Draft

Regulatory investment test for distribution application guidelines

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AUSTRALIAN ENERGY REGULATOR

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Contents

Shortened forms

Shortened form	Full form
ACCC	Australian Competition and Consumer Commission
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
BAU	business-as-usual
distribution business	distribution network service provider
draft report	draft project assessment report
DSER	demand side engagement register
final report	final project assessment report
HILP event	high impact low probability event
ISP	integrated system plan
MW	megawatt
MWh	megawatt hour
NEM	National Electricity Market
NEO	National Electricity Objective
NER	National Electricity Rules
network business	a distribution or transmission network service provider
NNOR	non-network options report
NTNDP	national transmission network development plan
RET	renewable energy target
RIT–D	regulatory investment test for distribution
RIT–T	regulatory investment test for transmission
SAIDI	system average interruption duration index

SAIFI	system average interruption frequency index
transmission business	transmission network service provider
USE	expected volume of unserved energy
VAR	volt-ampere reactive
VCR	value of customer reliability

1 Nature and Authority

1.1 Introduction

Consistent with the requirements of clause 5.17.2(a) of the National Electricity Rules (NER), this document (the RIT–D application guidelines) sets out guidance for the operation and application of the regulatory investment test for distribution (the RIT–D).

1.2 Authority

Clause 5.17.2(a) of the NER requires the Australian Energy Regulator (AER) to develop and publish, in accordance with the distribution consultation procedures, guidelines for the operation and application of the RIT–D. The RIT–D application guidelines must:

- give effect and be consistent with the relevant provisions of the NER.[1]
- provide guidance on:
    - the operation and application of the RIT–D;
    - the process to be followed in applying the RIT–D;
    - what will be considered to be a material and adverse National Electricity Market (NEM) impact for the purpose of the definition of interested parties; and
    - how disputes raised in relation to the RIT–D and its application will be addressed and resolved[2]; and
- provide guidance and worked examples as to:
    - how to make a determination when a RIT–D proponent is not required to prepare and publish a non-network options report (NNOR)[3];
    - what constitutes a credible option;
    - the suitable modelling periods and approaches to scenario development;
    - the classes of market benefits to be considered;
    - the acceptable methodologies for valuing the market benefits of a credible option;
    - acceptable methodologies for valuing the costs of a credible option;
    - the appropriate approach to undertaking a sensitivity analysis;
    - the appropriate approaches to assessing uncertainty and risks; and
    - what may constitute an externality under the RIT–D.[4]

1 NER, cl. 5.15.2; 5.17.2–5.
2 NER, cl. 5.17.2(b)(2).
3 NER, cl. 5.17.2(c); 5.17.4(c).
4 NER, cl. 5.17.2(c).

1.3 Role of the RIT–D application guidelines

RIT–D proponents must apply the RIT–D to all proposed distribution investments, except in the circumstances described in clause 5.17.3(a) of the NER. The RIT–D application guidelines provide guidance on the operation and application of the RIT–D, the process for RIT–D proponents to follow in applying the RIT–D, and how we will address and resolve disputes regarding the RIT–D.

RIT–D proponents should read the RIT–D application guidelines in conjunction with the requirements in the RIT–D and the relevant clauses of the NER.

1.4 Definitions and interpretation

In the RIT–D application guidelines, words and phrases have the meaning given in the RIT–D or otherwise in:

- the glossary; or
- the NER.

1.5 Process of revision

We may amend or replace the RIT–D application guidelines from time to time in accordance with the distribution consultation procedures and clause 5.17.2 of the NER.

1.6 Version history and effective date

A version number and an effective date of issue will identify every version of these RIT–D application guidelines.

Each version of these RIT–D application guidelines will be effective from its effective date of issue, and RIT–D proponents should apply it as soon as practical. However, for compliance purposes concerning a RIT–D, we will only have regard to the guidance that was in effect when a RIT–D proponent initiated the RIT–D in question. In this context, initiated means from the publication of a NNOR or a notice of non-network options under NER clause 5.17.4(d), whichever relevant.

2 Overview of the RIT–D

RIT–D proponents must apply the RIT–D in accordance with clause 5.17 of the NER to assess the economic efficiency of proposed investment options. The RIT–D aims to promote efficient investment in distribution networks in the NEM by promoting greater consistency, transparency and predictability in distribution investment decision making.

2.1 Purpose of the RIT–D

Clause 5.17.1(b) of the NER states that the purpose of the RIT–D is to:

> ...identify the *credible option* that maximises the present value of the net economic benefit to all those who produce, consume and transport electricity in the *National Electricity Market* (the *preferred option*). For the avoidance of doubt, a *preferred option* may, in the relevant circumstances, have a negative net economic benefit (that is, a net economic cost) where the *identified need* is for reliability corrective action.

Fulfilling this purpose contributes to achieving the National Electricity Objective (NEO) to promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity.[5] Before investing in a large distribution project to meet a need on the distribution network, a RIT–D proponent must consider all credible options to meet that need, before selecting the option that maximises the net economic benefit across the NEM. This reduces the risks that consumers will pay for inefficient investments.

Requiring RIT–D proponents to consider all credible options promotes competitive neutrality, which promotes selecting the most efficient investment. This also encourages efficient outcomes in the longer-term by allowing the contestable market to develop without bearing unnecessary risks from their customers or competitors investing inefficiently.

The RIT–D further promotes investment efficiency by imposing transparency and accountability on major distribution investment decisions. This contributes to the NEO to the extent that other efficiency incentives under regulatory regime are imperfect, or to the extent that the economic interests of the RIT–D proponent differ from what maximises the net economic benefit across the NEM.

2.2 Projects subject to a RIT–D assessment

Clause 5.17.3 of the NER provides that a RIT–D proponent must apply the RIT–D to a RIT–D project unless the project falls under defined circumstances. NER clause 5.10.2 defines a RIT–D project as a project to address an identified need that a distribution network service provider (distribution business) identified, or a joint planning project that is not a regulatory investment test for transmission (RIT–T) project.

The circumstances where a RIT–D proponent does not need to apply the RIT–D include where the:

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5 National Electricity Law, Section 7.

- RIT–D project is required to address an urgent and unforeseen network issue that would otherwise put at risk the reliability of the distribution network or a significant part of that network (see section 2.2.1).
- Estimated cost to the network service providers (network businesses) affected by the RIT–D project of the most expensive potential credible option to address the identified need is less than $5 million (as varied in accordance with a 'RIT–D cost threshold' determination).[6] For an explanation of how external capital contributions relate to the exemption, see section 2.2.2.
- Cost of addressing identified need is to be fully recovered through charges other than charges in respect of standard control services or prescribed transmission services. For an explanation of how external capital contributions relate to the exemption, see section 2.2.2.
- Identified need can only be addressed by expenditure on a connection asset that provides services other than standard control services or prescribed transmission services.
- RIT–D project relates to the maintenance of existing assets and is not intended to augment a network or replace network assets.
- Proposed expenditure relates to a 'protected event emergency frequency control scheme' investment and is not intended to augment a network.

In determining whether a RIT–D proponent must apply the RIT–D to a proposed project, that proponent must not treat different parts of an integrated solution to an identified need as distinct and separate options.[7]

For the purposes of asset replacement programs, if a distribution business plans to replace multiple assets of the same type across more than one location in the same year, the RIT–D proponent must apply the RIT–D if it is above the RIT–D cost threshold and if these assets are addressing one identified need.

NER clause 5.17.3(e) requires that where a RIT–D project receives an exemption, with the exception of negotiated network services, the network business affected by the RIT–D must, acting reasonably, plan and develop the investment required to address the identified need at the lowest cost over the life of the investment.

More generally, since the principles behind the RIT–D represent good practice, we encourage network businesses to perform transparent efficiency assessments, engage effectively with their stakeholders and to procure solutions competitively wherever possible. To assist in the latter, we encourage network businesses to proactively develop relationships with non-network businesses and make useful and user-friendly data available in their annual planning reports and other relevant documents. Network businesses should use their discretion in determining the rigour they apply to their investment decisions, which should be commensurate with the magnitude and risks associated with the investment at hand.

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6 Under clause 5.15.3 of the NER, we must review RIT–D cost thresholds every three years. We will publish details regarding any review of the RIT–D thresholds (including any revisions to this threshold) on our website, www.aer.gov.au.

7 NER, cl. 5.17.3(e).

2.2.1 Urgent and unforeseen investments

As outlined in clause 5.17.3(a)(1) of the NER, a RIT–D proponent does not need to apply the RIT–D to a proposed RIT–D project to address an urgent and unforeseen network issue that would otherwise put at risk the reliability of the distribution network. Under cl. 5.17.3(c) of the NER, a proposed RIT–D investment is only subject to this exemption if:

- it is necessary that the assets or services to address the issue be operational within six months of the issue being identified;
- the event or circumstances causing the identified need was not reasonably foreseeable by, and was beyond the reasonable control of, the network business (or businesses) that identified the need;
- a failure to address the identified need is likely to materially adversely affect the reliability and secure operating state of the distribution network or a significant part of that network; and
- it is not a contingent project.

2.2.2 Capital cost thresholds and external contributions

A RIT–D project is exempt from a RIT–D if the estimated capital cost to the network businesses affected by the RIT–D project of the most expensive potential credible option to address the identified need is less than the RIT–D cost threshold.[8] An external financial or capital contribution would produce an exemption if it reduced the capital cost to network businesses affected by the RIT–D project to be below the RIT–D cost threshold.

In practice, this means a RIT–D is not required for a RIT–D project if an external contribution results in the project falling below the RIT–D cost threshold. In these circumstances, the external contribution means that, to the extent of that contribution, the costs of the project do not need to be recovered from electricity consumers via the regulated charges of the relevant network business or businesses.

8 Clause 5.17.3(a)(2) of the NER .The RIT–D cost threshold is currently $5 million. See AER, *Final determination: Cost thresholds review for the regulatory investment test*, November 2015, p. 10.

3 Operation and application of the RIT–D

This part of the RIT–D application guidelines provides guidance on the operation and application of the RIT–D. The broad steps for applying the RIT–D are:

1. Identify a need for the investment, known as the identified need (section 3.1).
2. Identify a set of credible options to address the identified need (section 3.2).
3. Characterise the base case, under which to compare credible options (section 3.3).
4. Identify reasonable inputs to include in the cost–benefit analysis (section 3.4).
5. Quantify the expected costs of each credible option (section 3.5).
6. Identify what classes of market benefits to quantify (section 3.6).
7. Estimate the magnitude of expected market benefits of each credible option by:
   (a) Deriving states of the world to compare the market benefits of credible options relative to the base case across a range of reasonable scenarios; and
   (b) Calculating the expected market benefit over a probability weighted range of reasonable scenarios (sections 3.7, 3.8, 3.9 and appendix A).
8. Rank each credible option by its expected net economic benefit to identify the credible option with the highest expected net economic benefit as the preferred option. In the relevant circumstances, this will require quantifying the expected net economic benefit of each credible option (section 3.10).

3.1 Identified need

Chapter 10 of the NER defines an identified need as the objective a network business seeks (or network businesses seek) to achieve by investing in the network. Either a network or a non-network option may address an identified need.

An identified need may consist of an increase in the sum of consumer and producer surplus in the NEM. Based on NER 5.17.1(b), an identified need may also be for reliability corrective action. This is where NER 5.10.2 defines reliability corrective action as a network business' investment in its network to meet 'the service standards linked to the technical requirements of schedule 5.1 or in applicable *regulatory instruments* and which may consist of *network options* or *non-network options*'. The capital expenditure objectives in NER 6.5.7(a) should guide RIT–D proponents when considering what service level outcomes are required to meet the above service standards.

RIT–D proponents should express an identified need as the achievement of an objective or end, and not simply the means to achieve the objective or end. The identified need should be clearly stated and defined in RIT–D reports[9], as opposed to being implicit. An identified need should be clear and articulated in a way that does not bias the development of credible options towards a particular solution. NER clause 5.15.2(c) prescribes that a RIT–D

9 That is, the reports the RIT–T proponent must publish under NER clause 5.17.4.

proponent must consider all options that it could reasonably classify as credible options without bias as to energy source, technology, ownership, and whether it is a network option or a non-network option. A description of an identified need should not mention or explain a particular method, mechanism or approach to achieve a desired outcome.

For example, where a RIT–D proponent is concerned about network constraints under increased load, the RIT–D proponent could express the identified need as an increase in the ability of the network to 'take up load'. This would not be an identified need to 'install a capacitor to address a voltage stability issue'.

In describing an identified need, a RIT–D proponent may find it useful to explain what will or may happen if the RIT–D proponent performs business-as-usual (BAU) activities rather than taking a specific action to address the identified need.

In NEM jurisdictions that rely solely on economic criteria to justify network investment (for example, Victoria[10]), the identified need must refer to an increase in consumer and producer surplus. In other NEM jurisdictions, if a RIT–D cannot point to a clear service standard obligation to justify the network investment in question, the identified need also defaults to an increase in consumer and producer surplus.

3.2 Credible options

This section provides guidance on how to apply clause 5.15.2(a) of the NER, which provides a credible option is an option (or group of options) that:

- Addresses (or address) the identified need. That is, achieves the objective the RIT–D proponent seeks to achieve by investing in the network;
- Is (or are) commercially and technically feasible; and
- Can be implemented in sufficient time to meet the identified need. That is, can be implemented to meet any specific timing imperatives of the RIT–D proponent's objective.

To the extent possible, RIT–D proponents should construct credible options using individual options that meet identified needs over broadly similar timeframes. This facilitates the use of similar modelling periods (see section 3.11.1) and increases the transparency and robustness of the analysis.

For meeting a service standard, the RIT–D proponent's choice of credible options should reflect the degree of flexibility offered by that service standard. For example, a standard might refer to maximum levels of system average interruption duration index (SAIDI) and system average interruption frequency index (SAIFI) across the RIT–D proponent's network over a year. In this case, the proponent should consider options at various locations on its network if some credible options could be more effective in limiting the network-average SAIDI and SAIFI than restricting attention to options in a single area. Conversely, if a standard refers to, say, SAIDI or SAIFI outcomes on individual feeders, the range of potential credible options will be correspondingly narrower.

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10 Victoria uses a 'probabilistic' approach to justifying network investment, utilising a Value of Customer Reliability (VCR) to represent the benefits of avoiding network outages that result in unserved energy.

In addition to helping stakeholders interpret the elements of NER clause 5.15.2(a), this section also provides guidance on:

- developing credible options with option value; and
- determining a reasonable number and range of credible options.

3.2.1 Addressing the identified need

As discussed in section 3.1, an identified need is the objective a network business (or network businesses, in the case of joint planning) seeks (or seek) to achieve by investing in the network. An option addresses an identified need if the RIT–D proponent reasonably considers that the option would, if commissioned within a specified time, be highly likely to meet that identified need.

Since a credible option can be an option or group of options that address an identified need, a set of projects may constitute one credible option if they form one integrated solution to meet a given identified need.

Example 1 provides guidance on two different types of identified needs, along with credible options to meet each of those identified needs.

Example 1: Identified need and credible options

Identified need driven by service standards

Changing patterns of generation investment have increased the likelihood of breaching voltage service standards in the next few years.

The identified need in this example is to ensure that voltage standards as outlined in Schedule 5.3 of the NER continue to be satisfied. An example of a credible option to address this identified need is the installation of one or more voltage control network elements, such as a static volt-ampere reactive (VAR) compensator.

Identified need driven by market benefits

A remote area receives supply from a limited sized link with the rest of the shared network, distributed generation (rooftop photovoltaics) and costly peaking generators (diesel). The RIT–D proponent identifies it is likely to be net beneficial to reduce the area's reliance on local peaking generation through introducing a demand management program.

The identified need in this example is an (expected) increase in net economic benefits compared to the base case. In formulating credible options to meet this identified need, we would expect the RIT-D proponent to reference the driver (or drivers) of the net economic benefits expected to flow from the credible option. For example, a program that delivers a defined kVA of demand management capability by incentivising owners of rooftop photovoltaics to purchase batteries and technology that optimises when they use and recharge their batteries could be justified on the basis of avoided network capital expenditure.

3.2.2 Commercially and technically feasible

An option is commercially feasible under clause 5.15.2(a)(2) of the NER if a reasonable and objective operator, acting rationally in accordance with the requirements of the RIT–D, would be prepared to develop or provide the option in isolation of any substitute options.

NER clause 5.15.2(d) prevents a RIT–D proponent from rejecting an option that would otherwise satisfy the RIT–D on the basis that it lacks a proponent. Such an option would be commercially feasible because, if undertaken, it would satisfy the RIT–D and therefore provide the investor with a reasonable expected return. This requirement prevents a RIT–D proponent from 'gaming' the RIT–D by only agreeing to act as a proponent for a network option that is over-engineered, more expensive and less net beneficial than other network options. Example 2 below provides an example of this.

An option is technically feasible if there is a high likelihood that it will, if developed, provide the services that the RIT–D proponent has claimed it could provide for the purposes of the RIT–D assessment. In providing these services, the option should also comply with relevant laws, regulations and administrative requirements. Technical feasibility will always turn on the relevant facts and circumstances, although example 2 provides a brief stylised example.

Example 2: Feasibility of options

Commercial feasibility

The most likely option for enhancing the sum of consumer and producer surplus in a particular area is to augment an existing distribution line between substation A and substation B that runs through a major load centre.

However, the RIT–D proponent refuses to act as a proponent for this option and thereby claims that the option is not a credible option for enhancing net economic benefits. Instead, the RIT–D proponent proposes a costlier option involving augmenting a line from substation A to substation C. This is where substation C is further away and has less in-built redundancy and, in turn, requires an upgrade as part of the credible option.

In this case, the cheaper augmentation must be considered a credible option, because a reasonable and objective RIT–D proponent would be willing (in isolation of any other substitute projects it might have in mind) to construct it if it passed the RIT–D.

Technical feasibility

A proponent has suggested a local geothermal generation option as an alternative to the network option above. According to the proponent, the local geothermal option would provide the same services as the RIT–D proponent's proposed network option.

However, the RIT–D proponent reasonably believes that the geothermal option will not presently be feasible due to the relatively untested nature of the technology in Australia. In this case, it need not consider the geothermal plant a credible option due to a lack of technical feasibility.

3.2.3 Developing credible options with option value

A RIT–D proponent may find value in retaining flexibility to respond to changing market developments or scenarios as they emerge where there is material uncertainty and the option/s that it is considering involve a sunk or irreversible action. One approach is to consider credible options formed by a group of options that include:

- an initial option that allows the RIT–D proponent to defer expenditure of a more costly option until more information becomes available; and
- a subsequent option that would only be implemented under certain future conditions or states of the world.

When a RIT–D proponent accounts for this value, as example 3 shows, it is effectively incorporating option value into its RIT–D assessment.

Example 3: Identifying credible options when there is uncertainty

A RIT–D proponent is considering augmenting a section of its distribution network. The RIT–D proponent has forecast future demand, and found that there is a material degree of uncertainty. A major property developer is exploring whether to build a large residential estate in the area. Consequently, the RIT–D proponent has forecast the following future scenarios:

- Low demand: demand decreases by 1 per cent over the next 6 years with 50 per cent probability.
- High demand: demand increases by 20 per cent over the next 6 years with 50 per cent probability.

In light of the high demand scenario, the RIT–D proponent is considering a network augmentation option by investing in a large substation and additional poles and wires. This investment would be costly and only beneficial in the forecast high demand scenario. There is a 50 per cent chance that this scenario would not eventuate.

However, it may be prudent for the RIT–D proponent to retain the flexibility to respond to the high demand scenario as it emerges. This could enable the RIT–D proponent to delay the large substation investment until it is certain that the major property development will go ahead.

If the identified need is such that it is sub-optimal for the RIT–D proponent to do nothing while it waits for information, it could be prudent for it to make a smaller or more reversible investment in the interim. This could entail implementing a direct load control project, or giving electricity consumers incentive payments to reduce their electricity consumption at periods of peak demand.

