale spot market prices; and promote innovation by TNSPs to deliver improved services through low cost alterations to their network.

The scheme has three main components:

- the service component, which has an incentive of +/- 1 per cent of maximum allowed revenue (MAR). It measures the overall availability of a

36 Please refer to chapter 7 of the distribution reliability final report available at www.aemc.gov.au.

37 Clause 6A.7.4 states that the maximum revenue increment or decrement as a result of the operation of the service target performance incentive scheme will fall within a range that is between 1 per cent and 5 per cent of the maximum allowed revenue for the relevant regulatory year.

TNSP's network to transport energy and the reliability of the network. It has three main parameters: loss of supply event frequency, which measures the number of large and small interruption to supply events; average outage duration, which measures the average duration of loss of supply events; and average circuit outage rate, which is a new measure of the number of unplanned faults on the transmission network;

- the market impact component, which has an incentive of 0 to 2 per cent of MAR. It is designed to incentivise TNSPs to improve network availability at those times and on those parts of the network that are most important in moderating wholesale electricity spot prices;
- the network capability component, which provides an incentive of 1.5 per cent of MAR subject to completion of projects that improve the capability of the transmission network at times most needed. The component is designed to influence a TNSP's operation and management of its network assets to develop one-off projects that can be delivered through low cost operational and capital expenditure (up to a total of 1 per cent of the proposed MAR per year).

An implication of the approach in Victoria is that it promotes a project by project assessment of TNSPs' investment proposals to determine the efficient reliability levels. Hence the economic efficiency of this approach is dependent on the quality and application of the project assessment process. The Victorian Department considers that this is addressed in Victoria through AEMO undertaking all transmission planning and procurement for augmentations to the network. However the Victorian Department also recognises that given the differences in industry structure in other jurisdictions, there may be issues with applying this approach across all NEM jurisdictions.[38]

We consider that the application of a project by project approach would not be compatible with the broad ex-ante incentive framework for transmission investment in the NEM.[39] As noted earlier, the existing ex-ante incentive framework in the NER forms the relevant background for the Commission's assessment of the appropriate transmission reliability framework. Grid Australia commented that it is essential that the framework for the setting of transmission reliability standards does not undermine the incentives provided by chapter 6A of the NER.[40]

We note that setting standards ex-ante is one facet of an overall incentive framework to promote efficient investment by TNSPs. Elements of the regulatory framework such as the proposal for an independent economic adviser during the standard setting

38 Victorian Department of State Development, Business and Innovation, Submission on the consultation paper, p. 4.

39 AEMO recognised that their approach, which applies to a subset of capex, represents a shift away from traditional ex ante incentive regulation. See: AEMO submission on consultation paper, p. 6

40 Grid Australia, Submission on the consultation paper, p.4.

process,[41] the application of the RIT-T and the suite of incentive mechanisms under chapter 6A of the NER work together with standards being set ex-ante to incentivise TNSPs to invest in an efficient manner to meet the needs of customers. This means that the framework would not lead to inefficient over investment in network infrastructure.

Transparency, certainty and accountability regarding future reliability levels

Without ex-ante standards, reliability levels will be effectively determined by TNSPs on a project by project basis in response to the incentives. The Commission considers that this results in a lack of transparency and certainty for customers and other stakeholders regarding the reliability levels they will receive. It may also be more difficult to hold TNSPs accountable for meeting their reliability standards particularly where existing levels of reliability are significantly higher or lower than efficient levels, as in these circumstances there would only be a limited expectation that a TNSP would meet their standards.

In contrast, where reliability standards are set prior to the commencement of the regulatory control period, as proposed under the AEMC's framework, stakeholders will have greater transparency and certainty regarding expected reliability levels. It would also be possible to hold TNSPs accountable for meeting their reliability standards, as the standard setter would be required to not only consider the efficient level of reliability, but also the physical and financial feasibility of meeting reliability levels as part of the standard setting process.

The AEMC's proposed approach of setting ex-ante transmission reliability standards is consistent with international practice.[42] We found that electricity markets in New Zealand, USA (PJM), United Kingdom and Nordic markets are set in advance of the decision to make transmission investments.

We consider that setting standards ex-ante does not necessarily result in duplication of resources needed for the economic analysis in setting the standard and that needed for the revenue determination and investment planning processes. Our view is that setting standards ahead of the need to invest can create savings in both these processes. These savings arise because parties are aware of the standards that must be complied with in setting revenues and making investment plans.

In the absence of an ex ante standard, the AER would have to make assumptions about the level of reliability to determine expenditure allowances. This is likely to result in the existing level of reliability becoming the de-facto standard, which we understand is the case for the Victorian networks. Hence allowed revenues would be determined based upon maintaining existing levels of reliability.

We question whether this will promote efficient level of investment, as it is more appropriate to have an independent economic cost-benefit process to determine the

41 Please refer to chapter 4 of this Final Report for a description of the role of the economic adviser.

42 See Appendix C for a detailed comparison of the key features of AEMC's recommended framework with New Zealand, USA (PJM), United Kingdom and Nordic markets.

efficient level. In addition, the AEMC has recently made a rule on the expenditure objectives set out in the rules.[43] Previously, these expenditure objectives could have potentially allowed network service providers to include in their regulatory proposals expenditure they considered necessary to maintain the level of reliability they achieved in the previous regulatory control period. This rule change now removes the reference to maintaining reliability, and therefore allows the AER to set allowed revenues to reflect the ex-ante efficient standard. This rule change supports the application of the recommended framework.

3.3 National reference standard template for transmission

3.3.1 Recommended approach

We propose that a national reference standard template for transmission be developed. This will be undertaken by AEMO in accordance with guidance in the NER and with public consultation. The national reference standard template for transmission would:

- identify the range of input and output measures that standard setters could choose from to express transmission reliability standards, while noting that an economically derived N-x input standard (based on probabilistic assessment) with restoration times is required as a minimum;
- provide consistent definitions of input and output measures, including any exclusions, as well as common methodologies for developing these measures;
- explain how input and output measures would interact with each other to appropriately express transmission reliability standards; and
- describe how N (as used in N-x input based measures) would be determined.

TNSPs would be required to report their performance against their standards in a manner that is consistent with the definitions set out in the national reference standard template for transmission.

The national reference standard template for transmission would cover transmission and sub-transmission assets owned by DNSPs. Similarly, the standard setter for transmission has the option of applying distribution targets to any part of the network owned by the transmission business, which is classified as a distribution asset.

43 AEMC 2013, Network Service Provider Expenditure Objectives Rule change, available at www.aemc.gov.au. The expenditure objectives in chapters 6 and 6A of the NER determine the level of expenditure NSPs must include in their regulatory proposal. They are also used by the AER in assessing NSPs' regulatory proposals.

3.3.2 Reasoning for the recommended approach

A national reference template will improve approaches to expressing transmission reliability standards through: identifying the appropriate range of input and output measures for transmission; developing common definitions and measurement methodologies for these measures; and providing advice on how to select the appropriate combination of measures to better reflect customer preferences.

Producing such a template would promote consistency in terms of the definitions used to describe transmission reliability measures and this would form the basis for comparisons and performance benchmarking to occur throughout the NEM. In this way, the template would assist in fulfilling the benefits of a national framework for transmission reliability in the NEM. Stakeholders also acknowledged the benefits of producing a national reference standard template for transmission.[44]

The national reference standard template for transmission, in particular the transmission reliability measures contained in the template, would need to be consistent with the following principles for the expression of standards:

- **Applicability** - definitions of reliability measures and events to be excluded from the measurement of reliability performance should be developed in consideration of the operating environments of NSPs in the NEM;
- **Measurability** - reliability measures should be developed so as to be able to be practically and objectively calculated by a third party with knowledge or expertise in the area;
- **Transparency** - NSPs, market participants, and consumers should be able to interpret the content of the set of definitions and its implications for the level of supply reliability they can reasonably expect to receive;
- **Quality** - reliability performance measures should be based upon best practice engineering and technical analysis performed by expert practitioners within the field;
- **Accountability** - TNSPs should be able to report on their performance against their reliability standards to enable them to be held accountable for meeting their reliability standards; and
- **Economic efficiency** - reliability performance measures should promote economically efficient decisions and should not be biased towards network solutions when non-network options can provide a comparable level of reliability.

The national reference standard template for transmission would set out common definitions used to define input and output based measures including common

44 See submissions on the consultation paper from: Grid Australia, p.7; EnergyAustralia, p.3.

methodologies for deriving and measuring those measures. This would also include the appropriate definition of 'N' as used in the economically derived network redundancy (N-x) input standards where 'N' - typically defined as system normal conditions - would need to be determined for a particular connection point.

The Parsons Brinckerhoff report prepared for this review will provide guidance to AEMO when developing the national reference standard template for transmission.[45] In particular, this report can inform on how to combine input and output measures as proposed under the AEMC's framework.

AEMO would be responsible for developing the national reference standard template for transmission. Industry stakeholders and consumer groups expressed support for AEMO developing the template, including AEMO itself,[46] while others considered the AER could fulfil this function.[47] We consider that AEMO has the requisite technical expertise and is the appropriate body to develop the template given their National Transmission Planning functions.

In developing the template, AEMO would be required to actively involve TNSPs and jurisdictional governments in the development of the template. AEMO would also be required to update the template as appropriate through a process of review and stakeholder consultation.[48] AEMO would also need to consult with the AER as the AER would need to consider transmission reliability standards when making its revenue determinations and the AER will also be tasked with the development of common definitions for distribution reliability targets.

The national reference standard template for transmission would also set out the key considerations for the standard setter when expressing transmission reliability standards as a minimum of economically derived N-x input standards with restoration times combined with any additional parameters, such as output-based measures. These considerations would also include the interactions between output based measures in the expression of transmission reliability standards. Some of these design considerations include:

- the need for measures to be 'fit for purpose' so that the measures sufficiently describe transmission reliability at a connection point in terms of frequency, duration or impact of supply interruptions while also minimising the risk of measures duplicating each other;

- the need to avoid double counting of reliability benefits when using multiple measures in the standard;

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45 Parsons Brinckerhoff (2013) 'Approaches for the flexible expression of electricity transmission reliability standards' available at www.aemc.gov.au.

46 See submissions on the consultation paper from: AEMO, p.4; MEU, p. 23; Alinta Energy, p. 2; ENA, p. 8.

47 See submissions on consultation paper from: Networks NSW, p. 7; ENA, p. 8.

48 Grid Australia, Submission on the consultation paper, p. 8.

- the need to place limits on the number of measures used to express transmission reliability standards at a connection point to reduce complexity in the economic assessment process; and

- the administrative burden on the standard setter in using the selected measures to set and determine compliance against those reliability standards and the administrative ease for TNSPs to be able to comply and make investment decisions in light of those standards.[49]

The national reference standard template for transmission would also apply to those transmission and sub-transmission assets that are owned by DNSPs. The key factor is not the ownership of the asset; rather, it is the nature or use of the asset. For those assets owned by DNSPs that are properly characterised as forming part of the transmission network, then the transmission reliability standards as expressed in the template would apply to those connection points. Conversely, those assets owned by a TNSP that are characterised as a distribution asset, could be expressed in terms of distribution reliability targets consistent with the common definitions developed for distribution.[50]

49 For a more detailed discussion of these issues, please refer to the Parsons Brinckerhoff report titled 'Approaches for the flexible expression of electricity transmission reliability standards' available at www.aemc.gov.au. Parson Brinckerhoff was commissioned by the AEMC to investigate the feasibility of expressing transmission reliability standards through a combination of input and output based measures.

50 Please refer to the AEMC's Final Report on a national framework for distribution reliability available at www.aemc.gov.au

4 Standard setting process

This chapter outlines the separate components of the process for setting transmission reliability standards. This includes consultation with customers and the selection of reliability scenarios, the evaluation of those reliability scenarios under the economic assessment process, and the setting of transmission reliability standards. It also outlines the Commission's approach to key components of the framework, including the development of guidelines for the standard setting process and VCRs for use in the economic assessment process.

Many of these components are the same as recommended in the AEMC's final report on the framework for distribution reliability which was published on 27 September 2013. The main points of difference relate to the expression of transmission reliability standards compared to distribution reliability targets, the requirement to comply with transmission reliability standards every year, and the ability to update transmission reliability standards during the regulatory control period.

4.1 Structure of the standard setting process

This section discusses the responsibilities of participants and provides an overview of the process for setting transmission reliability standards. It also outlines the content of the guidelines for the standard setting process and responsibility for the development of VCR measures.

4.1.1 Process steps and responsibilities

Overview of the standard setting process

Sections 4.2 to 4.4 outline the proposed design of the standard setting process in three separate stages, which can be broadly considered to follow a chronological path. The three stages include:

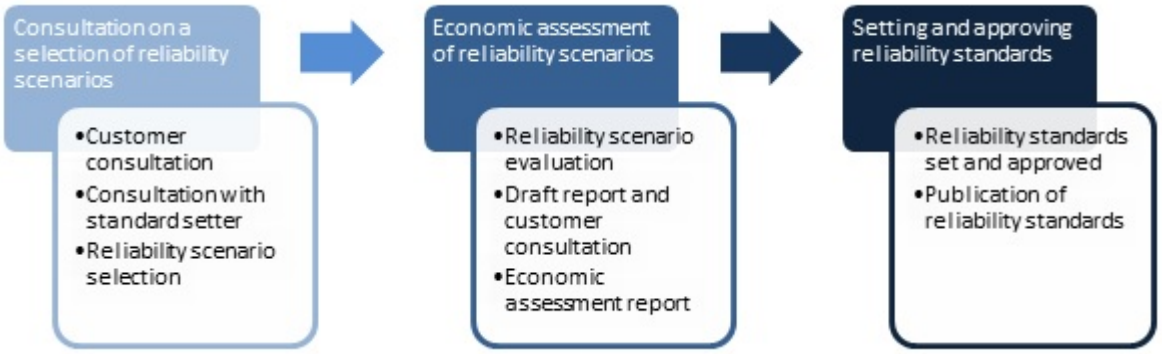
1. a process for the selection of a range of feasible reliability scenarios, which will involve consideration of the outcomes of customer consultation and advice from the TNSP on the costs and constraints of achieving different levels of reliability;

2. an economic assessment process to evaluate how network capital and operating costs vary with different levels of reliability and then compare the level of expected capital and operating expenditure against the value that customers place on reliability for each selected scenario; and

3. a process for the selection and publication of reliability standards for each TNSP.

The sequence of these stages is presented in Figure 4.1. Within each of the three stages, a number of individual steps are listed.

Figure 4.1 Stages of the standard setting process



A reliability scenario represents a potential level of reliability that could be achieved by the TNSP over the next regulatory period. Therefore each scenario would consist of a different level of N-x standards for each connection point in the network plus an expected time for restoration of supply following an interruption. Additional output measures for each connection point may be included in the reliability scenario at the discretion of the standard setter.

Overall, the standard setting process is expected to take 12 months:

- three months for consultation on and selection of reliability scenarios;
- six months to undertake the economic assessment of reliability scenarios; and
- three months to set the reliability standards.

Taking into account a timeframe of 17 months for the AER to undertake the revenue determination process, and allowing nine months for the NSPs to prepare their regulatory proposals once standards have been set, the standard setting process will commence 38 months prior to the start of each regulatory control period.

A detailed A3 figure of the standard setting process has been published with this report on the AEMC website.

Responsibilities under the standard setting process

The principal roles under the framework would include:

- **Standard setter –** Responsible for selecting the reliability scenarios to be economically assessed and setting reliability standards. This role may be retained by the jurisdictional minister or delegated by the minister to the AER or a jurisdictional body.
- **Economic adviser –** Responsible for undertaking an economic assessment of the costs and reliability impact for each reliability scenario, based on information obtained from the TNSPs, and providing advice to the standard setter. The jurisdictional minister would decide who performs this role but it may be

delegated to an appropriate jurisdictional government body, jurisdictional regulator, the AER, or any other body independent of the TNSPs.

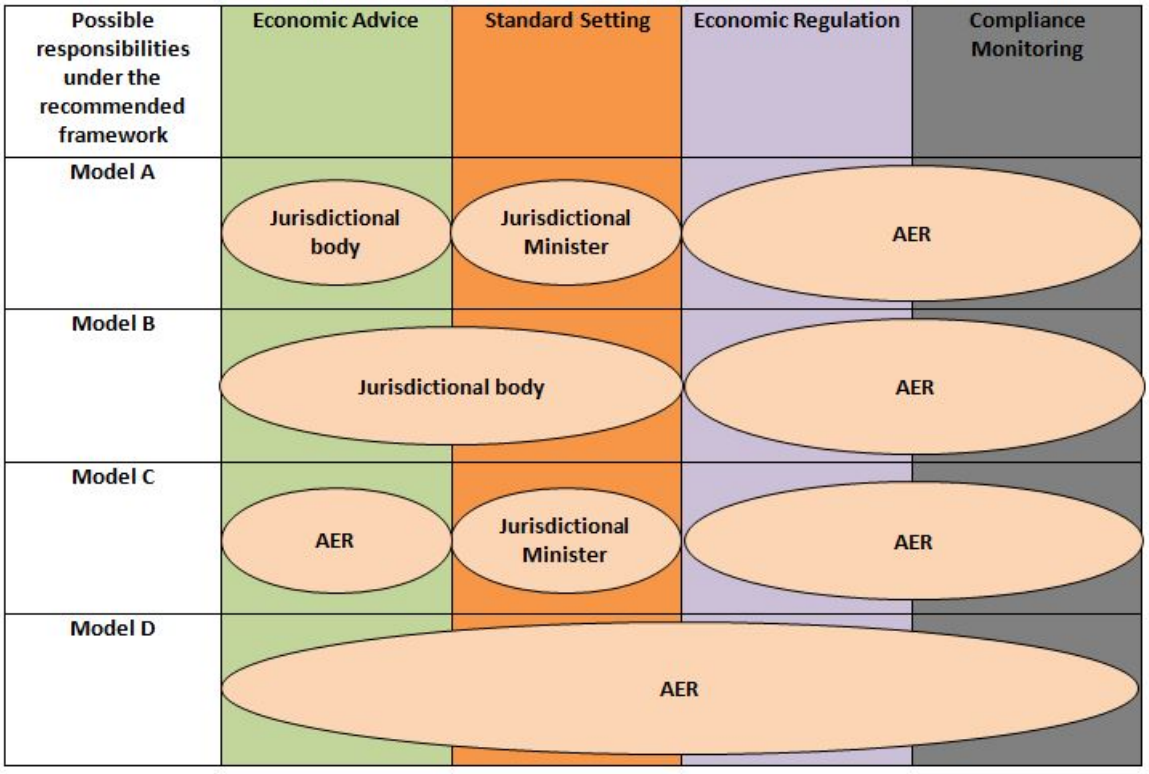
- **Compliance monitor –** Monitors compliance with reliability standards and the results of audits which assess the effectiveness of TNSPs' plans and internal systems to meet their reliability standards.

Jurisdictional ministers could continue to be responsible for setting transmission reliability standards under the framework, as per current practice. However, jurisdictional ministers would also have the ability to delegate the standard setting functions to the AER or a jurisdictional body. The jurisdictional body would need to be independent from the TNSPs and without financial interest in any aspect of the standard setting process. It would not be possible to delegate standard setting to a TNSP.

Our review of how transmission standards are set in international jurisdictions shows that the delegation of responsibility by an elected government representative(s) to a separate body is a common feature of these arrangements.

The possible models for how the various responsibilities could be allocated are set out below in Figure 4.2.

Figure 4.2 Possible responsibilities under the framework



Jurisdictional ministers would have the ability to decide whether to delegate the standard setting functions prior to each five yearly standard setting process. This could allow jurisdictional ministers to change the body which is responsible for setting reliability standards if considered appropriate.

The default position for standard setting responsibilities would be a continuation of the arrangements for the preceding standard setting process. This would apply unless a decision was made by the minister to change the delegations prior to the commencement of the standard setting process.

All standard setters would be informed on the costs and benefits of each reliability scenario being considered through the economic assessment process, prior to making their decision on which reliability standards will apply.

Where a jurisdictional minister has delegated the responsibility for standard setting, the economic adviser role would also be performed by the same body. As a result, the body would be responsible for undertaking the economic assessment process for each reliability scenario, as well as determining the reliability scenarios and reliability standards that will apply to each TNSP.

In delegating responsibility, jurisdictional ministers would be able to provide the AER or jurisdictional body with guidance on how they should select reliability scenarios and determine the economically derived reliability standards.

This guidance would be in the form of information that the AER or jurisdictional body would use to either determine the range of feasible reliability scenarios to be economically evaluated or could affect the level at which the reliability standard is set. For instance, this could include a requirement to not lower reliability in certain areas that are considered to be economically or socially important. The jurisdictional minister would also be able to use the guidance to instruct the standard setter regarding the inclusion of additional output based standards beyond the basic N-x requirements and times for restoration of supply.

The AER or jurisdictional body would be required to select the reliability scenario with the highest net economic benefits which is consistent with the minister's guidance, as identified through the economic assessment process.

In selecting reliability scenarios, the standard setter would take into consideration the inter-linkages that exist between jurisdictions and the impacts that network investments in other jurisdictions may have on their jurisdiction. It is possible that jurisdictional ministers may see benefit in delegating responsibility for standard setting to the AER as they may be better placed to determine the economic impacts of network investments across jurisdictions.

Where a jurisdictional minister retains responsibility for setting reliability standards, the economic adviser role would either be undertaken by the AER or by a jurisdictional body appointed by the minister. In setting standards, jurisdictional ministers would be able to take into account any factors that are not incorporated in the economic assessment process. This could include the risk aversion of customers or the broader costs to society from wide-area outages. As a result of considering these additional factors, there is the potential that jurisdictional ministers could select an alternative scenario to the one of highest net economic benefit that was calculated on the basis of VCR alone.

4.1.2 Development of guidelines for the standard setting process

The framework would include a set of guidelines which would provide the necessary detail for the consistent economic assessment of reliability scenarios across the NEM, customer consultation by TNSPs during the standard setting process, and details on audit requirements to demonstrate that TNSPs have undertaken adequate planning and have appropriate systems in place to meet their reliability standards.

This section sets out the proposed contents of the guidelines and reasons for our recommendation that the AER be responsible for the development of the guidelines.

