# FINAL DECISION
# TransGrid transmission determination
# 2018 to 2023

# Attachment 6 – Capital expenditure

May 2018

AUSTRALIAN ENERGY REGULATOR

Inquiries about this publication should be addressed to:

Australian Energy Regulator
GPO Box 520
Melbourne Vic 3001

Tel: (03) 9290 1444
Fax: (03) 9290 1457

Email: AERInquiry@aer.gov.au

# Note

This overview forms part of the AER's final decision on TransGrid's transmission determination for 2018–23. It should be read with all other parts of the final decision.

The final decision includes the following documents:

Overview

Attachment 1 – Maximum allowed revenue

Attachment 2 – Regulatory asset base

Attachment 5 – Regulatory depreciation

Attachment 6 – Capital expenditure

Attachment 8 – Corporate income tax

Attachment 9 – Efficiency benefit sharing scheme

Attachment 10 – Capital expenditure sharing scheme

Attachment A – Negotiating framework

Attachment B – Pricing methodology

# Overview

In our draft decision we did not accept TransGrid's initial capex forecast of $1638.0 million for the 2018-23 regulatory control period. We instead included an alternative capex forecast of $992.2 million.

In response to our draft decision, TransGrid revised its capex forecast to $1559.7 million. TransGrid's revised capex forecast reflects a proposed average annual capex of $312 million, which is 48 per cent higher than its estimated average annual capex of $211 million over the three year 2015-18 regulatory control period. This increase is driven by:

- A large project to upgrade supply to meet projected demand growth and supply reliability in the inner Sydney and the CBD (referred to as the 'Powering Sydney's Future' project).
- Increases in asset replacement capex.
- Increases in network capacity to meet localised demand, direct customer connections, revised transmission planning standards and to provide improvements in network reliability and quality of supply.

In assessing TransGrid's revised proposal we are required to be reasonably satisfied that the capex forecast is likely to reflect efficient costs to maintain supply reliability and safety of operating the network. In performing this task, we have undertaken a comprehensive assessment of TransGrid's revised capex forecast, which has taken into account its revised proposal, stakeholder submissions and where relevant independent expert advice.

TransGrid has not satisfied us that its revised capex forecast is reasonably likely to reflect prudent and efficient costs. Instead, we have determined that an alternative total forecast capex amount of $1249.2 million reasonably reflects prudent and efficient costs. This reflects a reduction of $310 million (or 20 per cent) from TransGrid's revised capex forecast.

Key aspects of our draft decision are:

- We have accepted TransGrid's revised single cable solution for the 'Powering Sydney's Future' project, though we have revised construction cost forecasts down by eight per cent.
- We have reduced TransGrid's proposed non load driven capex on the basis of our findings that project risk costs are overstated.
- We have reduced TransGrid's proposed capex driven by customer connection, economic benefits, and non-network information and communications technology on the basis that aspects of its proposed capex are not sufficiently supported.

## Asset risk management framework

TransGrid recently enhanced its asset and risk management processes in order to better understand the condition and performance of its assets and to more effectively target expenditure to address asset risks.

We consider that the methodology adopted by TransGrid in regard to its asset risk management framework is consistent with good industry practice. However, the evidence indicates that in the application of its methodology TransGrid overstates asset risk costs, therefore prudent and efficient costs are overstated. In particular, we consider that:

- There is insufficient evidence of capex portfolio optimisation.
- TransGrid's application of its risk assessment methodology overstates project risk costs and therefore the expected benefits of proposed capex.
- There is insufficient consideration of the optimal timing of capex.

TransGrid has developed its forecast predominately through a bottom-up aggregation of individual projects and programs. We have previously expressed our view that bottom-up forecasts have a tendency to overstate efficient capex as they do not adequately account for overlap and synergies between projects. This is particularly relevant here as TransGrid does not appear to have developed an overall network risk profile that would provide an overall assessment of the value of network risk reductions which could be compared with its proposed investment cost. The evidence suggests that a significant proportion of TransGrid's proposed capex will provide few benefits in terms of risk reduction. In some cases TransGrid's proposed capex is not consistent with the capex objectives by aiming to improve, rather than maintain service performance. We consider a material capex reduction can be achieved with little impact on risk.

In its application of its risk cost methodology TransGrid's uses a 'worst case' consequence of asset failure to value risk. The evidence suggests that TransGrid has not sufficiently moderated this 'worst case' consequence to reflect the likelihood of the consequence occurring. This issue is particularly relevant to environmental and safety risks associated with TransGrid's proposed line renewal program. Further, despite being raised in our draft decision, TransGrid has not always substantiated the project risk cost inputs used to inform its risk analysis.

We are also not satisfied that TransGrid has taken into account the optimal timing of its proposed investment. In particular, TransGrid considers that the optimal timing is evidenced by a project with a positive net present value. As we stated in our draft decision, the project timing which maximises customer value occurs when the annual risk cost exceeds the cost of avoiding/mitigating the risk. This issue was particularly relevant in our assessment of TransGrid's proposed 'Powering Sydney's Future' project, where the project provided positive net benefits, but our assessment focused on whether the timing of the investment was optimal.

In some cases, TransGrid's estimate of risk costs may not be consistent with the outcomes of its recent asset management practices. In particular, TransGrid's risk analysis used in support of its capex forecast suggests that either:

- Some investment should already have been undertaken to address these risks in the 2015-18 regulatory control period; or
- TransGrid has been carrying an unwarranted level of risk.

TransGrid has had an opportunity to address some of these risks during the 2015-18 regulatory control period. The fact that it did not address these risks whilst simultaneously underspending against its capex forecast suggests that TransGrid's risk analysis used to inform its repex forecast is not consistent with its current asset management and risk management practice. In addition, there is evidence to indicate that TransGrid may not be targeting its proposed expenditure to address the most critical risks as evidenced by capex programs to replace a significant proportion of existing assets (these programs are identified in our assessment of repex).

Overall, our alternative amount for repex is 19 per cent lower than TransGrid's proposed repex. In determining our alternative estimate of repex, we have placed significant weight on the findings of Energy Market Consulting associates (EMCa). While our alternative amount reflects a reduction that is marginally outside the lower end of the range identified by EMCa, we consider it to be appropriate. We have formed this view on the basis that our alternative amount is more consistent with TransGrid's estimated expenditure in the 2015-18 regulatory control period. We have also had regard to TransGrid's expected expenditure in the 2015-18 regulatory control period on the basis that:

- This period reflects TransGrid's actual expenditure after its application of its new asset management and risk management process. This level of expenditure has been sufficient for TransGrid to manage and operate its network in a manner that achieves the capex objectives.
- Average historical repex over the two most recent regulatory control periods has been relatively stable, therefore it provides us with a reasonable reference point in determining our alternative estimate.
- The application of our capital expenditure sharing scheme (CESS) in the 2015-18 regulatory control period provides us with additional confidence that TransGrid's estimated repex over this period is likely to be prudent and efficient as TransGrid has been incentivised to minimise expenditure throughout this period.

*Powering Sydney's Future' project*

TransGrid has proposed the joint 'Powering Sydney's Future' project with Ausgrid to address supply reliability and future demand in inner Sydney and CBD. A regulatory investment test for transmission (RIT-T) was completed in 2017 for this project. TransGrid's revised proposal reflected the preferred option identified in the final RIT-T published on its website.

*Project scope and timing*

In our draft decision we did not include any capex for the Powering Sydney's Future project. While we accepted that the project may be required in the future, we were not satisfied that TransGrid's economic analysis supported its proposed project scope and timing. We invited TransGrid to provide further information to address the concerns identified in our draft decision. In particular, we raised our concerns about the cable outage assumptions and demand projections inputs used in TransGrid's economic analysis. In response to our draft decision, TransGrid reduced its proposed scope and cost of the project. In its revised proposal TransGrid proposed installing a single 330kV cable (rather than two cables) with the installation of conduits for a second cable should it become necessary in the future.

TransGrid provided additional information to substantiate its key assumptions used in its economic analysis to support the timing of the project. This included information to substantiate its cable outage assumptions which underpin its projections of the cost of energy not supplied to customers. We engaged a cable expert to provide advice on the reasonableness of TransGrid's cable outage assumptions. The advice we received suggests that TransGrid's/Ausgrid's cable outage assumptions are overstated. However, economic modelling with the adoption of the consultant's alternative input assumptions were supportive of TransGrid's/Ausgrid's proposed timing.

We also conducted sensitivity testing on TransGrid's/Ausgrid's proposed demand forecasts. The outputs of our analysis also support TransGrid's proposed project timing. On this basis, we are satisfied that the scope and timing of the proposed project is likely to reflect the costs that a prudent operator would require to achieve the capex objectives.

*Project costing*

In response to our draft decision TransGrid submitted an estimate of capex for a single cable solution. This cost estimate included:

- proposed capex of $244 million for the installation of a 330kV cable; and
- Proposed capex for the conversion of an existing 330 kV cable to a 132kV cable.

We engaged EMCa to advise us on TransGrid's scope of works and its estimated capex associated with its revised proposal. EMCa concluded that TransGrid's scope of works is reasonable. However, EMCa considered that TransGrid's proposed capex is likely to be overstated by around $17.2 million (seven per cent) based on its view that TransGrid's cost estimate concluded specific provisions for costs, where general provisions had already been made. In reaching our final decision we took into account EMCa's advice and TransGrid's view that there are costs items which are considered to be understated in support of its estimate. Overall our final decision has reduced TransGrid initial proposed cost by $96.6 million. We are satisfied that this alternative amount reasonably reflects prudent and efficient costs.

*Stakeholder engagement and the regulatory process in relation to the Powering Sydney's Future project*

We welcome the collaborative engagement between TransGrid and stakeholders in finalising the timing and costing of the Powering Sydney's Future project. As part of the process TransGrid has agreed to the establishment of a stakeholder monitoring committee representing stakeholders. The committee will meet with TransGrid to regularly review project costs and timing. Where it is agreed that the project can be deferred or substantially reduced in scope the financial benefits would be passed through to consumers in full. This approach is consistent with the CESS. Under the CESS, in certain circumstances, material cost reductions that are achieved by deferring capital expenditure do not attract a CESS payment in the next period (specifically, they are not included in any positive carryover amounts in the following regulatory control period). For example, cost reductions because of project delays such as planning approvals or land acquisitions do not reflect business efficiencies.

We recognise that TransGrid completed a RIT-T for this project in 2017 which involved consultation with affected parties. However, the information in the RIT-T was limited to a high level summary of the key inputs and the output of TransGrid's economic modelling. We consider that stakeholders (and their advisers) were not in a position to adequately scrutinise the benefits and costs of the project, and were thereby not in a position to make an informed view on the overall reasonableness of the proposed project. We would expect that in the event of any future RIT-T's of this scale and complexity that relies on economic analysis, TransGrid would make the relevant supporting information and economic modelling publically available. This should provide the opportunity for stakeholders to better assess whether the investment is in their long term interests for consumer funded projects. In the context of revenue proposals, we also encourage TransGrid to engage with us and stakeholders early on large complex projects.

Our final decision is limited to the capex forecast for a single cable solution. In the event that TransGrid considers that a second cable is required (as circumstances are likely to change) we do not consider that the recently completed RIT-T is relevant to any future investment associated with a second cable. As such, we expect that TransGrid will undertake a RIT-T for any future investment involving a second cable. We would encourage TransGrid to seek early engagement with us and where possible make any relevant information publically available.

## Contingent projects

Contingent projects are significant network augmentation projects that may arise during the regulatory control period but the need and or timing is uncertain. While the expenditures for such projects do not form a part of our assessment of the total forecast capital expenditure that we approve in this determination, the cost of the projects may ultimately be recovered from customers in the future if:

- Pre-defined conditions (trigger events) are met, where these project specific conditions are specified in the service providers' revenue determination.

- The service provider submits an application for a contingent project, and we are satisfied that the pre-defined triggers have been meet.
- We are satisfied that the proposed project is consistent with the contingent project specified in our revenue determination.

If these conditions are met we are also required to assess whether the capex is reasonably likely to reflect prudent and efficient costs. If we are not satisfied that this is the case, we are required to determine a substitute forecast.

TransGrid proposed nine contingent projects as contingent projects (estimated costs up to $4.9 billion). The proposed projects predominately reflect the uncertainty regarding the need for network upgrades associated with the connection of large scale renewable generation to the transmission network, including major projects such as Snowy 2.0 and an interconnector between New South Wales and South Australia.

TransGrid submitted that the ongoing policy and regulatory reform which followed the endorsement of the Finkel Review recommendations may create a new method (or methods) for the planning and approval of transmission investment. This approach is reflected in TransGrid's proposed project trigger events. In particular, TransGrid proposed the following amendments to provide flexibility in the relevant contingent project trigger event to accommodate possible changes to the regulatory framework in relation to transmission investment.

- 'Inclusion' of the relevant project in AEMO's Integrated Grid Plan (now referred to as an Integrated System Plan(ISP)) or similar plan
- Notification to TransGrid by the Federal Government, COAG Energy Council, State Government's or the ESB that the project is required to manage expected demand or comply with regulatory obligations
- Successful completion of a RIT-T or alternative framework.

We appreciate that TransGrid has proposed these amended triggers to provide flexibility in the trigger event to accommodate possible changes to the regulatory framework in relation to transmission investment. We consider that the regulatory framework needs to ensure that transmission is able to support the efficient and effective evolution of the NEM. While we recognise that the final report of the Finkel review and the ISP contemplate new pathways for transmission development, a RIT remains a legal requirement for projects above a threshold of $6m that cannot be circumvented through trigger events. Should the framework be amended such that an alternative to the RIT-T is set out in the NER or legislation, then this alternative would become the regulatory obligation. In the event that policy makers amend the regulatory framework, we consider that where the RIT-T is embedded in the trigger events, this issue would be addressed through transitional mechanisms or consequential amendments to existing obligations where necessary, including in relation to aspects of Revenue Determinations. We consider that the successful completion of a RIT-T should be mandated in contingent project trigger events given the RIT-T is the relevant safeguard to ensure that customer do not bear inefficient transmission investment. We also consider, as outlined in our submission to AEMO as part of its consultation on the

ISP, that the RIT-T should complement the development of an ISP and the ISP is not a substitute for the RIT-T. However, we also recognise that in the event that regulatory arrangements may change in the future, including the obligation for TNSP's to conduct a RIT-T, it may be appropriate to allow for this circumstance in the trigger events. We have therefore amended the proposed trigger event to recognise that a RIT-T would no longer apply to the trigger event where the obligation to undertake a RIT-T in the NER is no longer applicable.

# Contents

# Shortened forms

| Shortened form | Extended form |
|---|---|
| AARR | aggregate annual revenue requirement |
| AEMC | Australian Energy Market Commission |
| AEMO | Australian Energy Market Operator |
| AER | Australian Energy Regulator |
| ASRR | annual service revenue requirement |
| augex | augmentation expenditure |
| capex | capital expenditure |
| CCP | Consumer Challenge Panel |
| CESS | capital expenditure sharing scheme |
| CPI | consumer price index |
| DMIA | demand management innovation allowance |
| DRP | debt risk premium |
| EBSS | efficiency benefit sharing scheme |
| ERP | equity risk premium |
| ISP | integrated system plan |
| MAR | maximum allowed revenue |
| MRP | market risk premium |
| NSCAS | network support control ancillary service |
| NEL | national electricity law |
| NEM | national electricity market |
| NEO | national electricity objective |
| NER | national electricity rules |
| NSP | network service provider |
| NTSC | negotiated transmission service criteria |
| opex | operating expenditure |
| PPI | partial performance indicators |
| PTRM | post-tax revenue model |
| RAB | regulatory asset base |
| RBA | Reserve Bank of Australia |
| repex | replacement expenditure |

| Shortened form | Extended form |
|---|---|
| RFM | roll forward model |
| RIN | regulatory information notice |
| RPP | revenue and pricing principles |
| SLCAPM | Sharpe-Lintner capital asset pricing model |
| STPIS | service target performance incentive scheme |
| TNSP | transmission network service provider |
| TUoS | transmission use of system |
| WACC | weighted average cost of capital |

# 6 Capital expenditure

Capital expenditure (capex) refers to investment incurred in the provision of prescribed transmission services. This investment mostly relates to assets with long lives, the costs of which are recovered from customers over several regulatory control periods. However, on an annual basis the financing cost and depreciation associated with these assets are recovered (return on and of capital) from customers as part of the 'building blocks' that form TransGrid's total revenue requirement.[1]

## 6.1 Structure of the attachment

This attachment sets out our final decision on TransGrid's proposed total forecast capex for the 2018-23 regulatory control period [2]. Further detailed analysis is in the following appendices:

- Appendix A - Assessment of capex drivers (excluding the 'Powering Sydney's Future project)
- Appendix B - Assessment of the Powering Sydney's Future project
- Appendix C - Contingent projects
- Appendix D - Key aspects of our capex assessment process.

## 6.2 Final decision

We are not satisfied that a substantial part of TransGrid's proposed total forecast capex of $1559.7 million ($2017–18) for the 2018–23 regulatory control period reasonably reflects the capex criteria. We have instead substituted TransGrid's forecast with our alternative estimate of total capex for the 2018–23 regulatory control period. We are satisfied that our alternative estimate of $1249.2 million reasonably reflects the capex criteria. Table 6-1 sets out our final decision. Unless otherwise stated, all dollar values in this attachment are in $2017–18.

1 NER, cl. 6A.5.4(a).

2 Includes the five (5) regulatory years from 1 July 2018 to 30 June 2023.

## Table 6-1 Final decision on TransGrid's total forecast capex (inc. overheads) ($2017/18, million)

| | 2018–19 | 2019–20 | 2020–21 | 2021–22 | 2022–23 | Total |
|---|---|---|---|---|---|---|
| TransGrid's revised proposal | 286.5 [3] | 331.5 | 333.4 | 349.3 | 258.8 | 1559.7 |
| **AER final decision** | **217.2** | **261.7** | **265.3** | **296.2** | **208.9** | **1249.2** |
| Total adjustment | -69.3 | -69.9 | -68.1 | -53.2 | -49.9 | -310.4 |
| Total adjustment (%) | -24% | -21% | -20% | -15% | -19% | -20% |

Source: TransGrid, *Revised regulatory proposal*, December 2017, p. 41; and AER analysis

Note: Numbers may not add up due to rounding.

The difference between TransGrid's revised capex forecast and our alternative estimate in this final decision is predominately due to our findings that TransGrid has applied an overly conservative approach to quantifying risk. As such, we are not satisfied that TransGrid's revised proposal reasonably reflects prudent and efficient capex. A summary of our reasons and findings that are presented in this attachment is set out in Table 6-2 and in Appendix A and B.

In Table 6-2 we present our reasons and findings by capex category (such as augmentation capex (augex) and replacement capex (repex)). This reflects the way in which we tested TransGrid's proposed forecast total capex. Our tests used techniques tailored to the different capex categories, taking into account all available evidence. Through this technique, we found some aspects of TransGrid's proposal were not consistent with the NER. For the same reasons as set out in our draft decision, our findings on TransGrid's quantification of reliability, safety and environmental risks used to derive project risk cost estimates are overestimated and largely explains why we are not satisfied that TransGrid's proposed total forecast capex meets the capex criteria set out in the NER.[4]

## Table 6-2 Summary of AER reasons and findings

| Issue | Reasons and findings |
|---|---|
| Total capex forecast | TransGrid proposed a total capex forecast of $1559.7 million in its revised proposal. We are not satisfied that this forecast reasonably reflects the capex criteria.<br><br>We are satisfied our substitute estimate of $1249.2 million reasonably reflects the capex criteria. Our alternative estimate is 20 per cent lower than TransGrid's revised proposal. |
| Forecasting methodology and key assumptions | We have identified issues involving some aspects of TransGrid's forecasting methodology, including the key input assumptions used to calculate risk costs, the outcome of which resulted in a proposed total forecast capex that does not reasonably |

[3] Includes $25.7 million that TransGrid proposed to transfer from an unregulated service to a prescribed transmission service for Network Support and Control Ancillary Services.

[4] NER, cl. 6A.14.1(2)(ii).

| | |
|---|---|
| | reflect the capex criteria.<br><br>TransGrid's forecasting methodology predominately relies upon a bottom-up build of projects and programs (or bottom-up assessment) to estimate the forecast expenditure. As discussed in recent determinations, bottom-up approaches have tendency to overstate the efficient forecast capex as they do not adequately account for inter-relationships and synergies between projects or areas of work.<br><br>We recognise that TransGrid has implemented a new asset management framework which is consistent with good industry practice. However, we found that in applying this new asset management framework to develop its forecast capex, TransGrid has adopted overly conservative assumptions in applying its framework and has therefore overstated its asset risk and as a result prudent and efficient capex.<br><br>Key concerns with TransGrid's forecasting methodology and key input assumptions include:<br><br>• The capital investment framework does not appear to include an effective portfolio optimisation process. There is also a lack of evidence to indicate that TransGrid has adequate information to assess risks and investment requirements at the portfolio level.<br><br>• A bias towards an over-estimation of risks from asset failures resulting in an overestimation of the capex forecast.<br><br>• Insufficient consideration of the optimal timing of forecast capex as in most cases TransGrid's risk cost methodology is not used to determine the optimal timing of investment.<br><br>In constructing our alternative estimate we have had regard to these aspects of TransGrid's forecasting methodology and key assumptions. |
| Augmentation capex - 'Powering Sydney's Future' project | We are satisfied that TransGrid's the scope and timing of the proposed project to address expected cable reliability and expected demand for electricity in the Inner Sydney and CBD area is optimal in the 2018-23 regulatory control period. TransGrid proposed $252.3 million for this project. However, we are satisfied that a lower amount reasonably reflects prudent and efficient costs. We have instead included in our alternative estimate of total capex an amount of $235.1 million. |
| Augmentation capex | We do not accept TransGrid's forecast augex of $212.3 million on the basis that:<br><br>• The project risk costs associated with proposed capex for projects that are predominately driven by economic benefits to address low probability, high cost events is likely to be overstated or projects are not necessary on the basis that any reliability improvements should be funded through the STPIS and not in the ex-ante capex forecast.<br><br>• Proposed direct customer connection capex is not supported by sufficient evidence to satisfy us that the forecast of specific customer connections is likely to reflect a realistic expectation of the demand forecast and cost inputs required to achieve the capex objectives.<br><br>• We accept TransGrid's proposal to transfer unregulated Network Support Control and Ancillary Services to the regulated asset base as a prescribed transmission services. However as the asset has been fully recovered as an unregulated services, we consider that this asset should be included in the RAB at zero value and have not included the proposed capex in our substitute estimate of overall capex<br><br>Overall we are satisfied that a lower amount of augex reasonably reflects prudent and efficient costs. We have instead included in our alternative estimate of total capex an amount of $119.6 million. |
| Replacement capex | We do not accept TransGrid's forecast repex of $937.1 million, inclusive of $48.5 million security and compliance capex) on the basis that:<br><br>• There is insufficient evidence of capex portfolio optimisation<br><br>• There is evidence that the quantification of risks of the proposed investment have been materially overstated |

| | |
|---|---|
| | • The optimal scope of works and prudent and efficient timing of capex has not been demonstrated<br><br>Given these issues, we consider that a lower amount of repex reasonably reflects prudent and efficient costs. We have instead included in our alternative estimate of overall total capex an amount of $754.4 million for repex (including security and compliance capex). |
| Non-network (business support) capex | We do not accept TransGrid's forecast non-network (business support) capex of $157.9 million largely on the basis of:<br><br>• The options analysis appears to be insufficient and may not identify the optimal timing of asset replacement<br><br>• limited information to support risk cost parameters adopted in the analysis and these inputs are likely to be overstated<br><br>• there is an absence of any compelling evidence to support the improved ICT capability, including TransGrid's IT/OT integration strategy; and<br><br>We are satisfied that a lower amount of non-network ICT capex reasonably reflects prudent and efficient costs. We have instead included in our substitute estimate of overall total capex an amount of $140.1 million for non-network capex. |
| Contingent projects | TransGrid proposed $4.9 billion for nine contingent projects. We accept these projects as contingent projects. However we have amended the trigger events for these projects. |

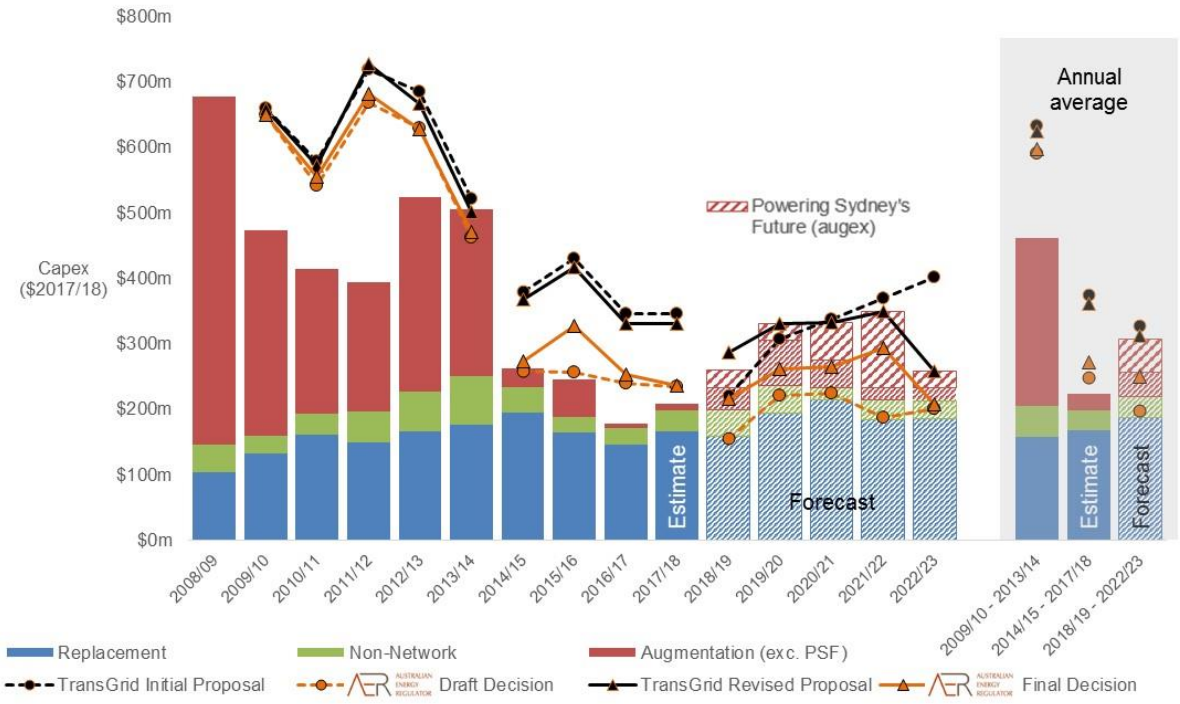
Source: AER analysis.

## 6.3 TransGrid's revised proposal

In its revised proposal TransGrid forecast a total capex of $1559.7 million for the 2018-23 regulatory control period. TransGrid's revised capex forecast is 57 per cent higher than our draft decision, but 5 per cent lower than forecast in its initial revenue proposal.

Figure 6-1 shows the difference between TransGrid's revised proposal and our draft and final decisions for the 2018–23 regulatory control period, as well as the actual/estimated capex that TransGrid spent during previous regulatory control periods.

## Figure 6-1 TransGrid's total actual, estimated and forecast capex (inc. overheads) ($2017/18)




Source: AER analysis

*Includes $25.7 million in 2018/19 that TransGrid proposed to transfer from an unregulated service to a prescribed transmission service for Network Support and Control Ancillary Services.

TransGrid has estimated its average annual capex for the 2015-18 regulatory control period[5] to be $211.3 million.[6] Over the 2018-23 regulatory control period TransGrid is forecasting its average annual capex to increase to:

- $261.5 million (↑24 per cent) when excluding the 'Powering Sydney's Future' project; or
- $311.9 million (↑48 per cent) when including the 'Powering Sydney's Future' project.

In response to our draft decision, TransGrid reduced its proposed capex for one large augmentation project proposed to address supply reliability and demand in inner Sydney and the CBD. This largely explains the reduction in TransGrid's proposed capex in its revised proposal from that in its initial proposal. In summary, TransGrid has proposed:

5 We note that the 2014/15 regulatory year reflects a transitional period between regulatory control periods. As such, when comparing time periods within this attachment we refer to the three year 2015-18 period as the regulatory control period (RCP) and the four year 2014-18 period as the 'regulatory period'.

6 TransGrid's actual expenditure for the 2017-18 year was not known at the time this final decision was published.

- A 10 per cent net reduction in proposed augmentation capex as a result of a reduction in the scope of the 'Powering Sydney's Future' project
- A 3 per cent reduction in proposed repex (TransGrid provided a further submission proposing a 10 per cent reduction from its initial proposal); and
- non-network capex that is similar to its initial proposal.

## 6.4 Assessment approach

We must determine whether TransGrid's proposal reasonably reflects the capex criteria set out in the National Electricity Rules (NER).[7] We use various qualitative and quantitative assessment techniques to assess the different elements of TransGrid's proposal. We also use these techniques to develop our alternative estimate of the total forecast capex, which we use to test TransGrid's total forecast capex.

If we are satisfied that TransGrid's proposal reasonably reflects the capex criteria in meeting the capex objectives, we accept it.[8] If we are not satisfied, the NER requires us to put in place a substitute estimate which we are satisfied reasonably reflects the capex criteria.[9] Where we have done this, our substitute estimate is based on our alternative estimate.

Our assessment approach is outlined in more detail in the draft decision.[10] In particular, we considered whether TransGrid's methodology is a sound basis for developing expenditure forecasts that reasonably reflect the capex criteria.[11]

## 6.5 Reasons for final decision

We are not satisfied that TransGrid's total forecast capex reasonably reflects the capex criteria. We compared TransGrid's revised capex forecast to the alternative capex forecast. TransGrid's revised proposal is materially higher than our alternative estimate. We are satisfied that our alternative estimate reasonably reflects the capex criteria.

Table 6-3 sets out the capex amounts by driver that we have included in our alternative estimate of TransGrid's total forecast capex for the 2018–23 regulatory control period.

7 NER, cl. 6A.6.7(c).
8 NER, cl. 6A.6.7(a).
9 NER, cl. 6A.14.1(2)(ii).
10 AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-31.
11 AER, *Expenditure Forecasting Assessment Guideline*, December 2013.

### Table 6-3 Final decision assessment of required capex by capex driver 2018–23 ($2017-18, million)

| Category | 2018–19 | 2019–20 | 2020–21 | 2021–22 | 2022–23 | Total |
|---|---|---|---|---|---|---|
| Replacement | 129.6 | 156.0 | 171.6 | 148.4 | 148.8 | 754.4 |
| Augmentation | 52.4 | 68.9 | 76.1 | 121.8 | 35.5 | 354.7 |
| Non-network | 35.2 | 36.8 | 17.7 | 25.9 | 24.5 | 140.1 |
| **Total capex** | **217.2** | **261.7** | **265.3** | **296.2** | **208.9** | **1249.2** |

Source: AER analysis

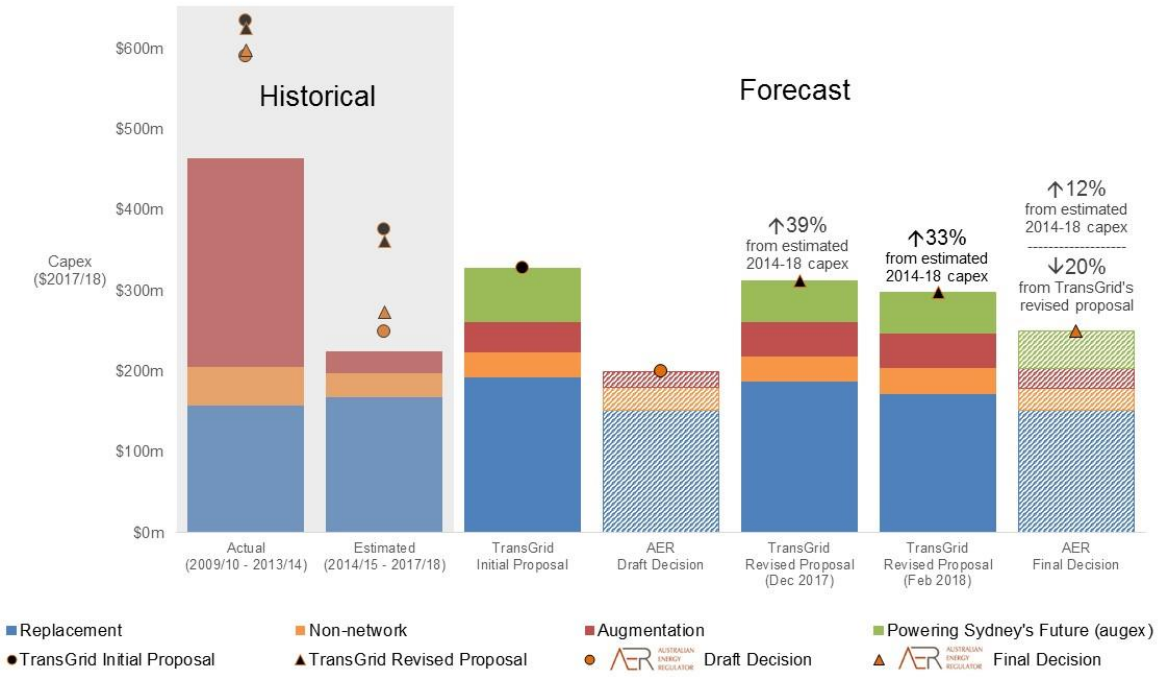
Note: Numbers may not add up due to rounding

Our alternative forecast of $1249.2 million is:

- $310.4 million (or 20 per cent) lower than TransGrid's revised forecast of $1559.7 million, and
- 12 per cent higher than TransGrid's estimated average annual capex over the 2014-18 regulatory period.

However, we note that TransGrid's revised forecast represents a level of expenditure that is 39 per cent higher than its estimated capex over the 2014-18 regulatory period (or 17 per cent higher when excluding TransGrid's proposed capex for its 'Powering Sydney's Future' project).

## Figure 6-2 TransGrid's average annual estimated and forecast capex (inc. overheads) ($2017/18)[12]




Source: AER analysis

The key components of our final decision include:

- Non-load driven capex (replacement) that is 19 per cent lower that TransGrid's revised forecast (from $937.1 million to $754.4 million)
- Load driven capex (augmentation) that is 24 per cent lower than TransGrid's revised forecast (from $464.6 million to $354.7 million) on the basis of:
    - 'Powering Sydney's Future' augex that is 7 per cent lower than TransGrid's revised forecast (from $252.3 million to $235.1 million).
    - Economic benefits driven augex that is 51 per cent lower than TransGrid's revised forecast (from $80.1 million to $39.2 million).
    - Connection driven augex that is 70 per cent lower than TransGrid's revised forecast (from $37.3 million to $11.1 million).
    - The inclusion of unregulated NSCAS assets in the RAB at zero value.
- Non-network driven capex that is 11 per cent lower than TransGrid's revised forecast (from $157.9 million to $140.1 million).

[12] TransGrid submitted a 'revised' revised capital accumulation model (CAM) and post-tax revenue model (PTRM) on 21 February 2018.

We used the reasoning set out in the Appendix A and B to form our alternative estimate.

### 6.5.1 Interrelationships

There are a number of interrelationships between TransGrid's total forecast capex for the 2018–23 regulatory control period and other components of its transmission determination (see Table 6-4 below). We considered these interrelationships in coming to our final decision on total forecast capex.

**Table 6-4 Interrelationships between total forecast capex and other components**

| Other component | Interrelationships with total forecast capex |
|---|---|
| Total forecast opex | In general our total opex forecast will provide TransGrid with sufficient opex to maintain the reliability and safety of its network. Although we do not approve opex on specific categories of opex such as maintenance, the total opex we approve will in part influence the capex TransGrid needs to spend during the 2018-23 period. Operational expenditures may be effective in managing existing risks and defer or displace capital expenditures. Similarly, capital expenditures will reduce future operational and maintenance expenditures. |
| Forecast demand | Forecast demand affects forecast capex. The demand forecast is an important input into, for example, TransGrid's proposed 'Powering Sydney's Future' project as demand forecasts affect the amount of unserved energy which is the key driver of this project. In addition, a key driver of augmentation related capex is maximum demand and its effect on network utilisation and reliability. |
| Capital Expenditure Sharing Scheme (CESS) | The CESS is related to TransGrid's total forecast capex. In particular, the effective application of the CESS is contingent on the approved total forecast capex being efficient, and that it reasonably reflects the capex criteria. As we note in the capex criteria table below, this is because any efficiency gains or losses are measured against the approved total forecast capex. In addition, we are required to undertake an ex post review of the efficiency and prudency of capex to exclude any inefficient capex in excess of the approved total forecast capex from TransGrid's regulatory asset base. In particular, the CESS will ensure that TransGrid bears at least 30 per cent of any overspend against the capex allowance. Similarly, if TransGrid can fulfil its objectives without spending the full forecast capex, it is entitled to retain 30 per cent of the benefit of this. |
| Service Target Performance Incentive Scheme (STPIS) | The STPIS is interrelated to TransGrid's total forecast capex, insofar as it is important that it does not include any expenditure for the purposes of improving supply reliability during the 2018–23 regulatory control period. This is because such expenditure should be offset by rewards provided through the application of the STPIS.<br>Further, the forecast capex should be sufficient to allow TransGrid to maintain performance at the targets set under the STPIS. The capex allowance should not be set such that there is an expectation that it will lead to TransGrid systematically under or over performing against its targets. |
| Contingent project | A contingent project is interrelated to TransGrid's total forecast capex. This is because an amount of expenditure that should be included as a contingent project should not be included as part of TransGrid's total forecast capex for the 2018–23 regulatory control period. |

Source: AER analysis

### 6.5.2 Consideration of the capex factors

As we discussed in section 6.4 of our draft decision, where relevant we took the capex factors into consideration when assessing TransGrid's total capex forecast. Table 6-5 summarises how we have taken into account the capex factors.

## Table 6-5 AER consideration of the capex factors

| Capex factor | AER consideration |
|---|---|
| The most recent annual benchmarking report and benchmarking capex that would be incurred by an efficient distributor over the relevant regulatory control period | We had regard as stated in our draft decision, to our most recent benchmarking report in assessing TransGrid's proposed total forecast for the 2018–23 regulatory control period. However, we have not used the outcome of this report determinatively in determining our alternative estimate of total capex. |
| The actual and expected capex of TransGrid during any preceding regulatory control periods | We had regard to TransGrid's actual and expected capex during the 2018–23 regulatory control period and preceding regulatory control periods in assessing its proposed total forecast.<br>Our assessment of the forecast capex had regard to this capex factor associated with the capex drivers and programs that underlie TransGrid's total forecast capex. In particular, we had regard to historical trends in assessing:<br>• Connection related capex<br>• Non-load driven capex; and<br>• Non-network driven capex. |
| The extent to which the capex forecast includes expenditure to address concerns of electricity consumers as identified by TransGrid in the course of its engagement with electricity consumers | We had regard to the extent to which TransGrid's proposed total forecast capex includes expenditure to address consumer concerns that TransGrid identified. TransGrid has undertaken engagement with its customers and has relied on the adoption of the value of customer reliability in its economic analysis to reflect customer preferences in developing its forecast capex. |
| The relative prices of operating and capital inputs | We had regard to the relative prices of operating and capital inputs in assessing TransGrid's proposed real cost escalation factors. In particular, we have accepted TransGrid's proposed cost escalation for labour. |
| The substitution possibilities between operating and capital expenditure | We had regard to the substitution possibilities between opex and capex. We considered whether there are more efficient and prudent trade-offs in investing more or less in capital in place of ongoing operations. In particular, our assessment of proposed non-network capex and specific capex projects, had regard to the potential opex savings associated with proposed capex. |
| Whether the capex forecast is consistent with any incentive scheme or schemes that apply to TransGrid | We had regard to whether TransGrid's proposed total forecast capex is consistent with the CESS and the STPIS. See our discussion about the interrelationships between TransGrid's total forecast capex and the application of the CESS and the STPIS in Table 6-4 above. |
| The extent to which the capex forecast is referrable to arrangements with a person other than the service provider that do not reflect arm's length terms | We had regard to whether any part of TransGrid's proposed total forecast capex or our alternative estimate is referrable to arrangements with a person other than TransGrid that do not reflect arm's length terms. Based on the information provided by TransGrid we are satisfied that the capex forecast is based on arrangements that reflect arm's length terms. |
| Whether the capex forecast includes an amount relating to a project that should more appropriately be included as a contingent project | We had regard to whether any amount of TransGrid's proposed total forecast capex or our alternative estimate relates to a project that should more appropriately be included as a contingent project. We did identify amounts that should more |

| Capex factor | AER consideration |
|---|---|
| | appropriately be included as a contingent project. |
| The most recent National Transmission Network Development Plan (NTNDP), and any submissions made by AEMO, in accordance with the Rules, on the forecast of TransGrid's required capex | In our assessment of contingent projects, we have taken into account the most recent NTNDP in assessing TransGrid's forecast capex. AEMO did not make a submission on TransGrid's capex proposal in this instance. |
| The extent to which TransGrid has considered and made provision for efficient and prudent non-network alternatives | We had regard to the extent to which TransGrid made provision for efficient and prudent non-network alternatives as part of our assessment. TransGrid submitted that it considered non-network alternative in some of its options analysis for some augmentation programs. We also considered non-network options as part of our assessment of the 'Powering Sydney's Future' project. |
| Any relevant project assessment conclusions report required under clause 5.6.6 of the NER | We have had regard to the extent to which TransGrid made project assessment conclusions in relation to the 'Powering Sydney's Future' project under clause 5.16 of the NER. See Appendix B. |
| Any other factor the AER considers relevant and which the AER has notified TransGrid in writing, prior to the submission of its revenue proposal, is a capex factor | We did not identify any other capex factor that we consider relevant. |

Source: AER analysis

# A Assessment of capex drivers (excluding the 'Powering Sydney's Future project)

## A.1 Alternative estimate

We assessed TransGrid's revised proposal and we formed our alternative estimate of the capex required to reasonably reflect the capex criteria. Our alternative estimate is based on our assessment techniques (refer to appendix A in our draft decision). Our weighting of each of these techniques and our response to TransGrid's submissions on the weighting that should be given to particular techniques, is set out under the capex drivers in appendices A and B.

## A.2 Forecast load driven capex

Augmentation capex (augex) is capex primarily required to increase the capacity of a network to allow for load growth. Load growth (increases in demand and network utilisation) triggers the need to build or upgrade the network. Augex is also triggered by the need to upgrade the network to comply with quality, safety, reliability and security of supply requirements.

### A.2.1 Position

We do not accept TransGrid's revised load driven augex proposal of $212.3 million (excluding the 'Powering Sydney's Future' project). We have instead included an alternative estimate of $119.6 million (excluding the 'Powering Sydney's Future' project) into our alternative overall capex. Our alternative estimate is 44 per cent lower than proposed by TransGrid in its revised proposal.

We are satisfied that our alternative estimate reasonably reflects the capex criteria. In coming to this view, we had regard to:

- a review of the forecast methodology, including further information submitted by TransGrid
- trend analysis, comparing past trends in actual and forecast capex for the connection driven capex programs; and
- stakeholder submissions.

Table 6-6 below summarises TransGrid's proposals and our alternative estimates for augex.

### Table 6-6 Final decision on TransGrid's forecast augex (inc. overheads) ($2017/18 million)

| | TransGrid initial proposal | AER Draft Decision | TransGrid revised proposal | Final decision |
|---|---|---|---|---|
| Economic benefits driven | 61.9 | 30.4 | 80.1 | 39.2 |
| Reliability driven | 41.2 | 41.0 | 48.6 | 48.6 |
| Connection driven | 36.0 | 7.5 | 37.3 | 11.1 |
| Localised demand driven | 21.0 | 17.8 | 20.7 | 20.7 |
| NSCAS | 25.7 | 0.0 | 25.7 | 0.0 |
| **Total** | **185.7** | **96.6** | **212.3** | **119.6** |

Source: AER analysis

Note: Numbers may not add up due to rounding

Our findings, which are consistent with those discussed in our draft decision, are:

- the risks of certain projects predominately driven by economic benefits to address 'low probability → high consequence' events are likely to be materially overstated and therefore prudent and efficient costs are likely to be overstated.
- TransGrid has demonstrated the need for the proposed capex driven by the revised mandatory transmission planning standards.
- Proposed capex driven by localised demand has been supported by economic analysis and in joint planning with the relevant DNSP[13].
- Proposed direct customer connection capex is not likely to reflect a realistic expectation of the demand forecast and cost inputs required to achieve the capex objectives.
- Proposed capex for the transfer of unregulated NSCAS assets to the RAB is not reasonably likely to reflect prudent and efficient costs.

## A.2.2 TransGrid's revised proposal

TransGrid's revised proposal of $212.3 million is $26.6 million (or 14 per cent) above its initial proposal of $185.7 million. This increased expenditure is largely the result of:

- 'economic-benefit' driven capex of $20.9 million to include ten projects initially proposed as part of the Network Capability Incentive component of the STPIS; and
- 'reliability-driven' capex of $7.1 million (up from $0.2 million in TransGrid's initial proposal) due to a delay to the Mudgee project, which has required capex to be incurred in the 2018-23 regulatory control period.

[13] Endeavour Energy and Evoenergy.

Table 6-7 summarises TransGrid's revised proposal for augex.

