COMPARISON OF ELECTRANET'S 2017 TAPR PROJECTS AND THEIR REVENUE PROPOSAL

SOUTH AUSTRALIAN ADVISORY FUNCTIONS

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

IMPORTANT NOTICE

Purpose

This document compares the projects proposed in ElectraNet's 2017 Transmission Annual Planning Report (TAPR) with ElectraNet's plan accepted by the Australian Energy Regulator (AER) for the current regulatory period (2013–18) and with ElectraNet's revenue proposal for the next regulatory period (2018–23). The purpose of this document is to provide the Australian Energy Market Operator's (AEMO's) view on the alignment of these plans.

AEMO's comparison and assessment focuses on transmission network projects that fall into the project categories reported in ElectraNet's 2017 TAPR: augmentation, connection, security/compliance, and replacement.

AEMO publishes this document as part of its South Australian Advisory Functions (SAAF) in accordance with section 50B of the National Electricity Law.

This publication has been prepared by AEMO using information available at 30 June 2017.

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Version control

Version	Release date	Changes
1	1 September 2017	

EXECUTIVE SUMMARY

AEMO has undertaken this report as part of its advisory role for the South Australian jurisdiction. It compares the projects ElectraNet has proposed in its 2017 Transmission Annual Planning Report (TAPR) against capital expenditure plans in the Australian Energy Regulator (AER) revenue determination for ElectraNet's ongoing regulatory period (July 2013 to June 2018) and ElectraNet's proposal to the AER for the forthcoming regulatory period (July 2018 to June 2023).

In summary:

- **Current regulatory period** – 2017 TAPR proposed projects satisfy reliability and security requirements set out in both the National Electricity Rules (NER) and the South Australian Electricity Code (ETC). Differences compared to regulated capex largely arise from demand forecast reductions and AEMO's recommendations following the review of South Australia's 2016 black system event.
- **Forthcoming regulatory period** – 2017 TAPR proposed projects are consistent with those assessed by AEMO as part of AEMO's March 2017 Independent Planning Review[1] for the 2018–23 period, with the exception of one minor security and compliance,[2] and two replacement projects.[3]

Comparison against current regulatory period

On 30 April 2013, the AER published its final decision on ElectraNet's revenue proposal for the regulatory period 2013–18. There are differences between the committed and proposed projects in ElectraNet's 2017 TAPR and the capex plan in the AER's revenue determination for the 2013–18 period. These differences largely arise from:

- Connection point forecasts – ElectraNet's revenue determination was based on SA Power Networks' (SAPN's) connection point forecasts in 2012, while the 2017 TAPR was based on SAPN's forecasts in 2016. The 2016 forecasts are lower as a whole compared to 2012.
- AEMO's recommendations following the review of South Australia's 2016 black system event.

2017 TAPR projects proposed for the current regulatory period, but not included in the AER's capex determination in 2013, are:

- The South Australian Over-Frequency Generation Shedding (OFGS) scheme, which addresses one of the recommendations from AEMO's final report into the South Australia black system[4].
- A battery storage project at Dalrymple to improve transfer capability and reliability before summer 2017–18. AEMO has reviewed this project and considers the project is economically justified.
- Two projects to replace substation battery charger units and address low spans to achieve the design ratings of the Davenport–Pimba 132 kV line.

AEMO notes that the Magill – East Terrace cable joint monitoring security and compliance project has been deferred to 2019, in the next regulatory period.

The key project differences between the 2017 TAPR and the AER's capex determination for the current regulatory period are summarised in Table 1.

[1] AEMO, Available at: http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/SA_Advisory/2017/Independent_Planning_Review-ElectraNet_Capital_Expenditure_Projects.pdf.
[2] Install, upgrade or replace transformer oil containment systems and associated equipment at various sites (see Table 7).
[3] Program of unit asset replacements at various substations and asset condition online monitoring equipment (see Table 8)
4 AEMO, *Black System South Australia 28 September 2016*, March 2017. Available at: http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Market-notices-and-events/Power-System-Operating-Incident-Reports.

Table 1 Key project differences between the 2017 TAPR and the AER's capex determination for the current regulatory period (2013–18)

Classification	Number of projects	Comments (if any)
Projects accepted by AER but cancelled or deferred beyond the 2013–18 period	1	The security and compliance project: Magill – East Terrace cable joint monitoring.
Additional projects proposed for the 2013–18 period	4	Includes one augmentation project (battery storage system at Dalrymple), one security and compliance project (SA OFGS scheme), and two asset replacement projects.