In this example, the RIT–D proponent identifies the following credible options:

- Augment the network in year 2.
- Implement a voluntary load curtailment program in year 1 and wait for more information before deciding whether to augment its network. Subject to the information, which the

RIT–D proponent expects to receive in year 3, the RIT–D proponent could augment the network in year 4.

After the RIT–D proponent quantifies the market benefits in both reasonable scenarios, it finds that the market benefits are highest in the second option.

In the above example, the RIT–D proponent is effectively considering a credible option that includes a decision rule or policy specifying, not just an action or decision to take now, but also an action or decision to take in the future if the appropriate market conditions arise. As another example, where future demand growth is uncertain, the following may all be legitimate credible options:

- Option (a): fully upgrade a distribution line in the immediate term to accommodate all likely demand growth over the next 15–20 years.
- Option (b): upgrade a distribution line to the minimum extent necessary to cover likely demand growth in the next five years (without any further consideration of the potential for further growth in the future).
- Option (c): upgrade a distribution line to the minimum extent necessary in the immediate term, but allow extra space for a relatively low-cost expansion of the network if load growth materialises in the future.

The ability of a RIT–D proponent to formulate credible options incorporating a decision rule or policy enables the RIT–D cost–benefit analysis to include option value as a potential source of market benefit. Section 3.8 discusses this further by providing guidance on identifying credible options where there is a material degree of uncertainty.

3.2.4 Number and range of credible options

Clause 5.15.2(c) of the NER states that in applying the RIT–D, the RIT–D proponent must consider all options that it could reasonably classify as credible options, without bias to energy source, technology, ownership and whether it is a network or non-network option.

The number of credible options a RIT–D proponent assesses for meeting a particular identified need should be proportionate to the magnitude of the likely costs of any credible option. Therefore, if the RIT–D proponent reasonably estimates that the costs attributable to any one of several credible options orientated towards meeting an identified need at particular town is $50 million, the RIT–D proponent should consider a larger number and range of credible options than if the estimated cost of most credible options was $10 million.

3.3 Characterising the base case

If the identified need is for reliability corrective action, the RIT–D proponent may choose to select a credible option as its base case. Otherwise, the base case in the RIT–D is where the RIT–D proponent does not implement a credible option to meet the identified need. We refer to this base case as a:

- 'do-nothing' base case when applying the RIT–D to augmentation projects. The 'do-nothing' base case is where the RIT–D proponent does not implement a credible option to meet the identified need, but continues its BAU activities otherwise.
- 'BAU' base case when applying the RIT–D to replacement projects or programs. The 'BAU' base case should refer to a state of the world where the RIT–D proponent does not retire the poor condition element nor implement any other relevant credible option to meet the identified need. In this instance, the base case must incorporate the operational and maintenance expenditure required to allow the ageing element to remain in service as effectively as possible for as long as possible. The 'BAU' base case may include credible BAU expenditure relating to the deteriorating asset to manage safety risk, environmental risk and equipment protection to the extent this expenditure meets legal obligations or is consistent with efficient industry practice.

Example 4 illustrates characterisation of the base case where the identified need for a credible option is to increase the sum of consumer and producer surplus in the NEM.

Example 4 Characterisation of base for providing a net economic benefit

Augmentation project to provide a net economic benefit

A RIT–D proponent is considering a network augmentation to avoid an increase in the expected volume of unserved energy (USE) as load at a particular location on its network grows.

No mandatory service standard or regulatory instrument is driving the augmentation to avoid expected load shedding. This implies that the identified need must be characterised as an increase in the sum of consumer and producer surplus in the NEM. Accordingly, the base case for the RIT–D assessment must refer to a state of the world in which the RIT–D proponent does not pursue the augmentation project nor implement any other credible option to meet the identified need. From the RIT–D proponent's perspective, this is a ‘do nothing’ base case, as defined above this example.

While this 'do nothing' option in the face of ongoing load growth may eventually result in what appears to be unrealistically high levels of USE, what is important from the perspective of a RIT–D assessment is that the base case provides a clear reference point for comparing the performance of different credible options.

The RIT–D assessment would then involve a comparison of:

- the net economic benefit available from the augmentation option as against the 'do nothing' base case; to
- the net economic benefit available from other relevant credible options as against the 'do nothing' base case.

The preferred option is the option that maximises the net economic benefit across the NEM. If no credible option yields a net economic benefit, it means the base case represents the best course of action. That is, the RIT–D proponent should accept the 'do nothing' base case.

Replacement project to provide a net economic benefit

A RIT–D proponent expects the condition of a network element to result in increasing USE over time as the network element becomes increasingly prone to failure.

No mandatory service standard or a regulatory instrument is obligating the RIT–D proponent to avoid an expected increase in load shedding. Therefore, the identified need must be characterised as an increase in the sum of consumer and producer surplus in the NEM. Accordingly, the base case for the RIT–D assessment should refer to a state of the world where the RIT–D proponent does not replace the poor condition element nor implement any other relevant credible option. In this base case, the RIT–D proponent will still incur operating and maintenance expenditure to allow the network element to remain in service effectively for as long as possible. From the RIT–D proponent's perspective, this is a 'BAU' base case, as defined above this example.

While this base case option may eventually result in a complete and irreparable failure of the poor condition element and very high volumes of USE, what is important from the perspective of a RIT–D assessment is that the base case provides a clear reference point for comparing the performance of different credible options.

The RIT–D assessment will then involve a comparison of:

- the net economic benefit available from replacing the poor condition network element as against the 'BAU' base case; to
- the net economic benefit available from other relevant credible options as against the 'BAU' base case.

The preferred option is the option that maximises the net economic benefit across the NEM. If no credible option yields a net economic benefit, it means the base case represents the best course of action. That is, the RIT–D proponent should accept the 'BAU' base case.

Example 5 illustrates how to characterise the base case where the identified need for a credible option is to meet any of the service standards linked to the technical requirements of schedule 5.1 or in applicable regulatory instruments—that is, reliability corrective action.

Example 5 Characterisation of the base case for meeting a service standard obligation

Augmentation project to meet a service standard obligation

A RIT–D proponent is considering a network augmentation to meet service standards contained in a jurisdictional regulatory instrument as load grows. The standard obliges the RIT–D proponent to meet individual feeder standards in the form of maximum levels of SAIDI and SAIFI.

As the identified need is to meet service standard obligations, the preferred option may have a negative net market benefit, as long as it maximises net economic benefit (or equivalently, minimises net economic detriment) while also meeting the standard. Since this is an augmentation project where the identified need is for reliability corrective action, the base case may be a state of the world where the RIT–D proponent implements a credible option that meets the service standard obligation. However, in other cases, the RIT–D proponent must adopt a 'do nothing' base case, as defined above example 4.

The RIT–D proponent must consider credible options that take advantage of whatever flexibility the service standard obligation offers to maximise the net economic benefit or minimise the net economic cost of meeting the standard in question. This could mean considering options that relate to different locations on the network, that reduce SAIDI more than SAIFI (or vice versa), or where a given option is implemented at different points in time.

Replacement project to meet a service standard obligation

A RIT–D proponent is considering replacing a poor condition network element so it can continue to meet service standards contained in a jurisdictional regulatory instrument. The instrument obliges the RIT–D proponent to meet individual feeder standards in the form of maximum levels of SAIDI and SAIFI. Replacing the element will help the RIT–D proponent avoid breaching those limits as the poor condition network element becomes increasingly prone to failure.

As above, since the identified need is to meet service standard obligations, the preferred option may have a negative net market benefit. However, since the RIT–D proponent is exploring asset replacement, it will be clearer to select a 'BAU' base case rather than adopting a base case where the RIT–D proponent implements a credible option to meet the identified need.

3.4 Selecting reasonable inputs

As a principle, wherever possible, RIT–D proponents should use:

- Inputs based on market data where this is available and applicable.
- Assumptions and forecasts that are transparent and from a reputable and independent source. For instance, material that the Australian Energy Market Operator (AEMO) publishes will often be a useful starting point for developing assumptions to use in a RIT–D analysis.
- Up-to-date and relevant information. For instance, it might be appropriate to depart from information that AEMO has published where alternative sources of information are more up-to-date or more appropriate to the particular circumstances under consideration.

3.4.1 Using integrated system plan and other external documents

To the extent they are relevant to the RIT–D, RIT–D proponents should consider external documents when developing assumptions and inputs to use in a RIT–D analysis. These documents would typically include material published by AEMO in developing the National Transmission Network Development Plan (NTNDP), the Integrated System Plan (ISP), or similar documents. However, it may be more appropriate to use alternative sources of information where this information is more up-to-date or is more appropriate to the particular circumstances under consideration. In applying this guidance, RIT–D proponents should note that AEMO has integrated its 2017 NTNDP into its 2018 ISP. It is currently unclear whether there will be a rule change to integrate the current NTNDP content into the ISP in future years.

Example 6 illustrates how a RIT–D proponent might have regard to the information in an ISP when considering how to apply its cost–benefit analysis to RIT–D projects.

Example 6: Having regard to the ISP in applying a RIT–D

A RIT–D proponent observes an increasing risk of lost load in its network due to the poor condition of a network element. There is an identified need to manage this electricity supply risk, and thereby deliver market benefits from reducing expected load curtailment.

AEMO has recently published an ISP that forecasts a lowest present value resource cost path for generation and network infrastructure development that will meet reliability and renewable energy targets. This path includes expanding the capacity of an existing transmission line that runs through the RIT–D proponent's network (project T). The RIT–D proponent was not planning to account for project T prior to the publication of the ISP, as the main driver for project T will be to connect a renewable energy zone that was yet to be explored commercially.

In the RIT–D proponent's view, unless a high load growth scenario is realised, this transmission upgrade will defer the identified need by several years. Moreover, the transmission upgrade will increase the net market benefits of the smaller credible options under the RIT–D relative to the larger credible options.

In this example, the RIT–D proponent should:

- Undertake joint planning with the transmission business that would be responsible for project T.
- Treat project T as a modelled project in the RIT–D. It should work closely with this transmission business in estimating the weighting to apply to the reasonable scenario (or scenarios) where project T becomes committed.
- Carefully explore staging options, as well as how the RIT–D project's commissioning date might affect its expected net economic benefits. For example, if the net economic benefits are higher when commissioning the RIT–D project earlier than project T, the RIT–D proponent might explore undertaking a smaller solution in the short term (such as network support), with the option to expand that solution (such as by augmenting network capacity) when more information is known about project T.

3.4.2 Discount rates

Following NER clause 5.17.1(c)(9)(iii), the RIT–D to specifies the method for determining the discount rate or rates to apply. Paragraphs 16–17 of the RIT–D state:

> 16. The present value calculations must use a commercial discount rate appropriate for the analysis of a private enterprise investment in the electricity sector. The discount rate used must be consistent with the cash flows that the RIT–D proponent is discounting.

17. The lower boundary should be the regulated cost of capital.

Paragraph 16 of the RIT–D provides RIT–D proponents with the flexibility to adjust the discount rate to reflect the risks that different types of projects carry. We expect these adjustments would vary between identified needs rather than between credible options to address a specific identified need. It will typically be best practice to capture the relative riskiness of different credible options through scenario analysis rather than by using different discount rates (see section 3.8 on scenario analysis).

Considering the above, as a default, a RIT–D proponent should use the same discount rate for different credible options to address a given identified need. If a RIT–D proponent has a sound reason to depart from this default by using a different discount rate for a particular credible option, it must:

- Clearly and transparently provide this reasoning, including providing supporting evidence; and
- Show if or how this decision affects the ranking of credible options.

Since the discount rate is a particularly important parameter for estimating the present value of long-term projects, we expect RIT–D proponents to explore:

- Whether as part of its scenario analysis, there is reason to include reasonable scenarios with different discount rates. If it includes a scenario with a lower than expected discount rate, it would also be reasonable to explore a scenario with a higher than expected discount rate. As required in paragraph 17 of the RIT–D, the regulated cost of capital should be the lower bound.
- When sensitivity testing the outcome of its cost–benefit analysis, if applicable, illustrate 'boundary values' for discount rates at which the preferred option changes. The RIT–D proponent can then discuss the plausibility of those values and analyse this risk.

3.4.3 Value of customer reliability

The value of customer reliably (VCR), typically reported in dollars per kWh, is an important proxy for estimating classes of market benefits that relate to reliability, such as changes in voluntary and involuntary load curtailment. When considering what VCR to apply, a RIT–D proponent should:

- Consider the willingness to pay for a reliable supply of electricity, across a range of customers that the credible options in question will affect. Related to this, it should consider the economic merits to consumers of carrying out additional investment in the electricity network.
- Have regard to the factors that cause the VCR to vary. These include outage length, width of affected area, and customer type.
- Wherever possible, use estimates that are up-to-date, fit for purpose and based on a transparent methodology. An independent expert should makes these estimates publicly available. As an example:

- The VCR that AEMO uses for network planning in Victoria should meet a number of these criteria. To the extent that a RIT–D proponent is considering a credible option that affects a different customer make-up or different circumstances to what AEMO has considered, this value may require adjustments to be fit for purpose.
- The VCR estimates we will publish from 31 December 2019, which we will base on a transparent methodology on which we have publicly consulted. We are an independent, expert source. We will also provide relatively up-to-date estimates because we will adjust our VCR estimates annually. Our estimates should be fit for purpose, as we will have regard to the current and potential uses of VCRs, and reflect the range and geographic locations of customers when developing the VCR methodology.

In general, the RIT–D proponent should clearly justify any excursion of VCR calculations away from an accepted estimate such as those produced by AEMO, or by us from 31 December 2019. Any such excursion should reflect the unique circumstances associated with a specific RIT–D application. The primary issues involved with VCRs are generally:

- Consideration of customer types in the supply area under consideration — that is, different customer types place different values on reliability and on different aspects of reliability. For example, residential VCR would reflect the general inconvenience attached to an outage. In contrast, for industrial customers, the VCR reflects lost sales and productivity, as well as stand down, shut down and start-up costs.
- VCRs should reflect the weighted mix of customers that the option affects. Weighting based on actual or projected customer types and on the reliability value of those customer types should be used in economic analysis.
- Outage duration and outage frequency have different values, as does momentary reliability. A RIT–D proponent should select a VCR that reflects the circumstances of the affected customers, and the nature and type of reliability issue it is modelling.

Since, like the discount rate, the VCR is an important metric, we expect RIT–D proponents to explore:

- Whether as part of its scenario analysis, there is reason to include reasonable scenarios with different VCRs. If it includes a scenario with a higher than expected VCR, it would also be reasonable to explore a scenario with a lower than expected VCR. The expected VCR should have a basis in an independent estimate (such as values that AEMO uses, or that we will provide from 31 December 2019).
- When sensitivity testing the outcome of its cost–benefit analysis, if applicable, illustrate 'boundary values' for VCRs at which the preferred option changes. The RIT–D proponent can then discuss the plausibility of those values and analyse this risk.

For a more general discussion on scenario analysis and sensitivity analysis, see section 3.8.

3.5 Valuing costs

Under clause 5.17.1(c)(6) of the NER, the RIT–D proponent must consider whether the following classes of costs would be associated with each credible option:

- financial costs incurred in constructing or providing the credible option;
- operating and maintenance costs over the operating life of the credible option;
- cost of complying with laws, regulations and applicable administrative requirements in relation to the credible option;
- costs unique to asset replacement projects or programs; and
- any other financial costs we determine to be relevant.

A RIT–D proponent must capture these classes of costs in its RIT–D assessment.

Where the identified need is for reliability corrective action, costs refer to the incremental or relative costs of another credible option over (or under) the costs of the base case. RIT–D proponents must not subtract actual option costs from relative market benefits.

For asset replacement projects or programs, there are costs unique to asset replacement resulting from the removal and disposal of existing assets, and a RIT–D assessment must recognise these costs. RIT–D proponents should include these costs in the costs of all credible options that require removal and disposal of retiring assets. For completeness, the RIT–D proponent would exclude these costs from the 'BAU' base case, which section 3.3 defines.

3.5.1 Accounting for demand response payments

In the case of demand side options, rewards or inducements paid to consumers for voluntary load curtailment may be counted as either a:

i. cost of the demand side option (implicitly included in the full contract cost paid by the RIT–D proponent to the non-network businesses); or

ii. negative market benefit of the demand side option (while the commission or fees paid by the RIT–D proponent to the demand side aggregator or relevant energy service business count as a cost of the demand side option).

The less consumers require payment to curtail their power use, the lower the negative market benefits from a voluntary curtailment option. This is because, in a competitive market, the payment consumers need to curtail their power should reflect, at a minimum, the real loss of utility they experience from not consuming power.

As set out in example 7 below, the two options for the treatment of demand side payments are intended to be equivalent, although the second option may yield a more accurate result where payments to consumers vary by reasonable scenario.

Example 7: Treatment of demand-side response payments

A RIT–D proponent expects load on a particular network to reach 201 MW, but the network's capacity is only 200 MW. Consumers value involuntarily curtailed load at $45,000/MWh. A demand side credible option involves paying a demand aggregator:

- $500,000 per year as an availability payment, which the aggregator will pass on in full to a group of large electricity consumers; and

- $1,500/MWh to curtail load by 1 MW during 100 pre-notified hours of critical peak periods each year. Of this, the aggregator will retain $500/MWh and pay the remaining $1,000/MWh to the group of large electricity consumers to curtail their load during these periods.

In the base case:

- Demand exceeds supply by 1 MW for 100 hours a year.
- The value of voluntary load curtailment is $0.
- The value of involuntary load curtailment is 1 MW x 100 hours x $45,000/MWh = $4.5 million per year.

Under the demand side credible option, demand is curtailed by 1 MW for 100 hours a year so system load does not exceed system supply. As such, the demand side option avoids involuntary load shedding, in contrast to the base case. Table 1 shows the apportioning of costs and market benefits under the two options.

Benefits less costs are the same in both treatments. The two options are equivalent.

Table 1 Modelling and analysis required under the RIT–D (reliability corrective action project)

	Credible option	Option (i)	Option (ii)
Costs	Payment to the demand aggregator	Full load curtailment payment + availability payment: 1 500/MWh x 1 MW x 100 hours + $500 000 = $650 000 per year	Only the part of the load curtailment payment retained by the aggregator: $500/MWh x 1 MW x 100 hours = $50 000
	Total Cost	$650 000	$50 000
Market Benefits	Negative value of voluntary load curtailment (as reflected in payments to consumers)	$0	Load curtailment payment + availability payment: -$1 000/MWh x 1 MW x 100 hours - $500,000 = -$600 000
	Value of avoided involuntary load curtailment	$4 500 000	$4 500 000
	Total Market Benefit	$4 500 000	$3 900 000
	Benefits less costs	$4 500 000 - $650 000	$3 900 000 - $50 000

		= $3 850 000 per year	= $3 850 000 per year

3.5.2 The treatment of land

Given that the cost of land may be a cost incurred in constructing or providing a credible option[11], the value of land should be included as part of a RIT–D assessment. The purpose of the RIT–D is to identify the credible option that maximises the present value of the net economic benefit to all those who produce, consume and transport electricity in the NEM. Therefore, the RIT–D proponent should assess all credible options at present values. The RIT–D proponent should therefore use the market value of land in assessing the costs incurred in constructing or providing credible options.

3.5.3 Other financial costs

A RIT–D proponent may propose any other financial cost that it considers relevant. If a RIT–D proponent includes other financial costs in its RIT–D assessment, it should provide us with a written explanation outlining the relevance of the financial cost, including any underlying assumptions.

The RIT–D proponent must submit this proposal us before making its NNOR available to other parties. If the RIT–D proponent is not preparing a NNOR, we must approve the proposal before the RIT–D proponent publishes a notice of its determination that there are no credible non-network options.

If we agree that the RIT–D proponent should account for the proposed class and magnitude of financial cost, we will provide approval in writing as soon as practical.