**Table 6-7 TransGrid's revised proposal for augmentation expenditure (inc. overheads) ($2017/18 million)**

| | 2018-19 | 2019-20 | 2020-21 | 20121-22 | 2022-23 | Total |
|---|---|---|---|---|---|---|
| Economic benefits driven | 8.2 | 22.1 | 29.4 | 9.6 | 10.8 | 80.1 |
| Reliability driven | 21.9 | 26.6 | 0.0 | 0.0 | 0.0 | 48.6 |
| Connection driven | 3.8 | 18.8 | 10.9 | 1.0 | 2.9 | 37.3 |
| Localised demand driven | 1.2 | 2.2 | 2.9 | 7.7 | 6.8 | 20.7 |
| NSCAS | 25.7 | 0.0 | 0.0 | 0.0 | 0.0 | 25.7 |
| **Total** | **60.7** | **69.8** | **43.1** | **18.3** | **20.4** | **212.3** |

Source: AER analysis

Note: Numbers may not add up due to rounding

In regard to economic benefits driven capex, TransGrid submitted that:

- Our reliance on EMCa's report and our application of its findings on the systemic overestimation of replacement expenditure to augex is problematic as these findings have been shown to be weakly supported.[14]
- An arbitrary reduction of 20 per cent to this proposed capex appears to have been applied on the basis of a flawed review of our risk analysis method. [15]

TransGrid also submitted that we made analytical errors and misinterpretations to justify its decision. [16] In particular, TransGrid considered we erroneously relied on trends in connection point utilisation, to conclude that demand driven augmentation should remain at historical levels.[17]

## A.2.3 AER augex findings

This section sets out our findings in relation to proposed augex driven by:

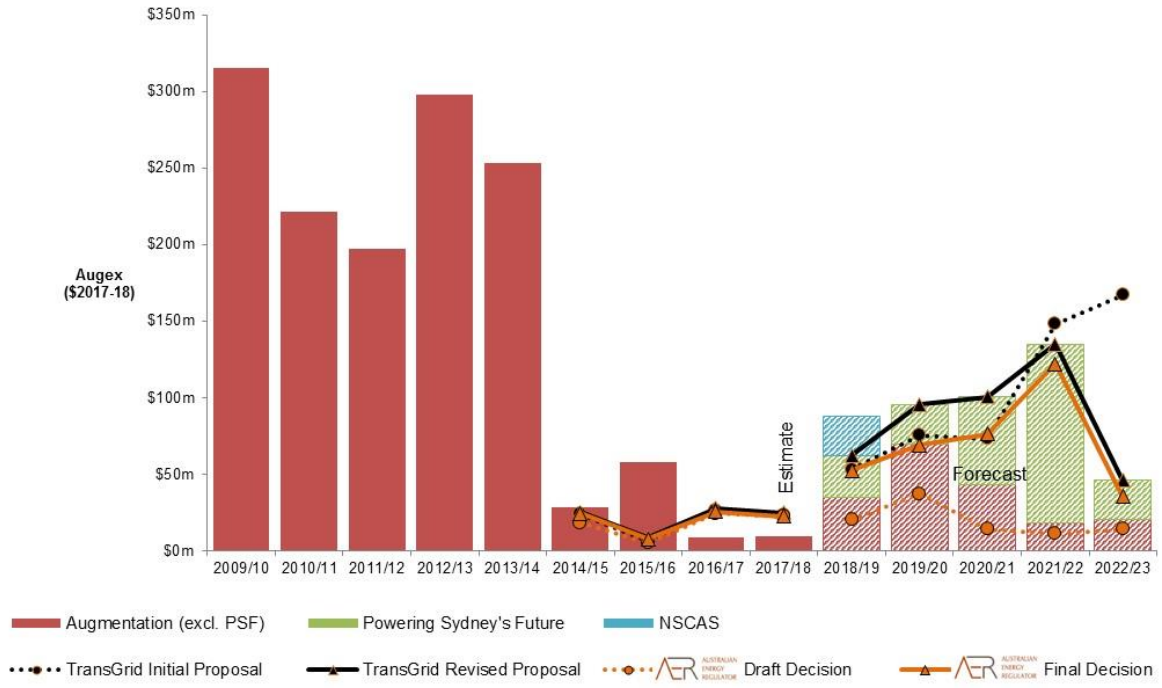
- Economic benefits associated with improved network performance
- Demand growth in specific areas of the network
- New customer connections to the transmission network (mining and large customer loads)

[14] TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 83.
[15] TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 83.
[16] TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 44.
[17] TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 46.

- revised transmission planning standards; and
- The transfer of unregulated assets into the RAB associated with maintaining power system security reliability of supply and maintaining or increasing the power transfer capability of the transmission network.

Figure 6-3 shows TransGrid's estimated load driven capex (augex) since 2009-10 and its forecast load driven capex for the 2018-23 regulatory control period. TransGrid's proposed capex of $212.3 million (excluding the 'Powering Sydney's Future' project) in the 2018-23 regulatory control period reflects a 64 per cent increase over its estimated average annual augex in the 2014-18 regulatory period.

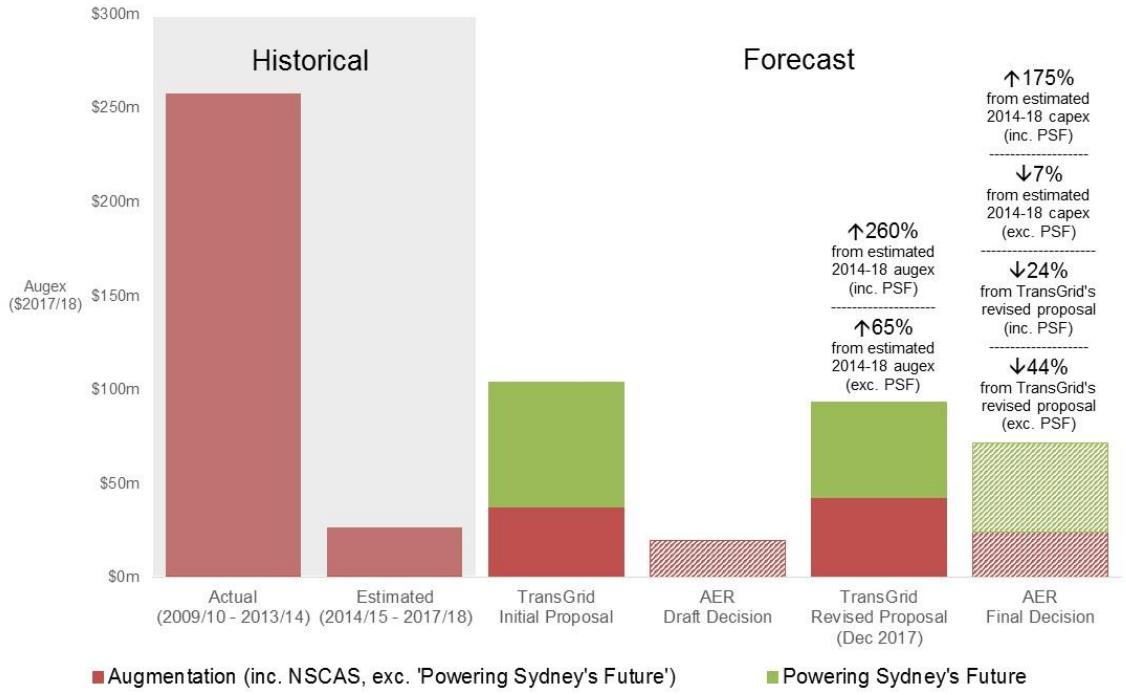
### Figure 6-3 TransGrid's historical and forecast augex (inc. overheads) ($2017/18 million)




Source: AER analysis

Figure 6-4 (below) provides a snapshot of TransGrid's annualised historical and forecast augex.

## Figure 6-4 TransGrid's annualised historical and forecast augex (inc. overheads) ($2017/18)




Source: AER analysis

TransGrid's revised proposal identified issues with the analysis supporting our draft decision.[18] In doing so, TransGrid considered that we made analytical errors and misinterpretations to justify its decision.[19] TransGrid considered we erroneously relied on trends in connection point utilisation, to conclude that demand driven augmentation should remain at historical levels.[20] While TransGrid did not refer to specific aspects of our decision, we consider that this view is relevant to our assessment of localised demand driven capex.

We do not accept that we relied on this analysis in a determinative way when considering TransGrid's augex requirements for the 2018-23 regulatory control period. The NER requires that we consider the actual and expected capital expenditure during any preceding regulatory control period.[21] As we described in our draft decision, our use of trend analysis is to gauge how TransGrid's historical actual augex compares to

---

18 TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 44.

19 TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 44.

20 TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 46.

21 As noted in our draft decision TransGrid's revenue proposal as its starting point to which we apply our various assessment techniques. Our techniques for assessing augmentation capex include detailed review of projects as well as consideration of trends in demand driving augmentation needs. In arriving at our substitute estimate, we weight the various techniques used in our assessment. We give more weight to techniques we consider are more robust in the particular circumstances of the assessment.

its expected augex for the 2018-23 regulatory control period.[22] We recognise the limitations of expenditure trends, especially in circumstances where augmentation needs may change over time (for example specific areas of the network might be growing or legislative obligations may change over time). Our draft decision noted that:[23]

> An increasing or decreasing trend in total augex does not, in and of itself, indicate that a service provider has proposed augex that is likely to reflect or not reflect the capex criteria.

In recognising these limitations, we have used this analysis to draw general observations in relation to augex, but we have not used it to reject TransGrid's forecast of augex.

We must consider whether we are satisfied that the forecast capex reasonably reflects the capex criteria. The reasons for our decision are discussed below.

## Economic benefit driven capex

TransGrid has included in its capex forecast a program to realise economic benefits by augmenting the network to address low-probability, high consequence events. TransGrid submitted that this augmentation provides benefits by:[24]

- improving power quality
- reducing load restoration times and increasing operational efficiency, network resilience; and
- increasing responsiveness to grid emergencies.

TransGrid's revised proposal includes forecast capex of $80.1 million for projects driven by economic benefits.[25] We are not satisfied that TransGrid's revised proposal reasonably reflects the capex criteria and therefore we do not accept the proposed amount. We have instead included an alternative amount of $39.2 million for this program in our alternative capex estimate.

Table 6-6 summarises TransGrid's proposal and our alternative amount for augex.

---

22 AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-38.

23 AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-40.

24 TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017*,* p. 83.

25 AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, pp. 6-47; and
TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017*,* p. 40.

## Table 6-8 Economic benefits driven augex (inc. overheads) ($2017/18 million)

| | 2018–19 | 2019-20 | 2020–21 | 2021–22 | 2022–23 | Total |
|---|---|---|---|---|---|---|
| TransGrid initial proposal | 3.0 | 15.2 | 26.7 | 7.2 | 9.9 | 61.9 |
| AER draft decision | 1.2 | 6.2 | 9.4 | 5.7 | 7.8 | 30.4 |
| TransGrid revised proposal | 8.2 | 22.1 | 29.4 | 9.6 | 10.8 | 80.1 |
| **AER final decision** | **3.0** | **10.5** | **16.4** | **5.1** | **4.2** | **39.2** |

Source: AER analysis

Note: Numbers may not add up due to rounding

Our assessment of each of these economic benefit driven programs is discussed below.

TransGrid's revised proposal included augex for the 2018-23 regulatory control period for programs and projects to manage 'low-probability, high consequence events'. These programs are expected to provide net economic benefits. These projects include:

- Smart grid control projects (proposed capex of $20.6 million)
- Yass terminal station project (proposed capex of $5.1 million)
- Tomago 330kV bus capacity augmentation (proposed capex of $5.1 million)[26]
- QNI flows (proposed capex of $2.1 million)
- VHF telecommunications improvements (proposed capex of $2.6 million).

TransGrid has also proposed capex for projects to realise economic benefits in relation to:

- The provision of dynamic voltage support ($24.4 million) [27]; and
- Ten projects initially proposed as part of the Network Capability Incentive component of the STPIS which it included in its revised capex forecast ($20.9 million). [28]

[26] TransGrid's revised proposal removed its initially proposed 'Travelling Wave Fault Location' project (estimated capex $2.5 million) on 132kV lines to improve reliability.

[27] TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 83. TransGrid included an estimate of $19.4 million for Dynamic Voltage Support in response to information request #053.

[28] AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 11 - Service target performance incentive scheme*, September 2017.

We engaged Energy Market Consulting associates (EMCa) to consider the issues raised by TransGrid and to advise whether any further information is likely to affect it initial findings. We detail our assessment below.

*Smart grid control projects*

TransGrid's revised proposal included seven projects to manage non-credible, concurrent transmission line contingencies at the time of maximum system demand at seven locations in the network that may give rise to cascading network failures, leading to significant loss of load. [29] TransGrid submitted that these minor network augmentation investments reduce the restoration times of an unplanned outage to improve operation of the network.[30]

We are satisfied that TransGrid is required to manage risks associated with these events to meet its obligations under the NER. [31] However, we are not satisfied that TransGrid has addressed our concern identified in our draft decision that TransGrid's project risk analysis is likely to be overstated. [32] For each of the projects, estimated risk costs assume that the non-credible events causing cascading network failure will coincide with peak demand in the areas of the network. TransGrid submitted that it moderated the reliability risk by discounting the load at risk assumption by 0.5. [33] As noted above, TransGrid's submitted we based our draft decision on a flawed review of its risk analysis method. [34]

EMCa assessed these projects as part of its review of TransGrid's revised proposal and considered the use of a 0.5 moderation factor was reasonable to account for progressive load restoration in instances where peak demand is present when the network constraint is realised.[35] However, with respect to the smart grid controls, EMCa found that:

- The risk analysis does not recognise the likelihood that demand may not be at the system peak level if the non-credible contingent events occur, leading to an overstatement of the energy at risk.
- The probability of such an event (or the 'likelihood of consequence') may be significantly lower than 1 in 100 years as assumed by TransGrid.[36]

---

29 TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017*,* p. 83.

30 TransGrid, *Revised revenue proposal 2018-19 - 2022/23: Appendix G*, December 2017, p. 24.

31 AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-47.

32 AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-48.

33 TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017*,* p. 83.

34 TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017*,* p. 83.

35 TransGrid's NOS statements quantifies the risk cost by applying a factor of 0.5 to account for expected decreasing demand over time.

EMCa concluded that the 'likelihood of consequence' (LoC) is likely to be significantly lower than 1 in 100 years as the following sequence of events is required to occur concurrently to result in a system voltage collapse:[37]

> Extreme weather event day + large bushfire + in a specific (and relatively confined) location of the network + occurring at a time of high transfer, leading to loss of a minimum of three specific transmission lines + operator unable to prevent system collapse.

TransGrid's response on load restoration time did not address the issue identified by EMCa. Given that EMCa has identified six events that must coincide, this suggests that TransGrid has not sufficiently moderated the estimated risk cost for this project. We have reduced the proposed capex for this program by 20 per cent. We consider that a reduction of this size is appropriate on the basis, as set out above, that there is evidence of a material overestimation of risk.

We are satisfied that our alternative amount of $16 million reasonably reflects prudent and efficient costs.

*Tomago connection point and Yass terminal station augmentations*

TransGrid's revised proposal includes capex of:

- $5.1 million for augmentation to the transformers at the Tomago Aluminium Company's (TAC) connection point to avoid coincident events causing significant load loss event.[38]
- $5.1 million for augmentation to the Yass terminal station to install special protection systems to avoid coincident events resulting in network outages.[39]

In our draft decision for both these projects, based partly on advice from EMCa, and for the reasons set out in our draft decision, we considered that the project risk costs were likely to be overestimated. [40] TransGrid submitted that EMCa inappropriately interpreted how TransGrid had moderated its assumptions in determining its probabilities as part of its risk analysis. Similar to the smart grid control projects discussed above, TransGrid stated that it applied a moderation factor of 0.5 to address EMCa's concerns. EMCa advised that this moderation factor does not relate to concerns regarding the coincident probability calculation, but rather relates to the calculation of the load at risk should the event occur. EMCa concluded that for the Yass terminal station augmentation, TransGrid has grossly overstated the likelihood of

---

37 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 51.

38 TransGrid's proposal is based on the significant load loss event would be realised by the interruption of TAC's operations when two of the four transformers on the connection point are out of service. That is, TAC requires three transformers to be in service at all times to continue its operation. TransGrid is proposing augmentation to avoid potential interruption events by upgrading the connection.

39 TransGrid, *Options Evaluation Report (OER) - Project #1472,* January 2017.

40 AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-48.

consequence associated with a circuit breaker outage and that, after correcting for this error the project is no longer justified.

In relation to the Tomago project, EMCa considered that:

- The unserved energy value from the loss of a Tomago potline (Tomago is a directly connected aluminium smelter) is overstated such that the project is not economically viable.
- TransGrid has presented insufficient evidence that the temporary loss of a potline will lead to a cascading network failure.

EMCa concluded that after taking into account these issues the Tomago project is no longer justified.[41]

On the basis of this further assessment we are not satisfied that:

- TransGrid has demonstrated that the use of the moderation factor addresses our concerns regarding the overestimation of project risk costs; and
- TransGrid has demonstrated the need for these projects.

Therefore, we are not satisfied that the proposed capex reasonably reflects the costs that a prudent operator would require to achieve the capex objectives and we have not included capex for these projects in our alternative estimate.

*QNI flows and improving VHF communications*[42]

TransGrid's revised proposal also includes capex of:[43]

- $1.2 million to address network constraints on the QNI that are the result of meeting the NER specified negative sequence voltage magnitude limits.
- $2.6 million for improving VHF communications facilities to replace batteries and battery charges at base stations and repeater sites.

In our draft decision, we reduced TransGrid's forecast capex for these proposed projects by 20 per cent consistent with our reduction to forecast capex driven by economic benefits. In relation to the 'QNI flow' project, EMCa stated that TransGrid has not addressed its initial query as to why TransGrid had not undertaken the work in the 2015-18 regulatory control period.[44] TransGrid also suggest that this program will also require coordination with AEMO.[45] However, there is no evidence that TransGrid has consulted with AEMO. In relation to the project to improve VHF communications,

---

41 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 5.2

42 TransGrid also proposed $0.4 million for other projects driven by economic benefits and we have reduced these proposed costs by 20 per cent for the same reasons as the smart grid projects given the assumptions have not been supported.

43 TransGrid revised proposal, Capital Accumulation Model, December 2017.

44 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 54.

45 TransGrid, options evaluation report, Armidale and Dumaresq QNI transpositions, January 2017.

TransGrid has proposed the project on the basis of a program to replace batteries at base stations and repeater sites as the manufacturer will cease supporting the hardware in 2018.[46] While the project appears to be driven by replacement needs, TransGrid has not:

- provided information to indicate whether there are reliability issues with the existing batteries/chargers that would justify replacement at all these sites immediately after the manufacturer ceases support; and
- limited information has been provided to support the risk cost assumptions (e.g. TransGrid has assumed will be a black start requirements once every 100 years and time to restore load is assumed to be 12 hours due to unavailability of telecommunications assets).[47]

Similar to our assessment of smart grid projects, we have reduced the proposed capex for these two programs by 20 per cent. We consider that a reduction of this size is appropriate on the basis, as set out above, TransGrid's proposed scope for the proposed capex is not well supported, and therefore a reduced amount for these projects reasonably reflects prudent and efficient costs.

*Dynamic voltage support*

In our draft decision we were not satisfied that TransGrid demonstrated that its 'dynamic voltage support' project would be required to achieve the capex objectives in the event the forecast demand materialises. We concluded that the need for the project and the associated costs were not sufficiently certain to be included in an alternative capex estimate.[48] Further, our draft decision suggested that with the uncertainty regarding the driver and costs for this project, TransGrid should consider reproposing this project as a contingent project as part of its revised proposal.[49]

TransGrid's revised proposal submitted that dynamic voltage support projects are too small to be eligible as contingent projects. TransGrid also submitted that new generation is now committed in the relevant areas and further new generation connections are now more likely.[50]

The CCP in its submission questioned why this project was not included as part of scope of TransGrid's contingent project proposal.[51] TransGrid's revised proposal submitted that the requirement for additional dynamic voltage support is not necessarily linked to where specific generators connect and there connection can

---

46 TransGrid, Revenue proposal, options evaluation report, January 2017.

47 TransGrid, Revenue proposal, options evaluation report, January 2017.

48 AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-49.

49 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 53.

50 TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017*,* p. 82.

51 Consumer Challenge Panel, *Submission to the Australian Energy Regulator Consumer Challenge Panel Sub-Panel 9 Response to Draft Decision and Revised Proposal for Revenue Reset for TransGrid for 2018-2023* January 2018 p. 48.

impact the wider network area.[52] TransGrid also submitted the clustering of generators it expects to connect is driving the need for dynamic voltage support rather than any particular connection. [53]

EMCa recognised there is uncertainty regarding the extent of renewable generation connections which will occur. EMCa noted that the assumed level of generation connection is a key input to determining the risk cost underlying the project and is a key determinant of the net benefit of the project. [54] We acknowledge that there is uncertainty regarding the scale of expected renewable generator connections. We also are satisfied that this project does not meet the criteria for a contingent project on the basis that:

- The revised proposed costs do not meet the contingent project threshold in the NER, which states that project must exceed either $30 million or 5 per cent of the value of the maximum allowed revenue.[55]
- This project appears to comprise a number of projects which are not location specific.

We have reviewed developments in the renewable generation sector since our draft decision. We are satisfied it is probable there will be significant developments in renewable generation over the 2018-23 regulatory control period such that TransGrid is likely to require dynamic voltage support. In particular, TransGrid provided further information in regard to committed and prospective renewable generation connections across the South West, Central West and North regions of its network. [56] In addition, AEMO's preliminary analysis of renewable resources as part of its Integrated System Plan Consultation identified parts of NSW as potential location for renewable energy zones.[57] EMCa also considered that this project is likely to represent the best technical solution if there are unacceptable system strength issues in its network.[58]

On the basis of the updated information on the specific and potential likely renewable generator connections, we are satisfied that the provision of dynamic voltage support is likely to be required for the 2018-23 regulatory control period. Therefore we are satisfied that the proposed capex reflects a realistic expectation of the demand forecast and cost inputs required to achieve the capex objectives. We have included in our alternative estimate, TransGrid's proposed revised amount of $19.4 million for dynamic voltage support.[59]

*Proposed ex-NCIPAP projects*

---

52 TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p. 82.

54 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 55.

55 NER 6A.8.1(b).

56 TransGrid, *Response to AER information request # 053*, 22 February 2018 p. 1.

57 AEMO, *Integrated System Plan Consultation*, December 2017 p. 5.

58 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 54.

59 This amount is consistent with TransGrid's planned voltage support investment as detailed in its response to information request #053.

TransGrid proposed capex of $20.9 million for a number of additional projects in its revised proposal that were initially proposed as part of the Network Capacity Incentive Parameter Action Plan (NCIPAP) in the Service Target Performance Incentive Scheme (STPIS) such that the costs of these projects would be recovered through the NCIPAP component of the STPIS.

We did not accept these projects in our draft decision on the basis that these projects did not meet the criteria for a NCIPAP project.[60] In its revised proposal, TransGrid reproposed these capex projects in its ex-ante capex forecast on the basis that these projects will deliver economic benefits.[61]

We are not satisfied that these projects reasonably reflect the prudent and efficient costs of maintaining service quality, reliability and security or supply or maintaining the reliability, security or safety of the transmission system. We have therefore not included the proposed capex for these projects in our alternative amount of total capex.

The reasons for our decision are detailed below.

We sought comment from TransGrid on our position that:

- the majority of these projects are likely to improve network reliability rather than maintain network reliability and;
- these projects are more appropriately funded through the STPIS.

TransGrid submitted that:[62]

- The quantification of the benefits of these projects has been undertaken using the same approach as for other projects in the ex-ante capex forecast and has not been undertaken to improve performance under the STPIS.
- An AEMC consultation paper regarding a review of the capex factors in the NER, that the capex objectives should not be limited to meeting jurisdictional standards in the short term but should require the AER to take a broader and long term view.[63]
- In the absence of such aspirations, it would likely not allow for expenditure that better reflects efficient costs that consumers are willing to pay for in the long term.
- The proposed projects have a clear net benefit using an approach consistent with the RIT-T and thereby reflect efficient costs that consumers are willing to pay for in the long term and these benefits have been endorsed by AEMO.

---

60 AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 11 - Service Target Performance Incentive Scheme.*

61 TransGrid, *Revised revenue proposal 2018/19 -2022/23,* December 2017*,* pp. 84-85.

62 TransGrid, *Response to Information request #057 - Augmentation - ex NCIPAP projects*, 22 February 2018.

63 AEMC, *Consultation Paper: National Electricity Amendment (Network Service Provider Expenditure Objectives) Rule* 2013, 7 February 2013, pp.16-17.

- The projects efficiently manage the demand for services by reducing the impact of events which result in some or all of those services being available and this is consistent with the NEO.
- Finally, TransGrid considered that the AER's view that these projects could be funded under the service component of the STPIS is unclear and submitted that:[64]
    - It is unlikely that there would be sufficient incremental revenue to TransGrid through the service component of the STPIS to fund these projects
    - It does not necessarily follow that TransGrid would receive greater revenue from the STPIS if the projects proceed (i.e. the benefits to consumers do not necessarily correlate with movements in performance against specific STPIS parameter definitions).
    - Not all causes of the events that these projects seek to fund would be captured under a STPIS (e.g. overvoltage control and automatic under frequency load shedding event may be caused by events affecting generation or other regions of the NEM).

Our assessment of these projects is outlined below.

- The supporting information provided by TransGrid suggests that the benefits to customers of these proposed projects involve improving network reliability through reduced outages or outage duration times with the exception of two projects, which we have considered separately. [65] As the majority of TransGrid's proposed projects are expected to improve network reliability, rather than maintaining network reliability, the inclusion of these projects in the ex-ante capex forecast may provide a total capex forecast that is more than required to achieve the capex objectives. This is relevant as the capex objectives requires us to be satisfied that the total capex is necessary for a TNSP to achieve the capex objectives, which (subject to jurisdictional obligations, amongst other things), requires that network reliability be maintained.
- TransGrid's view that the AER should take a broader view that better reflects efficient costs that consumers are willing to pay for in the long term is addressed by and under the NER through:
    - the establishment of the STPIS, and
    - our application of the STPIS to TransGrid for the 2018-23 regulatory control period.
- The STPIS, rather than the capex forecast, provides an incentive for a TNSP to improve reliability, where this is valued by customers, by providing funding arrangements for the relevant TNSP for projects that will improve network reliability. As such any inclusion of capex for projects that improve network

---

64 TransGrid, *Response to Information request #057 - Augmentation - ex NCIPAP projects*, 22 February 2018.

65 TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017*,* p. 82.

reliability in the ex-ante capex may also provide an opportunity for a TNSP to 'double dip' on the recovery of these projects. This opportunity for double recovery of these projects would arise once through the ex-ante capex forecast and then through the STPIS reward payment adjustment to the revenue cap. We do not consider that this outcome would be consistent with the NEO.

- There is no evidence to suggest that TransGrid has sought customer views on the proposed capex for these projects or is seeking to address an issue identified by customers, which is a relevant capex factor in assessing whether the forecast capex is reasonably likely to reflect the capex criteria. In the absence of customer feedback, we are not satisfied that TransGrid has evidence to suggest that customers are willing to pay for these improvements.
- TransGrid commented that it was not clear that these projects would be funded through the STPIS. [66] However, TransGrid did not provide any further information in support of this view. [67] It is important to recognise that the intent of the STPIS is to provide an incentive through a financial reward where this is valued by customers. Where the financial reward provided to a TNSP through the STPIS for improving reliability does not cover the costs of the project, the project is unlikely to provide a net benefit to customers. In other words the STPIS in intended to encourage investment where the marginal benefit outweighs the marginal cost of the investment, otherwise the investment will not be consistent with the NEO.
- TransGrid has submitted general statements that:
    - the benefits to consumers do not necessarily correlate with movements in performance against specific STPIS parameter definitions; and
    - not all causes of the events that these projects seek to mitigate would be captured under the STPIS.

TransGrid (with one exception) has not identified where it considers that this is likely to be the case nor for which projects it considers that this may apply.

As indicated above, and on the basis of the information provided to us by TransGrid which describes the benefits of these projects, these benefits refer to reduced outages and reduced supply restoration times. The frequency of supply outages and the duration of outages are captured by the service component of the STPIS. With the exception of one project ('overvoltage control' project discussed further below), TransGrid has not clarified or provided information to support its view that the service component of the STPIS may not be fully capture the type of benefits outlined in its supporting information. Further, we have made reasonable inquiries and provided TransGrid with an opportunity to clarify this aspect of its proposal. On the basis of its generalised response we are not satisfied that TransGrid has demonstrated that the STPIS is not the appropriate regulatory mechanism for funding these projects.

---

[66] TransGrid, *Response to AER information request # 057*, 1 March 2018.

[67] TransGrid, *Response to AER information request # 057*, 1 March 2018.

- We have considered two projects which appear to be driven by power quality (rather than network reliability issues covered by the STPIS) and market efficiency benefits through improved inter-regional transfer limits, respectively. These projects include:
    - *Remote relay interrogation* (proposed capex $2 million) this project involves installing fault data interrogation system software to provide remote access to fault data at 73 sites; and
    - *Overvoltage control after automatic under-frequency load shedding (proposed capex $4.1 million)* this project is driven by the benefits of reduced unserved energy following a sudden deficiency in generation.

AEMO considered the remote relay interrogation project as part of its review of proposed NCIPAP projects and considered this project would provide operational efficiencies.[68] This suggests that this project is likely to provide cost savings to TransGrid which will reduce TransGrid's costs. On this basis, we are not satisfied that funding from customers is required in order for TransGrid to implement this project.

For the 'overvoltage control' project, TransGrid submitted that the project need is driven by the benefits of avoiding additional loss of load following a widespread 'under frequency event' which in turn results from a sudden large deficiency of generation (either in NSW or in other regions of the NEM).[69] TransGrid referred to various studies but has provided no evidence to suggest that there would be voltage issues associated with non-credible contingencies, where 60 per cent of NSW load is shed following a widespread overvoltage frequency event. In addition, TransGrid provided limited information to support the assumptions used in its risk cost analysis.[70] In particular:

- there is a lack of evidence to support its assumed failure rate, and TransGrid did not quantify or comment on the likelihood of a consequence from a failure
- TransGrid's analysis assumes a 20 per cent system wide load loss due to consequential overvoltage condition, but TransGrid presented no evidence or analysis to support this assumption; and
- the basis for the assumed failure duration and load form factor has not been supported in TransGrid's risk analysis.

Accordingly, even if TransGrid is correct that this project would not be funded by the STPIS, we are not satisfied, in any event, that this project would satisfy the capex criteria.

## Reliability and security driven

[68] AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 11 - Service target performance incentive scheme*, September 2017.

[69] TransGrid, *Options Evaluation Report (OER) - Project #1520,* January 2017.

[70] TransGrid, *Options Evaluation Report (OER) - Project #1520,* January 2017.

TransGrid's revised proposal included capex for projects that are required to meet their reliability transmission planning standards. In particular, TransGrid's revised proposal includes an amount of $48.6 million in its capex estimate to comply with reliability obligations in relation to:

- The provision of a second supply to the ACT, where TransGrid has proposed $38.1 million associated with the Stockdill switching station.
- Upgraded supply at the Mudgee and Molong supply points required to meet revised transmission planning standards, where TransGrid has proposed $7.1 million and $3.4 million, respectively.

We are satisfied that these projects and the associated capex are required to meet the revised transmission planning standards given the requirement for TransGrid to plan the network to meet its obligations at relevant parts of the network.

Table 6-9 summarises TransGrid's proposed reliability and security driven augex and our final decision.

### Table 6-9 Reliability and security driven augex (inc. overheads) ($2017/18, million)

| | 2018–19 | 2019-20 | 2020–21 | 2021–22 | 2022–23 | Total |
|---|---|---|---|---|---|---|
| TransGrid initial proposal | 15.5 | 25.6 | 0.0 | 0.0 | 0.0 | 41.2 |
| AER draft decision | 15.5 | 25.5 | 0.0 | 0.0 | 0.0 | 41.0 |
| TransGrid revised proposal | 21.9 | 26.6 | 0.0 | 0.0 | 0.0 | 48.6 |
| **AER final decision** | **21.9** | **26.6** | **0.0** | **0.0** | **0.0** | **48.6** |

Source: AER analysis

Note: Numbers may not add up due to rounding

In our draft decision we accepted the proposed capex in the initial revenue proposal associated with these projects. In its revised proposal TransGrid proposed a further $7.4 million above its initial proposal and our draft decision. TransGrid's revised proposal submitted that the increase is because of a delay to the Mudgee reliability reinforcement project.[71] The CCP recommended we review augmentation capital expenditure in light of the absence of discussion with consumers, of whether the reliability improvements are ones that consumers are willing to pay for, or whether they are required to meet compliance obligations.[72] In November 2016 IPART made recommendations to the Minister for Industry, Resources and Energy on setting out a new planning standard for the electricity transmission network. The Minister adopted

[71] TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 87.

[72] Consumer Challenge Panel, *Submission to the Australian Energy Regulator Consumer Challenge Panel Sub-Panel 9 Response to Draft Decision and Revised Proposal for Revenue Reset for TransGrid for 2018-2023* January 2018 p. 5.

these recommended reliability standards on 1 June 2017 and these will apply to TransGrid from 1 July 2018. This included revised standards at Mudgee and Molong. For the reasons discussed below, we are satisfied that TransGrid's network requires augmentation to meet these compliance obligations.

TransGrid provided further supporting information detailing why a delay to the Mudgee project has increased reliability-driven capex. TransGrid submitted that the cost estimate for this project has not increased rather a project delay moved $7.4 million of expenditure that was expected to be incurred in the 2015-18 regulatory control period to the 2018-23 regulatory control period. TransGrid submitted that the project delay was necessary to allow for detailed designs and operational aspects to be finalised.

Given this delay, we requested TransGrid indicate how it had considered alternative options to meet this transmission reliability standard. In particular, whether the option of meeting the transmission reliability standard through a lower cost 'automated changeover scheme' provided by Essential Energy was feasible.[73] We considered this particularly relevant, where as noted in our draft decision, under the reliability standard, TransGrid can develop alternative solutions, where these solutions provide a greater net-benefit than complying with the reliability requirement.[74]

We note that Clause 6 of the Electricity Transmission Reliability Standard allows an exemption where, amongst other things, TransGrid has:

- developed a plan for altering the reliability of the supply capacity at the bulk supply point; and
- the plan provides a greater net benefit than the net benefit of complying with Clause 4 of the Electricity Transmission Reliability Standard.

TransGrid advised that it does not have a reasonable ground to apply for an exemption from the expected unserved energy (EUE) allowance in Clause 8 of the Electricity Transmission Reliability Standard at Mudgee, as the IPART optimisation model determined the most effective economic allowance. However, we do not consider TransGrid's reasoning is a sound basis for not seeking an exemption which is based on a net benefits test.

TransGrid also submitted that for the Essential Energy solution to meet the reliability standard, the automated change over scheme needs to be remotely operable. TransGrid further submitted that this makes maintaining auxiliary electrical supply following a fault with suitably robust communication systems challenging. These technical challenges have delayed the development of a business case which TransGrid submitted is required by IPART (where IPART is responsible for assessing compliance with the planning standard).

---

[73] TransGrid, *Response to AER information request # 053*, 22 February 2018, p. 9.

[74] NSW Electricity Transmission Reliability and Performance Standard 2017, cl.6 (a).

We acknowledge that there appear to be technical challenges in developing remote switching solutions to meet the transmission reliability standard. Though, the evidence suggests that the Essential Energy 'automated change over scheme' solution may potentially be deliverable at lower cost than the solution included in TransGrid's revised proposal. However, on balance given that there is some uncertainty regarding the technical feasibility of this option, we are satisfied that TransGrid's proposal is likely to reasonably reflect prudent and efficient costs to comply with the new reliability standard. In the event that TransGrid and Essential Energy implement an 'automated change over scheme', this will result in lower costs for customers.

## Connection driven

TransGrid has included $37.3 million in its revised proposal for possible new loads connecting directly to the transmission network within the 2018-23 regulatory control period. TransGrid's forecast relied on including probability-adjusted capex associated with the four potential new demands from direct connection customers. These included:

- Hawsons iron ore project driven by the need to strengthen the far west NSW network (proposed capex of $19.9 million)
- Beryl area constraint driven by the connection of Bowden's silver mine and Cockatoo Mine (proposed capex of $10.6 million)
- Thermal limitation on 969 line driven by the connection of Shenhua Liverpool Plains mine (proposed capex of $3.3 million); and
- Essential Energy Connection of Narrabri gas project (proposed capex of $2.7 million).

We have assessed TransGrid's revised proposal and we are not satisfied that the probabilities of these loads connecting in the 2018-23 regulatory control period are likely to reflect a realistic estimate of the demand forecast and cost inputs required to achieve the capex objectives. We have instead included an amount of $11.1 million in our alternative estimate of total capex that is consistent with actual connection costs. We have relied on recent past connection costs to determine our alternative estimate as TransGrid has not provided information to support its estimated probabilities of these loads connecting. In the absence of such information, we consider that recent past connection costs provide a reasonable indication of the amount of expenditure that will be required in the next 2018-23 regulatory control period. We are satisfied that our alternative estimate reasonably reflects a realistic expectation of cost inputs required to achieve the capex objectives.

Table 6-10 below summarises TransGrid's proposal and our alternative amount for connection driven augex.

## Table 6-10 Connections driven augex (inc. overheads) ($2017/18 million)

| | 2018–19 | 2019-20 | 2020–21 | 2021–22 | 2022–23 | Total |
|---|---|---|---|---|---|---|
| TransGrid initial proposal | 5.4 | 16.5 | 10.9 | 0.9 | 2.3 | 36.0 |
| AER draft decision | 1.1 | 3.4 | 2.3 | 0.2 | 0.5 | 7.5 |
| TransGrid revised proposal | 3.8 | 18.8 | 10.9 | 1.0 | 2.9 | 37.3 |
| **AER final decision** | **1.1** | **5.6** | **3.2** | **0.3** | **0.9** | **11.1** |

Source: AER analysis

Note: Numbers may not add up due to rounding

In our draft decision we were not satisfied that TransGrid's forecast connection driven capex was required to meet or manage the expected connections over the 2018-23 regulatory control period. In making this decision we had regard to whether the probabilistic adjusted forecast of the proposed projects reasonably reflects the degree of certainty of the connection occurring in the 2018-23 regulatory control period. We also considered the need for the projects and TransGrid's preferred option, including its options analysis.

TransGrid's revised proposal acknowledges that there is uncertainty in determining network connections. TransGrid submitted that some of these projects have become more likely based on new information since submitting its proposal. [75] TransGrid also submitted that our use of historical connection costs is not an appropriate substitute to its forward-looking forecast, driven by known, possible new large mining and resources loads.[76] The CCP recommended we review TransGrid's approach to connection driven capital expenditure, in particular, the statement that the approach balances the costs to consumers but includes some risk for TransGrid.[77] The CCP raised concerns about the allocation of costs for the identified loads and questioned why these were not being recovered directly from the connecting customers rather than being spread across other customers.[78] JWH Consulting (on behalf of the ECA) considered that TransGrid has not adequately responded to the issues that we raised in relation to the probability of connections and the analysis of options.[79]

TransGrid's revised proposal also has raised concerns with our options evaluation for the proposed connection projects. [80] We have tested the sensitivity of the input

---

75 TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 87.

76 TransGrid relied on advice from Ernst & Young (EY) to identify potential new loads connecting to its network

77 Consumer Challenge Panel, *Submission to the Australian Energy Regulator Consumer Challenge Panel Sub-Panel 9 Response to Draft Decision and Revised Proposal for Revenue Reset for TransGrid for 2018-2023* January 2018 p. 5.

78 Consumer Challenge Panel, *Submission to the Australian Energy Regulator Consumer Challenge Panel Sub-Panel 9 Response to Draft Decision and Revised Proposal for Revenue Reset for TransGrid for 2018-2023* January 2018 p. 49.

79 *JWH Consulting, Report to Energy Consumers Australia, January 2018.*

80 TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 87.

assumptions with which we had concerns and we are satisfied that the need and options analysis is reasonable. However, the relevant issue is whether or not the connection is likely to proceed during the 2018-23 regulatory control period. We have assessed the available information and we are not satisfied that there has been a material change in the circumstances that indicates that these connections are any more likely than when we made our draft decision. TransGrid's revised proposal did not provide further substantiation to assess the reasonableness of its probability adjusted forecasts for each potential customer connection identified in its forecast.

We discuss our assessment of each connection project below.

***Beryl area augmentation - Silver and coal mining connections***

TransGrid proposed augmentation in the Beryl area of $10.6 million to facilitate the connection of Bowden's silver mine.[81] At the time of draft decision, Silver Mines Limited (the proponent of the connections) was projecting completion of its Environmental Impact Statement by the end of 2017 instead of the end of 2016, when Ernst and Young identified this load as a potential connection.[82] Further, we noted that Silver Mines Limited is now planning a smaller, lower impact development than that included in the primary feasibility study.[83] In particular, Silver Mines Limited is projecting a mine with production of 2 million tonnes per annum of ore, rather than 4 million tonnes per annum. We examined major mining projects that the NSW Department of Planning and Environment is actively assessing in this region.[84] We identified all the projects within the western coalfields of NSW that are in close proximity to the town of Ilford. This would reasonably include the potential additional load from the Cockatoo mine. We noted that these projects are still in the preliminary stages of achieving development approval.

TransGrid's revised proposal submitted there is an increase in the likelihood of TransGrid experiencing a network constraint from the connection of these mining loads than at the time of submitting its initial proposal. Specifically, TransGrid submitted that one of the mining loads has progressed to the connection enquiry stage and if both loads connected there would be a constraint that would require network augmentation.

We had regard to the connection enquiry and verified the status of the underlying project by assessing available information regarding the project. Based on the proponents most recent quarterly activities report to the ASX, the Bowden's Silver Feasibility Study and Environmental Impact Statement is still to be finalised.[85] This report also mentions that the proponent is still conducting exploratory works on the site

---

81 TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p. 87.

82 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 144.

83 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 144.

84 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 144.

85 Silver Mines Limited, *ASX: SVL Corporate Presentation*, March 2018.

and is currently considering additional geochemical and geophysical studies to assist in the understanding and continued exploration across the area. [86]

As neither the environmental impact or feasibility study are finalised, we are not satisfied that the scope and timing of the connection is reasonably reflected by the probability estimate which TransGrid has relied on in determining its forecast. We therefore are not satisfied that TransGrid's assumed 51 per cent probability of the project proceeding to connection within the 2018-23 regulatory period is a realistic expectation of demand and cost inputs to achieve the capex objectives. Therefore we have not included the $10.6 million forecast capex in our alternative estimate.

***Essential Energy connection augmentation - Narrabri gas project***

TransGrid has proposed network augmentation for voltage support of $2.7 million to facilitate the connection of the Narrabri gas project. [87] TransGrid's revised proposal submitted there is an increase in the likelihood of TransGrid experiencing a network constraint from the connection of these mining loads than at the time of its initial proposal. The basis of this being that the project's Environment Impact Statement (EIS) was exhibited and submissions are under review. [88]

We have reviewed the available information regarding the likelihood of the Narrabri gas project proceeding. Since our draft decision the Narrabri gas project is still progressing through the environmental approval process. [89] This project also appears to be dependent on a proposed connection to the NSW gas transmission network through the development of a new 450km 'Western Slopes Pipeline' by APA Group. APA issued an activity update in February 2018 which advises that APA is still progressing through community consultation with affected landowners along the route of the pipeline. Further, it advises that APA is still conducting field surveys to inform its environment impact statement, which it expects to lodge with the Department of Planning and Environment. Given the typical time required to achieve development approval and as APA is still seeking community support for its project, this adds to the uncertainty regarding the Narrabri Gas project.

We maintain our view that the probability adjusted forecast has not been supported in the revised proposal. Further, we are not satisfied that circumstances have materially changed since the draft decision. TransGrid acknowledges in its revised proposal that estimating the probability of connection is complex. [90] However, we are not satisfied that TransGrid has adequately substantiated that its probabilistic forecast is a realistic expectation of the demand forecast and cost inputs required to achieve the capex objectives. Therefore, we have not included the $2.7 million forecast capex in our alternative estimate.

---

86 Silver Mines Limited, *ASX: SVL Corporate Presentation*, March 2018.

87 TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p. 89.

88 TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p. 89.

89 Santos, *Santos Activities Update* April 2018.

90 TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p .87.

***Far West NSW Network augmentation - Hawsons Iron Ore Project***

TransGrid has proposed network augmentation of $19.9 million to facilitate the connection of Hawsons Iron Ore project. [91]

TransGrid's revised proposal maintains its position that a network constraint in the Far West NSW network will exist if the Hawsons iron ore project connects near Broken Hill.[92] TransGrid submitted that is reasonable to expect that the events required to cause the constraint could coincide. [93] TransGrid cited analysis indicating that to remain within the NER requirements regarding 'Power Frequency Voltage levels' under light loads it will be required to augment its network to accommodate the connecting load. [94]

We are not satisfied that TransGrid has substantiated the 75 per cent probability this connection will occur in the 2018-23 regulatory control period. In assessing the project probability, we had regard to the connection enquiry and verified the status of the underlying project by assessing available information regarding the project. This included examining publicly available information published by the mine's proponent Carpentaria Resources. In an update to investors in March 2018, the proponent noted that the project is still in the approval stage. With the indicative project schedule is subject to funding. [95] This suggests that there is significant uncertainty in the progress of the project and on this basis we are not satisfied that circumstances have materially changed since the draft decision. We therefore are not satisfied that TransGrid's has substantiated its assumed 75 per cent probability of the project proceeding is a realistic expectation of demand and cost inputs to achieve the capex objectives. Therefore we have not included the $19.9 million forecast capex in our alternative estimate.