Comparison against next regulatory period

In March 2017, ElectraNet submitted its revenue proposal for the next regulatory period (2018–23) to the AER. Prior to their submission, also as part of the South Australian advisory function, AEMO published an independent review of ElectraNet's proposed capex projects. The AER is currently formally assessing and consulting with stakeholders on ElectraNet's revenue proposal.

AEMO has reviewed ElectraNet's 2017 TAPR and compared it with ElectraNet's network capex proposal for the next regulatory period of 2018–23 and found both are broadly consistent. AEMO notes:

- There are five contingent projects outlined in the 2017 TAPR. All these projects are included as contingent projects in ElectraNet's regulatory proposal. AEMO notes:
  - ElectraNet is undertaking RIT-T assessments for interconnector options between South Australia and the eastern states and for options to strengthen transmission capacity in the Eyre Peninsula.
  - One contingent project is to address insufficient system strength in the South Australian transmission network. AEMO, in its 2016 National Transmission Network Development Plan (NTNDP), identified a Network Support and Control Ancillary Services (NSCAS) gap to maintain system strength in South Australia. AEMO expects to provide the details of this NSCAS gap by the end of 2017.
- ElectraNet's TAPR includes five potential intra-regional market benefit projects contingent on future generation and/or load commitment.[5] These projects have not been included in ElectraNet's 2018–23 regulatory proposal.
- AEMO assessed the Blanche circuit breaker arrangement upgrade, and found that it was not economically justified. This project was included in the 2017 TAPR for the period 2024–28 and not included in the capex proposal for the next regulatory period.

[5] Refer to Table 9.

CONTENTS

TABLES

CHAPTER 1. BACKGROUND

This chapter provides background on the capital expenditure (capex) revenue proposal and the Transmission Annual Planning Reports (TAPRs) prepared by ElectraNet. In particular:

- Section 1.1 describes the background and next steps in ElectraNet's revenue determination.
- Sections 1.2 provides background information on ElectraNet's TAPR.
- Section 1.3 outlines the impact of any differences between the AER's regulatory determinations and ElectraNet's 2017 TAPR.[6]
- Section 1.4 describes the extent to which AEMO and ElectraNet collaborate on transmission network planning.

1.1 ElectraNet's revenue determination

The regulatory framework established by the National Electricity Rules (NER) is an ex-ante framework, meaning that the revenue a Transmission Network Service Provider (TNSP) earns is based on expected future costs rather than historical costs.

The AER undertakes a detailed review of the TNSP's forecast expenditure to form a view of the economic efficiency of the proposed capital works program over the five-year regulatory period. On this basis, it determines a capital expenditure allowance, forming the basis of the maximum allowed revenue the TNSP can recover over the regulatory period.

The TNSP do have a discretion to deviate, as circumstances may require, from the capital expenditure allowance determined by the AER when augmenting and maintaining their network however, consumers:

- Do not pay for overspends the AER determines to have been inefficient in an ex-post review.
- Pay a portion of overspends determined to be efficient.
- Share in the benefits when a network business is able to spend less than its forecast capex allowance.

The business retains 30% of an underspend (or overspend), while the remaining 70% is passed through to (or recovered from) consumers.[7]

Plan accepted by the AER for the current regulatory period

In April 2013, the AER made their final determination for ElectraNet's revenue proposal for the current regulatory period 1 July 2013 to 30 June 2018.

Table 2 provides a timeline of the AER's regulatory determination process for this proposal. Note that ElectraNet's revised revenue proposal and the AER's final decision were based on an updated version of SA Power Networks' 2012 connection point demand forecasts.

[6] ElectraNet. South Australian Transmission Annual Planning Report. June 2017. Available at: https://www.electranet.com.au/wp-content/uploads/2017/06/2017-Transmission-Annual-Planning-Report.pdf.

[7] AER: Expenditure incentives guideline 2013. December 2012. Available at: https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/expenditure-incentives-guideline-2013.