3.5.4 The cost of complying with laws and regulations

In some cases, a proponent may have a choice as to how it complies with a law, regulation or administrative requirement. For example, the proponent may lawfully choose to pay a financial amount rather than undertake some other action (which is otherwise necessary to comply with the relevant law, regulation or administrative requirement). If the financial amount is smaller than the costs of undertaking some other action, the RIT–D proponent may treat the financial amount as part of that credible option's costs.

A RIT–D proponent must exclude from its analysis, the costs (or negative benefits) of a credible option's harm to the environment or to any party that is not expressly prohibited or penalised under the relevant laws, regulations or administrative requirements. This places the onus on policy makers to prohibit certain activities or to value various types of harm and impose financial penalties accordingly. The RIT–D has no role in prohibiting or penalising activities that policy does not prohibit or penalise.

A RIT–D proponent may expect a credible option would change whether another party in the NEM pays penalties or incurs costs in connection with meeting a government policy

11 NER, cl. 5.17.1(c)(6)(i).

connected to their role as a producer, consumer or transporter of electricity in the NEM (such as a renewable energy target, the National Energy Guarantee or similar scheme). In such cases, the RIT–D will capture these changes in costs to other parties in that credible option's market benefits, rather than its costs.

Example 8 demonstrates costs of a credible option on externalities.

Example 8: Cost of a credible option

Unpriced externality

To meet an identified need, a RIT–D proponent identifies the development of a local gas-fired embedded generator in close proximity to an existing hotel as a credible option. The present value of the embedded generator's expected construction and operating costs is $90 million. The RIT–D proponent expects the generator to reduce the hotel's earnings due to a loss of visual amenity. The present value of this loss is $5 million. There are no planning standards, consents or other requirements to protect the hotel against this loss.

In the absence of any planning standards, consents or other requirements hindering its development, the costs of the credible option remain $90 million. The negative externality created by the embedded generator's development and borne by the hotel is not regulated or legislated by any relevant law, regulation or administrative requirement and therefore does not form part of the costs of the credible option.

Penalised externality

Continuing from above, assume that a regulatory body allows the development of the credible option contingent on the RIT–D proponent paying for landscaping to conceal the embedded generator and to reduce the harm to the visual amenity of the hotel's guests. The present value of this landscaping is $5 million.

In this case, the costs of the credible option would be 90 + 5 = $95 million. The $5 million is now included as part of the costs of the credible option since a relevant regulatory body requires the generator's development was contingent on such an expense being incurred.

3.6 Market benefit classes

Clause 5.17.1(c)(4) of the NER requires RIT–D proponents to consider whether each credible option could deliver the following classes of market benefits:

- changes in voluntary load curtailment;
- changes in involuntary load shedding and customer interruptions caused by network outages, using a reasonable forecast of the value of electricity to customers;
- changes in costs for parties, other than the RIT–D proponent, due to differences in:
    - the timing of new plant;
    - capital costs; and
    - operating and maintenance costs;

- differences in the timing of expenditure;
- changes in load transfer capacity and the capacity of embedded generators to take up load;
- any additional option value (where this value has not already been included in the other classes of market benefits) gained or foregone from implementing the credible option with respect to the likely future investment needs of the NEM;
- changes in electrical energy losses; and
- any other class of market benefit that we determine to be relevant.

This section provides guidance on:

- when a class of market benefit is material and should in included in the RIT–D analysis; and
- how an additional class of market benefit can be added to the classes defined above.

3.6.1 Material classes of market benefits

We require a RIT–D proponent to include all classes of market benefits in its analysis that it considers material. A RIT–D proponent must consider whether each credible option could deliver the classes of market benefits specified under clause 5.17.1(c)(4) of the NER. Clause 5.17.1(d) of the NER specifies that:

> A RIT–D proponent may, under the regulatory investment test for distribution, quantify each class of market benefits under paragraph (c)(4) where the RIT–D proponent considers that:
>
> (1) any applicable market benefits may be material; or
>
> (2) the quantification of market benefits may alter the selection of the preferred option

While a RIT–D proponent must consider each class of market benefit specified under NER clause 5.17.1(c)(4), it is not obligated to quantify the benefits that it considers to be immaterial or will not alter the selection of the preferred option. Likewise, a RIT–D proponent is not obligated to quantify market benefits for reliability driven projects.[12]

However, where an identified need is not for reliability corrective action, including more classes of market benefits may assist a credible option to have a positive net economic benefit and hence satisfy the RIT–D. Therefore, in this circumstance the quantification of market benefits is effectively required.

While there might be some ambiguity in the NER, the AEMC clarifies this in its final determination:[13]

12 AEMC, *Rule Determination: National Electricity Amendment (Distribution Network Planning and Expansion Framework) Rule 2012*, 11 October 2012, pp. 81–82.

13 AEMC, *Rule Determination, National Electricity Amendment (Distribution Network Planning and Expansion Framework) Rule 2012*, 11 October 2012, pp. 81–82.

The Commission confirms that it is the intention of clause 5.17.1(d) that the quantification of market benefits is optional under the RIT–D. However, this clause must be read in conjunction with clause 5.17.1(b) which states that:

"(b) ...For the avoidance of doubt, a preferred option may, in the relevant circumstance, have a negative net economic benefit (that is, a net economic cost) where an identified need is for reliability corrective action."

Therefore, where an identified need is not for reliability corrective action, a RIT–D proponent would need to quantify both the applicable costs and market benefits associated with each credible option in order for the preferred option to have a positive net economic benefit. On this basis, the quantification of market benefits under the RIT–D would be optional for reliability driven projects only.

Example 9: Market benefits

Market benefits with immaterial impacts

A RIT–D proponent's preferred option is to upgrade one of its substations. The RIT–D proponent expects that constructing this credible option will cost $40 million. As a part of this upgrade, the RIT–D proponent proposes to install more efficient transformers.

Load at the region of the distribution network is 100 MW. Energy costs after generation are $11/MWh.

The RIT–D proponent expects the new transformers to marginally reduce electrical energy losses from 6 per cent to 5.9 per cent when operating at 100 MW.

Total losses are:

- In the base case: $11*0.06*100 MW = $66 per hour.
- In the state of the world with the credible option: $11*0.059*100 MW = $64.9 per hour.

Assuming the same conditions over 8,760 hours per year, the contribution of decreased network losses to the market benefit of the credible option is ($66 – $64.9)*8760 = $9,636 per year. As the net present value of such a benefit would only be approximately $100,000, this could be considered immaterial given the cost of this credible option.

Market benefits that will not alter the selection of the preferred option

RIT–D proponents should quantify classes of market benefits that may affect the identification of the preferred option. For example, a RIT–D proponent is considering three credible options:

- network option;
- sophisticated demand side option; and
- simple demand side option with a deferred network option.

Assume that each option has a similar cost and only has an impact on load shedding. The RIT–D proponent determines on reasonable grounds, that all three credible options will reduce involuntary load shedding by a very similar amount. However, the RIT–D proponent expects that these credible options will differ significantly in the changes in voluntary load shedding they produce.

The RIT–D proponent may not have to calculate the marginal differences in involuntary load shedding if this is irrelevant for identifying the preferred option. In this example, the RIT–D proponent may only need to quantify the changes in voluntary load shedding to identify the preferred option.

3.6.2 Additional classes of market benefits

Clause 5.17.1(c)(4) of the NER requires RIT–D proponents consider whether each credible option could deliver specific classes of market benefits. Among this list, it includes classes of market benefits that we determine to be relevant.

If a RIT–D proponent quantifies an additional class of market benefit in its RIT–D assessment, we will consider it. However, a RIT–D proponent must receive approval from us before it makes its NNOR available to other parties. If the RIT–D proponent is not preparing a NNOR, we must provide approval before the RIT–D proponent publishes the notice of its determination stating that there are no non-network options that are credible options.

When determining whether to approve a new class of market benefit, we will consider whether the proposed benefit:

- Should already be reflected in another market benefit class. If it is effectively a component of a pre-existing class of benefits, there is no need to introduce a new class. In these cases, the RIT–D proponent should consider whether it should perform an additional calculation to add this 'sub-component' into the market benefit class. If it has already captured this benefit indirectly, it should not perform a separate calculation that would result in double counting the value of the benefit.
- Would accrue to a producer, consumer or transporter of electricity in the NEM. If the class of benefit falls outside the scope of the NEM, the proponent should not include it in its cost–benefit analysis (see section 3.11 for a discussion on externalities).

3.7 Methodology for valuing market benefits

The total benefit of a credible option includes the change in:

- consumer surplus, being the difference between what consumers are willing to pay for electricity and the price they are required to pay; and
- producer surplus, being the difference between what electricity producers and transporters receive in payment for their services and the cost of providing those services (excluding the costs of the credible option).

In applying the RIT–D, where the identified need for an investment is to increase market benefits, the market benefit of a credible option is obtained by:

i. comparing, for each relevant reasonable scenario, the state of the world with the credible option in place with the state of the world in the base case in which the RIT–D proponent does not implement a credible option; and

ii. weighting any benefits or costs in (i) by the probability of each reasonable scenario occurring.

If in the context of considering an augmentation, a deterministic reliability standard drives the identified need for reliability corrective action, a RIT–D proponent can select a credible option as a 'base case', rather than having to establish a base case where it does not implement a credible option to meet the identified need. However, for asset replacement or retirement projects, the RIT–D proponent should always adopt a 'BAU' base case, consistent with section 3.3.

Appendix A provides guidance and worked examples for calculating different classes of market benefits. In addition, the following sections provide guidance on valuing market benefits for a given credible option. A RIT–D proponent can obtain a market benefit for a credible option by:

1. **deriving** the states of the world with the credible option in place and in the 'base case' for each reasonable scenario;
2. **comparing** the relevant states of the world with the credible option in place and in the 'base case' for each reasonable scenario to derive the market benefit of the credible option in each reasonable scenario; and
3. **weighting** any market benefits or costs by the probability of each reasonable scenario occurring.

3.7.1 Deriving states of the world in each reasonable scenario

For each credible option, a RIT–D proponent must develop two states of the world (one with the credible option in place and the other being the base case) for each reasonable scenario. This allows the RIT–D proponent to later derive the market benefits of an option by comparing these states of the world, and then probability weighting those benefits across a range of reasonable scenarios.

Explanatory box 1 explains the difference between a 'state of the world' and a 'reasonable scenario.

Explanatory box 1: States of the world versus reasonable scenarios

Reasonable scenarios are independent of the credible option, whereas states of the world are dependent on the credible option.

A state of the world is a detailed description of all of the relevant market supply and demand characteristics and conditions likely to prevail if a credible option proceeds or —if the credible option does not proceed—in the base case. A state of the world should be internally consistent in that all aspects of the state of the world could reasonably coexist.

In some cases, the development of new generation (incorporating capacity, technology, location and timing) may vary depending on which credible option RIT–D is implemented. Therefore, each credible option and the base case will be associated with a different state of the world reflecting different patterns of generation investment and other characteristics and conditions.

A reasonable scenario is a set of variables or parameters that are not expected to change across each of the relevant credible options or the base case. For example, the following variables should be independent of the credible options and considered as components of each reasonable scenario:

- levels of economic growth and the associated level of base electricity demand;
- level of population growth and the associated level of base electricity demand;
- unit capital and operating costs of generation plant (in $/MW or $/MWh);
- value of any environmental penalties; and
- value of unserved energy.

In a particular analysis, it may be appropriate to assess the benefits of a credible option across high, medium and low demand reasonable scenarios.

For the avoidance of doubt, to the extent that a demand-side option leads to lower peak demand under each of these reasonable scenarios, this effect should be accounted for in the states of the world associated with that option in each of those reasonable scenarios. This ensures that the benefits of the demand-side option are transparently calculated separately in high, medium and low demand scenarios, because such benefits of the demand-side option may vary according to the demand scenario.

Notwithstanding the need for probability weighting market benefits to derive the market benefit of a credible option, RIT–D proponents will continue to provide details of the estimated market benefits of a credible option under each reasonable scenario.

When deriving all states of the world, RIT–D proponents must consider including:

- To the extent relevant, all existing assets and facilities at the time the RIT–D is applied. These must form a part of all states of the world, at least initially.[14]
- Appropriate committed, anticipated and modelled projects, which are future investment in generation, network and load relevant to or contingent on any or all credible options proceeding or not proceeding.

Committed and anticipated projects should form a part of all states of the world, based on the reasonable judgement of RIT–D proponents.

The choice of modelled projects, if relevant, in a given state of the world will need to be determined based on appropriate market development modelling. This involves determining the kind of projects that would be undertaken in the longer term, with and without each credible option proceeding. Market development modelling must occur on a transparent and robust basis.

14 Reasonable scenarios may appropriately contemplate retirement of existing plant or facilities.

By enabling the derivation of modelled projects in the presence of a credible option and the base case, market development modelling assists in determining the market benefits of the credible option in a given reasonable scenario. For example, market development modelling may assist in determining whether, in high, medium or low demand reasonable scenarios, a demand side option is likely to lead to the deferral (or advancement) of new generation investment compared to other credible options. To the extent it does, this would constitute a positive (or negative) contribution to the market benefit of the credible option in each of those reasonable scenarios.

3.7.2 Deriving and weighting market benefits

RIT–D proponents estimate the market benefit of a credible option in a given reasonable scenario with each option in place against the base case. RIT–D proponents must derive the states of the world with each credible option and the base case to compare the associated states of the world across all reasonable scenarios. Example 10 below illustrates this step.

Example 10: Comparing states of the world where the identified need is for reliability corrective action

Two credible options (a network option and a demand side option) can meet an identified need to address a mandatory service standard. There are three reasonable scenarios (high, medium and low demand). In this example, the RIT–D proponent must:

- derive both a network option state of the world and a demand side option state of the world under conditions of high, medium and low demand. This will require the development of six market modelling paths to establish the states of the world:
    1. network option with high demand;
    2. demand side option with high demand;
    3. network option with medium demand;
    4. demand side option with medium demand;
    5. network option with low demand; and
    6. demand side option with low demand.
- compare the states of the world under each credible option. This requires a comparison between state of the world (1) against (2), (3) against (4) and (5) against (6). Treating the network option as the base case credible option yields the relative market benefits of the demand side option as compared to the network option in each of the three reasonable scenarios.

For this example, assume that in the network option states of the world, the RIT–D proponent estimates the following costs of generation and involuntary load shedding:

- $30 million in a high demand scenario;
- $20 million in a medium demand scenario; and
- $10 million in a low demand scenario.

Further, assume that in the demand side option states of the world, the RIT–D proponent estimates the following costs of generation and voluntary load curtailment (assume there is no involuntary load shedding under the demand side option state of the world):

- $60 million in a high demand scenario;
- $40 million in a medium demand scenario; and
- $15 million in a low demand scenario.

This means that the demand side option has relative market benefits of:

- negative $30 million in a high demand scenario;
- negative $20 million in a medium demand scenario; and
- negative $5 million in a low demand scenario.

The final step is then to weight the market benefits of each credible option arising in each reasonable scenario. Assume the following probabilities of each reasonable scenario occurring:

- high demand scenario is 50 per cent;
- medium demand scenario is 40 per cent; and
- low demand scenario is 10 per cent.

Under these assumptions, the relative market benefits of the demand side option is -$23.5 million (0.5* -$30 million + 0.4* -$20 million + 0.1* -$5 million).

Note: this example incorporates the negative utility from voluntary demand side curtailment as part of the negative market benefits of the demand side option. This means that payments to consumers for curtailment do not need to be counted again as part of the costs of the option. Accordingly, the costs of the option will be limited to the fees or commissions of the demand side aggregator or energy service company. As long as the demand side option involves fees or commissions to the demand side provider, that are at least $23.5 million less than the costs of the network option, the demand side option will provide relative net economic benefit over the network option. Therefore, the demand side option would be the preferred option.

3.7.3 Categories of market benefits

Broadly speaking, the market benefit of a credible option predominately reflects savings in:

- capital costs, including the costs of generation and network assets;
- operating costs, including fuel costs, network losses, ancillary services, as well as voluntary and involuntary load reduction; and

- where applicable and material, the costs of meeting mandated government targets, such as the renewable energy target (RET) or similar developments (like the proposed National Energy Guarantee).

The draft RIT–T application guidelines provides worked examples on estimating these categories of savings. While these worked examples will generally be more relevant to transmission network investments, there may be some instances where this guidance will be relevant and useful to distribution network investments. If a distribution business is considering a credible option that it expects will have wholesale market or inter-regional impacts, they should consider section 3.7.3 of the draft RIT–T application guidelines.

Given there has been an increased demand for guidance on accounting for government policies, as well as the need to consider interregional impacts of investments, we provide some additional guidance on these areas below. Nevertheless, we also acknowledge that this guidance may only be relevant to some RIT–D projects.

Cost savings in meeting mandated targets

Some credible options in RIT–Ds might produce a material NEM-wide saving in meeting an environmental, reliability or other mandated target (for example, a RET or the proposed National Energy Guarantee). If or where this occurs, a RIT–D proponent can calculate this expected saving by comparing plant development and load-flow (or market dispatch, where relevant) outcomes for a credible option to the base case.

In the absence of any price caps or penalties, it is reasonable to assume that the market will meet an applicable mandated target, like the RET. Using the RET as an example, a RIT–D proponent could assume that the price of a renewable energy certificate would rise to the level necessary to induce compliance with the target. Therefore, under any state of the world, the benefits from meeting that target will be identical and need not be included in the RIT–D. Rather, the differences in other costs under the RIT–D will reflect any differences in the resource costs of meeting these targets under different states of the world.

It may be that there is a cap on prices (renewable energy certificates, in the case of the RET) or a penalty for not meeting the relevant target. In this case, it would be reasonable to assume that this cap or penalty reflects the maximum per unit benefit to the NEM of providing the relevant service (renewable energy, in the case of the RET). In such a case, it may not be net beneficial for the NEM to meet the target because the cost of meeting the target could exceed the benefits, as indicated by the level of the cap or penalty. As such, a RIT–D proponent can consider the benefits associated with the target in each state of the world equivalent, even where the target is not met due to it being lower-cost to pay the cap or penalty price.

Using the RET as an example, in a state of the world where the RET is not met, the amount of renewable energy short of the target will be valued at the capped price and contribute to the resource costs in that state of the world. Comparing the resource costs in different states of the world may then make a positive or negative contribution to the market benefits of a credible option.

For additional guidance on how treat the tax deductibility of RETs, and a worked example on calculating the costs savings in meeting a RET, see section 3.7.3 of the draft RIT–T application guidelines.

Benefits accruing across regions

Unlike the RIT–T provisions, the NER do not require the RIT–D application guidelines to specify which methods a RIT–D proponent can use to estimate market benefits that may occur outside its network. Nevertheless, we provide some high-level guidance to assist RIT–D proponents in estimating market benefits that accrue across regions because:

- RIT–D proponents must consider whether credible options could deliver changes in costs for parties other than themselves due to differences in the timing of new plant, capital costs, and operating and maintenance costs.[15]
- In our view, the increasingly distributed nature of electricity and the increased potential to orchestrate distributed energy resources has increased the potential for distribution-level investments to provide material benefits to different regions of the NEM.
- In our view, because the transition to a greater reliance on intermittent generation resources is increasing the complexity of network planning, it has become increasingly important to consider the systemic impacts of individual network investments when assessing whether a given investment will maximise net economic benefits across the NEM.

Our more general guidance on estimating benefits, such as the methods outlined above, also applies to quantifying benefits that accrue in more than one region. RIT–D proponents need not separately quantify benefits that arise in each region of the NEM. Nevertheless, in calculating benefits that accrue to other regions in the NEM, we suggests that RIT–D proponents:

- Liaise with producers, consumers and transporters of electricity in other regions of the NEM to inform their understanding of how different credible options will affect them. If the RIT–D proponent is exploring credible options that it expects will 'materially affect' another electricity network, we would expect the proponent to instigate a joint-planning project with that other electricity network. In this context, 'materially affect' means it will create an identified need sufficiently large that it will require a RIT–T or RIT–D project to meet it.
- Have regard to AEMO's NTNDP, ISP, or equivalent document to inform their understanding of how different credible options will fit into or affect the broader development of the NEM.