***Augmentation to connect the Shenhua Liverpool Plains mine***

TransGrid has proposed network augmentation of $3.3 million to facilitate the connection of the Shenhua Liverpool Plains mine. [96] TransGrid's revised proposal maintained that a network constraint will exist if the Shenhua mine connects. [97] TransGrid submitted that the Shenhua mine is understood to be progressing, noting that the mines proponent had discussions in September 2017 with Essential Energy in relation to its connection. [98]

In assessing the project probability, we had regard to the connection enquiry and verified the status of the underlying project by assessing available information regarding the project. To verify the likelihood of this connection proceeding we have

---

91 TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p. 90.
92 TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p. 90.
93 TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p. 90.
94 TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p. 90.
95 Carpentaria Resources, *Investor Presentation, March 2018.*
96 TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p. 89.
97 TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p. 89.
98 TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p. 89.

assessed available information regarding the project. However consistent with what was available at the draft decision, there is a lack of publicly available information regarding the future of the mine. On this basis we are not satisfied that circumstances have materially changed since the draft decision In addition, given the significant uncertainty regarding the probability of connection of coal seam gas projects, we are not satisfied that TransGrid has provided sufficient information to support its assumed 53.5 per cent likelihood of this connection proceeding. We therefore are not satisfied that TransGrid's has substantiated its assumed 53.5 per cent probability of the project proceeding is a realistic expectation of demand and cost inputs to achieve the capex objectives. Therefore we have not included the $3.3 million forecast capex in our alternative estimate.

## Localised demand driven

TransGrid is forecasting peak load growth in specific locations to an extent where capex will be required.[99] TransGrid has included in its augex forecast $20.7 million for projects driven by demand growth in specific areas.[100]

Table 6-11 summarises localised demand driven augex.

### Table 6-11 Localised demand driven augex (inc. overheads) ($2017/18 million)

| | 2018–19 | 2019-20 | 2020–21 | 2021–22 | 2022–23 | Total |
|---|---|---|---|---|---|---|
| TransGrid initial proposal | 2.6 | 2.4 | 2.9 | 6.3 | 6.7 | 21.0 |
| AER draft decision | 2.2 | 2.0 | 2.4 | 5.4 | 5.7 | 17.8 |
| TransGrid revised proposal | 1.2 | 2.2 | 2.9 | 7.7 | 6.8 | 20.7 |
| **AER final decision** | **1.2** | **2.2** | **2.9** | **7.7** | **6.8** | **20.7** |

Source: AER analysis

Note: Numbers may not add up due to rounding

Our draft decision largely accepted TransGrid's proposal for augmentation driven by localised demand. However, we did not accept part of TransGrid's proposal for augmentation for the installation of an additional switch-bay at the Macarthur area of Endeavour Energy's distribution network in Western Sydney.[101] TransGrid's revised proposal submitted further information to demonstrate its preferred network solution is the most efficient solution. Our draft decision noted that Endeavour Energy was yet to conclude its preferred solution to meet the localised demand and at least four other

[99] TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 91.

[100] TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 92.

[101] AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p.129.

network augmentation options had been identified. [102] This is relevant as TransGrid's proposal is dependent on Endeavour Energy's preferred solution.

Based on further information we are satisfied that the need for the switch-bay has been confirmed. We are satisfied that circumstances have changed since the draft decision such that the project will be required in the 2018-23 regulatory control period. In reaching this decision we had regard to Endeavour Energy's latest annual planning report which as identified firm dates for the requirements relating to the Macarthur area.

## Transfer of unregulated Network Support and Control Ancillary Services

TransGrid 's revised proposal maintains the inclusion of $25.7 million for assets that are currently providing unregulated Network Support and Control Ancillary Services (NSCAS). TransGrid proposes to transfer those assets to its RAB after the commencement of the 2018-23 regulatory control period.

As discussed in our draft decision, NSCAS are services used to maintain power system security, reliability of supply and maintain or increase the power transfer capability of the transmission network.[103] TransGrid has a service agreement with AEMO for the provision and recovery of the costs of these services. This agreement will expire in 2019 and TransGrid proposes to transfer these assets to the RAB to be recovered as prescribed transmission services following the expiry of the agreement on 30 June 2019.[104] Our draft decision provides the relevant background and details of the existing arrangements for these services.

TransGrid disagreed with our draft decision to transfer these assets into the RAB at zero value. TransGrid submitted that: [105]

- Adding the assets to the RAB at a depreciated value and earning a fair return is a reasonable proposition.
- It is unsustainable and unreasonable to require a business to provide a free service for 35 to 40 years. Like any business TransGrid is entitled to make a fair rate of return on investments. The AER's draft decision does not offer a fair return on assets which have saved customers possibly up to $100 million (assuming the previous contract had continued on).

---

[102] AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p.129.

[103] AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-50.

[104] TransGrid, *Response to information request #003 - compliance with RIN*, 8 February 2017.

[105] TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017*,* p. 142.

- The fact that some costs have been recovered prior to their use as a prescribed asset does not lessen the need for the business to make a return on the investment.
- The draft decision may be unprecedented in requiring a business to earn no revenue on assets put in place for the benefit of consumers over so many years. In fact, the AER''s 2006 Directlink decision provides evidence of a contradictory precedent.
- its Revenue Proposal Working Group, which comprises consumer representative groups and transmission customers provided feedback that the AER's draft decision on TransGrid's NSCAS proposal was not in the long term interest of consumers, and would lead to higher costs for consumers. [106]

TransGrid also submitted that it considers the rationale for the position detailed in our draft decision was unreasonable, and that consumer representatives and customers support its conclusion. [107]

We accept TransGrid's revised proposal to transfer these assets into the RAB on the basis that these assets are required to provide prescribed transmission services in the 2018-23 regulatory control period. [108] However, we do not accept the revised proposal to transfer these assets into the RAB at a depreciated value of $25.7 million. We have instead included these assets into the RAB at a zero value in our alternative estimate of overall total capex consistent with our draft decision.

Our draft decision is consistent with TransGrid and AEMO's view that that these assets are likely to be required over the 2018-23 regulatory control period to address an NSCAS 'gap'.[109] We accept that these assets will be required as prescribed transmission services following expiry of the agreement and this is supported by AEMO.[110] The key issue of difference between our draft decision and the initial and revised proposal is TransGrid's proposal to recover $25.7 million for these assets over their remaining asset life. We are satisfied that a zero capital value reflects the capex criteria. In coming to this view we have considered the further views of TransGrid and stakeholder submissions. Our reasoning is detailed below.

*Recovery of NSCAS assets*

In determining our alternative estimate of overall total capex that we satisfied reasonably reflects the capex objectives, we are required to arrive at an alternative estimate that reasonably reflects the efficient and prudent costs of achieving those objectives. [111] The capex objectives and capex criteria are forward looking – that is,

---

106 TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017*,* pp. 25, 107.

107 TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017*,* p. 25.

108 TransGrid, *Response to information request #003 - compliance with RIN*, 8 February 2017.

109 AEMO, Submission on TransGrid's revised revenue proposal, 18 January 2018.

110 AEMO, Submission on TransGrid's revised revenue proposal, 18 January 2018.

111 NER, cll 6A.6.7(d) and 6A.14.1(2)(ii).

they are directed at meeting the relevant requirements over the forthcoming regulatory control period (that is 2018-23). The required estimate is an estimate of the future expenditure that is needed to achieve those outcomes.

As we discussed in our draft decision, at the expiry of the agreement, the value of these assets will have been more than fully recovered over the period of the service agreement with AEMO. [112] We concluded in our draft decision that as the capital costs will have already been more than fully recovered through the service agreement, these assets have been fully paid for by market participants.[113] It follows that had the asset been included in the RAB when it was built and received revenue allowance equivalent to AEMO's payment, it would have been fully depreciated. The remaining physical life of the asset is not relevant. TransGrid did not address this matter in its revised proposal.

Given that TransGrid has not addressed our concern that these assets have been fully recovered, we consider that further expenditure in the 2018-23 regulatory control period is not required in order to meet the capex objectives. We are therefore not satisfied that the inclusion of the value of these assets in the RAB would be efficient and prudent or reasonable.

We also consider that the past recovery of the cost of these assets is a relevant consideration in reaching this conclusion given that these assets are expected to provide the same service following the expiry of the agreement. [114] The CCP commented that it appears that TransGrid tendered for the service at a price that either reflected an ability to profitably recover the investment over the contract period or priced on the basis that conversion to a regulated asset was a likely outcome.[115] The services agreement indicates that there appears to be an expectation that these assets would be transferred into the RAB at the expiry of the agreement. [116] However, the agreement does not refer to the expected valuation of assets on transfer. It is noteworthy that the contract was amended in 2014 to remove the reference to transmission use of system charges (regulated charges for the recovery of prescribed transmission services) in relation to any future charging arrangements for these assets. [117]

The AER acknowledges that the existing agreement, being the outcome of a tender process conducted by AEMO, may have resulted in savings for consumers when compared to the previous agreement under which the relevant services were provided. However, as the service is provided under the existing agreement as an unregulated

---

112 AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-53.

113 AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-53.

114 AEMO, *Submission on TransGrid's revised proposal,* 18 January 2018.

115 CCP Response to draft decision and revised proposal for revenue reset TransGrid 2018-23. p. 53

116 TransGrid, *Response to information request #003 - compliance with RIN*, 8 February 2017.

117 TransGrid, *Response to information request #003 - compliance with RIN*, 8 February 2017.

service, no conclusions can be drawn from this comparison, or from revenue received by TransGrid under the existing agreement as the outcome of that tender process, about the prudent or efficient costs of providing the service as a regulated service. We agree with the CCP's comments that: [118]

> CCP9 is of the view TG's methodology does not reflect efficient costs and that it has already made a risk weighted return on its investment.

And that:

> Inclusion in the RAB and the provision of NSCAS as a prescribed service allows TG to recover any operating costs associated with the service. TG's assertion that **"In effect, the AER is proposing that TG provides this service for free for the next 35 to 40 years"** (emphasis in original, page 106) is not accepted by CCP9 and we support the AER's Draft Decision.

As we have accepted these assets in the RAB, our decision recognises that TransGrid has the opportunity to recover any ongoing costs from operating these assets. Thus, a zero RAB valuation does not require TransGrid to provide these assets for free. This view was supported by the CCP.

Additionally, and contrary to TransGrid's submission that customers do not consider that it is unreasonable to expect the service to be provided for free, we note that the CCP also stated that it did not observe any consensus on this issue by Revenue Proposal Working Group members.[119] The CCP also stated that its observation was that the AER's reasoning was not adequately explained by TransGrid making it more difficult for stakeholders to make an informed view. [120]

TransGrid in its revised proposal also referred to the AER's 2006 Directlink decision which approved the conversion of a merchant interconnector (unregulated asset) to a regulated interconnector in support of TransGrid's revised proposal. This decision provided Directlink with a RAB valuation based on the expected future benefits to consumers. TransGrid submitted that the AER considered that as Directlink already exists and provides benefits to market participants over and above its operating costs, an asset value that is greater than zero would be appropriate. [121]

We do not agree with TransGrid that the 2006 Directlink decision provides a precedent for the inclusion of the NSCAS assets in the RAB at a value greater than zero. In particular, the Directlink conversion decision was made in the context of regulatory arrangements that sought to: [122]

- provide for the early encouragement of MNSPs investment, along with the option to potentially obtain regulated status by way of conversion (referred to as 'safe

---

[118] Consumer Challenge Panel, *Submission on TransGrid's revised proposal,* 1 February 2018, p. 52.

[119] Consumer Challenge Panel, *Submission on TransGrid's revised proposal,* 1 February 2018, p. 13.

[120] Consumer Challenge Panel, *Submission on TransGrid's revised proposal,* 1 February 2018, p. 32.

[121] TransGrid, *Revised revenue proposal 2018/19 - 2022/23,* December 2017, p. 107.

[122] Directlink, *Joint Venture Application for Conversion and Revenue Cap, Draft Decision,* 8 November 2005, p. 18.

harbour' provisions in the National Electricity Code to promote unregulated investment); and

- balance the intent of the safe harbour considerations against the fact that the merchant interconnector investment (unregulated asset) did not satisfy the equivalent of a RIT-T.

The question of whether the Directlink assets should be included in the RAB with a zero asset value arose because the regulatory test assessment (as applicable at the time of the conversion decision) indicated that no project was optimal and that Directlink would not be constructed.[123] The AER reasoned that a decision to provide DJV (the owners of Directlink) with a zero asset value may be inconsistent with the intention of the MNSP safe harbour provisions.[124] The AER stated that in the circumstances of the conversion application, its decision was guided as set out below:[125]

> The AER is seeking to provide certainty and thereby maintain an environment that is conducive to efficient investment, foster the efficient use of existing infrastructure and achieve reasonable consistency in the outcomes of regulatory processes. In these circumstances, an approach that provides Directlink with an appropriate asset value that is greater than zero means market participants benefit in the long term through the encouragement of ongoing investment in the NEM.

Accordingly, the AER decided that it would be appropriate to provide DJV with an asset value greater than zero. The AER adopted an asset value that it considered was consistent with the approach adopted under the regulatory regime applicable at the time, as it provided a fair and reasonable risk adjusted cash flow rate of return on efficient investment and balances the interests of TNSPs and users.[126]

We consider that the Directlink conversion decision is clearly distinguishable, in several key respects, from the circumstances of TransGrid's proposal to transfer the unregulated NSCAS assets to the RAB:

- Firstly, there are no specific ‘safe harbour’ provisions in the NER which superseded the National Electricity Code relevant to TransGrid’s investment.
- Secondly, the question of whether the Directlink assets should be included in the RAB at zero value arose because neither Directlink nor any other alternative project would have passed the regulatory test. That is, it appears that there was real doubt about whether the project was efficient. In the case of TransGrid’s NSCAS assets, the relevant issue is not whether TransGrid’s original expenditure on the assets was efficient, but rather whether a portion of that past expenditure

---

123 Directlink, *Joint Venture Application for Conversion and Revenue Cap, Draft Decision,* 8 November 2005, p. 125.
124 Directlink, *Joint Venture Application for Conversion and Revenue Cap, Draft Decision,* 8 November 2005, p. 13.
125 Directlink, *Joint Venture Application for Conversion and Revenue Cap, Draft Decision,* 8 November 2005, p. 127.
126 Directlink, *Joint Venture Application for Conversion and Revenue Cap, Draft Decision,* 8 November 2005, p. 161.

should be included in a future capital expenditure forecast under the NER, given the capital costs will have been fully recovered.

- Thirdly, there was no evidence that the capital costs of Directlink had already been recovered from users. While TransGrid's unregulated NSCAS assets are likely to continue to provide future benefits to customers over and above its operating costs, the capital costs of those assets have been fully recovered, and the asset have therefore been fully paid for by market participants.

More specifically, TransGrid's investment was made following a tender process conducted by AEMO. TransGrid was able to participate in that process, and to then enter into an agreement with AEMO for the supply of the services, in a manner, and on terms, that enabled it to recover its capital costs and achieve a return on its investment in the relevant assets.

We therefore do not consider that the 2006 Directlink conversion decision is an example of where a RAB value that is greater than zero has been previously accepted in the same circumstances as proposed for the NSCAS assets.

## A.3 Forecast non-load driven capex

TransGrid's non-load driven capex primarily reflects asset replacement expenditure (repex) that involves replacing an asset with its modern equivalent where the asset has reached the end of its economic life. Economic life takes into account age, condition, technology or the operating environment of an existing asset. In general, we classify capex as repex where the expenditure decision is primarily based on the existing asset's inability to efficiently maintain its service performance.

### A.3.1 Position

We do not accept TransGrid's revised repex forecast of $937.1 million. We have instead included an alternative forecast of $754.4 million for repex into our alternative overall capex. Our alternative forecast is $182.7 million (19 per cent) lower than the amount proposed by TransGrid in its revised proposal.

We are satisfied that our alternative forecast reasonably reflects the capex criteria. In coming to this view, we:

- applied trend analysis, comparing past trends in actual and forecast capex for TransGrid's proposed repex programs;[127] and
- conducted a review of TransGrid's 's expenditure forecasting methodology, including its key inputs and assumptions.

Table 6-12 summarises TransGrid's revised proposal and our alternative estimate for non-load driven capex.

**Table 6-12 Final decision on TransGrid's total forecast non-load driven capex ($2017/18 million)**

| | 2018–19 | 2019–20 | 2020–21 | 2021–22 | 2022–23 | Total |
|---|---|---|---|---|---|---|
| TransGrid's revised proposal[128] | 158.6 | 194.4 | 213.9 | 184.8 | 185.4 | 937.1 |
| **AER final decision** | **129.6** | **156.0** | **171.6** | **148.4** | **148.8** | **754.4** |
| Total adjustment | -29.0 | -38.4 | -42.3 | -36.5 | -36.6 | -182.7 |
| Total adjustment (%) | -18% | -20% | -20% | -20% | -20% | -19% |

Source: AER analysis

Note: Numbers may not add up due to rounding

[127] NER, cl. 6.5.7(e)(5).

[128] TransGrid submitted a further revised repex amount of $861.5 million in February 2018.

We are not satisfied that TransGrid's revised repex forecast reasonably reflects the capex criteria. [129] In reaching our final decision, we have considered the information provided, and the issues raised, by TransGrid in its revised proposal.

Our key findings are:

- TransGrid has not provided sufficient evidence that its bottom-up repex forecast has been subject to an effective portfolio optimisation assessment at the total capex level.
- TransGrid's application of its risk cost methodology has led it to overstate risk, and therefore overstate the expected benefits of its proposed expenditure.
- TransGrid has justified the inclusion of certain projects/programs using insufficiently moderated 'likelihood of consequence' inputs (i.e. the likelihood of a fatality).
- A significant proportion of TransGrid's proposed repex comprises of projects with only a marginally positive net present value.
- There is a lack of consideration of the timing of capex with options for extending the programs (or some portion of them) beyond the end of the regulatory control period.

We consider that the impact of the issues identified above has led TransGrid to overstate its forecast capex. We formed our view based on evidence that indicates TransGrid's project risk cost analysis is overly risk averse, therefore project costs are likely to be materially overstated and not reflective of prudent and efficient expenditure. For the reasons discussed in attachment A of our draft decision, we have placed limited weight on benchmarking analysis and predictive modelling.[130]

In making this final decision, we have had regard to EMCa's findings from both its initial and revised reviews of TransGrid's risk-cost analysis, and its portfolio level assessment. [131] EMCa's assessment of TransGrid's revised capex proposal was based on its review of:

- TransGrid's revised proposal
- supporting documents (including TransGrid's workings and models)
- TransGrid's responses to information requests.
- Information provided by TransGrid at onsite meetings.

EMCa's assessment built on its previous analysis and its findings from its assessment of TransGrid's initial capex proposal. [132]

---

[129] NER, cl. 6A.14.1(2)(ii).

[130] AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-67.

[131] EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. i.

[132] EMCa, *Review of aspects of TransGrid's forecast capital expenditure*, June 2017.

EMCa concluded that TransGrid's initial repex forecast was overstated by 15 per cent to 25 per cent.[133] In its revised proposal TransGrid reduced its repex forecast from $961.8 million to $937.1 million (↓3 per cent).[134]

TransGrid raised a number of concerns with aspects of our draft decision, including aspects of the advice provided by EMCa which we used to inform elements of that decision. Specifically, TransGrid disagreed with our draft decision on the basis that our proposed repex reduction relied on 'errors and misunderstandings' and was therefore poorly supported.[135] TransGrid submitted that given the errors and misunderstandings, the conclusions reached in our draft decision could not be reasonably reached.[136] In response, EMCa clarified that there are no areas of misunderstanding or misinterpretation regarding TransGrid's risk cost methodology that would affect its conclusions. [137]

Following its review of TransGrid's revised revenue proposal EMCa concluded that TransGrid's revised repex forecast of $937.1 million was overstated, and that an adjustment of between -20 per cent and -30 per cent is likely to be more reflective of a prudent and efficient level of expenditure.[138]

EMCa's key findings included:[139]

- TransGrid's application of its risk based methodology has led it to overstate risk and therefore overstate its required expenditure.
    - TransGrid has used a high and unsupported 'consequence of failure' cost assumption for estimating environmental risk in relation to transmission lines.
    - TransGrid has not always sufficiently moderated its safety risk costs relating to the possibility of a fatality.
    - TransGrid has tended to over-estimate reliability consequences as justification for some of its proposed capex.
- TransGrid has not meaningfully sought to determine the optimal timing or extent of its proposed program of work; and
- Through a prudent deselection of projects, TransGrid's expenditure could be considerably less than it has proposed with relatively little impact on safety, reliability or environmental risk.

---

133 EMCa, *Review of aspects of TransGrid's forecast capital expenditure 2018-23*, June 2017, p. 84.

134 Following requests for information and onsite discussions TransGrid proposed a further revised forecast of $861.5 million (↓10 per cent from its initial repex forecast.

135 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 38.

136 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 70.

137 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 9.

138 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p.iv.

139 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p.iv.

The most significant component of EMCa's recommended adjustment related to TransGrid's proposed repex on transmission lines (TransGrid's revised proposal: $335.9 million). EMCa are of the view that TransGrid's 'consequence of failure' risk cost parameter that is used to quantify environmental risks may overstate these risks by a factor of at least four times. TransGrid relied heavily on its estimate of environmental risks to justify its proposed transmission line projects.[140] EMCa concluded that when substituting TransGrid's environmental consequence cost assumptions with more realistic assumptions, the benefits of undertaking certain projects are considerably reduced. When these changes are applied to TransGrid's proposed transmission lines projects, a number of projects are no longer justified. As such, EMCa recommended an adjustment of -30 per cent to -40 per cent on TransGrid's revised transmission lines forecast.[141] Our assessment of TransGrid's application of its risk cost methodology, and more specifically its application of the 'consequence of failure' for environmental risk can be found on page 6-67 of this attachment.

EMCa also recommended adjustments of -10 per cent to -15 per cent to TransGrid's revised substation repex forecast (TransGrid's revised proposal: $304.3 million), and -71 per cent to TransGrid's revised communications repex forecast (TransGrid's revised proposal: $51.3 million). Subsequent to submitting its revised proposal TransGrid proposed a further revised forecast which included a reduction of $64.1 million (↓18 per cent) to its combined substation and communications related repex forecasts. We have taken into account TransGrid's further proposed reductions in determining our alternative amount of repex.

Our alternative repex forecast of $754.4 million is $182.7 million (or 19 per cent) less than TransGrid's revised repex forecast. Our -19 per cent adjustment is marginally outside the range recommended by EMCa. This is attributed to a number of factors.

Firstly, we have accepted TransGrid's forecast expenditure for 'test equipment and tools' ($10.0 million), and its forecast expenditure for RIT-Ts ($2.8 million). We have also accepted $9.6 million of repex for TransGrid's existing committed projects.[142]

Secondly, we consider that a -19 per cent adjustment is appropriate as the evidence suggests that a significant amount of TransGrid's proposed capex projects are estimated to provide limited reductions in risk and relatively low incremental net benefits. In particular, EMCa found that a significant amount of TransGrid's proposed capex is estimated to relatively low positive net economic benefits in terms of reduced risk costs.[143] EMCa also concluded that TransGrid's proposed capex could be

---

140 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 27.

141 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 27.

142 For Munmorah, Orange, Vales Point, and Wagga substation rebuild projects due to be completed in 2018-19.

143 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, pp.17-18.

considerably less than proposed with relatively little impact on safety, reliability or environmental risk. [144]

Thirdly, we consider that a -19 per cent adjustment is more appropriate than a -20 per cent to -30 per cent adjustment as it provides an alternative repex forecast that is more consistent with TransGrid's estimated repex over the 2015-18 regulatory control period. Our consideration of TransGrid's actual and estimated annual expenditure over the 2015-18 regulatory control period is particularly relevant given:

- TransGrid's estimated capex over the 2015-18 regulatory control period has been subject to its new risk asset management framework and therefore actual/estimated capex in this period provides a relevant reference point for our assessment of forecast capex; and
- TransGrid has been subject to our CESS throughout the 2015-18 regulatory control period. We therefore have confidence that the level of actual/estimated capex throughout the 2015-18 regulatory control period provides useful guidance on prudent and efficient costs in the 2019-24 regulatory control period.

As such, for the reasons stated in both this final and our earlier draft decision, we are of the view that a -19 per cent adjustment to TransGrid's revised repex forecast is reasonably likely to reflect prudent and efficient costs.

TransGrid submitted that our reduction to in its initial repex forecast did not have an adequate basis and that it was founded on a backward looking trend analysis, and did not adequately consider future asset condition and risks.[145] We consider that our adjustment does have an adequate basis, as we found evidence which indicates that TransGrid's forecast capex is supported by a risk cost analysis that is likely to be materially overstated. It can be seen in Figure 6-5 (page 6-61) that while TransGrid's historical repex exhibited an upward trend until 2014/15, this trend is no longer apparent following the introduction of its new asset risk management framework in 2015/16.

We note that while TransGrid has had an opportunity to address some of these risks throughout the 2015-18 regulatory control period, it is expecting to underspend against our alternative forecast repex by around 12 per cent. [146] As TransGrid has not addressed these risks, whilst simultaneously underspending against the forecast, it suggests that TransGrid's risk analysis, used to inform its repex forecast, is not consistent with its current asset management and risk management practice. As the evidence indicates that TransGrid's risk analysis is likely to be overstated, we have placed significant weight on the outcomes of the application of its current asset management and risk management practices applied over the 2015-18 regulatory control period.

---

144 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. iii.

145 TransGrid, Revised revenue proposal, 2018-19 to 2022-23, December, 2017, p. 77.

146 TransGrid is expecting to underspend against our alternative forecast total capex by 18 per cent over the 2014-18 regulatory period.

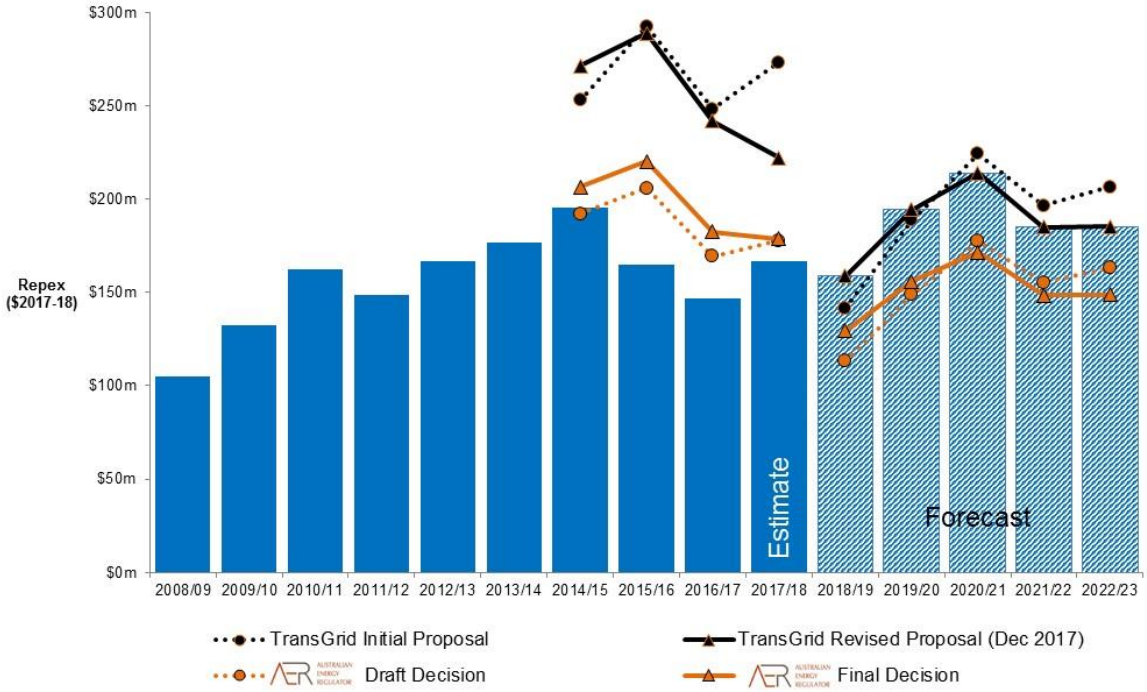
Furthermore, it can be seen in Figure 6-5 (page 6-61) that TransGrid's historic repex is less volatile and exhibits more gradual changes over time compared to its historical augex profile (see Figure 6-4 on page 6-29). This is to be expected, as the condition of the population of assets is likely to deteriorate gradually over time. Given the nature of these past expenditure trends, we also have confidence that TransGrid's past repex provides a reasonable basis to inform our alternative estimate.

The application of our capital expenditure sharing scheme (CESS) over the 2015-18 regulatory control period provides us with additional confidence that TransGrid's historical repex has allowed it to sufficiently manage and operate its network in a manner that achieves the capex objectives. Prior to the application of our CESS, service providers had an incentive to delay expenditure until later in the regulatory control period. As TransGrid has been subject to the CESS throughout the 2015-18 regulatory control period, it has an incentive to minimise costs throughout this period. Accordingly, this gives us additional confidence that TransGrid's actual/estimated repex in the 2015-18 regulatory control period provides a reasonable basis to inform our alternative estimate.

### A.3.2 TransGrid's revised revenue proposal

TransGrid did not agree with our alternative forecast for repex in our draft decision. TransGrid's revised forecast for repex is $937.1 million, which is $179.2 million (or 24 per cent) higher than our draft decision. TransGrid's revised forecast reflects an average annual repex of $187.4 million over the 2018-23 regulatory control period. This represents a proposed increase of 11 per cent over its estimated average annual repex for the 2015-18 regulatory control period (see Figure 6-5).

## Figure 6-5 TransGrid's historical and forecast repex (inc. overheads) ($2017/18 million) [147]




Source: AER analysis

Following requests for information and onsite discussions TransGrid proposed a further revised forecast of $861.5 million subsequent to its revised proposal. TransGrid submitted that the further reduction in its revised repex forecast reflected:[148]

- a change in the value of statistical life (VoSL) risk input parameter
- the identification of some asset replacements which were not optimally timed
- savings identified through its portfolio optimisation review; and
- numerous errors in calculations.

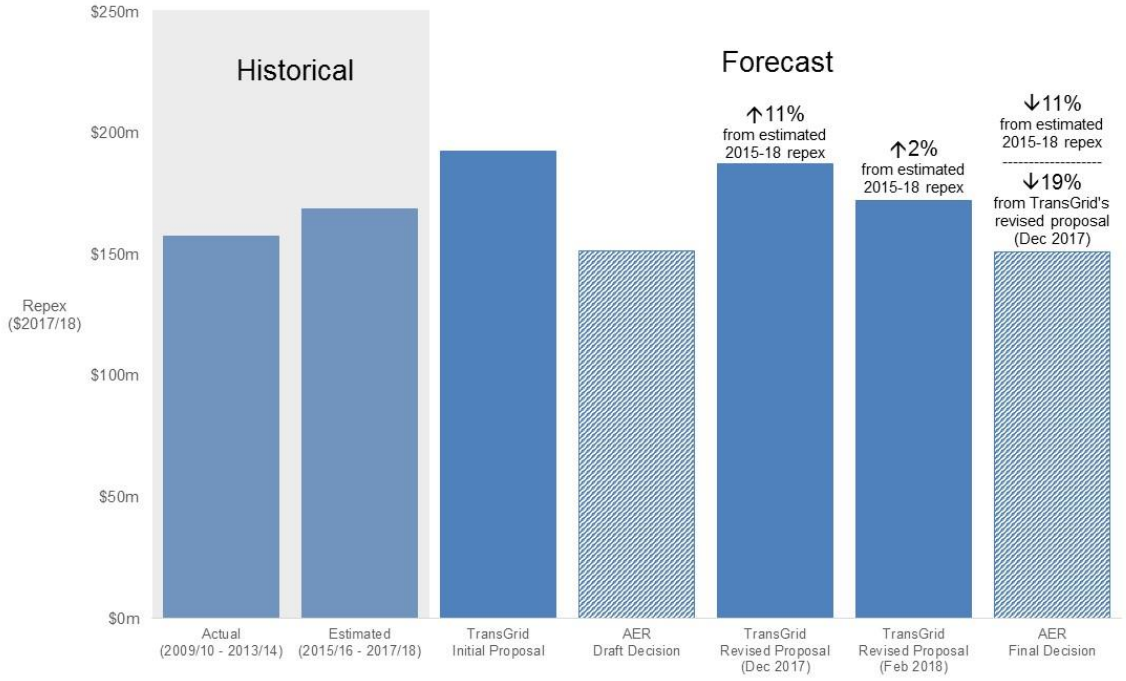
We have taken TransGrid's further revised proposal into account in forming our alternative estimate.

---

147 We note that the 2014/15 regulatory year reflects a transitional period between regulatory control periods. When comparing time periods within this attachment we refer to the three year 2015-18 period as the regulatory control period (RCP) and the four year 2014-18 period as the 'regulatory period'. Our use of the 2015-18 regulatory control period is particularly relevant for repex given that was the year in which TransGrid applied its new asset management framework.

148 TransGrid, CAM and PTRM update, 21 February 2018.

## Figure 6-6 TransGrid's annualised historical and forecast repex (inc. overheads) ($2017/18 million) [149]




Source: AER analysis

As with our draft decision, we have placed significant weight on the outcomes of EMCa's technical review of TransGrid's governance, asset risk framework, forecasting methodologies, and major repex programs.[150]

In its revised proposal, TransGrid raised a number of concerns with aspects of our draft decision, including aspects of the advice provided by EMCa which we used to inform elements of that decision. Specifically, TransGrid disagreed with our draft decision on the basis that our proposed repex reduction relied on 'errors and misunderstandings' and was therefore poorly supported.[151] TransGrid submitted that given the errors and misunderstandings, the conclusions reached in our draft decision could not be reasonably reached.[152]

TransGrid also disagreed that:

---

149 We note that Figure 6-5 and Figure 6-6 compare TransGrid's forecast(s) with the three year regulatory control period (2015-18) instead of the four year regulatory period (2014-18). We consider comparing TransGrid's forecasts with the shorter three year period is particularly relevant, given its current Risk Assessment Methodology was not adopted until 2015/16.

150 AER, Draft decision, *TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-56.

151 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 38.

152 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 70.

- its risk based approach is a work in progress[153]
- it is overly risk averse[154]
- the bottom-up forecast is likely to be overstated;[155] and
- project timing is not justified.[156]

TransGrid submitted that, amongst other things, it did not consider our reliance on recent repex to be relevant in determining our alternative estimate.[157] Further, TransGrid submitted that it is more likely that the largest impacts of the 'expenditure reduction' in our draft decision will be increases in reliability risks and asset lifecycle costs resulting from higher operating costs as asset failure rates increase and replacement is pushed back in time. [158]

TransGrid also proposed capex to recover costs associated with the extension of the RIT-T to repex and for tools and equipment that we did not accept in our draft decision.[159]

### A.3.3 AER repex findings

We are not satisfied that TransGrid's revised repex forecast is reasonably likely to reflect prudent and efficient costs. We reached this conclusion for the same reasons we outlined in our draft decision. These reasons include:

- the bottom-up aggregation of individual projects is likely to lead to an overstatement of capex (i.e. there is insufficient evidence of capex portfolio optimisation)
- TransGrid's application of its risk assessment methodology overstates risk costs, therefore overstating the expected benefits of proposed capex
- the lack of consideration of the timing of capex with options for extending the programs (or some portion of them) beyond the end of the regulatory control period
- TransGrid's risk cost methodology is not used to determine the optimal timing.

In reaching our final decision, we have considered the issues raised by TransGrid in its revised proposal. Our reasons for our final decision are set out below.

***Insufficient evidence of capex portfolio optimisation***

In our draft decision we raised our concern that there was a lack of evidence to indicate that TransGrid's bottom-up forecast had been subject to an effective portfolio optimisation process. [160]

---

153 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 70.
154 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, pp. 70-71.
155 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 72.
156 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 73.
157 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 76.
158 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 79.
159 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, pp. 80-81.

TransGrid disagreed that its approach does not include a 'top-down' portfolio review. TransGrid refers to its application of predictive modelling (a form of 'repex model') as evidence of its top-down assurance of its repex forecast.[161] As we stated in our draft decision, we support the use of alternative assessment techniques as a sense check of whether a bottom-up forecast is reasonable. [162] However, for the reasons also outlined in our draft decision we are not satisfied that TransGrid's repex model validates its capex forecast which was developed through an aggregation of projects and programs. We also do not consider that TransGrid's repex model provides evidence of an effective portfolio optimisation process. In its revised proposal TransGrid did not address our concerns detailed in the draft decision. These concerns, amongst other things, included:[163]

- Our view that at this time, limited weight should be placed on the application of predictive modelling to transmission networks[164] such that this technique is not sufficiently reliable to validate the repex forecast
- TransGrid's adoption of a new asset management strategy suggests that reliance on historical replacement practices may not be representative of future replacement needs
- TransGrid's change in asset management strategy further reduces the value of any predictive modelling (which relies on using past asset management practices) to predict repex.

TransGrid's revised proposal did not address our concerns in relation to the use of the repex model to validate its bottom-up forecast.

As outlined by EMCa, an overall review of a proposed capex portfolio provides, amongst other things, information to identify:

- the marginal projects and whether a cut-off point appropriately included or excluded the right projects; and
- if there are synergies that might provide opportunities to reduce delivery cost for the program in aggregate.

In its review of TransGrid's revised proposal EMCa concluded that:[165]

> We sought further information from TransGrid on any portfolio-level ('top down') assessment that it may have relied on in helping to justify its proposed

---

160 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-65.

161 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 77.

162 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-65.

163 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, pp. 6-67, 6-68.

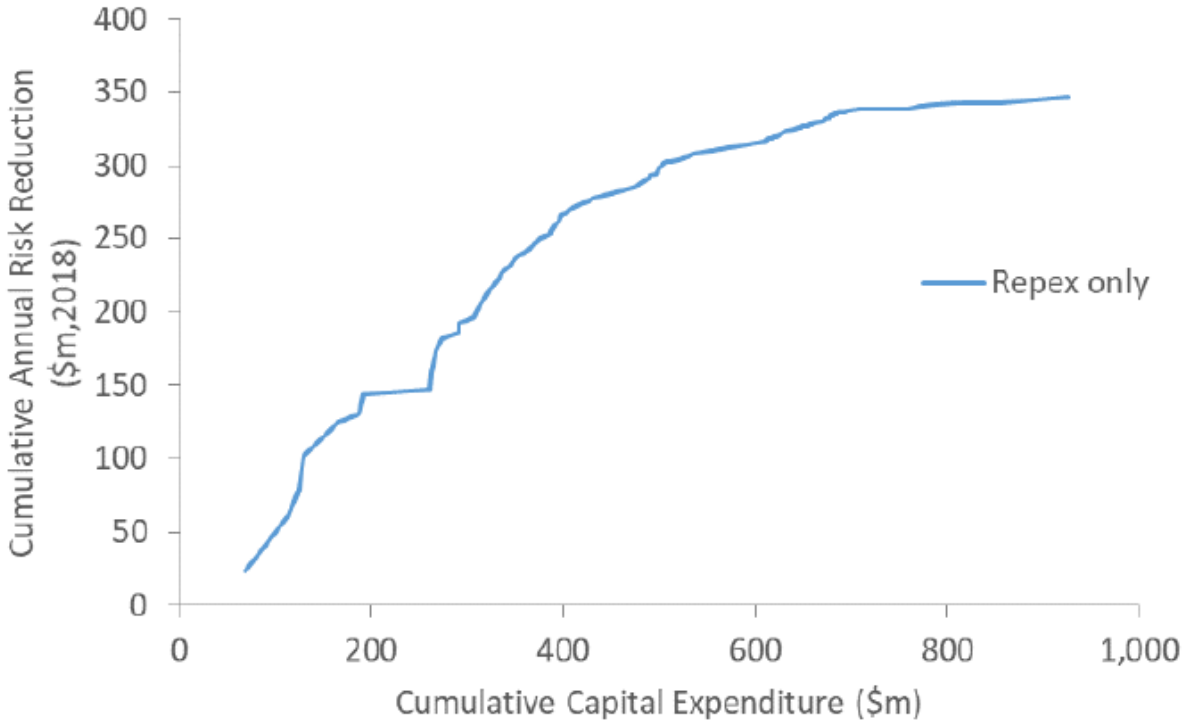
164 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, Appendix A.

165 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. iii.

> expenditure. The information provided further confirms the view in our initial RP [Revenue Proposal] report that TransGrid has not meaningfully sought to determine the optimal timing or extent of its proposed program of work.

EMCa found that a significant amount of TransGrid's proposed capex projects are estimated to provide limited reductions in risk (see Figure 6-7). EMCa also found that a significant amount of proposed capex is estimated to provide only a marginally positive net economic benefit in terms of reduced risk costs.[166]

**Figure 6-7 Areas of low incremental repex benefit (risk reduction)**




Source: EMCa graph, from TransGrid data in response IR50-Q6

EMCa concluded that:[167]

> TransGrid has not provided evidence of having identified and more closely scrutinised the more marginal projects to confirm validity of the assumptions which drive the claimed 'need'. Moreover, and contrary to TransGrid's assertions in its RRP, the evidence appears to suggest that by prudent deselection of projects, TransGrid's expenditure could be considerably less than it has proposed, with relatively little impact on safety, reliability or environmental risk.

Further: [168]

---

166 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 18.

167 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. iii.

> While the updated scale [shown in Figure 6-7] helps with interpretation of this data, the message is essentially the same as we stated in our initial RP report, namely that …the cumulative risk cost savings flattens for increasing capex' and that…. the general shape of the relationship suggests that there may be an opportunity to test that the level of capex is optimised.

While some of TransGrid's proposed projects have a negative NPV and have been justified based on 'as low as reasonably practical' (ALARP) or other criteria, almost all of the positive NPV risk cost benefits arise from around half of the proposed repex program. The incremental net benefit of the remainder of the proposed program is relatively low. [169]

Further, EMCa concluded that TransGrid's assertion that a reduction relative to its proposed program would 'increase the risk of loss of supply events, lead to higher asset lifecycle costs and has potential safety and environmental impacts'[170] and that it would 'increase risks for customers and the community'[171] is misleading in that it materially overstates the risks. EMCa concluded that TransGrid does not demonstrate that the investment cost is justified. [172]

We maintain our position from the draft decision that limited weight should be placed on TransGrid's repex modelling to validate its bottom-up repex forecast. We also maintain our position that evidence indicates TransGrid has not undertaken an effective capex portfolio optimisation assessment.[173]

Our position was informed by EMCa's findings in its review of TransGrid's portfolio assessment, the outcome of which indicates that:

- a significant proportion of TransGrid's proposed capex is likely to provide limited benefits; and
- there is scope for a material reduction in capex that a prudent operator would require to achieve the capex objectives.

***TransGrid's application of its asset risk management framework***

In its revised proposal TransGrid highlighted the key aspects of its repex planning process, specifically its risk assessment methodology which identifies safety and compliance obligations and how they link to key enterprise risks. TransGrid noted that a fundamental part of its replacement forecasting approach is the quantification of risk

---

168 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 17.

169 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 17.

170 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 36.

171 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 36.

172 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 18.

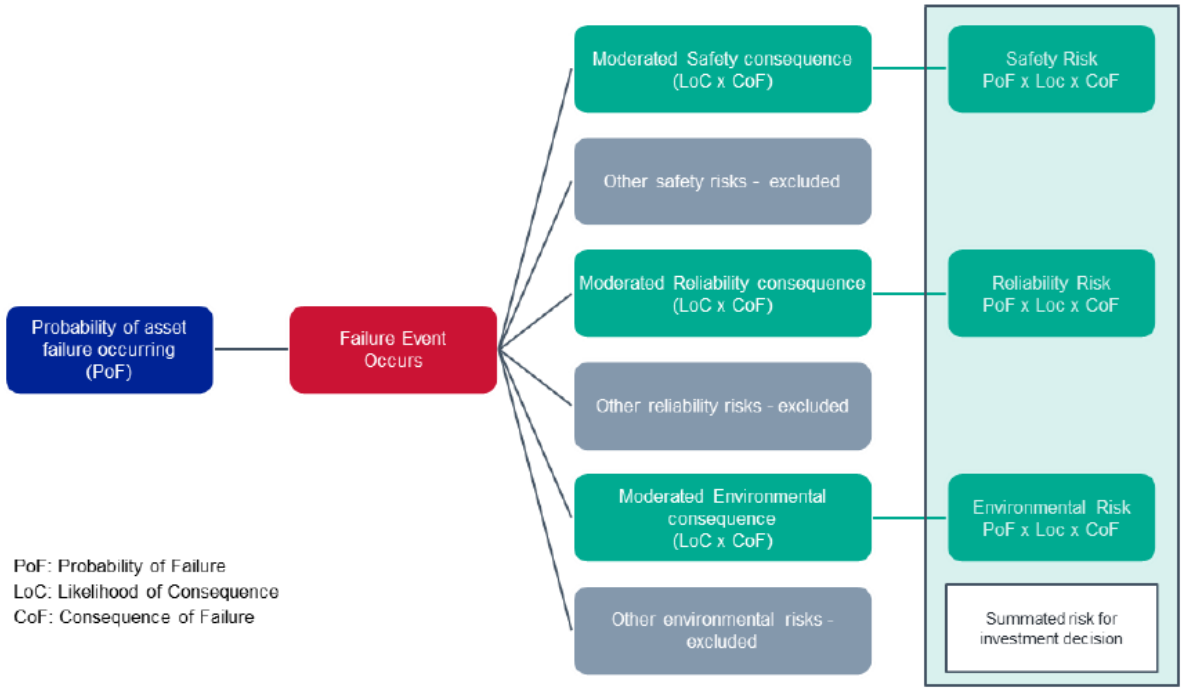
173 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-65.

costs (i.e. the monetised impacts of the reliability, safety, environmental and other risks). [174]

In particular, TransGrid's expenditure forecasting methodology is based on a quantified risk based approach that supports an economic analysis. This approach adopts a risk based cost benefits analysis, where the benefits are the avoided costs of the risks and the cost is the proposed network investment.

Figure 6-8 provides a snapshot of TransGrid's risk cost methodology. TransGrid stated that its quantification of risk is a key aspect of its risk cost methodology. [175]

## Figure 6-8 TransGrid - Quantification of risk




Source: TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, p. 65

Figure 6-8 shows that TransGrid's approach to calculate/quantify project risk costs relies on the following three project risk cost parameters:

- Probability of failure (PoF)
- Likelihood of consequence (LoC); and
- Consequence of failure (CoF).