Recommended approach

The guidelines would outline the methodologies to be followed for consulting with customers, selecting reliability scenarios, the application of the economic assessment process, and undertaking audit requirements. The development of the guidelines would form part of the implementation of the framework and would act as the primary tool through which national consistency in the customer consultation process, economic assessment process, and compliance processes would be achieved. The Commission's recommendation for the guidelines to cover the entire standard setting process is an expansion on the approach in the consultation paper which proposed that the guidelines be focused on the economic assessment process only.

The AER is the appropriate body for developing, publishing and revising the guidelines. The AER is considered to have a sufficient technical understanding of the processes and measures used in the framework. Furthermore it is independent and without financial interest in any aspect of the framework. The AER would be required to develop the guidelines in consultation with TNSPs and relevant jurisdictional bodies. The guidelines will be prepared to be consistent with a set of principles and obligations set out in the NER.

The guidelines would cover the following aspects of the customer consultation process:

- the stages of the customer consultation process;
- requirements for the types of customers to be surveyed to ensure that consultation is undertaken with a representative set of customers from each network;
- minimum relevant information to be requested from customers to determine customer expectations regarding network reliability; and
- the method by which results of the customer consultation should be compiled and presented for discussion with the standard setter and economic adviser.

The guidelines would cover the following aspects of the scenario selection process and economic assessment process:

- relevant considerations that should be take into account by the standard setter in the selection of reliability scenarios, including any guidance provided by the jurisdictional minister;
- the stages of the economic assessment process;
- information requirements and assumptions to be used as inputs to the process, including how data from TNSPs and estimates of the VCR should be considered;
- the methodology to be applied to determine the costs and benefits of each reliability scenario, including the requirement to adopt a probabilistic approach and guidance on how costs that are not captured in estimates of VCR can be objectively assessed; and
- the range of sensitivities to be applied and the methodologies to be adopted in evaluating the sensitivities.

With respect to the compliance process, the guidelines would contain the details on the requirements for the audits:

- to demonstrate that TNSPs have undertaken adequate planning and have appropriate systems in place to meet their reliability standards; and
- to assess whether TNSPs have accurately measured reliability performance in accordance with the definitions contained in the national reference standard template.

Reasoning for the recommended approach

The jurisdictional minister will have responsibility for determining the appropriate bodies to act as standard setter and to undertake the economic assessment process. While the jurisdictional minister may elect the AER as economic adviser, they may also delegate the responsibility to another independent body. As such, the Commission considers that there is the possibility that a number of different economic advisers could be responsible for applying the economic assessment process across the NEM.

Guidelines will therefore be important in establishing and maintaining consistency when consulting with customers, undertaking audits, as well as in the application of the economic assessment process between jurisdictions. This will facilitate the meaningful comparison of reliability standards developed for different networks across the NEM. As a consequence, the Commission is recommending that the guidelines cover the entire standard setting process. The Commission agrees with the MEU that economic assessment guidelines will be an important tool in ensuring consistency in approach.[51]

51 MEU, Submission on the consultation paper, p. 25.

As the AER would be responsible for developing the guidelines, it would also be responsible for further updating and refining the guidelines based on the repeated application of the customer consultation process, compliance processes, and economic assessment process. The AER would be required to undertake public consultation in making any changes to the guidelines to allow stakeholder views to be taken into account. This is consistent with the MEU's submission that the AER is the appropriate body to develop the guidelines and that is should do so in consultation with AEMO, NSPs and other stakeholders.[52]

4.1.3 Development of the value of customer reliability

The VCR will form a key component of the framework as it will be used to assess the potential customer impact of reliability scenarios during the standard setting process. This will assist in determining the costs and benefits of each scenario.

This section sets out which body will be responsible for updating the VCR under the framework and the process that would be used in updating it.

Recommended approach

The AER would be responsible for updating VCRs. VCRs would need to be developed to reflect the range of customers and geographic locations of customers in each transmission network. As a result, separate VCRs would be developed for each customer type for each NEM jurisdiction. These estimates of VCR would then be weighted to reflect the quantity of energy consumed by different customer types at each connection point, in order to derive a VCR for each connection point.

These VCRs would be updated at least every five years to align with the standard setting process and revenue determination process for each TNSP, where possible. In between five yearly updates, the VCR would be escalated by an appropriate methodology each year by the AER. The AER would be required to publish any changes to VCR values and the methodology it has used in changing the VCR, following any updates or annual escalations in VCRs.

VCRs will be used in the economic assessment process to quantify the value of expected unserved energy for each connection point. Determining the extent of unserved energy will involve estimating the probability of supply interruptions at each connection point and the extent of load supplied. This level of expected unserved energy would then be multiplied by the applicable VCRs to determine the value of expected unserved energy for each connection point.

52 Ibid.

The AER would be required to initially use AEMO's national VCR methodology as a starting point.[53] AEMO's measures of VCRs would also be used initially until it is considered that the measures need to be re-estimated.

AEMO has been requested to develop a national VCR methodology and VCR measures by SCER and this review is expected to be finalised in early 2014. The AEMC will continue to work with AEMO as it develops its recommendations so that the methodology which is developed is appropriate for standard setting under the frameworks for transmission and distribution reliability.

The AER would have the ability to further develop and refine AEMO's methodology as it develops VCRs into the future. The AER would be required to undertake public consultation in making any changes to the VCR methodology to allow stakeholder views to be taken into account.

Reasoning for the recommended approach

The AER's role in updating the VCR would be consistent with its roles as the economic regulator and standard setter on a national level, where this responsibility has been delegated by a jurisdiction. This is because the VCR is a key input into the standard setting process, which in turn has significant implications for the revenue allowance which is set for a TNSP. The VCR is also used in the application of regulatory investment tests and in the calculation of incentive payments under the STPIS, both of which fall within the responsibilities of the AER.

Developing VCRs for each customer type for each NEM jurisdiction will allow the economic adviser to derive specific VCRs for each transmission network connection point, based on the composition of customer types within each transmission network.

Submissions on the consultation paper broadly supported the AER being responsible for the VCR.[54] However, the MEU and the EUAA considered that AEMO should undertake this role instead because it has expertise in this area and it would complement its role as the National Transmission Planner.[55]

As the AER will be required to use AEMO's VCR methodology as a starting point in developing VCRs, the Commission considers that the AER will be able to build on the existing expertise that AEMO has in this area and through repeated application of the VCR methodology. The AER would also be required to undertake public consultation in making any changes to the VCR methodology, which would allow the AER to draw on the views and expertise in the broader market.

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53 Further information on AEMO's Value of customer reliability review can be found at www.aemo.gov.au.

54 See submissions on the consultation paper from: EnergyAustralia, p. 3; Networks NSW, p. 9; SA Power Networks, p. 10; Grid Australia, p. 26; Alinta Energy, p. 3; Energex, p. 6.

55 See submissions on the consultation paper from: MEU, p. 26; EUAA, p. 4.

Where possible, the future timing of VCR updates would be aligned to the standard setting process and revenue determination process. The Commission notes that as the timing of the regulatory control periods for TNSPs and DNSPs within each jurisdiction are not aligned, there is the potential that the VCR may not be updated prior to the standard setting process for all NSPs. The Commission considers that the AER would need to determine the appropriate timing for each VCR update after having regard to the timing of the standard setting process for NSPs.

The Energy Networks Association (ENA) considered that the AER should first determine if a "reset" of the VCR is required before updating the VCR every five years, as changes in the VCR should be gradual given the long planning horizons of networks.[56] Grid Australia also agreed that there should be reasonable stability in the VCR over time so that investment plans are not distorted by factors such as survey error or timing differences between revenue reviews.[57] However, Grid Australia considered that it is preferable to have the best available VCR in determining reliability levels and revenue requirements.[58]

The Commission notes that while existing VCR estimates have been variable, over time as the VCR is undertaken on a more regular and consistent basis and the VCR methodology develops, stakeholders will gain greater confidence that the values which are developed reflect the preferences of customers.

While we agree that stability in the VCR is important for long term network planning, we also consider that the VCR needs to be updated on a regular basis to capture possible changes in customer preferences. We also note that where customer preferences change significantly, TNSPs would adjust their network plans to that reliability levels reflect customer preferences. As a result, the Commission continues to consider that updating VCRs every five years provides an appropriate balance between stability and maintaining the relevance of VCRs. We also note that the costs of undertaking VCRs should reduce over time as it is undertaken on a more regular basis.

While the consultation paper proposed that the VCR be escalated by the consumer price index (CPI) between five yearly updates, the Commission considers that the AER would be best placed to determine the appropriate escalation methodology and has recommended that this decision be left to the AER as part of its responsibility for estimating and updating the VCR.

4.2 Customer consultation and selection of reliability scenarios

This section explores the design of the initial stage of the standard setting process under the framework. The initial stage relates to consultation with customers on

56 ENA, Submission on the consultation paper, p. 21.

57 Grid Australia, Submission on the consultation paper, p. 27.

58 Ibid.

reliability matters and selection of reliability scenarios for the purposes of establishing transmission reliability standards.

4.2.1 Customer consultation

This section outlines the initial step of customer consultation by TNSPs for the standard setting process under the framework.

Recommended approach

The standard setting process would commence with a customer consultation process. This process would be undertaken by each TNSP to determine which aspects of reliability are particularly important for customers in their transmission networks. Prior to this consultation, the TNSP will discuss the content and form of the consultation with the economic adviser and standard setter, to establish that the consultation is adequate and appropriate.[59]

Under the framework, transmission standards would be expressed in terms of network redundancy on an N-x basis and include expected times for restoration of supply. The process of customer consultation will be used to inform the selection of a range of additional reliability measures as set out in the national reference standard template for transmission. This could include, for example, maximum hours of customer lost load per year. The standard setter may use this information to decide on the appropriate use of additional reliability measures, in addition to network redundancy and restoration time.

The consultation would provide the standard setter with the necessary information to establish a range of potential reliability scenarios to be assessed. TNSPs would have the flexibility to adapt customer consultation to the specific circumstances of their networks, having regard to discussions with the economic adviser and standard setter.

Where the jurisdictional minister has retained the responsibility for standard setting, the process of customer consultation could inform whether there are specific social or community objectives that may not be captured by the use of the VCR, and which therefore could benefit from further consideration and judgement during the standard setting process.

The AEMC's recent determination on the 'Economic Regulation of Network Service Providers' rule change introduced an obligation on NSPs to consult with customers prior to submitting their regulatory proposal.[60] Under the recommended framework, this requirement would be combined with the process of customer consultation for

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59 As discussed in section 4.1, where the standard setting responsibility has been delegated to the AER or a jurisdictional body, this body would also undertake the role of the economic adviser.

60 See AEMC, Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services, final determination, 29 November 2012.

setting reliability standards. Further detail on aligning these two consultation processes is provided in chapter 5.

Reasoning for the recommended approach

A process of customer consultation supports the principle of basing the reliability standards that are assessed on customer preferences. Consultation will allow customer preferences to be taken into account when determining the level of the standards and whether it is important to reflect other facets of reliability in the expression of standards, in addition to network redundancy and restoration time.

Customer consultation would also be important in establishing specific social objectives or areas of economic importance to customers and the community. The consultation would provide the standard setter with information that could be used to establish the range of potential reliability levels that the community would be comfortable receiving and in determining areas of the network that may justify receiving specific levels of reliability.

This process of consultation by TNSPs to assist in the development of reliability scenarios would form the first of a number of opportunities for public consultation during the standard setting process. Consultation with customers will also be necessary for the development of the VCR and for obtaining stakeholder views on the outcomes of the economic assessment process. This is consistent with the EUAA's submission that customer consultation should occur at multiple points in the process.[61]

Co-ordination with other bodies undertaking consultation processes during the standard setting process may be required to provide consistency in how customers are consulted and to limit the potential for inconsistencies in the responses provided. Each body running a consultation process would also need to consult with a representative set of customers in each TNSP's network.

4.2.2 Selection of reliability scenarios

This section outlines how the reliability scenarios would be selected under the standard setting process.

Recommended approach

Under the framework, the process of public customer consultation would be followed by a requirement for the TNSP, the economic adviser, and the standard setter to work together to develop the range of feasible reliability scenarios that could be applied over the next regulatory control period.

61 EUAA, Submission on the consultation paper, p. 6.

Each scenario would consist of a different level of network redundancy (N-x) standards for each connection point in the network plus an expected time for restoration of supply following an interruption. Additional output measures for each connection point may be included in the reliability scenario at the discretion of the standard setter.[62]

The standard setter will select the number of reliability scenarios and would be able to choose reliability scenarios which provided both higher or lower levels of reliability than was currently provided. The TNSP and economic adviser would provide advice to the standard setter on the costs and constraints of achieving different levels of reliability performance.

Where a jurisdictional minister has delegated the role of standard setting to the AER or a jurisdictional body, the standard setter would take into consideration any guidance that was provided by the jurisdictional minister when selecting reliability scenarios. This could include guidance on the treatment of areas of the network associated with high economic or social importance.

To help inform the selection of reliability scenarios, the standard setter would be required to calculate a baseline reference case. The baseline reference case would be determined by:

- Calculating the level of expected unserved energy that would arise if no further investments were undertaken over the next regulatory period.
- The value of expected unserved energy would then be determined by multiplying the VCR by the level of expected unserved energy. This value of expected unserved energy would represent the potential benefits to customers of possible reliability improvements based solely on the VCR.
- Investments equal to that value of expected unserved energy would be identified.
- The resulting level of reliability that would occur if those investments were undertaken would represent the baseline reference case.

Given the discrete nature of network costs, calculating the baseline case may not result in a level of network capability that could be reflected in a network redundancy (N-x) expression. However the baseline could still be useful to inform on the appropriate range of reliability scenarios to be modelled in the economic assessment process. This represents an additional requirement from the proposals included in the Commission's consultation paper. In some cases, the baseline scenario would be the same as the maintenance of existing reliability standards.

62 An example of a reliability scenario for the Commission's recommended framework for distribution reliability is set out in the final report for the distribution workstream (AEMC, Final report - Review of the national framework for distribution reliability, 27 September 2013, p. 56).

The standard setter would select a number of reliability scenarios under an economic cost-benefit assessment process in accordance with the guidelines. The process of customer consultation and selection of reliability scenarios would need to be completed 35 months prior to the commencement of the regulatory control period.

Reasoning for the recommended approach

The development of feasible reliability scenarios would be undertaken collaboratively between the standard setter, the economic adviser, and the relevant TNSP. While the standard setter would have ultimate discretion over the standards that are set, the TNSPs are the best placed to determine the costs and constraints of achieving different levels of reliability. The purpose of developing a number of scenarios is to establish a range of feasible reliability outcomes and to provide flexibility to the standard setter to choose a level of reliability that best meets community expectations, given the costs of network investment.

The number of reliability scenarios that are selected would be at the discretion of the standard setter. For example, the standard setter may select two reliability scenarios above existing levels of reliability and two scenarios below. Alternatively, if the customer consultation process had suggested that customers were comfortable with existing levels of reliability, the standard setter may choose to evaluate the reliability scenario which corresponds to a maintenance of existing levels of reliability.

Allowing the standard setter to select scenarios with higher and lower levels of reliability will allow the costs and benefits of a range of scenarios to be tested, which would assist in establishing the efficient range of possible reliability levels. Where the standard setter considers that the economic assessment process is unlikely to point to a step-change in reliability, the ability to determine the number of reliability scenarios to evaluate would allow the economic assessment process to be scaled up or down to suit the requirements of the jurisdiction.

The Commission agrees with the view expressed by the EUAA that jurisdictional governments have a right to regulate electricity within their jurisdictions and that they should not be limited in their discretion.[63] The Commission considers that transparency in the selection of reliability scenarios will increase the accountability of jurisdictional governments in the provision of network reliability.

When selecting reliability scenarios, the standard setter would also need to be aware that changes in customer preferences may not be able to be efficiently met through changes in asset investments given the lumpy nature of the majority of investments in the transmission network. Demand side participation (DSP) may provide a greater range of smaller scale projects that may be used to incrementally adjust network costs as customer preferences change.

63 EUAA, Submission on the consultation paper, p. 6.

4.3 Economic assessment of reliability scenarios

This section sets out how the economic assessment process of reliability scenarios would be undertaken by the economic adviser, including the requirement to adopt a probabilistic approach.

4.3.1 Recommended approach

The role of the economic adviser would be to undertake a transparent economic assessment of the costs and benefits of each reliability scenario which has been selected by the standard setter. This economic assessment would take six months and would be used by the standard setter in determining the reliability standards that will apply to each TNSP over the next regulatory control period.

The benefits of each reliability scenario would be based upon the value of expected unserved energy. The economic adviser would be required to adopt a probabilistic approach in undertaking this assessment. This would involve:

- evaluating the way network costs vary with different levels of reliability;
- undertaking a probabilistic assessment of expected unserved energy where the impacts of a supply interruption, in terms of its duration, the type of the load lost, and the probability of its occurrence are evaluated. The unserved energy is then valued using estimates of the VCR; and
- comparing the expected costs of investment and operation against the value that customers place on reliability.

The benefits would also reflect any inter-regional impacts of the network investment needed to meet each reliability scenario.

Box 4.1 Probabilistic approach to determining reliability standards

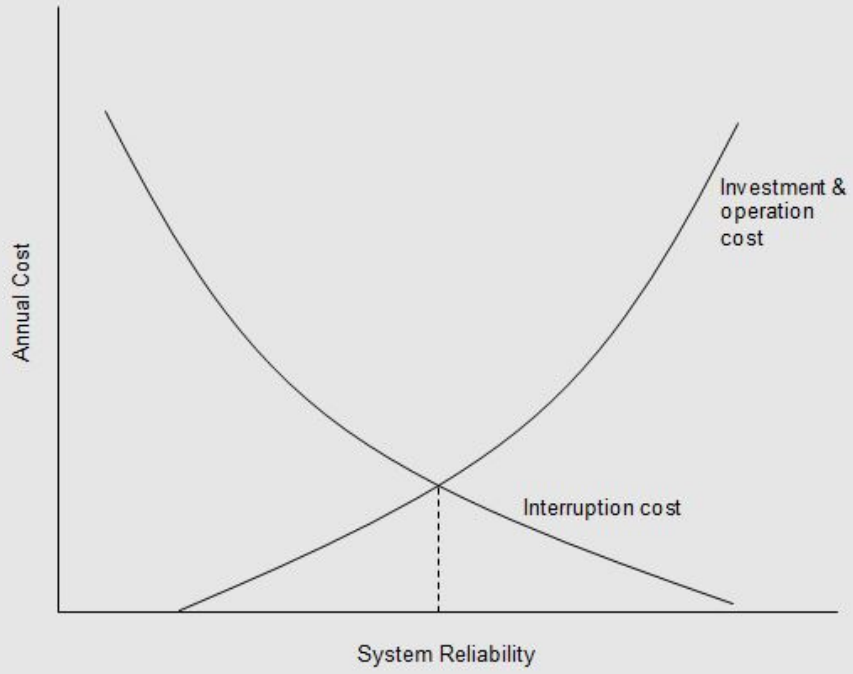
A probabilistic approach to setting reliability standards involves evaluating the probability and impact of an interruption occurring to determine the expected costs or benefits to customers from a change in reliability levels. This allows the costs of providing a specific level of reliability to be compared against the expected value placed on reliability by customers, based on the probability of the interruption occurring, it's associated duration and the load affected. This process allows the trade-off between the costs and benefits of different reliability levels to be examined.

The probabilistic approach recommended by the Commission in this report is quite different to the use of a deterministic approach. A deterministic approach involves evaluating the outcomes of a predetermined set of contingencies, without reference to the probability of the contingencies occurring. This means that probabilistic methods have the advantage of quantifying the probability of interruptions for different network conditions, rather than just the 'worst' case

that may be captured by deterministic methods. Probabilistic methods can also be used to capture multiple asset failures, which are not usually captured by deterministic analysis.

Figure 4.3 illustrates the economic trade-off that exists between costs and levels of reliability. The upward sloping curve represents network costs with respect to the level of reliability. Typically, the costs of building and maintaining the network increase as the level of reliability increases. Conversely, the downward sloping curve represents the costs to customers with respect to the level of reliability. Typically, the cost to customers reduces as they are faced with fewer or shorter interruptions to their supply. Where these two curves intersect represents the most efficient level of reliability in the trade-off between the costs to build and maintain the network and the costs to customer of interruptions to supply. The economic assessment process would evaluate this trade-off for each reliability scenario using estimates of network costs provided by the TNSPs and estimates of the VCR.

Figure 4.3 Trade-off between costs and levels of reliability



The Commission notes that some stakeholders have referred to "probabilistic planning approaches" when referring to economic assessments which are undertaken on a project by project basis.[64] The Commission's recommended framework would require the economic adviser to consider the level of expected unserved energy that would arise under each reliability scenario, which would require a probabilistic assessment. In contrast to the current project by project approach used in Victoria, this probabilistic assessment

64 For example, see the submission on the consultation paper from the Victorian Department of State Development, Business and Innovation.

process would be used to set reliability standards prior to the decision to invest. We have recommended this approach because it is consistent with the ex-ante incentive framework for setting network revenues and it also provides greater accountability and transparency in the standards that are set.

The framework recommended by the Commission incorporates the advantages of probabilistic assessments through the economic assessment process conducted by the economic adviser. Specifically, the calculation of expected unserved energy for this assessment would involve assessing the probability and impact of interruptions occurring under each reliability scenario being considered. The level of expected unserved energy would then be multiplied by the relevant VCR for the TNSP to quantify the customer impact of each scenario. The value of expected unserved energy would then be compared against the expected cost of meeting that level of reliability. This would provide transparency around the expected costs and benefits of each reliability scenario being considered to allow the standard setter to make an informed decision when setting standards.

The economic assessment would involve:

- evaluating the expected network costs under the efficient level of reliability scenario (ie baseline reference case);
- evaluating the expected unserved energy under the baseline reference case. As discussed further in Box 4.1, this will involve applying a probabilistic approach through assessing the probability of supply interruptions, and the nature and duration of expected outages, in order to derive the expected unserved energy;
- evaluating the expected change in network costs for each additional reliability scenario compared to the baseline reference case;
- evaluating the expected change in expected unserved energy for each additional reliability scenario compared to the baseline reference case and multiplying this by the relevant VCR for the TNSP; and
- comparing the expected change in network costs against the value of the expected change in unserved energy for each additional reliability scenario.