Table 2 Timeline of ElectraNet's 2013–18 regulatory determination

Date	Action	Document and link
31 May 2012	ElectraNet submits revenue proposal	ElectraNet. Transmission Network Revenue Proposal (2013–2018). Available at: http://www.aer.gov.au/system/files/ElectraNet%20Revenue%20Proposal%20.pdf
30 November 2012	AER releases draft decision	AER. Draft Decision – ElectraNet Transmission determination 2013-14 to 2017-18. Available at: http://www.aer.gov.au/system/files/ElectraNet%202013%20-%20AER%20-%20draft%20decision%20-%2030%20November%202012.pdf
16 January 2013	ElectraNet submits revised revenue proposal	ElectraNet. Transmission Network Revised Revenue Proposal (2013–18). Available at: http://www.aer.gov.au/system/files/ElectraNet%20-%20Revised%20revenue%20proposal%202013-19%20-%2021.1.13.pdf
30 April 2013	AER releases final decision	AER. Final Decision, ElectraNet, Transmission Determination, 2013–14 to 2017–18. Available at: https://www.aer.gov.au/system/files/AER%20-%20final%20decision%20for%20ElectraNet%27s%202013–18%20regulatory%20control%20period%20-%2030%20April%202013_0.pdf

The AER's final decision accepted the following capex categories in ElectraNet's revised capital expenditure (capex) proposal:

- Network capex:
  - Augmentation.
  - Connection.
  - Security/compliance.
  - Inventory and spares.
  - Reduced number of replacement and refurbishment projects.
- Non-network capex:
  - Business information technologies (IT).
  - Buildings and facilities.

AEMO has reviewed ElectraNet's 2017 TAPR and compared it with network capex in the latest relevant revenue determinations and submissions (see Chapter 2). In summary,

- All five committed augmentation projects, which were committed for the current regulatory period of 2013–18, were approved by AER revenue or NCIPAP determination.
- Two of four committed security and compliance projects are not in the plan accepted by the AER for the current regulatory period of 2013–18 (see Appendix A).
- Of the 17 committed asset replacement projects 10 are in the current regulatory period and 7 were not in the plan accepted by the AER.

ElectraNet's revenue proposal for the next regulatory period

On 28 March 2017, ElectraNet submitted its revenue proposal for the 2018–23 regulatory revenue period to the AER. Table 3 summarises the timeline for ElectraNet's next regulatory determination.

Table 3 Timeline of ElectraNet's 2018–23 regulatory determination[a]

Date	Action	Document and link
May – June 2016	ElectraNet provides information to AEMO on its preliminary proposals	*Not published.*
September 2016	AEMO publishes independent review of the preliminary proposals based on the information supplied by ElectraNet by June 2016	AEMO. Independent Planning Review – ElectraNet Preliminary Capital Expenditure Projects. Available at: http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/SA_Advisory/2016/Independent-Planning-Review-ElectraNet-Preliminary-Capital-Expenditure-Projects.pdf
September 2016	ElectraNet releases its preliminary revenue proposal for early engagement with customers and stakeholders	ElectraNet. Preliminary Revenue Proposal 2019–2023. Available at: https://www.electranet.com.au/wp-content/uploads/resource/2016/09/20160906-Report-PreliminaryRevenueProposal.pdf
September 2016 – February 2017	ElectraNet provides information to AEMO on its updated proposals	*Not published.*
March 2017	AEMO publishes independent review of the final proposals based on the information supplied by ElectraNet by February 2017	AEMO. Independent Planning Review – ElectraNet Preliminary Capital Expenditure Projects. Available at: http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/SA_Advisory/2017/Independent_Planning_Review-ElectraNet_Capital_Expenditure_Projects.pdf
28 March 2017	ElectraNet submits revenue proposal to AER	ElectraNet. Revenue Proposal Overview 2019–2023. Available at: https://www.aer.gov.au/system/files/ElectraNet%20%E2%80%93%20ENET002%20%E2%80%93%20ElectraNet%20%E2%80%93%20Revenue%20Proposal%20Overview%20%E2%80%93%20March%202017.pdf
End October 2017	AER releases draft decision	*Not yet published.*
January 2018	ElectraNet submits revised revenue proposal	*Not yet published*
30 April 2018	AER releases final decision	*Not yet published.*

[a] AER. ElectraNet Issues Paper – updated 31 May 2017. Available at: https://www.aer.gov.au/system/files/AER%20-%20ElectraNet%20Issues%20Paper%20-%20May%202017%20-%20updated.pdf.

In September 2016, ElectraNet provided to AEMO information on its preliminary revenue proposal for the next regulatory period (2018–23) commencing on 1 July 2018. After receiving feedback from AEMO, ElectraNet submitted its revenue proposal to the AER on 28 March 2017.