In our draft decision we acknowledged that TransGrid has recently enhanced its asset management and risk management processes. We understand that TransGrid's

[174] TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 64.
[175] TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 64.

enhanced asset management and risk management processes were introduced as a means of gaining a better understanding of the condition and performance of its asset and to improve the targeting of expenditure to address critical asset risks. We consider that the methodology adopted by TransGrid in regard to its asset risk management framework is consistent with good industry practice. However, in our draft decision we noted that TransGrid's new asset risk management framework was only introduced in 2015-16 and evidence suggests that the new framework was currently a work in progress. [176]

We formed our view on the basis that when used to develop its capex forecast, the inputs used in TransGrid's project risk cost analysis were overly risk averse such that capital expenditure was likely to be overstated beyond what would be considered prudent and efficient to achieve the capex objectives. Moreover, evidence indicated that this overestimation of project risk costs is systemic across TransGrid's proposed capex projects and programs.

TransGrid did not agree that its asset risk management framework is a work in progress. TransGrid submitted that its 'robust approach to replacement forecasting is evolving, as any good asset management framework should be but it is not a 'work in progress''. [177] TransGrid submitted that our assessment of its approach to risk management appeared to be based on a poor understanding of its actual approach. [178] TransGrid also submitted that its risk analysis is robust and that it does not appear to have been well understood by EMCa and the AER. [179]

In its revised proposal TransGrid sought to further clarify, through the use of examples, how it quantifies environmental risk and estimates project risk costs associated with transmission lines.[180] However, when considered together, TransGrid's examples apply input values and calculation methods that are not consistent with each other. These inconsistencies are outlined in Figure 6-9 (below). TransGrid's attempt to clarify the application of its risk analysis has the potential to result in confusion, and as a result, could lead the reader to consider that TransGrid has misapplied its risk cost analysis.

---

176 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-3.

177 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 63.

178 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 63.

179 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 36.

180 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, pp. 39, 66.

## Figure 6-9 Worked examples of TransGrid's risk quantification

### Equation 1

TransGrid bases its risk cost calculation on the following three (3) project risk cost parameters (see page 65 of TransGrid's revised revenue proposal):

- Probability of failure (PoF),
- Likelihood of consequence (LoC), and
- Consequence of failure (CoF)

On page 39 of its revised proposal TransGrid uses a highlighted text box to provide the following values for two (2) of the three (3) project risk cost parameters ('probability of failure' and 'consequence of failure'), as well as the output of its risk cost calculation.

- Probability of failure (PoF) = 0.7% (~1 in 150 years for towers)
- Likelihood of consequence (LoC) = not stated
- Consequence of failure (CoF) = $400 million
- Risk cost = $2.9 million

With these stated values it is possible to calculate the unstated 'likelihood of consequence' input value (shown in red) using TransGrid's quantification of risk calculation:

**0.7% (PoF) x $400 million x 100% (LoC) = $2.9 million**

TransGrid's implied 100 per cent 'likelihood of consequence' would indicate one of the following:

- TransGrid assumes that if a transmission line/tower asset fails, then there is a 100 per cent likelihood that it will be exposed to a $400 million consequence (comparable to the relevant consequence of the Black Saturday bushfires); or
- TransGrid has failed to determine, or failed to input a reasonable 'likelihood of consequence' value.

However, the relevant chart in TransGrid's text box infers that the -99.3 per cent moderation factor reflects the impact of both 'probability of failure' and 'likelihood of consequence'. This is not consistent with what is written in the supporting text.

TransGrid then states that the $2.9 million represents the average bushfire consequence cost per transmission line used in its capital expenditure forecast.

### Equation 2

On page 66 of its revised proposal TransGrid provided the following values for two (2) of the three (3) project risk cost parameters ('likelihood of consequence' and 'consequence of failure'), as well as the output of its risk cost calculation.

- Probability of failure (PoF) = not stated

- Likelihood of consequence (LoC) = 0.7%
- Consequence of failure (CoF) = $400 million
- Risk cost = $2.9 million

With these stated values it is possible to calculate the unstated 'probability of failure' input value (shown in red) using TransGrid's quantification of risk calculation:

**100% (PoF) x $400 million x 0.7% (LoC) = $2.9 million**

This should imply that TransGrid assumes that if a transmission line/tower asset fails, there is a 0.7 per cent probability that the bushfire will result in a $400 million consequence cost (comparable to the relevant consequence cost of the Black Saturday bushfires). However, after discussing the (largely) unrelated topics of safety and reliability risk (which included text and tables) TransGrid states:

> *As for the transmission lines example, to calculate the full risk cost, the moderated consequence cost still has to be multiplied by the relevant Probability of Failure (of the event which would lead to the particular consequence).*

We consider that the disconnected placement of TransGrid's qualifying statement has the potential to confuse readers and lead to a misunderstanding of how it calculates risk cost. Regardless of the potential for misunderstanding, as discussed above TransGrid has already stated within its revised proposal that the 'probability of failure' is not 100 per cent, and that it is in fact only 0.7 per cent (see page 66 of TransGrid's revised proposal).

As such, it is possible to calculate the risk cost for lines/towers (shown in red) using TransGrid's quantification of risk calculation.

- Probability of failure (PoF) = 0.7%
- Likelihood of consequence (LoC) = 0.7%
- Consequence of failure (CoF) = $400 million

With these three (3) stated components we are able to complete the risk cost:

**0.7% (PoF) x $400 million x 0.7% (LoC) = $19,600**

Source: TransGrid, Revised revenue proposal, December 2017 and AER analysis

In its revised proposal, TransGrid provided a further example detailing the application of its risk cost assessment in relation to substation civil projects.[181] We consider this example better reflects TransGrid's intended application of its risk analysis.

[181] TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 71.

It its review of TransGrid's revised proposal EMCa concluded that it found no area of misunderstanding of TransGrid's risk cost methodology, nor with how TransGrid has used its assumed input values in applying its methodology.[182] EMCa stated that:[183]

> TransGrid has not specified the aspects of its methodology that it claims EMCa misunderstood. From careful scrutiny of TransGrid's RRP, and of the list of claimed errors and misunderstandings that TransGrid provided to the AER subsequent to being provided with our initial RP report, and from our discussions with TransGrid during the RRP review onsite meetings, we cannot discern any misunderstanding of TransGrid's risk-cost methodology.

TransGrid confirmed that as part of its risk assessment methodology it:[184]

> … applies a worst case asset failure consequence and significantly moderates this down to reflect the likely consequence in the particular circumstances.

EMCa identified TransGrid's insufficient moderation of 'worst case' consequence of failure, stating that:[185]

> TransGrid states that it *"…uses a moderated 'worst case' consequence to value risk."* Whilst EMCa has (in our initial RP report) already taken into account that the risk cost methodology involves factors which moderate these consequence costs, our concerns with TransGrid's selection of worst case consequences remain. While the possibility of 'worst case' consequences cannot be dismissed, TransGrid creates a challenge for itself in determining appropriate moderating factors for such extreme events, particularly where they have never occurred in TransGrid's history or from 'like events' in the combined history of electricity transmission utilities in Australia. As a result, TransGrid has in many instances been unable to substantiate the moderating factors that it has used. Examples of this include moderation of extreme bushfire risk and moderation of the risk of failures leading to 'system black' for the whole state of NSW or for the whole of Sydney. TransGrid has adopted assumptions without evidence for these likelihood values.

It is also noteworthy that JWH Consulting (on behalf of the Energy Consumers Australia) submitted that:[186]

> TransGrid on numerous occasions ... suggest that the AER and EMCa don't fully understand or misinterpret the process and numbers. My reading of the AER and EMCa reports and the TransGrid documentation suggest that the AER and EMCa do understand the process and have not misinterpreted the information and have reasonably come to the conclusion that there is an overstating of the risk or a bias towards overstating the risk generally. The bias

---

182 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. ii.

183 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 9.

184 TransGrid, *Revised revenue proposal 2018/19 – 2022/23*, December 2017, p. 64.

185 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 9.

186 JWH Consulting, *Report to Energy Consumers Australia*, 2 January, p. 4.

> appears to come from using the worst case scenario and then assigning a probability which is small but arguably not small enough.

We agree with both EMCa and JWH Consulting that TransGrid's risk analysis does not include sufficient risk moderation factors to offset its use of 'worst case' consequences events.

In its revised proposal TransGrid stated that when a 'worst case' consequence of failure is multiplied by an appropriately small likelihood of consequence it is realistic and credible. [187] We do not dispute this. In our draft decision we neither stated, nor inferred that TransGrid's use of a “worst case consequence of failure' was the reason that we considered its risk costs to be overstated. Conversely, we stated that the difference between TransGrid's proposed capex and our alternative estimate was largely due to our findings that TransGrid has adopted an overly conservative approach to quantifying risk. [188]

In our draft decision we considered that in its estimation of project risk costs, TransGrid did not *sufficiently* moderate its 'worst case consequence of failure' to reasonably reflect the risk of the given consequence occurring. As such, we do not dispute that in principle when a 'worst case consequence of failure' is multiplied by an *appropriate* 'likelihood of consequence', the estimate would be expected to be both realistic and credible.

In our draft decision we also made reference to Aurecon's review[189] of TransGrid's proposed capex plan. We referenced Aurecon's report as further evidence that TransGrid’s risk analysis is biased towards worst case hazardous events and worst case consequences such that it is likely to materially overstate network risks and proposed capex.[190] TransGrid submitted that we used Aurecon's report selectively and that in its report Aurecon also stated that TransGrid's capex forecast is in accordance with good industry practice and will meet the capex criteria.[191] However, TransGrid did not acknowledge, nor did it attempt to explain the apparent contradiction regarding Aurecon's views that:[192]

> Whilst the consequence magnitude should not be underestimated (or overestimated) a realistic estimate is deemed advisable. When the stakes are high, as is the case with several key hazardous events, a range of techniques should be used to arrive at a cost of risk estimate which is credible and realistic.

---

187 TransGrid, *Revised revenue proposal 2018/19 – 2022/23*, December 2017, p. 65.

188 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-11.

189 An engineering and advisory company engaged by TransGrid; Aurecon, *Independent Review of TransGrid's CAPEX Plan, Final Report*, 25 January 2017.

190 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-69.

191 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 71.

192 Aurecon, *Independent Review of TransGrid's CAPEX Plan, Final Report*, 25 January 2017, p. 20.

And:[193]

> It is Aurecon's view that TransGrid's framework for the preparation of its capital expenditure plan for the 18/19 to 22/23 regulatory period will result in a CAPEX forecast that is in accordance with good electricity utility practice and will meet the capital expenditure criteria as set out in 6A.6.7 of the National Electricity Rules.

TransGrid submitted that it has built a number of controls into its investment analysis approach that significantly limit the possibility of overstating capex. [194] [195] TransGrid submitted that the following controls have been built into its risk analysis to limit the possibility that its capex forecast is overstated:[196]

- Investment is only undertaken where condition reports or other analysis suggests action may be required; and
- The analysis approach and overall assumptions are biased against finding projects to be economically viable.[197]

TransGrid considered that neither we, nor EMCa recognised it's in built controls/constraints in our assessment of its bottom-up investment forecast. We disagree with TransGrid that these aspects of its risk analysis are likely to control or limit the possibility that its capex forecast is overstated. As EMCa noted management of the electricity grid constantly involves measures to mitigate risk. This includes mitigation of safety risks, environmental risks and risks of customer interruption, notwithstanding the reality that equipment failures can and will occur from time to time. The assumptions in the LoC and in the CoF estimates need to model realistically the risk mitigation measures that TransGrid has in place and/or would prudently adopt in the 'failure' circumstance being modelled. As the evidence indicates that TransGrid has materially overstated the benefits of the avoided risks associated with its proposed capex, and that its proposed capex is not likely to reflect the optimal timing, we are not satisfied that these identified controls provide an assurance that the proposed capex is reasonable.

### *Forecast methodology input assumptions - project risk cost parameters overestimated*

As discussed above, TransGrid has relied upon its estimation of project risk costs (i.e. the avoided cost to be mitigated by proposed capex) to support its bottom-up forecast.

---

193 Aurecon, *Independent Review of TransGrid's CAPEX Plan, Final Report*, 25 January 2017, p. ii.

194 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 68.

195 TransGrid submitted that these controls included: limiting possible investments (i.e. only undertaking investments where condition reports or other analysis suggests that action might be required), and; the analysis approach and overall assumptions are biased against finding projects to be economically viable.

196 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 12.

197 TransGrid submitted that its economic analysis is biased against finding projects that are economically viable as it uses a discount rate of 10% and as a result the PV of avoided risk benefits in future years is reduced more than the capex as it occurs earlier; the risk values used in the NPV analysis are not escalated; and the analysis assumes that the benefits of avoided risk only begin to accrue when the full program is complete.

In its revised proposal TransGrid sought to further explain and clarify the application of its risk assessment methodology. We consider that this information provides further evidence that TransGrid's project cost risk assessments are likely to be overstated, therefore prudent and efficient capex is also likely to be overstated.

Our reasons are outlined below.

***Environmental risk input parameters***

TransGrid's estimation of environmental risk is a key driver of its proposed conductor/structure replacement program (i.e. proposed capex of $335.9 million or 36 per cent of total forecast repex). We have the following concerns with TransGrid's estimation of environmental risks:

- The likelihood of a consequence associated with a conductor drop or structure failure is likely to be overstated due to the following:
    - The assumption that a conductor or structure failure will lead to a major bushfire event [198] has not been sufficiently moderated in the risk analysis
    - The risk analysis uses inconsistent input assumptions (i.e. 'worst case' consequence of failure is moderated using incompatible 'likelihood of consequence' NSW fire condition data)
    - The likelihood of a 'worst case' consequence occurring appears to be more consistent with distribution networks, whereas the likelihood of a worst case consequence occurring may be lower for transmission networks
- The monetised consequence of conductor or structure failure is also likely to be overstated given the likelihood of a consequence attributed to a failure is likely to be overstated through the application of a 'worst case' consequence.

These issues are discussed below.

*Likelihood of consequence and 'moderating factors'*

In our assessment of the 'likelihood of consequence' for a conductor drop or structure failure we have considered the following aspects of TransGrid's estimation of the:

- likelihood of major NSW bushfire weather events
- average number of days with catastrophic, extreme, severe and very high bushfire ratings for NSW transmission areas
- likelihood that a broken structure/conductor will be lower for transmission networks compared to distribution networks.

[198] TransGrid defines a 'major bushfire event' as a bushfire event which will cause fatality/fatalities (TransGrid, Network Asset Criticality Framework, p. 9).

TransGrid's approach to estimating the 'likelihood of consequence' (i.e. likelihood that a conductor drop or failure of a structure will lead to a major bushfire event) is set out in Figure 6-10.[199]

## Figure 6-10 TransGrid - Calculation of 'likelihood of consequence'

The LoC for each transmission line (TL) has been calculated by the following equation:

$$TL\ Environment\ (Bushfire)\ LoC = \text{Likelihood of major NSW bushfire weather conditions} \times \frac{TL\ Fire\ Propagation\ Score + TL\ Environmental\ Impact\ Score}{Maximum\ Fire\ Propagation\ Score + Maximum\ Environmental\ Impact\ Score} \times \frac{Average\ number\ of\ days\ with\ Bushfire\ Rating\ of\ Catastrophic, Extreme, Severe\ and\ Very\ High\ for\ TL\ NSW\ Fire\ Area}{365}$$

(A.2)

The 2009 Victorian Bushfires[1] is considered an extreme weather condition and should be further moderated using the bushfire experience of NSW. A review of major bushfire events (that is, bushfire events which have caused fatality/fatalities) was undertaken. Historical data from 1915 and 2003[2] suggests that extreme bushfire weather conditions occur in NSW once every five years. A moderating factor of 0.2 has therefore also been included in the LoC calculation.

For the NSW Fire Area(s)[5] defined by the Rural Fire Service through which transmission lines traverse, an average number of days with a Bushfire Rating of Catastrophic, Extreme, Severe and Very High has been calculated based on historical data provided by the Bureau of Meteorology for the NSW bushfire periods from 2012 to 2015.

Source: TransGrid, *Network Asset Criticality Framework*, p. 9 **[red boxes added]**

As noted on page 6-71, TransGrid applies a 'worst case asset failure consequence' and 'moderates it down' to reflect the likely consequence in the particular circumstances.[200] TransGrid stated that the $400 million 'worst case' consequence for transmission conductor/structure asset failure is based on the class action settlement value of the 2009 ‘Black Saturday’ bushfires in Victoria. TransGrid also stated that the 2009 ‘Black Saturday’ bushfires in Victoria provide an actual event with known consequence costs.[201] Most notably, the 2009 ‘Black Saturday’ bushfires:[202]

> … caused the death of 173 people. Black Saturday wrote itself into Victoria’s history with record-breaking weather conditions and bushfires of a scale and ferocity that tested human endurance ... There was also widespread devastation of considerable areas of the scenic forests and woodlands that form part of Victoria’s natural heritage.

It follows that in applying a $400 million 'consequence of failure' value (based on 2009 ‘Black Saturday’ bushfires in Victoria), TransGrid should also apply a 'likelihood of

199 TransGrid, *Network Asset Criticality Framework*, p. 9.

200 TransGrid, *Revised revenue proposal 2018/19 – 2022/23*, December 2017, p. 64.

201 TransGrid, *Response to Information request #050*, 19 February 2018.

202 Victorian Bushfires Royal Commission (2009).

consequence' value that reflects the likelihood of a bushfire causing damage comparable to that of the 2009 'Black Saturday' bushfires in Victoria. The evidence suggests that TransGrid does not appear to have done this.

In the following section we discuss our concerns with two of the key variables used by TransGrid in its calculation of the 'likelihood of consequence' caused by a conductor drop or failure of a structure (see Figure 6-10 above).

*(i) Moderating factor- Likelihood of major NSW bushfire weather conditions*

The first key variable used by TransGrid in its calculation of the 'likelihood of consequence' relates to the likelihood of major NSW weather conditions.

TransGrid has stated that it applied a moderating factor of 0.2 (i.e. there will be one major bushfire in NSW every five years) based on a review of historical information on major bushfire events in NSW, which have caused a fatality or fatalities.[203] However, TransGrid's definition of a 'major bushfire event' used in its risk analysis does not appear to be consistent with the definition adopted in the relevant *National Inquiry on Bushfire Mitigation* report from which TransGrid sourced the data used to estimate its 0.2 moderating factor.[204] In particular, the likelihood/frequency of these major bushfire events does not appear to be reflective of bushfire events that are of a comparable scale to the relevant 'Black Saturday' bushfires. Table 6-13 provides a reproduction of Table D.1 from the relevant *National Inquiry on Bushfire Mitigation* report.

### Table 6-13 Fire history in NSW [205]

| Year | No of deaths | Area of fire (ha) | Losses | Location(s) |
|---|---|---|---|---|
| 1915-16 | - | Not known | | Many districts, Hollbrook, Howlong |
| 1926 | - | Not known | Property losses | Junee, Canberra, Albury, Rydal, Wagga Wagga |
| 1926-27 | 8 | > 2,000,000 | | North Coast and Newcastle district, Canberra, Albury, Dubbo, Griffith |
| 1938-39 | 13 | 73,000 | Many houses, pine plantations | Dubbo, Lugamo, Snowy Mountains, Canberra |
| 1944 | 2 | - | 150 houses, churches | Blue Mountains, Lochinvar |
| 1951-52 | 11 | >4,000,000 | | Worst affected district around Wagga Wagga and Pilliga in the north-west |

[203] TransGrid, *Network Asset Criticality Framework*, p. 9.

[204] We note this Report stated that there are many inconsistencies and gaps in the available information because there are no nationally agreed criteria defining a 'significant fire year' or a 'major fire event'.

[205] Ellis, S. Kanowski, P. and Whelan, R., *National Inquiry on Bushfire Mitigation and Management. (2004)* Commonwealth of Australia, Canberra, p. 339.

| | | | | |
|---|---|---|---|---|
| 1957-58 | 5 | >2,000,000 | 158 houses, many businesses, shops, schools, churches and a hospital | Blue mountains, Leura |
| 1964-65 | 5 | 530,000 | Houses, farms, forests | Snowy Mountains, Southern Tablelands, Nowra, Sydney |
| 1968-69 | 14 | >2,000,000 | 161 buildings (80 houses) | South Coast (Sept.), much of the coastal and nearby range areas of the state |
| 1969-70 | 1 | 280,000 | | Roto and Riverina areas |
| 1972-73 | - | 300,000 | | Kosciusko National Park, Eden, Queanbeyan, Burrinjuck Dam |
| 1974-75 | 6 | 4,500,000 | 50,000 stock, 10,170km fencing | Bourke to Balranald, Cobar Shire, Moolah-Corinya - most of the Western Division |
| 1976-77 | - | 74,000 | 3 houses | Hornsby, Blue Mountains |
| 1977-78 | 3 | 54,000 | 49 buildings | Blue Mountains |
| 1978-79 | - | >50,000 | 5 houses, heavy stock loss | Southern Highlands, south-west slopes |
| 1979-80 | 13 | >1,000,000 | 14 houses | Mudgee, Warringah and Sutherland Shires, majority of council areas, Goulburn and South Coast |
| 1982-83 | 3 | 60,000 | $12 million of pines | Blue Mountains, Sutherland and Southern NSW |
| 1984-85 | 5 | 3,500,000 | 40,000 stock, $40 million damage | Western Division |
| 1986 | - | 10,000 | - | Mount Kaputar National Park |
| 1987-88 | 4 | 180,000 | - | Bethungra, Warurillah-Yanco, south-eastern part of Kosciuzsko National Park, Sutherland, Penrith, Wellington |
| 1990-91 | - | >280,000 | 8 houses, 176,000 sheep, 200 cattle, hundreds of km fencing | Local government shires of Hay, Murrumbidgee, Carrathool; Hornsby, Ku-ring-gai, Cessnock, Hawkesbury, Warringah, Wollondilly, Gosford, Wyong |
| 1991-92 | 2 | 30 fires | 14 houses | Baulkham Hills, Gosford City, Wyong Shire, Lake Macquarie |
| 1993-1994 | 4 | >800,000 (>800 fires) | 206 houses destroyed, 80 other premises destroyed | North Coast, Hunter, South Coast, Blue Mountains, Baulkham Hills, Sutherland, most of Royal National |
| 1997-98 | 3 | >500,000 (250 fires) | 10 houses destroyed | Hunter, Blue Mountains, Shoalhaven, Menai, Coonabarabran, Padstow Heights, South Windsor - Bligh Park |
| 2001-02 | - | 744,000 (454 fires) | 109 houses destroyed; 6,000 head of livestock | Across 44 local government areas in the Greater Sydney, Hunter, North Coast, mid-north coast, Northern Tablelands, Central Tablelands areas |
| 2002-03 | 3 | 1,464,000 (459 fires) | 86 houses destroyed; 3,400 stock; 151 days of severe fire activity | 81 local government areas in Greater Sydney, Hunter, North Coast, Northern Tablelands, Northern Rivers, north-west slopes, north-west plains, Central Tablelands, Southern Tablelands, Illawarra, South Coast |

Source: National Inquiry on Bushfire Mitigation and Management (2004)

It is evident that based on the information that was relied on by TransGrid in Table 6-13 to calculate its 'likelihood of consequence' there is no recorded history of fires in NSW that have resulted in losses comparable in scale to those of the 'Black Saturday Bushfires' in Victoria. As previously mentioned, it follows that in order for TransGrid to apply a $400 million 'consequence of failure' value (based on 2009 ‘Black Saturday’ bushfires in Victoria), it should also apply a 'likelihood of consequence' that reflects the likelihood of a bushfire causing damage comparable to that of the 2009 ‘Black Saturday’ bushfires in Victoria. However, the evidence indicates that in calculating the likelihood of a worst case consequence occurring, TransGrid appears to rely upon data that does not reflect the scale, therefore the expected consequence, of a comparable 'worst case' event. This has the effect of overstating risk, or biasing towards overstating risk generally, therefore overstating prudent and efficient capex. JWH Consulting (on behalf of the Energy Consumers Australia) stated that: [206]

> TransGrid have chosen to use the methodology in a slightly unusual manner, in that it uses not the most likely consequence of a failure or a range of consequences but it concentrates on only the “worst case” consequence and then applies a likelihood of this consequence (LoC) to the calculation. I share the AER and EMCa’s concern that the event used in many of the assessments is an extreme event with a probability of event (PoE) (this is the same as probability of failure (PoF)) and likelihood of consequence (LoC) which is too high. In many cases there is no historic data to back up the LoC used in the assessments. In other words, the process looks to cover the required analysis but when scrutinised more closely, the numbers used appear to be overstating the risk … bias appears to come from using the worst case scenario and then assigning a probability which is small but arguably not small enough.

Moreover, as we indicated in our draft decision, evidence suggests that since 2007 TransGrid has reported 31 instances of conductor drop, compared to only nine network related fire starts. [207]

This indicates that at most only 29 per cent of TransGrid's conductor drops since 2007 could have been the cause of a fire start. Further, the calculation of 'maximum 29 per cent' assumes that none of the 18 catastrophic failure events, nor the 11 structure fall events were responsible for any of TransGrid's network related fire starts over the period. This suggests that despite TransGrid’s moderating its transmission line (environment) ‘likelihood of consequence’ by considering:

- The likelihood of a major NSW bushfire;
- Bushfire weather conditions; and
- A fire propagation score.

---

[206] JWH Consulting, *Report to Energy Consumers Australia*, 2 January, p. 4.

[207] AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-72.

it does not appear to have been sufficiently moderated to consider TransGrid's recent history of network fire starts. Therefore, TransGrid's forecast capex is likely to be overstated. We note that in its revised proposal TransGrid did not directly address this issue.

*(ii) Moderating factor- Days with comparable Fire Danger Ratings*

The second key variable used by TransGrid in its calculation of the 'likelihood of consequence' (or the third as shown in Figure 6-10 on page 6-18) relates to the proportion of days with bushfire ratings of:

- 'Catastrophic'
- 'Extreme'
- 'Severe'; and
- 'Very High'.

We have compared the Fire Danger Ratings between NSW and Victoria given TransGrid has assumed a ' consequence of failure' based on the Victorian Black Saturday bushfires in its risk analysis. It is relevant to note that Fire Danger Ratings vary between NSW and Victoria; therefore the definitions of the ratings in NSW are not directly comparable with those in Victoria (see Table 6-14). However, given the record-breaking weather conditions Victoria was experiencing at the time of the Black Saturday Bushfires we consider that it is reasonable to assume that had the Black Saturday Bushfires taken place in NSW, the NSW Rural Fire Service Fire Danger Ratings would likely have rated the weather conditions on the relevant day to be 'catastrophic' (or at least 'extreme').

## Table 6-14 Fire Danger Ratings - NSW and Victoria

| | | | | | | |
|---|---|---|---|---|---|---|
| **NSW Rural Fire Service** | LOW MODERATE | HIGH | VERY HIGH | SEVERE | EXTREME | CATASTROPHIC |
| **Victorian Country Fire Authority** | LOW MODERATE | HIGH | VERY HIGH | SEVERE | EXTREME | CODE RED |

Source: NSW Rural Fire Service - Fire Danger Ratings; CFA (Victoria) - Fire Danger Ratings

In this context, the 2009 Victorian Bushfires Royal Commission stated that:[208]

> Victoria endured one of its most severe and prolonged heatwaves during the final week of January 2009. The temperature in Melbourne was above 43°C for three consecutive days for the first time since records had been kept. Saturday 7 February was forecast to reach temperatures in the low 40s, accompanied by strong winds. In the lead-up to the day the Premier of Victoria, the Hon. John Brumby MP, described the state as 'tinder dry'. The Country Fire Authority and the Department of Sustainability and Environment, the State's primary bushfire

[208] Victorian Bushfires Royal Commission, *Final Report - Summary*, July 2010.

agencies, warned that forests and grasslands were the driest they had been since the Ash Wednesday fires in 1983.

The conditions forecast for 7 February were realised, as were people's worst fears when fires broke out across the state. Temperatures were nearing 40°C by 11.00 am in many parts of the state and later climbed to the mid-40s. Numerous areas endured record-breaking maximums—including Melbourne, which reached 46.4°C. Strong winds in the morning grew to storm force as the day progressed, and a wind change moved across the state during the afternoon, greatly intensifying the fires.

We consider that in order for TransGrid to estimate a reasonable and comparable 'likelihood of consequence' for each transmission line, it would be reasonable to only consider the average number of days with a Bushfire Rating of 'Catastrophic' (or at least 'extreme'). It follows that TransGrid's inclusion of days with Bushfire Ratings of 'severe or very high' is not consistent with the relevant 'catastrophic' (or at least 'extreme') Black Saturday conditions (refer to Figure 6-5). We consider that this has the effect of overstating the likelihood of TransGrid's exposure to a $400 million consequence in its risk analysis and therefore is likely to overstate prudent and efficient capex.

Table 6-15 provides a summary of the annual average number of days per year for each of the NSW Fire Danger Ratings [209]

### Table 6-15 TransGrid - Summary of average number of days with applicable Fire Danger Rating – NSW bushfire periods from 2012 to 2015

| | Low-Moderate | High | Very High | Severe | Extreme | Catastrophic |
|---|---|---|---|---|---|---|
| Lowest average number of days experienced in any NSW Fire Areas | 50[210] | 21[211] | 4[212] | 0[213] | 0[214] | 0[215] |
| Highest average | 166[216] | 85[217] | 48[218] | 6[219] | 1[220] | 0.25[221] |

[209] TransGrid, *Response to Information request #047*, 13 February 2018.
[210] North Western Fire Area.
[211] South Western Fire Area.
[212] South Western Fire Area.
[213] South Western Fire Area.
[214] Far North Coast, North Coast, Far South Coast, Southern Ranges, Central Ranges, New England, Northern Slopes, Lower Central-West Plains, Southern Slopes, Northern Riverina, South Western, and Far Western Fire Areas.
[215] Far North Coast, North Coast, Greater Hunter, Greater Sydney Region, Far South Coast, Monaro-Alpine, Central Ranges, New England, Northern Slopes, North Western, Upper Central-West Plains, Lower Central-West Plains, Southern Slopes, Southern Riverina, South Western, and Far Western Fire Areas.
[216] South Western Fire Area.
[217] North Western Fire Area.
[218] North Western Fire Area.
[219] North Western Fire Area.

| | | | | | | |
|---|---|---|---|---|---|---|
| number of days experienced in any NSW Fire Areas | | | | | | |
| Probability of occurrence (per year) | 13.69% - 45.48% | 5.75% - 23.29% | 1.10% - 13.15% | 0% - 1.64% | 0% - 0.27% | 0% - 0.07% |

Source: AER analysis of TransGrid response to IR#047, 13 February 2018

We recognise that there is a considerable difference between the highest and lowest instances of Fire Danger Rating for each of the relevant Fire Areas. We also acknowledge that analysing the data using this method does not represent the most accurate method of calculating the likelihood of occurrence of each Fire Danger Rating for TransGrid's network. However, summarising the data in this way has the effect of identifying the relevant bandwidths for the probabilities of occurrence for each Fire Danger Rating.[222]

Undertaking a conservative approach[223] still only assumes a 0.07 per cent probability of a 'Catastrophic' Fire Danger Rating being applied in NSW in any given year. [224] This lower probability suggests that TransGrid has materially overstated the 'likelihood of consequence' associated with worst case conditions and has therefore overstated environmental risks in support of its proposed transmission line capex.

EMCa also supported our view, stating that:[225]

> If TransGrid was to assume that a 'worst case' fire consequence of this magnitude would result from a line failure on 'severe', 'extreme' or 'catastrophic' bushfire danger days, (i.e. excluding 'very high' fire danger days), then TransGrid's data shows that there are only between one and six such days per year (depending on region), and the LoC would be correspondingly lower.

*(iii) Moderating factor- Likelihood of transmission and distribution network fire starts*

Finally, TransGrid has not addressed our concern that its estimated 'likelihood of consequence' appears to be more relevant to distribution networks. As such, the 'likelihood of consequence' inputs used by TransGrid may be overstated, therefore environmental risks are also likely to be overstated.

In its review of TransGrid's initial proposal EMCa stated that:[226]

---

220 Greater Hunter, Greater Sydney Region, Illawarra/Shoalhaven, Monaro-Alpine, North Western, Upper Central-West Plains, Eastern Riverina, and Southern Riverina Fire Areas.

221 Illawarra/Shoalhaven, Southern Rangers, Eastern Riverina, and Northern Riverina.

222 The minimum probability is lower than would be reasonably expected and the maximum probability is higher than would be reasonably expected.

223 We have adopted the highest average number of days experienced across the NSW fire areas for each fire rating.

224 Based on the data provided by TransGrid in its response to *Information request #047*, 13 February 2018.

225 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 9.

226 EMCa, *Review of aspects of TransGrid's forecast capital expenditure 2018-23*, June 2017, p. 21.

> Our principle concern is that TransGrid's approach does not appear to adequately account for the likelihood that a broken transmission structure/conductor will start a bushfire.[227] This factor would be much less than 1.0 and lower than the equivalent moderating factor for distribution networks (which were involved in the 2009 bushfire) due to differences such as the effectiveness of protection systems.

TransGrid's revised proposal did not dispute, nor address EMCa's view that the likelihood of a broken structure/conductor causing a bushfire will be lower for transmission networks than for distribution networks.

In its review of TransGrid's revised proposal EMCa stated that: [228]

> In our experience, there is a considerably lower risk of transmission line failures causing a fire compared with distribution line failures. Nevertheless, for the purpose of the current analysis, we consider that TransGrid's assumption is reasonable in this respect, given that its LoC calculations already assume that a fire will result only under the combined conditions of high risk fire impact and fire propagation in 'one-in-five-years' bushfire risk circumstances.

We understand that when considered in full context, EMCa's qualifying statement that 'TransGrid's assumption is reasonable' refers to the likelihood of a transmission line failure causing a fire, not the likelihood of a transmission line failure causing a fire resulting in consequence cost on the scale of the Victorian Black Saturday bushfires.

Figure 6-11 (below) compares TransGrid's network to AusNet Services' distribution network which was affected by the 'Black Saturday' bushfires in Victoria. It can be seen that TransGrid's transmission network has significantly fewer maintenance spans in high bushfire risk areas [229] than AusNet Services' distribution network.[230] These direct comparisons between TransGrid's transmission network and AusNet Services' distribution network suggest that on the basis of differences in the operating environment the likelihood of consequence[231] as the result of a major bushfire event may be less for TransGrid's transmission network than it is for a distribution network.

---

227 From the information provided, TransGrid's PoF parameter does not appear to take this into account.

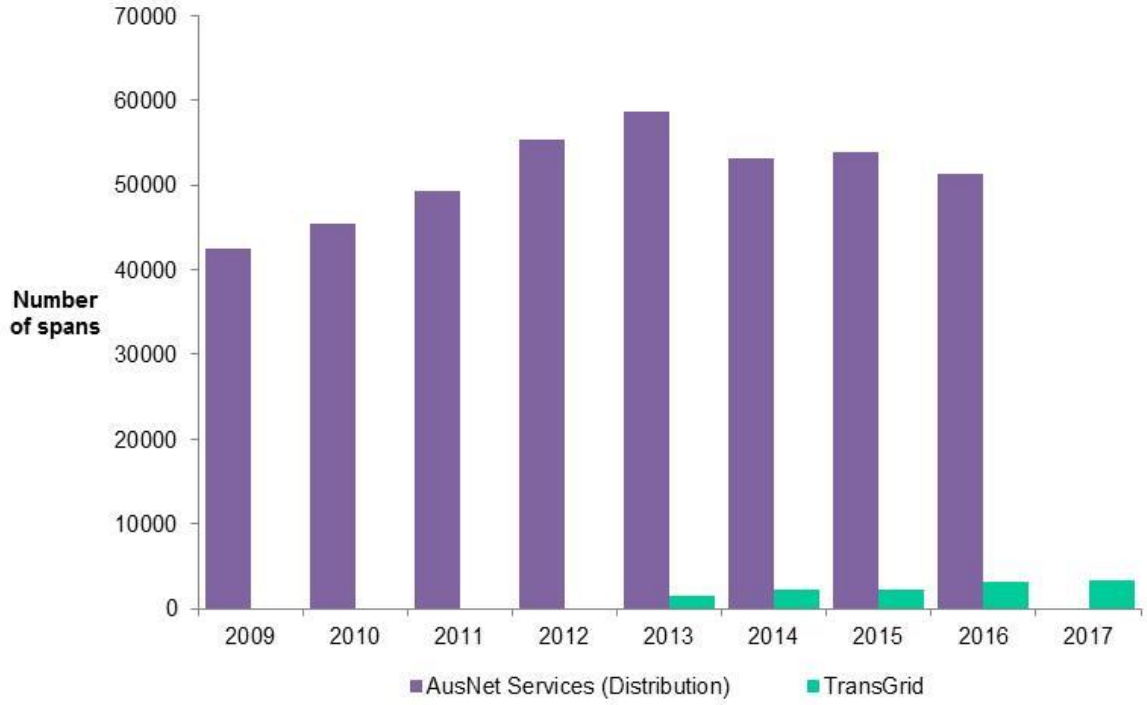
228 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 14.

229 High bushfire risk areas are classified by a person or organisation with appropriate expertise on fire risk (see definition in our EB RIN's).

230 This includes but is not limited to TNSP/DNSP's jurisdictional fire authority, local councils, insurance companies, TNSP/DNSP's consultants, Local fire experts.

231 TransGrid's definition of 'likelihood of consequence' refers to 'full value of the consequence' (i.e. $400 million) (see TransGrid, *Network Asset Criticality Framework, Table 3.1*, January 2017, p. 3).

## Figure 6-11 Terrain factors - Bushfire risk (number of spans)




Source: Economic Benchmarking RIN

In summary, TransGrid has adopted a value of $400 million as the 'consequence of failure' based on a class action settlement involving bushfires related to a distribution network. We are not satisfied that TransGrid's methodology for determining the likelihood of consequence adequately takes this into account. Any further moderation of the potentially inflated 'likelihood of consequence' for a transmission network [232] would also reduce the estimated environmental risk. This suggests that these risks are likely to be overstated, therefore prudent and efficient capex is also likely to be overstated.

*Consequence of failure - Environmental risk*

In its revised proposal, TransGrid stated that: [233]

> …….the *average* [emphasis added] bushfire consequence per transmission line used in the capital expenditure forecast is $2.9 million

TransGrid provided a number of worked examples that demonstrate the inputs it used in its calculation of $2.9 million (see page 6-68) [234]

[232] in the context of a 'Black Saturday' scale of consequence.

[233] TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 39.

[234] TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, pp. 39, 66.

Further, TransGrid stated in its *Network Asset Criticality Framework* that: [235]

> … the 2009 Victorian Bushfires class action settlement has provided a guide to the level of consequence that could result from a catastrophic bushfire. A value of $400,000,000 is therefore nominated for the Bush – Urban Fringe Level [see Table 6-16 below]

### Table 6-16 TransGrid – Community Cost – Bushfire – standard values

| Level | Value |
|---|---|
| Urban | $25,000,000 |
| Bush - remote | $100,000,000 |
| Rural | $100,000,000 |
| Bush - Accessible | $200,000,000 |
| Bush - Urban Fringe[236] | $400,000,000 |

Source: TransGrid, Network Asset Criticality Framework, Table J.9 Community Cost - Bushfire - standard values, p. 23

We note that in order for the 'average' bushfire consequence per transmission line to be $2.9 million, the 'consequence of failure' input used in TransGrid's risk cost calculation must be $400 million (see text box on page 39 of TransGrid's revised proposal). This implies that all transmission lines within TransGrid's transmission network are located within the 'Bush - Urban fringe' zone. This suggests that TransGrid has been applying a $400 million consequence of failure across all of its relevant transmission lines, despite the geographic zoning of the line. This would have the impact of overstating risk costs. This also supports our view that TransGrid's overly conservative use of 'worst case' consequence costs is likely to inflate its estimate of the risk cost and therefore prudent and efficient capex. [237]

In its submission dated 27 April 2018 TransGrid stated that [238]

> By the very nature of a mean (average) value, it cannot also be a 'worst case' value.

TransGrid's statement is not consistent with its consideration that a $400 million (i.e. 'worst case') 'consequence of failure' input is reasonable when calculating the 'average' bushfire consequence per transmission line.

---

[235] TransGrid, *Network Asset Criticality Framework*, p. 23.

[236] TransGrid also appears to have adopted a value of $500 million for some project cost risks.

[237] AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-70.

[238] TransGrid, *Submission on review of TransGrid's revised forecast capital expenditure by EMCa for Bushfire Risk,* 27 April 2018, p. 1.

In its revised proposal TransGrid stated that: [239]

> The AER highlights the use of a 'consequence cost of $400 million based on the Black Saturday bushfire' which is 'likely to inflate the estimate of the risk cost' (Draft Decision 6-70). This conclusion and its basis are not reasonable. The $400 million value is merely a starting point based on a published source (i.e. it is 10% of the Victorian Bushfire Royal Commission's $4bn Black Saturday cost).

And in a further submission dated 27 April 2018 TransGrid stated: [240]

> The Canberra ACT bushfire in 2003 led to an economic bushfire consequence of $765 million ($2016). It is no exaggeration to conclude that a fire start in these areas of the ACT could be catastrophic and far exceed the $100 million consequence suggested by EMCa as well as the $400 million used by TransGrid.

It is important to note that the estimated $4 billion 'Black Saturday' cost stated in the Victorian Bushfire Royal Commission referred to the total cost of the 'Black Saturday' bushfires.[241] The $400 million 'worst case' consequence of failure adopted by TransGrid is reflective of the value of the class action settlement against AusNet Services (Then SP AusNet) specifically.[242] The $765 million value quoted by TransGrid refers to the estimated total cost of the Canberra bushfires (that is, it is comparable to the $4 billion total estimated cost of the 'Black Saturday bushfire' not to the $400 million SP AusNet settlement). As such comparisons relating to the economic consequence of these two bushfire events should not be made using $765 million and $400 million values, given the former reflects the total economic cost of the event and the latter is the value of a related class action settlement. [243]

In principle, as previously discussed, the scale of the 'consequence' must be consistently recognised and applied in both the 'consequence of failure' and 'likelihood of consequence' risk cost parameters. In practice, this means that TransGrid's $400 'consequence of failure' is reflective of a bushfire start resulting in an economic consequence on a scale comparable to the Victorian Black Saturday bushfires.

Based on the evidence, we consider that TransGrid's 'likelihood of consequence' value is likely to be overstated, and that it has not sufficiently moderated its 'worst case' 'consequence of failure' to reflect the likelihood of a worst case consequence occurring.

In summary, we consider that a reasonable estimate of risk would involve either:

---

239 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 39.

240 TransGrid, *Submission on review of TransGrid's revised forecast capital expenditure by EMCa for Bushfire Risk,* 27 April 2018, p. 1.

241 Victorian Bushfires Royal Commission, Final report - Summary, July 2010.

242 The Age, *Black Saturday survivors receive payments totalling $496 million,* March 30 2017.

243 The class action settlement, required SP AusNet to pay $380 million and government agencies to pay $104 million.

- Adopting a $400 million consequence of failure value and sufficiently adjusting (downwards) the likelihood of consequence; or
- Adopting a lower consequence of failure value and determining a more reasonable likelihood of consequence using more robust historical data.

***Reliability risk assumptions***

In our draft decision we raised our concerns that: [244]

- The reliability risks based on the duration of load at risk and the likelihood of consequence for TransGrid's substation projects, [245] secondary systems replacement, and communications projects are likely to be overstated.
- TransGrid's 'likelihood of consequence' [246] resulting from the failure of steel structures within a substation was not credible as it does not appear to be based on any supporting information.[247]

In its revised proposal TransGrid submitted that the effect of load restoration activities has been accounted for in its analysis. In particular, TransGrid stated that it applies an initial (higher) value from the time of the incident until load restoration occurs and, a lower value for the period after load restoration until the repair of the failed equipment. [248]

EMCa concluded that following review of further information, the derivation of reliability risk costs appear reasonable for substation renewal projects. [249] EMCa also concluded on the basis of further information, for the loss of supply of associated with protection systems, the return to service time has been moderated. [250]

However, EMCa concluded that the estimated reliability risk costs for the following systems appear high:

- **415 AC supply system:** Whilst a supply outage is possible from the failure of the 415 AC supply system, the failure of a non-critical power supply at a substation used for lighting and general outlets is unlikely to result in the loss of supply to customers.
- **50V RPS systems:** TransGrid's assumptions of a loss of supply of 150MW for 8 hours at a 'likelihood of consequence' of 1 per cent has not been supported by the evidence and are likely to overstate risk.

---

244 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-73.

245 includes transformer renewals, circuit breaker renewals, 'AC/DC systems'.

246 TransGrid identifies the consequence as the loss of the entire substation for 720 hours (30 days).

247 In EMCa's experience, steel structure failure within substations is rare. To EMCa's knowledge, structure failure causing loss of 1300MW supply for 30 days or anywhere near that has not occurred in Australia.

248 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 72.

249 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 34.

250 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 40.

- **Steelwork or gantry failure:** the loss of load from a substation for 30 days is likely to reflect 'worst case' consequences but is satisfied that the need has been established.
- **Transformer renewal program:** evidence suggests that the average unavailability rate of transformer outages is likely to be overstated such that there is likely to be a reduction in the calculated avoided risk.
- **Protection systems on the 300Kv and 500Kv network:** while the loss of the entire network is a possible outcome for failure of the primary and secondary protection schemes, the likelihood is very low. EMCa also considered that TransGrid has not supported the 'likelihood of consequence' and 'consequence of failure' values used in its risk analysis and alternative assumptions may be applied resulting in lower estimate of reliability risk.

Overall, while TransGrid appears to have addressed some of the issues identified in our draft decision, EMCa's analysis suggests that reliability risks for some projects may be overstated and therefore prudent and efficient capex may be overstated.

***Safety risk input assumptions***

In our draft decision we raised the following concerns:[251]

- TransGrid assumes a 100 per cent likelihood of a fatality in the event of a conductor or structure fails
- TransGrid has applied a 'consequences of failure' value of $10 million based on the value of statistical life (and applied a value of $20 million including legal costs)
- TransGrid did not provide sufficient evidence to support the application of its disproportionality multipliers
- In some instances, TransGrid did not sufficiently justify its use of the 'probability of failure' and 'likelihood of consequence' risk cost parameters, most notably in its proposed substation security projects.