Box 4.2 Inputs to the economic assessment process

The economic assessment process would involve evaluating expected levels of unserved energy using the probability of equipment failures, expected outage duration, and forecast loads for the range of reliability scenarios. The level of expected unserved energy would then by multiplied by the relevant VCR, and compared against the expected changes in network costs.

Table 4.1 sets out the inputs to the economic assessment process and the relevant sources for obtaining information.

Table 4.1 Inputs to the economic assessment process

Input	Source
VCR	Estimates provided initially through AEMO's review. The AER would be responsible for developing future estimates
Levels of unserved energy	Economic adviser to determine based on estimates of forecast loads and the probability of equipment failures provided by the TNSP consistent with the standard setting guidelines
Costs of network investment and operations and demand-side participation (DSP) options	Economic adviser to determine based on estimates provided by the TNSP consistent with the standard setting guidelines

It is important that the standard setter is basing its decisions on the best information available on the costs and benefits of reliability improvements. Therefore, there would be an onus on the economic adviser to estimate the efficient cost of each reliability scenario for use in the economic assessment process. The economic adviser would use the information available at that time with input from the TNSPs.

The economic adviser would prepare and publish a draft report for public consultation which would set out the expected change in costs and value of expected unserved energy for each reliability scenario. The report would also include a description of the process and key assumptions used in the economic assessment process and the results of the sensitivities undertaken. After considering any submissions received during the public consultation process, the economic adviser would prepare and publish a final report, which would be submitted to the standard setter.

The required contents of the economic adviser's reports would be specified in the NER to provide standard setters with sufficient information on customer preferences and, importantly, the trade-offs between cost and reliability for each transmission network, and the basis on which the standard has been selected.

During the economic assessment process, the relevant TNSP would be required to provide information to the economic adviser on the expected change in capital and operating expenditure and expected unserved energy for each reliability scenario. The economic adviser would assess whether the information provided by the TNSP represented a reasonable forecast of the expected changes in costs and reliability performance. This would include the ability for the economic adviser to interrogate, and if necessary, amend the TNSP's forecasts, if the economic adviser does not consider that they represent a reasonable forecast of the expected changes under each scenario.

If the TNSP did not provide sufficient information to the economic adviser for it to perform its assessment, the economic adviser would also have the ability to develop its own forecast of the expected changes under each scenario.

The economic adviser's assessment would not be a substitute for the requirement on TNSPs to prepare detailed expenditure forecasts as part of their regulatory proposals to the AER, or a substitute for the AER's assessment of the efficiency of these forecasts during the revenue determination process. However, the economic adviser's assessment should be a reasonable representation of expected network expenditure and so may assist with the formation of regulatory proposals. Importantly, the assessment conducted by the economic adviser does not imply approval of specific investments to meet the reliability standard, which remain the responsibility of the TNSP under the ex-ante incentive framework in the NER.

The economic adviser would also undertake a range of sensitivities to test the key assumptions and inputs for each scenario. The range of sensitivities to be undertaken by the economic adviser would be set out in guidelines. However, it is anticipated that at a minimum sensitivities would be undertaken around the expected costs of each scenario, demand forecasts, and the VCR. The sensitivities would be assigned probabilities by the economic adviser to assist stakeholders to understand the relative likelihood of each sensitivity occurring.

4.3.2 Reasoning for the recommended approach

Benefits of the economic assessment process

The use of an economic assessment process will promote the setting of transmission reliability standards at an economically efficient level consistent with customer preferences. This will lead to more efficient investment decisions and ultimately more efficient pricing outcomes and reliability levels for consumers. An independent economic assessment process, which is undertaken by a body which is separate from the TNSP, will assist in revealing the efficient point on the trade-off between cost and reliability.

We consider that our recommended process is necessary to fulfil the requirements in SCER's terms of reference and is consistent with the principles for the review as set out in chapter 2. As the economic adviser's reports will be published, this process will increase transparency around the costs and benefits of achieving different levels of

reliability in the standard setting process. This information would assist stakeholders to understand the implications of each reliability scenario.

The information from the economic assessment process will enable the standard setter to make an informed decision on which level to set the standards at. An explicit consideration of the VCR, along with a number of public consultations during the standard setting process, shall improve the likelihood that customer preferences are reflected in the standards.

A requirement to assess a scenario where reliability levels are set at a level where the expected cost of investment is as close as possible to the value of expected unserved energy will provide the standard setter and other stakeholders with information on a level of reliability based on measurable factors only. Comparing the outcomes of other scenarios to this baseline scenario will assist in revealing the extent to which other scenarios deviate due to the inability to measure the full benefit that the community places on reliability.

The use of sensitivities during the standard setting process should assist in addressing any uncertainties that may exist around key assumptions. It should also aid the economic adviser and the standard setter in understanding whether the overall costs and benefits of a scenario are likely to change if key assumptions changed within a reasonable range. The submission from Origin Energy noted that sensitivities around the VCR should be undertaken to address risks around the accuracy of this measure.[65] The Commission notes that further detail regarding the use of sensitivities and how they should be considered during the economic assessment process would be set out in guidelines for the standard setting process.

Submissions from the NSW Independent Pricing and Regulatory Tribunal (IPART), Alinta Energy, the AER, Origin Energy, and Grid Australia supported the Commission's proposed economic assessment process, as they considered it would result in more efficient standards and encourage TNSPs to deliver services that are most valued by customers.[66]

The MEU expressed concern that costs of the economic assessment process are likely to be substantial, at least initially, and borne by consumers particularly if ex ante assessment is progressed.[67] In response, the Commission agrees that there will be initial costs involved in establishing the economic assessment process, but as the process evolves these costs should decline and these costs would be outweighed by the benefits in efficiency gains resulting from an economically derived process.

65 Origin Energy, Submission on consultation paper, p. 2.

66 See submissions on the consultation paper from: IPART, p. 1; Alinta Energy, p. 4; AER, p. 1; Origin Energy, p. 1; Grid Australia, pp. 17-19.

67 MEU, Submission on the consultation paper, p. 30.

In their submission on the consultation paper, AEMO raised concern regarding the timing of the economic assessments.[68] While AEMO supports an economic assessment of reliability that takes into account the value that customers place on a reliable electricity supply, they consider that the process carried out as part of the standard setting process is likely to be based on a high level assessment and less well placed to conduct a robust and thorough review. AEMO proposes that economic assessments should be undertaken on a project by project basis rather than fixing economically derived standards over a regulatory control period. This view was reiterated in the submission from the Victorian Government.[69]

The Commission considers that project by project economic assessments is likely to be insufficient to provide adequate transparency and accountability to stakeholders and levels of reliability that reflect all the preferences of customers. A separate independent assessment of the trade-offs between different levels of reliability is required to achieve this. This is because:

- an independent process provides an opportunity to examine existing reliability levels and set standards at a more efficient level, which is likely to result in a faster transition to more efficient network investment and pricing outcomes for customers;

- a separate process for setting standards will improve the capacity for customers to be consulted, which will allow standards to reflect customer preferences.

Under the Commission's recommended framework, a separate economic assessment process will be undertaken to set reliability standards by a body which is independent from the TNSP. A separate process to set reliability standards across a TNSP's network is likely to provide greater opportunities for customer engagement and consultation, than a number of economic assessments which are undertaken by TNSPs as part of their RIT-Ts for specific projects.

An independent and experienced standard setter is also likely to place more scrutiny over a TNSP's expected costs and benefits of meeting reliability levels than may occur through a RIT-T process or an internal assessment by a TNSP. Also as explained in chapter 3, setting ex-ante standards will improve the AER's revenue determination process.

A process to allow for the consideration of the reliability levels that would apply across a TNSP's network, compared to a project by project assessment, is also likely to allow for a broader more holistic assessment of the expected costs and benefits of providing a reliable supply of electricity. These factors may lead to a more efficient level of reliability being set by the standard setter.

Under a project by project assessment, there would be a lack of transparency and certainty for customers and other stakeholders regarding the reliability levels they will

68 AEMO, Submission on the consultation paper, p. 4.

receive. It may also be more difficult to hold TNSPs accountable for meeting their reliability standards particularly where existing levels of reliability are significantly higher or lower than efficient levels, as in these circumstances there would only be a limited expectation that a TNSP would meet their standards.

In contrast, where reliability standards are set prior to the commencement of the regulatory control period, as proposed under the AEMC's framework, stakeholders will have greater transparency and certainty regarding expected reliability levels. It would also be possible to hold TNSPs accountable for meeting their reliability standards, as the standard setter would be required to not only consider the efficient level of reliability, but also the physical and financial feasibility of meeting reliability levels as part of the standard setting process.

Estimating the probability of outages

A key input into valuing the reduction in expected unserved energy for the economic assessment process will be values for the probability of outages at each connection point.

AEMO considered that there is sufficient expertise and historical data, to enable TNSPs to determine probabilities of outage rates of their equipment, with a reasonable level of certainty.[70] A report prepared by Nuttall Consulting, which accompanied AEMO's submission to the Issues Paper, proposed the use of a measure of forecast reliability based on the statistical expectation of energy not supplied.[71] This measure would be calculated using a simulation approach based on historical records of outage events. The simulation approach would use contemporary engineering risk and reliability analysis techniques to model the power system, and determine the likelihood and extent of customer interruptions.

Grid Australia commented that the probability of duration of an outage depends upon the nature and timing of transmission equipment failure both of which are inherently uncertain. While Grid Australia agreed that it would be possible to calculate such probabilities, it raised concerns with determining reliability standards solely using estimated probabilities of outages.[72]

Grid Australia argued that the average view of the world conveyed in calculations of expected unserved energy masks the very significant potential exposures faced by consumers in relation to inherently uncertain and unknowable catastrophic events. Cost benefit assessments based on probability of outages could therefore under-estimate the value of reliability as it attributes a very low weighting to these types of events due to their very low probability of occurrence. Therefore Grid

69 DSDBI, Submission on the consultation paper, pp. 1-4.

70 AEMO, Submission on the consultation paper, p. 7.

71 Nuttall Consulting, *Electricity Transmission Reliability Measures, Review of Options and Concept Design - A report to AEMO*, 24 May 2013.

72 Grid Australia, Submission on the consultation paper, p. 2-4.

Australia argued that such probabilistic approaches need to be supported by the consideration of the maximum exposure from a transmission outage, which requires the exercise of judgement by the standard setter.

The Commission recognises that the probability of an equipment failure at a specific connection point cannot be known with certainty. However, we consider that a credible approach can be developed for estimating these values for use in the economic assessment process. The approach to determine probability values will be set out in the economic assessment guidelines, to be developed by the AER. Given the technical nature of this matter, there is a need for input from the TNSPs. We note that in its submission, AEMO stated this it is willing to work with TNSPs to determine probabilities of outages and we would encourage the TNSPs to work together to develop an appropriate method which can feed into the AER's considerations.[73]

We also consider that the estimation approach will need to be adaptable to take into consideration the specific circumstances at each connection point in order to value the probability of failure. This would include factors such as load profile, operating condition, and remaining life of the asset.

Estimation methods by their nature can never perfectly forecast probability values. This underlines the need for the framework to allow the exercise of judgement for unknown or unpredictable events when setting transmission reliability standards. The Commission agrees with Grid Australia that the use of probabilistic values in the economic assessment process needs to be supported by a degree of judgement when setting the reliability standards. The framework allows the jurisdictional minister to make informed judgements either when performing the standard setter role or when giving guidance to the AER or jurisdictional body.

Challenges associated with determining the trade-off between cost and reliability

There are a number of challenges in using an economic assessment process to set reliability standards. A principal challenge arises from the uncertainty that exists in relation to determining both sides of the trade-off between the costs and benefits of different reliability standards.

Determining the cost of meeting reliability standards requires a range of data to be provided by TNSPs, which is generally underpinned by a number of assumptions regarding matters such as future demand levels, the costs of materials and labour, and plant characteristics, amongst other factors. These costs need to be independently assessed and verified to determine if TNSPs have taken into account all relevant factors, which can be a highly technical and extensive task. Costs will also differ depending on the characteristics of each network.

Determining the value placed on reliability by customers is significantly more difficult and uncertain than assessing the expected costs of meeting reliability standards. VCR

73 AEMO, Submission on the consultation paper, p. 7.

cannot be directly observed and there remains no universally accepted methodology for estimating the value placed on reliability by customers. In Australia, the VCR has only been assessed a handful of times and results have varied extensively.

Developing a methodology which can accurately estimate the VCR is difficult, as the VCR is inherently subjective. For instance, some of the variables which can affect a customer's value of reliability include: the characteristics of the customer; whether the customer has recently experienced a supply interruption; the length, duration and timing of the supply interruption; the time of day of the supply interruption; and whether the supply interruption was planned or unplanned, amongst a number of other variables.

As each transmission connection point serves a large number of customers, the VCR will always need to be aggregated to some extent across a number of different customers to determine the appropriate reliability levels. This is because different levels of reliability cannot be provided by TNSPs for individual customers which are being served by the same network assets. This ultimately means that determining the level of reliability that TNSPs must provide involves trading-off the reliability preferences of different customers in the same supply area.

In addition, there are a number of factors which may affect the value that customers place on reliability, which are difficult to capture in the calculation of the VCR. For example, the potential broader costs to society from high impact, low probability events such as city wide supply interruptions, or the impacts from loss of supply to areas of the network that are associated with high economic or social importance.

High impact, low probability events such as city wide supply interruptions are difficult to value as they tend to have wider ranging social and economic impacts on society as a whole in addition to the measurable impacts that they have on individual customers. Moreover, they are difficult to account for in VCRs because the high cost of these events is weighted by the very low probability of their occurrence, which results in a low overall impact on the final value. The submission from Grid Australia noted that VCR may not fully account for the impact of these types of events.[74]

As a result of the difficulties associated with assessing the trade-offs between cost and reliability, there may be the need for a degree of judgement in setting reliability standards to supplement assessments based on the VCR. Over time with the repeated application of the standard setting process, the quality of inputs and experience of participants in the process are likely to develop and improve, which may reduce the reliance on the need for subjective judgement.

In particular, AEMO's work to develop a national approach to estimating the VCR would improve the accuracy of this measure, particularly once the VCR is measured on a regular, consistent and independent basis across the NEM. The explicit consideration of the preferences of customers during the standard setting process through the VCR

74 Grid Australia, Submission on the consultation paper, p. 3.

will also be an improvement on the current processes used in some jurisdictions, as it will allow the value placed on reliability by customers to be transparently and consistently considered.

Level of assessment required will vary by the circumstances of each TNSP

The economic assessment process could create additional time, cost and resource requirements on TNSPs. This depends upon the extent of assessment performed in the current jurisdictional processes for setting reliability standards. It is likely that over time less reliability scenarios will need to be tested under the economic assessment process, as reliability standards are set in a manner which more closely reflects the preferences of customers. The level of assessment required will depend on:

- whether the preferences of customers have changed significantly since standards were last set and customer views on whether existing levels of reliability are adequate;
- whether the costs of undertaking investments has changed substantially; and
- whether the jurisdictional minister considers that additional factors, which are not captured by the VCR, should be taken into account.

As a result, unless there are significant changes in the three factors discussed above from one regulatory control period to the next, the need for step changes in reliability standards may reduce once the standard setting process has been run once or twice for each TNSP. This could result in the standard setting process involving more of a review of the level of the existing reliability standards, rather than a full assessment of a range of alternative reliability scenarios for each connection point.

Therefore, as the number of scenarios and level of assessment required will depend on the circumstances of each network, the costs of applying the recommended framework will be proportionate. This would minimise the costs for TNSPs of participating in the economic assessment process over the longer term.

An independent economic assessment process will also assist the AER in assessing the efficient level of expenditure which is required to meet the reliability standards which have been set in making its revenue determinations, whilst not substituting for that assessment. This shall reduce the costs associated with the revenue determination process and further improve the potential for efficient investment.

4.3.3 Productivity Commission proposed approach for setting transmission reliability

A number of stakeholders have noted the approach developed by the Productivity Commission as an alternative to the regulation of transmission reliability. This section outlines the Productivity Commission's proposed approach and differences with the AEMC's recommended framework.

In response to a request from the Commonwealth Treasurer, the Productivity Commission has undertaken an inquiry into electricity network frameworks. The Productivity Commission released its final report in June 2013 and set out a proposed approach for a national framework for transmission reliability.[75]

Under the Productivity Commission's approach, AEMO would undertake all transmission planning centrally across the NEM and determine the level of reliability that should be provided using economic cost benefit assessments that incorporate VCR estimates and demand forecasts from TNSPs to develop a reliability standard at each connection point. The standards would be expressed in the existing N-x format or in other ways such as the probability-weighted quantity of electricity at risk.

The proposed approach would also form the basis of the annual National Transmission Network Development Plan (NTNDP), which would be used as an input into the planning undertaken by TNSPs and in the assessments made by the AER.

The Productivity Commission's approach involves the setting of reliability standards at each connection point based on economic cost benefit assessments of the level of reliability that corresponds to the VCR, and is therefore different to the existing approach used in Victoria where there are no reliability standards and each project is assessed individually as to whether it provides a net economic benefit.

Based on the standards that are set, TNSPs would undertake reliability planning of their networks with reference to the NTNDP under two separate components:

- The first component would comprise identified augmentation and replacement projects less than a certain threshold. These projects would be undertaken by the TNSP without direct AEMO or AER oversight. The TNSP would not be obliged to provide detail on these projects at the time of the revenue determination and revenue to fund these projects would be drawn from the aggregate revenue determination made by the AER.

- The second component would comprise identified augmentation and replacement projects above a certain threshold. These projects would be assessed through a RIT-T process that would require a full cost-benefit analysis of the investment. The RIT-T would be approved by the AER if the project was shown to generate net economic benefits using current information. The AER would determine the allowable revenue on a project by project basis. The AER would be required to accept advice from AEMO about the need for, timing, scale, choice, and costs of the project, ie AEMO advice would have a presumptive force.

The AEMC supports a number of aspects of the Productivity Commission's proposed approach to the regulation of transmission reliability. Specifically, reliability standards should be set:

75 Productivity Commission, *Electricity Network Regulatory Frameworks*, 26 June 2013, pp. 581-625.

- with reference to the trade-off between the value placed on reliability by customers and the costs of investing in and maintaining transmission networks;
- before the investment planning process;
- through a transparent public consultation process, which includes close consultation with TNSPs and other key stakeholders, including DNSPs; and
- through a consistent approach to expressing and setting reliability standards at each connection point.

In particular, setting clear and transparent reliability standards in advance of transmission businesses' decisions to invest allows transmission businesses to be held accountable to customers and regulators for the level of reliability that they provide in practice.

However, the AEMC has the following concerns with the Productivity Commission's proposed framework:

- **Reliance on VCR to set reliability standards**

  The AEMC agrees that the value that customers place on reliability should be a key input when setting required reliability standards for TNSPs. The requirement to take into account the value customers place on reliability is also a key requirement of SCER's terms of reference for the AEMC's reviews of the national framework for transmission reliability.

  However, the AEMC has concerns about the accuracy of VCR measures. Using customer surveys to estimate the VCR faces serious challenges, including:

  — whether the set of customers surveyed is a representative sample set, ie whether their views sufficiently represent the views of customers in an area;

  — stated preferences often differ from revealed preferences. The amount that customers would pay in reality often differs from what they say they would pay in a survey; and

  — preferences are not stable over time, eg willingness to pay for increased reliability commonly increases after a well-publicised blackout and then declines over time.

  Further, VCR estimates may not be a precise reflection of all customer preferences or the full benefit that the community places on reliability. For example, customers may place additional value on avoiding extended interruptions which, although unlikely to occur, would have major disruption costs. As a result, the AEMC does not consider that reliability settings can be determined mechanistically based solely on VCR and cost inputs.

Determining the appropriate level of reliability involves exercising judgement. The AEMC's framework allows jurisdictional ministers the ability to exercise judgement in an informed and transparent manner. Economic assessments on the quantitative trade-off between cost and reliability will be provided to the jurisdictional minister or their delegated standard setter to inform this exercise of judgement.

- **Accountability for network performance**

  There should always be a clear "line of sight" as to who is accountable for outcomes on the shared network. This accountability includes formal legal liability, but also community and political accountability for the provision of an essential service. Clear accountability depends on both investment and operational decisions. Shifting decision making away from the entity that should, and in the eyes of the public will, be accountable and bears risks is fundamentally poor governance.

  Accountability is best achieved where network businesses are responsible for investment in, and operation, control and maintenance of, the shared network in their licensed area. This focussed accountability for operation on a single body represents the best framework for a secure and reliable electricity system, with each network business clearly required to deliver to the level of their reliability standards.

  A principle of good governance is that risks should be allocated to the party that is best able to manage that risk. The Productivity Commission's proposals would blur accountability for investment decision making. On one hand, transmission businesses would make investment decisions, with oversight from AEMO and the AER for projects over a defined threshold. On the other hand, the AER's approval would be required for such projects, and AEMO's advice to the AER would take "presumptive force". AEMO could also direct additional investment to occur as a last resort.

  It appears that at least some part of the power to make specific investment decisions would be moved from transmission businesses to the AER and AEMO. The Productivity Commission does not address whether the associated risks would be reallocated accordingly, in order to maintain alignment of risk and decision making. We contend that it would be very difficult to do so, due to the dilution of clear accountability.

  An alignment of risks with accountability would require AEMO to bear some responsibility for operational outcomes on the shared network, where they resulted from an investment decision for which AEMO was partly responsible – for instance, through advising the AER to approve an investment option over the one favoured by the transmission business.

  Even if it were possible to decide accountability, and therefore the appropriate allocation of risk in this case, AEMO - as a not-for-profit entity - is not an appropriate party to bear the associated risks as:

- financial incentives cannot be meaningfully imposed on it; and
- AEMO may be unwilling to assume the other legal liabilities that arise.

Further, the body that sets reliability standards should be independent from the body that must apply the standard when making planning, investment, and operational decisions. The Productivity Commission's proposals would have the effect of making AEMO both standard setter and (at least in part) implementer of the standard – in Victoria, where AEMO makes the investment decision currently – and more generally, through its influence over transmission investment decisions in the "improved RIT-T process".

We note that SCER's terms of reference required that jurisdictions should have the opportunity to transfer responsibility for applying the national framework for transmission reliability to the AER, where a jurisdiction decides to adopt the AEMC's recommended framework.