3.8 Reasonable scenarios and sensitivities

Clause 5.17.1 of the NER requires RIT–D proponents to base the RIT–D assessment on a cost–benefit analysis that includes an assessment of reasonable scenarios of future supply and demand. For example, in assessing two credible options, a RIT–D proponent might

15 See NER 5.17.1(c)(4)(iii).

formulate a reasonable scenario based on a set of input assumptions that it reasonably considers most likely. These might include, for instance:

- medium base forecast electricity demand;
- a discount rate of 7 per cent; and
- medium capital and operating costs for existing, committed, anticipated and modelled generation projects.

In this example, this set of inputs would represent the central reasonable scenario with which the RIT–D proponent can proceed to calculate the net economic benefit of the two credible options. However, depending on the nature of the options being assessed, the use of additional reasonable scenarios may be appropriate.

This section provides guidance on forming reasonable scenarios, including:

- Selecting an appropriate number of reasonable scenarios; and
- Giving consideration to high impact low probability (HILP) events.

3.8.1 Testing sensitivities to select reasonable scenarios

Under the RIT–D, the number and choice of reasonable scenarios must be appropriate to the credible options under consideration. Specifically, the choice of reasonable scenarios must reflect any variables or parameters that are likely to affect:

- the ranking of the credible options, where the identified need is for reliability corrective action and therefore only the ranking is important; and
- the ranking or the sign of the net economic benefits of any of the credible options, for identified needs other than reliability corrective action.

Clause 5.17.1(c)(2) of the NER states that the RIT–D must not require a level of analysis that is disproportionate to the scale and likely impact of each credible option considered. Consequently, the appropriate number and choice of reasonable scenarios is likely to vary for each set of credible options.

These requirements mean that the appropriate number and choice of reasonable scenarios is likely to vary for each set of credible options under consideration. As such, we cannot prescribe these requirements in advance. We do not intend to specify the appropriateness (or otherwise) of a particular number of reasonable scenarios in a given set of circumstances. However, as guidance, when developing reasonable scenarios, we recommend RIT–D proponents:

- Use sensitivity analysis to assist in determining an appropriate set of reasonable scenarios. We describe this approach in the following paragraphs.
- As a principle, be conscious of the current NEM reforms and relevant policy developments, including:
    - Electricity pricing reforms.

- The development of new markets and products, such as demand response markets and products that allow consumers to select their own price-reliability preference.
- Policies relating to features of the NEM, such as those concerning carbon emissions, renewable energy, reliability, energy security and other factors. For example, if the introduction of the National Energy Guarantee could affect the ranking or sign of credible options (or just the ranking, if the identified need was for reliability corrective action), the RIT–D proponent should include it in a reasonable scenario.

- Construct scenarios that are genuinely reasonable, in that they comprise of internally consistent parameters so that they can define a reasonable range of plausible states of the world.
- Where appropriate, have regard to AEMO's work in developing modelling forecasts, scenarios and assumptions, such as the information provided in the ISP (see section 3.4.1 for more information on using information that AEMO publishes).

The following paragraphs further explain the first dot point above—that is, how the development of additional reasonable scenarios involves a process of applying sensitivity analysis to key input variables that will likely affect the performance of credible options. Such inputs might include those relating to technology costs, fuel costs, distributed generation and storage growth.

It may be that a reasonable change to the value of a parameter changes the ranking of credible options by net economic benefit. In such cases, the RIT–D proponent should explore states of the world under a reasonable scenario that is consistent with that different, yet reasonable, parameter value.

For example, sensitivity analysis might show that the relative performance of credible options changes if there are high (yet, not unreasonably high) technology costs. On this basis, a RIT–D proponent should explore different states of the world under a reasonable scenario that is consistent with high technology costs.

Explanatory box 2: Sensitivity analysis versus scenario analysis

This section of the RIT–D application guidelines recommends using sensitivity analysis as a tool to assist in selecting the appropriate scenarios to use when performing scenario analysis. As such, it is beneficial to distinguish these concepts.

Sensitivity analysis entails varying one or multiple inputs to test how robust the output of an analysis or model is to its input assumptions. For example, we suggest that if the results of the analysis in one reasonable scenario appear to be sensitive to a particular input (say, forecast electricity demand), this provides a strong basis to explore reasonable scenarios that incorporate different levels of that input more holistically. For example, this might entail adopting a range of scenarios where there is particularly high or low load growth.

It is worth noting that we do not recommend limiting the use of sensitivity analysis to selecting reasonable scenarios. After identifying the preferred option, the RIT–D proponent should illustrate 'boundary values' for important input assumptions (such as the discount rate and VCR) at which the preferred option changes. The RIT–D proponent can then discuss the plausibility of that value and evaluate the risk of that credible option.

Scenario analysis focuses on describing different sets of states of the world that reflect common values of particular parameters that are relevant to the investment decision. For example, a reasonable scenario will reflect a common set of values for the rate of demand growth, fuel costs, technology costs and environmental target(s). Under the RIT–D, the use of scenario analysis to assess a credible option entails:

- Developing/describing different scenarios based on a range of parameters, which the RIT–D refers to as 'reasonable scenarios'; and then
- Exploring how different projects (credible options) produce different outcomes (states of the world) under a range of different reasonable scenarios.

Through this, RIT–D proponents gain a comprehensive understanding of what states of the world could arise with and without a credible option in place under different sets of external circumstances. For a given credible option, a RIT–D proponent then probabilistically weights the outcomes (the states of the world under that option relative to the base case) across the different reasonable scenarios to derive that option's expected net market benefit.

For example, drawing from example 10 above, a RIT–D proponent could choose to undertake a sensitivity analysis on demand. This will determine whether the ranking of credible options by net economic benefit changes if demand grows faster or slower than anticipated, assuming no change in new generation costs (which are assumed to be independent of demand growth). In some cases, where relevant and appropriate, sensitivity analysis may include using plant expansion modelling to capture changes in one variable (such as demand) on other inputs, such as new generation investment.

Example 11 illustrates how a RIT–D proponent could undertake a sensitivity analysis of forecast demand.

Example 11: Demand sensitivity

Assume a RIT–D proponent is exploring an augmentation project for reliability corrective action (that is, to meet a deterministic reliability standard). In this example, the RIT–D proponent chooses to select a credible option as its 'base case'.

Assume there are two credible options:

1. augmenting a distribution line at a cost of $60 million (taken as the 'base case' option); and
2. contracting with an embedded generator to provide additional peak demand support at a cost of $15 million.

The RIT–D proponent forecasts that energy and peak demand in the region will grow by 3 per cent over the period of the analysis.

In the central reasonable scenario, the relative market benefits of the embedded generation credible option will be determined as follows:

- Variable electricity supply costs will be higher than under the base case network augmentation option because the embedded generator is likely to have a higher variable cost than a remote generator. This makes a negative contribution to the embedded generation option's relative market benefits.
- Fixed new generation costs (excluding the cost of the embedded generator option itself) will be lower than under the base case network augmentation option. This is because the embedded generator postpones the need for new generation from year 5 in the base case to year 10. This makes a positive contribution to the embedded generation option's relative market benefits.

Assume that the RIT–D proponent calculates the relative market benefits of the embedded generation credible option as -$40 million. As the costs of the embedded generator credible option are lower than the costs of the network augmentation credible option, the relative costs of the embedded generator will be negative, -$45 million. This results in a relative net economic benefit of the embedded generation credible option of $5 million.

The RIT–D proponent now runs a sensitivity analysis on the projected growth in energy and peak demand. Under the sensitivity analysis, growth in energy and peak demand in the region will be 10 per cent over the period of the analysis, instead of 3 per cent.

In the modified high demand scenario, the relative market benefits of the embedded generation credible option will change from that in the central reasonable scenario in that:

- The relative total variable electricity costs will be higher than under the central reasonable scenario, because more high-cost electricity from the embedded generator will be consumed over the assessment period. This should further reduce the embedded generation option's relative market benefits.
- The relative new generation fixed costs will be lower than under the central reasonable scenario, because more generation investment will be required over the assessment period even if the augmentation proceeds. This should further reduce the embedded generation option's relative market benefits.

Accordingly, the RIT–D proponent calculates the relative market benefit of the embedded generation connection credible option is -$55 million. Assuming the project's costs have not changed, the relative net economic benefit of the embedded generation connection credible option is now -$10 million.

The analysis shows that, in the event that growth in energy and peak demand is higher than forecast, the ranking of net economic benefit between the two credible options may change. Therefore, it would be worthwhile for the RIT–D proponent to adopt additional reasonable scenarios with varying levels of forecast demand in its assessment of the credible options.

The impact of sensitivity analysis on the number and choice of reasonable scenarios used to assess a particular set of credible options will vary according to the circumstances surrounding the RIT–D assessment. Further, there may be other approaches for deriving the appropriate number and choice of reasonable scenarios for each set of credible options under consideration.

3.8.2 Modelling and analysis required under the RIT–D

Once a RIT–D proponent has formulated an appropriate number and choice of reasonable scenarios, it will need to calculate the market benefits of each credible option arising under each reasonable scenario. These market benefits would then need to be probability-weighted to derive the relevant market benefits of each credible option. We discuss the process earlier on in the section 3.8.

The number of reasonable scenarios and credible options used in a particular RIT–D assessment will have a major influence on the extent of modelling and analysis for the RIT–D proponent to undertake.

Assume that a RIT–D proponent has undertaken appropriate sensitivity analysis and chooses to assess a $30 million investment to upgrade a zone substation to accommodate expected load growth (option 1). The RIT–D proponent assesses the project:

- against a 'do nothing' base case (base case);
- against one alternative credible option (option 2);
- based on a single set of capital and operating costs for existing, committed, anticipated and modelled projects;
- based on two alternative demand forecasts; and
- using two alternative materials costs.

This would require the development of:

- four reasonable scenarios—encompassing two different demand levels (high and low) and two different materials costs; and
- 12 states of the world, reflecting one set of reasonable scenarios for option 1, option 2 and the base case.

Table 2 Modelling and analysis under the RIT–D

Reasonable scenario	Credible option	State of the world
1: High demand, low materials costs	Base case	1
1: High demand, low materials costs	Option 1	2
1: High demand, low materials costs	Option 2	3
2: High demand, high materials costs	Base case	4
2: High demand, high materials costs	Option 1	5
2: High demand, high materials costs	Option 2	6
3: Low demand, materials costs	Base case	7
3: Low demand, low materials costs	Option 1	8
3: Low demand, low materials costs	Option 2	9

4: Low demand, high materials costs	Base case	10
4: Low demand, high materials costs	Option 1	11
4: Low demand, high materials costs	Option 2	12

As reflected previously in example 11, where relevant, a RIT–D proponent may also need to model a separate market development path for each state of the world to identify whether different options or changes in scenarios affect pattern of new plant development. However, this will not always be feasible or necessary.

If RIT–D proponents varied some of the input assumptions further, then the number of reasonable scenarios, market development paths and required states of the world would multiply.

3.8.3 High impact, low probability events

A RIT–D will appropriately capture the economic impacts of high-impact, low probability (HILP) events if the RIT–D proponent follows these RIT–D application guidelines in:

- Exploring reasonable scenarios where relevant HILP events occur. For guidance on selecting reasonable scenarios, see section 3.8.1.
- Costing the impact of that HILP event occurring. In costing this event, we would expect the RIT–D proponent include the market benefit categories, changes in involuntary and voluntary load shedding. In valuing these changes in market benefits, the RIT–D proponent should use a VCR that is appropriate to the range and duration of customers that the HILP event would affect. If a RIT–D proponent has supporting evidence, it might be reasonable to associate a high VCR with the HILP event. For guidance on selecting VCR inputs, see section 3.4.3.
- Weighting the economic impact of the event by a reasonable estimate of its probability of occurring. For clarity, weighting these events differently to their probability of occurring would have no reasonable economic basis and would only serve to distort the RIT–D outcome. For more information on weighting reasonable scenarios, see sections 3.8.2 and 3.9.

3.9 Uncertainty and risk

We recognise that at the time of applying a RIT–D, the future will be uncertain. This section provides information and guidance on how a RIT–D proponent can respond to this uncertainty when applying the RIT–D.

3.9.1 Uncertainty regarding market benefits

The first step in taking account of material uncertainty over future market supply and demand conditions is to formulate a set of reasonable scenarios that reasonably reflect potential future market conditions. The process for deriving reasonable scenarios is discussed section 3.7.3.

The next step is for the RIT–D proponent to assign a reasonable probability to each of these reasonable scenarios occurring in practice. The need to attribute probabilities to each reasonable scenario is unavoidable if the RIT–D is to transparently produce a clear ranking of credible options. We do not expect the RIT–D proponent to ascribe an exact probability to every scenario.

For example, it is sufficient for a proponent to attach a 20 per cent probability to a scenario, as opposed to 23 per cent. We do not intend for relatively small divergences of views over reasonable scenario probabilities to become a source of dispute. Rather, the RIT–D proponent must be able to provide a sound reason for its use of particular probabilities based on the information it has or reasonably ought to have had available when it made the assessment and given the nature of the credible options under consideration.

The market benefit of a credible option is the probability-weighted sum of all market benefits of that option across all reasonable scenarios. The methodology for assigning probabilities to each reasonable scenario will depend on the methodology for defining the reasonable scenario. For example, where there is uncertainty about future demand, two different methodologies are possible:

- Approach 1—a range of equally-spaced values for future demand, and probability weightings for each of these values are chosen. Extreme values of future demand will receive lower probabilities than values closer to the mean.
- Approach 2— RIT–D proponents will rank different values for future demand. After RIT–D proponents rank these values, they will divide them into groups—quartiles, or deciles, and so on. The RIT–D proponents will then select a representative value for demand from each group. The probability assigned to each representative value is the same for example, 25 per cent in the case of quartiles and 10 per cent in the case of deciles. Under this approach, the probability of each demand value arising is constant, but the chosen representative demand values are likely to be grouped closer together for values of demand closer to the mean.

Either approach is acceptable. However the methodology for assigning probabilities to each reasonable scenario must be consistent with the methodology for choosing the reasonable scenarios.

Where a RIT–D proponent does not reasonably consider one reasonable scenario is more likely than any other, they may weight all reasonable scenarios equally.

Example 12: Calculating market benefits across a probability weighted range of reasonable scenarios

Assume a deterministic reliability standard is driving a need to augment the network. A RIT–D proponent is considering three credible options to address an identified need for reliability corrective action across four reasonable scenarios.

The three credible options are a:

- Network option (the RIT–D proponent chooses to adopt this as the base case option).

- Distributed generation option.
- Demand side participation option.

The four reasonable scenarios and their probabilities of occurrence are:

- High capital costs, high demand (scenario 1) – 10%.
- High capital cost, low demand (scenario 2) – 30%.
- Low capital costs, high demand (scenario 3) – 10%.
- Low capital costs, low demand (scenario 4) – 50%.

Table 3 shows the performance of the two other credible options across each of the four reasonable scenarios according to their relative market benefits over the base case option (which by definition has a relative market benefit of zero).

Table 3: Relative market benefits across reasonable scenarios ($m)

Credible option	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Base case network option	0	0	0	0
Distributed generation option	3	11	-5	7
Demand side option	-5	20	-35	4

For each other credible option, the RIT–D proponent must weight the relative market benefit under each reasonable scenario by that reasonable scenario's probability of occurrence. Calculating the probability-weighted relative market benefit across the range of reasonable scenarios requires analysis from the results generated in Table 3. Table 4 therefore generates one relative market benefit estimate for each other credible option.

Table 4 Probability weighted relative market benefits ($m)

Credible option	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Sum of probability-weighted scenarios
Base case network option	0	0	0	0	0
Distributed generation option	0.3	3.3	-0.5	3.5	6.6
Demand side participation option	-5	6	-3.5	2	4

3.9.2 Uncertainty regarding costs

The cost of the credible option is the probability weighted present value of the direct costs of the credible option under the different cost assumptions. Where the identified need is for reliability corrective action and the RIT–D proponent has selected a credible as its base case, costs refer to incremental costs above (or below) that base case credible option.

For the avoidance of doubt, 'cost assumptions' are distinct from the reference to costs within reasonable scenarios as used elsewhere in the RIT–D and the RIT–D application guidelines. Here, 'cost assumptions' refers to the costs of each credible option. Elsewhere, in the context of reasonable scenarios, cost assumptions refers to the costs of existing, committed, anticipated and modelled projects that may arise within the relevant reasonable scenario.

The direct costs of a credible option may vary for reasons other than the nature of the relevant reasonable scenario. For example, the direct costs of a credible option may be uncertain because they depend on variables such as exchange rates or the price of copper. Similarly, whether a reasonable scenario reflects high or low demand growth is unlikely to affect the costs of a credible option. This is why the RIT–D requires the RIT–D proponent to separately undertake a weighted averaging of the direct costs and the market benefits of a credible option.

As with the probabilities assigned to reasonable scenarios, the probabilities assigned to different costs need only be broadly reasonable given the information available or reasonably available to the RIT–D proponent and the nature of the credible option under consideration.

Example 13 illustrates calculating expected costs. It follows on from example 12 above.

Example 13: Calculating expected costs

For each of the three credible options, the RIT–D proponent also considered three cost assumptions (‘low’, ‘medium’ and ‘high’). The three cost assumptions and associated probabilities of occurrence for each credible option are:

- Base case network option:
    - Low (low steel prices; favourable exchange rate) = 20%.
    - Medium (medium steel prices; average exchange rate) = 50%.
    - High (high steel prices; unfavourable exchange rate) = 30%.
- Distributed generation option:
    - Low (low steel prices, low labour costs) = 10%.
    - Medium (medium steel prices; medium labour costs) = 50%.
    - High (high steel prices; high labour costs) = 40%.
- Demand side participation option:
    - Low (low implementation and maintenance costs) = 30%.
    - Medium (medium implementation and maintenance costs) = 50%.
    - High (high implementation and maintenance costs) = 20%.

A RIT–D proponent can calculate an expected cost for each credible option by taking a weighted-average across cost assumptions. This is set out in Table 5 below.

Table 5: Calculating expected cost ($m)

Credible option	Low cost scenario	Medium cost scenario	High cost scenario	Expected cost	Expected relative cost
Base case network option	7.5	10	17.5	11.8	0
Distributed generation option	8	12	14	12.4	0.6
Demand side option	0.4	0.5	0.75	0.5	-11.3

3.9.3 Option value

NER clause 5.17.1(c)(4)(vi) requires RIT–D proponents to consider option value as a class of potential market benefit. This is where option value is a benefit resulting from retaining flexibility where certain actions are irreversible (sunk), and new information may arise in the future as to the payoff from taking a certain action.

It is important for RIT–D proponents to consider option value because many network investment decisions are partially or fully irreversible, such as the decision to undertake a major augmentation of the transmission network. In some cases, past decisions are reversible at an increased cost. For example, a RIT–D proponent might decide to purchase land for a substation where land is inexpensive. If it is later determined that twice as much land is required but the surrounding areas are fully developed, expanding the substation might remain feasible but significantly costlier.

A RIT–D proponent might expect that information will later become available that affects the net market benefit of a partially or fully irreversible action that it is deciding to carry out. In such circumstances, we would expect there would be value in retaining some flexibility to respond to that new information as or when it emerges. For example, if demand for a distribution line is uncertain but might increase, a RIT–D proponent might wish to retain the flexibility to expand the capacity of the distribution line at a relatively low cost in the future. If demand for a distribution line is uncertain but might decrease, a RIT–D proponent may prefer to implement a temporary (perhaps a non-network) solution to congestion problems, and defer a major sunk investment until the demand for the distribution line is clear.

Capturing option value when applying a RIT–D

Where the future is uncertain, the RIT–D proponent may consider investment options that retain some flexibility and allow it to respond to any new information that arises. For example, where there is material uncertainty about future demand growth, the set of credible options could include an option that allows the RIT–D proponent to make a smaller network investment now, but retain flexibility to upgrade the line at reduced cost later.