We considered that these issues may overstate safety risk costs therefore, TransGrid's forecast capex was likely to be significantly overstated. [252]

Having reviewed further information provided by TransGrid, we maintain our position that, as per our draft decision, some elements of TransGrid's application of its safety risk cost methodology have led it to overstate risk and therefore to overstate its forecast repex.

---

[251] AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, pp. 6-73, 6-75, 6-79.

[252] AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, pp. 6-75.

*'Likelihood of consequences - fatality'*

In its revised proposal, TransGrid provided two examples of how safety risk cost is moderated - one for substations, and one for transmission lines.[253] In the transmission lines example, TransGrid moderates the 'likelihood of consequence' (i.e. the likelihood of fatality) by considering the likelihood that a member of staff is working on a transmission line in the event of a failure.[254] We are not satisfied that TransGrid has sufficiently moderated its safety risk costs relating to the possibility of a fatality, to allow for hazard zone occupancy. TransGrid has not sufficiently responded to our concern that the 'likelihood of a consequence' (i.e. fatality) in the event of an asset failure would be considerably less than 100 per cent.

EMCa noted that:[255]

> A fatality does not necessarily result from explosive failures in a substation or collapse of a tower or from a dropping conductor. Within a substation, the risk needs to be moderated for example by the probability of a person being within the substation, and then further by the person being within the hazard zone, being in proximity of the equipment whose failure risk is being assessed. Within that hazard zone, there may be a further moderation as to the risk of any injury being fatal. For lines, similar logic applies. The risk is first moderated by the probability that a person is in proximity to the line, and further by the probability that they are sufficiently close to the location of the failure being a structure or conductor, to be at risk. Finally, there may be a further moderation as to the risk of any injury being fatal.

EMCa queried an apparent bias in TransGrid's calculations for lines hazard risks. TransGrid acknowledged that in its revised proposal, it had overstated the fatality risk by failing to properly define the relevant hazard zone.[256] As we stated in our draft decision, we considered a similar issue in our assessment of explosive equipment failure as part of our recent AusNet Services decision. In that case, we moderated AusNet Services' assumption to assume a 17 per cent likelihood of a fatality.[257]

Subsequent to its revised proposal TransGrid also confirmed that it made an error in the application of its safety 'likelihood of consequence' for transmission lines. TransGrid advised that this change results in an $8 million reduction in the risk associated with all transmission line projects.[258] TransGrid advised that only a single proposed project in the transmission lines category was no longer justified as a

---

253 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, Table 4.8, December 2017, pp. 66-67.

254 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, Table 4.8, December 2017, p. 67.

255 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 11.

256 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 15.

257 We note that in that case EMCa considered a 17 per cent Hazard Zone Occupancy rate to be 'conservatively high'.

258 -$6.8 million for the transmission lines low span stage 2, and -$1.1 million for the 330kV line renewal program.

result. [259] However, TransGrid has not addressed our concern that it has not sufficiently moderated its estimate of safety risk to allow for hazard zone occupancy and as such we consider that TransGrid has overstated prudent and efficient costs.

*'Consequences of failure'*

In our draft decision we raised concern that TransGrid had not provided sufficiently compelling information to support its use of a 'consequences of failure' value of $10 million based on the value of statistical life (VoSL). Further, in our draft decision we noted that the safety related costs attributable to transmission lines of $20 million (inclusive of legal costs) were overstated. In response, TransGrid submitted that: [260]

> The AER noted that the modelling for transmission line portfolio applied a total safety consequence cost of $20 million. This analysis correctly used the value of statistical life (VoSL) of $10 million. However, the addition of legal and legislative costs incorrectly brought the total to $20 million; this total should have been $11 million. The correction has been made, however it results in no change to the required investments in the transmission line portfolio.

In its assessment of TransGrid's application of VoSL, EMCa stated that: [261]

> Where safety is a relevant risk, TransGrid used an assumed Value of Statistical Life (VoSL) of $10 million in its RP supporting documentation. In EMCa's initial RP report, we stated our view that TransGrid did not provide sufficiently compelling information to support the use of this figure, and we noted that the report that TransGrid itself had largely relied on provides an Australian VoSL figure of $6.9 million in ($2017). TransGrid reiterates this assumption in its RRP. However, at our onsite, TransGrid stated that it would re-present its proposed program using a VoSL of $6.9 million.

Subsequent to its revised proposal TransGrid provided an updated capex proposal. In that submission TransGrid stated that: [262]

> TransGrid has presented the basis for selecting a value of statistical life (VoSL) of $10 million. While TransGrid believes this is justifiable, EMCa did not believe that there was sufficient compelling information to support this value and instead noted that the mean Australian VoSL was $6.9m.[263] Therefore TransGrid has elected to change the VoSL input parameter from $10 million to $6.9 million.

---

[259] EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 28

[260] TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, Table 4.8, December 2017, p. 77

[261] EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 11

[262] TransGrid, CAM and PTRM update, 21 February 2018

[263] EMCa, *Review of aspects of TransGrid's forecast capital expenditure*, June 2017, p. 20.

As a result of this adjustment, TransGrid proposed a further reduction of $11.5 million to forecast repex.[264] EMCa noted that a $20 million → $11 million adjustment represents a large reduction to the safety related consequence costs. However, TransGrid did not provide information to verify that this has been correctly applied to all affected projects. [265]

*'Disproportionality multipliers'*

In its initial review EMCa concluded, amongst other things, that there was not sufficient evidence to conclude that the disproportionality multipliers are not already considered in TransGrid's selection of worst case consequence costs in its risk analysis; therefore, are likely to result in a bias to overstate the level of risk. [266]

EMCa considered, and we agree, that it was reasonable for TransGrid to include a test to assess whether the cost of the proposed projects was disproportionate to the benefits of conducting the project. [267] However, EMCa noted that the 'as low as reasonably practicable' (ALARP) test indicates that the positive cost benefit is marginal for some line renewal projects when adjusted for the cost of capital and when considered with other risk assumption biases, is likely to result in changing the scope of the proposed expenditure

TransGrid submitted that ALARP multipliers are not considered in the selection of consequence of failure costs, which are moderated prior to the application of ALARP multipliers. [268] However, we agree with EMCa that any ALARP multipliers should only be applied once, and that they should not be inherent in the 'consequence of failure' which may be the case for worst case consequence costs.[269] EMCa considered that changes to the calculation of the ALARP test has the result of requiring higher benefits to justify the project and with these changes a number of transmission line projects are no longer justified.[270] EMCa further noted as an example that 'Line 86' (proposed capex of $74 million) is not justified using either NPV analysis or the ALARP test.

In its revised proposal TransGrid stated that it is required to take all reasonable steps to ensure certain risks are eliminated, or if that is not reasonably practicable, risks be reduced to ALARP. [271] TransGrid submitted that it tests ALARP through the use of disproportionality factors which increase the risk cost consequence in risk analysis. These increase risk consequence costs to just below the level which the community,

---

264 -$10.8 million for the replacement of various circuit breakers, -$0.7 million for the VT renewal program, and -$0.1 million for the CT renewal program.

265 EMCa, *Review of aspects of TransGrid's forecast capital expenditure*, June 2017, p. 28.

266 EMCa, *Review of aspects of TransGrid's forecast capital expenditure 2018-23*, June 2017, p. 59.

267 EMCa, *Review of aspects of TransGrid's forecast capital expenditure*, June 2017, p. 33.

268 EMCa, Review of aspects of TransGrid's revised forecast capital expenditure, March 2018.

269 EMCa, Review of aspects of TransGrid's revised forecast capital expenditure, March 2018.

270 EMCa, Review of aspects of TransGrid's forecast capital expenditure 2018-23, March 2018 p. 28.

271 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, Table 4.8, December 2017, p. 67.

government and law would consider risk reduction expenditure to be 'grossly disproportionate'.[272]

While neither we nor EMCa disputed TransGrid's use of the ALARP methodology, EMCa considered that the cost of capital should be applied when annualising the cost of the investment. In its revised proposal TransGrid submitted that it had corrected its ALARP methodology to include the cost of capital (using 6.75 per cent). TransGrid also submitted that this correction led to the reduction in scope of two projects and a reduction in the replacement expenditure of $0.95 million. [273] Though, EMCa stated that it has not been provided with information to verify that this has been correctly applied to all affected projects.[274]

*'Safety risks associated with security and compliance capex'*

In our draft decision we did not accept TransGrid's proposed security and compliance related expenditure of $54 million. We specifically noted our concerns with TransGrid's application of the 'likelihood of consequence' and the ALARP test in its justification of security and compliance projects.

EMCa noted an apparent discrepancy between statements in TransGrid's revised proposal (following its correction of its ALARP methodology) and in other documentation provided. TransGrid stated that when reapplying the ALARP test using the only one project (1455 – Substation Lighting Replacement) no longer passes the investment criteria. [275] However, TransGrid's revised forecast proposed only a small reduction in the proposed project (from $8.2 million to $8.1 million). [276]

As previously discussed, TransGrid has proposed the removal of one project in relation to security and compliance capex (i.e. a project related to 'low spans' of $6.8 million).

*Conclusion*

In summary, we consider that safety related risk costs are likely to be overstated on the basis that:

- Evidence indicates that the 'likelihood of consequence' risk cost parameter has not been sufficiently moderated for safety related consequences associated with substation asset and transmission line assets.
- TransGrid's application of the disproportionality multipliers to worst case consequence is likely to overstate risks.

---

[272] TransGrid submitted that the disproportionality values it uses were determined through a review of practises and legal interpretations across multiple industries, with particular reference to the work of the UK Health and Safety Executive.

[273] TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 77.

[274] EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 16.

[275] TransGrid, Errors of fact and opinion, in relation to EMCa paragraphs 150 and 151.

[276] TransGrid, *Capital Accumulation Model*, December 2017.

- The revised ALARP methodology that appears to have been applied by TransGrid, requires higher benefits (i.e. project risk costs) to demonstrate that a proposed project is reasonably likely to reflect prudent and efficient costs. As benefits are likely to be overstated, this suggests that prudent and efficient costs haven been overstated.
- The risk analysis is likely to overstate substation security risks associated with personal injury, amongst other risks and is therefore likely to overstate prudent and efficient capex.

***Optimal scope of works and prudent and efficient timing of capex***

In our draft decision we stated that TransGrid's adoption of a risk based methodology, reflects good industry practice. However, EMCa in its assessment of TransGrid's risk based methodology found that: [277]

- there was insufficient justification for all the proposed activity to be undertaken in the 2018-23 regulatory control period:
- it is likely to be prudent and economically efficient for TransGrid to address some risk in the remaining years of the 2015-18 regulatory control period, and some risk after the 2018-23 regulatory control period; and
- for transformer renewal projects a large amount of expenditure appears to be sensitive to the timing.

We also observed that less than one percent of proposed capex has been allocated to projects already underway. [278] This is also the case for TransGrid's revised proposal which indicates that of the $1.56 billion total forecast capex for the 2018-23 regulatory control period, only $11 million (less than one per cent) is allocated to projects that are already under way. We also identified that we raised similar concerns with TransGrid's assessment of prudent and efficient timing prior to the 2014-18 regulatory period. [279]

In its revised proposal TransGrid submitted that it does take into account the optimal timing of investment. In particular, TransGrid stated that it agreed with our draft decision [280] that: [281]

> (t)he economically optimum project implementation time is when the annual risk cost exceeds the annualised cost of avoiding/mitigating the risk."

---

277 EMCa, *Review of AusNet Services Transmission safety risk cost*, April 2017 .

278 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-76.

279 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-48.

280 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-75.

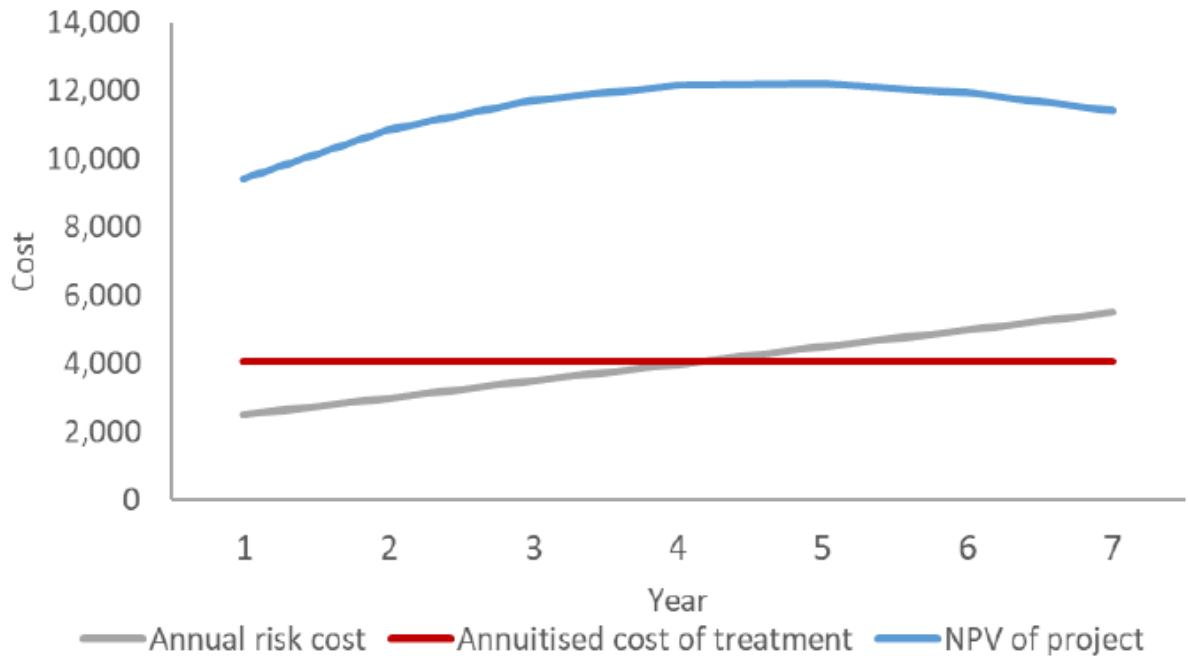
281 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 74.

TransGrid submitted that its approach is not inconsistent with only including replacement projects with a positive net benefit. Further, TransGrid submitted that: [282]

> …each project in the forecast (excluding compliance projects) has a positive net benefit. This indicates that project timing is optimised.

We agree with EMCa that TransGrid has erroneously claimed that, by selecting projects with a positive net present value (NPV), it has optimised their timing.[283] Figure 6-12 (which reproduces Figure 4 in EMCa's report) indicates that the maximum NPV of a project is in year four, where the annual risks cost first exceeds the annualised investment cost. EMCa also highlighted in its illustration of this issue that the project has a positive NPV even if it is undertaken prior to its optimum timing. EMCa also noted that in the example submitted by TransGrid (refer Figure 4.16 in the revised proposal) that the project may have a positive NPV, however; if the project was undertaken prior to year three it would not result in the maximum positive NPV. [284]

### Figure 6-12 EMCa - Illustration of project timing optimisation




Source: EMCa *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 21

EMCa concluded that: [285]

> We reiterate the conclusion from our assessment of TransGrid's RP, that TransGrid has not provided evidence of having optimised the timing of its

[282] TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 74.
[283] EMCa, Review of aspects of TransGrid's forecast capital expenditure 2018-23, June 2017, p. 20.
[284] EMCa, Review of aspects of TransGrid's forecast capital expenditure 2018-23, June 2017, p. 20.
[285] EMCa, Review of aspects of TransGrid's forecast capital expenditure 2018-23, June 2017, p. 20.

> proposed projects. By conflating the inclusion of 'projects with a positive NPV' with a claim that, therefore, those project timings are optimised, TransGrid has not demonstrated that the timing of its proposed work program is justified.

In our draft decision we also raised concerns that the most critical assets may not be targeted for replacement in the capex forecast. In particular, the evidence suggested that this issue is relevant to the following proposed projects/programs:

- replacement of 'Line 86' (proposed capex of $74 million)
- program to replace 132kV wood poles (proposed capex of $70 million)
- program to remove asbestos impregnated paint from towers (proposed capex of $42 million)
- proposed replacement of individual substation systems, where a more comprehensive options analysis would consider partial replacement options, packaging with other works or both
- the scope and volume of transformers is likely to be overstated was not well supported and there may be some scope for deferral of transformer renewal; and
- the proposed scope of secondary stem and substation security projects had not been adequately supported.

In a further submission subsequent to its revised proposal, TransGrid reduced substation project components that were no longer considered to be justified within the 2018-23 regulatory control period. [286] TransGrid also proposed a further reduction of $8.4 million based on identified efficiencies through optimisation of delivery of capital works by bundling design work or site delivery.[287] However, after considering the new information provided by TransGrid in its revised proposal EMCa stated that: [288]

> We have identified opportunities where the scope and timing of projects are not sufficiently justified, including opportunities where work may be reasonably reduced and/or deferred. However, based on the stated condition of TransGrid's transmission line assets, some targeted works would be required to replace any of TransGrid's full-scale projects not undertaken in the next RCP, or which are materially deferred.

EMCa estimated that the scope of projects that may be reduced or deferred comprises approximately 10 per cent of TransGrid's revised expenditure forecast. [289] EMCa reviewed further line condition information to ascertain whether, in its experience, it

---

[286] In February 2018 TransGrid submitted a further revised repex amount of $16.7 million (down from $20.5 million) for its CT Renewal program, $14.4 million (down from $17.7 million) for its VT Renewal program, and $3.7 million (down from $5.5 million) for bushing renewal.

[287] EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 33.

[288] EMCa *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. ii.

[289] EMCa *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 31.

was likely for a prudent network operator to undertake the nominated projects. [290] In relation to the proposed line renewal program, EMCa concluded that:

- For 'Line 86' TransGrid has not provided new information and no compelling evidence has been found for the replacement of the remaining 391 pole structures being the full replacement of the line. [291]
- Evidence in the condition assessment reports for the 330KV line renewal program suggested that the identified condition issues were not widespread and did not require immediate attention. [292] EMCa also concluded that there is also evidence from the condition assessment reports to suggest there is an opportunity to prioritise this work, while other projects are likely to be deferred to the subsequent regulatory control period. [293]
- TransGrid has not adequately explained the rationale for the its proposed 132 kV pole replacement program, which is more than double the number of forecast pole defects.[294]
- The volume of expenditure in the 2018-23 regulatory control period to address 'end of life; renewal of grillage (tower) foundations' for some transmission line structures has not been sufficiently justified .[295]
- For the proposed program related to asbestos impregnated paint remediation, there is an opportunity to prioritise this program to the most critical sites or higher risk sites and adopt other control measures for lower risk sites. This approach is likely to lead to significantly lower capex that is considered to be reflective of prudent and efficient capex. [296]
- For proposed security and substation security projects, based on the stated condition of the assets, a prudent operator would prioritise and undertake some more focused work within the 2018-23 regulatory control period.[297]
- There are opportunities where proposed secondary systems projects may be reasonably reduced and optimisation of the proposed projects may result in a reduced expenditure forecast.[298]

In summary, TransGrid's forecast is likely to be overstated as the evidence suggests that there are opportunities for TransGrid to reduce/modify scope or defer work on some projects, or where further optimisation across the portfolio is likely to result in a

---

290 EMCa *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 28.
291 EMCa *Review of aspects of TransGrid's revised forecast capital expenditure*, April 2018, p. 29.
292 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, 15 March 2018, p. 29.
293 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, 15 March 2018, p. 29.
294 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, 15 March 2018, p. 29.
295 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, 15 March 2018, pp. 30-31.
296 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, 15 March 2018, p. 30.
297 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, 15 March 2018, p. iv.
298 EMCa, *Review of aspects of TransGrid's revised forecast capital expenditure*, 15 March 2018, p. iv.

reduction to the level of expenditure a prudent network operator would require to achieve the capex objectives.

***Expenditure driven by non-condition related drivers***

In our draft decision we identified proposed capex that is driven by non-condition related reasons that was relevant to proposed: [299]

- Substation security projects
- Telecommunication projects.

In our draft decision we considered that TransGrid had not demonstrated the benefits of the additional functionality for some of its proposed projects. TransGrid's revised proposal has reduced the scope of some capex associated with substation security capex (e.g. CCTV system renewal of $3.4 million[300]and reduced capex by $4.9 million associated with its noise compliance program). [301] EMCa considered that TransGrid has not justified additional functionality to substation controls (i.e. qaud lens cameras, infrared cameras and movement activated lighting).[302] TransGrid also removed some of its proposed expenditure in its revised proposal related to transformer replacement driven by noise related obligations and subsequently removed expenditure related to low span obligations.

In our draft decision we noted that TransGrid is implementing a strategy to roll out fibre optic rings for its HV network to be completed in 5-10 years.[303] EMCa noted that TransGrid has included a project to install fibre optic networks (estimated capex of $36.5 million) due to the additional benefits to be realised from system security and capacity of the fibre optic network and not on the basis of avoided risk costs. [304] Subsequent to its revised proposal TransGrid submitted a further revised repex forecast which removed the proposed capex associated with this project. [305] In addition as we stated in our draft decision this program appears to be related to TransGrid's IT/OT integration strategy as part of its proposed non-network capex. [306] TransGrid did not dispute this relationship in its revised proposal between this project and its proposed non-network ICT capex. This suggests that there should also be a consequential reduction in its proposed non-network ICT capex program.

---

299 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-80.

300 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 77.

301 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 77.

302 EMCa *Review of aspects of TransGrid's revised forecast capital expenditure*, 15 March 2018, p. 49.

303 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-80.

304 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-80.

305 In February 2018 TransGrid submitted a further revised repex amount of $0.0 million (down from $36.5 million) for its Installation of Fibre Networks - Phase 2 project.

306 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-80.

### *Unallocated repex*

We did not include TransGrid's proposed $12.9 million for unallocated repex in our draft decision on the basis that we were of the opinion that the tools and equipment, capex already appeared to be allowed for in TransGrid's non-network capex forecast. [307]

TransGrid clarified that the proposed capex of $10 million for tools and equipment does not double count the tools and equipment capex already included in its non-network capex forecast. [308]

We have included the proposed amount in our alternative amount of repex. TransGrid also proposed $2.8 million for additional costs associated with the application of the RIT-T to replacement projects. [309] We have accepted this amount on the basis that the proposed capex is comparable to opex for these costs submitted by ElectraNet. [310] While these costs may be better characterised as opex, we are satisfied that the application of a RIT-T to replacement costs represents a new regulatory obligation resulting in an increase in costs above business as usual costs.

---

[307] AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-81.

[308] TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 81.

[309] TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 80.

[310] ElectraNet, *Revenue Proposal Overview 2019 - 2023*, 28 March 2017, pp. 57-62.

## A.4 Forecast non-network capex

The proposed non-network capex for TransGrid includes expenditure on information and communications technology (ICT), buildings and property, motor vehicles, and tools and equipment.

### A.4.1 Position

We do not accept TransGrid's revised non-network capex forecast of $157.9 million. We have instead included an alternative forecast of $140.1 million for non-network capex into our alternative overall capex. Our alternative forecast is $17.8 million (11 per cent) lower than the amount proposed by TransGrid in its revised proposal, but 2 per cent higher than our draft decision.

Table 6-17 summarises TransGrid's revised proposal and our alternative estimate for non-network capex.

**Table 6-17 AER final decision on TransGrid's total forecast non-network capex ($2017/18 million)**

| | 2018–19 | 2019-20 | 2020–21 | 2021–22 | 2022–23 | Total |
|---|---|---|---|---|---|---|
| TransGrid's revised proposal | 40.2 | 41.8 | 19.0 | 29.4 | 27.6 | 157.9 |
| **AER final decision** | **35.2** | **36.8** | **17.7** | **25.9** | **24.5** | **140.1** |
| Total adjustment ($) | -5.0 | -5.0 | -1.3 | -3.5 | -3.1 | -17.9 |
| Total adjustment (%) | -12% | -12% | -7% | -12% | -11% | -11% |

Source: AER analysis.

Note: Numbers may not add up due to rounding.

We are satisfied that our alternative forecast for non-network capex reasonably reflects prudent and efficient capex. In coming to this conclusion, we considered:

- TransGrid revised proposal which has not addressed the key concerns we raised within our draft decision; and
- Stakeholder submissions.

Our assessment of TransGrid's revised non-network ICT proposal is outlined below.

We have accepted TransGrid's revised forecast expenditure for the remaining categories of non-network capex for the reasons outlined in our draft decision.[311]

### A.4.2 TransGrid revised proposal

We do not accept TransGrid's revised non-network ICT forecast of $102.2 million. We have instead included an alternative forecast of $84.3 million for non-network ICT into our alternative overall capex. Our alternative forecast is $17.9 million (17 per cent) lower than the amount proposed by TransGrid in its revised proposal (refer to Table 6-18). We are satisfied that our alternative forecast for ICT capex reasonably reflects prudent and efficient capex.

**Table 6-18 TransGrid's revised non-network ICT capex forecast ($2017/18 million)**

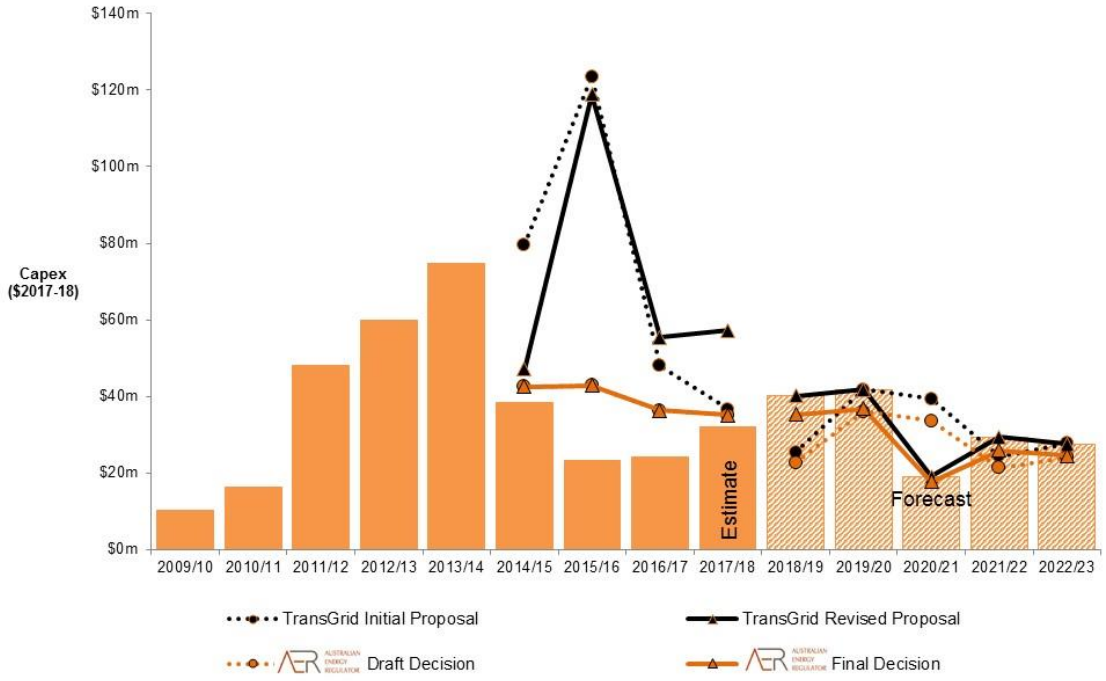
| | 2018–19 | 2019-20 | 2020–21 | 2021–22 | 2022–23 | Total |
|---|---|---|---|---|---|---|
| TransGrid's revised proposal | 28.6 | 28.5 | 7.7 | 20.0 | 17.5 | 102.2 |
| **AER final decision** | **23.6** | **23.5** | **6.3** | **16.5** | **14.5** | **84.3** |
| Total adjustment ($) | -5.0 | -5.0 | -1.3 | -3.5 | -3.1 | -17.9 |
| Total adjustment (%) | -17% | -18% | -18% | -18% | -18% | -17% |

Source: AER analysis.

Note: Numbers may not add up due to rounding.

[311] AER, Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure, September 2017, pp. 6-82 to 6-95.

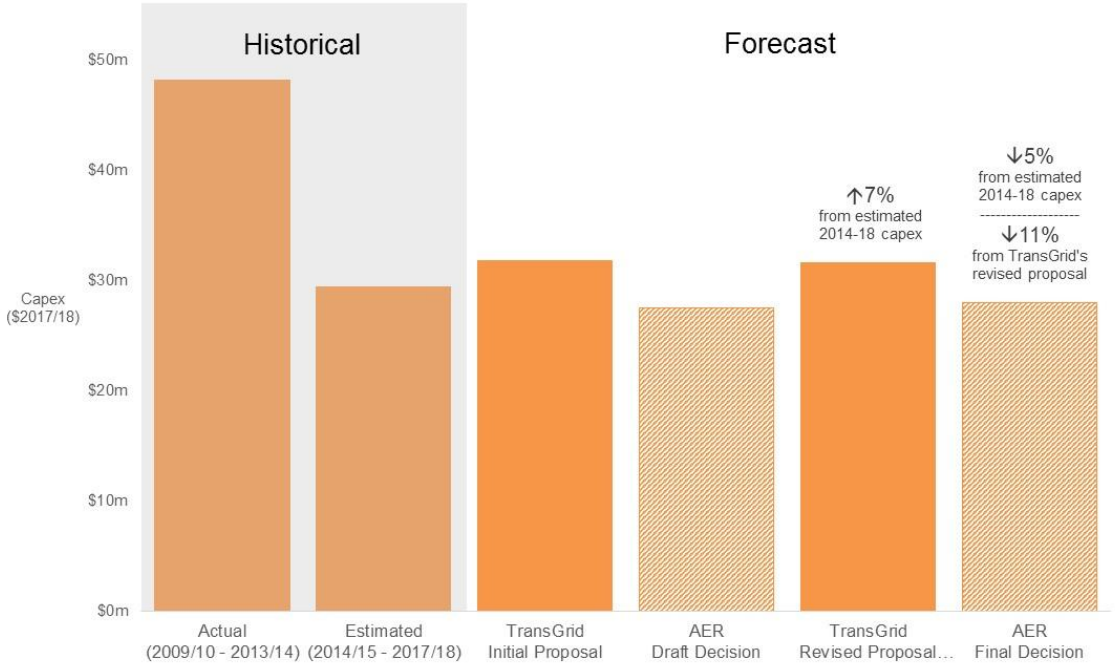
## Figure 6-13 TransGrid's historical and forecast non-network capex (inc. overheads) ($2017/18 million)




Source: AER analysis.

Figure 6-14 below shows that TransGrid has forecast spending seven per cent more on ICT related capex over the 2018-23 regulatory control period than it is expecting to spend over the 2014-18 regulatory period.

## Figure 6-14 TransGrid's annualised historical and forecast non-network capex (inc. overheads) ($2017/18 million)




Source: AER analysis.

TransGrid's revised ICT capex forecast includes the same programs it proposed in its initial proposal. However, these programs (with the exception of the 'Corporate Data Network Refresh' program) have been resubmitted with changes to the forecast costs and/or scope. In particular, in its revised proposal, TransGrid reduced the capex forecast for four programs by $7 million; but these reductions were largely offset by higher forecasts for three programs totalling $6.3 million.

TransGrid's revised proposal for each project is summarised in Table 6-19.

## Table 6-19 TransGrid's changes to proposed ICT programs ($2017/18 million)

| Program | Updated Estimate | Change | Reason |
|---|---|---|---|
| Digital Enterprise | 38.5 | +1.3 | Forecast ERP implementation cost reduced slightly following recent market analysis. The integration platform scope was transferred in to better align the work program.<br>Scope items transferred to Information Infrastructure Refresh for greater program alignment |
| Digital Field Force | 6.3 | -2.6 | Efficiency-driven scope items have been removed |

| | | | |
|---|---|---|---|
| Intelligent Operations Centre | 7.3 | -3.1 | Integration platform scope transferred to Digital Enterprise<br>"Asset monitoring and predictive analytics" items (previously based on efficiency savings) were removed |
| Intelligent Asset Design | 2.6 | -0.5 | Efficiency-driven scope items have been removed |
| Pervasive Security | 10.1 | +2.5 | Increase to support data protection license requirements |
| Enterprise Analytics Platform | 7.6 | -0.8 | Efficiency-driven "KPI dashboards" scope was removed<br>Following updated market analysis implementation costs for enterprise content management increased slightly |
| Information Infrastructure Refresh | 18.1 | +2.5 | Scope items on power system analysis, workflow management and integrated service delivery added for greater program alignment |
| Corporate Data Network Refresh | 11.6 | - | No change |

Source: TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 94

In support of its revised proposal, TransGrid provided an updated 'investment analysis approach for the IT portfolio'. TransGrid submitted that its updated approach:[312]

- Uses a new risk model which is more appropriately aligned to IT requirements and is more transparent for a reviewer.
- Includes options analysis for all programs. This now includes consideration of a base case (replacing asset as planned), a two year delay before replacement (i.e., a life extension) and a five year delay before replacement.
- Includes updated risk assumptions, including the removal of efficiency benefits and revised risk impacts which the AER was concerned might be double counted.

TransGrid submitted that for all programs, the option to replace as proposed yielded the highest NPV and thus was the preferred option.[313]

### A.4.3 AER non-network ICT capex findings

We are not satisfied that TransGrid's ICT capex forecast of $102.2 million is reasonably likely to reflect the capex criteria.[314] We have instead included an alternative forecast of $84.3 million for ICT capex into our alternative overall capex.

312 TransGrid, *Revised Revenue Proposal 2018/19 - 2022/23*, December 2017, p. 93.
313 TransGrid, *OER 000W Information Technology*, December 2017.
314 NER, cl. 6A.14.1(2)(ii), NER, cl. 6A.6.7(c), NEL, s.7 and s.7A.

Our alternative forecast is $17.9 million (17 per cent) lower than the amount proposed by TransGrid in its revised proposal. We are satisfied that our alternative amount reasonably reflects the capex criteria. In coming to this view, we had regard to:

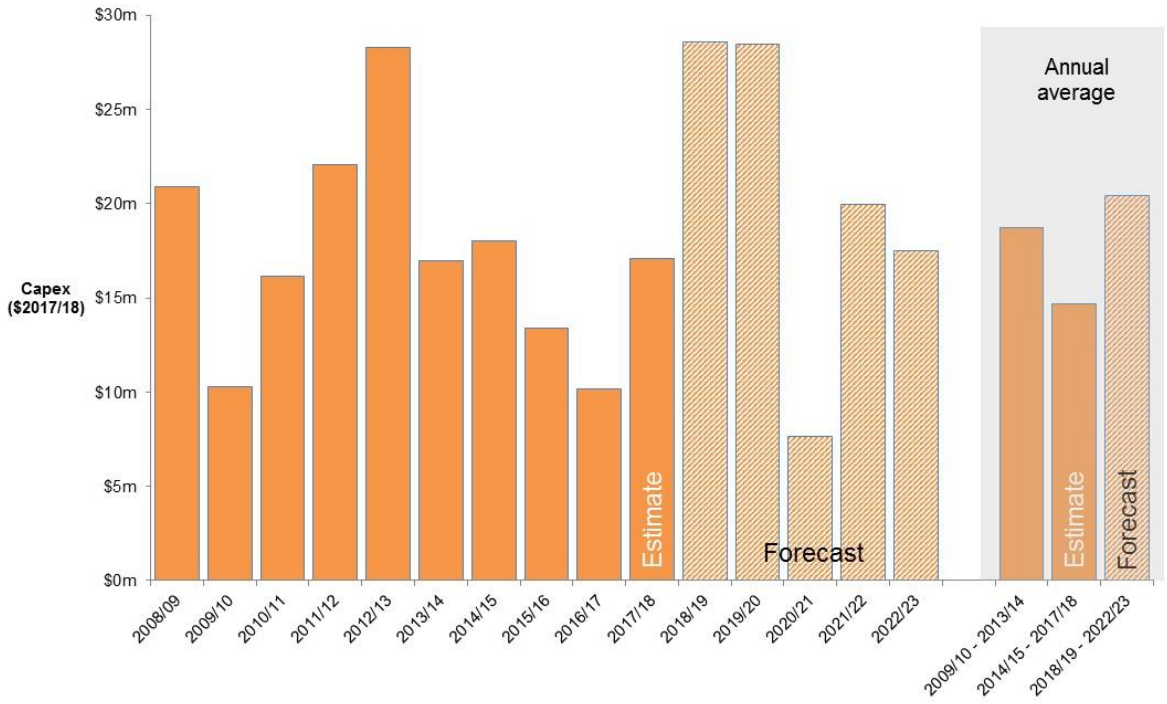
- trend analysis, comparing past trends in total actual and forecast capex for the proposed non-network driven capex programs[315]
- a methodology review of TransGrid's 's expenditure forecasting methodology, including key inputs and assumptions; and
- stakeholder submissions.

Our reasons are discussed below.

## Comparison of forecast expenditure to past expenditure

Figure 6-15 compares TransGrid's actual and estimated historical ICT capex with its revised forecast ICT capex over the 2018-23 regulatory control period.

### Figure 6-15 TransGrid's historical and forecast non-network ICT capex (inc. overheads) ($2017/18 million)




Source: TransGrid, *Capital Accumulation Model*, December 2017; TransGrid, *RIN responses.*

315 NER, cl. 6.5.7(e)(5).

As shown in Figure 6-15, TransGrid's forecast non-network ICT capex is $3.5 million (or 21 per cent) higher than its estimated non-network ICT expenditure over the previous two regulatory periods.

TransGrid submitted that in regard to its proposed ICT program, the past is not a predicator for the future.[316] In particular, TransGrid submitted that this is because actual expenditure does not consider the cancellation of the planned 'ERP' upgrade in 2016 and that: [317]

- The underlying assumption in using historical expenditure is that the required capabilities and demand for IT services will be static over the next regulatory period. This is not the case for TransGrid. TransGrid submitted that the changing nature and role of technology in the business is leading to demand for new services as a result of the:
    - cybersecurity threat is increasing and likely to continue to do so over the foreseeable future requiring additional investment to counter the threat
    - need to collect, consume and analyse more and more operational technology information to guide better asset management, operational and financial decisions, and to respond to requests for information (RINs)
    - need to provide enhanced and extended IT services to field based staff.

We acknowledge that the cancellation of the ERP upgrade during the 2014-18 regulatory period is a contributing factor to TransGrid's ICT capex forecast for the 2018-23 regulatory control period. However, we also recognise that an ERP upgrade was also implemented during the 2009-14 regulatory control period, and that TransGrid's actual ICT capex during 2009-14 regulatory control period was eight per cent lower than its forecast for the 2018-23 regulatory control period.

Further, where TransGrid has proposed capex associated with enhancements and capability upgrades to its ICT portfolio, we expect this capex to be supported by a business case. TransGrid initially submitted that approximately 30 per cent of its capex forecast was related to enhancements or added capability.[318] As part of our draft decision, we expressed concern that TransGrid had not demonstrated that this expenditure was required to meet the capex criteria.

We have reviewed the updated information provided by TransGrid in support of its revised proposal, including any further supporting information used to support the assumptions used in its project risk cost analysis.

Our assessment is discussed below.

---

316 TransGrid, *EMCa TransGrid Response*, 23 August 2017, p. 3.

317 TransGrid, *EMCa TransGrid Response*, 23 August 2017, p. 3.

318 TransGrid, *Regulatory Proposal Regulatory Information Notice, Template 2.6*, January 2017.

## Methodology review (business case review)

We reviewed the following supporting information provided by TransGrid in its revised proposal:

- updated risk model [319]
- revised Options Evaluation Reports [320]
- TransGrid's response to the EMCa report [321]; and
- TransGrid's responses to AER information requests.

Overall, we are not satisfied that TransGrid has addressed the concerns we raised in our draft decision. We have reached this view on the basis that TransGrid's revised proposal:

- Did not provided sufficient options analysis
- Did not provide sufficient information to support the assumed risk cost parameters
- Bundled risk assessments together for individual projects; and
- Provided no further information to support the proposed capability improvement, including the IT/OT integration strategy.

Our assessment of these issues is discussed below.

**Insufficient options analysis**

TransGrid revised its options analysis to address our concern that the 'do nothing' investment scenario used in its risk analysis is likely to bias investment decisions towards its preferred option.

We are not satisfied that the revised options analysis has addressed these concerns. In particular, while TransGrid has revised its options analysis to now include options for a delay in the retirement of assets and new investment, TransGrid has also included an assumption of an increase in replacement costs for the delayed investment. However, TransGrid did not provide information to support its assumptions regarding the cost of investment deferral. TransGrid's analysis assumed that deferral will lead to higher project costs than the immediate replacement option.[322] In particular, TransGrid assumed a 50 per cent increase in labour costs arising from a two year deferral and a 100 per cent increase from a five year deferral. In the case of the 'Digital Enterprise', 'Intelligent Operations Centre' and 'Pervasive Security' programs, TransGrid's analysis assumed the same assumed percentage increases to the entire project cost (i.e. both material and labour costs). TransGrid provided no basis for these assumptions. We

---

319 TransGrid, *IT Program Risk Calculation Spreadsheet*, December 2017.

320 TransGrid, *OER 000W Information Technology*, December 2017.

321 TransGrid, *EMCa TransGrid Response*, 23 August 2017.

322 TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p. 93.

also are not satisfied that such increases in project costs are likely to reflect realistic input cost assumptions. JWH Consulting submitted that:[323]

> The projects do not consider that in IT if you delay a project by 2 years the cost will reduce and productivity of the devices will increase making it a real tradeoff between implementing at end of life and waiting for the next generation of products.

And [324]

> I think TransGrid has not fundamentally changed its evaluation process but rather created a more impressive evaluation process to justify the original forecast.

As such, we maintain our view that TransGrid's options analysis is likely to bias the analysis towards its preferred replacement option, such that TransGrid's ICT forecast is likely to overstate prudent and efficient costs.

We are also concerned that TransGrid's analysis does not appear to consider the optimal timing of a project. This is because even if the option of a two or five year deferral of investment yields a lower NPV than the immediate investment option, the deferral of investment by one, three, four or possibly more years may not yield a lower NPV. A more comprehensive options analysis may identify projects that may be more efficiently deferred into the following regulatory control period.

In summary, we are not satisfied that TransGrid's revised options analysis has addressed the concerns we identified in our draft decision on the basis that:

- the options analysis assumes that deferral of investment will lead to higher project costs which is not supported (i.e. advice to the ECA suggests that costs may reduce over time); [325]and
- the options analysis may not be sufficiently comprehensive to ensure the optimal timing of reinvestment.

**Limited information to support risk cost parameters**

We are not satisfied that TransGrid's revised proposal has sufficiently demonstrated that its assumed risk costs are realistic. As discussed in our draft decision, without evidence to demonstrate that TransGrid's risk cost parameters are reasonable, we are not satisfied that its risk analysis supports its proposed capex.

In particular, TransGrid did not demonstrate that assumed probability of failure rates are realistic. EMCa also raised this issue in its assessment of TransGrid's initial proposal.[326] TransGrid did not provide evidence to support its assumed asset failure

---

323 ECA, *Submission on TransGrid's revised proposal - Attachment 1 JWH Consulting Report*, 11 January 2018, p. 12.
324 ECA, *Submission on TransGrid's revised proposal - Attachment 1 JWH Consulting Report*, 11 January 2018, p. 12.
325 ECA, *Submission on TransGrid's revised proposal - Attachment 1 JWH Consulting Report*, 11 January 2018, p. 12.
326 EMCa, *Review of aspects of TransGrid's forecast capital expenditure*, June 2017, p. 90.

rates, such as historical failure rates or an explanation to verify that these rates are reasonable.

TransGrid, in its revised proposal adjusted its assumptions regarding the probability of failure while assets are within vendor support. We consider these adjusted assumptions reflect a more realistic approach to estimating the probability of failure. However, TransGrid's revised approach still assumes in some cases rapid increases in the probability of failure after the assumed end of life or loss of vendor support (e.g. this rate increases from 4 per cent → 40 per cent for software components of the 'Information Infrastructure Refresh' program).[327] As mentioned in our draft decision and by EMCa, TransGrid has not provided evidence supporting the rapid increases in probability of failure. We do not consider that TransGrid has addressed our concern that the probability of failure used in its risk analysis is likely to reflect a realistic input to derive project risk costs.

TransGrid has also not addressed our concern that vendor agreements have informed past replacement practices and guided TransGrid's project risk cost estimates for the 'Information Infrastructure Refresh' project, rather than historical experience. We raised this issue as vendor agreement periods may not be related to the condition of the asset and therefore may not be a reasonable basis for estimating likely asset failure. EMCa also raised concerns that vendor support agreements to guide forecast replacement practices was unsupported.[328]

Similarly, TransGrid provided no evidence in support of its assumed likelihood of consequence or consequence of failure parameters in its risk analysis. We consider that in the absence of any evidence, TransGrid has not addressed EMCa and our concerns such that these risk parameter assumptions remain unsupported. JWH Consulting also commented that:[329]

> The annual risk cost during the delay period is not well justified.

In the absence of such supporting information we are not satisfied with the project risk cost assumptions support the forecast capex. To the extent that these project risk costs are overstated, the cost of investment deferral will be overstated and therefore prudent and efficient costs also be overstated.