Under the AEMC's recommended framework, jurisdictions would also have the ability to adopt the national framework, but retain responsibility for applying it, thereby maintaining accountability on the jurisdiction to provide a level of reliability that reflects the expectations of the community. Under the Productivity Commission's proposed model, jurisdictions would not be able to retain responsibility for setting transmission reliability standards as this role would be undertaken by AEMO across the NEM.

- **Inconsistent with existing regulatory approach**

  In developing the framework for transmission reliability, the AEMC has taken as given the current ex-ante incentive based approach to regulating the TNSPs, as set out in the NER. The AEMC considers it important that the recommended framework is consistent with and complements the existing regulatory approach.

  Under the Productivity Commission's proposed approach, the AER's determination of allowable revenue on a project by project basis for projects above a certain threshold would not be consistent with the existing ex-ante regulation framework in the NEM.

  We also note that under the Productivity Commission's proposed approach, AEMO would become the national planner for all transmission augmentations. This would be a fundamental shift in current market arrangements and would have implications for the operation of the regional TNSPs.

4.4 Setting reliability standards

This section sets out how reliability standards will be set under the framework and our reasoning for this approach.

4.4.1 Recommended approach

Jurisdictional ministers would be responsible for setting transmission reliability standards but would be able to delegate this role to the AER or a jurisdictional body.

While the Commission has recommended a similar approach for setting distribution reliability targets,[76] the jurisdictional minister's decision regarding the body responsible would not be required to be the same for both transmission and distribution.

All standard setters whether they are a jurisdictional minister, the AER, or a jurisdictional body, would be informed on the costs and benefits of each reliability scenario being considered. The economic assessment of the reliability scenarios will be the same irrespective of which body performs the role of standard setter.

Standard setters would have three months after receiving the economic adviser's final report to make their decision on the standards which will apply over the next regulatory period.

The standard setter would also be required to take into account current levels of reliability and the extent to which TNSPs could realistically achieve the reliability standards. The standard setter may justify the selection of a reliability scenario with a lower net benefit, but which is closer to current levels of reliability, if it considers that the step-change associated with the scenario of highest net benefit is too substantial to be achieved over the next regulatory control period. Alternatively, the standard setter could choose to develop a path to transition to its selected reliability scenario over the regulatory control period.

The decision making criteria for a jurisdictional minister would be slightly different to that of the AER or a jurisdictional body.

Decision making criteria for the AER or a jurisdictional body

Where the AER or a jurisdictional body is responsible for setting reliability standards, they would be required to make their decision on the reliability standards on the basis of measurable factors only. As a result, they would be required to select the reliability scenario with the highest net economic benefits, as identified through the economic assessment process, subject to two conditions:

- the step-change in levels of reliability can be reasonably and practically achieved by the TNSP over the regulatory control period; and
- levels of reliability are consistent with guidance provided by the jurisdictional minister at the start of the standard setting process.

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76 See the AEMC's final report on the review of a national framework for distribution reliability published on 27 September 2013.

Decision making criteria for a jurisdictional minister

Where a jurisdictional minister retains responsibility for setting reliability standards, they would be able to take into consideration other factors which may not be fully accounted for in the economic assessment process which are difficult to quantify in the VCR, such as the risk aversion of customers, high impact low probability events, equity, affordability, regional development, or environmental factors.

The jurisdictional minister would continue to have discretion to set the reliability standards at any level that they considered to be appropriate to meet the needs and expectations of network users within their jurisdiction. The framework will allow the minister to make such decisions in an informed and transparent manner.

As the Commission does not consider it practical or necessary to constrain the decision making ability of jurisdictional ministers, the level of reliability standards would not be required to correspond to any of the individual reliability scenarios that were evaluated under the economic assessment process. This represents a change from the approach in the consultation paper which proposed that jurisdictional ministers would be required to set reliability standards that correspond to a specific reliability scenario.

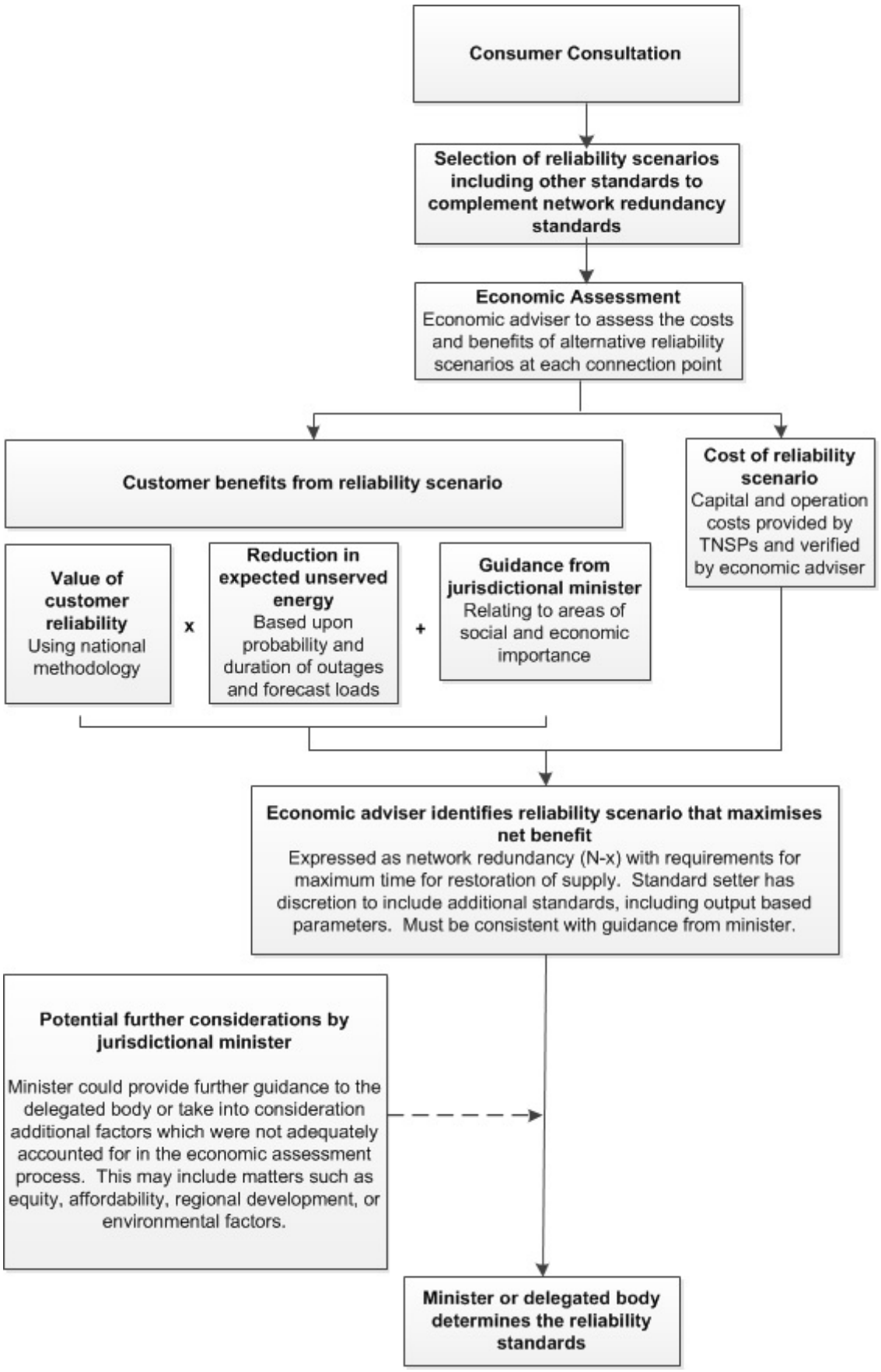
Reliability standards would be set and published by the standard setter for each TNSP. The timing for setting and publishing standards in each jurisdiction would be consistent with the AER's regulatory control period to allow reliability standards to be set nine months prior to the submission of regulatory proposals for the AER. This is an additional three months from the six months proposed in our consultation paper.

After setting reliability standards, standard setters would be required to submit the standards they have set to the AER. The AER would be required to maintain the details of the current reliability standards for all TNSPs in the NEM on their website.

Overview of the reliability standard setting process

Figure 4.4 sets out the standard setting process discussed in section 4.2 to 4.4.

Figure 4.4 Determining economically derived transmission reliability standards



4.4.2 Reasoning for the recommended approach

The framework would provide transparency on the costs and benefits of the reliability standards which are set, as all standards setters would be required to consider the outcomes of the economic assessment process. An ability to set lower reliability standards, as well as either maintaining or increasing reliability levels, would allow the standard setter flexibility in determining the most appropriate reliability level for each network.

The Commission considers that the exercise of judgement and the consideration of additional factors, such as social equity concerns, are best performed by elected officials rather than regulatory bodies. This is because jurisdictional ministers are held responsible by the community for the provision of adequate levels of service, and therefore bear accountability for meeting the needs and expectations of the community.

SCER's terms of reference required the Commission to develop a framework and methodology which makes explicit the opportunity for jurisdictions to transfer responsibility for applying the framework to the AER.

The Commission considers that its proposed approach provides common arrangements for jurisdictional ministers or the AER or any other jurisdictional body. However, the Commission's approach also recognises the inherent differences in these bodies. As a result, the recommended approach provides a balance between providing for standards to be set in a transparent and accountable manner, while also providing flexibility for matters which cannot be fully accounted for in the economic assessment process to be considered. The MEU and the EUAA consider that the Commission's recommended framework should provide sufficient information to the jurisdictional minister to make an informed decision on the levels of reliability appropriate to the community.[77]

77 See submissions on the consultation paper from: EUAA, p. 6; MEU, p. 31.

5 Implications for the revenue determination process

This chapter sets out how transmission reliability standards set under the framework will interact with the AER's revenue determination process. The chapter also outlines a mechanism that could be used to update reliability standards within a regulatory control period, where there has been a material change in the costs and benefits of meeting the standards.

5.1 Links between the standard setting process and the revenue determination process

5.1.1 Recommended approach

Under the framework there are two linkages between the standard setting process and the AER's revenue determination process, which relate to:

- aligning the TNSP's customer consultation process during the standard setting process with its consultation process to develop its regulatory proposal; and
- the use of reliability standards in setting a TNSP's revenue allowance.

Alignment of consultation processes

As discussed in chapter 4, TNSPs would be required to consult with customers at the beginning of the standard setting process to determine which aspects of reliability are particularly important to their customers. This information would be used by the standard setter in determining which reliability scenarios would be economically evaluated. This consultation process would occur 21 months prior to the submission of a TNSP's regulatory proposal for the next regulatory control period. As a result, this consultation process could be undertaken as part of a TNSP's customer consultation on the development of its regulatory proposal for the revenue determination process.[78]

Use of reliability standards in setting revenue allowances

Under the NEL and NER, the AER is required to set the maximum allowed revenue that TNSPs can recover from their customers over each regulatory control period, which generally spans five years. This revenue must be set at a level by the AER which enables TNSPs to comply with all applicable regulatory obligations or requirements.[79]

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78 Under recent changes to the NER as part of the 'Economic Regulation of Network Service Providers' rule change proposal, NSPs are required to indicate in their regulatory proposals the extent to which they have engaged with consumer representatives in the development of their regulatory proposal.

79 See clauses 6A.6.6(a)(2) and 6A.6.7(a)(2) of the NER. Until recently, the AER was also required to provide TNSPs with sufficient capital and operating expenditure to allow TNSPs to maintain the

As discussed in chapter 6, transmission reliability standards set under the framework will be a regulatory obligation under the NER. As a result, TNSPs would be required to include the forecast capital and operating expenditure associated with complying with their reliability standards in their regulatory proposals for the next regulatory control period. The AER would then be required to provide TNSPs with a level of revenue which reflects an efficient, prudent, and realistic expectation of the costs of complying with their reliability standards in making its determinations.[80]

Reliability standards would be set every five years by the relevant standard setter nine months prior to the due date for the submission of a TNSP's regulatory proposal to the AER.

TNSPs would have already undertaken high level modelling of the costs of meeting the reliability scenarios selected by the standard setter during the standard setting process. A more detailed forecast of the costs of meeting their reliability standards would be included in a TNSP's regulatory proposal. Any differences between a TNSP's forecast costs submitted to the standard setter and the costs submitted to the AER in its regulatory proposal would need to be fully explained by the TNSP in its regulatory proposal. Where the AER is not the economic adviser, it will be able to obtain access to both the forecast costs submitted during the standard setting process and the final forecasts used by the economic adviser.

Where there has been a step change in a level of reliability standards from one regulatory control period to the next, the AER will consider whether to amend a TNSP's STPIS targets as part of the revenue determination process. The Commission notes that unlike the distribution STPIS, a TNSP's STPIS targets provide a complementary service incentive to a TNSP's reliability standards, rather than having a direct link.[81]

5.1.2 Reasoning for the recommended approach

Alignment of consultation processes

Aligning a TNSP's customer consultation process during the standard setting process with its consultation process during the development of its regulatory proposal will improve the quality and transparency of the consultation process. Customers will gain a clearer understanding of the broader factors affecting a TNSP's network and how

reliability of their prescribed transmission services and the reliability of their transmission system. In September 2013, the AEMC amended the NER, in response to a rule change proposal from SCER, to limit the expenditure that TNSPs can seek in their regulatory proposals to meeting their reliability standards, rather than maintaining reliability levels.

80 See clauses 6A.6.6(c) and 6A.7(c) of the NER.

81 The transmission STPIS is primarily focussed on incentivising the capability of transmission networks at times when this would be highly valued by network users. For example, this includes incentives on TNSPs to minimise the number of planned transmission outages that can affect wholesale market outcomes.

they may impact on the level of reliability they receive. Aligning these consultation processes would also reduce the administrative burden on TNSPs and customers plus improve the efficiency of the consultation process.

EnergyAustralia agreed that consulting with customers is essential to ensuring reliability standards reflect customer preferences.[82] The MEU supported aligning the customer consultation processes but noted that consulting so far in advance of the commencement of the regulatory control period could reduce the relevance of the consultation process.[83] The MEU supported coordination of regulatory processes as a way of limiting gaming and considered that differences in costs between reliability assessment and revenue proposals should converge overtime as the AER implements detailed performance/benchmarking exercises.[84]The EUAA also saw no reason as to why it is not feasible to align customer consultation with the regulatory proposal.[85]

Submissions from the ENA and Grid Australia considered that TNSPs should be able to discharge their customer consultation obligations by working with DNSPs to consult with end use customers, as a TNSP's customer base is quite different to the customer base for distribution networks.[86]

The Commission agrees that a TNSP's customer base is different to that of a DNSP's, as TNSPs do not deal directly with end use customers. As a result, the Commission anticipates that TNSPs will need to consult with DNSPs and any directly connected customers in undertaking customer consultation to allow the views of end use customers to be taken into account.

The consultation process will assist TNSPs to understand the level of reliability that their customers are seeking and therefore it would not be appropriate for TNSPs to discharge their customer consultation obligations by solely working with DNSPs. The Commission notes that this consultation process will also enable TNSPs to build and develop their relationship with a broader customer base, which will assist customers to understand how reliability is provided.

The Commission notes the MEU's concerns regarding the length of time between the consultation process and the commencement of the regulatory control period. However, the Commission considers that there are significant benefits from aligning the consultation process used by TNSPs to understand community concerns regarding their reliability levels with the consultation process to develop a TNSP's regulatory proposal. We also note that customers will also have a further opportunity to comment as part of the consultation process on the economic adviser's economic assessment draft report.

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82 EnergyAustralia, Submission on the consultation paper, p. 3.

83 MEU, Submission on the consultation paper, p. 32.

84 MEU, Submission on the consultation paper, p. 33.

85 EUAA, Submission on the consultation paper, p. 7.

86 See submissions on the consultation paper from: ENA, p, 8; Grid Australia, p. 17.

Use of reliability standards in setting revenue allowances

The use of reliability standards in the AER's revenue determination process would allow TNSPs to recover sufficient revenue from their customers to meet their standards. This will, in turn, allow TNSPs to be held accountable for their performance against their standards.

The Commission has decided to extend the timeframe between the setting of reliability standards and the submission of a TNSP's regulatory proposal from six months to nine months to allow TNSPs additional time to take into account the impact of their standards on their capital and operating expenditure program.

Submissions on the consultation paper from the ENA and Grid Australia suggested that NSPs should have 12 months rather than six months to prepare their regulatory proposal.[87] The MEU noted that the timeframe for setting standards and incorporating them into regulatory proposals was challenging, but considered that the timeframes should not be extended as it would increase the risk of standards becoming out of date before coming into effect.[88]

The Commission considers that providing TNSPs with nine months rather than six months provides an appropriate balance between allowing TNSPs sufficient time to develop their regulatory proposals and minimising the length of time between when standards are set and when they will apply. The Commission also notes that TNSPs will have already considered the impact of the standards which have been set as part of the standard setting process, albeit at a higher level. This will assist in reducing the time required to prepare their regulatory proposals.

A requirement for TNSPs to explain any differences between their cost forecasts will assist in encouraging the forecasts submitted by TNSPs during the standard setting process to have a degree of rigour. This will provide greater transparency around the likely costs and benefits of each reliability scenario and improve the ability of the standard setter to make an informed decision in setting standards.

In its submission to the consultation paper, the AER proposed that NSPs should be required to submit the same cost forecasts during the revenue determination process as those submitted during the standard setting process.[89] The AER noted that this would further strengthen incentives on NSPs to submit robust cost information to both the standard setter and the AER and that there should only be extremely limited circumstances in which a NSP's cost forecasts should change significantly because of the short time lag between the processes.[90]

87 See submissions on the consultation paper from: ENA, p. 20; Grid Australia, p. 25.

88 MEU, Submission on the consultation paper, pp. 23-24.

89 AER, Submission on the consultation paper, p. 3.

90 Ibid.

Submissions from network users considered that NSPs should be required to explain differences in the costs forecasts provided.[91] Grid Australia suggested that there would be differences in costs forecasts due to differences in timing and that it was unclear why the AER should be engaged in a separate review of the cost assumptions adopted by the economic adviser.[92]

The Commission agrees that there could be some differences in the costs forecasts submitted during the standard setting process and the revenue determination process. This is because the costs forecasts prepared during the standard setting process will be modelled at a relatively high level because of the limited timeframe to undertake this modelling. In contrast, the cost forecasts submitted during the revenue determination process will be far more detailed as TNSPs will have had longer to prepare them and may also have updated information. We also note that the economic adviser may have amended a TNSP's forecasts where it does not consider that they are reasonable.

The Commission considers that in most cases the differences in cost forecasts provided by TNSPs during the standard setting process and the revenue determination process are unlikely to be significant. The Commission suggests that a requirement on TNSPs to explain any differences and for the AER to be provided with access to the forecasts used during the standard setting process will provide sufficient incentives on TNSPs to provide rigorous information.

The Commission notes that the AER will not be required to undertake a separate review of the cost forecasts submitted during the standard setting process. Rather, this information will be used to inform the AER's revenue determination process.

5.2 Updating reliability standards within the regulatory control period

5.2.1 Recommended approach

The standard setter has the opportunity to change the reliability standards within a regulatory control period if it considers that:

(a) there has been, or is likely to be, a material change in the costs or benefits of meeting their reliability standards since the standard setting process was undertaken; and

(b) that continuation of the existing standards would not be in the interests of customers.

The relevant TNSP or the economic advisor can request the standard setter to consider a change to the reliability standards. Alternatively the standard setter could initiate its own review of the standards.

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91 See submissions to the consultation paper from: MEU, p. 33; EUAA, p. 7.

92 Grid Australia, Submission on the consultation paper, p. 29.

A TNSP would only be able to seek an update where it can demonstrate that there has been a change in the input assumptions used during the standard setting process beyond the range of sensitivities that had been considered during this process. In seeking an update to its standards, a TNSP would be required to provide the following information to the standard setter:

- details of the change in input assumptions that has, or is likely to, occur since the standard setting process;
- how the change in assumptions has, or is likely to, contribute to a material change in the overall costs and benefits of achieving its reliability standards over the remainder of the regulatory control period;
- why that change in assumptions means that meeting its existing reliability standards is unlikely to be in the long term interests of consumers; and
- the proposed change to be made to the level of its reliability standards.

Where the standard setter initiates its own review of the standards, it can request the TNSP to provide this information. An update could be sought for either an increase or decrease in the level of a TNSP's reliability standards. The standard setter would be required to publish any update requests it receives or has initiated itself.

In determining whether an update should occur, the standard setter would be required to request the economic adviser to undertake an economic assessment of the costs and benefits of meeting the TNSP's existing reliability standards and the potential impact of any changes to the level of these standards. If the economic adviser requires additional information to undertake this assessment beyond the information provided in the TNSP's update request, the TNSP would be required to provide this information.

The standard setter would be required to publish a draft report for public consultation, which would include the results of the economic assessment, as well as its draft decision. After considering submissions on the draft report, the standard setter would be required to publish its final report setting out its final decision. The standard setter could decide to:

- reject the update request and maintain the standards that had been set under the standard setting process; or
- update the standards by substituting one or more of the TNSP's standards with amended standards which are set at a level which is higher or lower than the existing standards.

The decision making process on an update request would reflect the same process as the standard setting process. Where standard setting had been delegated to the AER or a jurisdictional body, the AER or jurisdictional body would be required to make their decision on the basis of the economic assessment and any guidance provided by the jurisdictional minister. Where the jurisdictional minister has retained responsibility for standard setting, the minister would be able to take into account additional factors,

beyond the results of the economic assessment, in determining whether an update is made.

Where a standard setter has decided to update a TNSP's reliability standards, a TNSP would not be able to seek any changes in its revenue allowance from the AER as a result of this decision. As a result, while updates to standards could occur within a regulatory control period, corresponding changes in allowed revenue to reflect any changes in standards could not be made during the regulatory control period. In addition, TNSPs would not be able to seek any changes in its allowed revenue under the cost pass through provisions in the NER, in relation to changes in reliability standards.[93]

Any change in reliability standards made as a result of material changes in costs will reduce the risks associated with changes in actual costs compared with forecasts costs (both positive and negative) that would otherwise be borne by the TNSP during the regulatory period. Given that expenditure incentives are set by the AER at the start of the regulatory period, it is appropriate that the TNSP has the flexibility to respond to those incentives and consider how best to adapt its expenditure over the remainder of the period to the updated standards.