RIT–D proponents can make investment decisions that capture these benefits of retaining flexibility, or 'account for option value' through appropriately identifying credible options and reasonable scenarios. By performing scenario analysis consistently with these RIT–D application guidelines, RIT–D proponents should estimate how the net benefits of different credible options will vary under different scenarios. In appropriately identifying credible options, RIT–D proponents should be considering credible options where the decision-maker is able to change its action in response to new information. Where this type of credible option is available (that is, an option that has flexibility built into it), we can see the RIT–D as allowing for two stages: 1) whether to commit to an option with built-in flexibility, and 2) whether to partially or completely reverse the earlier decision.

Decision rules and visual aids can assist the RIT–D proponent to value the option it can exercise in stage 2) above. As noted in section 3.2, RIT–D proponents can formulate credible options incorporating a decision rule or policy regarding how the RIT–D proponent will respond to certain changes in variables. Visual aids such as 'tree' diagrams can often represent such rules or policies (see figure 8).

For clarity, the RIT–D allows RIT–D proponents to capture option value beyond what they have otherwise captured by probabilistically weighting credible options over reasonable scenarios, as long as it is not double-counted.[16]

Example 29 in appendix A provides a stylised example of how RIT–D proponents can capture option value when applying RIT–Ds through using such visual aids and decision rules.

3.10 Selecting the preferred option

Under the RIT–D, the preferred option is the credible option that maximises the net economic benefit to all those who produce, consume and transport electricity in the NEM. Where an identified need is for reliability corrective action, the preferred option may have a net economic cost.[17] The net economic benefit of a credible option is the market benefit less the costs of the credible option.

A credible option is a project, or set of projects, established to meet an identified need. A set of projects may constitute one credible option in the form of an integrated solution to meet an identified need.

Example 14: Selecting a preferred option

A RIT–D proponent has identified five credible options. For each credible option, the RIT–D proponent quantified the costs and market benefits. The RIT–D proponent then deducted the costs from the market benefits to derive the net economic benefit.

16 Specifically, RIT–D paragraph (7)(f) provides that market benefit includes the present value of 'any additional option value (where this value has not already been included in other classes of market benefits) gained or foregone from implementing the credible option with respect to the likely future investment needs of the NEM'.

17 NER, cl. 5.17.1(b).

The credible option with the highest net economic benefit receives the highest ranking. The RIT–D proponent therefore identifies this credible option as the preferred option. The preferred option in this example is the demand side option combined with a network option.

Table 6 Calculating expected net economic benefit ($m)

Credible option	Market benefits	Costs	Net economic benefit	Ranking
Network option 1	11.3	11.9	-0.6	5
Network option 2	18	17	1	3
Embedded generation option	13.5	12.4	1.1	2
Demand side option	0.9	0.5	0.4	4
Demand side option, combined with a network option	14	12	2	1

3.11 Externalities

The RIT–D seeks to identify the credible option that maximises the present value of the net economic benefit to all those who produce, consume and transport electricity in the NEM. Consequently, the RIT–D considers economic impacts that accrue to parties other than those who produce, consume and transport electricity in the NEM as externalities.

Clause 5.17.1(c)(4) of the NER requires the RIT–D proponent to consider whether each credible option could deliver specified classes of market benefits. Similarly, 5.17.1(c)(6) of the NER requires the RIT–D proponent to consider whether each credible option would be associated with various classes of costs. These clauses do not require RIT–D proponents to consider externalities as costs or market benefits of a credible option. Therefore, externalities should not be included in the determination of the net economic benefit.

We interpret that, 'all those who...consume...electricity in the NEM' in NER clause 5.17.1(b) refers to costs or market benefits incurred or obtained, respectively, by parties in their capacity as consumers of electricity. Thus, RIT–D proponents should exclude costs or market benefits that are incidental or consequential to parties' electricity consumption from their RIT–D analysis. For further explanation, example 15 illustrates negative and positive externalities.

Example 15: Changes in property values

To support increased consumer demand for electricity, a RIT–D proponent explores augmenting the distribution network by installing a new substation and electricity wires.

The RIT–D proponent expects this augmentation will decrease the visual aesthetics of that region. Residents around the new substation were also concerned that the new plant could cause negative health impacts. Consequently, in the state of the world with this credible option in place, the RIT–D proponent expects property prices around this area of the network would be 2 per cent lower than under the base case state of the world.

The RIT–D proponent cannot measure the decrease in visual aesthetics and the decrease in property values as a negative market benefit to persons in their capacity as generators, transporters (that is, network businesses) or consumers of electricity. Therefore, the RIT–D proponent would consider it an externality and exclude it from its RIT–D analysis.

3.11.1 Externalities and external funding contributions

Our guidance that RIT–D proponents must exclude externalities from their RIT– D assessments has a bearing on how RIT–D proponents should treat external project funding for a credible option differently depending on whether it has or will be provided by:

- A Registered Participant under the NER or any other party in their capacity as a consumer, producer or transporter of electricity (a Participant)[18]; or
- Any other party (Other Party).

As Example 16 illustrates, funds that move between Participants count as a wealth transfer and should not affect the calculation of the final net economic benefit under the RIT–D. This wealth transfer occurs because the benefit gained by the Participant receiving the external funds (that is, the RIT–D proponent) is directly offset by the cost incurred by the other Participant providing the external funds.

As Example 17 illustrates, funds from an Other Party to a Participant should count as a reduction in the costs of the option. This occurs because the benefit gained by the Participant receiving the external funds is not offset by the cost incurred by the Other Party in providing the external funds. This is because the Other Party's costs are an externality for the purposes of the RIT–D cost–benefit analysis. As such, these external funds increase the final net economic benefit calculated under a RIT–D.

Example 16: Funding from a Participant

A retailer wishes to support developing a virtual power plant to facilitate increased generation from distributed energy resources at times of high wholesale spot prices, as well as network support services when the existing distribution network is constrained. Augmentation in network infrastructure to support the virtual power plant (including supporting new storage connections and improving control systems) costs $5 million and the present value of the lifetime operating and maintenance costs of the virtual power plant is $2 million.

The retailer wishes to contribute $2 million to the proponent of the virtual power plant, being

18 For clarity, by including parties in their capacity as producers and/or transporters of electricity, this definition captures entities such as distributed energy resources suppliers and energy service companies, that may wish to support (and implicitly, discourage) particular credible options from which they benefit in a RIT–D. Such an entity could provide this support directly as a proponent of a non-network option, or indirectly via subsidies to end-use consumers to encourage take-up of non-network options.

the distribution business in the region of the virtual power plant.

As the retailer is a Participant, its $2 million contribution to the proponent distribution business does not reduce the cost of the virtual power plant option for the purposes of a RIT–D assessment. That is, the cost of the credible option for RIT–D purposes remains $7 million. The retailer's $2 million contribution is effectively treated as a voluntary wealth transfer between the retailer and the distribution business.

Example 17: Funding from another party

Taking example 16, assume that now the jurisdictional government wishes to support the development of the virtual power plant given it has social benefits relating to supporting innovation and renewable energy.

Rather than the retailer, the government wishes to contribute $2 million to the proponent of the virtual power plant, being the distribution business in the government's region.

As the government is not a Registered Participant and is not making the contribution in its capacity as a producer, consumer or transporter of electricity in the NEM, the government's $2 million contribution to the proponent distribution business reduces the cost of the credible option for the purposes of a RIT–D assessment. That is, the cost of the virtual power plant option for RIT–D purposes becomes $5 million. The government's $2 million contribution is effectively treated as a reduction in costs borne by those who consume, produce and transport electricity in the NEM in relation to the virtual power plant option.

3.12 Suitable modelling periods

The duration of modelling periods should take into account the size, complexity and expected life of the relevant credible option. The modelling period should provide a reasonable indication of the market benefits and costs of the credible option. This means that by the end of the modelling period, the network is in a 'similar state' in relation to meeting a similar identified need to where it is at the time of the investment. The suitable modelling period could vary according to the credible option under consideration. However, to the extent possible, the RIT–D proponent should construct credible options (using individual options) that require assessment under similar modelling periods.

It is difficult to provide definitive guidance on how RIT–D proponents should implement this principle. However, it is unlikely that a period of less than 5 years would adequately reflect the market benefits of any credible option. In the case of high-cost investments that provide a return over a longer period, it may be necessary to adopt a modelling period of 20 years or more. Moreover, RIT–D proponents should also consider including any relevant and material terminal values into their discounted cash flow analysis, where appropriate.

When considering longer modelling periods, a RIT–D proponent may find that costs and market benefits may eventually become immaterial due to discounting future costs. Under such circumstances, a RIT–D proponent may exercise discretion when selecting a suitable modelling period so that the RIT–D does not require a level of analysis that is disproportionate to the scale and likely impact of the credible options being considered.

Example 18: Suitable modelling periods

The identified need is to maintain reliability under conditions of rising peak load. The RIT–D proponent has identified two credible options that could achieve this:

- Option 1: Increase capacity in the section of the network to take up load by 10 per cent. This will be achieved through network augmentation.
- Option 2: Decrease peak demand through a demand side participation program so that the existing network can serve an increase in the pre-demand side participation peak load of 10 per cent.

Under the Option 1, the RIT–D proponent will build the plant in year 4. Project planning will commence in year 2. The RIT–D proponent expects the new plant will satisfy the capacity needs on the section of the distribution network until year 20, after which it will consider more options for meeting the identified need. In this case, a suitable modelling period would be 20 years.

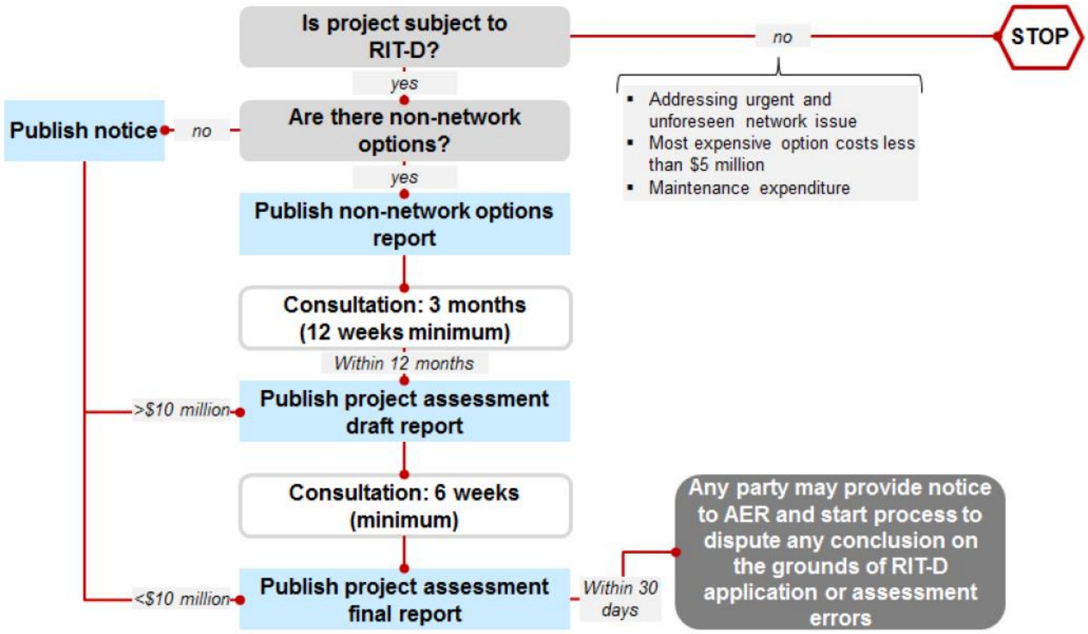
Under Option 2, the RIT–D proponent will develop the demand response program to commence in year 3. Project planning will commence in year 1. The RIT–D proponent expects end-users to gradually take up the demand response, which will reach a steady state in year 12. The RIT–D proponent expects it will need to consider more options for meeting the identified need in year 20. In this case, a suitable modelling period should be approximately 20 years. This is because there are approximately 20 years from the commencement of project planning until the network is in a similar state in terms of the identified need.

4 Stakeholder engagement process in applying the RIT–D

This section of the RIT–D application guidelines summarises the process that a RIT–D proponent must follow to consult with stakeholders when applying the RIT–D, as provided in clause 5.17.4 of the NER. This process is summarised in figure 1, and includes:

- screening for non-network options;[19]
- publishing a non-network options report (NNOR);
- publishing a draft project assessment report (draft report); and
- publishing a final project assessment report (final report).

Figure 1 The RIT–D process



Source: AEMC, *Rule determination: National Electricity Amendment (Replacement expenditure planning arrangements) Rule 2017*, July 2017, p. 64.

In following this process in NER clause 5.17.4(a), RIT–D proponents must consult with the following stakeholders:

- Registered Participants;[20]

19 Proponents should also be encouraged to engage stakeholders early on in (possibly before commencing) the RIT application process. Early engagement facilitates the development of mutually beneficial performance-based arrangements to share benefits, risks and accountabilities in undertaking an investment. This form of stakeholder interaction might include opportunity analysis with demand maps or incentive programs.

20 NER, chapter 10. The NER defines Registered Participants as a person who AEMO has registered in any one or more of the categories listed in r. 2.2 to 2.7 of the NER. In the case of a person who AEMO has registered as a Trader, such a person is only a Registered Participant for the purposes referred to in r. 2.5A of the NER. However, as set out in cl. 8.2.1(a1) of the NER, for the purposes of some provisions of r. 8.2 of the NER only, AEMO, Connection Applicants,

- AEMO;
- Interested parties;
- Non-network providers; and
- If the RIT–D proponent is a distribution business, persons registered on its demand side engagement register (DSER).[21]

When approaching stakeholder engagement, RIT–D proponents:

- Must consult with stakeholders throughout all stages of the RIT–D process. Ideally, RIT–D proponents should proactively engage with stakeholders before commencing individual RIT–Ds. For instance, these engagement activities will likely occur through developing distribution annual planning reports under NER clause 5.13.2 and using our 'demand management incentive scheme' under NER clause 6.6.3.
- Must identify the parties they must consult with and invite them to register on their DSER. RIT–D proponents should have sufficient internal capabilities and processes to maintain its DSER and the contact details of the above parties.

4.1 Consumer engagement

The NEO requires network businesses operate their networks in the long-term interests of consumers. Accordingly, network businesses should engage with their consumers so they can provide services that align more with consumers' long-term interests. While the NER is not prescriptive about consumer engagement during RIT–D application, we consider it a best practice for the RIT–D to describe in each of the three reports, how they have:

- engaged with consumers; and
- sought to address any relevant concerns identified as a result of that engagement.

In the interests of maximising net economic benefit resulting from a RIT–D application, proponents may wish to:

- Undertake early engagement with consumers and non-network businesses. Early engagement with stakeholders on an investment proposal can occur before a RIT–D application has formally commenced, particularly through consultation on the RIT–D proponent's annual planning report.
- Focus on providing transparent, user-friendly data to stakeholders. We respect the need for network businesses to protect commercially sensitive information, but note that the effectiveness with which alternative credible options may be proposed for a RIT–D application is maximised when stakeholders have access to all of the relevant information to appropriately contextualise an investment proposal.

Metering Providers and Metering Data Providers who are not otherwise Registered Participants are also deemed to be Registered Participants.

21 NER, cl. 5.17.4(a)(2).

- Make efforts to understand broader consumer views, recognising that the consumers who do not actively participate in consultation with RIT–D proponents can be those most affected by investment decisions.
- Making submissions on a RIT–D application takes considerable time and effort on the part of consumers. As such, we encourage RIT–D proponents to give adequate weight to the suggestions made and perspectives offered by consumers in their submissions.

Our 'consumer engagement guideline for network service providers' states our expectations for how network businesses should engage with their consumers—that is, their 'end users'.[22] We encourage best practice consumer engagement in line with these guidelines in general, as well as when applying a RIT–D and in other aspects of network planning, such as providing information in annual planning reports.

4.2 Non-network options report

Clauses 5.17.4(b)-(h) of the NER outline the process that RIT–D proponents must follow in screening for non-network options and drafting a NNOR.

All RIT–D proponents must prepare and publish a NNOR unless they determined, on reasonable grounds, that there will not be a non-network option that is a potential credible option or that forms a significant part of a potential credible option. Section 6 provides guidance and worked examples on how RIT–D proponents can determine whether this exemption applies.

A RIT–D proponent must provide the stakeholders specified in NER clause 5.17.4(a) at least three months after it publishes the NNOR to make submissions.[23] If the RIT–D proponent is a distribution business, it must notify persons registered on its DSER when it publishes its NNOR.

When calling for submissions, RIT–D proponents should clarify that identifying additional options should predominately occur at the NNOR stage of the consultation process. RIT–D proponents should request stakeholders to support any potential credible options they propose and provide sufficient information to enable the RIT–D proponent to assess the option's technical feasibility.

Information required in a NNOR

The NNOR must include the following information:

- A description of the identified need, consistent with the guidance provided in section 3.1.
- The assumptions used in identifying the identified need. In cases of proposed reliability corrective action, this must also include reasons the RIT–D proponent considered reliability corrective action necessary.

22 AER, *Better Regulation, Consumer Engagement Guideline for Network Service Providers*, 2013.
23 NER, cl. 5.17.4(h).

- If available, the relevant annual deferred augmentation charge associated with the identified need.
- The technical characteristics of the identified need that a non-network option would be required deliver. For instance, this should include:
  - the size of load reduction or additional supply;
  - location;
  - contributions to power system security or reliability;
  - contribution to power system fault levels as determined under NER clause 4.6.1; and
  - the operation profile.
- A summary of potential credible options to address the identified need, including both network and non-network options.
- To the extent practicable, the following information for each credible option:
  - a technical definition or characteristics of the credible option;
  - the estimated construction timetable and commissioning date (where relevant); and
  - the total indicative cost (include capital and operating costs).
- Information to assist others to present an alternative potential credible option. This should include details on how to submit a non-network proposal for the RIT–D proponent to consider.

The RIT–D proponent must publish the NNOR in a timely manner. The NNOR must have regard to the ability of parties to identify the scope for, and develop, alternative potential credible options or variants to the potential credible options.

RIT–D proponents should pay particular attention when considering the risk, value of optionality and expenditure timing of non-network options. In particular, modelling, forecasts and assumptions should be consistent, open and transparent to help effectively explore non-network options.

4.3 Draft project assessment report

If a RIT–D proponent decides to proceed with the proposed distribution investment, it must prepare a draft report:

- within 12 months of:
  - the end of the consultation period on a NNOR; or
  - where a NNOR is not required, the publication of the RIT–D proponent's notice setting out its reasons for not preparing a NNOR; or
- a longer period agreed to by us in writing.

The consultation period on the draft report must be at least six weeks.[24] The RIT–D proponent must undertake the following when consulting on the draft report:

- Publish a request for submissions on the matters set out in its draft report, including the proposed preferred option.
- Consult directly with potentially affected customers if the proposed preferred option in the draft report has the potential to have an adverse impact on the quality of service experienced by electricity consumers. This includes anticipated changes in voluntary load curtailment by electricity consumers and anticipated changes in involuntary load shedding and customer interruptions caused by network outages.[25]

Under NER clause 5.17.4(i)(2), we can provide a RIT–D proponent an extension to publish the draft report. When a RIT–D proponent expects it will require an extension, we recommend it submit a request to us a soon as practicable, and preferably at least six weeks from the publication date. The application for extension must include sufficient information to allow us to consider the request.