**Bundling of risk assessments**

In our draft decision, we expressed concern that TransGrid had bundled a number of ICT asset replacement activities into single program assessments.[330] We raised this issue as different assets will likely have different risk profiles. As such TransGrid's risk analysis did not consider individual asset replacement assets on a standalone basis in

---

327 TransGrid, *IT Program Risk Calculation Spreadsheet*, December 2017.

328 EMCa, *Review of aspects of TransGrid's forecast capital expenditure*, June 2017, p. 88.

329 ECA, *Submission on TransGrid's revised proposal - Attachment 1 JWH Consulting Report*, 11 January 2018, p. 12.

330 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-90.

terms of the risk of the failure of individual assets and the relationship to its specific replacement cost. We acknowledge that TransGrid has now provided estimates of the risk costs for individual components of programs in response to our draft decision.[331]

However, TransGrid's revised approach aggregated the individual assets risk cost to obtain the risk cost of the overall program. TransGrid then appeared to use this as an input into the calculation of the entire projects NPV (together with the entire program's capex cost). We refer to our specific concern regarding the bundling of risk assessments that we identified with TransGrid's initial proposal:[332]

> As there is likely large variability between assets in terms of their risk profile (PoF, LoC and CoF), there will likely be large differences between the ratio of a particular assets within each project risk to its replacement cost. **Hence, it is possible that were the replacement of each asset analysed individually, some would not yield a positive NPV (given its own cost to risk ratio)**. [Added emphasis]

While TransGrid's revised methodology considers the variation in risk within each of its individual ICT capex programs, it does not consider how this level of risk compares to its corresponding replacement cost. Showing that immediate replacement is the preferred option for a group of individual assets does not provide evidence that each individual program requires immediate replacement. We therefore maintain that if the replacement of each component was considered on their own, it is possible the immediate investment option may not yield the highest NPV. In its revised proposal TransGrid has not satisfactorily addressed the concerns expressed in our draft determination that proposed capex is likely to be overstated based on the bundling of individual assets within a broader ICT program.

**Improved ICT capability and IT/OT integration strategy**

In our draft decision, we observed that TransGrid submitted that approximately 30 per cent of its non-network ICT capex proposal is related to enhancements or extending the capability of assets.[333] We also stated that in relation to its plan for the integration of IT and OT TransGrid has not evidenced:[334]

- whether there are likely to be benefits of this shift in strategy; and therefore
- whether the proposed scope of the proposed ICT capex reasonably reflect prudent and efficient costs.

---

331 TransGrid, *OER 000W Information Technology*, December 2017.

332 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-91.

333 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-92.

334 AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, pp. 6-91 to 6-93.

TransGrid's revised proposal did not provide any further information that the additional costs of the added ICT capability are expected to outweigh benefits, including the benefits on the IT/OT convergence strategy. The improved ICT capability or the IT/OT convergence strategy has not been demonstrated to be prudent and efficient.

We observe that in its revised proposal TransGrid has removed some expenditure it initially proposed to deliver 'efficiency benefits'.[335] We estimate that this has resulted in a reduction of approximately $3.9 million to forecast capex. However, as noted in our draft decision,[336] TransGrid originally submitted that approximately 30 per cent (or $30.7 million) of its non-network ICT capex proposal was related to enhancements or extending the capability of assets. This indicates that there is still a material amount of capex included in TransGrid's revised proposal associated with capability improvements and the IT/OT strategy. In the absence of supporting information to demonstrate this strategy provides net benefits to customers, we are not satisfied that the forecast ICT capex is reasonably required to meet the capex criteria.

Finally, in our draft decision we noted that that there are likely to inter-relationships between the forecast non-network capex and aspects of its non-load driven capex. In particular, the non-network capex program is related to two communications repex projects, including the S*DH Network Connection and Installation of Fibre Networks (Phase 2)* project. TransGrid has now removed the Installation of Fibre Networks (Phase 2) project from its revised repex forecast. As we noted in our draft decision, TransGrid had included this program as part of a broader 'Digital Network' program related to the IT/OT convergence identified in TransGrid's IT strategy. The removal of this project from the repex forecast, suggests there may be further reductions in TransGrid's non-network ICT forecast.

## Conclusion

In summary, we consider that TransGrid has not addressed our concerns from our draft decision. Thus we are not satisfied that TransGrid has demonstrated that its non-network ICT forecast of $102.2 million reasonably reflects prudent and efficient costs on the basis that:

- The options analysis provided was not sufficient:
    - It was assumed deferral would lead to large increases in project costs and this assumption was not supported; and
    - The options analysis did not demonstrate optimal timing.
- The risk costs parameters were not justified:
    - No evidence was provided in support of chosen probability of failure (PoF), likelihood of consequence or cost of failure.

---

[335] TransGrid, *Revised revenue proposal 2018/19 - 2022/23, December 2017,* p. 93.

[336] AER, *Draft decision - TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure*, September 2017, p. 6-92.

    - No evidence was provided in support of rapid increase in PoF post 'standard asset life' or vendor support

- The risk assessment 'bundled' assets instead of assessing the replacement of individual components such that capex associated with some assets may not be prudent and efficient.
- No supporting information was provided in support of the IT/OT convergence strategy or improved capability, as such capex associated with ICT improvements and enhancements has not been demonstrated to meet the capex criteria.

Overall we have included an additional $2.5 million required to meet new regulatory obligations associated with TransGrid's Licence Conditions that was not considered at the time of our draft decision. We have also recognised the additional opex costs associated with these new Licence obligations (refer to section 2.5 of the final decision Overview). Our final decision after taking into account these additional costs has included an amount of $84.3 million for non-network ICT capex over the 2018-23 regulatory period. This is on average $16.9 million per year which is higher than the average actual annual expenditure over the past two regulatory periods of $16.1 million. We are satisfied that our alternative estimate reasonably reflects prudent and efficient costs.

# B Assessment of the Powering Sydney's Future project

TransGrid has proposed $252 million for the Powering Sydney's Future project (the project). The project involves the supply of electricity to customers in the Sydney inner-metro and CBD areas. TransGrid is seeking to address the expected reliability of future supply by installing new transmission assets within the 2018-23 regulatory period. This will include installing one 330kV underground circuit and provision for a second circuit in the future. TransGrid and Ausgrid are jointly planning this project and have finalised a Regulatory Investment Test for Transmission (RIT-T) process.

TransGrid expects a mix of rising demand and falling cable reliability will increase the risk of unserved energy in the future.[337] TransGrid considers that installing new transmission cables will reduce this risk. The project will also allow Ausgrid to retire some of its older cables, leading to a reduction in maintenance and environmental costs. TransGrid submitted these benefits will outweigh the cost of the project. It also submitted that the project timing will deliver the greatest net benefit of all realistic options considered in its RIT-T.[338]

## B.5 Position

We apply the criteria set out in the NER in assessing TransGrid's proposed capex forecast. We are satisfied that including $235 million of capex related to the Powering Sydney's future project (the project) in our alternative estimate of capex reasonably reflects the capex criteria, and are not satisfied that the $252 million proposed by TransGrid reasonably reflects those criteria. Our reasoning is set out below.

We considered the efficient scope and cost of the project, along with the proposed timing of the capex. While we are reasonably satisfied that the timing and scope of the project are prudent and efficient, we are not satisfied that the proposed cost of $252 million is reasonable. In particular, the proposed cost of the project includes a number of allowances for uncertainties that are likely to over-state the efficient cost.

TransGrid initially proposed a dual circuit line, which it then revised to a lower cost single circuit. The cost forecasts in this decision make provision for the installation of extra cable ducts and other supporting assets. These would allow TransGrid to install a second circuit at a lower cost with less construction time, should it be required in a future regulatory control period. If TransGrid considers there is a need for a second circuit in a future proposal, we will make a decision based on the information available at the time. In this event, we would expect that TransGrid would carry out a RIT-T to, among other things:

---

337 TransGrid, Revised revenue proposal, December 2017, p. 51.

338 TransGrid, Revised revenue proposal, December 2017, p. 60.

- demonstrate the economic justification for further investment
- consult with stakeholders and
- test non-network alternatives to the investment.

Stakeholders supported the need for the project but submitted that, should the AER include the project in its alternative estimate of capex, TransGrid should not benefit from inefficient deferral of the project costs. In response to this concern, TransGrid has agreed to the establishment of a stakeholder monitoring committee. The committee will meet with TransGrid to regularly review project costs and timing. Where it is agreed that the project can be deferred or substantially reduced in scope the financial benefits would be passed through to consumers in full. This approach is consistent with the capital expenditure sharing scheme (the CESS), where in certain circumstances the CESS payments may be adjusted to remove any benefits from the deferral of a project which is subsequently included in the capex forecast at the next regulatory control period.

## B.6 Background and summary of decision

TransGrid and Ausgrid have forecast a mix of rising demand and falling cable reliability in inner-Sydney will increase the risk of unserved energy in the future. TransGrid considered that installing new transmission cables will reduce this risk. The project will also allow Ausgrid to retire some of its older cables, leading to a reduction in its maintenance and environmental costs.

TransGrid carried out a RIT-T process to identify solutions and recommend an approach to the rising risk associated with the transmission cables supplying the inner-Sydney area. We assessed this proposal in our draft decision. While we agreed that new 330kv circuits were likely to be required at some stage in the future, we were not satisfied that the assumptions used in TransGrid's economic model were reasonable. Based on this, we considered:[339]

- the optimal timing of the project was likely to be later than TransGrid's proposal; and
- suggested that TransGrid may consider proposing a contingent project to manage reliability risk that may arise in the regulatory control period.

TransGrid finalised its RIT-T after we published our draft decision.[340] The revised proposal reflects the preferred investment option identified in the final RIT-T. TransGrid reduced the scope of the project over the 2018-23 regulatory control period. TransGrid's revised proposal includes the installation of a single circuit, and installing an extra set of ducts that allow for a second circuit in the future.[341] The ducts would

[339] AER, Draft decision, TransGrid, attachment 6, September 2017, pp.4, 96.

[340] TransGrid, RIT-T, Project Assessment Conclusions Report, Powering Sydney's Future, November 2017.

[341] TransGrid, Revised revenue proposal, December 2017, p. 60.

allow TransGrid to install a second circuit in a shorter timeframe should this become necessary.

In response to our draft decision, TransGrid updated its economic analysis in its revised proposal.[342] TransGrid (and Ausgrid) adopted the AER's approach to calculating a key network reliability input assumption[343], though they also updated the underlying data.[344] TransGrid also adopted new analysis to test the sensitivity of its model, where it moved 40 per cent of predicted cable outages away from the summer peak period. These changes had the effect of lowering the estimate of unserved energy. We have reviewed TransGrid's revised proposal for the project.

As discussed below, stakeholders expressed differing views in their support of various elements of the project. However, based on further information provided by TransGrid following the draft decision, further analysis by us and independent advice, we are satisfied the timing and scope of the project are likely to be prudent and efficient.

We are not satisfied however, that TransGrid's forecast reasonably reflects prudent and efficient costs. We are satisfied an amount of $235 million rather than $252 is likely to reasonably reflect prudent and efficient cost, and is in the long-term interests of consumers. While we remain concerned that some of TransGrid's modelling assumptions may be upwardly conservative, our alternative modelling of more realistic assumptions does not ultimately alter the optimal timing of the project.

TransGrid and interested parties engaged further on this project in response to our draft decision.[345] Following this, interested parties expressed their view that should the AER include the project in its alternative estimate of capex, TransGrid should not benefit from any inefficient deferral of the project costs. In response to this concern, TransGrid has agreed to the establishment of a stakeholder monitoring committee. The committee will meet with TransGrid to regularly review project costs and timing. Where it is agreed that the project can be deferred or substantially reduced in scope the financial benefits would be passed through to consumers in full.

This approach is consistent with the capital expenditure sharing scheme (the CESS). Under the CESS, in certain circumstances, material cost reductions that are achieved by deferring capital expenditure do not attract a CESS payment in the next period (specifically, they are not included in any positive carryover amounts in the following

---

342 TransGrid, Revised revenue proposal, December 2017, p. 58.

343 TransGrid and Ausgrid adopted a weighted average approach to finding mean cable repair time (mean time to repair or MTTR). This is an important input to cable reliability, as it is used to determine how long a cable will be out of service when it experiences an outage.

344 Ausgrid provided a list of different repairs required on its cables before the draft decision. We used this to find a weighted average MTTR. Ausgrid updated this data after our draft decision, moving a number of events that did not require repairs into categories requiring repair. This increased the weighted average MTTR.

345 A stakeholder forum was held on 19 March 2018, attended by TransGrid, AER staff, Energy Consumers Australia, Public Interest Advocacy Group, Consumer challenge panel 9, City of Sydney, Australian Industry Group, Sydney Business Chamber.

regulatory control period). For example, cost reductions because of project delays such as planning approvals or land acquisitions do not reflect business efficiencies.

Notwithstanding the fact that this came very late in the process, TransGrid's engagement with its stakeholders in this area was a welcomed step towards a more collaborate approach to achieving positive outcomes for consumers.

## B.7 Comments on TransGrid's engagement with the AER

TransGrid has based its RIT-T on an economic assessment of the project. TransGrid's RIT-T shows significant benefits in undertaking the project that exceed its estimated cost. It calculated these benefits using a series of complex models, including:

- unserved energy modelling
- cable unavailability modelling
- capacity modelling; and
- future demand modelling.

Through the RIT-T consultation, stakeholders had access to a high-level summary of the output of TransGrid's modelling and descriptions of how the modelling functioned. However, stakeholders were not able to access the inputs and assumptions used to estimate cable unavailability, particularly the:

- regression analysis used to predict future repair rate; and
- method and inputs used to calculate the average repair time.

TransGrid and Ausgrid claimed confidentiality over these models, and did not make them available to interested parties.

TransGrid and Ausgrid did not make these models available to the AER as part of its initial or revised proposals. These models were necessary for us to conduct a robust and detailed assessment of the inputs to TransGrid's cost benefit model. As a result we had to rely on issuing a number of formal information requests which ultimately afforded us less time for analysis and consultation.

Overall, we consider that stakeholders (and their advisers) were not in a position to adequately scrutinise the benefits and costs of the project, and were not well placed to make an informed view based on all the information on the overall reasonableness of the costs and benefits of the proposed project.

We would expect any future RIT-T of this scale that relies on an economic assessment that TransGrid should share the majority of supporting information and modelling with the AER and interested parties. This will allow the regulator and stakeholders to scrutinise the costs and benefits associated with the project. This would give customers confidence that the proposal is in their long-term interest. It would also provide the opportunity for independent verification of the inputs. We consider this appropriate, given consumers are bearing the cost of these investments. In the context

of revenue proposals, we also encourage TransGrid to engage with stakeholders and us early on large complex projects.

We acknowledge that TransGrid's engagement with consumer groups at the consumer forum later in the process represented a positive development and welcome this more collaborative approach to consultation.

## B.8 Changes from the initial proposal

TransGrid initially proposed installing two new 330kv underground circuits from Rookwood Road bulk supply point (BSP) to Beaconsfield West BSP at a cost of $332 million[346] (later revised upwards to $370 million[347]). These circuits would be installed simultaneously and to be commissioned in 2022/23.

In our draft decision, we did not include TransGrid's proposed capex for the project in our alternative estimate of total capex. We accepted a project such as 'Powering Sydney's Future' might be required in the future. However, we were not satisfied that TransGrid had provided robust analysis to show that the project had the greatest net benefit of all realistic options. In particular, we considered there might be greater benefit in delaying the project until a future date. We reached this position after considering uncertainty in future demand growth, network capacity, and future cable reliability. Our detailed reasoning can be found in Attachment 6 of the draft decision.[348] We set out our expectation that TransGrid would address our concerns and provide further information to support its proposed project as part of its revised proposal.

TransGrid's revised proposal has reduced the scope and cost of the project within the regulatory period. TransGrid has now proposed to install a single 330kv circuit at a cost of $252 million.[349] TransGrid would also install conduits for a second circuit, which would reduce construction time should a second circuit be required in the future.

## B.9 Submissions on the draft decision and revised proposal

We have summarised submissions received on the draft decision and revised proposal below. In order to assist us in considering TransGrid's proposal, CCP9 convened a stakeholder forum on 19 March 2018 to test the level of agreement among stakeholders on the single cable proposal (whether it should proceed, and, if so, how it should be treated in the TransGrid revenue determination). At the forum, parties indicated broad support for an option where, in the event that the AER includes the single cable project in its alternative estimate of total capex:

346 TransGrid, initial revenue proposal, 31 January 2017, p. 31.

347 TransGrid, RIT-T, Project Assessment Draft Report, Powering Sydney's Future, May 2017, p. 20.

348 AER, Draft decision, TransGrid, attachment 6, September 2017, p. 96.

349 TransGrid, Revised revenue proposal, December 2017, p. 60.

- a supervisory monitoring committee is established to regularly review and advise the costs and timing of the project, although TransGrid would retain responsibility for decision-making for the project
- if it is agreed that the project can be deferred or substantially reduced in scope the financial benefits would be passed through to consumers in full.[350]

These would be achieved through an agreement to be negotiated with TransGrid.

While some stakeholders to the process still had concerns over elements of the project, all stakeholders supported TransGrid's staged approach.

*Energy Consumers Australia* [351]

ECA considered a five-year delay for the installation of a single circuit is appropriate. ECA submitted an experts report from JWH Consulting in support of its view.

JWH Consulting queried whether increasing energy efficiency levels for new high-rise buildings have been adequately captured in the demand forecasts used by TransGrid, and concluded that the forecasts are too high.

*Public Interest Advocacy Group* [352]

PIAC considered the project will be necessary at some point in the future. PIAC considered it prudent for the project to take place later than proposed, either through a contingent project or inclusion in the capex allowance for a subsequent regulatory period. PIAC noted the competing risks of implementing the project now or later, being the risk of significant unserved energy occurring because of underinvestment, versus the risk of TransGrid installing new assets that are not needed to meet demand. PIAC noted that future demand and cable unavailability remain uncertain. Given the uncertainty about the optimal timing and scope for Powering Sydney's Future, PIAC contended that the risks to supply noted by TransGrid do not currently outweigh the cost to consumers of potentially overbuilding the network.

*Consumer challenge panel* [353]

CCP9 submitted that it is prudent to undertake some expenditure in response to issues affecting TransGrid and Ausgrid's oil-filled cables. In CCP9's view the staged approach set out in the revised proposal is a significant improvement on the previous proposal. However, the proposed investment of $252 million is substantial and CCP9 considered it has not yet been sufficiently justified.

CCP9's view is that we should consider an alternative investment program that manages risk to consumers. This would involve a comprehensive demand

---

350 CCP9, Stakeholder Forum on Powering Sydney's Future - Summary letter, March 2018.

351 Energy Consumers Australia, Submission on TransGrid's revised proposal, 11 January 2018.

352 Public Interest Advocacy Group, Submission on TransGrid's revised proposal, 12 January 2018.

353 Consumer Challenge Panel subpanel 9, Submission on TransGrid's revised proposal, 1 February 2018.

management program in order to manage demand risk and a reasonable allowance for pre-construction costs that would allow for rapid implementation of a single-cable construction program.

CCP9 noted that TransGrid's consumer engagement on the project was well received. However, CCP9 expressed concern at the way TransGrid represented aspects of the AER's draft decision to consumers.[354] CCP9 was concerned this may impact consumers' perception of the regulatory process and their confidence in both TransGrid and the AER. CCP9 noted an example of this was TransGrid's focus on the AER's use of 2016 AEMO demand data instead of the latest 2017 demand data. CCP9 noted that more open and collaborative discussion would place less emphasis on which forecast the AER relied on, and more emphasis on explaining its own assumptions and the differences from alternative forecasts.

*Australian Energy Market Operator* [355]

AEMO commented on the AER's use of its 2016 Sydney Region demand forecast in the draft decision. AEMO noted that Ausgrid's development forecast of demand is more appropriate for use in assessing the project, as it takes account of local factors driving demand growth. AEMO's forecast relates to a broader geographic reason, and does not consider the same growth factors as Ausgrid.

*Ausgrid* [356]

Ausgrid is a joint party to the RIT-T for the project, as it shares transmission planning with TransGrid in the Sydney inner-metro area. Ausgrid supported the staged approach to installing new 330kv circuits. Ausgrid noted that deferring the installation of a second cable until 2028 will bring down the initial cost of the project. It will also provide flexibility to act sooner, later or not at all based on future load growth and whether demand management solutions become available.

*City of Sydney* [357]

The City of Sydney supported the project. They noted that the staged approach is a better option for the rollout of Power Sydney's Future. In particular, they noted that the new approach:

- deals with uncertainty about future load growth and its timing;
- mitigates the risk to security of supply associated with the present aged infrastructure;
- is a cost effective solution for consumers; and will still maintain incentives to undertake demand management initiatives.

---

[354] Consumer Challenge Panel subpanel 9, Submission on TransGrid's revised proposal, 1 February 2018, p.18.

[355] Australian Energy Market Operator, Submission on TransGrid's revised proposal, 5 January 2018.

[356] Ausgrid, Submission on TransGrid's revised proposal, 12 January 2018.

[357] City of Sydney, Submission on TransGrid's revised proposal, 11 January 2018.

*Australian Industry Group* [358]

AIG submitted that, on balance, the revised project appears reasonable. AIG submitted that the investment strategy (installing the new 330 kV circuits in two stages) effectively allows for greater consideration of non-network options such as demand management and batteries as an alternative to further network augmentation.

*Energy Users Association of Australia* [359]

EUAA supported the revised proposal for a single circuit. It considered this represents a reasonable compromise between maintaining reliability and security of supply in the Sydney metropolitan area and minimising costs for consumers.

*Sydney Business Chamber* [360]

The Sydney Business Chamber supported the proposed single circuit solution for project. It noted that should a major outage occur in Sydney, it would not only be economically damaging, it would be unlikely that a quick restoration would be possible without affecting other States and the National Electricity Market generally.

*Snowy Hydro* [361]

Snowy Hydro noted the Powering Sydney's Future project is a good example of how TransGrid has re-modified their revenue proposal to accommodate the concerns of consumer representatives. From the information presented, the proposed two-stage option is a reasonable compromise for all stakeholders.

*NSW Department of Planning and Environment* [362]

The Department of Planning and Environment (DPE) submitted that the security and reliability of Sydney's energy supply is of utmost importance. It noted the economic risk of a transmission cable failure in the central Sydney area are significant. DPE forecasts a 72 per cent increase in Inner Sydney's population from 2011 to 2036. It submitted that this growth will have a direct impact of the level of energy demand in the area. It also noted that there are several large-scale infrastructure projects in development or underway that will contribute to future demand.

DPE submitted that, as the project is likely to have significant cost implications for consumers, it is important that the need for the network investment is firmly established.

---

358 Australian Industry Group, Submission on TransGrid's revised proposal, 5 February 2018.

359 Energy Users Association of Australia, Submission on TransGrid's revised proposal, 8 January 2018.

360 Sydney Business Chamber, Submission on TransGrid's revised proposal, 7 December 2017.

361 Snowy Hydro, Submission on TransGrid's revised proposal, 12 January 2018.

362 NSW Department of Planning and Environment, Submission on TransGrid's revised proposal, 11 January 2018.

## B.10 Issues identified in the draft decision

As noted earlier, we did not accept TransGrid's proposed capex for the project in our draft decision. We considered the key issue was whether the timing and scope of the project was optimal, rather than whether the project was necessary (if demand growth is continual, at some point TransGrid will need to add more capacity). We were not satisfied that TransGrid has shown that the assumptions it relied on were reasonable.[363]

In particular, we were not satisfied that the estimated maximum demand growth, cable capacity and falls in expected cable availability TransGrid relied on in its economic analysis were reasonable. In our view, TransGrid:

- derived the likelihood of network outages from historical outage rates that include events within the control of Ausgrid. The inclusion of these events is likely to overstate the probability of cables being unavailable and therefore underestimating network availability and overestimating the expected amount of unserved energy
- relied on assumptions of cable capacity that are inconsistent with industry practice, which are likely to underestimate network capacity and so overstate the amount of expected unserved energy
- used maximum demand forecasts that were significantly higher that other available forecasts. We considered that TransGrid has not adequately explained that its forecast represent a realistic expectation of demand; and
- relied on assumptions for the value of customer reliability that are above estimates used in determining TransGrid's planning standards for inner Sydney and the CBD.[364]

## B.11 Analysis of revised proposal

In response to the draft decision, TransGrid substantially revised the scope of the project. As noted earlier, the project now includes a single new circuit rather than the original double circuit, and other related works.[365] We have reviewed TransGrid's response to the concerns raised with the draft decision. We have also reviewed the cost of the project to form a view on whether these are likely to reasonably reflect prudent and efficient costs.

### B.11.1 Prudent and efficient costs

TransGrid changed the scope of the project for the revised proposal. Instead of installing two circuits at the same time, TransGrid will install one circuit and make provision for the faster installation of a second circuit if it is required in the future.

---

[363] AER, Draft decision, TransGrid, attachment 6, September 2017, p. 96.

[364] AER, Draft decision, TransGrid, attachment 6, September 2017, p. 96-97.

[365] The project also includes the laying of ducts for a second circuit, which would allow TransGrid to install an additional circuit more quickly if required.

TransGrid's revised capex proposal for the project is $252 million, $79 million less than its initial proposal, and $118 million less than its draft RIT-T.[366]

We engaged EMCa to give independent advice on the efficient scope and costing of the project.[367] The project includes two work programs, the installation of a new 330kv circuit ($244 million) and the conversion of TransGrid's cable 41 from 330kv to 132kv ($8 million).

EMCa concluded that:[368]

- The scope of work included in the estimate is appropriate
- Of the stage 1 total of $244.0 million for the 330kV cable installation work, the cost estimate should be reduced by approximately $17 million, which is within the current planning estimate accuracy of ±25 per cent; and
- TransGrid's estimate for the conversion of Cable 41 to 132kV is reasonable.

Regarding the recommended reduction in cost, EMCa considered that:

- TransGrid unnecessarily added a project level contingency amount to its costs. Given TransGrid's stated level of accuracy in forecasting costs and other adjustment factors included elsewhere in its forecast, EMCa concludes that sufficient allowance for unbiased contingency is already included in its forecast.[369]
- NSW Road & Marine Services (RMS) has advised TransGrid of a requirement to have the new cables buried deeper than TransGrid's standard depth. TransGrid has included a variation in its costs to account for this. The amount is based on a volumetric percentage increase over base costs. EMCa notes that this is effectively a worst-case approach, as no discussions have taken place to look at the issues in detail or discuss alternatives. While an increase in cost is likely as a result of the RMS requirements, the final cost would be less than the amount identified. EMCa considers TransGrid's forecast is well above the P50 level estimate, and that a lower amount is more reasonable.[370]
- TransGrid has included an allowance for the increased cost associated with the need to carry out some works at night. While EMCa recognised the need for an allowance, it considered an allowance was already made by TransGrid in a 10 per cent Ancillary Works Factor (AWF).[371]

In response to EMCa's findings, TransGrid submitted that:

---

366 TransGrid released the draft RIT-T after it submitted the initial proposal. The initial proposal is consistent with the earlier RIT-T consultation paper.

367 EMCa, Review of aspects of TransGrid's revised forecast capital expenditure, April 2018.

368 EMCa, Review of aspects of TransGrid's revised forecast capital expenditure, April 2018, p. v.

369 EMCa, Review of aspects of TransGrid's revised forecast capital expenditure, April 2018, p.62-63.

370 EMCa, Review of aspects of TransGrid's revised forecast capital expenditure, April 2018, p. 64.

371 EMCa, Review of aspects of TransGrid's revised forecast capital expenditure, April 2018, p. 65

- The scope allowance is necessary to provide a P50 estimate. TransGrid referenced a consultant's report that indicated it did not include sufficient allowance for unbiased contingency. TransGrid also cited a change in scope and change in other costs that had already increased the cost of these items.[372]
- The estimated cost to meet RMS requirements is based on the best currently available information. EMCa's recommended reduction appears without basis and arbitrary.[373]
- Night works are not covered by the AWF, and the allowance for night works should not be removed. TransGrid submitted that the AWF is a provision for base scope items that are not covered within the base rates of work. The past projects used to estimate current rates did not include night works. Consequently, the AWF does not include night works.[374]

We are not satisfied TransGrid requires a general scope provision to achieve a P50 estimate of cost. In particular, TransGrid did not address EMCa's concern that a general scope contingency should not be required at this stage of the planning process. We also note that TransGrid has pointed to areas where the costs may potentially increase in support of a general provision, but has omitted any potential savings. We are satisfied with EMCa's advice that specific provisions are included to achieve a P50 estimate, and a general provision is not appropriate.

We are not satisfied that TransGrid has established that the cost associated with deeper and wider trenching is appropriate. TransGrid has not addressed EMCa's concerns. In particular, EMCa was concerned that TransGrid had not yet engaged with the RMS about the RMS's depth requirements and had taken no account of potential cost reductions. TransGrid submitted that EMCa's recommendation appeared arbitrary and without basis. We note that EMCa based its view on industry expertise, and noted that potential cost saving measures could be implemented, such as improved backfill materials, additional compaction, and/or geo-textile matting.[375] TransGrid did not address these issues.

We are not satisfied that TransGrid's has established that costs associated with night works require a separate provision. EMCa considered these would be accounted for by the AWF. TransGrid submitted that the cost of night works is not considered within the AWF. The AWF is designed to account for the difference between the standard cost in TransGrid's estimating database and the expected additional costs that will be encountered for the 'Powering Sydney's Future' project.[376] As noted by EMCa, the

---

372 TransGrid, Response to EMCa report, Assessment of scope and cost estimates for POWERING SYDNEY'S FUTURE, April 2018, p. 1.

373 TransGrid, Response to EMCa report, Assessment of scope and cost estimates for POWERING SYDNEY'S FUTURE, April 2018, p. 1.

374 TransGrid, Response to EMCa report, Assessment of scope and cost estimates for POWERING SYDNEY'S FUTURE, April 2018, p. 1.

375 EMCa, Review of aspects of TransGrid's revised forecast capital expenditure, April 2018, p. 64.

376 EMCa, Review of aspects of TransGrid's revised forecast capital expenditure, April 2018, p. 64-65.

AWF for the project (10 per cent) is higher than a typical project (6 per cent), allowing for the complexity of the construction. We are not satisfied that TransGrid has established that the already estimated higher AWF would not account for unique construction challenges such as night works.

In summary, we are not satisfied TransGrid's forecast of $252 million for the project reasonably reflects prudent and efficient cost. Instead, we have included $235 million in our alternative estimate of efficient capex. We are satisfied this reasonably reflects prudent and efficient costs.

### B.11.2 Optimal project timing – Unserved energy modelling

TransGrid has estimated that, in the absence of investment in the network, the risk of unserved energy (energy demanded by customers, but not delivered) is likely to grow significantly over the next twenty years.

TransGrid has used forecasts of demand growth and falling cable unavailability to predict unserved energy in the future. It initially forecast unserved energy over a 30-year period, but has since reduced this to 20 years.

In summary, TransGrid's modelling examined whether there is likely to be a shortfall in capacity in the future (demand exceeds supply), quantified this as megawatt hours (MWh) of unserved energy per year, and then multiplied the result by a value of customer reliability (VCR, the dollar value customers place on each MWh of reliability).[377]

The key inputs into this model are:

- Demand forecasts for the next 20 years
- The amount of network capacity under different operational network states (i.e. how much energy the network can deliver when different cables are in or out of service)
- Individual cable unavailability forecasts for the next 20 years (which are used to find the probability of different operational network states occurring, and therefore, the likelihood that the network will be able to supply a particular quantity of energy)
- The amount of demand management and non-network solutions that can reduce network demand
- The value of customer reliability.

The optimal timing of TransGrid's proposed capex is not particularly sensitive to different VCR assumptions. We have not considered whether the VCR proposed by TransGrid is appropriate. However, we note that TransGrid has used a lower value of VCR for CBD customers in the revised proposal than it did in its initial proposal.

[377] We described TransGrid's unserved energy model in detail in the draft decision. Dr Darryl Biggar also examined TransGrid's approach in a report to the AER.

As noted in the draft decision, the optimal timing is sensitive to different assumptions of cable unavailability, demand, network capacity and demand management. In the draft decision, we considered that, on the basis of available information, TransGrid's chosen model inputs were conservative. When we substituted these with inputs that were, in our view, more realistic, the optimal timing of the project was likely to be more than five years later than proposed. We sought TransGrid's response to this in its revised proposal.[378]

On balance, we consider TransGrid has addressed the concerns expressed in our draft decision. While we consider the inputs adopted by TransGrid in its modelling are likely to remain upwardly conservative, we have revised our view on realistic inputs. TransGrid has provided new information that has informed this view. We have also sought independent advice on this information in reaching our view.[379] When using these realistic input assumptions in place of TransGrid's inputs, the project timing remains consistent with or very close to TransGrid's proposed timing.

## Unavailability

The risk of unserved energy is the main factor driving the project. Along with growing demand, falling cable reliability is a significant source of projected future unserved energy.

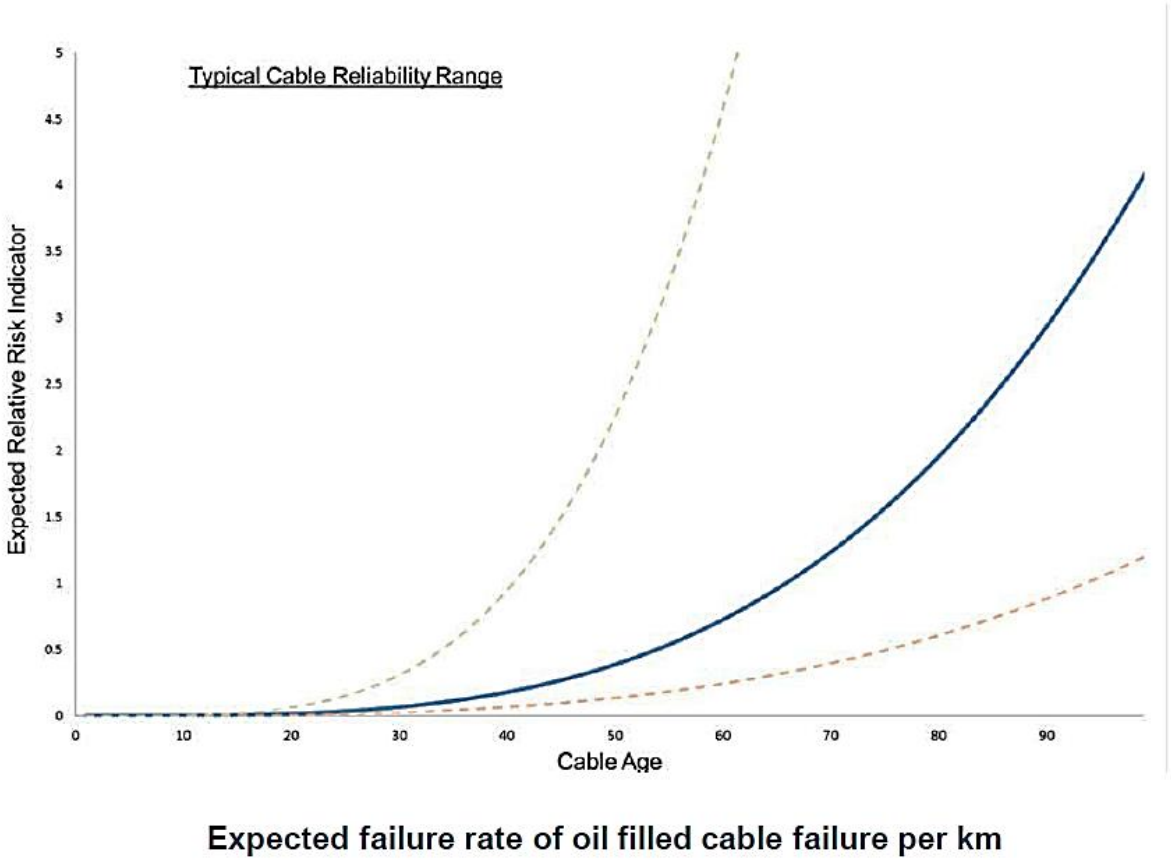
TransGrid's modelling is predominantly based on inputs from Ausgrid. Ausgrid has used data on past network faults to predict how often faults may occur in the future. This tells Ausgrid how many repair events it can expect for each cable on the network each year. For oil-filled cables, as the age of cables goes up, the frequency of repair events increases. Figure 6-16 shows the decrease in reliability that Ausgrid has estimated over time.[380]

[378] AER, Draft decision, TransGrid, attachment 11, September 2017, pp. 96-97.

[379] EMCa, Review of 132kV cable MTTR assumptions for Powering Sydney's Future project, April 2018.

[380] TransGrid and Ausgrid have claimed confidentiality over the actual results of this modelling. To preserve confidentiality, the Y-axis is an index, and does not show the actual number of outages expected.

## Figure 6-16 Ausgrid's typical cable reliability range




Source: TransGrid and Ausgrid

The actual amount of time a cable is likely to be out of service in a given year depends on the number of times it needs repair and the amount of time each repair takes (or, more precisely, how long a cable needs to be switched off – repairs that take place on live cables are not relevant). Ausgrid uses the mean time to repair (MTTR) as a proxy for the repair time for each fault. The MTTR represents the average time each repair takes.

If a cable is out of service, it cannot deliver energy, leaving the remaining cables to manage the load. Having one or more cables out of service will reduce TransGrid and Ausgrid's capacity to supply customers. Ausgrid's modelling suggests that, if there are no new assets to replace aging assets, the network will continue to age and outages will become more frequent. Events where one, two or three cables are out of service will become increasingly likely, reducing network capacity, and increasing the risk of unserved energy (energy demanded, but not supplied).

Ausgrid has identified three classes of cable fault, and presented a fault frequency schedule and MTTR for each. The repair classes are corrective, breakdown and third party damage. It used regression analysis of historical faults to derive cable outage frequency and a simple average of different repair types to determine MTTR.

On review of the data presented by Ausgrid, we considered the simple average outage durations did not appropriately reflect the repair time incurred for corrective actions. The data provided before the draft decision indicated that the vast majority of corrective actions reported by Ausgrid resulted in no repair outage – with only 19 of 1136 reported against a fault category that would require an outage.

In our draft decision, we considered a weighted average of Ausgrid's historical repair time would better capture the average repair time, and provide a more realistic estimate of cable unavailability. Using the best available data, we calculated an MTTR for corrective actions that was significantly lower than the simple average MTTR calculated by Ausgrid. When we used the weighted averaged MTTR in TransGrid's unavailability modelling, we observed a significant reduction in projected unserved energy, particularly over the next ten years. We concluded that the lower estimate of unserved energy was likely to delay optimal timing for the project by a significant period.[381]

### *TransGrid's response to the draft decision*

Following the draft decision, TransGrid and Ausgrid accepted that a weighted average approach to calculating MTTR was appropriate. However, Ausgrid revised the underlying repair data, apportioning previously uncategorised faults to outage events.[382] This resulted in a new estimated MTTR of 1.87 weeks.[383]

If applied to TransGrid's unserved energy model, this MTTR would result in significant additional unserved energy, as multi-cable outage events would be more likely.

In incorporating a new, longer MTTR, TransGrid has adjusted its modelling to move a number of corrective repairs outside of the summer peak period.[384] This is in recognition that a number of these repairs do not need to be carried out immediately, and can be scheduled for a later date to minimise the risk of unserved energy. Specifically, TransGrid has moved 60 per cent of corrective repairs outside of the summer peak period, reducing the probability of outages in summer, and increasing them in the remainder of the year. TransGrid carried out new modelling based on these assumptions and found that the optimal timing for the project did not change. [385]

### *Our assessment*

In assessing TransGrid's response to the draft decision, we have focussed on whether the new data provided by Ausgrid is realistic, such that it is suitable for use in unserved energy modelling. The new data provided significantly revised the types of faults (and,

---

381 AER, Draft decision, TransGrid, attachment 11, September 2017, p. 116.

382 TransGrid, Revised revenue proposal, December 2017, p. 58.

383 TransGrid Response to Information request #042 - FREQUENCY WEIGHTED M2 (CORRECTIVE) MEAN TIME TO REPAIR (MTTR) CALCULATION, 19 December 2018.

384 TransGrid, Revised revenue proposal, December 2017, p. 58.

385 TransGrid, Revised revenue proposal, December 2017, p. 58.

consequently, the average repair time) that Ausgrid reported in their historic repair time sample.

Ausgrid's original data showed that 1136 corrective actions had taken place on its 132KV underground oil-filled cables in its historic sample.[386] Ausgrid's original data showed that 1117 of these actions resulted in no cable outage (that is, cables did not need to be taken out of service for repair, and continued to deliver energy). Ausgrid reported 19 instances where its cables were out of service for repairs. Our draft decision estimate of MTTR was based on a weighted average of outage times for these corrective actions.

Following our draft decision, Ausgrid considered 526 of the 1117 corrective actions related to oil leaks, which would usually require an outage to repair. Ausgrid used the trend from its known oil leak repairs to approximate the repair times for the 526 corrective actions for oil leaks. This trend was based on the 19 instances where Ausgrid took cables out of service for repair, along with 38 other instances where it did not need to take a cable out of service. Using this trend, Ausgrid considered a further 358 corrective actions were likely to have required a cable outage to repair (in addition to the original 19 outages).[387] This increased the average repair time for corrective actions, substantially increasing the MTTR.

We were concerned that Ausgrid had re-categorised a large proportion of its historic fault data in a way that materially increased the MTTR and, ultimately, the estimate of unserved energy.

We sought actual information on outage time as a cross check on this new data.[388] If the total outage time were higher than the repair time for Ausgrid's sample, we would have some comfort that the allocation of uncategorised faults was appropriate. Ausgrid provided actual information showing outage times.[389] We observed that the Ausgrid's new fault data was consistent with this outage time, and corrective outage repairs would have accounted for around 37 per cent of outages.

While this provided us comfort over the allocation of corrective actions, we did not consider it sufficient to form a view on whether the inputs would result in a realistic estimate of MTTR for use in unserved energy modelling. This is because outage data captures all reasons a cable may be out of service, not simply the time it takes to restore a cable following a fault (including upgrades to ancillary equipment, substation works and planned maintenance).

---

386 As noted earlier, Ausgrid has categorised cable faults as corrective actions, breakdowns or third-party damage. The majority of Ausgrid's data relates to corrective actions, and these have the greatest short-term impact on estimates of cable availability.

387 TransGrid Response to Information request #042 - FREQUENCY WEIGHTED M2 (CORRECTIVE) MEAN TIME TO REPAIR (MTTR) CALCULATION, 19 December 2018, p. 3.

388 AER, Information request #048 - POWERING SYDNEY'S FUTURE cable reliability and demand forecasts, 5 February 2018.

389 TransGrid Response to Information request #048, TransGrid-IR048-Ausgrid-Cable Availability_Oil TM Cables_20100701_20160307 Summary-20180212-CONFIDENTIAL.xlsx, 13 February 2018.

We sought independent expert advice on cable repair times in addition to this high-level check of outage data. We considered this advice necessary to clarify whether the new data was reasonable and realistic. The advice of EMCa (assisted by cable expert, Richard Gibbons) was that the outage times proposed by TransGrid (based on Ausgrid's modelling) were high for the following reasons[390]:

- The repair times used in the MTTR were higher than EMCa's view of reasonable repair times[391]
- Ausgrid's method of apportioning events with unknown causes is likely to overstate MTTR.

EMCa considered an MTTR of 1 to 1.5 weeks to be more reasonable.[392]

We consider an MTTR of 1 to 1.5 weeks is more reasonable MTTR than 1.87 weeks. Table 6-20 Probability of network states shows the probability of different network states if the MTTR is 1.87 or 1 week.

### Table 6-20 Probability of network states

| Number of simultaneous outages | Likelihood at MTTR of 1.87 weeks | Likelihood at MTTR of 1 week |
|---|---|---|
| 0 | 31.79% | 46.68% |
| 1 | 40.23% | 37.83% |
| 2 | 20.89% | 12.78% |
| 3 | 5.93% | 2.40% |
| 4 | 1.02% | 0.28% |
| 5 | 0.10% | 0.02% |
| 6 | 0.00% | 0.00% |

Source: AER analysis

Under TransGrid's assumption, it is probable that N-3 events would occur approximately 6 per cent of the time, N-4 1 per cent and N-5 0.1 per cent. We have no information to suggest such events have ever occurred at times of peak demand. By contrast, an MTTR of 1 week results in N-4 and N-5 being much less likely to occur. At a high level, this appears more realistic than TransGrid/Ausgrid's estimate, and tends to support the advice given by our consultant.

390 EMCa, Review of 132kV cable MTTR assumptions for Powering Sydney's Future project, April 2018, p. 2.

391 EMCa considered a range of repair times of between 1 and 4 weeks to be reasonable under normal operating conditions, however this did not include time for consideration uncertainty, engagement and planning approvals, which would tend to increase repair times, EMCa, Review of 132kV cable MTTR assumptions for Powering Sydney's Future project, April 2018, p. 23.

392 EMCa, Review of 132kV cable MTTR assumptions for Powering Sydney's Future project, April 2018, p. 2.

We consider TransGrid/Ausgrid's estimate of MTTR to be unrealistically high for corrective actions, leading to a higher probability of simultaneous cable outages. However, we observe that the lower value does not ultimately change the optimal timing of the project. We tested TransGrid's unserved energy modelling using the lower MTTR input. Our findings remain close to TransGrid's, that the use of this MTTR in the modified unserved energy model (where TransGrid shifted 60 per cent of summer outages to the shoulder period) does not affect project timing. We also note that a more aggressive assumption, where 100 per cent of corrective actions are moved out of the summer peak period and demand growth is reduced, yields the same result.

While the estimated unserved energy is significantly lower under our assumption, it is still greater than the estimated cost of installing the new assets. The benefit of delaying the investment in the short term is less than the avoided detriments over the same period (unserved energy, maintenance costs, environmental costs etc.), indicating that the greatest benefit is likely to be associated with commissioning the assets in the timeframe proposed by TransGrid.