The Commission notes that this position differs from the proposed approach outlined in its consultation paper and from the approach adopted for distribution reliability. The Commission's reasoning for this change in position is outlined below.[94]

5.2.2 Reasoning for the recommended approach

Summary of the Commission's reasoning

Ideally, reliability standards would remain unchanged over the duration of the regulatory control period where possible to provide certainty and transparency to stakeholders regarding the reliability levels they can expect to receive. As discussed in chapter 3, fixed reliability standards also allow TNSPs to be held accountable for the levels of reliability that they provide in practice.

However, the Commission acknowledges that in a limited number of cases there may be a need for transmission reliability standards to be updated within a regulatory control period. This is because under the recommended framework TNSPs would have a regulatory obligation to comply with their reliability standards in every year under the NER. As a result, if TNSPs are not able to comply with their reliability standards because of a material change in the assumptions that were used in the standard setting

93 For example, TNSPs would not be able to seek a cost pass through under a "regulatory change event" or "service standard event" under clause 6A.7.3 of the NER. The Commission notes that this will require changes to the NER.

94 Further details regarding the reasoning for the difference in the Commission's approach for distribution is set out in its final report on the Review of the national framework for distribution reliability, which is available on the AEMC website.

process, TNSPs may be subject to compliance penalties under the NER. Further discussion on the compliance obligations that TNSPs would face is set out in chapter 6.

The Commission also considers that as TNSPs undertake a small number of large projects and will be subject to standards for each connection point, TNSPs may have limited scope to effectively manage changes in the costs and benefits of meeting their standards. As a result, the Commission considers that TNSPs should have an ability to seek a change to their reliability standards within a regulatory control period where there has been a material change in the costs and benefits of meeting their standards, in order to manage the risks they would otherwise face.

The Commission also notes that an update mechanism would provide standard setters with an opportunity to update standards where changes in costs and benefits mean that the original standard no longer represents an efficient outcome. This allows flexibility in the framework to provide for more efficient investment by TNSPs and more efficient pricing outcomes for customers. The standard setter's considerations and the outcomes under this update mechanism will be useful for the AER when it is reviewing the efficiency of past capital expenditure at the end of the period. As both standard setters and TNSPs could seek an update to standards, this will allow both increases and decreases in the level of the standard to be considered. The Commission notes that the economic adviser would also be able to request the standard setter to initiate an update.

Application of the update mechanism

In relation to the application of the update mechanism, the Commission has deliberately not defined what would constitute a "material" change in the costs and benefits of meeting a TNSP's reliability standards. The Commission has also recommended a limited number of criteria that would need to be met by TNSPs to seek an update. This approach differs from the approach proposed in our consultation paper. These changes have been made to provide standard setters with a degree of flexibility in how the mechanism is applied. The standard setter would exercise judgement in considering whether to update the standards.

The update process would also have a high degree of transparency as update requests, as well as the standard setter's draft and final decisions, would be published. The standard setter would also be required to request the economic adviser to undertake an economic assessment of the costs and benefits of meeting the TNSP's existing reliability standards and the potential impact of any changes. This would allow the standard setter to make an informed decision.

The Commission also anticipates that any requests for updates will be rare. This is because TNSPs only undertake a small number of investments and transmission investments are generally planned over a relatively long time period. This will limit the need for updates to standards within a five year regulatory control period. The standard setter would only change the standards if it considers that this would be in the long term interests of customers.

Processing an update request would also be a relatively lengthy and resource intensive process to undertake within a regulatory control period, which will reduce incentives on TNSPs to seek updates. Further, as the standard setting process will commence 38 months prior to the commencement of the next regulatory control period, where there are significant changes in the costs and benefits of meeting a TNSP's standards, in some cases it may be more prudent for these changes to be considered as part of the standard setting process for the next regulatory control period rather than seeking to amend the standards for the current regulatory control period.

Submissions on the consultation paper from Alinta Energy, the MEU, EnergyAustralia and Grid Australia supported the use of an update mechanism under defined circumstances.[95] However, Grid Australia considered that a lower threshold for updating standards may be justified compared to the threshold proposed in the Commission's consultation paper.[96]

Submissions from the AER, the Victorian Government and AEMO did not support the use of an update mechanism. The AER considered that an update mechanism could reduce incentives for TNSPs to manage their allowances efficiently and inappropriately shift the risk of cost over-runs onto consumers, who are less able than TNSPs to manage this risk.[97]

The Victorian Government considered that the update mechanism would increase the costs of standard setting and detract from the transparency and certainty benefits of the recommended framework.[98] The Victorian Government and AEMO also considered that the update mechanism would not be needed if a project by project approach was used to determine reliability levels.[99] AEMO suggested that the contingent projects mechanism could be used for large and uncertain transmission augmentations as an alternative to the update mechanism, to reduce the revenue risks for consumers.[100]

Implications of an update mechanism for a TNSP's revenue allowance

The Commission notes that most of the concerns regarding the update mechanism have been related to the potential revenue implications of any updates in standards that may occur. In the Commission's consultation paper, the Commission had proposed that the cost pass through mechanism be used to adjust a TNSP's revenue following any update in its reliability standards.

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95 See submissions on the consultation paper from: Alinta Energy, p. 4; MEU, p. 34-35; Energy Australia, p. 4; Grid Australia, p. 21.

96 Grid Australia, Submission on the consultation paper, p. 21.

97 AER, Submission on the consultation paper, p. 4.

98 Victorian Department of State Development, Business and Innovation, Submission on the consultation paper, p. 2.

99 See submissions on the consultation paper from: Victorian Department of State Development, Business and Innovation, p. 2; AEMO, p. 5.

100 AEMO, Submission on the consultation paper, p. 5.

However, on further reflection, the Commission has decided that where the standard setter has updated a TNSP's standards, there will be no scope to adjust a TNSP's revenue allowance for the remainder of the regulatory control period.

The Commission has made this decision because determining the effect of the update in standards on a TNSP's revenue would be an administratively complex and lengthy task. This is because changes in standards may have broader implications on a TNSP's investment program which would need to be considered by the AER. Further, as discussed above, as the update process itself would be a lengthy process, a further process to adjust a TNSP's revenue following the completion of the update process would be unlikely to be finalised within a regulatory control period. Therefore, the Commission considers that the potential costs of providing for a revenue adjustment would be likely to outweigh the benefits for customers of any short term savings that may occur.

The Commission also considers that mid period changes in revenue could affect the incentives for efficient investment that arise under ex-ante revenue allowances and other incentive measures that have been put in place for NSPs following recent changes to the NER. This is because, as noted by the AER, it may reduce the incentives on TNSPs to manage changes in costs during the regulatory control period, if they consider that they are able to seek a mid-period revenue adjustment to address these changes.[101]

Allowing the opportunity for the reliability standards to be adjusted during the regulatory period allows for the standards to be revised to better reflect the costs and benefits associated with the standards, where there are material changes in these costs and benefits. This could be to either lower the standard in light of higher than expected costs or alternatively to increase the level of required reliability, if actual costs turn out to be less than estimated.

Importantly, the ability to adapt the standards provides flexibility to avoid the possibility of TNSPs being required to undertake inefficient investments in order to comply with standards which no longer remain appropriate, given material changes in costs and benefits. In the absence of a change in the standard during the period, where the investment was substantially more expensive than initially forecast, the TNSP would still be required to undertake the investment to meet the standard.

As the TNSP would be complying with its regulatory obligations, the AER would be required to include such investments in the TNSP's regulatory asset base, which in turn would feed through into customers' prices in future regulatory periods. In such circumstances, allowing the standards to be lowered would reduce this risk of inefficient investment.

Allowing for a revision in standards also assists TNSPs to better manage the risks associated with setting allowed revenues based upon estimates of costs at the start of

101 AER, Submission on the consultation paper, p. 4.

the five yearly regulatory period. Under a revenue determination, TNSPs are exposed to any differences in the actual costs incurred in meeting the reliability standard during the regulatory period, compared to the forecasts used to set the allowed revenue. It is appropriate that TNSPs and not customers are exposed to these risks as network businesses can better manage such risks.

Where the reliability standard is able to be adjusted during the regulatory period to reflect a material change in costs, this reduces the TNSP's exposure to the risks associated with cost changes. For example, an increase in the cost of investments required to meet the standard would be borne by the TNSP for the remainder of the regulatory period, in the absence of an adjustment to the standard. Where the standard is lowered to reflect the higher cost, the extent of the risk faced by the TNSP is reduced.

Conversely, where a material reduction in investment costs means it is efficient for the reliability standard to be increased, then the TNSP will receive less of the benefit from the cost reduction than it would have in the absence of the change in standard.

Mid-period changes in revenue could also result in greater volatility in network charges over the regulatory control period, which could be difficult to manage for retailers and consumers. The Commission notes that as any updates to standards would be rare, any potential revenue risks for TNSPs would be limited and would only be borne for the remainder of the regulatory control period. Therefore, the Commission considers that these risks would not be significant.

Therefore, the Commission considers that the opportunity for reliability standards to be revised but not for allowed revenue to be adjusted, during a regulatory period achieves an appropriate balance between helping TNSPs to manage their risks under the framework and protecting customers from inefficient network investment for reliability purposes.

For the framework for distribution reliability, the Commission recommended that distribution reliability targets should remained fixed during the regulatory period. The Commission considers that a different approach is appropriate for transmission given that TNSPs would be obligated to meet their regulatory standards each year. Under the distribution framework, DNSPs would not be required to achieve their reliability targets each year and instead would be incentivised through the distribution STPIS. Therefore, the risk that reliability standards set under the framework could lead to inefficient investment during the regulatory period is less for distribution than for transmission.

6 Compliance and reporting obligations

This chapter outlines the compliance obligations and reporting requirements associated with meeting transmission reliability standards under the recommended framework.

6.1 Compliance and audit obligations

6.1.1 Recommended approach

TNSPs would be required to meet their reliability standards in every year under the recommended framework. Compliance with transmission reliability standards would form an obligation under the NER. As a result, a TNSP's compliance with its transmission reliability standards would be subject to monitoring and enforcement by the AER. This role would be in addition to the AER's existing role in monitoring compliance against the transmission STPIS.[102]

To support these compliance obligations, TNSPs would be required to set out their plans for meeting their transmission reliability standards for each connection point as part of their Annual Planning Reports.

TNSPs would also be required to complete an audit every five years to demonstrate that they have undertaken adequate planning and have appropriate systems in place to meet their reliability standards. Those audits must be carried out by a suitable expert body with the details of how the audits are undertaken set out in both the NER and the standard setting process guidelines. TNSPs would submit the outcomes of the five-yearly audit as part of their regulatory proposals for the AER's revenue determination process. This represents a change to the approach outlined in the consultation paper which involved independent audits being undertaken on an annual basis.

As discussed in section 6.2 below, TNSPs would also be subject to performance reporting requirements. The AER would have the discretion to undertake audits of the performance reporting undertaken by TNSPs to assess whether performance levels had been measured accurately in accordance with the definitions contained in the national reference standard template and the guidance included in the NER and guidelines for the standard setting process.

In addition, TNSPs would have obligations relating to customer consultation, the provision of information, and reporting as part of the standard setting process. As these obligations will be set out in the NER, TNSPs will also be subject to monitoring and enforcement by the AER in relation to these obligations.

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102 As discussed in chapter 5, we note that a TNSP's targets under the transmission STPIS will have an indirect relationship to a TNSP's reliability standards.

6.1.2 Reasoning for the recommended approach

The performance of transmission networks, unlike distribution networks, cannot be easily observed. As discussed in chapter 3, this is because transmission networks are built to provide a higher level of reliability than distribution networks due to the potentially widespread consequences of a failure on a transmission network.

Interruptions on transmission networks may not only affect a large amount of customers within a jurisdiction, they may also have implications for the level of reliability and prices paid by customers and the revenues received by generators in other jurisdictions. This is due to the integrated nature of the transmission system. As transmission networks are built to provide a high level of reliability, under investment on transmission networks is unlikely to result in observable changes in performance in the short term.

To protect against the risk of under investment and inadequate maintenance in reliability, the Commission considers that TNSPs should face regulatory obligations under the NER to meet their reliability standards in every year. We note that this is a different arrangement to the recommended approach for distribution reliability, where the DNSPs are incentivised to meet their reliability targets directly through the distribution STPIS. This difference is appropriate given the different characteristics of transmission networks.

The AER will be able to continue to set incentives for reliability performance under its transmission STPIS. Currently, the transmission STPIS includes components relating to the duration and frequency of loss of supply. This provides supporting incentives for the TNSP to operate the existing network efficiently. Therefore, the transmission STPIS could complement the recommended framework and further support these compliance obligations. Under the NER, the AER has sufficient flexibility to adjust the operation of the STPIS to take into account the reliability standards set under the recommended framework.

To provide greater transparency and a degree of accountability that reliability standards will be met, TNSPs will also be required to publicly report on their plans to meet their standards each year, as well as have their plans independently audited every five years. A combination of public reporting and independent audits will assist in promoting compliance by TNSPs. This will also provide an indication of the business' preparedness to deal with interruptions.

As compliance with standards would form a NER obligation, the AER would be tasked with monitoring compliance even where the jurisdictional minister retains responsibility for standard setting. We consider that the transfer of the compliance function to the AER would assist in facilitating a NEM-wide approach to network reliability and would be consistent with the AER's role as the economic regulator.

In submissions to the consultation paper, Grid Australia and the ENA suggested that TNSPs should only have a "reasonable endeavours" obligation to comply with their reliability standards rather than an obligation to comply in every year.[103] Grid Australia and ENA considered this was necessary as there may be factors beyond a TNSP's control, such as demand being higher than forecast, which could affect its compliance.[104]

While the Commission acknowledges that in some cases there may be factors beyond a TNSP's control which could affect its compliance, the Commission considers that the AER would have sufficient discretion in how it undertakes any enforcement activities to allow these factors to be considered.

The Commission also notes that compliance with existing transmission reliability standards forms a condition of a TNSP's operating licence in a number of jurisdictions. As a result, non-compliance could theoretically lead to the loss of a TNSP's licence. In light of these existing compliance obligations, the Commission considers that its recommended approach places an appropriate level of accountability and responsibility on TNSPs to meet their standards.

Grid Australia and the ENA also raised concern about the proposed annual audit requirement, as set out in the Commission's consultation paper. Grid Australia suggested that annual audits were not required as TNSPs are already required to report on their processes to satisfy current reliability standards in their Annual Planning Reports, while the ENA considered that the AER already has the power to audit compliance.[105] Grid Australia also considered that the costs of an audit would be non-trivial.[106]

The MEU agreed that audits should be conducted in a manner that minimises costs and resources, but considered that annual independent audits were important to maintain the integrity of the system.[107]

The Commission continues to consider that independent audits are required to provide sufficient scrutiny, transparency and accountability on a TNSP's plans to meet its standards. Further, as transmission planning is a relatively technical exercise, the Commission considers that an expert audit of a TNSP's plans is necessary to provide jurisdictional ministers, the AER and customers with a degree of comfort that the standards which have been set are being met.

One goal of reliability standards is to prevent interruptions where the impact is too costly. Therefore, the audit will assess whether a TNSP has a minimum set of capabilities and appropriate procedures to demonstrate the ability to meet the required

103 See submissions on the consultation paper from: Grid Australia, p. 22; ENA, p. 9.

104 Ibid.

105 See submissions on the consultation paper from: Grid Australia, p. 31; ENA, p. 9.

106 Grid Australia, Submission on the consultation paper, p. 31.

107 MEU, Submission on the consultation paper, p. 37.

reliability standards. This would include looking at the TNSPs back-up facilities, interruption procedures, communications and maintenance plans (ie vegetation clearance).

However, the Commission agrees that annual audits may impose too high a regulatory burden on TNSPs. Therefore, the Commission has reduced the audit requirement to a five-yearly requirement.

The Commission has also recommended that the results of audits be considered by the AER as part of the revenue determination process rather than under a separate process, which will assist in further reducing the regulatory burden of this obligation. This information will also assist the AER in determining the level of revenue which is consistent with the efficient delivery of a TNSP's standards for the next regulatory control period.

6.2 Performance reporting requirements

6.2.1 Recommended approach

TNSPs would be required to publicly report on their performance against their transmission reliability standards in their Annual Planning Reports. This reporting would be for each connection point in a TNSP's network and includes an explanation of any deviations in their performance against their reliability standards. TNSPs would be required to report on their performance in a manner consistent with the definitions and measurement methodologies contained in the national reference standard template for transmission.

As discussed in Box 6.1, because supply interruptions only occur on transmission networks in a limited number of cases each year, alternative methods to reporting on performance may be required beyond the use of actual performance data. The method which is used to report on performance may also differ depending on the reliability standards which have been set for each connection point. The detail of the performance reporting requirements would be set out in the NER, with further details specified in the guidelines for the standard setting process.

The AER would be required to summarise the performance outcomes of each of the TNSPs in the NEM based on the information published in their Annual Planning Reports. This summary would form a component of the AER's annual benchmarking report on the relative efficiencies of NSPs, which is a requirement on the AER following changes to the NER under the Economic Regulation of Network Service Providers rule change.[108] The Commission considers that benchmarking reports will need to be carefully prepared by the AER so that the implications of differences in network characteristics are clearly explained.

108 See AEMC, Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services, final determination, 29 November 2012.

As discussed above in section 6.1, TNSPs would also be required to report on the plans they have in place to meet their reliability standards in their Annual Planning Reports each year.

Box 6.1 Alternative methods for assessing transmission reliability performance and compliance

It is difficult to directly observe the outcomes of transmission networks as supply interruptions on transmission networks are rare. As a result, in assessing a TNSP's compliance with its reliability standards both in terms of the recommended audit process and performance reporting requirements, it may not be possible to rely on actual performance data alone. This is because there may not be sufficient performance data to assess a TNSP's compliance or this data may not provide an accurate reflection of the underlying reliability of a TNSP's network.

To address these issues, a combination of actual data and simulation data could be used to assess a TNSP's performance. The AEMC requested Parsons Brinkerhoff to undertake work to examine how actual data and simulation data could be used and the advantages and disadvantages of these methods.

Parsons Brinkerhoff identified four possible methods which could be used to measure transmission reliability performance and compliance:

- **The measurement of transmission outputs**: This would involve measuring the actual output performance of a TNSP as faced by customers (eg number of supply interruptions due to the transmission network). While this method is relatively low cost and transparent, events may not occur often enough to be measured on an annual basis. The measurement of outputs is also backwards looking so may not provide an indication of the future level of reliability, particularly under low frequency events.

- **The measurement of transmission inputs**: This would involve measuring the reliability of components of the network which can be measured by the TNSP, but may not be directly observable by customers. For example, this could include measures of the unavailability of specific network elements. The unavailability of a network element may not necessarily result in a supply interruption to customers, but can be measured by TNSPs and may assist in providing an indication of the risk of supply interruptions to customers.

  Similarly, to the measurement of transmission outputs, this method is low cost. However, the use of input measures also need to be complimented by the use of other measures to provide a more complete understanding of a network's performance.

- **Simulations**: This would involve modelling the potential long term reliability outcomes that would occur on a network. Simulations can be

used where historic data is unavailable or an unsatisfactory base from which to forecast future reliability levels. They can also be used to assess a broad range of timeframes, reliability metrics, and possible network scenarios, including the impact of infrequent events.

However, simulations are generally higher cost than the measurement of actual output or input performance. They are also not transparent to stakeholders due to their technical nature and do not directly measure the performance of a network. The value of a simulation method is also highly dependent on the inputs (eg expected restoration times) used in the simulation.

- **Simulation- probability modelling**: This is a subset of simulation methods and would involve the use of actual network outage data to assess the probability of customers experiencing an interruption to supply over the long term. This method allows the potential for infrequent events to be assessed and is a lower cost method compared to more complex simulations. However, as with all simulation methods, this method has disadvantages relating to transparency and a dependence on the inputs used.

Parsons Brinkerhoff concluded that a mix of both actual reliability data and simulation data should be used to assess a TNSP's compliance with its reliability standards. As these methods have different advantages and disadvantages, a combination of methods can be used to provide a fuller understanding of the reliability performance of a network. Further detail on how each of these methods could be applied is set out in Parsons Brinkerhoff's report, which has been published on the AEMC website.

6.2.2 Reasoning for the recommended approach

Public reporting by TNSPs on their performance against their reliability standards, in combination with the audit and planning requirements discussed above, will increase the accountability of TNSPs. It will also promote transparency in relation to the reliability levels which are achieved in practice.

The Commission considers that the use of a common set of definitions when reporting is undertaken will facilitate consistent reporting throughout the NEM. This will improve the ability of standards to be compared across jurisdictions. This is likely to assist generators and large customers to determine where to locate their operations, which could lead to more efficient investment decisions by market participants. It is also likely to assist TNSPs to undertake joint planning with other TNSPs, which will promote a more integrated transmission system. This is consistent with the submission

from the AER which supported the clear expression and consistent definition of reliability measures to facilitate comparisons between NSPs' performances.[109]

Consistent performance reporting would also assist the AER to undertake benchmarking, which in turn will assist the AER in determining revenues which are consistent with the efficient delivery of a TNSP's reliability standards. This provides for more efficient network investments by TNSPs and more efficient pricing outcomes for customers.

The ENA agreed that public reporting of performance through Annual Planning Reports would promote accountability, transparency, and facilitate benchmarking.[110] The ENA also noted that reporting should be undertaken with and without exclusions and that networks should report on factors beyond their control and the reasons for any departure from their reliability standards.[111]

The MEU considered that transparency and consistency were key to the reporting framework and that reporting should not only include performance against standards, but trends over time.[112] The MEU also suggested that exclusions and special circumstances should be fully detailed.[113]

Grid Australia noted that transmission performance cannot be accurately measured by examining outcomes and therefore reporting should be materially different for TNSPs and DNSPs.[114]

As discussed in Box 6.1 above, the Commission agrees that performance reporting for TNSPs, unlike for DNSPs, cannot rely solely on actual performance data. We have also noted that the method which is used for performance reporting will vary with the type of standards which have been set. These factors will be considered further in the development of the NER requirements and guidelines for the standard setting process.