Information required for draft report

The draft report must include the following information:

- A description of the identified need for the investment, consistent with the guidance in section 3.1.
- The assumptions used in identifying the identified need. In the case of proposed reliability corrective action, this should include reasons why the RIT–D proponent considers the reliability corrective action is necessary.
- If applicable, a summary of, and commentary on, the submissions on the NNOR.
- A description of each credible option assessed.
- Where a distribution business had quantified market benefits, a quantification of each applicable market benefit of each credible option.
- A detailed description of the methodologies used in quantifying each class of cost or market benefit.
- Where relevant, the reasons why the RIT–D proponent has determined that a class or classes of market benefits or costs do not apply to a credible option.
- The results of a net present value analysis of each credible option and accompanying explanatory statements regarding the results.
- The proposed preferred option and details on its:
    - Technical characteristics. Where relevant, this should include its estimated construction timetable, estimated commissioning date, and indicative capital and operating costs.

24 NER, cl. 5.17.4(m).
25 NER, cl. 5.17.4(l).

- A statement and accompanying analysis that the proposed preferred option satisfies the RIT–D.
- If the proposed preferred option is for reliability corrective action and that option has a proponent, the name of the proponent.

- Contact details for a suitably qualified staff member of the RIT–D proponent that can receive queries on the draft report.

Where a RIT–D proponent has undertaken modelling, the draft report should also include a description of the assumptions used with summarised results. While not explicitly required under the NER, we also consider it best practice to publish the following documentation along with the draft report:

- Relevant documents that show detailed modelling, inputs and assumptions used for the RIT–D assessment.
- Submissions received in response to the NNOR, unless marked confidential. In case of confidential submissions, a RIT–D proponent should explore making a redacted or non-controversial version public.

Exemption from preparing a draft report

Under NER clause 5.17.4(n), RIT–D proponents are exempt from providing a draft report if all these conditions occur:

- the RIT–D proponent determines under NER clause 5.17.4(c) that no non-network option is a credible option or forms a significant part of a credible option;
- the RIT–D proponent publishes a notice under NER clause 5.17.4(d) setting out the reasons for its determination, including any methodologies and assumptions it used; and
- the estimated capital cost to the network businesses affected by the RIT–D project of the proposed preferred option is under $10 million (varied in accordance with a cost threshold determination).

4.4 Final project assessment report

The RIT–D proponent must consider all submissions received and publish a final report. The RIT–D proponent may discharge its obligation to publish a final report as a standalone document if NER clause 5.17.4(s) applies. In this case, the RIT–D proponent must include a final report as part of its annual planning report. Otherwise, the RIT–D proponent must publish a final report as soon as practicable:

- After the consultation period for the draft report; or
- Where a RIT–D proponent is exempt from preparing a draft report, after publishing a notice setting out reasons for no credible non-network options.

If a RIT–D proponent is a distribution business, it must notify persons on its DSER when it publishes its final report.

While not explicitly required by the NER, we consider it best practice for a RIT–D proponent to publish the final report on its website. The RIT–D proponent may also note on its website that a process exists for resolving RIT–D disputes and provide the timeframes for lodging a dispute notice with the AER.

Information required for final report

If a draft report was prepared, the final report must set out:

- the matters as required under NER clause 5.17.4(j); and
- only if the RIT–D proponent published a draft report, a summary of any submissions received on the draft report and the RIT–D proponent's response to each submission.[26]

We consider it best practice to publish the following documentation along with the final report:

- Relevant documents that show detailed modelling, inputs and assumptions used for the RIT–D assessment.
- Submissions received in response to the draft report, unless marked confidential. In case of confidential submissions, the RIT–D proponent should explore whether to make a redacted or non-controversial version public.

Publishing a final report

NER clause 5.17.4(s) can exempt a RIT–D proponent from publishing a final report under NER clauses 5.17.4(o)–(p), if:

- the preferred option has an estimated capital cost to the network businesses affected by the RIT–D project of less than $21 million (varied in accordance with a cost threshold determination); and
- the RIT–D proponent includes its final report as a part of its annual planning report.

4.5 Reapplication of the RIT–D

NER clause 5.17.4(t) states that if a material change in circumstances leads to, in the reasonable opinion of the RIT–D proponent, the preferred option identified in the final report no longer being the preferred option, the RIT–D proponent must re-apply the RIT–D to the RIT–D project.

A material change in circumstances may include, but is not limited to, a change in the key assumptions used in identifying:

- the identified need described in the final report; or
- the credible options assessed in the final report.

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26 NER, cl. 5.17.4(r).

Where appropriate, we can make a determination to exclude RIT–D proponents from this clause. In making a determination under NER clause 5.17.4(t), we must have regard to:

- the credible options (other than the preferred option) identified in the final report;
- the change in circumstances identified by the RIT–D proponent; and
- whether a failure to promptly undertake the RIT–D project is likely to materially affect the reliability and secure operating state of the distribution network, or a significant part of that network.[27]

We expect that situations requiring a re-application of the RIT–D under NER clause 5.17.4(t) will be exceptional. Similarly, circumstances where we make a determination to exclude RIT–D proponents from this clause are likely to be exceptional. Therefore, we will consider whether such a determination would be appropriate on a case-by-case basis.

Example 19: Material change in circumstances

Material change in forecast demand

In year 0, a RIT–D proponent forecasts the following needs at a 33/11kV zone substation:

- assets deteriorating in quality will require replacement by year 2; and
- firm capacity (limited by the 33kV supply feeders) will be exceeded in year 2.

Before commencing work, the RIT–D proponent carries out a RIT–D and publishes a final report with the preferred option to replace the aged substation assets and install an additional 33kV supply feeder.

After publishing the final report, the RIT–D proponent issues a higher demand forecast in year 2 than it initially expected. In the absence of demand management or additional transformer capacity at the zone, the installation of an additional 33kV supply feeder (as per the preferred option) will not address the new forecast capacity constraint.

This is a material change in circumstances. Therefore, the RIT–D proponent is required to reapply the RIT–D.

Material change in expected costs

A RIT–D proponent has completed the RIT–D process by publishing a final report. Its preferred option is to construct a 132kV overhead line. In the process of obtaining jurisdictional approvals, significant community opposition emerges in the area. Approval for construction is contingent on undergrounding sections of the original route. This will increase the cost of the preferred option.

This is a material change in circumstances. Therefore, the RIT–D proponent is required to reapply the RIT–D.

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27 NER, cl. 5.17.4(u)–(v).

4.5.1 Cancellation of a RIT–D

NER clause 5.17.4(t) describes when a RIT–D proponent must re-apply a RIT–D. This must occur if a material change in circumstances means that, in the reasonable opinion of the RIT–D proponent, the preferred option identified in the final report is no longer the preferred option.

However, it is also reasonable that a material change in circumstances may lead to the identified need no longer existing, even mid-way through the RIT–D process. This may lead a RIT–D proponent to cancel its RIT–D assessment before completing the RIT–D process. For example, a RIT–D proponent may publish a NNOR, only for its customers to later advise that, due to a material change in circumstances, the identified need no longer exists.

While not explicitly required under the NER, in circumstances mentioned above, we expect the RIT–D proponent to clearly set out reasons that led to cancelling the particular RIT–D assessment. It is also a best industry practice to keep stakeholders informed as soon as a RIT–D proponent becomes aware of the material change of circumstances around the identified need.

5 Dispute resolution

NER clause 5.17.5 sets out the process to follow in resolving RIT–D disputes.

5.1 Who can make a RIT–D dispute

The NER and the RIT–D application guidelines refer to a person or party disputing a conclusion in the final report as a disputing party. Only the following parties can lodge a dispute:

- Registered Participants;
- the Australian Energy Market Commission (AEMC);
- Connection Applicants;
- Intending Participants;
- AEMO;
- interested parties; and
- Non-network providers.[28]

Clause 5.15.1 of the NER defines an interested party in this context as a:

> ...a person including an end user or its representative who, in the AER's opinion, has the potential to suffer a material and adverse National Electricity Market impact from the investment identified as the preferred option...

For the purpose of this clause, material and adverse NEM impacts include impacts on:

- a network operator or other stakeholders such as aggregators or energy service companies in the NEM that:
  - constrains the network operator's ability to fulfil functions mandated under the NER; or
  - undermines the stakeholder's ability to perform its operations to the extent that it can no longer operate or perform a particular function. This may result from physical obstruction or a substantial reduction in profitability; or
- an electricity consumer, in their role as a consumer of electricity that reduces the quality or reliability of their electricity supply below what is required under the NER or reduces the sum of consumer and producer surplus.

A stakeholder cannot be an interested party for the purposes of NER clause 5.15.1 if its potential to suffer material and adverse impact relates to an externality rather than a NEM impact (see section 3.11 for a discussion on externalities). Given this, material and adverse NEM impacts do not relate to personal detriment or personal property rights.

28 NER, cl. 5.17.5(a).

The following examples demonstrate impacts relating to personal detriment and property rights to provide guidance on how we would apply NER clause 5.15.1.

Example 20: Material and adverse impacts

Impacts relating to personal detriment

A RIT–D proponent has identified a non-network option as its credible option. Part of this program will entail procuring network support services from back-up diesel generators. The RIT–D proponent expects this will defer its need for network augmentation and reduce the costs of electricity to end-users overall.

The RIT–D proponent also expects that some of its consumers will claim that the preferred option would cause detriment by increasing health-related costs due to the diesel generators increasing air pollution.

The negative impacts of this program on some consumers would constitute an impact relating to personal detriment. Therefore, we would not consider these consumers as interested parties on this basis.

Impacts relating to personal property rights

The RIT–D proponent has identified a network option as its credible option. Under this option, the RIT–D proponent will build poles and wires. This network infrastructure will run through several properties. Some of the property owners consider that this action will devalue their property.

This would constitute an impact relating to personal property rights. Therefore, we would not consider these property owners as interested parties.

5.2 What can be disputed

The disputing party may only dispute conclusions made by the RIT–D proponent in the final report on the following grounds:

- the RIT–D proponent has not applied the RIT–D in accordance with the NER; or
- there was a manifest error in the calculations performed by the RIT–D proponent in applying the RIT–D.[29]

Disputing parties cannot dispute issues in the final report that:[30]

- the RIT–D treats as externalities (section 3.11 discusses externalities in more detail); or
- relate to an individual's personal detriment or property rights.

5.3 Lodging a dispute and information required

29 NER, cl. 5.17.5(a)(1) and (2)

30 NER, cl. 5.17.5(b)(1) and (2).

Within 30 days of the RIT–D proponent publishing the final report, the disputing party must:

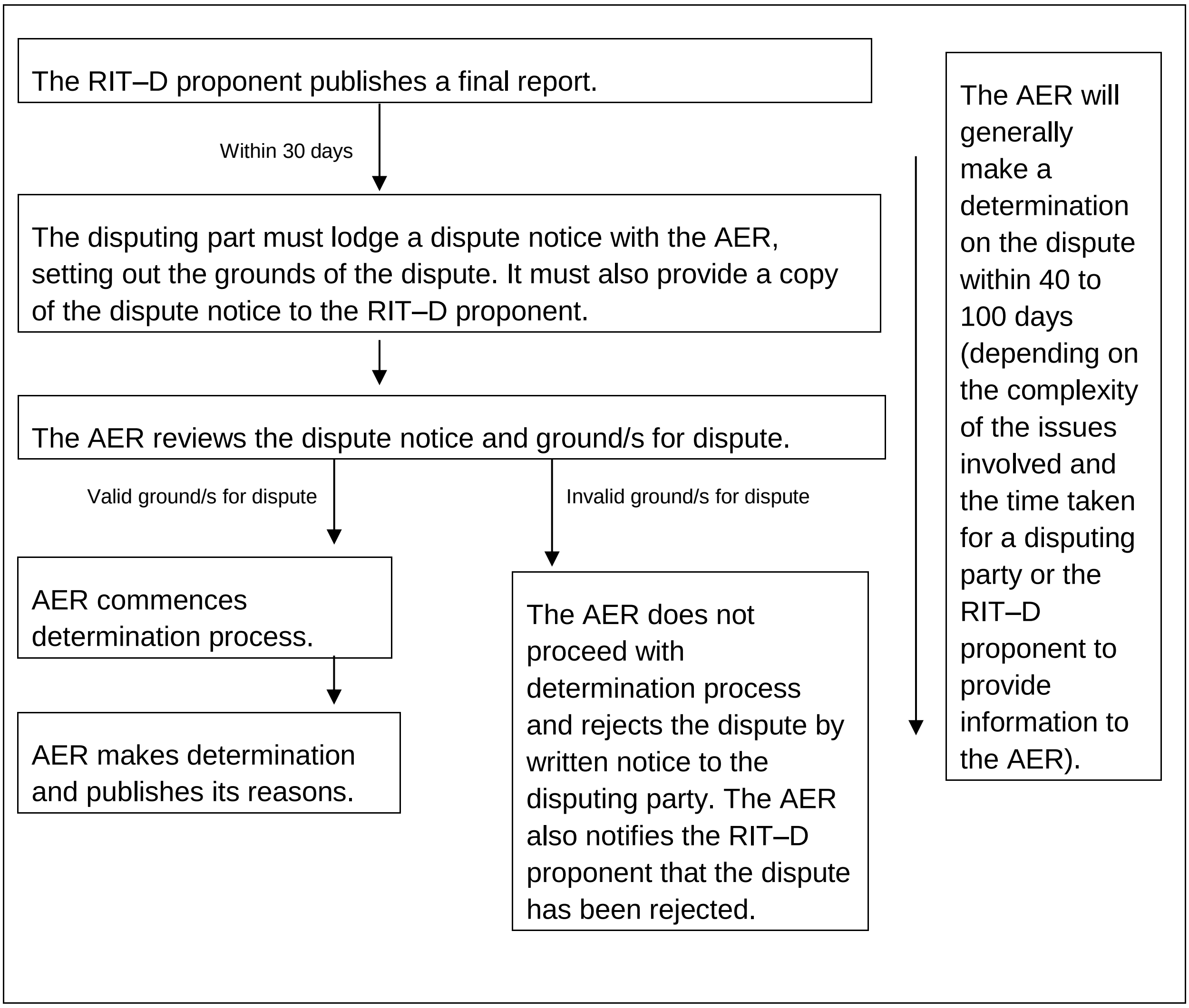
- give us the notice of the dispute in writing setting out the grounds for the dispute (the dispute notice); and
- provide a copy of the dispute notice to the relevant RIT–D proponent.[31]

The dispute notice should include the following information:

- the disputing party's name, a contact officer, address, email and telephone number;
- the ground/s for the dispute;
- any submissions the disputing party made regarding the RIT–D proponent's NNOR, the draft report and the final report (if applicable);
- the RIT–D proponent's response to any submissions made by the disputing party regarding the draft report (if applicable);
- details of any meetings held by the RIT–D proponent with the disputing party (if applicable); and
- the details of any other known parties involved in the matter.

31 NER, cl. 5.17.5(c).

Figure 2 Dispute Resolution Process



5.4 Procedure for a dispute

All parties have different obligations under NER clause 5.17.5 to ensure the timely resolution of disputes. Figure 2 summarises the process for resolving RIT–D disputes.

Timeframe for resolving disputes

We must decide whether a dispute is valid within:

- 40 days of receiving the dispute notice; or
- an additional period of up to 60 days where we notify a relevant party that additional time is required to make a determination because of the complexity or difficulty of the issues involved.[32]

AER determination

[32] NER, cl. 5.17.5(d).

After considering the dispute notice and any other relevant information, we must either reject the dispute or make and publish a determination. We only require the RIT–D proponent to amend its final report if we determine that it applied the RIT–D incorrectly or there was a manifest error in its calculations when applying the RIT–D.

If we decide to reject the dispute, we must do the following:

- reject the dispute by written notice to the disputing party if we consider that the grounds for the dispute were misconceived or lacking in substance; and
- notify the RIT–D proponent that the dispute has been rejected.[33]

If we do not reject the dispute, we must make and publish a determination that:

- directs the RIT–D proponent to amend the matters set out in the final report; or
- states that, based on the grounds of the dispute, the RIT–D proponent will not need to amend the final report.[34]

Expert consultants

We may engage an expert to provide advice on specific matters. The experts may include engineers, economists or other experts in the electricity industry.

It is likely that an engineering expert would be needed to advise us on the engineering/planning aspects where the identified need is for reliability corrective action. Given the complex economic modelling and analysis required, we may also require an economic expert to assist in resolving disputes regarding the quantification of market benefits.

Material the AER may consider

In making a determination on the dispute, we:

- must only take into account information and analysis that the RIT–D proponent could reasonably be expected to have considered or undertaken at the time it performed the RIT–D;
- must publish our reasons for making the determination;
- may disregard any matter raised by the disputing party or the RIT–D proponent that is misconceived or lacking in substance; and
- must specify a reasonable timeframe for the RIT–D proponent to comply with our direction to amend the matters set out in the final report.[35]

We are likely to consider the following material:

- the dispute notice;

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33 NER, cl. 5.17.5(d)(1) and (2).
34 NER, cl. 5.17.5(d)(3).
35 NER, cl. 5.17.5(f).

- the NNOR, the draft report, and the final report (as applicable);
- any expert advice or reports on the proposed preferred option;
- the RIT–D proponent's annual planning reports and any other relevant planning publications;
- relevant planning criteria, reliability requirements or jurisdictional licensing requirements; and
- relevant regulatory decisions relating to the proposed preferred option.

Requests for further information

Under NER clause 5.17.5(h), we may request additional information regarding the dispute from the disputing party and/or the RIT–D proponent. The disputing party or the RIT–D proponent (as the case may be) must provide any additional information as soon as reasonably practicable.

A request for additional information will be in writing. The notice will explain that the:

- request is being made under NER clause 5.17.5(h);
- period of time for making a determination is automatically extended by the amount of time it takes the relevant party to provide the requested information, provided that:
    - we make the request for additional information at least seven days prior to the expiry of the relevant period; and
    - the RIT–D proponent or disputing party provides the information within 14 days of receipt of the request.

While the NER expressly provides for us to request information from the RIT–D proponent or the disputing party, we can request information from a party that is external to a dispute.

We may ask third parties to provide information voluntarily. We can also issue a notice under section 28 of the National Electricity Law.

6 Clause 5.17.4(c) determinations

The RIT–D application guidelines must provide guidance on how to make a determination under NER clause 5.17.4(c). Clause 5.17.4(c) states that a RIT–D proponent need not prepare a NNOR if it determines, on reasonable grounds, that there will not be a non-network option that is a potential credible option or that forms a significant part of a potential credible option to address the identified need.

6.1 Screening for non-network options

Before RIT–D proponents can make a determination under NER clause 5.17.4(c), they must screen for non-network options. In this context, screening means that RIT–D proponents must consider all feasible non-network options, such as:

- Any measure or program targeted at reducing peak demand, including:
  - Applying automatic control schemes, such as direct load control.
  - Applying broad-based demand management programs, such as energy efficiency measures;
  - Entering demand response arrangements with customers, which will often include procuring network support services from demand aggregators.
- Increased local or distributed generation/supply options, including:
  - Capacity for standby power from existing or new embedded generators.
  - Using energy storage systems, load transfer capacity and more.

6.2 Assessing non-network options as potential credible options

Once a RIT–D proponent screens for non-network options, it can determine whether any of these non-network options could individually or jointly, with other option/s constitute a credible option.

A credible option may combine various measures to form one integrated solution to an identified need. Therefore, a RIT–D proponent must consider treating a package of different non-network options as one credible option when determining whether a non-network option could constitutes part of a credible option. A RIT–D proponent must also determine whether any non-network options could combine with a network or generation option to form a significant part of a credible option. Non-network options could form a significant part of a credible option to address the identified need where:

- Adding a non-network option to a network option or a generation option could from an integrated solution to address an identified need, such as increasing the net economic benefits in the NEM.
- The network option is not a feasible credible option, unless the RIT–D proponent combines it with a non-network option.

When making this determination, a RIT–D proponent should assess whether the option or group of options:

- would potentially address the identified need;
- would be commercially and technically feasible[36]; and
- could be implemented in a sufficient time to meet the identified need.

A RIT–D proponent must state its reasoning if it determines that no non-network options satisfy these criteria.