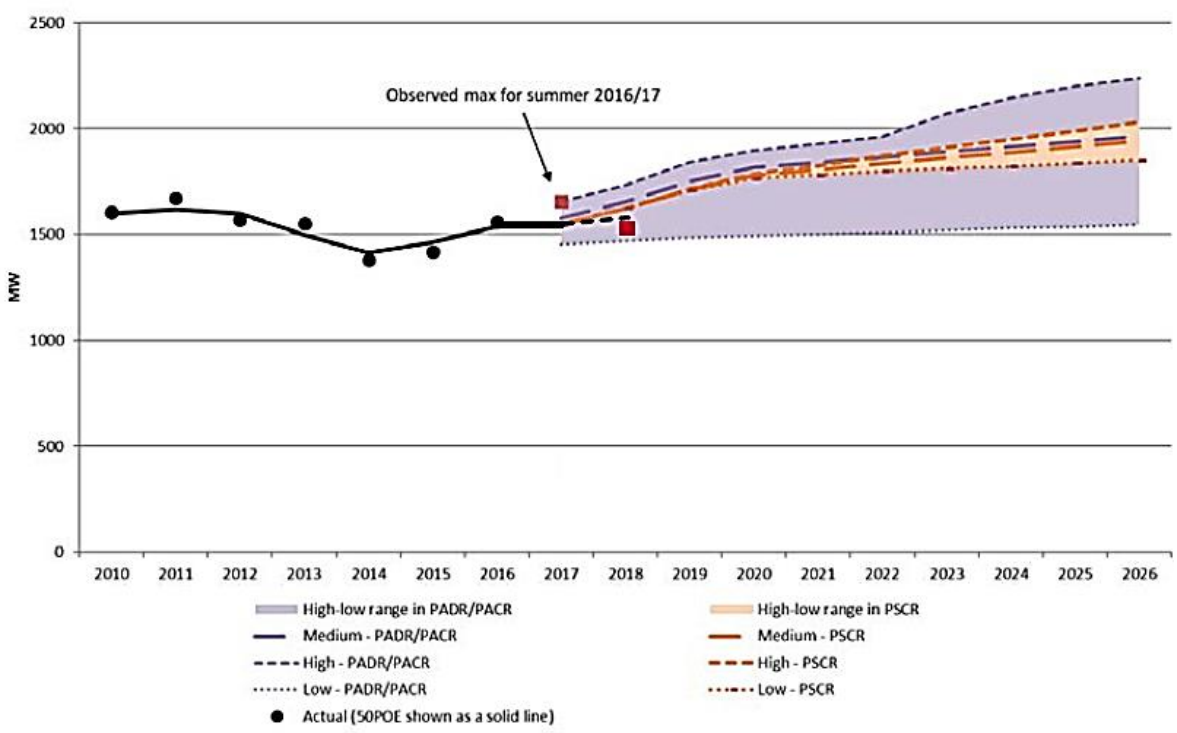
## Demand forecasts

In our draft decision, we noted our concern that TransGrid had used maximum demand forecasts that were significantly higher than other available forecasts. We did not consider that TransGrid had adequately explained why the maximum demand forecasts it used were appropriate. We were also concerned that high demand growth in the short-term was driven by large customer connections (spot loads) which are inherently uncertain. [393]

Figure 6-17 shows the growth in maximum demand TransGrid used as an input to its unserved energy modelling. TransGrid used Ausgrid's 2017 development forecast of demand to estimate growth in maximum demand.

[393] AER, Draft decision, TransGrid, attachment 6, September 2017, p. 102.

## Figure 6-17 Ausgrid 2016 development forecast of maximum demand




Source: TransGrid and Ausgrid

Ausgrid's development forecast includes an underlying trend, based on economic factors, and adds large one-off additions of large new customers to the network, known as spot loads. The sharp increase in projected demand over the next five years is the result of the addition of an increasing number of spot loads. These spot loads include large projects such as light rail, Westconnex and significant projected growth in 11Kv residential connections. [394]

In the draft decision, we considered the impact of alternative demand forecasts, including AEMO's 2016 connection point forecast for the Sydney region, which includes the inner metro and CBD areas (but is far broader geographically), and a report by BIS Shrapnel, which considered a growth rate of 0.9 per cent a year to be reasonable.[395]

In the following sections, we assess:

- whether alternative demand forecasts are suitable for use in unserved energy modelling;

[394] TransGrid, Revised revenue proposal, December 2017, p. 57.

[395] TransGrid, RIT-T: Project Specification Consultation Report Powering Sydney's Future, Appendix D - BIS Shrapnel Demand Forecast Report, October 2016.

- if the optimal timing of the project is sensitive to lower 11Kv residential connection growth; and
- whether TransGrid's selection of a sample year for its model was reasonable.

### *AEMO's forecast*

AEMO's forecast showed falling to flat growth in maximum demand over its forecast horizon.[396] Including a forecast such as this in TransGrid's unserved energy model would greatly reduce projected unserved energy. This reduced the benefits associated with the project, and was likely to push back the optimal commissioning date by up to ten years.

AEMO wrote to the AER on 5 January 2018 regarding its forecast.[397] AEMO stated that its demand forecast is not directly comparable to Ausgrid's, and that forecasts that capture local trends and developments may be more appropriate for assessing the project. AEMO stated a range of reasons why its Sydney region forecast is not directly comparable with the demand forecast used by TransGrid. AEMO stated that its Sydney region forecast:

- Covers a much wider area than the inner metro and CBD network, as sub-transmission meshing in the Sydney area limits visibility of changes at individual connection points. Inner Sydney represents the main load centre in AEMO's Sydney region forecast and influences the forecast demand trajectory.
- Incorporates a more diverse range of customer and demand profiles, including a much higher proportion of residential load.
- Does not specifically include new large spot loads such as Westconnex and light rail. AEMO does not consider these individual loads are large enough to represent a structural shift in its broader Sydney region demand forecast. Instead, AEMO's methodology assumes that loads less than 5% of maximum demand are captured in the underlying growth trend. AEMO does not have visibility of information in the distribution network and is reliant on information provided by Ausgrid.

We note the information provided by AEMO, that its forecast might not be suitable for use in transmission planning. Given the limitations of the forecast identified by AEMO, we have not considered this forecast as part of this final decision.

### *BIS Shrapnel forecast*

In the draft decision, we noted that using BIS Shrapnel trend of 0.9 per cent a year in conjunction with the spot load growth put forward by the parties, optimal project timing would still align to TransGrid's proposal. Consequently, we noted that the spot loads

---

396 Australian Energy Market Operator, 2016 AEMO Transmission connection point forecasting report for NSW and ACT, July 2016, p. 7.

397 AEMO, Submission on TransGrid's revised regulatory proposal, January 2018.

were a more important factor driving optimal timing than general trend growth. [398] We consider the impact of spot loads below.

### *Spot loads*

Spot loads drive the short-term growth in maximum demand for the inner Sydney area. Demand growth in the next five years is a key driver of short-term estimated unserved energy, and ultimately the optimal timing put forward by the parties for installation of new capex. Without the spot loads, it is likely that optimal timing for the project would be beyond the next regulatory period.

In its revised proposal, TransGrid noted that the demand forecast included 340MW of spot loads forecast to have connected before 2022/23.[399] These include:

- large new infrastructure and commercial loads
    - WestConnex motorway tunnels – 38MW by 2021
    - Light Rail and Sydney Metro – 7 MW by 2021, increasing to 69MW
    - Data centre loads – 35MW by 2022
- Large residential and commercial developments – 18 MW by 2020
- Smaller spot loads, mainly at 11kV, driven by new medium and high-density dwellings – 150MW by 2022

WestConnex and Light Rail are currently under construction, and there is a large degree of certainty regarding their inclusion. We consider the largest and least certain spot loads are the 150MW associated with new high and medium dwellings. We consider these are uncertain because:

- Peak demand occurs at a different time for residential and non-residential customers.[400] TransGrid noted that 85 per cent of peak demand in the inner Sydney area is driven by non-residential customers.[401] As a result, the full value of new residential loads should not be included in a demand forecast, and should be reduced by a load diversity factor.
- The ECA expressed concern that energy efficiency savings had not been captured in the demand forecast – if this is the case, it would reduce the load applied by residential customers

We have tested the sensitivity of TransGrid's timing to significant reductions in this load. We note that halving this input to 75MW does not change the optimal timing of the project. Therefore, while we have not formed a view on whether the 150MW

---

398 AER, Draft decision, TransGrid, attachment 6, September 2017, p. 126.

399 TransGrid, Revised revenue proposal, December 2017, p. 57.

400 TransGrid, Revised revenue proposal, December 2017, p. 55.

401 TransGrid, Revised revenue proposal, December 2017, p. 55.

amount is overstated, we are satisfied that the optimal timing is not sensitive to material changes in this assumption.

### *TransGrid's selection of a typical energy consumption year for modelling*

TransGrid's unserved energy model used half hourly energy consumption data from 2013-14 as a base year for its analysis.[402] TransGrid scaled up consumption for each half hour by the growth in maximum demand expected for each of the next 20 years.[403] TransGrid also provided consumption data for the years 2010-11 to 2014-15, but did not use these in its analysis.

We tested TransGrid's modelling using the other years' consumption data as a base, and found that the year selected by TransGrid resulted in the largest estimate of unserved energy. However, the lower unserved energy derived from the other data sets was not sufficient to change the optimal timing of the project.

We sought further information from TransGrid on why it considered 2013-14 appropriate for use as a base year. TransGrid noted that 2013-14 had a POE50 peak demand lower than its actual demand, and was the first year in which demand began to increase, and was used for these reasons.[404]

We do not consider these reasons justify the use of 2013-14 as a base year, when the other five available data sets all demonstrate a lower estimate of unserved energy.

Dr Darryl Biggar referenced the selection of peak demand profiles to model future demand. Dr Biggar noted that:[405]

> in principle, it is not correct to use the out-turn profile of a single year. Instead, the modelling should reflect all possible load profiles that may occur. In some years the demand will be much higher (above the POE10 level), but with a low probability. In some years demand will be lower. The selection of the load profile in any one year cannot represent the range of possibilities that could occur in all future years.

We consider a more robust approach for such modelling would be to use an averaging approach to capture more than a single year of consumption. However, in this case the optimal timing of the project has not been affected by the choice of base year. We therefore consider TransGrid should look to adopt an approach that captures more than one year of data in future modelling exercises of this type.

## Network capacity

---

402 TransGrid, RIT-T: Project Specification Consultation Report – Powering Sydney's Future, October 2016, p. 26.

403 TransGrid, RIT-T: Project Specification Consultation Report – Powering Sydney's Future, October 2016, p. 51.

404 TransGrid Response to Information request #048, POWERING SYDNEY'S FUTURE cable reliability and demand forecasts, February 2018, p. 3

405 Dr Darryl Biggar, An assessment of the modelling conducted by TransGrid and Ausgrid for the "Powering Sydney's Future" program, May 2017, p. 23.

TransGrid has relied on cable ratings (capacity) provided by Ausgrid in its unserved energy modelling.[406]

In our draft decision, we noted concern that the ratings used by TransGrid understated the actual capacity of the network. Specifically, we were concerned that TransGrid did not use the highest available ratings in its modelling, being the emergency cyclic ratings.[407] To test the sensitivity of the modelling to this assumption, we applied an uplift factor to the capacities used in the model, based on information available to us. We observed that optimal timing was sensitive under our uplift factor, such that the project could be delayed by up to five years.[408]

TransGrid responded to this in its revised proposal. TransGrid noted that the highest technically feasible ratings were used in the model. It noted that this included emergency ratings in its modelling, though some cables cannot use emergency ratings because they run parallel to other cables that are in service.[409]

We sought further information from TransGrid on its use of emergency ratings. TransGrid provided a sample of different network configurations, demonstrating where these ratings were used.[410] We are satisfied that TransGrid's response addresses our concerns from the draft decision.

## Demand management

Our analysis of TransGrid's forecast unserved energy indicates that a significant reduction in demand from demand management and non-network solutions would be necessary to change the optimal timing of the project. As noted earlier in our assessment of demand, a reduction in peak demand of 75MW would not alter the optimal timing of the project. While demand management is an important element to consider in assessing any need, as it is often less costly than a network solution, in this instance we do not consider demand management initiatives would be sufficient to delay a large project such as this in the short-term.

We note that the revised project scope allows opportunity for greater demand management response in the future, as it does not seek to address all medium to long-term increases in demand (as would have been the case in the original double-circuit solution). Demand management may play a role in delaying or removing the need for a second circuit.

TransGrid has proposed $19 million of network support opex to provide demand responses to manage potential unserved energy in the short-term (i.e. in the years

---

406 TransGrid, RIT-T: Project Specification Consultation Report – Powering Sydney's Future, October 2016, p. 20.

407 AER, Draft decision, TransGrid, attachment 6, September 2017, p. 102.

408 AER, Draft decision, TransGrid, attachment 6, September 2017, p. 120.

409 TransGrid, Revised revenue proposal, December 2017, p. 59.

410 TransGrid Response to Information request #042, POWERING SYDNEY'S FUTURE models and data, 19 December 2018, pp. 2-3.

before the new circuit is operational).[411] We have included $19 million in our assessment of opex (see section 2.5 of the final decision Overview). We therefore consider demand management will likely have a greater role in managing potential unserved energy in the future and is likely to be a factor in whether a second circuit is required for the inner metro and CBD area.

[411] TransGrid, Revised revenue proposal, December 2017, p. 61.

# C Contingent projects

Generally, contingent projects are significant network augmentation projects that may be reasonably required to be undertaken in order to achieve the capex objectives. However, unlike other proposed capex projects, the need for the project and the associated costs are not sufficiently certain. Consequently, expenditure for such projects does not form a part of our assessment of the total forecast capex that we approve in this determination. The cost of the projects may ultimately be recovered from customers in the future if certain predefined conditions (trigger events) are met. Specifically, these projects are linked to unique investment drivers and are triggered by a defined 'trigger event'. We must have regard to the need for the trigger event to be probable during the relevant regulatory control period.[412]

We must review each of TransGrid's proposed contingent projects against the assessment criteria in the NER. [413] In doing so, we must consider whether:

- the proposed contingent project is reasonably required to be undertaken in order to achieve any of the capex objectives[414]
- the proposed contingent project capital expenditure is not otherwise provided for in the capex proposal[415]
- the proposed contingent project capital expenditure reasonably reflects the capex criteria, taking into account the capex factors, in the context of the proposed contingent project[416]
- the proposed contingent project capital expenditure exceeds the defined materiality threshold[417] and
- the trigger events in relation to the proposed contingent project are appropriate.[418]

The definition of the trigger events associated with each project is important, as it is the occurrence of these events that determines if and when TransGrid may apply to us to recover the efficient costs of undertaking the projects. In assessing whether the proposed trigger events are appropriate, we have regard to the need for each trigger event to be:

- reasonably specific and capable of objective verification[419]

---

412 NER, cl. 6A.8.1.

413 NER, cl. 6A.8.1.

414 NER, cl. 6A.8.1(b)(1).

415 NER, cl. 6A.8.1(b)(2)(i). A TNSP must include forecast capex in its revenue proposal which it considers is required in order to meet or manage expected demand for prescribed transmission services over the regulatory control period (see NER, cl. 6A.6.7(a)(1)).

416 NER, cl. 6A.8.1(b)(2)(ii).

417 NER, cl. 6A.8.1(b)(2)(iii).

418 NER, cl. 6A.8.1(b)(4).

419 NER, cl. 6A.8.1(c)(1).

- a condition or event which, if it occurs, makes the project reasonably necessary in order to achieve any of the capex objectives[420]
- a condition or event that generates increased costs or categories of costs that relate to a specific location rather than a condition or event that affects the transmission network as a whole[421]
- described in such terms that it is all that is required for the revenue determination to be amended;[422] and
- probable during the 2018–23 period but the inclusion of capex in relation to it (in the total forecast capex) is not appropriate because there is not sufficient certainty regarding either the occurrence of the event or condition during the regulatory control period or the costs associated with the event or condition.[423]

If, during the regulatory control period, TransGrid considers that the trigger events for an approved contingent project have occurred, then it may apply to us to amend its revenue determination.[424] In particular, at that time, we will assess whether the trigger event has occurred and whether the project meets the NER materiality threshold. If we are satisfied of both, we would then go on to determine the efficient incremental revenue which is likely to be required in each remaining year of the regulatory control period as a result of the contingent project, and amend the revenue determination accordingly.[425] This process is summarised below:

1. We will publish the application and invite written submissions.[426]
2. We will then assess whether the defined trigger events have occurred and the project meets the materiality threshold.
3. If satisfied that this is the case, we will determine the amount of capex and incremental opex that we consider is reasonable to undertake the project and therefore the efficient incremental revenue which is likely to be required in each remaining year of the regulatory control period as a result of undertaking the contingent project.[427]
4. In doing so, we will consider whether the amounts of forecast capex and incremental operating expenditure reasonably reflect the capex and opex criteria, taking into account the capex and opex factors, in the context of the contingent project.[428]

---

420 NER, cl. 6A.8.1(c)(2).
421 NER, cl. 6A.8.1(c)(3).
422 NER, cl. 6A.8.1(c)(4).
423 NER, cl. 6A.8.1(c)(5).
424 NER, cl. 6A.8.2 (a).
425 NER, cl.6A.8.2.
426 NER, cl. 6A.8.2 (c).
427 NER, cl. 6A.8.2 (e).
428 NER, cl. 6A.8.2 (f)(2).

In our draft decision, we were satisfied that the five contingent projects proposed by TransGrid may reasonably be required to be undertaken in order to meet or manage the expected demand for transmission services, and/or maintain reliability, over the 2018-23 regulatory control period.[429] However, we were not satisfied that the trigger events in relation to the proposed contingent projects proposed by TransGrid were appropriate.[430] As such, we required TransGrid to amend the trigger events for all the proposed contingent projects.[431]

As we noted in our draft decision, on 22 August 2017 TransGrid informed us that since it submitted its revenue proposal several events had occurred that were likely to change the requirements of the transmission network in New South Wales in the 2018-23 regulatory control period and that we expected TransGrid to provide further information in its revised proposal.[432] In its revised proposal, TransGrid has proposed:[433]

- updated trigger events in response to our draft decision
- amended trigger events in response to changes in the energy sector; and
- a further four contingent projects in response to rapidly changing circumstances.

## C.12 Position

We are satisfied that TransGrid's proposed nine contingent projects may be reasonably required to be undertaken in order to meet or manage the expected demand for transmission services, and/or maintain reliability, over the 2018–23 regulatory control period.[434]

However, we are not satisfied that the trigger events in relation to the proposed contingent projects are appropriate.[435] Rather, we consider that the trigger events required for TransGrid's proposed contingent projects are those set out in Table 6-21. We are satisfied that the trigger events in Table 6-21 meet the NER requirements.

### Table 6-21 Final decision, trigger events

| Contingent Project | triggers |
|---|---|
| New South Wales to South Australia Interconnector ($276m | 1. Successful completion of a RIT-T demonstrating an overall network investment by all parties involved in the interconnector construction that maximises the positive net economic benefits from establishing a new high |

[429] AER, *Draft Decision, TransGrid transmission determination 2018–19 to 2022–23, Attachment 6 –Capital Expenditure*, September 2017, p. 6-153.
[430] NER, cl. 6A.8.1(b)(4).
[431] AER, *Draft Decision, TransGrid transmission determination 2018–19 to 2022–23, Attachment 6 –Capital Expenditure*, September 2017, p. 6-154.
[432] AER, *Draft Decision, TransGrid transmission determination 2018–19 to 2022–23, Attachment 6 –Capital Expenditure*, September 2017, p. 6-154.
[433] TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 95.
[434] NER, cl. 6A.8.1(b)(1).
[435] NER, cl. 6A.8.1(b)(4).

| | |
|---|---|
| to $1074m) | voltage interconnection from South Australia, and/or that addresses a reliability corrective action.<br>2. Determination by the AER that the proposed investment satisfies the RIT-T.<br>3. TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.<br>4. Clauses 1 and 2 do not apply if a change in the law occurs that allows the inclusion of the proposed investment in TransGrid's maximum allowed revenue under this revenue determination even if a RIT-T is not carried out. |
| Reinforcement of Southern Network ($60m to $393m) | 1. New generation of more than 350 MW is committed in southern NSW at any current or future connection point(s) south of Bannaby and Marulan, or NSW import capacity from Southern Interconnectors is determined to be increased by more than 350 MW due to committed expansion of southern interconnections.<br>2. Successful completion of the RIT-T demonstrating a network investment by TransGrid maximises the positive net economic benefits from increasing the capacity of the network south of Bannaby and Marulan at 132/330kV or other voltages.<br>3. Determination by the AER that the proposed investment satisfies the RIT-T.<br>4. TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.<br>5. Clauses 2 and 3 do not apply if a change in the law occurs that allows the inclusion of the proposed investment in TransGrid's maximum allowed revenue under this revenue determination even if a RIT-T is not carried out. |
| Reinforcement of Northern Network (QNI upgrade) ($63m to $141m) | 1. Either:<br>i. Committed retirement of more than 1100 MW of generation in the Hunter or Central Coast area; and/or<br>ii. AEMO classification of generation developments as being at the 'committed' stage of development on the 'Generator Information' webpage, exceeding 1100 MW at any current or future connection point(s) north of Armidale; and/or<br>iii. AEMO classification of generation developments as being at the 'committed' stage of development on the 'Generator Information' webpage, exceeding 350 MW at any current or future connection point(s) south of Liddell and Bayswater.<br>2. Successful completion of the RIT-T demonstrating a network investment by TransGrid that maximises the positive net economic benefits from increasing the capacity of the network between Bulli Creek and Liddell at 132/330kV or other voltages.<br>3. Determination by the AER that the proposed investment satisfies the RIT-T.<br>4. TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.<br>5. Clauses 2 and 3 do not apply if a change in the law occurs that allows the inclusion of the proposed investment in TransGrid's maximum allowed revenue under this revenue determination even if a RIT-T is not carried out. |
| Support South Western NSW for Renewables ($89m to $477m) | 1. Either:<br>i. New generation of more than 400 MW is committed in South Western NSW (west of Wagga); and/or<br>ii. New generation in North West Victoria<br>(a) exceeding 800 MW for connection to the Ballarat - Waubra - Ararat - Horsham 220 kV Lines or connection point(s); and/or<br>(b) exceeding 200 MW for connection to the Redcliffs – Weman – |

| | |
|---|---|
| | Kerang 220 kV Lines or connection point(s); and/or<br>(c) exceeding 500 MW for connection to the Ballarat – Terang – Moorabool 220 kV Lines or connection point(s); and/or<br>(d) exceeding 1,500 MW in the North West Victoria zone<br>2. Where the optimal solution involves works in NSW and Victoria, successful completion of the RIT-T demonstrating an overall network investment by all parties of their respective works maximises the positive net economic benefits from strengthening the high voltage interconnection between New South Wales and Victoria.<br>3. Determination by the AER that the proposed investment satisfies the RIT-T.<br>4. TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.<br>5. Clauses 2 and 3 do not apply if a change in the law occurs that allows the inclusion of the proposed investment in TransGrid's maximum allowed revenue under this revenue determination even if a RIT-T is not carried out. |
| Supply to Broken Hill ($52m to $177m) | 1. Notification from Essential Energy of available capacity of backup generation at Broken Hill that would result in expected unserved energy exceeding 10 minutes at average demand.<br>2. Successful completion of the RIT-T, including a comprehensive assessment of the credible options, that demonstrates a network investment by TransGrid maximises the economic benefits while meeting reliability of supply obligations to the Broken Hill area.<br>3. Determination by the AER that the proposed investment satisfies the RIT-T.<br>4. TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.<br>5. Clauses 2 and 3 do not apply if a change in the law occurs that allows the inclusion of the proposed investment in TransGrid's maximum allowed revenue under this revenue determination even if a RIT-T is not carried out. |
| Reinforcement of Southern Network in response to Snowy 2.0 ($831m to $1,228m) | 1. New generation of 2000 MW is committed in southern NSW at any current or future connection point(s) south of Bannaby and Marulan.<br>2. Where the optimal solution involves related works across other TNSPs, successful completion of the RIT-T demonstrating an overall network investment by all parties involved in the construction of their respective works that maximises the positive net economic benefits from strengthening their transmission networks in response to the Snowy 2.0 project.<br>3. Determination by the AER that the proposed investment satisfies the RIT-T.<br>4. TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.<br>5. Clauses 2 and 3 do not apply if a change in the law occurs that allows the inclusion of the proposed investment in TransGrid's maximum allowed revenue under this revenue determination even if a RIT-T is not carried out. |
| Support Central Western NSW for Renewables ($120m to $455m) | 1. New generation of more than 900 MW is committed in central western NSW (west of Wollar and Mt Piper).<br>2. Successful completion of the RIT-T demonstrating a network investment by TransGrid maximises the positive net economic benefits from increasing the capacity of the network west of Wollar and Mt Piper at 132/330kV or other voltages.<br>3. Determination by the AER that the proposed investment satisfies the RIT-T.<br>4. TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.<br>5. Clauses 2 and 3 do not apply if a change in the law occurs that allows the inclusion of the proposed investment in TransGrid's maximum allowed |

| | |
|---|---|
| | revenue under this revenue determination even if a RIT-T is not carried out |
| Support North Western NSW for Renewables ($500m to $945m) | 1. New generation of more than 800 MW is committed in North Western NSW (north of Bayswater and Liddell).<br>2. Successful completion of the RIT-T demonstrating a network investment by TransGrid maximises the positive net economic benefits from increasing the capacity of the network north of Bayswater and Liddell at 132/330kV or other voltages.<br>3. Determination by the AER that the proposed investment satisfies the RIT-T.<br>4. TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.<br>5. Clauses 2 and 3 do not apply if a change in the law occurs that allows the inclusion of the proposed investment in TransGrid's maximum allowed revenue under this revenue determination even if a RIT-T is not carried out. |
| Renewables development in the Mt Piper to Wellington area ($36.8m) | 1. New generation of more than 150 MW is committed in the Mt Piper to Wellington area.<br>2. Successful completion of the RIT-T demonstrating a network investment by TransGrid maximises the positive net economic benefits from increasing the capacity of the network between Mt Piper and Wellington at 132/330kV or other voltages.<br>3. Determination by the AER that the proposed investment satisfies the RIT-T.<br>4. TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.<br>5. Clauses 2 and 3 do not apply if a change in the law occurs that allows the inclusion of the proposed investment in TransGrid's maximum allowed revenue under this revenue determination even if a RIT-T is not carried out. |

Source: AER analysis.

## C.13 TransGrid revised proposal

In summary, TransGrid's revised proposal submitted:[436]

- Amendments to our draft decision trigger events, including proposed amendments to the triggers in response to changes in the energy sector.
- Minor amendments to its estimated cost ranges for the five contingent projects included in its initial revenue proposal.
- A further four contingent projects (resulting in nine proposed contingent projects).
- That the four new contingent projects and the revisions to the trigger events of the five original contingent projects reflect:[437]
    - the possibility that a new pathway for transmission investment may be developed; and
    - the possibility that some projects have potential reliability triggers as well as market benefits triggers.

[436] TransGrid, *Revised revenue proposal 2018–23*, December 2017, pp. 95-105.

[437] TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 95.

- That its proposed trigger events were appropriate (and in some cases necessary).

Table 6-22 below summarises the four new contingent projects proposed by TransGrid in its revised proposal and the five contingent projects in its initial proposal for the 2018–23 regulatory control period.[438]

## Table 6-22 TransGrid's revised proposal's contingent projects

| Contingent Project | Contingent Capex ($m) | Brief Project Description |
|---|---|---|
| New South Wales to South Australia Interconnector | $276m to $1074m | Manage low reserve conditions and system security by increasing interconnection to another state as a result of the announcement of withdrawal of over 1,000MW of generation capacity reserves in South Australia. |
| Reinforcement of Southern Network | $60m to $393m | Reinforce the Southern NSW transmission network (between Yass and Wellington) to remove constraints on new renewable generation connections in this region. |
| Reinforcement of Northern Network (QNI upgrade) | $63m to $141m | Reinforce the Northern NSW transmission network (around the New England area) to remove constraints on new generation connections in this region. |
| Support South Western NSW for Renewables | $89m to $477m | Reinforce the South Western NSW transmission network (west of Wagga Wagga) to remove constraints on new renewable generation connections in this region. |
| Supply to Broken Hill | $52m to $177m | Provide additional capacity to supply Broken Hill in the event that the total 220kV and 22kV load at Broken Hill exceeds the capacity of the backup gas turbines owned by Essential Energy and expected unserved energy exceeds the unserved energy allowance. |
| Reinforcement of Southern Network in response to Snowy 2.0 | $831m to $1,228m | After TransGrid submitted its revenue proposal, the Federal Government announced the Snowy 2.0 expansion. Although TransGrid's revenue proposal included "Reinforcement of Southern Network" as a contingent project, the scale of this is not sufficient to accommodate the transmission augmentation required to connect Snowy 2.0. |
| Support Central Western NSW for Renewables | $120m to $455m | Reinforce the Central Western NSW transmission network (around Wellington area) to remove constraints on new renewable generation connections in this region. |
| Support North Western NSW for Renewables | $500m to $945m | Reinforce the North Western NSW (north of Bayswater and Liddell) transmission network to remove constraints on new renewable generation connections in this region. |
| Renewables development in the Mt Piper to Wellington area | $36.8m | Reinforce the Mt Piper to Wellington area of the NSW transmission network to remove constraints on new renewable generation connections in this region. |

Source: TransGrid, Revised revenue proposal 2018–23.

[438] TransGrid, *Revised revenue proposal 2018–23*, December 2017, pp. 100-105.

TransGrid's proposed trigger events for each proposed contingent project is set out in Table 6-23.

## Table 6-23 TransGrid - Proposed trigger events

| Contingent Project | Proposed trigger events |
|---|---|
| New South Wales to South Australia Interconnector ($276m to $1074m) | (a) Two or more of the following:<br>(i) Inclusion of interconnection between NSW and South Australia in AEMO's Integrated Grid Plan or similar plan as recommended by the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council<br>(ii) Notification to TransGrid by the Federal Government, COAG Energy Council, NSW Government, South Australia Government or the Energy Security Board that it considers that interconnection between NSW and South Australia is required in order to meet or manage the expected demand for prescribed transmission services or comply with an applicable regulatory obligation or requirement associated with the provision of prescribed transmission services<br>(iii) Successful completion of a RIT-T or alternate framework introduced in response to the recommendation of the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council (including comprehensive assessment of alternative options) demonstrating that:<br>(A) new interconnection between NSW and South Australia is the option or part of the option that maximises the positive net economic benefits; or<br>(B) new interconnection is the option that most cost effectively addresses system security issues<br>(iv) Determination by the AER that the proposed investment satisfies the RIT-T or abovementioned alternate framework<br>(b) TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules. |
| Reinforcement of Southern Network ($60m to $393m) | (a) New generation of more than 350 MW is committed in southern NSW at any current or future connection point(s) south of Bannaby and Marulan or NSW import capacity from Southern Interconnectors is determined to be increased by more than 350 MW due to committed expansion of southern interconnections.<br>(b) Two or more of the following:<br>(i) Inclusion of renewable energy zones in Southern NSW and/or Northern Victoria in AEMO's Integrated Grid Plan or similar plan as recommended by the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council<br>(ii) Notification to TransGrid by the Federal Government, COAG Energy Council, NSW Government, Victorian Government or the Energy Security Board that it considers that augmentation of the transmission network to deliver increased capacity from Southern NSW and/or Northern Victoria is required in order to meet or manage the expected demand for prescribed transmission services or comply with an applicable regulatory obligation or requirement associated with the provision of prescribed transmission services<br>(iii) Successful completion of a RIT-T or alternate framework introduced in response to the recommendation of the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council (including comprehensive assessment of alternative options) demonstrating that increasing the capacity of the network in Southern NSW at 330/132kV or other voltages used in |

| | |
|---|---|
| | future is the option that maximises the positive net economic benefits<br><br>(c) Determination by the AER that the proposed investment satisfies the RIT-T or abovementioned alternate framework<br><br>(d) TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules. |
| Reinforcement of Northern Network (QNI upgrade) ($63m to $141m) | (a) One or more of the following:<br><br>(i) Committed retirement of more than 1,100 MW of generation in the Hunter or Central Coast area<br><br>(ii) New generation of more than 1,100 MW is committed in northern NSW at any current or future connection point(s) north of Armidale<br><br>(iii) New generation of more than 350 MW is committed at any current or future connection point(s) south of Liddell and Bayswater<br><br>(b) Two or more of the following:<br><br>(i) Inclusion of an augmentation to increase the capacity of the interconnection between NSW and Queensland in AEMO's Integrated Grid Plan or similar plan as recommended by the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council<br><br>(ii) Notification to TransGrid by the Federal Government, COAG Energy Council, NSW Government, Queensland Government or the Energy Security Board that it considers that augmentation of the transmission network to increase the capacity of the interconnection between NSW and Queensland is required in order to meet or manage the expected demand for prescribed transmission services or comply with an applicable regulatory obligation or requirement associated with the provision of prescribed transmission services<br><br>(iii) Successful completion of a RIT-T or alternate framework introduced in response to the recommendation of the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council (including comprehensive assessment of credible options) demonstrating that increasing capacity of the network between Bulli Creek and Liddell zones at 330/132kV or other voltages used in future is the option or part of the option that maximises the positive net economic benefits<br><br>(iv) Determination by the AER that the proposed investment satisfies the RIT-T or abovementioned alternate framework<br><br>(c) TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules. |
| Support South Western NSW for Renewables ($89m to $477m) | (a) One or more of the following:<br><br>(i) New generation more than 400 MW is committed in South Western NSW (west of Wagga)<br><br>(ii) New generation is committed in North West Victoria:<br><br>(A) exceeding 800 MW for connection to the Ballarat - Waubra - Ararat - Horsham 220 kV Lines or connection point(s); and/or<br><br>(B) exceeding 200 MW for connection to the Redcliffs – Weman – Kerang 220 kV Lines or connection point(s); and/or<br><br>(C) exceeding 500 MW for connection to the Ballarat – Terang – Moorabool 220 kV Lines or connection point(s); and/or<br><br>(D) exceeding 1,500 MW in the North West Victoria zone<br><br>(b) Two or more of the following:<br><br>(i) Inclusion of renewable energy zones in South Western NSW and/or North Western Victoria in AEMO's Integrated Grid Plan or similar plan as |

| | |
|---|---|
| | recommended by the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council<br><br>(ii) Notification to TransGrid by the Federal Government, COAG Energy Council, NSW Government, Victorian Government or the Energy Security Board that it considers that augmentation of the transmission network to deliver increased capacity from South Western NSW and/or North Western Victoria is required in order to meet or manage the expected demand for prescribed transmission services or comply with an applicable regulatory obligation or requirement associated with the provision of prescribed transmission services<br><br>(iii) Successful completion of a RIT-T or alternate framework introduced in response to the recommendation of the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council (including comprehensive assessment of credible options) demonstrating that increasing capacity of the network in South Western NSW at 330/220/132kV or other voltages used in future is the option that maximises the positive net economic benefits<br><br>(iv) Determination by the AER that the proposed investment satisfies the RIT-T or abovementioned alternate framework<br><br>(c) Where the optimal solution involves works in NSW and Victoria, successful completion of joint planning obligations under the NER demonstrating that strengthening the high voltage interconnection between New South Wales and Victoria is the option that maximises the positive net economic benefits<br><br>(d) TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules. |
| Supply to Broken Hill ($52m to $177m) | (a) Notification from Essential Energy of available capacity of backup generation at Broken Hill that would result in expected unserved energy exceeding 10 minutes at average demand<br><br>(b) Either:<br><br>(i) Where the investment is driven by market benefits:<br><br>(A) Successful completion of the RIT-T (including a comprehensive assessment of the credible options) that demonstrates a network investment by TransGrid maximises the market benefits while meeting reliability of supply obligations to the Broken Hill area<br><br>(B) Determination by the AER that the proposed investment satisfies the RIT-T; or<br><br>(ii) Where the investment is driven by a need for reliability corrective action that emerges during TransGrid's 2018-2023 regulatory control period, successful completion of economic evaluation demonstrating that a network investment is the most efficient option to meet the applicable electricity transmission reliability standard<br><br>(c) TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules. |
| Reinforcement of Southern Network in response to Snowy 2.0 ($831m to $1,228m) | (a) Notification from Snowy Hydro that its Board has made a final investment decision to proceed with Snowy 2.0<br><br>(b) Two or more of the following:<br><br>(i) Inclusion of the Snowy 2.0 transmission augmentation in AEMO's Integrated Grid Plan or similar plan as recommended by the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council<br><br>(ii) Notification to TransGrid by the Federal Government, COAG Energy Council, NSW Government, Victorian Government or the Energy Security Board that it considers that augmentation of the transmission network to deliver increased output from Snowy 2.0 is required in order to meet or |

| | |
|---|---|
| | manage the expected demand for prescribed transmission services or comply with an applicable regulatory obligation or requirement associated with the provision of prescribed transmission services<br><br>(iii) Successful completion of a RIT-T or alternate framework introduced in response to the recommendation of the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council (including comprehensive assessment of credible options) demonstrating that a Snowy 2.0 transmission augmentation is the option that maximises the positive net economic benefits<br><br>(iv) Determination by the AER that the proposed investment satisfies the RIT-T or abovementioned alternate framework<br><br>(c) TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules. |
| Support Central Western NSW for Renewables ($120m to $455m) | (a) New generation more than 900 MW is committed in Central Western NSW (west of Wollar and Mt Piper)<br><br>(b) Two or more of the following:<br><br>(i) Inclusion of renewable energy zones in Central Western NSW in AEMO's Integrated Grid Plan or similar plan as recommended by the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council<br><br>(ii) Notification to TransGrid by the Federal Government, COAG Energy Council, NSW Government or the Energy Security Board that it considers that augmentation of the transmission network to deliver increased capacity from Central Western NSW is required in order to meet or manage the expected demand for prescribed transmission services or comply with an applicable regulatory obligation or requirement associated with the provision of prescribed transmission services<br><br>(iii) Successful completion of a RIT-T or alternate framework introduced in response to the recommendation of the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council (including comprehensive assessment of credible options) demonstrating that increasing capacity of the network in Central Western NSW at 330/132kV or other voltages used in future is the option that maximises the positive net economic benefits<br><br>(iv) Determination by the AER that the proposed investment satisfies the RIT-T or abovementioned alternate framework<br><br>(c) TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules. |
| Support North Western NSW for Renewables ($500m to $945m) | (a) New generation more than 800 MW is committed in North Western NSW (north of Bayswater and Liddell)<br><br>(b) Two or more of the following:<br><br>(i) Inclusion of renewable energy zones in North Western NSW in AEMO's Integrated Grid Plan or similar plan as recommended by the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council<br><br>(ii) Notification to TransGrid by the Federal Government, COAG Energy Council, NSW Government or the Energy Security Board that it considers that augmentation of the transmission network to deliver increased capacity from North Western NSW is required in order to meet or manage the expected demand for prescribed transmission services or comply with an applicable regulatory obligation or requirement associated with the provision of prescribed transmission services<br><br>(iii) Successful completion of a RIT-T or alternate framework introduced in response to the recommendation of the Independent Review in to the Future |

| | |
|---|---|
| | Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council (including comprehensive assessment of credible options) demonstrating that increasing capacity of the network in North Western NSW at 330/132kV or other voltages used in future is the option that maximises the positive net economic benefits<br><br>(iv) Determination by the AER that the proposed investment satisfies the RIT-T or abovementioned alternate framework<br><br>(c) TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules. |
| Renewables development in the Mt Piper to Wellington area ($36.8m) | (a) New generation more than 150 MW is committed in Mt Piper to Wellington area<br><br>(b) Successful completion of a RIT-T or alternate framework introduced in response to the recommendation of the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council (including comprehensive assessment of credible options) demonstrating that increasing capacity of the network between Mt Piper and Wellington at 132kV or other voltages used in future is the option that maximises the positive net economic benefits<br><br>(c) Determination by the AER that the proposed investment satisfies the RIT-T or abovementioned alternate framework<br><br>(d) TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules. |

Source: TransGrid revised revenue proposal 2018-23.

### *Possible new pathway for transmission investment planning and assessment*

TransGrid submitted that the ongoing policy and regulatory reform which followed the endorsement of the 'Finkel Review' recommendations could create a new method (or methods) for the initiation of transmission investment. TransGrid submitted that a new pathway for transmission investment reflected two 'Finkel Review' recommendations:[439]

- AEMO to develop an integrated grid plan to identify efficient locations for renewable energy zones and subsequently to identify potential priority transmission projects to facilitate the connection of these (TransGrid expect AEMO's first Integrated Plan to be released in mid-2018); and
- specifying a potential role for governments in supporting specific transmission investments, if the market does not deliver.

TransGrid submitted that the potential role for governments would be supported by a rigorous framework of project evaluation, to be developed by the AEMC.[440] TransGrid also considered that this process minimises the risk to consumers of bearing unnecessary cost. TransGrid suggested that this might be separate from, or an alternative to, the RIT-T process.[441]

[439] TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 95.
[440] TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 95.
[441] TransGrid, *Revised revenue proposal 2018–23*, December 2017, pp. 95-96.

With the exception of the proposed contingent projects related to supply to Broken Hill and renewables development in Mt Piper to Wellington area, this new method for initiation of transmission investment is reflected in TransGrid's revised trigger event for its contingent projects.

## C.14 Submissions

The CCP recommended we consider TransGrid's contingent project triggers in light of AEMO's Integrated System Plan (ISP) and seek consistency with the approach for other TNSPs.[442] The CCP expressed its concern that the timing of AEMO's ISP and the AEMC's Market Review into Coordination of generation and transmission investment makes our determination for TransGrid due for commencement on 1 July 2018 challenging.[443]

The Public Interest Advocacy Centre (PIAC) generally supported TransGrid using the contingent projects mechanism where the benefits of an accelerated transition to a low emissions sector must be balanced against the risk of saddling consumers with inefficient investments.[444] The PIAC submitted that it supported the contingent projects mechanism in such cases rather than in the ex-ante capex proposal, considering the level of uncertainty in the volume, timing and precise location of the new renewable energy connections.[445]

The PIAC submitted that it generally supported TransGrid's proposed trigger conditions, but was concerned that in some cases TransGrid may allow a project to proceed without necessarily completing a RIT-T, or equivalent. The PIAC considered that this would not be an appropriate outcome. The PIAC recommended that the trigger conditions be amended such that the contingent projects must successfully pass a RIT-T, or equivalent test, as well as either:

- included in renewable energy zones in AEMO's Integrated Grid Plan; or
- notification by the Federal Government, COAG Energy Council, NSW Government or the Energy Security Board that transmission augmentation is required to meet or manage expected demand for prescribed transmission services or associated regulatory obligation.[446]

Snowy Hydro supported the inclusion of the Reinforcement of Southern Network in response to Snowy 2.0 project and the project's proposed triggers.[447] Snowy Hydro

---

442 CCP 9, *Response to AER draft decision and TransGrid's revised proposal,* February 2018, p. 5.

443 CCP 9, *Response to AER draft decision and TransGrid's revised proposal,* February 2018, p. 52.

444 Public Interest Advocacy Centre, *PIAC submission to the AER Draft Determination and TransGrid revised 2018-23 regulatory proposal*, January 2018, p. 7.

445 Public Interest Advocacy Centre, *PIAC submission to the AER Draft Determination and TransGrid revised 2018-23 regulatory proposal*, January 2018, p. 7.

446 Public Interest Advocacy Centre, *PIAC submission to the AER Draft Determination and TransGrid revised 2018-23 regulatory proposal*, January 2018, pp. 7-8.

447 Snowy Hydro, *Response to Draft Decision - TransGrid transmission determination 2018 to 2023,* 5 February 2018.

agreed with TransGrid's assessment that the market benefits from transmission to connect the new Snowy 2.0 would include:[448]

- lower costs associated with meeting the supply reliability standard in NSW
- a reduction in the risk of blackouts and unserved energy; and
- lower market dispatch costs.

Snowy Hydro submitted that the NER does not require the RIT-T to be a trigger for a contingent project in a revenue determination. Rather, Snowy Hydro submitted that the NER only requires that the AER be satisfied that the contingent project trigger is 'appropriate', having regard to certain factors such as that the trigger event is reasonably specific. Snowy Hydro submitted that the project would still be subject to the scrutiny of the AER under the NER and that the AER would still be required to assess the efficiency of the investment when deciding whether to accept the project as a contingent project in TransGrid's revenue determination, and when amending a revenue determination to account for the contingent project.[449]

## C.15 Reasons for final decision

### C.15.1 Assessment of proposed contingent projects

We are satisfied that the proposed nine contingent projects may be reasonably required to be undertaken in order to meet the expected demand for transmission services, and/or reliability over the 2018-23 regulatory control period.[450] We reviewed each contingent project based on the information provided by TransGrid. Given the uncertainty about the timing and requirements of each project, at this stage, it is not necessary to assess the costs and technical scope of each project in detail. Rather, we reviewed whether each contingent project is reasonably likely to be required in the 2018-23 regulatory control period based on the materiality and plausibility of the trigger conditions. This gives us a high level view of whether each project is reasonably required to be undertaken in the regulatory control period in order to achieve any of the capex objectives and reflect the capex criteria.

We consider that the trigger events that define each proposed project are probable during the 2018–23 regulatory control period but the inclusion of capex in relation to it (in the total forecast capex) is not appropriate because there is not sufficient certainty regarding either the occurrence of the event or condition during the regulatory control period or the costs associated with the event or conditions.[451]

**New South Wales to South Australia Interconnector**

---

448 Snowy Hydro, *Response to Draft Decision - TransGrid transmission determination 2018 to 2023,* 5 February 2018.
449 Snowy Hydro, *Response to Draft Decision - TransGrid transmission determination 2018 to 2023,* 11 January 2018.
450 NER, cl. 6A.8.1(b)(1).
451 NER, cl. 6A.8.1(c)(5).