For example, for connection points with an "N" standard, output parameters such as the level of expected unserved energy could be observed and reported on. This is because under an "N" standard a failure of a network element will be likely to lead to a supply interruption and unserved energy, because there is no additional redundancy built into that connection point. AEMO supported the use of measures of expected energy not served in its submission and noted that it was an "auditable" measure.[115]

109 AER, Submission on the consultation paper, p. 2.

110 ENA, Submission on the consultation paper, p. 15.

111 Ibid.

112 MEU, Submission on the consultation paper, pp. 37-38.

113 Ibid.

114 Grid Australia, Submission on the consultation paper, p. 31.

115 AEMO, Submission on the consultation paper, p. 8.

However, for connections points which have a high level of reliability, such as a N-2 standard, a reliance on the level of actual unserved energy alone is unlikely to provide sufficient information to determine how a TNSP has performed against its standard.

In relation to special circumstances in performance reporting, the Commission notes that TNSPs will have an ability to explain the reasons for any departures from their standards or special circumstances that have arisen as part of their Annual Planning Reports. Any exclusions would need to be reported in a manner which is consistent with the national reference standard template to allow performance to be compared across TNSPs.

We anticipate that the benchmarking report prepared by the AER would include information on the trends in the reliability performance for each TNSP to allow changes in performance to be considered. We note that our recommendations are broadly consistent with the reliability performance data proposed by the AER to enable it to undertake benchmarking.[116]

Under the existing NER requirements TNSPs are only required to include limited information relating to compliance against their reliability standards in their Annual Planning Reports. It appears that TNSPs are only required to include a forecast of constraints or an inability to meet their reliability standards, as well as information on any proposed augmentations to their network to meet their standards.[117]

TNSPs are not required to currently include any information relating to their actual performance against their standards or any reasons for non-compliance against their standards.

Therefore, the implementation of the framework will include changes to the content requirements for transmission Annual Planning Reports to ensure there is sufficient information to:

- provide to stakeholders and independent auditors on the plans TNSPs have in place to meet their reliability standards; and
- provide to stakeholders and the AER on the performance of TNSPs against their reliability standards.

116 AER, 'Explanatory statement: Draft Expenditure Forecast Assessment Guidelines for electricity transmission and distribution', August 2013, p. 80.

117 See clauses 5.12.2(c)(3) and (5) of the NER.

7 Implementation of the recommended framework

In this chapter, we explain:

- the way forward on how to capture and implement the benefits of our framework both now and over time; and
- highlight the main changes that each NEM jurisdiction would need to make to adopt the framework.

7.1 Way forward

The framework will establish an independent, transparent process to inform the standard setter on the economic trade-off between the costs and benefits of providing reliability. The framework will also allow more opportunities for customers to be consulted and provides for consistent reporting on transmission reliability performance. As explained in this report, these would yield significant benefits in the interests of consumers. These benefits are:

- economically determined reliability standards so that customers, as a group, pay for a level of reliability consistent with their preferences;
- transparency around the reliability standards setting process to facilitate stakeholder understanding and enabling customers to contribute to the process of determining the appropriate level of reliability; and
- consistency in how reliability performance is reported to improve understanding and facilitate benchmarking.

To implement the framework, changes would need to be made to the Australian Energy Market Agreement (AEMA), the NEL, the NER, and to jurisdictional instruments. Once implemented, the framework would set out the common arrangements for the regulation of transmission reliability standards across the NEM. Given the time involved to make the various legislative amendments needed, we are recommending that SCER proceed with an initial process where key parts of the framework are developed and applied in the interim prior to the implementation of the full framework.

This interim stage would involve SCER requesting the AER to have ongoing responsibility for reviewing and updating VCR measures after the completion of AEMO's review of the VCR. Jurisdictional VCRs would enable economic assessments of reliability standards to be undertaken as they would allow the benefits of different reliability levels to be quantified, based on customers' preferences. Jurisdictional VCRs would also deliver benefits in economic regulation and network investment planning. This is similar to the interim stage proposed in the distribution reliability framework final report.

The interim stage would also involve SCER submitting a rule change to the AEMC to establish the arrangements for AEMO to develop the national reference standard template for transmission. This rule change will set out AEMO's responsibilities and provide details on the process and considerations that AEMO must take into account when developing the national reference standard template.

Once the AEMC has processed the rule change request, AEMO would develop the national reference standard template in partnership with industry and jurisdictions. The national reference standard template would identify the range of input and output measures that could be used to express standards and provide consistent definitions, including common methodologies, for these measures. The template will also provide advice on how to select the appropriate combination of measures to better reflect customer preferences. AEMO would need to develop the template in a manner which can be adopted by jurisdictions and easily incorporated into their existing arrangements.

The national reference standard template would facilitate the achievement of economically derived standards. The template would also allow reliability standards and performance against these standards to be compared across the NEM. Jurisdictions could use the template in their current jurisdictional arrangements.

We recommend that the interim stage commence now as customers could benefit from a more transparent and efficient process before the framework is fully implemented. SCER could do this in conjunction with the interim stage recommended for distribution reliability.

Once the interim stage is complete, jurisdictions may decide to implement further aspects of the framework in their jurisdictional arrangements. For example, a jurisdiction could use the economic assessment process proposed in this report in setting reliability standards in their jurisdiction. In this way, jurisdictions could reap further benefits from the framework.

If jurisdictions decide to delegate standard setting to the AER, this will require implementation of the full framework. This would involve amendments to:

- the AEMA in order to transfer responsibility for reliability standard setting into the national electricity market arrangements;
- the NEL so that the AER has the legislative functions to perform its possible roles under the framework. These changes will enable jurisdictions to delegate standard setting to the AER;
- the NER to introduce rules for applying the framework including obligations on participants and specifying the various steps involved under the framework; and
- jurisdictional instruments so that they are consistent with the framework.

Once implemented, the framework would set out the common arrangements for the regulation of transmission reliability standards and performance across the NEM.

If SCER agrees to adopt the framework, the next stage would be to request the AEMC to develop a detailed implementation plan. This plan would include proposed drafting of the necessary legislative amendments to the NER, AEMA, NEL and any necessary changes to jurisdictional instruments. It would also provide advice on the appropriate sequencing of those changes.

7.2 Interim stage - Develop supporting arrangements

Under the interim stage, SCER would:

- request the AER to be responsible for reviewing and updating VCR measures after the completion of AEMO's review of the VCR;
- submit a rule change request to the AEMC to specify AEMO's responsibilities, including the process and key considerations, to develop the national reference standard template. Once the rule change request has been processed, AEMO would work with industry and jurisdictions to develop the national reference standard template.

Appendix B sets out these tasks in more detail.

The merit of having an interim stage is that it would allow some of the benefits of the framework to be captured before the full framework can be implemented. Estimates of the VCR and the national reference standard template would be useful tools to facilitate efficient investment, increase transparency, and improve regulatory outcomes.

We recommend that SCER request the AER to be responsible for reviewing and updating the VCR measures following the completion of AEMO's review of VCR in early 2014. The Commission considers that the AER is the most appropriate body to be responsible for the VCRs given the interactions with its economic regulation functions. This task was also included as part of the interim stage recommended for the distribution reliability framework.

As AEMO's VCR methodology and VCR measures will be finalised in early 2014, the work for the AER will be to consider how the VCR measures can be updated and incorporated into the existing jurisdictional reliability arrangements. This includes how to appropriately escalate the VCRs each year. The AER would also consider the timing of when VCR measures would need to be re-estimated and whether AEMO's methodology needs to be updated. The use of VCRs would have wider benefits than just setting reliability standards because the VCR is used as an input into other regulatory processes such as for transmission investment through the RIT-T and for the STPIS.

We also recommend that AEMO be required to develop the national reference standard template for transmission. The task would be to produce a template that identifies the range of input and output measures that standard setters could choose from to express transmission reliability standards. The template would provide

consistent definitions of these input and output measures as well as common methodologies for developing these measures. The template would also describe how the normal operating state 'N' as used in N-x network redundancy input based measures should be modelled.

We consider that AEMO could develop this template in connection with its national transmission planning functions under the NEL. However, as the NEL does not specifically contemplate AEMO providing advice based on terms of reference developed by SCER, there are limits on SCER's ability to prescribe the basis on which AEMO undertakes this work. Therefore, SCER would need to submit a rule change to the AEMC, which would set out AEMO's responsibilities, including the process and key considerations, to develop the national reference standard template.

The development of the national reference standard template for transmission would improve transparency and promote benchmarking. The national reference standard template for transmission will also facilitate efficient reliability setting through establishing both the range of appropriate input and output measures and the appropriate measurement methodologies for economically derived transmission reliability standards.

We note that developing the national reference standard template for transmission will be a technical process and therefore it would be important that AEMO works closely with industry, including TNSPs, and jurisdictions when undertaking this task in a manner consistent with the proposals set out in this report.

Once the framework is implemented in full, the tools developed in the interim stage can be readily used within that framework. VCRs and AEMO's national reference standard template for transmission will be key components of the framework.

In deciding whether to proceed with this interim stage, SCER would need to consider the resource implications for the AER and how the use of VCRs will enhance current arrangements.

Figure 7.1 below summarises the key features of the interim stage.

Figure 7.1 Interim stage

Stage of Implementation	Implementation Action	SCER Action	Key Tasks	Responsibility	Considerations
Interim Stage	**Develop supporting arrangements for potential implementation of the national framework**	SCER would submit a rule change request to the AEMC for AEMO to develop the national reference standard template for transmission. SCER to request the AER to be responsible for reviewing and updating the VCR measures.	Develop and submit a rule change request to the AEMC setting a requirement for AEMO to develop the national reference standard template for transmission in accordance with the principles and guidance set out in this final report. Also, request the AER to be responsible for reviewing and updating VCR measures.	SCER	The purpose of this Interim Stage is to develop the national reference standard template for transmission and to apply the VCR measures reviewed and updated by the AER (but initially developed by AEMO) to facilitate the setting of reliability standards in a manner consistent with the recommended framework.
			AEMC to process a rule change request from SCER requiring AEMO to develop the national reference standard template.	AEMC	The rule change request would set out AEMO's responsibilities, including the process and key considerations, when developing the national reference standard template.
			After the AEMC has completed the rule change request, AEMO to work in partnership with industry and jurisdictions to develop and publish the national reference standard template for transmission.	AEMO	AEMO could chair a working group with industry and jurisdictions to develop the national reference standard template for transmission.
			AER to have ongoing responsibility for reviewing and updating the VCR measures.	AER	While the AER would have ongoing responsibility for reviewing and updating the VCR measures, in the short term, jurisdictions could use the VCR methodology and values calculated by AEMO.

7.3 Implementing the framework

During the interim stage, jurisdictions may decide to implement further aspects of the framework in their jurisdictional arrangements. For example, jurisdictions could decide to apply the standard setting process and the economic assessment process proposed in this report to their arrangements. Jurisdictions can decide to apply these aspects of the framework in their own time.

If jurisdictions choose to delegate standard setting to the AER, then this will require implementation of the full framework. Implementation of the framework will require time to make the necessary amendments to the AEMA, NEL, NER, and relevant jurisdictional instruments. We have identified four stages that would need to be undertaken before the full framework could be applied to a TNSP.

In brief, these four stages of implementation include:

- Stage 1 would involve the AEMC working with jurisdictions to develop a detailed implementation plan of the necessary legislative changes to implement the framework.
- Stage 2 would involve roles for the Council of Australian Governments (CoAG), SCER, the AEMC and jurisdictions to implement the necessary legislative changes after SCER has considered the implementation plan in stage 1.
- Stage 3 would involve developing components of the framework such as the AER's guidelines for the standard setting process and jurisdictions making a decision on whether to delegate standard setting to the AER or a jurisdictional body. Jurisdictions would also provide any guidance to the AER or jurisdictional body at this stage where they have delegated standard setting.
- Stage 4 would involve applying the framework, as set out in this report, to the start of a NSP's regulatory control period.

The changes would also need to be correctly sequenced because the AEMC would only be able to consider proposed changes to the NER after the relevant NEL changes have been made.

7.3.1 Stage 1 - Identify and prepare legislative arrangements for the framework

In Stage 1, SCER would need to decide whether to establish the recommended framework. A SCER decision to establish the framework would involve a commitment to develop and apply all aspects of the framework set out in this final report. Jurisdictions would then be able to adopt the framework.

If a decision is made by SCER to establish the framework, then SCER would request the AEMC to prepare a detailed implementation plan (stage 1A). The AEMC's detailed implementation plan would set out all the required changes to the AEMA, NEL, NER and changes to jurisdictional instruments, including jurisdictional application acts, in

order to implement the framework. The AEMC would work closely with jurisdictions and stakeholders in developing this plan.

The AEMC's detailed implementation plan could include, among other things, determining what changes need to be made to the:

- AEMA in order for jurisdictions to delegate the standard setting process to the AER;
- AEMA and NEL to empower the AER to set reliability standards;
- NER to establish the framework;
- NER to empower the AER to develop guidelines for the standard setting process; and
- jurisdictional instruments to roll back existing arrangements including compliance obligations so that they are consistent with the recommended framework.

After the AEMC has developed a detailed implementation plan, SCER would then need to consider and make a decision on how to implement the framework. SCER's decision to implement the AEMC's detailed implementation plan would involve agreement on changes to the AEMA, NEL, and NER as well as any changes to jurisdictional instruments as a suite of legislative reforms. CoAG would need to make a decision on changes to the AEMA.

7.3.2 Stage 2 - Establish legislative arrangements for the framework

In Stage 2, SCER would need to establish the legislative arrangements for the framework by implementing the AEMC's detailed implementation plan completed in Stage 1.

There would be a set of three legislative changes:

- CoAG would need to change the AEMA and SCER would need to change the NEL. Such changes could be identified in the AEMC's detailed implementation plan (stage 2A).
- The AEMC would assess a request to make changes to the NER received from SCER. In order for the AEMC to assess the rule change request, the NEL changes must first be completed. Also the advice from the AER and AEMO in the interim stage could inform the development of the NER changes (stage 2B).
- Jurisdictions that adopt the framework would need to change their jurisdictional application acts and any other jurisdictional instruments in accordance with the drafting set out in the AEMC's detailed implementation plan (stage 2C).

To establish these legislative arrangements, there would be a need for coordination across all of the three tasks.

7.3.3 Stage 3 - Implement components needed for the framework

Stage 3 relates to the implementation of components needed for the framework following the establishment of legislative changes in stage 2. These components include the AER's guidelines for the standard setting process and any decision by a jurisdiction to delegate standard setting to another body.

The AER would develop the guidelines for the standard setting process for use by the economic adviser in assessing reliability scenarios under the framework (stage 3A).

Also, at this stage, jurisdictions could delegate standard setting to the AER or a jurisdictional body and provide any instructions associated with that delegation, where it decides to do so. This may include instructions relating to the management of high impact, low probability events (stage 3B).

7.3.4 Stage 4 - Application of the framework

Stage 4 involves the actual application of the standard setting process under the framework. Stage 4 would commence 38 months prior to the start of the relevant regulatory control period.[118] This stage would involve roles for the TNSP, economic adviser, standard setter, jurisdictions and the AER as set out in the framework.

Figure 7.2 below summarises the key features of the four stages of implementation.

118 As set out in chapter 5 of this report, the 38 month time frame is comprised of 12 months for the standard setting process, 9 months for the preparation by NSPs of the regulatory proposal and 17 months for the revenue determination process.

Figure 7.2 Four stages of implementation of the full framework

Stage of Implementation	Implementation Action	SCER Action	Key Tasks	Responsibility	Considerations
Stage 1	**Identify and prepare legislative arrangements for the national framework by AEMC developing an implementation plan.**	SCER would need to decide whether to establish the national framework for adoption by jurisdictions. If a decision is made, then SCER would need to request the AEMC to prepare a detailed implementation plan.	1A: AEMC to develop a detailed implementation plan. The AEMC's detailed implementation plan would comprehensively set out all the required changes to the AEMA, NEL and NER, including any changes to jurisdictional instruments to implement the recommended framework.	AEMC	Stage 1 should only be progressed following a commitment from SCER to adopt the national framework. Timing of stage 1 is not dependent upon completion of the interim stage.
		SCER to decide whether to implement AEMC's detailed implementation plan.	1B: SCER would need to consider and reach agreement on the AEMC's detailed implementation plan.	SCER	
Stage 2	**Establish legislative arrangements for the national framework**	SCER to establish legislative changes for the national framework.	2A: COAG would need to make AEMA changes and SCER would need to make NEL changes	COAG/SCER	COAG and SCER to consider what changes are needed following a review of the detailed implementation plan.
			2B: AEMC to assess NER changes	AEMC	The Request for Advice from the Interim Stage could inform the development of the NER changes.
			2C: Adopting jurisdictions to change their jurisdictional application acts (and any other jurisdictional instruments) to implement the national framework.	Jurisdiction	Jurisdiction to adopt the jurisdictional changes set out in the AEMC's detailed implementation plan prepared and agreed upon in Stage 1.
Stage 3	**Implement components needed for the national framework.**	No SCER action required.	3A: AER to consult on and publish economic assessment guidelines.	AER	AER would be empowered to develop the economic assessment guidelines only after the NER changes have taken effect.
			3B: Jurisdictional minister to decide whether to delegate standard setting including any instructions to the delegated body.	Jurisdiction	These instructions may include any consideration of high impact, low probability events.
Stage 4	**Application of the national framework.**	No SCER action required.	The proposed framework is applied 38 months prior to the start of the relevant regulatory control period.	NSP, economic advisor, standard setter, jurisdiction, AER	The 38 months comprises of 12 months for the standard setting process, 9 months for NSPs to prepare the regulatory proposal and 17 months for the revenue determination process.

7.4 Key changes to jurisdictional arrangements to adopt the framework

This section summarises the key changes that each NEM jurisdiction would be required to make to their respective reliability arrangements in order to adopt the recommended framework.

7.4.1 South Australia

In South Australia, the transmission planning framework is specified in the *Electricity Transmission Code*. A TNSP must comply with the code because it is a mandatory condition of its transmission licence. Each connection point is currently classified under one of five categories of 'exit point reliability standards' and each category is defined on a N-x basis with maximum restoration times for particular network elements.

The minimum requirements for the expression of transmission reliability standards under the recommended framework are consistent with South Australia's current arrangements. Under the recommended framework, the network redundancy/N-x standard would be derived on an economic cost-benefit assessment process, using a probabilistic approach. In its review of transmission reliability standards, the Essential Services Commission of South Australia (ESCOSA) has asked AEMO to conduct such a probabilistic analysis.[119] Additional parameters, such as output measures, could be used to add further expression to the standard.

Under the framework, the SA Minister could delegate both the economic adviser and standard setting roles to ESCOSA. Therefore, ESCOSA could maintain its current role in setting and reviewing transmission reliability standards.

In terms of compliance, ElectraNet is required to report to the jurisdictional regulator each year on its actual performance with the standard and explain any reasons for non-compliance and how it will continue to improve its performance to meet the standards. Under the framework, the AER would monitor compliance with standards.

7.4.2 Queensland

In Queensland, the transmission planning framework is set by the Queensland government and compliance with the transmission reliability standard is captured through conditions set in transmission licences. According to the terms of its transmission licence, Powerlink must plan its network to meet a N-1 criterion.

Under the recommended framework, transmission reliability standards are based on an economically derived level of network capability expressed in terms of network

119 ESCOSA (2012), review of the electricity transmission code, final decision. Available at www.escosa.sa.gov.au.

redundancy (N-x). Queensland can continue to express its standard in a N-x form but, to be consistent with the framework, the standard would need to be economically derived, on the basis of probabilistic analysis. The standard would also need to incorporate expected restoration times in the event of a supply interruption. Additional parameters, such as output measures, consistent with the national reference standard template for transmission, may also be included.

Under the framework, if the jurisdictional minister is the standard setter, then there would need to be a separate economic adviser. This means that if the Queensland minister continues to set the standards, then it would need to identify an economic adviser, which could either be a jurisdictional body or the AER. The economic adviser is required to be independent of the body that plans and makes network investment decisions. As a consequence, Powerlink could not play the role of economic advisor. The Queensland minister would also have the ability to delegate the standard setting role to another body.

Currently, as a condition of its transmission licence, Powerlink must submit an annual report on its operations to the Queensland government. This reporting includes the number of loss of supply events on Powerlink's network. Under the proposed framework, these jurisdictional arrangements could be maintained. However, the AER would be required to monitor Powerlink's compliance with its reliability standards.

7.4.3 New South Wales

In NSW, the transmission network planning framework and the transmission reliability standard is stipulated in the 'Transmission Network Design and Reliability Standard for NSW' and is set by the NSW government. A redundancy approach is taken to transmission reliability standards. The reliability standards are set at N-1 except for the Sydney CBD where a higher standard is required.

Under the recommended framework, transmission reliability standards would be based on an economically derived level of network capability expressed in terms of network redundancy (N-x). NSW could continue to express its standard in this form, although the standard would also need to incorporate expected restoration times in the event of a supply interruption. However, NSW would need to change the basis by which it derives the N-x standards, to an economic assessment, using probabilistic analysis. There would also be scope for NSW to include additional parameters, including output measures, in the expression of its reliability standards.

Under the framework, if the jurisdictional minister is the standard setter, then there will be a separate economic adviser. This means that where the NSW minister sets the standards, there would need to be an economic adviser independent of the body that plans and makes network investment decisions. TransGrid would not be able to be the economic adviser under the framework. The NSW minister has the ability to delegate the standard setting and economic adviser roles to another delegated body.

Transmission reliability requirements in NSW do not include any jurisdictional reporting obligations on TransGrid beyond the publication of an annual planning

report, which is also a requirement under the NER. Under the recommended framework, TNSPs would be required to report their performance against the standards on an annual basis.

As TransGrid is the TNSP for the Australian Capital Territory (ACT) the above considerations in relation to NSW are also applicable to the ACT.

7.4.4 Tasmania

In Tasmania, transmission planning criteria are set out in the *Electricity Supply Industry (Network Performance Requirements) Regulations 2008*. These requirements set out minimum network performance requirements covering situations where there are supply interruptions during normal operating conditions and for exposure when a network element has been withdrawn from service. Broadly, a N-1 standard applies in Tasmania combined with parameters relating to maximum loss of load (MW) or unserved energy (MWh).