Example 21: A non-network option as a significant part of a credible option

The identified need is to meet an expected 20 per cent increase in distribution network demand, thereby increasing market benefits by reducing involuntary load shedding. The RIT–D proponent has identified two credible options:

- Option 1: Install larger capacity feeders that will increase capacity in the distribution network by 40 per cent.
- Option 2: Introduce a demand management program to reduce peak load, increasing available network capacity by 10 per cent. The RIT–D proponent will then install smaller, less-costly feeders so that total capacity will increase by 20 per cent.

Both options 1 and 2 are credible in that they can address the identified need, and are commercially and technically feasible. Both can be implemented in sufficient time to meet the identified need.

Consequently, the RIT–D proponent cannot make a determination under NER clause 5.17.4(c).

6.3 Publishing a clause 5.17.4(d) notice

If a RIT–D proponent makes a determination under NER clause 5.17.4(c), it must publish a notice under NER clause 5.17.4(d) (the 'Notice'), which states:

> *If a RIT–D proponent makes a determination under paragraph (c), then as soon as possible after making the determination it must publish a notice setting out the reasons for its determination, including any methodologies and assumptions it used in making its determination.*

The Notice must include methodologies and assumptions used, and provide reasons why no non-network option could:

- address the identified need;

36 As discussed in 3.2.2, an option is commercially and technically feasible where its estimated costs are comparable to (or less than) other credible options that address the identified need. One exception includes where the credible option is likely to deliver materially higher market benefits. In such circumstances, the option may be commercially feasible despite the higher expected cost.

- be commercially feasible;
- be technically feasible;
- be implemented in a sufficient time to meet the identified need; nor
- satisfy all of the above requirements when forming a significant part of a credible option.

We require RIT–D proponents to apply this level of consideration to every non-network option available.

A RIT–D proponent only needs to describe one reason why a non-network option is not a credible option. For instance, if a non-network option does not address the identified need and is not technically feasible, the RIT–D proponent is only required to show that it does not address the identified need or that it is technically not feasible. This does not preclude a RIT–D proponent from showing why the option fails to satisfy both these requirements. To minimise the chance of potential disputes, a RIT–D proponent may find it prudent to explain the reasons the option fails both requirements.

A Valuing specific classes of market benefits

Under NER clause 5.17.2(c)(5), the RIT–D application guidelines must provide guidance and worked examples on the acceptable methodologies for valuing the market benefits of a credible option. In this appendix, we provide guidance and worked examples on valuing the following classes of market benefits:

- changes in voluntary load curtailment;
- involuntary load shedding;
- changes in costs to other parties;
- differences in the timing of distribution investment;
- changes in load transfer capacity and the ability of embedded generators to take up load;
- additional option value; and
- changes in electrical energy losses.

A.1 Voluntary load curtailment

A credible option may change the amount of voluntary load curtailment. For example, a demand side option may increase voluntary load curtailment. This would be a negative contribution to the market benefits of the credible option, calculated as:

- the quantity (in MWh) of voluntary load curtailment from the credible option; multiplied by
- consumers' willingness to pay (or be paid) (in $/MWh) for the electricity that is voluntarily curtailed due to the credible option.

The less consumers need to be paid to voluntarily curtail their electricity use, the lower the negative market benefits from a voluntary curtailment option. This is because, in a competitive market, the payment consumers must receive to voluntarily curtail their power should reflect, at a minimum, their real loss of utility from not consuming power.

However, the negative contribution to market benefits of a demand side option should be more than offset by a positive contribution to market benefit caused by a reduction in the involuntary load shedding that would otherwise occur. This is set out in example 22 below.

RIT–D proponents would derive the net contribution to market benefits of a demand side option as the value of unserved energy to consumers generally less the value of that energy to those consumers who have voluntarily agreed to consume less due to the demand side option. For example, a demand side option might lead to voluntary load curtailment of 10 MWh of electricity, valued by consumers at $30/MWh. This might prevent involuntary load shedding of 10 MWh of electricity, valued at $30,000/MWh. This would yield a positive contribution to market benefits of ($30,000 – $30)*10 = $299,700.

Example 22: Increased voluntary and decreased involuntary load curtailment

Assume that load is 201 MW. Remote coal-fired generation has a fuel cost of $10/MWh and capacity of 250 MW. The capacity of the network between the remote generator and the load is limited to 200 MW. If demand exceeds supply, load is involuntarily curtailed. Customers value involuntarily curtailed energy at $30,000/MWh.

The credible option is a demand side option where commercial customers agree with a retailer to reduce power demand by 1 MW when requested by the retailer. This will occur when the retailer expects the spot price to exceed $1,000/MWh in the absence of load curtailment. The $1,000/MWh price reflects the retailer's view of its commercial customers' likely willingness to accept being voluntarily curtailed.

In the base case:

- Demand outstrips supply by 201 MW – 200 MW = 1 MW.
- Price is set at the value customers place on involuntarily curtailed load ($30,000/MWh) and 1 MW of load is involuntarily curtailed to ensure demand = supply.
- Value of voluntary load curtailment = 0 MW*$1,000 = $0 per hour.
- Value of involuntary load curtailment = 1 MW*$30,000 = $30,000 per hour.

In the state of the world with the credible option:

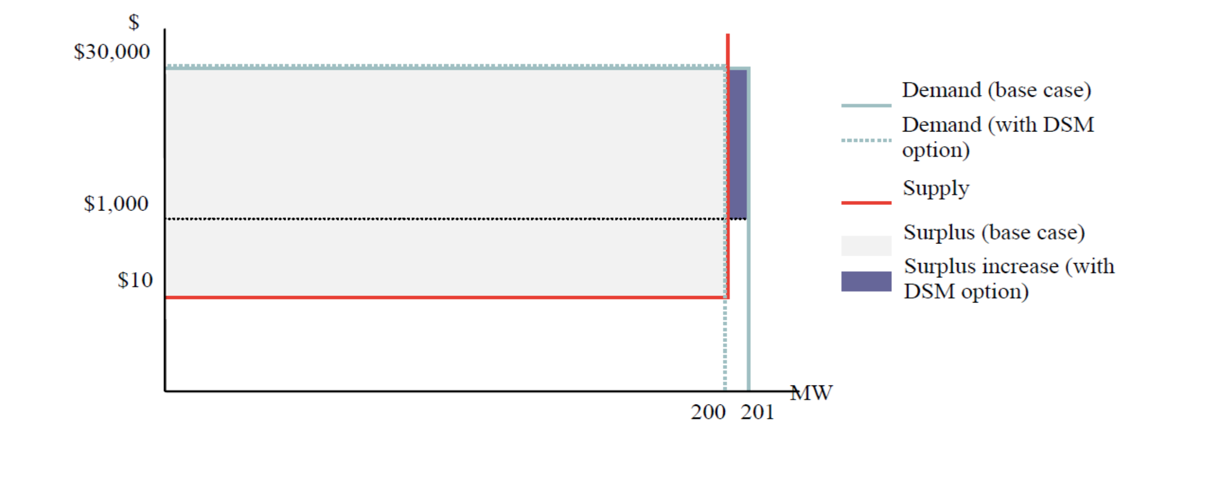
- Demand = load – voluntary load curtailment = 201 MW – 1 MW = 200 MW.
- The remote generator sets the price at $10/MWh.
- Voluntary load curtailment is 1 MW and at a price of $10/MWh.
- Demand = supply and there is no load shedding.
- Value of voluntary load curtailment = 1 MW*$1,000 = $1,000 per hour.

The market benefits of the credible option arise from the demand side option through:

- decreased involuntary load curtailment = $30,000 – $0 = $30,000; less
- increased voluntary load curtailment = $1,000 – $0 = $1,000.

The combined contribution to the market benefits of the credible option (in terms of increased voluntary and decreased involuntary load curtailment) is $29,000 per hour. Assuming the same conditions over 10 hours in a year, the total contribution to the market benefits of the credible option would be 10*$29,000 = $290,000 per annum. This is set out in figure 3 below.

Figure 3: Increased voluntary and decreased involuntary load curtailment



A credible option may reduce voluntary load curtailment. For example, a RIT–D proponent may have a pre-established program where it pays large customers to reduce their energy usage during times of peak demand. For instance, this may entail paying energy-intensive factories to shut down temporarily. If a RIT–D project (for example, augmenting the distribution network) decreases reliance on the programs, then it would represent a reduction in voluntary load curtailment.

A.2 Involuntary load shedding and customer interruptions

A credible option may reduce involuntary load shedding. This may occur if the credible option is a:

- local generation option that supplies electricity;
- demand side reduction option that leads to voluntary load curtailment and thereby reduces demand for electricity;
- control scheme that helps prevent overloads on the network; or
- network option that enables electricity to be plentiful at times that involuntary load shedding would otherwise need to occur. Network options could achieve this by:
  - transporting electricity from a location where it is relatively plentiful to where it is relatively scarce; or
  - improving infrastructure so that less energy is lost in distribution or so that infrastructure is more resilient to external interferences.

A RIT–D proponent can value the market benefit of reduced involuntary load shedding as:

- the quantity (in MWh) of involuntary load shedding not required due to the credible option; multiplied by
- a reasonable forecast of the value of electricity to consumers (in $/MWh) not shed due to the credible option (see section 3.4.3 on VCR).

A negative contribution from providing the credible option would partially offset this positive contribution to market benefits. For example, a local generation option may reduce involuntary load shedding but will increase the use of fuel to supply electricity.

Example 23: Decreased involuntary load shedding

Load is 201 MW. Remote coal-fired generation has a fuel cost of $10/MWh and capacity of 250 MW. The capacity of the network between the remote generator and the load is limited to 200 MW. Customers' value of involuntarily curtailed energy is $30,000/MWh.

The credible option is to build a 25 MW local gas-fired generator with a fuel cost of $100/MWh. In the base case:

- Demand outstrips supply by 201 MW – 200 MW = 1 MW.
- The value customers place on involuntarily curtailed energy is $30,000/MWh.
- Value of fuel consumed = 200 MW*$10 = $2,000 per hour.
- Value of involuntarily curtailed load = 1 MW*$30,000 = $30,000 per hour.

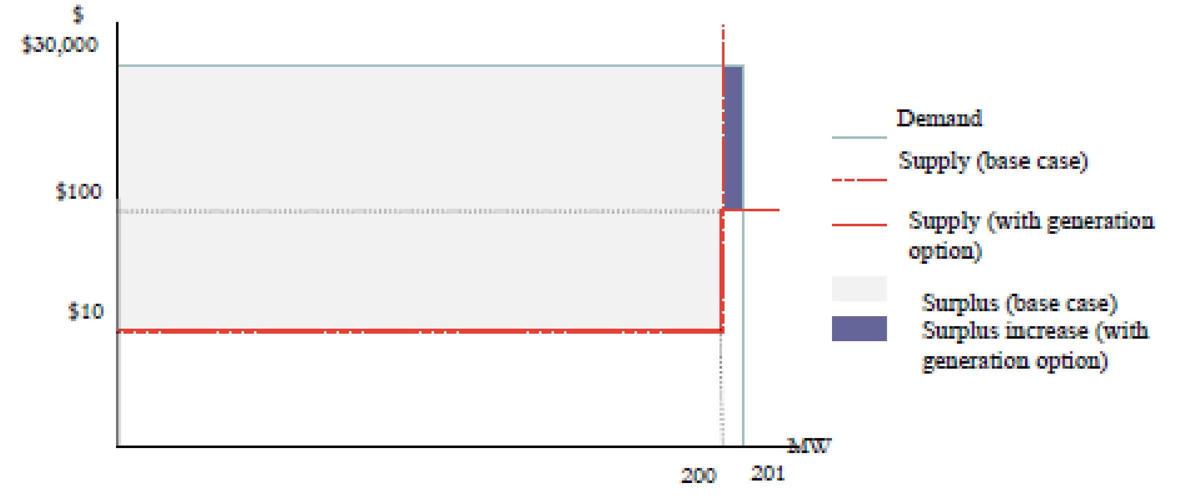
In the state of the world with the credible option:

- Output of remote generator = 200 MW and output of local generator = 1 MW.
- The local gas-fired generator has a fuel cost of $100/MWh.
- Value of fuel consumed = 200 MW*$10 + 1 MW*$100 = $2,100 per hour.
- Demand = supply and there is no load shedding.

The contribution to the market benefits of the credible option from reduced involuntary load curtailment is $30,000 – $0 = $30,000. This would be partly offset by the cost of increased fuel consumption needed to generate electricity, which is $2,100 – $2,000 = $100 per hour.

The net contribution to the market benefits of the credible option (in terms of decreased involuntary load curtailment and increased fuel consumption) is therefore $29,900 per hour. Assuming the same conditions over 10 hours in a year, the total contribution to the market benefits of the credible option is 10*$29,900 = $299,000 per annum. This is set out in figure 4 below.

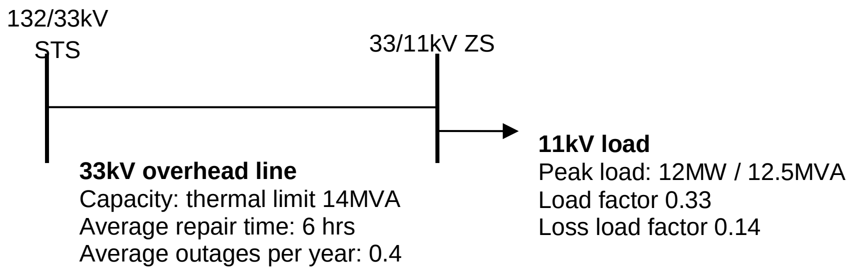
Figure 4 Decrease involuntary load shedding



Example 24: Reliability improvement in a radial system

A long 33kV overhead line from a 132/33kV sub transmission substation radially supplies a rural 33/11kV zone substation. Figure 5 shows the parameters of the system.

Figure 5 Existing supply arrangement



The thermal capacity of the 33kV line limits the substation capacity. Due to an emerging capacity constraint at the zone substation, the RIT–D proponent proposes to replace the existing line with a 33kV dual circuit overhead tower line. As well as addressing the capacity constraint, this option will result in higher customer reliability.

Assume:

- The period of risk is the average repair time after an outage = 6 hours.
- VCR is $50,000 per MWh.

Under the existing supply arrangement, for an outage on the 33kV line, the:

- Load at risk is the average load at the zone substation is (peak demand MW) * (load factor) = 12MW * 0.33 = 4 MW.
- Probability of an outage in a year is (number of elements) * (element outage rate per year) * (hours at risk in year / 8,760) = 1 * 0.4 * (8,760 hours / 8,760h hours) = 0.4.

- Energy at risk is (load at risk) * (period of risk) * (probability of outage) = 4 MW * 6h * 0.4 = 9.6 MWh.
- Value of risk in the first year is 9.6 MWh*$50,000/MWh = $480,000.

Under the credible option (replacing the existing 33kV line with a dual circuit 33kV line), the risk of a dual outage on both circuits is assumed to be small enough to be set to zero, so the value at risk is zero.

The contribution to market benefits of the credible option due to the reliability improvement (in the first year) is $400,000 – $0 = $400,000.

As discussed above, a demand side option may have a negative contribution to market benefits from increasing voluntary load curtailment, whilst also contributing positively by decreasing involuntary load shedding. In these cases, the net effect on market benefits would likely be positive, as electricity will usually be worth more to those that are involuntarily curtailed than to those voluntarily curtailed, see example 23.

A.3 Costs to other parties

Other parties may experience costs from differences in the timing of new plant, capital costs, as well as operating and maintenance costs. These costs capture the impact of a credible option on the plant expansion path of the market.

To the extent that a credible option delays the commissioning of a new plant (which reduces the present value of the resource costs incurred to meet demand), or reduces other parties' costs, this represents a positive market benefit of the option. The reverse may also apply.

Credible options that delay the need for investment in the distribution network could potentially have a similar impact on the need for investment in the transmission network. These are likely to include options aimed at managing load when and where there are network constraints. Such credible options may constitute demand management programs and the use of embedded generation and energy storage. This is set out in example 25 below.

Example 25: Delaying network augmentation

The credible option is a program aimed at managing peak demand. As well as delaying the need to augment the distribution network, it will delay the need to augment the transmission network by 3 years. Without the demand management program, the transmission network would need to be augmented immediately (t=0). The augmentation of the transmission network has a capital cost of $200 million. The discount rate is 7 per cent.

Based on the above assumptions, the positive contribution to the market benefits of the demand management program option to the delayed investment in the transmission network (in terms of delaying capital costs only) can be calculated as:

- The present value (PV) of the capital costs in the transmission augmentation in the base case: $PV = \frac{\$200 \text{ million}}{(1.07)^0} = \$200 \text{ million}$; less

- The PV of the capital costs in the transmission augmentation with the credible option:

$$PV = \frac{\$200 \text{ million}}{(1.07)^3} = \$163 \text{ million}$$

The positive contribution to the market benefits of the credible option due to the delayed investment in the transmission network is $200 million – $163 million = $37 million.

A.4 Timing of expenditure

A credible option may change the timing (or the configuration) of other future investments to be made by or for the RIT–D proponent.

When considering changes in timing, the RIT–D proponent should only take into account distribution investments to address different identified needs to that of the credible option. It is not clear whether or how many investments this category would include. This is set out in example 26 below.

Example 26: Changes in timing of expenditure

A RIT–D proponent has forecast that in 9 years, it will need to replace many plants in one of its substations as a cost of $15 million. The current discount rate is 9 per cent.

Meanwhile, the RIT–D proponent is considering a non-network option to meet an identified need for reliability corrective action. This will involve an integrated solution where it will combine direct load control, demand response and the connection of an embedded generator.

The RIT–D proponent has forecast that the integrated solution will decrease peak demand by 15 per cent by year 5, and 20 per cent by year 10. The RIT–D proponent has estimated that this will also alleviate stress on the network and will delay the need to replace the plant in its substation by 1 year.

The RIT–D proponent could calculate market benefits of the credible delaying the investment in the substation as the difference between the PV of replacement costs:

- In year 9 as a part of its base case:

$$PV = \frac{\$15 \text{ million}}{(1.09)^9} = \$6{,}906{,}417$$

- In year 10 as the state of the world with the credible option in place:

$$PV = \frac{\$15 \text{ million}}{(1.09)^{10}} = \$6{,}336{,}162$$

The positive contribution to the market benefits of the credible option due to the delayed investment in the substation decreases PV costs: $6,906,417 – $6,336,162 = $570,255.

A.5 Load transfer capacity and embedded generators

Clause 5.10.2 of the NER defines load transfer capacity as:

> *meeting the* load *requirements for a* connection point *by the reduction of* load *or group of loads at the* connection point *and increasing the* load *or group of* loads *at a different* connection point.

RIT–D proponents can improve load transfer capacity where a credible option allows end users to gain access to a back-up the power supply. This is a market benefit as backed-up power supplies can service end-users in the event of a power failure.

RIT–D proponents could count improved capacity for embedded generators to take up load as a market benefit for the same reason. Namely, where embedded generation can reliably take up load, it can contribute to the security of supply by supplementing the power available from the network. Consequently, in the event of a supply failure, RIT–D proponents can use protective equipment to 'island' the embedded generation and part of the affected network to retain supply to that a part of the affected load.

A RIT–D proponent could effectively treat market benefits gained from increased load transfer capability and/or the ability of embedded generators to take up load as it would for changes in involuntary load shedding.

A.6 Electrical energy losses

A credible option may lead to a net increase or decrease in network losses. An increase in network losses negatively contributes to the market benefits of a credible option, while a decrease in network losses positively contributes to the market benefits of a credible option.

Most electricity losses occur in the distribution network and may be minimised through:

- power lines being built to connect large consumers more directly;
- improving the efficiency of distribution transformers, or, where possible, reducing the number of transformation steps;
- reducing the average utilisation rate of distribution network cables, since higher loads on power lines result in higher variable losses;
- using power lines and cables with wider cross-sections;
- installing distributed generations systems for energy to be consumed locally or in densely populated areas;
- systems for optimising energy delivery efficiency on distribution systems; and
- power factor correction.