TransGrid submitted that the withdrawal of over 1,000 MW of generation capacity reserves in South Australia has been announced, to occur over the next ten years. TransGrid submitted that, simultaneously, AEMO is reporting that there are 15 proposals for new wind generation. TransGrid considers that this can cause low reserve conditions which can compromise system security. TransGrid has identified an option to manage the low reserve conditions and system security by increasing interconnection to an adjacent state such as NSW.[452]

We consider that the contingent project is reasonably likely to occur in the 2018-23 regulatory control period but that the timing and costs are not sufficiently certain. We stated that depending on the outcomes of ElectraNet's RIT-T process for its "South Australian Energy Transformation" contingent process, the options proposed by TransGrid may be reasonably required to achieve any of the capital expenditure objectives.[453] As such, we are satisfied that the project be included as a contingent project for the 2018-23 regulatory control period.[454]

**Reinforcement of the Southern Network**

TransGrid submitted that among the potential new generation connections in NSW is some 2,000MW of new generation connections proposed in the Southern NSW area.[455] We noted in our draft decision that some of this new generation has recently been commissioned.[456] TransGrid submitted that without this network augmentation this new renewable generation could be constrained due to transmission system limitations.[457]

We consider that the 'Reinforcement of Southern Network' project is reasonably likely to be required to be undertaken in order to achieve the capital expenditure objectives.[458] AEMO's 2016 National Transmission Network Development Plan (NTNDP) identifies economic limitations on the southern 220kV transmission network that are consistent with the options put forward by TransGrid.[459] The NTNDP also identifies that there is potential for overloading on the 132 kV parallel system between southern and western New South Wales (Yass – Wellington), due to a large number of generation projects connecting at Yass, Wellington, and Wallerawang.[460] On this basis, we are satisfied that the trigger event included in TransGrid's revenue proposal is probable in the 2018-23 regulatory control period but that the timing and costs are not sufficiently

452 TransGrid, *Revenue proposal 2018-23*, January 2017, p. 107.

453 NER, cl. 6A.8.1(b)(1).

454 AER, *Draft Decision, TransGrid transmission determination 2018–19 to 2022–23, Attachment 6 –Capital Expenditure*, September 2017, p. 6-162.

455 TransGrid, *Reinforcement of Southern Network Contingent Project*, January 2017.

456 Royalla Solar Farm (south of Canberra) has been progressively commissioned since 2014.

457 TransGrid, *Revenue proposal 2018-23*, January 2017, p. 108.

458 NER, cl. 6A.8.1(b)(1).

459 AEMO, *2016 National Transmission Network Development Plan*, December 2016, pp. 37, 46.

460 AEMO, *2016 National Transmission Network Development Plan*, December 2016, p. 46.

certain.[461] Consistent with our draft decision, we are satisfied that this project be included as a contingent project for the 2018-23 regulatory control period.[462]

**Reinforcement of Northern Network (QNI upgrade)**

TransGrid submitted that among the potential new generation connections in NSW, about 1,000MW of new generation connections are proposed in the northern NSW New England area (north of Armidale). In our draft decision we noted that recently some generation has been commissioned or is at an advanced design stage, and further new generation is forecast to be commissioned towards the end of the 2014-18 regulatory control period.[463]

We consider that the 'Reinforcement of Northern Network' (QNI upgrade) is reasonably likely to be required to be undertaken to achieve the capital expenditure objectives.[464] The NTNDP identifies economic limitations on the northern 330kV transmission network for the generation scenario identified in the contingent project trigger.[465] A number of the identified limitations are outside of the 2018-23 regulatory control period.[466] However, the NTNDP does identify an existing economic limitation on the Northern NSW network: “Transmission limitations between 330 kV lines between Dumaresq and Liddell”.[467] This limitation is forecast to continue under all of the NTNDP scenarios. On this basis we are satisfied that the trigger event is probable in the 2018-23 regulatory control period but that the timing and costs are not sufficiently certain. As such, we are satisfied that this project be included as a contingent project for the 2018-23 regulatory control period.[468]

**Support South Western NSW for Renewables**

TransGrid has identified over 1000MW of new generation connections proposed in the South Western NSW area. TransGrid has identified that this new renewable generation (along with imports from Victoria) could be constrained due to transmission system limitations west of Wagga Wagga. The Victorian Annual Planning Report for 2016 (VAPR) identified the potential growth of renewable generation in the North-West of Victoria. North West Victoria is experiencing a high level of interest for renewable generation connection, primarily due to favourable wind and solar resources.[469] However, the additional connection in the area is expected to exceed network

---

461 NER, cl. 6A.8.1(c)(5).

462 AER, *Draft Decision, TransGrid transmission determination 2018–19 to 2022–23, Attachment 6 –Capital Expenditure*, September 2017, p. 6-162.

463 AER, *Draft Decision, TransGrid transmission determination 2018–19 to 2022–23, Attachment 6 –Capital Expenditure*, September 2017, p. 6-165.

464 NER, cl. 6A.8.1(b)(1).

465 AEMO, *2016 National Transmission Network Development Plan*, December 2016, pp. 37, 46.

466 AEMO, *2016 National Transmission Network Development Plan*, December 2016, p. 46.

467 AEMO, *2016 National Transmission Network Development Plan*, December 2016, p. 37.

468 AER, *Draft Decision, TransGrid transmission determination 2018–19 to 2022–23, Attachment 6 –Capital Expenditure*, September 2017, p. 6-162.

469 AEMO, *2016 Victorian Annual Planning Report*, June 2016, p. 2.

capability. The NTNDP also identified the potential constraint of the South-Western NSW network.[470] The NTNDP identified projected economic limitations of the 220kV line between Broken Hill and Buronga due to the dispatch of high wind resources from Broken Hill. On this basis we are satisfied that the trigger event is probable in the 2018-23 regulatory control period but that the timing and costs are not sufficiently certain. As such, we are satisfied that this project be included as a contingent project for the 2018-23 regulatory control period.

**Reinforcement of Southern Network in response to Snowy 2.0**

TransGrid submitted that although its revenue proposal included 'Reinforcement of Southern Network' as a contingent project, the scale of this project is not sufficient to accommodate the transmission augmentation required to connect Snowy 2.0. TransGrid submitted that as the timing and exact requirements of the augmentation are not yet known, it is appropriate to treat this as a contingent project, rather than incorporating it into its ex-ante capital expenditure forecast. TransGrid anticipates that transmission investment to enable the output from Snowy 2.0 will form part of AEMO's inaugural Integrated System Plan (ISP) which is due by mid-2018.[471] This position is supported by Snowy Hydro who supported the inclusion of this project as a contingent project.[472] TransGrid has identified the following market benefits from transmission to connect the new Snowy 2.0:[473]

- lower costs associated with meeting the supply reliability standard in NSW
- a reduction in the risk of blackouts (and therefore unserved energy) at times where demand is high and the output from renewable generators is low, such as occurred in the summer of 2016-17; and
- lower market dispatch costs (and hence lower prices for consumers) resulting from the additional output from Snowy 2.0 and the facilitation of additional output from new renewable generators.

Snowy Hydro stated that the feasibility study of Snowy 2.0 it commenced on 16 March 2017 is complete and that following detailed and rigorous consideration, its independent Board of Directors has approved to progress the project from feasibility stage towards final investment decision and to undertake further work and project refinements.[474] Further, on 7 March 2018 the NSW Minister for Planning declared:[475]

> The proposed development to be carried out for the purposes of Snowy 2.0; and the Transmission project, including the construction of additional electricity

---

470 AEMO, *2016 National Transmission Network Development Plan*, December 2016, p. 37.

471 TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 100.

472 Snowy Hydro, *Response to Draft Decision - TransGrid transmission determination 2018 to 2023,* 5 February 2018.

473 TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 100.

474 Snowy Hydro, http://www.snowyhydro.com.au/our-scheme/snowy20/, cited on 16 April 2018.

475 Environmental Planning and Assessment Amendment (Snowy 2.0 and Transmission Project), Order 2018, 7 March, 2017.

power lines and substations, to be State significant infrastructure and critical State significant infrastructure.

In addition, as part of its Integrated System Plan Consultation AEMO identified the proposed expansion of the Snowy scheme with associated transmission upgrades in New South Wales and Victoria, as a potential location for a Renewable Energy Zone.[476] On this basis we are satisfied that the trigger event is probable in the 2018-23 regulatory control period but that the timing and costs are not sufficiently certain. As such, we are satisfied that this project be included as a contingent project for the 2018-23 regulatory control period.

**Supply to Broken Hill**

The unserved energy allowance for Broken Hill is defined in the IPART reliability standard final supplementary report at 10 minutes.[477] In its revenue proposal, TransGrid submitted that it would be required to provide additional capacity to supply Broken Hill in the event that the total 220kV and 22kV load at Broken Hill exceeds the capacity of the backup gas turbines owned by Essential Energy and expected unserved energy exceeds the unserved energy allowance.

We are satisfied that the trigger event is probable in the 2018-23 regulatory control period but that the timing and costs are not sufficiently certain. As such, we consider that this project be included as a contingent project for the 2018-23 regulatory control period.[478]

**Support Central Western NSW for Renewables**

TransGrid submitted that it has interest from renewable energy proponents seeking to connect to its network in South Western NSW. TransGrid also submitted that it is possible that South Western NSW will be identified as a renewable energy zone in AEMO's ISP.[479]

TransGrid identified the impacted area around the Wellington area comprising a parallel network of 132 kV and 330 kV lines connecting to the 500 kV substations at Mt Piper and Wollar. TransGrid submitted there is around 150 MW of generation currently connected in the area and that a further 230 MW of new generation is committed and more than 400 MW of capacity is well advanced.[480]

TransGrid has identified the following market benefits from addressing any transmission constraints from new generator connections in Central Western NSW:[481]

---

476 AEMO, *Integrated System Plan Consultation for the National Electricity Market*, December 2017.

477 IPART, *Electricity Transmission Reliability Standards 2016.*

478 AER, *Draft Decision, TransGrid transmission determination 2018–19 to 2022–23, Attachment 6 –Capital Expenditure*, September 2017, p. 6-172.

479 TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 101.

480 TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 101.

481 TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 102.

- lower costs for meeting the supply reliability standard in NSW through facilitating access to the output from these generation connections; and
- lower market dispatch costs (and hence lower prices for consumers) assuming the generators are low cost.

AEMO's 2016 NTNDP identified that New South Wales has a number of economic limitations on the main 330 kV network which forms the transmission flow paths between Victoria and the Sydney region, and the Sydney region and Queensland. AEMO stated that these limitations are projected to become more binding in later years, with the majority of new utility-scale PV and wind generation expected to be located on or nearby these 330 kV lines, and New South Wales projected to become more reliant on interconnection after the retirement of black coal generation.[482]

TransGrid identified the specific assets considered likely to be constrained should the new renewable generation of 900MW become committed.[483] On the basis of this further information, we are satisfied that the trigger event is probable in the 2018-23 regulatory control period but that the timing and costs are not sufficiently certain. As such, we are satisfied that this project be included as a contingent project for the 2018-23 regulatory control period.

**Support North Western NSW for Renewables**

TransGrid submitted that it has received applications for a number of generator connections to the North Western NSW transmission system. TransGrid stated that some of these projects are proposed to connect to the 132 kV and 66 kV network, increasing the power flow from the local 132 kV network to 330 kV network. TransGrid submitted that one generator of 170 MW is partially commissioned and other well advanced projects have a total capacity of 280 MW. TransGrid further submitted that connections directly to the 330 kV network are also expected and that there is 270 MW of committed generation capacity and 200 MW at an advanced stage of development. TransGrid considered that there is little spare capacity on this part of the 330 kV network.[484]

TransGrid has identified the following market benefits from addressing any transmission constraints from new generator connections in North Western NSW:[485]

- lower costs for meeting the supply reliability standard in NSW through facilitating access to the output from these generation connections; and
- lower market dispatch costs (and hence lower prices for consumers) assuming the generators are low cost.

---

[482] AEMO, *2016 National Transmission Network Development Plan*, December 2016.

[483] TransGrid, *Response to AER Information Request #46 - Proposed Contingent Projects,* 12 February, 2018.

[484] TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 103.

[485] TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 103.

AEMO's 2016 NTNDP identified that New South Wales has a number of economic limitations on the main 330 kV network which forms the transmission flow paths between Victoria and the Sydney region, and the Sydney region and Queensland. AEMO stated that these limitations are projected to become more binding in later years, with the majority of new utility-scale PV and wind generation expected to be located on or nearby these 330 kV lines, and New South Wales projected to become more reliant on interconnection after the retirement of black coal generation.[486] TransGrid identified the specific assets considered likely to be constrained should the new renewable generation of 800MW become committed.[487]

We are satisfied that the trigger event is probable in the 2018-23 regulatory control period but that the timing and costs are not sufficiently certain. As such, we are satisfied that this project should be included as a contingent project for the 2018-23 regulatory control period.

**Renewables development in the Mt Piper to Wellington area**

TransGrid submitted that there is strong interest from at least three renewable energy proponents seeking to connect to the 132 kV network between Mt Piper and Wellington in NSW and that the three generation connections have a total combined capacity of around 360MW. TransGrid stated that one proponent has signed a connection agreement and the others are at advanced development stages but are not yet committed.[488]

TransGrid submitted that if all three of these renewable generators connect, their outputs will be constrained under system normal conditions to maintain the transmission network within acceptable limits. TransGrid considered that the constraint is due to the thermal rating of the network and that it will limit the ability to transfer power out of the region. TransGrid submitted that its initial market modelling indicates there would be net market benefits from augmenting the transmission network to provide additional capacity.[489]

AEMO's 2016 NTNDP identified that NSW has a number of economic limitations on the main 330 kV network which forms the transmission flow paths between Victoria and the Sydney region, and the Sydney region and Queensland. AEMO stated that these limitations are projected to become more binding in later years, with the majority of new utility-scale PV and wind generation expected to be located on or nearby these 330 kV lines, and New South Wales projected to become more reliant on interconnection after the retirement of black coal generation.[490]

---

[486] AEMO, *2016 National Transmission Network Development Plan*, December 2016.

[487] TransGrid, *Response to AER Information Request #46 - Proposed Contingent Projects,* 12 February, 2018.

[488] TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 104.

[489] TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 104.

[490] AEMO, *2016 National Transmission Network Development Plan*, December 2016.

TransGrid identified the specific assets considered likely to be constrained should the new renewable generation of 150 MW become committed.[491]

On the basis of this further information, we are satisfied that the trigger event is probable in the 2018-23 regulatory control period but that the timing and costs are not sufficiently certain. As such, we are satisfied that this project be included as a contingent project for the 2018-23 regulatory control period.

## C.15.2 Further assessment of proposed trigger events

### Common trigger events across contingent projects

As discussed in section C.13, TransGrid has proposed revised trigger events for its contingent projects to reflect the possibility that a new investment planning and approval pathway for transmission investment may be developed.[492]

We are not satisfied that these trigger events are appropriate. Our reasoning is set out below.

TransGrid submitted that the ongoing policy and regulatory reform which followed the endorsement of the 'Finkel Review' recommendations could create a new method (or methods) for the initiation of transmission investment and that this could be separate from, or an alternate to, the RIT-T process. In particular, TransGrid proposed that the trigger events for each relevant project include:[493]

> Two or more of the following:
>
> (i) Inclusion of renewable energy zones in [……..] in AEMO's Integrated Grid Plan or similar plan as recommended by the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council.
>
> (ii) Notification to TransGrid by the Federal Government, COAG Energy Council, NSW Government, [……..] Government or the Energy Security Board that it considers that augmentation of the transmission network to […….] is required in order to meet or manage the expected demand for prescribed services or comply with an applicable regulatory obligation or requirement associated with the provision of prescribed transmission services.
>
> (iii) Successful completion of a RIT-T or alternative framework introduced in response to the recommendation of the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council (including a comprehensive assessment of alternative options) demonstrating that increasing capacity of

[491] TransGrid, *Response to AER Information Request #46 - Proposed Contingent Projects,* 12 February, 2018.

[492] TransGrid, *Revised revenue proposal 2018–23*, December 2017, pp. 95-96.

[493] TransGrid, *Revised revenue proposal 2018–23*, December 2017, pp. 96-104.

> the network [……..] is the option that maximises the positive economic benefits.

Through an information request we sought further clarification on TransGrid's proposed trigger events.[494] In its response, TransGrid submitted:[495]

- The proposed triggers take account of recommendation 5.2 of the Independent Review into the Future Security of the National Electricity Market, which was one of the 49 recommendations the COAG Energy Council agreed to implement at its meeting on 14 July 2017. The recommendation requires the Australian Energy Market Commission to develop a rigorous framework to evaluate the priority projects arising from the integrated grid plan, noting that government intervention may be required to facilitate specific transmission investments. As the COAG Energy Council has agreed to implement this recommendation, TransGrid considered that the appropriate tests for transmission investments may include either the RIT-T or the alternate framework to be established under the recommendation.
- The proposed trigger events ensure that an independent economic evaluation, including public consultation, is undertaken before a project is triggered. For projects identified in the ISP, the economic evaluation is undertaken by AEMO as the independent national transmission planner. For projects that otherwise pass through the existing RIT-T, the economic evaluation undertaken in the RIT-T process is reviewed by the AER at the time the contingent project is triggered.
- The proposed trigger events have also been carefully considered with the objective of being flexible and supporting the ongoing changes in the regulatory environment in a timely way, without increasing the risk of inefficient investment borne by consumers.

We recognise that TransGrid has proposed these amended triggers to provide flexibility to accommodate possible future changes to the regulatory framework in relation to transmission investment. However, AEMO in its recent consultation on the ISP stated that:[496]

> Under the present regulatory arrangements, it is important that projects in the ISP are individually economically justifiable, so each project can deliver overall benefits to consumers and pass a RIT-T.

And:

> The ISP will aim to use high-level economic assessments to achieve a staged plan for regional transmission planners to follow. Under the current transmission planning framework, individual stages of the ISP will need to be justified through the RIT-T framework.

---

494 *AER staff informal information request - Contingent Project Triggers*, 6 March 2018.

495 TransGrid*, Response to AER staff informal information request - Contingent Project Triggers,* 9 March 2018.

496 AEMO, Integrated Systems Plan Consultation, December 2017, p. 51

We agree with AEMO that each project should be economically justifiable and at this time the relevant economic assessment of transmission projects is the RIT-T.

We also recognise that in the event that regulatory arrangements may change in the future, including the obligation for TNSP's to conduct a RIT-T, it may be appropriate to allow for this circumstances in the trigger events. The trigger events in Table 6-21 (see page 6-137) recognise that a RIT-T would no longer apply to the trigger event where the obligation to undertake a RIT-T in the NER is no longer applicable.

Snowy Hydro submitted that the NER only requires that the AER be satisfied that the contingent project trigger is 'appropriate', having regard to certain factors such as that the trigger event is reasonably specific.[497] Snowy Hydro also submitted that the 'Snowy 2.0' project would still be subject to the scrutiny of the AER under the NER and that the AER would still be required to assess the efficiency of the investment when:[498]

- deciding whether to accept the project as a contingent project in TransGrid's revenue determination; and when
- amending a revenue determination to account for the contingent project.

We recognise Snowy Hydro's view that this project would still be subject to our assessment at the time TransGrid's submits a contingent project application to us. However, as we stated in section C.15.2 (see page 6-155), TNSPs are required under the NER to conduct a RIT-T and at this time the RIT-T is the appropriate economic test. PIAC also recommended that the trigger conditions be amended such that the contingent projects must successfully pass a RIT-T or equivalent test. PIAC was concerned that in some cases TransGrid may allow a project to proceed without necessarily completing a RIT-T or equivalent.[499] As customers face the risk of inefficient transmission investment, we agree with PIAC that the trigger event should include the requirement to successfully complete a RIT-T. The inclusion of the RIT-T as a mandatory aspect of the trigger event is also consistent with the CCP recommendation that we seek consistency with our approach in respect to contingent project triggers for TNSPs.[500]

**Conclusion**

TransGrid has proposed amended triggers in order to accommodate possible changes to current RIT-T obligations. However, if policy makers amend the regulatory framework for transmission investment in the future, we consider that:

- Any issues arising from amendments to the transmission investment framework should be addressed, as part of those amendments, through transitional mechanisms or consequential amendments to existing obligations.

---

497 Snowy Hydro, *Response to Draft Decision - TransGrid transmission determination 2018 to 2023,* 11 January 2018

498 Snowy Hydro, *Response to Draft Decision - TransGrid transmission determination 2018 to 2023,* 11 January 2018.

499 Public Interest Advocacy Centre, *PIAC submission to the AER Draft Determination and TransGrid revised 2018-23 regulatory proposal*, January 2018, p. 7.

500 CCP 9, *Response to AER draft decision and TransGrid's revised proposal,* February 2018, p. 5.

- While our final decision reflects the transmission investment framework as it currently stands, in the event that the NER removes TransGrid's obligation to conduct a RIT-T, the RIT-T aspects of the trigger will no longer apply (see Table 6-21 on page 6-137). In this circumstance TransGrid will still be required to demonstrate that the proposed costs are prudent and efficient.

Therefore, the trigger events set out in Table 6-21:

- require the successful completion of a RIT-T and determination by the AER that the proposed investment satisfies the RIT-T; but
- do not require completion of a RIT-T if a change in the transmission investment framework removes the obligation for TransGrid to conduct a RIT-T.

## Contingent project trigger events for specific projects

Our draft decision presented our considerations of the five contingent projects included in TransGrid's revenue proposal.[501] TransGrid did not provide additional information or amend its supporting documentation in its revised proposal for these five contingent projects, although it did amend its proposed trigger events and estimated cost ranges for these projects.[502]

Our consideration of the proposed trigger events for each project, including the additional four projects in TransGrid's revised proposal, are discussed below.

**New South Wales to South Australia Interconnector**

We are satisfied that this project may be reasonably required to be undertaken in order to meet the expected demand for transmission services, and/or reliability over the 2018-23 regulatory control period.[503] However, we are not satisfied that the trigger events in relation to this project proposed by TransGrid are appropriate.[504]

TransGrid proposed as part of its proposed trigger event for this contingent project in its revised proposal, the possibility that a new pathway for transmission investment planning and approval may be developed. As discussed in section C.15.2, we do not accept this aspect of the proposed trigger event is appropriate. TransGrid also revised its trigger event for this project to include a system security objective as part of its RIT-T trigger, which also includes an interconnection option that maximises positive net economic benefits.[505] In particular, TransGrid has proposed the following two limbs for its RIT-T trigger:[506]

---

501 AER, *Draft Decision, TransGrid transmission determination 2018–19 to 2022–23, Attachment 6 –Capital Expenditure*, September 2017, pp. 6-159 to 6-173.

502 TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 96.

503 NER, cl. 6A.8.1(b)(1).

504 NER, cl. 6A.8.1(b)(4).

505 TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 97.

506 TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 97.

- new interconnection between NSW and SA is the option or part of the option that maximises the positive net economic benefits; or
- new interconnection is the option that most cost effectively addresses system security.

We consider that the reference to system security in this two part trigger is not necessary as system security is already included in the economic benefits analysis as part of the RIT-T. Furthermore, the proposed trigger's reference to the most cost effective option suggests that this second limb is considered necessary to address a reliability corrective action. However, ElectraNet has initiated a RIT-T process for the NSW to SA interconnector option and has not proposed an interconnector need which is required to address a reliability corrective action.[507]

ElectraNet's revised proposal refers to a reliability corrective action as a potential need for its South Australian Transformation contingent project (which includes a proposal for an interconnector between South Australia and NSW), and the trigger events in Table 6-21 include this scenario.

**Reinforcement of Southern Network**

We are satisfied that this project may be reasonably required to be undertaken in order to meet the expected demand for transmission services, and/or reliability over the 2018-23 regulatory control period.[508] However, we are not satisfied that the proposed trigger events in relation to this project proposed by TransGrid are appropriate.[509]

TransGrid's proposed trigger event in its revised proposal included the possibility that a new pathway for transmission investment may be developed. As discussed in section C.15.2, we do not accept this aspect of the proposed trigger events appropriate. The trigger event in Table 6-21 is location specific. In particular, it requires successful completion of the RIT-T demonstrating a network investment by TransGrid that maximises the positive net economic benefits from increasing the capacity of the network south of Bannaby and Marulan at 132/330kV or other voltages. The RIT-T trigger in Table 6-21 is more location specific and is consistent with the trigger event for TransGrid's Reinforcement of Southern Network in response to the Snowy 2.0 contingent project given the overlap between these two projects. This is necessary to meet the assessment criteria in the NER which requires a trigger event to be reasonably specific and capable of objective verification.[510]

**Reinforcement of Northern Network (QNI upgrade)**

We are satisfied that this project may be reasonably required to be undertaken in order to meet the expected demand for transmission services, and/or reliability over the

---

[507] ElectraNet, https://www.electranet.com.au/projects/south-australian-energy-transformation/.

[508] NER, cl. 6A.8.1(b)(1).

[509] NER, cl. 6A.8.1(b)(4).

[510] NER, cl. 6A.8.1(c)(1).

2018-23 regulatory control period.[511] However, we are not satisfied that the proposed trigger events in relation to this project proposed by TransGrid are appropriate.[512]

TransGrid's proposed trigger event in its revised proposal included the possibility that a new pathway for transmission investment may be developed. As discussed in section C.15.2, we do not accept this aspect of the proposed trigger event.

TransGrid also proposed a modified trigger for this project from "AEMO classification of generation developments as being at the 'committed' stage of development on the 'Generator Information' webpage, exceeding 1100 MW at any current or future connection point(s) north of Armidale" to "New generation of more than 1,100 MW is committed in northern NSW at any current or future connection point(s) north of Armidale".[513] We requested a justification for this trigger modification and a definition for "new generation".[514] TransGrid submitted that the proposed modified trigger event is to simplify the trigger wording and align it with trigger wording for other contingent projects (including Support South Western NSW for Renewables).

TransGrid also stated that the important event is that new generation becomes committed, not that AEMO updates its webpage. TransGrid submitted that there is also the risk that AEMO's method of publishing committed generation information may change over the next five years.[515] TransGrid further submitted that "New generation" is defined as any generation which was not in-service at the time AEMO released its Need and Opportunities Statement (NOS). TransGrid stated that it includes new generation that is required to be registered with AEMO, which will connect to either the transmission network or DNSP sub-transmission network. It does not include generation which is not required to be registered with AEMO, such as small scale generation which is not dispatched by the National Electricity Market Dispatch Engine.[516]

In response, we support the inclusion of an independent verification from AEMO regarding committed generation where applicable. In circumstances where TransGrid considered that the threshold levels of committed generation have been realised, TransGrid should request that AEMO update their website, if necessary.[517] This will ensure that this aspect of the trigger event has been verified by AEMO.

**Support South Western NSW for Renewables**

We are satisfied that this project may be reasonably required to be undertaken in order to meet the expected demand for transmission services, and/or reliability over the

511 NER, cl. 6A.8.1(b)(1).
512 NER, cl. 6A.8.1(b)(4).
513 TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 98.
514 AER, *Information Request #46 - Proposed Contingent Projects*, 5 February 2018.
515 TransGrid, *Response to AER Information Request #46 - Proposed Contingent Projects,* 12 February, 2018.
516 TransGrid, *Response to AER Information Request #46 - Proposed Contingent Projects,* 12 February, 2018.
517 TransGrid, Response to *AER staff informal information request - Contingent Project Triggers,* 9 March 2018, p. 3.

2018-23 regulatory control period.[518] However, we are not satisfied that the trigger events in relation to this project proposed by TransGrid are appropriate.[519]

TransGrid proposed new triggers in its revised proposal for this contingent projects to reflect the possibility that a new pathway for transmission investment may be developed. As discussed in section C.15.2, we do not accept this aspect of the proposed trigger events.

The RIT-T trigger event set out in Table 6-21 does not include some terms that were redundant.

**Supply to Broken Hill**

We are satisfied that this project may be reasonably required to be undertaken in order to meet the expected demand for transmission services, and/or reliability over the 2018-23 regulatory control period.[520] However, we are not satisfied that the trigger events in relation to this project proposed by TransGrid are appropriate.[521]

TransGrid added the following trigger for a reliability corrective action in its revised proposal for the Supply to Broken Hill project:[522]

> Where the investment is driven by a need for reliability corrective action that emerges during TransGrid's 2018-2023 regulatory control period, successful completion of economic evaluation demonstrating that a network investment is the most efficient option to meet the applicable electricity transmission reliability standard.

TransGrid has proposed to exclude the successful completion of a RIT-T in the trigger where the investment is driven by a reliability corrective action on the basis that the investment may be exempted under NER 5.16.3(a)(1) that the project is required to address an urgent and unforeseen network issue which would otherwise put at risk the reliability of the transmission network.

We requested TransGrid to provide details of the constraints that would drive the reliability corrective action and why the successful completion of a RIT-T has not been included in the proposed trigger event.[523] TransGrid submitted that although Broken Hill load is supplied under system normal by one 220 kV transmission line from Buronga (X2 line), Broken Hill load can also be partially supplied during an islanded condition when the X2 line is out of service by local generation, currently provided by Essential Energy owned gas turbines located at its Broken Hill site.

---

518 NER, cl. 6A.8.1(b)(1).
519 NER, cl. 6A.8.1(b)(4).
520 NER, cl. 6A.8.1(b)(1).
521 NER, cl. 6A.8.1(b)(4).
522 TransGrid, *Revised revenue proposal 2018–23*, December 2017, p. 100.
523 AER, *Information Request #46 - Proposed Contingent Projects*, 5 February 2018.

TransGrid, considered that the Essential Energy gas turbines have exhibited deteriorating performance and are frequently unable to meet their nameplate capacity under the ambient temperatures at Broken Hill. TransGrid submitted that if Essential Energy were to decommission the gas turbines or revise their rating, TransGrid may not be able to rely on their use or nameplate capacity to meet the standard. To remedy this potential situation, TransGrid has proposed, along with procuring demand management, a contingent project such that TransGrid can install a network asset during the regulatory control period if required to meet the reliability standard.[524]

In response to TransGrid's view that a RIT-T is not appropriate, under the NER the RIT-T obligation does not apply to a proposed transmission investment where:[525]

1. it is necessary that the proposed investment be operational within six months of the TNSP identifying the need for the investment
2. the event or circumstance causing the identified need was not reasonably foreseeable and was beyond the reasonable control of the TNSP that identified the need
3. a failure to address the identified need is likely to materially adversely affect the reliability and secure operating state of the transmission network, and
4. it is not a contingent project.

TransGrid has an obligation in the NER to undertake a RIT-T. This project does not qualify as an urgent and unforeseen network issue for the purposes of 5.16.3(1) of the NER. As these circumstances do not appear to apply, TransGrid is obligated to undertake a RIT-T and we have included this obligation in the trigger event for the Supply to Broken Hill contingent project.

The trigger events in Table 6-21:

- require the successful completion of a RIT-T and determination by the AER that the proposed investment satisfies the RIT-T; and
- enables this aspect of the trigger event to not apply if a change in the law no longer obligates a TNSP to conduct a RIT-T.

## Additional contingent projects in the revised proposal

Three of the new contingent projects proposed by TransGrid are related to renewable energy generation connections and one to the proposed Snowy Hydro upgrade. In this section we consider whether the four new contingent projects proposed may be reasonably required to be undertaken in order to meet the expected demand for transmission services, and/or reliability over the 2018-23 regulatory control period.

**Reinforcement of Southern Network in response to Snowy 2.0**

[524] TransGrid, *Response to AER Information Request #46 - Proposed Contingent Projects,* 12 February, 2018.

[525] NER, clause 5.16.3(b).

We are not satisfied that the proposed trigger event in relation to this project is appropriate.[526] TransGrid proposed new triggers for this contingent project reflect the possibility that a new pathway for transmission investment may be developed. As discussed in section C.15.2, we do consider this aspect of the proposed trigger events is appropriate.

The trigger events in Table 6-21:

- are more load and location specific;[527] and
- require that where the optimal solution involves related works across other TNSPs in response to the Snowy 2.0 project, the RIT-T assessment must take this into account.

The trigger events in Table 6-21require that new generation of 2000 MW is committed in southern NSW at any current or future connection point(s) south of Bannaby and Marulan. A more location-specific trigger event is consistent with the assessment criteria in the NER which require consideration of whether a trigger event is reasonably specific and capable of objective verification.[528]

The trigger events in Table 6-21 also recognise that the RIT-T requirement needs to take into account where the optimal solution involves related works across other TNSPs in response to the Snowy 2.0 project. This is necessary to ensure that there is joint planning where relevant.

**Support Central Western NSW for Renewables**

We are not satisfied that the proposed trigger event in relation to this project is appropriate.[529] TransGrid's proposed trigger event for this contingent project reflects the possibility that a new pathway for transmission investment may be developed. As discussed in section C.15.2, we do not accept this aspect of the proposed trigger event is appropriate.

The trigger event in Table 6-21 is more load and location specific.[530] A more location-specific trigger event is consistent with the assessment criteria in the NER which require consideration of whether a trigger event is reasonably specific and capable of objective verification.[531]

**Support North Western NSW for Renewables**

526 NER, cl. 6A.8.1(b)(4).

528 NER, cl. 6A.8.1(c)(1).
529 NER, cl. 6A.8.1(b)(4).
530 NER, cl. 6A.8.1(c)(1).
531 NER, cl. 6A.8.1(c)(1).

We are not satisfied that the trigger events in relation to this project proposed by TransGrid are appropriate.[532] TransGrid proposed new triggers for this contingent projects reflect the possibility that a new pathway for transmission investment may be developed. As discussed in section C.15.2, we do not accept this aspect of the proposed trigger event is appropriate.

**Renewables development in the Mt Piper to Wellington area**

We are not satisfied that the proposed trigger event in relation to this project is appropriate.[533] TransGrid proposed a new trigger for this contingent projects to reflect the possibility that a new pathway for transmission investment may be developed. As discussed in section C.15.2, we do not accept this aspect of the proposed trigger event is appropriate.

[532] NER, cl. 6A.8.1(b)(4).

[533] NER, cl. 6A.8.1(b)(4).

# D Key aspects of our capex assessment process

## Initial revenue proposal

TransGrid lodged its revenue proposal on 31 January 2017, including proposed capex for the 2018-23 regulatory control period.

The AER engaged Energy Market Consulting associates[534] in April 2017 to review and provide advice on aspects of the capex proposal. EMCa provided its draft initial report on 29 June 2017, its final initlal report on 26 July 2017 and revised final initial report on 11 September 2017.

EMCa's review included an assessment of TransGrid's forecasting methodology and assumptions and providing an opinion on whether these forecasts are likely to be prudent and efficient. The areas of EMCa's initial review included:

- Non-load driven proposed capex (asset replacement capex)
- Load driven capex (augmentation capex) that was estimated to provide net economic benefits to customers, and
- Non-network driven capex (information and communications technology capex).

EMCa concluded that:

- TransGrid's capital investment framework does not appear to include an effective portfolio optimisation process
- There is a bias in TransGrid's proposal towards an over-estimation of risks from asset failures resulting in an overestimation of the capex forecast
- There is insufficient consideration in TransGrid's proposal of the optimal timing of capex as in most cases TransGrid's risk cost methodology is not used to determine the optimal timing of investment.

The AER released its draft decision and the EMCa report on 28 September 2017.

## Revised revenue proposal

TransGrid lodged its revised revenue proposal on 1 December 2017.

TransGrid's revised revenue proposal raised concerns regarding our draft decision on replacement capex. In particular, TransGrid submitted that our draft decision which reduced TransGrid's proposed repex by approximately $200 million was poorly

[534] EMCa provides advice specialising in the policy, strategy, implementation and operation of energy markets and related network management, access and regulatory arrangements.

supported on the basis that our decision was based on errors and misunderstandings. TransGrid submitted that this affected our draft decision that:[535]

- The risk assessment framework appears to be a work in progress
- The evidence indicates that TransGrid is overly risk averse
- The 'bottom up' forecast which is an aggregation of individual projects and programs is likely to be overstated
- The optimal timing of the capex program has not been demonstrated.

TransGrid also stated that it notified the AER in September 2017 that there were a range of errors in the EMCa's report.[536]

We re-engaged EMCa to assess the following aspects of TransGrid's revised capex proposal (which had also been the subject of EMCAs' initial report):

- Non-load driven proposed capex (asset replacement capex); and
- Load driven capex (augmentation capex) that was estimated to provide net economic benefits to customers,

We also asked EMCa to consider the issues raised by TransGrid in relation to any misunderstanding of its risk analysis and errors claimed by TransGrid. In addition to the revised revenue proposal, EMCa also considered:[537]

- TransGrid's responses to AER Information Requests' received after 29 May 2017 that were not considered in its initial report of June 2017 and TransGrid's responses to EMCa's initial report.
- Information provided by TransGrid during 'on site' meetings with TransGrid and the AER on 5-7 February 2018.
- TransGrid's reponse to AER Information Requests received by 28 February 2018.

EMCa's report (April 2018) was limited to issues raised by TransGrid in its revised revenue proposal. The report specifically addressed TransGrid's claims of errors in its response of September 2017 to the AER. In particular, EMCa noted that TransGrid's response it its September 2017 report submitted that there are:[538]

- Errors of fact
- Errors in interpretation
- Opinions; and
- Updated information.

---

535 TransGrid Revised revenue proposal 2018/19-2022/23, December 2017, p. 70

536 TransGrid Response, EMCa Report to AER - Review of Aspects of TransGrid's Forecast Capital Expenditure, September 2017.

537 EMCa, Review of TransGrid's revised forecast capital expenditure, April 2018, p. 2.

538 EMCa, Review of TransGrid's revised forecast capital expenditure, April 2018, p.5.

In its April 2018 report in response to TransGrid's revised revenue proposal, EMCa concluded that from a total of 35 claimed errors, it had identified only four errors and EMCa stated that these have been addressed in its April 2018 report. EMCa's review of TransGrid's claim of errors in its September 2017 report is set out in in Appendix A of EMCa's April 2018 report. EMCa also concluded that these four errors have not affected the findings in its final September 2017 report.[539] Further, EMCa stated that to the extent that these errors are relevant to EMCa's current report (April 2018 report), it has taken account of the information that TransGrid provided.[540]

EMCa also concluded that it found no area of misunderstanding of TransGrid's risk cost methodology and how it has used its assumed input values in applying its methodology.[541]

In response to the EMCa April 2018 report, TransGrid made a further submission on 27 April 2018 about environmental risk related to its proposed line renewals program. We have taken this submission into account in our final decision.

## Updated capex forecast and PTRM

TransGrid submitted an updated capex forecast and Post Tax Revenue Model on 21 February 2018.[542] This further submission proposed a revised forecast of $861.5 million for replacement expenditure subsequent to its revised proposal. TransGrid submitted that the further reduction in its revised repex forecast reflected:

- a change in the value of statistical life (VoSL) risk input parameter
- the identification of some asset replacements which were not optimally timed
- savings identified through its portfolio optimisation review; and
- numerous errors in calculations.

EMCa also took this into account in its final advice. We have also taken TransGrid's further revised proposal into account, where relevant as part of this final decision.

## Capex associated with 'ex NICPAP' projects

TransGrid's revised proposal included a number of capex projects that were not included in its revenue proposal. In particular, TransGrid proposed $20.9 million for a number of additional projects in its revised proposal that were initially proposed as part of the Network Capacity Incentive Action Plan in the Service Standard Performance Incentive Scheme such that these costs were proposed to by TransGrid to be recovered through the NCIPAP component of the STPIS.[543]

---

539 EMCa, Review of TransGrid's revised forecast capital expenditure, April 2018, p. 6.
540 EMCa, Review of TransGrid's revised forecast capital expenditure, April 2018, p. ii.
541 EMCa, Review of TransGrid's revised forecast capital expenditure, April 2018, p. ii.
542 TransGrid updated capex forecast and PTRM, 21 February 2018.
543 TransGrid Revised revenue proposal 2018/19-2022/23, December 2017, p. 85.

We did not accept these projects in our draft decision on the basis that these projects did not meet the criteria for a NCIPAP project. In its revised proposal,[544] TransGrid re-proposed these projects in its ex-ante capex forecast on the basis that these projects will deliver economic benefits.[545]

As part of our assessment we sought comment from TransGrid that:[546]

- The majority of these projects are likely to improve network reliability rather than maintain network reliability as is required to achieve the capex objectives; and
- These projects are more appropriately funded through the STPIS.

TransGrid submitted its response on 1 March 2018.[547] Our assessment of this aspect of proposed capex as part of the total capex forecast has taken into account TransGrid's response.

## Capex for the proposed project to address supply reliability in inner Sydney and the CBD

TransGrid's initially proposed a project to install two new 330kV underground cables from Rookwood Road Bulk Supply Point to Beaconsfield West BSP at a cost of $332 million. In our draft decision we did not accept TransGrid's proposed capex for the project. We did not include the proposed capex for this project on the basis that we were not satisfied that TransGrid's had demonstrated the project scope and timing was optimal. Our reasons for not including proposed capex is detailed in our draft decision.[548]

TransGrid's revised proposal has reduced the scope and cost of the project within the 2018-23 regulatory control period. TransGrid proposed installing a single 330kV cable at a cost of $252 million.[549]

TransGrid did not provide detailed costs in support of this proposed project in its revised proposal. We engaged EMCa to provide advice on the likely prudent and efficient scope of the proposed work and capex for this project. EMCa provided draft advice on 16 March 2018. As part of EMCa's assessment, we requested information, including detailed cost breakdowns used by TransGrid to support its proposal.[550] This also included information requested by EMCa[551] before the 'on site' meeting on 5

---

544 AER, Draft decision, TransGrid transmission determination 2018-19 to 2022-23: Attachment 11 - Service Target Performance Incentive Scheme.

545 TransGrid Revised proposal 2018/19-2022/23, December 2017, pp. 84-85.

546 AER, information request #057 - Augmentation - ex-NCIPAP projects, 22 February 2018.

547 TransGrid response to AER information request #057 - Augmentation - ex-NCIPAP projects, 1 March 2018.

548 AER, Draft decision, TransGrid transmission determination 2018-19 to 2022-23: Attachment 6 - Capital expenditure.

549 TransGrid, *Revised revenue proposal 2018-23*, December 2017, p. 62.

550 AER, Information request #050, Q2, - Annual expenditure for the PSF, 8 February 2018.

551 AER, information request #045 - PSF capex and cable capex, 1 February 2018.

February 2018 and information provided by TransGrid in response to information requested by EMCa following the 'on site' meeting.[552] TransGrid's responses to these requests was taken into account by EMCa in finalising its April 2018 report.[553]

EMCa concluded in its April 2018 report that the scope of work as part of the proposed capex is appropriate. However, EMCa considered that the proposed costs were likely to be overstated due to provision for uncertainties that were included in the capex forecast.[554] Following this draft EMCa advice:

- We sought comment from TransGrid on 3 April 2018 on EMCa's draft advice.[555]
- TransGrid provided its response on 6 April 2018;[556] and
- EMCa considered TransGrid's response in finalising this aspect of its April 2018 report.

Our assessment of TransGrid's proposed capex for this project has taken into account TransGrid's response to EMCa's advice.

## Proposed contingent projects - trigger events

TransGrid revised revenue proposal included:

- Amendments to our draft decision trigger events, including proposed amendments to the triggers in response to changes in the energy sector.
- Minor amendments to its estimated cost ranges for the five contingent projects included in its initial revenue proposal.
- A further four contingent projects (resulting in nine proposed contingent projects).
- That the four new contingent projects and the revisions to the trigger events of the five original contingent projects include a new method for initiating transmission investment to reflect:[557]
    - the possibility that a new pathway for transmission investment may be developed; and
    - the possibility that some projects have potential reliability triggers as well as market benefits triggers.

---

552 AER, Information request #055 - PSF costs (EMCa), 15 February 2018.

553 TransGrid, Response to AER information request #045 - PSF - capex and cable capex, 2 February 2018; TransGrid, Response to AER information request #055 - PSF costs (EMCa), 21 February 2018; TransGrid, Response to AER information request #0509, Q2 - annual expenditure for PSF, 16 February 2018.

554 EMCa, Review of TransGrid's revised forecast capital expenditure, April 2018, p. vi.

555 AER, Email to TransGrid seeking comments on EMCa draft report (POWERING SYDNEY'S FUTURE costs), 3 April 2018.

556 TransGrid response, EMCa report to the AER, Assessment of scope and cost estimates for POWERING SYDNEY'S FUTURE, 6 April 2018.

557 TransGrid, *Revised revenue proposal 2018–23*, December 2017, pp. 95-96.

On 22 August 2017, TransGrid advised the AER that it proposed to amend the contingent project trigger events that were set out in its initial proposal.[558] We acknowledged in our draft decision that TransGrid had informed the AER that since it submitted its revenue proposal, several events had occurred that were likely to change the requirements of the transmission network in NSW in the 2018-23 regulatory control period.[559] We did not consider these proposed contingent project amendments in our draft decision on the basis that:[560]

- TransGrid provided limited information regarding the proposed amendments; and
- we expected TransGrid to provide further information in its revised revenue proposal.

TransGrid revised revenue proposal included:

- Amendments to our draft decision trigger events, including proposed amendments to the triggers in response to changes in the energy sector.
- Minor amendments to its estimated cost ranges for the five contingent projects included in its initial revenue proposal.
- A further four contingent projects (resulting in a total of nine proposed contingent projects).
- That the four new contingent projects and the revisions to the trigger events of the five original contingent projects include a new method for initiating transmission investment to reflect:[561]
    - the possibility that a new pathway for transmission investment may be developed; and
    - the possibility that some projects have potential reliability triggers as well as market benefits triggers.

As part of our assessment of TransGrid's revised revenue proposal, we sought comment regarding the trigger events, including TransGrid's inclusion of a new method for initiating transmission investment.[562] The trigger events that form part of our final decision In particular, we amended TransGrid's proposed trigger events, which included:

- do not include TransGrid's proposed new method for initiating transmission investment; and
- include the successful completion of a RIT-T.

---

[558] TransGrid, Letter from Tony Meehan to Sebastian Roberts, 17 August 2017.

[559] AER, Draft decision, TransGrid transmission determination 2018 to 2023: Attachment 6 - Capital Expenditure, September 2017, p. 6-154.

[560] AER, Draft decision, TransGrid transmission determination 2018 to 2023: Attachment 6 - Capital Expenditure, September 2017, p. 6-154.

[561] TransGrid, *Revised revenue proposal 2018–23*, December 2017, pp. 95-96.

[562] AER, Staff informal information request - contingent project trigger events, 6 March 2018.

We consulted with TransGrid on the final form of the trigger events. TransGrid provided its response on 9 March 2018.[563] We have taken this response into account in this final decision.

[563] TransGrid response, AER, Staff informal information request - contingent project trigger events, 9 March 2018.