Under the recommended framework, Tasmania would be able to retain its N-x expression of standards. However, these standards would need to be derived using an economic assessment, using probabilistic analysis. Also, under the framework, at a minimum the N-x expression must also include expected restoration times. The current parameters relating to maximum loss of load or unserved energy can be retained as they add granularity to the standard and afford TNSPs flexibility in meeting these standards. In addition, other parameters could potentially be included that are consistent with the national reference standard template for transmission.

In Tasmania, standards are set in legislation by the government. Under the recommended framework, the jurisdictional minister would still be empowered to set the transmission reliability standard. However, there would also need to be an economic adviser, which could be the AER or a jurisdictional body independent of the body that plans and makes network investment decisions. Alternatively, under the framework the jurisdictional minister can delegate both the standard setter and economic adviser roles.

In Tasmania, Transend must inform the jurisdictional regulator of any material breaches of its legislative or regulatory obligations. Transmission network reliability is monitored and reported to the regulator in terms of 'loss of supply' events during a financial year. Under the recommended framework, these jurisdictional arrangements could be maintained with the addition of performance monitoring by the AER.

7.4.5 Victoria

The transmission planning framework in Victoria is set out in the NEL. Under the NEL, AEMO has responsibility for planning and procuring augmentations to the Victorian transmission network. As a result, AEMO makes all investment decisions relating to network augmentations in Victoria.

The approach to transmission planning in Victoria is based on economic cost-benefit assessments on a project by project basis. At the initial stages, AEMO begins its planning by conducting screening studies based on N-x indicators to identify emerging network limitations. Once an emerging network constraint is identified, then AEMO conducts a cost-benefit assessment on a set of options to manage the constraint and the option delivering the greatest expected net benefit is the preferred option. The transmission reliability 'standard' in Victoria would more accurately be described as an outworking of the economic cost-benefit assessment. Therefore, standards are not set prior to the determination of the TNSP's revenue allowance.

Under the recommended framework, Victoria would need to set its standards ex-ante or prior to the revenue determination process. Victoria would also need to meet minimum requirements of expressing standards in terms of network redundancy (N-x) plus supply restoration times consistent with the national reference standard template. Under the framework, these standards would be derived on the basis of an economic assessment, including probabilistic analysis. This is the similar to the approach currently taken by AEMO, although the difference would be that this assessment would need to be undertaken on an ex-ante basis and not on a project by project basis.

Under the recommended framework, the standard setter and economic adviser roles are required to be independent from the body responsible for making investment decisions. In Victoria, AEMO is responsible for investment decisions relating to network augmentations. To implement the framework in Victoria, the Victorian Minister would need to either appoint the AER or a jurisdictional body other than AEMO to undertake the economic assessment, or review AEMO's existing network planning role.

In terms of compliance, under the recommended framework, AEMO - the Victorian TNSP responsible for network augmentations - would need to report each year on its performance against the transmission reliability standards.

Abbreviations

AEMA	Australian Energy Market Agreement
AEMC or Commission	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
CoAG	Council of Australian Government
DNSP	distribution network service provider
DSP	demand-side participation
ENA	Energy Networks Association
ESCOSA	Essential Services Commission of South Australia
EUAA	Energy Users Association of Australia
IPART	NSW Independent Pricing and Regulatory Tribunal
MEU	Major Energy Users
NEL	National Electricity Law
NEM	National Electricity Market
NEO	National Electricity Objective
NER	National Electricity Rules
NSP	network service provider
NTNDP	National Transmission Network Development Plan
RIT-T	Regulatory Investment Test for Transmission
SCER	Standing Council on Energy and Resources
STPIS	Service Target Performance Incentive Scheme
TNSP	transmission network service provider
VCR	value of customer reliability

A Summary of submissions on the AEMC consultation paper

This appendix summarises the submissions received on the AEMC's consultation paper and the Commission's responses to the issues raised. 17 submissions were received in total. Copies of the submissions received can be found on the AEMC website.

Table A.1 Summary of submissions on the AEMC consultation paper

Stakeholder	Comment	Commission's response
General comments on the review		
AER	The AER broadly supports the AEMC's proposed frameworks. In particular, the AER supports: the move towards more consistently defined standards; greater emphasis on output based reliability standards; greater consideration of the value placed on reliability and the costs of achieving different reliability levels; and enhanced customer engagement. The AER notes that the proposed frameworks, combined with the new NER arrangements for the economic regulation of NSPs, are likely to support efficient investment in networks (pp. 1-2).	The Commission agrees that the recommended framework will promote more efficient network investment.
Grid Australia	Supports N-x input based standards rather than output observations, but considers that additional parameters could be included to improve the granularity and efficiency of the standard. Grid Australia considers that standards should be economically derived and expressed deterministically, and that the economic assessment process should include consideration of high impact, low probability events. Grid Australia also notes that the standard setting process should be consistent with the NEO and the incentive properties of the incentive framework in chapter 6A of the NER (p. 1).	Generally agree as explained in chapter 3 of this final report. Standards would be derived through an economic assessment process using probabilistic analysis and would be expressed as a required level of network capability in the form N-x.
AEMO	AEMO recognise that the proposed process represents a significant improvement on the status of quo in some jurisdictions, in particular the process to develop robust VCR measures, an economic assessment process, consumer consultation, and a transparent process which requires decision makers to provide reasons for their decisions. However AEMO disagrees with fixing standards over the regulatory control period. AEMO instead supports an economic project by project assessment approach.	As explained in chapter 3, the Commission considers that setting standards ex-ante is important for transparency and accountability. The Commission does not support a project by project assessment as it is not consistent with the ex-ante

Stakeholder	Comment	Commission's response
		incentive framework as expressed in the NER.
Alinta Energy	Alinta Energy broadly supports the proposed national framework as it provides consistency in reliability standards and improves benchmarking to assess and report in a consistent manner (p. 1).	The Commission agrees that the recommended framework will improve benchmarking.
Origin Energy	Origin Energy considers that there would be significant benefits from a national framework by facilitating comparison across jurisdictions and reducing the costs of regulation (p. 1).	Agreed.
EnergyAustralia	EnergyAustralia supports a national approach for setting transmission reliability standards that is economically derived and deterministically expressed (p. 2).	As explained in chapter 3, the Commission proposes that standards be derived through an economic assessment process using probabilistic analysis and would be expressed as a required level of network capability in the form N-x.
Victorian Department of State Development, Business and Infrastructure	The Victorian Government considers that the proposed national framework precludes significant benefits associated with the current Victorian arrangements. It considers that the Victorian probabilistic approach delivers a stronger and more dynamic focus on achieving a more economically efficient outcome than the AEMC's proposed framework (p. 1). The setting of ex-ante reliability standards is not of critical importance. Rather, an incentive mechanism, as supported by the Productivity Commission, based on historical performance should deliver efficient levels of reliability (p. 2).	The Commission considers that its approach where standards are set based on economic analysis, including a probabilistic assessment, would promote efficient outcomes. The Commission considers that standards should be set in advance of the decision to invest because it provides transparency to stakeholders regarding the level of reliability they can expect to receive and also allows TNSPs to be held accountable for the level of reliability they provide in practice.

Stakeholder	Comment	Commission's response
Expression of transmission reliability standards		
AER	The AER supports the use of N-x standards determined on a probabilistic basis, but considers there could be greater scope to explore whether redundancy standards could be expressed in a more flexible way (e.g. N–1 within 30 minutes, 99.95% of the time, based on a 10% probability of exceedance demand forecast). AEMO should be given the scope to consider the flexible expression of standards in the development of the national reference standard template for transmission (p.2).	Agree that there is scope for standards to be expressed in a more flexible way in a manner consistent with the national reference standard template.
AEMO	AEMO considers that the AEMC has not made a strong case about the advantages of deterministically expressed reliability standards. AEMO has a number of concerns with such standards 1) are ill suited to an environment of uncertain demand 2) creates a presumption in favour of network solutions and 3) does not inform the customer on the level of reliability they receive. AEMO considers that there is a strong risk of stranded assets under such standards given increasing customer participation and uncertain demand.	The AEMC's approach to setting reliability standards is not deterministic but rather is economically derived and incorporates probabilistic analysis. This approach would be responsive to changes in demand and would not be biased in favour of network solutions as explained in chapter 3.
	AEMO notes that some jurisdictions have sought to reduce the bias toward network options by adopting more flexible N-x standards. While this approach reduces the bias against non-network options, it also undermines the clarity and simplicity of using N-x standards. Furthermore, customers care about the level of reliability that they receive, not what assets are built. If reliability standards are expressed in terms of network engineering concepts, it will be more difficult for customers to make a meaningful contribution to the debate.	The AEMC's proposed expression of standards would consist of an economically derived standard expressed in a network redundancy/N-x form with expected restoration times. There would also be additional measures, such as output measures. This expression would enable customers to understand the level of reliability they should expect to receive.
	AEMO supports further development of standards based on expected energy not served. This approach would give TNSPs flexibility to meet the required level of reliability in the most efficient manner.	Expected energy not served could be one of the potential additional measures in the national reference standard template for selection by the standard setter.
	AEMO welcomes the role of developing the national standard reference template for	Under the AEMC's proposed framework,

Stakeholder	Comment	Commission's response
	transmission which it considers to be complementary to our national transmission planner role. However, AEMO consider that standard setters should be able to choose a set of reliability parameters which does not include N-x standards.	the minimum requirement would be economically derived standards expressed in a network redundancy/N-x form with restoration times. Additional parameters may be selected.
Grid Australia	Grid Australia supports N-x transmission reliability standards, as transmission networks are designed to ensure that the number of supply interruptions is low because of the potentially widespread implications of transmission failures. This may mean that prolonged under-investment in transmission networks may not translate to short term observable reductions in reliability outcomes. Grid Australia agrees that the use of additional parameters may improve the granularity and economic efficiency of a N-x standard (p. 2, 24). Grid Australia notes that the infrequent nature of high impact low probability events means that output based reliability targets may be an inappropriate mechanism to address the risk of these events (p. 23).	Agreed.
	Grid Australia notes that AEMO's proposal for expected unserved energy as an output based measure of transmission reliability would require significant modelling and undermine the compliance monitoring and accountability aspects of the framework as a result of its complexity. Grid Australia also considers it would not provide useful benchmarking information or drive TNSP performance improvements (p. 2).	The usefulness of particular measures to set transmission reliability standards will be a matter for the template developer and would be applied for each connection point by the standard setter.
	Grid Australia considers that TNSPs should be actively involved in the development of the national reference standard template for transmission (p. 5). Grid Australia supports the development of a national template and considers it will assist standard setters and facilitate the comparison of standards across TNSPs (p. 7). Grid Australia considers that AEMO would be well placed to develop the template, but this template could be developed by the AER or the AEMC Reliability Panel (p. 24).	Agreed. Under the framework, AEMO would be responsible for developing the template given its national transmission planning expertise.
ENA	Supports the expression of transmission reliability standards on an N-x basis with the ability to include additional parameters to define the most appropriate standard (p 6).	Agreed.
	Recommends that transmission network businesses be actively involved in the development of the national reference standard template (p 6). Important that the national reference	Agreed.

Stakeholder	Comment	Commission's response
	standard template appropriately balances the objectives of granularity and simplicity (p 19).	
	Supports either the AER or AEMO as responsible for the development of the national reference standard template (p. 8).	Under the framework, AEMO would be responsible for developing the template given its national transmission planning expertise.
	The AEMC's approach to the expression of transmission reliability standards will result in more efficient investment decisions by transmission networks and more effective benchmarking of the efficient costs of delivering reliability (p. 19).	Agreed.
Networks NSW	Networks NSW notes that it conducts joint planning with TransGrid and that the standard setter needs to ensure standards are compatible for both TNSP and DNSPs. It considers that AER should do template for both distribution and transmission (p. 7).	Agree that standards need to be compatible for TNSPs and DNSPs. However, AEMO is more appropriate body to develop the template for transmission given its national transmission planning expertise.
EnergyAustralia	EnergyAustralia supports a national reference standard template for transmission (p. 3).	Noted.
Alinta Energy	Alinta Energy supports the proposed use of N-x standards complemented by additional parameters. It supports AEMO taking this role for developing a template for transmission given its experience as the National Transmission Planner (p. 2).	Noted.
MEU	MEU is opposed to the use of deterministic input standards as it leads to over-investment and reduces ability for TNSP to respond to changes in demand or to non-network solutions (p. 21). It also breaks the link between management accountability, investment decisions, service delivery, revenue determinations and performance incentive schemes. The MEU finds it difficult to see how additional measures will address the inherent inefficiency of using input standards (p. 22).	The Commission disagrees and has responded to these points in section 3.1.2 of this final report. The framework recommended by the Commission reflects probabilistic analysis, rather than a deterministic standard.
	MEU agrees that AEMO should be responsible for developing the template given its technical experience in the operation of the NEM transmission network (p. 22). But AEMO should do so in close consultation with the AER to ensure there is consistency with AER requirements for	Agreed.

Stakeholder	Comment	Commission's response
	revenue setting and use of definitions between the templates (p. 23).	
EUAA	EUAA is disappointed in transmission-planning standards being expressed in deterministic terms and considers that probabilistic arrangements are superior (p. 2). Rather, EUAA supports AEMO's approach, including the use of Expected Energy Not Supplied (EENS) canvassed in Nuttall Consulting's report to the AEMO. EUAA urges the AEMC to carefully consider the evidence and argument provided by AEMO and Nuttall Consulting (p. 4).	As discussed in chapter 3, the Commission's approach will be expressed in terms of network redundancy (N-x). The standards would be based on probabilistic analysis rather than deterministic.
Structure of the standard setting process		
AER	The AER considers that if appropriately applied the standard setting process will be effective in ensuring NSPs deliver services that are most valued by customers. The use of an economic cost benefit analysis in the standard setting process is likely to result in more efficient targets (p. 2). The AER supports the range of roles for the AER under the proposed frameworks, but notes that these roles are likely to be resource intensive (p. 3).	Agreed. The Commission notes that each jurisdiction will decide whether to adopt the recommended framework. The level of adoption will affect the resource intensity of the implementation of the framework.
Grid Australia	The timeframes for setting standards should be brought forward by 6 months to allow TNSPs 12 months to take into account the impact of their reliability standards on their revenue proposal (p. 5). However, 12 months to undertake the standard setting process appears reasonable (p. 25).	As discussed in chapter 4, the Commission has decided to commence the standard setting process three months earlier than proposed in our consultation paper to allow TNSPs nine months rather than six months to prepare their regulatory proposal following the setting of their reliability standards.
	Grid Australia supports the key features of the proposed standard setting process (p. 14). Grid Australia agrees that some judgement is required in setting reliability standards, as some factors such as broader societal impacts from high impact low probability events are difficult to measure (p. 15).	Agreed.
Alinta Energy	Alinta Energy supports the proposed structure for the standard setting process and supports voluntary changes in institutional arrangements in determining reliability targets and standards (p. 3).	Agreed.

Stakeholder	Comment	Commission's response
Energex	Energex considers that the three month allowance for customer consultation, and development and selection of reliability scenarios is too short and considers that the process should start 48 months prior to the regulatory control period. Also the lead time between setting standards and the submission of regulatory proposals is too short (p. 5).	The Commission notes that as the customer consultation process commences the standard setting process, TNSPs would be able to commence customer consultation earlier than recommended if considered necessary. As discussed in chapter 4, the Commission has decided to commence the standard setting process three months earlier than proposed in our consultation paper to allow TNSPs nine months rather than six months to prepare their regulatory proposal following the setting of their reliability standards.
EnergyAustralia	EnergyAustralia considers that the national approach for deriving reliability standards economically will increase efficiency and transparency (p. 2).	Agreed.
EUAA	EUAA supports the proposed timeframe for the standard setting process (p. 5).	As discussed above, the Commission has decided to commence the standard setting process three months earlier than proposed in our consultation paper to allow TNSPs nine months rather than six months to prepare their regulatory proposal following the setting of their reliability standards.
MEU	MEU considers that the complexity of the process and rate of change in energy policy, consumption patterns and technology risks standards being out of date before coming into effect (p. 23).	As discussed in chapter 5, the Commission notes that where there are material changes in the costs and benefits of meeting a TNSP's reliability standards, the standard setter would be able to revisit

Stakeholder	Comment	Commission's response
		the standard.
	MEU considers that there may be jurisdictional differences in environmental, health and safety regulation, but reiterates its disappointment with the extent of flexibility provided to jurisdictional ministers because it detracts from national consistency (p. 24).	As discussed in chapter 4, the Commission considers that jurisdictional energy ministers should be able to take additional factors into account in setting reliability standards as they are best placed to make judgements regarding the trade-off between cost and reliability on behalf of the broader community.
Guidelines for the economic assessment process		
EUAA	EUAA does not think economic assessment guidelines are necessary (p. 4).	The Commission considers that the guidelines for the standard setting process are necessary to provide consistency in how the recommended framework is applied across the NEM. This will ensure that the standards which are set can be meaningfully compared.
Grid Australia	As well as the AEMC's proposed contents for the guidelines, Grid Australia considers the guidelines should also include the explicit consideration of high impact, low probability events in the economic assessment process. Grid Australia considers the AER is the appropriate body to develop the guidelines (p. 26).	The guidelines will include information on how the economic assessment process should be undertaken. The Commission considers that this could include the assessment of high impact, low probability events.
MEU	MEU considers economic assessment guidelines will be an important tool in ensuring consistency in approach. This should also include how non-measurable factors can be assessed objectively (p. 25). MEU considers that the AER is the appropriate body to develop guidelines although it should	See above. The Commission notes that the guidelines for the standard setting process would be undertaken through a public consultation process by the AER, which will allow stakeholder views to be

Stakeholder	Comment	Commission's response
	do so in consultation with AEMO, NSPs and other stakeholders (p. 25).	considered.
Value of customer reliability		
Alinta Energy	Alinta Energy supports the AER developing and updating the VCR by working with AEMO in the current VCR development process (p. 3).	Agreed.
AEMO	AEMO considers that its VCR review is a considerable step forward and provides more confidence that the appropriate VCR can be applied for its intended use. AEMO also believes that it is possible to develop credible estimates of the probability of outage events for network assets and is willing to work with TNSPs to do this.	Noted.
AER	The AER supports the establishment of a formal mechanism for considering customer preferences through VCR studies. The AER however recognises that the VCR is not a measure which can be objectively tested, but notes the proposed arrangements should support a cycle of continuous improvement in VCR estimation (p. 2).	Agreed.
Grid Australia	Grid Australia acknowledges that the VCR cannot be measured or applied with the degree of precision that is sometimes claimed (p.15). Grid Australia has no objection to the AER being responsible for the VCR and agrees it would be reasonable for the VCR to be escalated by CPI each year (p. 26). In terms of the timing of when updates to the VCR should occur, Grid Australia does not have a firm view on the best approach. However, it notes that there should be reasonable stability in the VCR over time so that investment plans are not distorted by factors such as survey error or timing differences between transmission and distribution revenue reviews.	Noted.
EnergyAustralia	EnergyAustralia supports the development of a national approach for developing the VCR to be set and updated by the AER (pp. 2-3).	Agreed.
EUAA	EUAA prefers AEMO to develop estimates of the VCR as it has expertise in this area (p. 4).	The Commission has recommended that the AER draw on the work AEMO has undertaken in developing VCRs. This will enable the AER to build on the existing

Stakeholder	Comment	Commission's response
		expertise that AEMO has in this area.
MEU	MEU considers that it is less appropriate for the AER to develop VCR; rather it prefers AEMO because it already has experience assessing the VCR and access to data at connection point and feeder level. It also complements its role as the National Transmission Planner (p. 26).	See response above.
Origin Energy	Origin Energy notes the VCR is complex but suggests a possible blend of technically sound approaches for estimating the VCR (p. 2).	The Commission notes that the AER will be required to undertake public consultation in developing the VCR methodology, which would allow the AER to draw on the views and expertise across the broader market. The Commission has also recommended that the AER use the VCR methodology developed by AEMO as a starting point.
Customer consultation process to select reliability scenarios		
AER	The AER notes increased engagement with consumers early on in the standard setting process may assist NSPs to better understand the needs of their consumers and that it complements the new requirements on NSPs to consult with consumers in developing their regulatory proposals (pp. 2-3).	Agreed.
Grid Australia	Grid Australia supports the proposal for NSPs to consult with customers and that this be incorporated within the broader customer consultation on the NSP's regulatory proposal. It notes that as transmission reliability standards affect the reliability enjoyed by end users connected to the distribution network, TNSPs may be able to discharge their consultation obligations by working with DNSPs to consult with end use customers (p. 17). Grid Australia considers that it is not appropriate for there to be detailed guidelines outlining how customer consultation should be undertaken as reliability issues will vary across NSPs (p. 27). Grid Australia also notes that as customer consultation is likely to be iterative, it may not be	The Commission agrees that TNSPs will need to consult with DNSPs and any directly connected customers. In addition, TNSPs would also need to consult a broader customer base as well to gain an understanding of customer's expectations of reliability. The Commission considers that aligning the consultation process at the start of the standard setting process and for the

Stakeholder	Comment	Commission's response
	appropriate or necessary to require the alignment of the consultation processes for reliability standards and the regulatory proposal (p. 29).	revenue determination process would reduce the administrative burden on TNSPs and customers and improve the efficiency of the consultation process.
ENA	Supports transmission network businesses consulting with their customers on reliability standards (p. 6). Supports the proposal that consultation by transmission network businesses should be consistent with the broader customer engagement required on revenue proposals (p. 8). See customer consultation as iterative and reliability consultation as one component of the consultation that is undertaken to develop the regulatory proposal (p. 8). AER regulatory guideline should not be prescriptive on how the customer consultation should be conducted but rather should set out some high level principles (p. 8).	See above.
Alinta Energy	Alinta Energy supports collaboration between the standard setter, economic adviser, NSPs and consumers in selecting reliability scenarios (p. 3).	Agreed.
EnergyAustralia	EnergyAustralia considers that appropriate customer consultation is essential to ensure that standards reflect customer preferences (p. 3).	Agreed.
EUAA	EUAA suggests that customer consultation occur on multiple points in the process, including at the start of the process, after the economic assessment, and in setting the standards (p. 6).	The Commission notes that there are a number of different opportunities for customer consultation under the recommended framework. As discussed in chapter 4, the Commission also supports ongoing consultation between TNSPs and customers during the regulatory control period.
MEU	MEU considers there should be further investigation of customer consultation to ensure it is thorough, objective and representative of the consumer base (p. 27). MEU argues that combining the obligation for NSPs to consult in setting standards with the preparation of regulatory proposals may appear efficient, but notes it could also bias the approach. MEU suggests that the AEMC review the AER's guideline for consumer engagement as a possible	The Commission notes that the guideline for the standard setting process will include guidance on how the customer consultation process should be undertaken. The Commission agrees that the guidelines should be consistent with