Example 27: Decreased electrical energy losses

Load at region B in a distribution network is 100 MW. Energy costs after generation are $12/MWh and capacity on the distribution network is 120 MW.

The credible option is the augmentation of the distribution network at region B. This will entail installing more distribution network cables. The RIT–D proponent expects the augmentation to reduce distribution losses from 20 to 5 per cent when operating at 100 MW.

In the base case:

- Price = $12/MWh.
- Total losses = $12*0.2*100 MW = $240 per hour.

In the state of the world with the credible option:

- Price = $12/MWh.
- Total losses = $12*0.05*100 MW = $60 per hour.

Assuming the same conditions prevail over 8,760 hours per year, the contribution of decreased network losses to the market benefit of the credible option is ($240 – 60)*8,760 = $1,576,800 per year.

Example 28: Energy loss reduction in a radial system

Under the supply arrangement set out in example 24, the network loss at the time of peak demand is 1.5 MW. After the construction of the dual circuit line, as per the credible option, this falls to 0.3 MW.

Annual losses are;

- Under the existing supply arrangement: (network loss at peak demand) * 8,760 hours * (loss load factor) = 1.5 MW * 8,760 hours * 0.14 = 1,840 MWh.
- Under the credible option: (network loss at peak demand) * 8,760 hours * (loss load factor) = 0.3 MW * 8,760 hours * 0.14 = 368 MWh.

The annual loss reduction under the credible option is 1,840 MWh – 368 MWh =1,472 MWh. Assuming the value of losses is $35 per MWh, the contribution of the decreased network losses to the market benefit of the credible option is 1,472 MWh * $35/MWh = $51,520 in the first year.

A.7 Option value

Clause 5.17.1(c)(4)(vi) of the NER requires RIT–D proponents to consider option value as a class of potential market benefits where it had not already been included in other classes of market benefits. Option value refers to a benefit that results from retaining flexibility where certain actions are irreversible (sunk), and new information may arise in the future as a payoff from taking a certain action. Option value is likely to arise where there is uncertainty regarding future outcomes, the information that is available in the future is likely to change, and credible options are sufficiently flexible to respond to that change.

In our view, if a RIT–D proponent preforms scenario analysis in accordance with these RIT–D application guidelines, then its RIT–D analysis should effectively capture any option value as a class of market benefit. We provide more guidance on scenario analysis and option value in sections 3.3 and 3.7–3.10. We also provide the worked example below, which extends from example 12 and example 13 earlier on in these RIT–D application guidelines.

Example 29: Flexibility and option value

This example extends from example 12 and example 13. Example 12 described three credible options: a network option, a distributed generation option and a demand-response option. It compared the merits of these options across four reasonable scenarios reflecting the potential combinations of future plant capital cost (high or low) and future demand growth (high or low). To simplify this example, assume that plant capital costs are certain to be low and the only uncertainty is demand growth, which may be high or low with equal probability (50% each).

Example 12 assumed that the size of each credible option was fixed and irreversible at the time of the investment decision. There was no scope to either expand or fully or partially reverse the option in the future once the RIT–D proponent new whether actual demand growth was high or low. This example relaxes that restriction.

Example 12 implicitly incorporated two time periods:

- Present – reflecting the time of the investment decision and commissioning date (hereinafter referred to as T_P); and
- Future – reflecting the time at which (hereinafter referred to as (T_F):
    - The identity of the true reasonable scenarios becomes apparent. That is, when it becomes known whether future demand growth is high or low); and
    - The time at which the market benefits of the credible option come to fruition.

Figure 6: Example 12 time periods

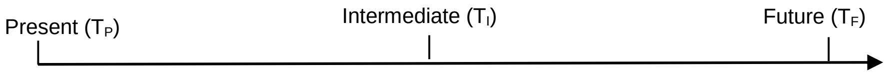
This example distinguishes between the times when the identity of the true reasonable scenarios becomes apparent from when the market benefits of the credible option come to fruition. Assume the RIT–D proponent can make a follow-up decision (after its initial investment decision) when it knows whether future demand will be high or low (T_I), but before the market benefits of any credible option arise (at T_F).

- Therefore, this example incorporates three time periods:

- Present (T_P)
- Intermediate (T_I)

- Future (T_F)

Figure 7: Revised time periods



The ability of the RIT–D proponent to make a follow-up investment decision at T_I when future demand growth is known but has not yet occurred opens up the possibility for it to:

- Develop a small-scale initial option at T_P; and
- If demand turns out to be high, expand or supplement that option at T_I in time to meet the higher demand at T_F.

In this way, the RIT–D proponent can more efficiently select its initial investment to reduce the risk of unnecessary (or insufficient) expenditure.

Given the opportunity to make a follow-up investment decision at T_I, the RIT–D proponent can undertake an option sufficient to cater for all future demand scenarios, including where there is high demand growth. Alternatively, the RIT–D proponent can undertake a smaller and cheaper option that it can expand if required. This smaller option would be sufficient if future demand growth turned out to be low. However, it would prove to be insufficient, requiring a subsequent upgrade or supplementary investment if demand growth turned out to be high.

To specify each credible option, the RIT–D proponent must specify (a) what action it will take in the short-term at T_P; and (b) in the event that demand turns out to be high at T_I, what further action it will take in advance of T_F. This example assumes any supplementary investment would be a network option or upgrade.

Under these assumptions, the RIT–D proponent estimates the following six credible options:

1. A full-scale network option that satisfies the high-growth scenario, as in example 12.
2. A full-scale distributed generation option that satisfies the high-growth scenario, as in example 12.
3. A full-scale demand-side option that satisfies the high-growth scenario, as in example 12.
4. A small-scale network option that satisfies the low-growth scenario and is upgradable to the level of the full-scale network option should demand turn out to be high. The RIT–D proponent assumes:
    - In the low-growth scenario, the benefits of the small-scale and full-scale network options are identical.
    - In the high-growth scenario, the benefits of the small-scale and full-scale network options are identical, because the RIT–D proponent upgrades the small-scale network option to the full-scale network option at T_I in time to meet the higher demand at T_F.
    - In the low-growth scenario, the costs of the small-scale network option are two-

thirds of the costs of the full-scale network option, reflecting the loss of economies of scale involved in network development as well as the costs of building-in upgradeability to the small-scale network option.

- The costs of initially developing the small-scale network option and subsequently upgrading to the full-scale network option at T_I are $5 million greater than the costs of developing the full-scale network option from the outset (at T_P). This reflects the loss of economies of scale and duplication involved in developing a full-scale network option in two stages.

5. A smaller-scale distributed generation option coupled with the ability to undertake a small-scale network option later should demand growth turn out to be high. The RIT–D proponent assumes: In the low-growth scenario, the benefits of the smaller-scale distributed generation option and the full-scale distributed generation option are identical.
   - In the high-growth scenario, the RIT–D proponent develops the small-scale network option at T_I, in time to meet the higher demand at T_F. The benefits of the smaller-scale distributed generation option combined with the small-scale network option in the high-growth scenario are $2.5 million lower than the benefits of the full-scale network option.
   - The costs of the smaller-scale distributed generation option are two-thirds the cost of full-scale distributed generation option, reflecting the loss of economies of scale involved in generation development.
   - The costs of developing the small-scale network option at T_I should demand growth turn out to be high are two-thirds the cost of the full-scale network option due to the loss of economies of scale.
6. A smaller-scale demand-side option coupled with the ability to carry out a subsequent small-scale network option should demand turn out to be high. The RIT–D proponent assumes:
   - In the low-growth scenario, the benefits of the smaller-scale and full-scale demand-side options are identical.
   - In the high-growth scenario, the RIT–D proponent will develop the smaller-scale network option at T_I, in time to meet the higher demand at T_F. The benefits of the smaller-scale demand-side option combined with the small-scale network option in the high-growth scenario are $20.5 million less than the benefits of the full-scale network option.
   - The costs of the smaller-scale demand-side option are two-thirds the cost of the full-scale demand-side option, reflecting the loss of economies of scale involved in arranging demand-side response.
   - The costs of developing the small-scale network option at T_I should demand growth turn out to be high are two-thirds the cost of the full-scale network option due to the loss of economies of scale.

For each of these six credible options, there are two reasonable scenarios to consider—a low demand growth scenario and a high demand growth scenario, each potentially with its own market development path. As noted above, a probability of 50 per cent is attributed to each demand growth scenario.

The ‘tree’ diagram in figure 8 can represent the RIT–D proponent's choices when making an investment decision at T_P without knowing how quickly demand will grow in the longer term. At T_P, the RIT–D proponent can invest in a large option or a small option. The RIT–D proponent will know the rate of growth at T_I, when it will make a supplementary investment if it initially invested in a small option and demand growth appears to be high. It will commission that supplementary investment so it can serve customers by the time the higher demand manifests at T_F.

The tree diagram in figure 8 is a stylised representation of a subset of the choices that could be available to RIT–D proponents. The tree diagram and the analysis will become more complex the more times the RIT–D proponent receives information that it act on it by expanding, supplementing or winding back or down a project. This is because the analysis will need to be to capture all the potential option values.

In this example, the unweighted and weighted market benefits and costs of each of these credible options in each reasonable scenario are set out in table 7 below. In this case, the preferred option is option 6 – the smaller-scale demand-side option coupled with the ability to carry out a subsequent small-scale network option should demand turn out to be high.

Figure 8: Tree diagram for Example 29

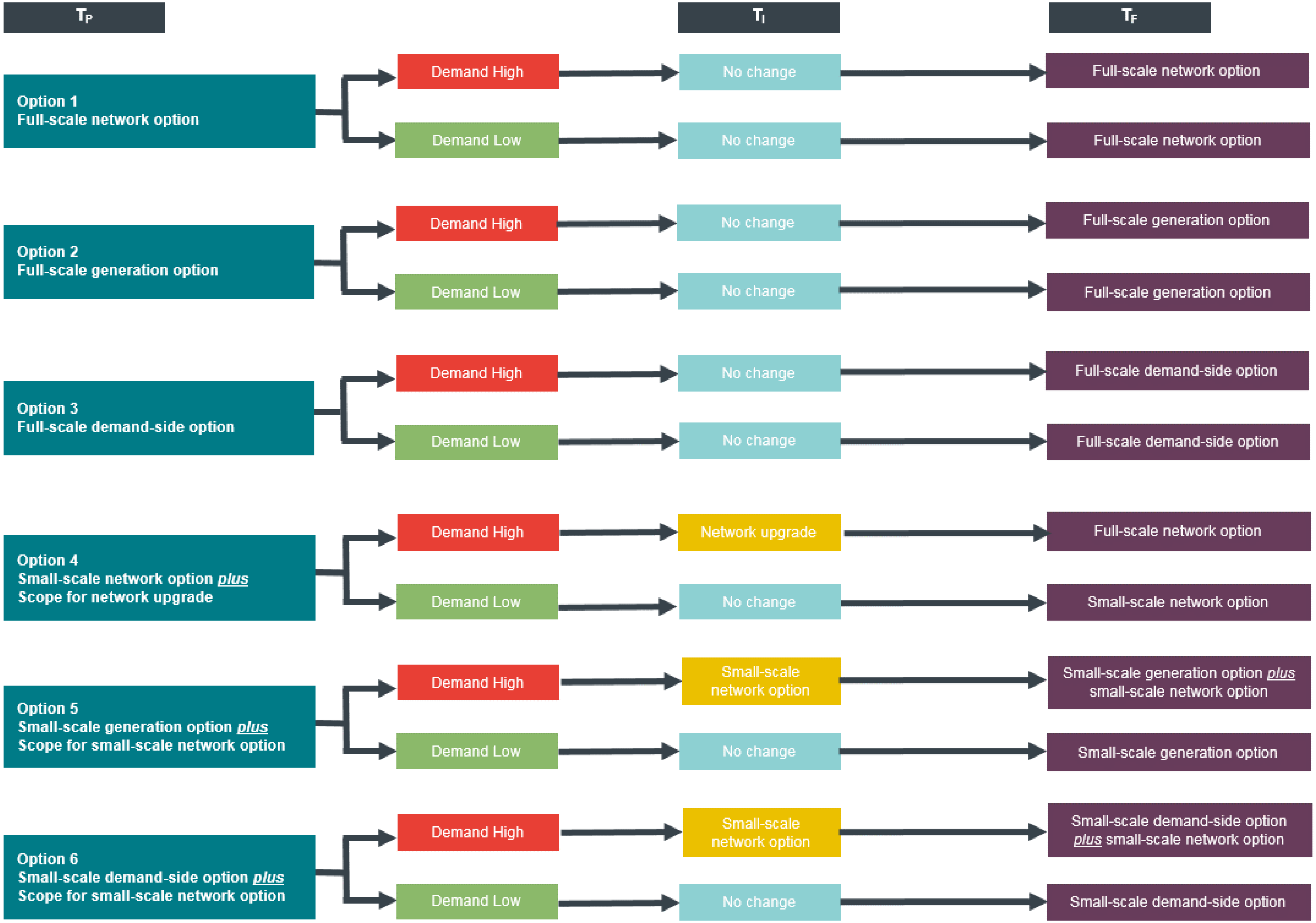


Table 7: Net benefit calculation for Example 29

Option	Description	Relative market benefits | high demand	Relative market benefits | low demand	Weighted-average relative market benefits	Relative costs | high demand	Relative costs | low demand	Weighted -average relative costs	Net economic benefit	Rank
1	Full-scale network option (the 'base case' for the purposes of this reliability-driven RIT–D)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3
2	Full-scale distributed generation option	-5.0	7.0	1.0	0.7	0.7	0.7	0.4	2
3	Full-scale demand-side option	-35.0	4.0	-15.5	-11.2	-11.2	-11.2	-4.3	6
4	Small-scale network option with scope for network upgrade	0.0	0.0	0.0	5.0	-3.9	0.5	-0.5	4
5	Smaller-scale distributed generation option with scope for small-scale network option	-2.5	7.0	2.3	4.4	-3.5	0.4	1.8	1
6	Smaller-scale demand-side option with scope for small-scale network option	-20.5	4.0	-8.3	-3.6	-11.4	-7.5	-0.8	5

B Glossary

Term	NER Ref	Meaning
Connection applicants	Ch. 10	A person who wants to establish or modify connection to a transmission network or distribution network and/or who wishes to receive network services and who makes a connection enquiry as described in cl. 5.3.2 of the NER. Note: In the context of Chapter 5A, the definition in cl. 5A.A.1 of the NER displaces this definition h.
Credible option	Cl. 5.15.2 (a)	An option (or group of options) that: (1) addresses the identified need; (2) is (or are) commercially and technically feasible; and (3) can be implemented in sufficient time to meet the identified need, and is (or are) identified as a credible option in accordance with paragraphs (b) or (d)(as relevant)
Demand side engagement register	Cl.5.10.2	A facility by which a person can register with a distribution business their interest in being notified of developments relating to distribution network planning and expansion.
Dispute notice	Cl. 5.17.5 (c) (1)	The notice given by the disputing party, setting out the grounds for the dispute in writing as required under cl.5.17.5(c)(1) of the NER.
Disputing party	Cl. 5.17.5 (c)	The party disputing matters in the final project assessment report.
Draft project assessment report	Cl.5.10.2	The report prepared under cl. 5.17.4(i) of the NER
Embedded generating unit	Ch. 10	A generating unit connected within a distribution network and not having direct access to the transmission network.
Embedded generator	Ch. 10	A Generator who owns, operates or controls an embedded generating unit. Note: In the context of Chapter 5A, clause 5A.A.1 displaces this definition.
Final project assessment report	Cl.5.10.2	The report prepared under cl. 5.17.4(o) or (p) of the NER.
Identified need	Cl.5.10.2	Identified need means the objective a network business (or in the case of a need identified through joint planning under clause 5.14.1(d)(3) or clause 5.14.2(a), a group of network businesses) seeks to achieve by investing in the network.
Interested parties	Cl. 5.15.1	In cl. 5.16.4, 5.16.5, 5.17.4 and 5.17.5 of the NER, a person including an end user or its representative who, in the AER's opinion, has the potential to suffer a material and adverse NEM impact from the investment identified as the preferred option in the PACR (or the final project assessment report for a RIT–D).

Involuntary load shedding	Ch. 10	Load shedding where the load shed is not an interruptible load except load under the control of under frequency relays as described in cl. S5.1.10.1(a) of the NER, or a scheduled load.
Intending Participant	Ch. 10	A person AEMO has registered as an Intending Participant under Chapter 2.
Load	Ch. 10	A connection point or defined set of connection points at which electrical power is delivered to a person or to another network or the amount of electrical power delivered at a defined instant at a connection point, or aggregated over a defined set of connection points.
Load shedding	Ch. 10	Reducing or disconnecting load from the power system.
Load transfer capacity	Cl.5.10.2	Meeting load requirements for a connection point by the reduction of load or group of loads at the connection point and increasing the load or group of loads at a different connection point.
Network option	Cl.5.10.2	A means by which an identified need can be fully or partly addressed by expenditure on a transmission asset or a distribution asset which is undertaken by a network business.
Non-network option	Cl.5.10.2	A means by which an identified need can be fully or partly addressed other than by a network option.
Non-network options report	Cl.5.10.2	The report prepared under cl. 5.17.4(b) of the NER.
Non-network provider	Cl.5.10.2	A person who provides non-network options.
Potential credible option	Cl.5.10.2	An option which a RIT–D proponent or RIT–T proponent (as the case may be) reasonably considers has the potential to be a credible option based on its initial assessment of the identified need.
Preferred option	Cl. 5.17.1 (b)	The credible option that maximises the present value of the net economic benefit to all those who produce, consume and transport electricity in the NEM. For the avoidance of doubt, a preferred option may have a negative net economic benefit (that is, a net economic cost) where the identified need is for reliability corrective action.
Publish/publication	Ch. 10	A document is published by the AER if it is: (a) published on the AER's website; and (b) made available for public inspection at the AER's public offices; and (c) in the case of a document inviting submissions from members of the public – published in a newspaper circulating generally throughout Australia. In Part B of Chapter 5, a document is published by the *distribution* business if it is published on the distribution business' website.

Registered Participant	Ch. 10	A person who is registered by AEMO in any one or more of the categories listed in rule 2.2 to 2.7 (in the case of a person who is registered by AEMO as a Trader, such a person is only a Registered Participant for the purposes referred to in rule 2.5A). However, as set out in cl. 8.2.1(a1), for the purposes of some provisions of rule 8.2 only, AEMO, Connection Applicants, Metering Providers and Metering Data Providers who are not otherwise Registered Participants are also deemed to be Registered Participants.
Reasonable scenario	N/A	A set of variables or parameters that the RIT–D proponent does not expect to change across each of the relevant credible options.
Reliability corrective action	Cl.5.10.2	Investment by a transmission business or a distribution business in respect of its transmission network or distribution network for the purpose of meeting the service standards linked to the technical requirements of schedule 5.1 or in applicable regulatory instruments and which may consist of network options or non-network options.
Renewable energy zone	N/A[37]	Either the definition: • In the NER, if the NER provides a definition. • In the AEMC's coordination of generation and transmission investment review, if the AEMC provides a definition in this review but has not defined it in the NER. • AEMO uses in connection with the ISP, if neither of the above apply.
RIT–D project	Cl.5.10.2	A project the purpose if which is to address an identified need identified by a distribution business, or a joint planning project that is not a RIT–T project.
RIT–D proponent	Cl.5.10.2	The network business applying the RIT–D to a RIT–D project to address an identified need. The RIT–D proponent may be: (a) if the identified need is identified during joint planning under cl. 5.14.1(d)(3), a distribution business or a transmission business; or (b) in any other case, a distribution business.
Value of customer reliability		The value that electricity customers place on avoiding service interruptions. The VCR determines how much customers are willing to pay for improved service.
Zone substation	Cl.5.10.2	A substation for the purpose of connecting a distribution network to a sub-transmission network.

37 At the date of publication, the NER did not define 'renewable energy zone'. We anticipate the NER will eventually provide this definition.