Stakeholder	Comment	Commission's response
	model of engagement (p. 28).	the AER's 'Consumer Engagement Guideline for Network Service Providers'.
Selection of reliability scenarios		
MEU	MEU agrees that there should be compatibility between the reliability scenarios for TNSPs and DNSPs within a jurisdiction and that scenarios should be reasonably representative (p. 28).	Agreed.
ENA	The ENA considers it is appropriate that the jurisdictional decision maker should be able to take the positive social and community benefits of additional expenditure and externalities into account in setting the standard (p. 7).	The Commission agrees that where the jurisdictional energy minister retains responsibility for setting reliability standards, they should be able to take additional factors into account.
Economic assessment of reliability scenarios		
Grid Australia	Grid Australia considers that high impact low probability events should be open to consideration by the economic adviser and standard setter through the economic assessment process, particularly where customers have suggested that they are concerned about these types of events at a particular connection point. It notes that the full societal costs of major disruptions are difficult to quantify in cost benefit assessments (pp. 2-4). However, some events are capable of estimation in some circumstances, e.g. the total value of unserved energy if there is a transformer failure at a substation during the summer peak (p. 20).	The Commission recognises that high impact, low probability events are difficult to value and therefore recognises that there may need to be a degree of judgement in setting reliability levels.
	Grid Australia notes that as the new framework is a new process it will involve additional resources and that these should be recognised by the AER in future revenue determinations. However, it expects that the national framework should deliver a net economic benefit if it enhances the economic efficiency of investment decisions (p. 28).	The Commission recognises that the economic assessment could create additional time, cost and resource requirements on TNSPs. This depends on the extent of assessment performed in the current jurisdictional processes for setting reliability standards. The Commission agrees that this process will enhance the

Stakeholder	Comment	Commission's response
		efficiency of investment decisions.
EUAA	EUAA does not support the role of the AER in the economic assessment of NSP reliability scenarios as this would fetter AER's discretion to make revenue determinations (p. 5).	The Commission notes that the jurisdictional energy minister will have discretion in determining which body should undertake the economic assessment process. However, the Commission does not agree that undertaking the economic assessment process would affect the AER's discretion to make revenue determinations, as the differing responsibilities under each role would be clear under the NER.
MEU	MEU considers that costs of the economic assessment process are likely to be substantial, at least initially, and borne by consumers particularly if an ex-ante economic assessment is progressed. Every effort should be made to create synergies with other activities of consumer consultation, performance reporting, incentive schemes, and revenue determination. The economic assessment process should cover all of a given jurisdiction (i.e. all DNSPs and TNSPS in a jurisdiction) (p. 30). MEU considers that the main risks with the economic assessment process is that standards are set ex-ante for up to five years, which reduces the flexibility for NSPs to respond efficiently to changes in demand and other circumstances. Sensitivities will provide some insights into alternative outcomes (p. 31).	The number of scenarios and level of assessment which is undertaken can be adapted to the characteristics of each network. This should ensure that the costs of applying the framework are proportionate to its expected benefits. Where the costs and benefits of meeting a TNSP's reliability standards change over the regulatory control period, TNSPs will be able to adjust their performance in response under the recommended framework.
Alinta Energy	Alinta Energy supports a cost benefit analysis of each reliability scenario against a baseline of maintaining existing reliability scenarios and considers these measures increase transparency (p. 4).	The Commission has recommended that reliability scenarios should be assessed against an efficient level of reliability scenario, to assist in revealing the extent to which other scenarios deviate from the efficient level. Further discussion on this

Stakeholder	Comment	Commission's response
		recommendation is set out in chapter 4.
AEMO	AEMO disagrees with Grid Australia's view that a probabilistic approach would not consider high impact, low probability events. AEMO notes that its approach to developing VCRs includes consideration of a range of outage durations as well as severity of outages (that is whether it is a localised or widespread outage). Hence appropriate consideration of high impact, low probability events can be taken into account when developing appropriate VCRs.	Noted. See above - the Commission notes that some high impact low probability events may still require judgement in setting reliability levels.
Setting reliability standards		
EUAA	EUAA considers that the jurisdictional minister has sufficient information to make an informed decision on the levels of reliability appropriate to the community (p. 6).	Agreed.
MEU	MEU considers that the jurisdictional minister should have sufficient information to make an informed decision in setting targets (p. 31). MEU notes the importance of setting realistic scenarios for the minister to consider (p. 32).	Agreed.
Links between standard setting process and revenue determination process		
MEU	MEU welcomes consumer consultation but raises the issue of the heavy demands on consumers and consumer organisations to contribute effectively and the risk of engagement waning over a long consultation process (p. 32). MEU suggests that there could be an optional step in the process to confirm consumer perspectives prior to finalising reliability targets (p. 33). MEU strongly supports coordination of regulatory processes as a way of limiting gaming and considers that differences in costs between the reliability assessment and revenue proposals should converge over time as the AER is implementing detailed performance/benchmarking exercises, which contribute to reliability and revenue assessments (p. 33).	The Commission notes that customers will have a further opportunity to provide their views during consultation on the economic adviser's draft report. The Commission also notes that the use of the VCR should ensure that reliability standards are set at a level which reflects customer preferences. The Commission considers that there should not be significant differences between the costs forecasts submitted during the standard setting process and the revenue determination process, but notes that TNSPs will be required to

Stakeholder	Comment	Commission's response
		explain any differences which do occur.
EUAA	EUAA sees no reason why it is not feasible to align consultation process at the start of the standard setting process and for the regulatory proposal (p.7). EUAA considers that NSPs should be asked to explain differences in data between setting standards and for use in a revenue determination (p. 7).	Agreed.
Grid Australia	Grid Australia considers that the AER should accept that some cost differences are bound to arise as a result of timing differences between the setting of reliability standards and the NSP's submission of its regulatory proposal. Grid Australia questions whether any significant benefit would be achieved from conducting detailed examination of the differences in cost forecasts (p. 29).	As discussed in chapter 5, the Commission has recommended that TNSPs be required to explain any differences between the cost forecasts they provide to the standard setter and those included in their regulatory proposal to ensure that the forecasts provided during the standard setting process have a degree of rigour. The Commission agrees that there are likely to be some circumstances where there are differences between the cost forecasts provided, due to differences in timing and the level of detail of the modelling.
AER	As noted in previous submissions, the AER's preference is to integrate standards setting and revenue setting where a jurisdictional minister has delegated standard setting to the AER. The AER notes that the AEMC has not proposed an integrated approach, but has proposed mechanisms to strengthen the links between standard setting and revenue setting. The AER supports these mechanisms, but suggests they could be further improved by requiring NSPs to submit the same cost information in both processes unless there are valid reasons for departing from this. The AER considers that as there is a relatively short time period between when standards are set and when a NSP must submit its regulatory proposal,	The Commission considers that a requirement on TNSPs to explain any differences in the cost forecasts provided should provide sufficient incentives on TNSPs to submit robust cost forecasts. Further, as noted above, the Commission considers that in some circumstances there may be a reasonable explanation for differences between the cost forecasts

Stakeholder	Comment	Commission's response
	there should be extremely limited circumstances in which a NSP's costs forecasts should change significantly. The AER considers this would strengthen incentives on NSPs to develop accurate cost forecasts (p. 3).	provided.
Updating reliability standards within a regulatory control period		
AEMO	AEMO notes that a special mechanism for updating standards would not be required if the TNSPs were subject to economic reliability standards, since the cost benefit assessment would be built into the standard.	The Commission considers that there should be an update mechanism for transmission reliability standards if there is a change in input assumptions beyond the range of sensitivities considered during the standard setting process.
	AEMO considers that there is scope to improve the effectiveness of the proposed adjustment mechanism. It supports expanded use of the contingent projects mechanism as this approach removes the risk and uncertainty of setting allowed revenue above what the business actually requires.	The Commission has proposed an update mechanism for transmission reliability standards, but if standards are updated, a TNSP will not be able to seek any changes in its revenue allowance from the AER within that regulatory control period.
MEU	MEU considers that the requirement to update standards is appropriate for TNSPs and DNSPs (p. 34). MEU considers that the criteria proposed should preserve the integrity of the incentive schemes but should be closely monitored so that regulatory pass-throughs do not significantly increase (p. 35).	The Commission recommends an update mechanism for transmission reliability standards if there is a change in input assumptions beyond the range of sensitivities.
Alinta Energy	Alinta Energy supports the update mechanism based on material differences in assumptions which could emerge (p. 4).	Agreed.
AER	The AER does not consider that a mechanism to adjust reliability standards and revenues within a regulatory control period is warranted. The AER notes that there are several existing mechanisms for seeking revenue adjustments within period and that the proposed standard setting process and revised framework for economic regulation provides a robust framework	The Commission has proposed an update mechanism for transmission reliability standards, but if standards are updated, a TNSP will not be able to seek any

Stakeholder	Comment	Commission's response
	for efficient investment. The AER considers that under the proposed mechanism there is a high risk that it will undermine incentives on NSPs to manage expenditure allowances efficiently and inappropriately shift the risk of cost over-runs onto consumers (p. 4). The AER also notes that the update mechanism has the potential to lead to a project by project approval process, which moves the regime away from an incentive based approach and could lead to higher costs for customers (p. 4).	changes in its revenue allowance from the AER within that regulatory control period.
Victorian Department of State Development, Business and Infrastructure	The Victorian Government considers that an update mechanism would increase costs for participants and detracts from transparency and certainty (p. 2).	As discussed above, the Commission has decided to include an update mechanism for the national framework for transmission reliability, but without changes to revenues within that regulatory control period.
Compliance obligations		
Grid Australia	TNSPs should have a reasonable endeavours obligation under the NER to comply with their reliability standards, as there may be factors beyond a TNSP's control which may prevent it from meeting its standards (e.g. if the peak demand is higher than forecast the permitted load at risk may be exceeded at a connection point).	The Commission considers that the AER would have sufficient discretion in how it undertakes any enforcement activities to allow these factors to be taken into account.
	A requirement to undertake an annual audit would not deliver benefits that outweigh the additional costs involved. (p. 6, 22) Grid Australia notes that the Annual Planning Report provides evidence that TNSPs have processes in place to satisfy current reliability requirements (p. 31).	Rather than annual audits, the Commission recommends that TNSPs would be required to complete audits every 5 years and be required to set out their plans to meet their standards for each connection point in their Annual Planning Reports.
ENA	Recommends that the requirement to comply with the applicable transmission reliability standard at a connection point should be a "reasonable endeavour obligation" (p6). Factors beyond the transmission business' control may prevent them from satisfying the input	See above.

Stakeholder	Comment	Commission's response
	standards (p9).	
	It is unclear why the annual audit obligation for TNSPs is necessary. The AER already has the power to audit to ensure compliance, so it is unclear why a more prescriptive obligation is needed (p9).	See above.
Performance reporting requirements		
Grid Australia	Grid Australia notes that transmission reliability performance cannot be accurately measured by examining reliability outcomes. As a result, performance reporting should be materially different for TNSPs and DNSPs (p 31).	The Commission agrees that performance reporting for TNSPs cannot rely solely on actual performance data. We note that the method of reporting will vary with the type of standard set.
ENA	ENA supports public reporting through annual planning reports of NSP performance against their reliability standards and targets, to ensure accountability, promote transparency, and facilitate benchmarking (p. 15). ENA proposes that a distinction is made between public reporting and reporting for the purposes of measuring performance against the STPIS. Public reporting needs to explain the context and the potential pitfalls of performing simple comparisons between networks, ie density of customers, geography, events and the types of assets employed. Reporting of outages should include associated analysis, including causes for loss of supply (p. 16).	As discussed in chapter 6, performance reporting would be undertaken by TNSPs as part of their Annual Planning Reports. This data would then be used by the AER as part of its annual benchmarking report on the efficiencies of NSPs. The Commission agrees that benchmarking reports will need to be carefully prepared by the AER to ensure differences in network characteristics are clearly explained.
Implementation considerations		
Grid Australia	Grid Australia notes the AEMC may want to consider whether AEMO's declared network functions under section 50F(2) of the NEL presents an impediment to the implementation of the proposed framework for Victoria's shared transmission network (p. 25).	The Commission notes that it is a matter for jurisdictions to implement the recommended framework. The implementation plan in chapter 7 sets out

Stakeholder	Comment	Commission's response
		the key changes that need to be made.
MEU	MEU considers that changes to the NEM regulatory architecture be done holistically rather than in an ad-hoc manner (p. 38).	Agreed. As set out in chapter 7, the Commission has recommended that if SCER agrees to progress the recommended framework that it should request the AEMC to develop a detailed implementation plan. This should allow changes to the NEM regulatory architecture to be co-ordinated.

B Interim implementation stage tasks

As discussed in chapter 7, we consider that an interim implementation stage should be undertaken by the Standing Council on Energy and Resources (SCER). This interim implementation stage would involve SCER:

- asking the Australian Energy Market Operator (AEMO) to work with industry and jurisdictional governments to develop the national reference standard template for expressing transmission reliability standards across the National Electricity Market (NEM); and
- making the Australian Energy Regulator (AER) responsible for updating values of customer reliability for each jurisdiction in the NEM.

This appendix provides further details on the tasks involved under the interim stage. Once the full implementation of the framework has been completed, the AER's and AEMO's obligations will be specified in the National Electricity Rules (NER).

B.1 Development of a national reference template for transmission reliability

We recommend that SCER request AEMO to develop the national reference standard template for transmission. Developing the national reference standard template will require AEMO to work closely with industry and jurisdictional governments. AEMO would need to develop the template in a manner which can be adopt by jurisdictions and easily adapted into their existing arrangements.

This document will be used by standard setters to set transmission reliability standards. It will also be used by transmission network service providers (TNSPs) to provide consistency in how they report on their performance against their reliability standards across the NEM. This will assist the AER and other stakeholders to compare the reliability performance of TNSPs in the NEM. This will in turn assist the AER in undertaking benchmarking, which can be considered in the development of its revenue determinations for each TNSP.

This document must include:

(a) the input and output measures that the standard setter could choose from for transmission reliability standards;

(b) consistent definitions on each input and output measure identified;

(c) methodologies for measuring each of the input and output measures;

(d) guidance on how input and output measures would interact with each other to be complementary in order to appropriately express transmission reliability standards; and

(e) an explanation of how the normal operating state (N) would be determined for use in N-x economically derived input measures for the reliability standards.

Relevant Considerations

The document must be prepared to be consistent with the following principles:

- **Applicability** - Definitions of reliability measures and events to be excluded from the measurement of reliability performance should be developed in consideration of the operating environments of TNSPs in the NEM.

- **Measurability** - Reliability performance measures should be developed so as to be able to be practically and objectively calculated by a third party with knowledge or expertise in the area.

- **Transparency** - TNSPs, market participants, and consumers should be able to interpret the content of the set of definitions and its implications for the level of supply reliability they can reasonably expect to receive.

- **Quality** - Reliability performance measures should be based upon best practice engineering and technical analysis performed by expert practitioners within the field.

- **Accountability** - TNSPs should be able to report on their performance against their reliability standards to enable them to be held accountable for meeting their reliability standards.

- **Economic efficiency** - Reliability performance measures should promote economically efficient decisions and should not be biased towards network solutions when non-network options can provide a comparable level of reliability.

In addition to these principles, in developing the template AEMO must have regard to:

- the need to ensure that the reliability measures can be practically applied by TNSPs across the NEM;

- the need to provide consistency in the transmission reliability standards which are set for TNSPs across the NEM as well as consistency in the reporting TNSPs undertake for their performance against their standards;

- the National Electricity Objective;

- the AEMC's final report on the national framework for transmission reliability; and

- the need for consistency with the national framework for distribution reliability, to the extent possible.

Timeframe and deliverables

The national reference template must be published by XX XX 2014.

AEMO must work with TNSPs and jurisdictional governments in developing this document. In addition, AEMO must also consult broadly with stakeholders, which includes but is not limited to: the AEMC, AER, jurisdictional reliability setting bodies, distribution network service providers (DNSPs), and community representatives.

B.2 Responsibility for the value of customer reliability in the NEM

SCER also requests the AER be responsible for updating measures of the value of customer reliability (VCR) in the NEM. This would involve responsibility for:

- the methodology for calculating VCRs on a consistent basis across the NEM;
- updating the VCRs for each NEM jurisdiction at least every five years and developing a timetable for when these updates should occur; and
- escalating VCR measures for each NEM jurisdiction using an appropriate escalation methodology each year between updates.

In undertaking this responsibility, the AER must take into account the work undertaken by AEMO to establish a national approach to estimating the VCR and the VCR measures which AEMO has calculated. The AER must initially use the methodology and VCR values developed by AEMO and consider the appropriate timing for when the methodology and VCR values should be updated. In making this decision, the AER must have regard to:

- the need for VCR measures to take into account an appropriate range of customers and geographic locations within each NEM jurisdiction; and
- the range of uses for VCR measures, including in the: setting of transmission, distribution, and generation reliability standards and targets; network investment planning; and the economic regulation of NSPs.

If the AER amends the methodology for the VCR, it must undertake public consultation prior to finalising the methodology. Following any updates or annual escalations to VCR measures, the AER must publish a report setting out the amended VCR measure and the method that was used to amend the measure.

C Comparing the AEMC's framework against international practice

In this appendix, key features of the AEMC's framework are compared against international practice. New Zealand, the USA (Pennsylvania-New Jersey-Maryland or PJM), the United Kingdom and Nordic countries were selected because these markets had comparable developed transmission network systems. The AEMC commissioned Parsons Brinckerhoff to conduct this analysis.

Table C.1 Comparing AEMC's framework against international practice

Key features of transmission network reliability arrangements	AEMC's recommended framework	New Zealand	USA (PJM)	United Kingdom	Nordic nations (Denmark, Sweden, Finland and Norway)
Responsible body for setting standards	Jurisdictional minister, with ability to delegate to the AER or a jurisdictional body.	NZ Commerce Commission under the Commerce Act. Electricity Authority monitors and enforces compliance with the Electricity Industry Participation Code, which includes the Grid Reliability Standards (GRS).	Federal Energy Regulatory Commission (FERC) oversees development of mandatory reliability and security standards. North America Electric Reliability Corporation (NERC) develops and enforces reliability standards for North American bulk power systems (including regional transmission organisations).	Ofgem (intra-regional) and European Network of Transmission System Operators for Electricity (ENTSO-E) (inter-regional).	Country based jurisdictional regulators (intra-regional) and European Network of Transmission System Operators for Electricity (ENTSO-E) (inter-regional).

Key features of transmission network reliability arrangements	AEMC's recommended framework	New Zealand	USA (PJM)	United Kingdom	Nordic nations (Denmark, Sweden, Finland and Norway)
Reliability standards set in advance of investments	Yes	Yes	Yes	Yes	Yes
Process for setting reliability levels	Economic cost benefit assessment used to compare network costs and value placed on reliability every five years prior to the revenue determination process. Jurisdictional minister may take into account other factors.	Deterministic approach used to set incentive targets, based on the approved standards and historical trends, as part of the revenue determination process every 5 years.	Deterministic approach used to determine NERC Reliability Standards, developed from results based approach that focuses on performance, risk management, and entity capabilities. Any entity or individual may propose the development of a new or modified Reliability Standard, or may propose the retirement of a Reliability Standard.	Deterministic approach used by the ENTSO-E / Regional Group Great Britain (GBRG) to set inter-regional standards relating to the reliability of the European electricity transmission systems. The GBRG proposes and decides on issues related to system operation relevant to its region in compliance with European rules and standards.	Deterministic approach used by the ENTSO-E / Regional Group Nordic (RGN) to set inter-regional standards relating to the reliability of the European electricity transmission systems. For inter-regional, the EU standard states that transmission system operators (TSO) are required to define unacceptable consequences of incidents, identify the initiating events and define mitigation measures limiting the risks.
Reliability measures used	Economically derived 'N-x' input standard plus restoration times and can be combined with	Quality measures, such as loss of supply event frequency, HVAC circuit unavailability -	Minimum N-1 planning for credible contingencies, supported by reliability	N-1 criterion, supported by an Ofgem developed performance based model for setting the	N-1 criterion All countries have some

Key features of transmission network reliability arrangements	AEMC's recommended framework	New Zealand	USA (PJM)	United Kingdom	Nordic nations (Denmark, Sweden, Finland and Norway)
	additional parameters, such as output measures of outage duration.	unplanned, and total impact of interruption. GRS consist of an economic (probabilistic based) standard for the whole grid, and a 'safety net' minimum reliability standard of N-1 for contingencies on the core grid.	indicator. For example, an Event Driven Index (EDI) measures the relative severity ranking of events based on event occurrence rate and their impact on the bulk power system.	network companies' price controls over an eight year period.	form of quality of supply indicators (such as SAIDI, SAIFI, impact of outages on customers) in the economic regulation of networks.
Consideration of value of customer reliability/willingness to pay	Yes, in setting reliability standards and incentive rates.	Yes, in setting quality standards and a quality incentive mechanism.	No explicit requirement. Unable to confirm whether TNSPs apply value of customer reliability/willingness to pay to individual investment decisions.	Yes, in setting reliability standards and incentive rates.	No, but noting that customers are compensated for long interruptions (in all countries).
Compliance obligations	TNSPs will be required to report their performance against their standards every year.	TNSPs are required to report their performance against the quality standards.	TNSPs are required to report their performance against their standards every year. To monitor compliance, a range of methods are used by NERC (or its delegated body) such as compliance audits, self-reports and	TNSPs are required to report their performance against their standards every year. There is a framework which enables Ofgem to collect data from the transmission owners annually.	There are several levels for the rules of regulation: the EU-level with the directives; the actual rules given by the parliament in each country; followed by the interpretation and application of these rules by the different

Key features of transmission network reliability arrangements	AEMC's recommended framework	New Zealand	USA (PJM)	United Kingdom	Nordic nations (Denmark, Sweden, Finland and Norway)
			complaint investigations.		regulators. TSOs are required to report their performance against their standards every year with additional 5 yearly 'Periodic on-site compliance' audits.