AEMO has worked closely with ElectraNet since May 2016 on both these proposals, and provided an independent review of the proposals in two stages.

- Stage 1 – In September 2016, AEMO published an independent review of ElectraNet's preliminary proposals provided for AEMO's review between May and June 2016.
- Stage 2 – In March 2017, AEMO published consolidated findings of its independent review of all ElectraNet's network capex projects provided to AEMO before 1 February 2017. This report superseded the report published in September 2016.

ElectraNet's final revenue proposal is currently undergoing formal assessment and public consultation before a decision is made by the AER. The AER's draft and final decisions are expected to be published in October 2017 and 30 April 2018 respectively.

AEMO expects that the AER will use the information supplied in AEMO's report from March 2017 to inform their assessment of ElectraNet's revenue proposal for the coming regulatory period.

ElectraNet has considered AEMO's demand forecast from the 2016 *National Electricity Forecasting Report* (NEFR) and Value of Customer Reliability (VCR)[8] for its final proposal.[9]

AEMO has reviewed ElectraNet's 2017 TAPR and compared the capex projects against ElectraNet's revenue proposal for the next regulatory period (2018–23).

1.2 ElectraNet's TAPR

The transmission planning regime established under Chapter 5 of the National Electricity Rules (NER) requires TNSPs to publish a TAPR by 30 June each year.

Role of the TAPR

The TAPR is an annual planning review which analyses the expected operation of each transmission network over an appropriate planning period taking into account the relevant forecast loads, any future generation, market network service, demand side and transmission developments and any other relevant data.

TNSPs are not constrained to act in accordance with their TAPRs in making investment decisions or submitting regulatory proposals to the AER.

Scope of the TAPR

The requirements for a TAPR are defined in the NER under clauses 5.12.1 and 5.12.2. Clause 5.12.2(c) describes matters that the report must set out. The NER do not require the TAPR to comprehensively address all aspects of a TNSP's capex program.

Table 4 lists the capex categories included in and excluded from ElectraNet's 2017 TAPR. All these categories are considered as part of the AER's revenue determination process.

Table 4 Capex categories reported in ElectraNet's 2017 TAPR

Included in the TAPR[A] and the revenue determination	Included in the revenue determination but not in the TAPR
• Augmentation (including market benefit project proposals) • Connection • Security/compliance • Replacement/Refurbishment	• Inventory and spares • Land and easement • Business information technologies (IT) • Buildings and facilities

[a] ElectraNet's 2017 TAPR does not report on all the projects proposed in the plan accepted by the AER, even those which fall into the categories reported in the 2017 TAPR, as this is not required by the NER.

This report focuses on the capex categories included in the TAPR (see Section 2.1).

2017 TAPR and connection point forecasts

ElectraNet published its 2017 TAPR on 30 June 2017.[10] The TAPR covers a 10-year planning period and describes the current network, demand projections, emerging network limitations or constraints, and information on completed, committed, pending, and proposed transmission network developments in South Australia.

[8] AEMO. Value of Customer Reliability review. http://www.aemo.com.au/-/media/Files/PDF/VCR-final-report--PDF-update-27-Nov-14.pf.
[9] AEMO. 2016 *National Electricity Forecasting Report*. Available at: http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEFR/2016/2016-National-Electricity-Forecasting-Report-NEFR.pdf.
[10] ElectraNet. South Australian Transmission Annual Planning Report. June 2017. Available at: https://www.electranet.com.au/wp-content/uploads/2017/06/2017-Transmission-Annual-Planning-Report.pdf.

ElectraNet annually receives 10-year demand forecasts from SA Power Networks, and collaborates with AEMO to receive forecasts from direct connect customers. The development plans presented in the 2017 TAPR are based on the connection point demand forecasts that were provided to ElectraNet by SA Power Networks in November 2016 and are detailed in ElectraNet's 2017 *South Australian Connection Point Forecasts Report*.[11] Additionally, ElectraNet has used the forecast provided in AEMO's 2016 NEFR[12] to determine future needs for improved voltage control on the Main Grid[13] at times of minimum demand in South Australia.

1.3 TAPR comparison with revenue proposals

In accordance with AEMO's South Australian Advisory Function (SAAF) requirements, AEMO undertook a high-level review of ElectraNet's 2017 TAPR.

Assessment methodology

The review incorporated a comparison of the augmentation plan proposed in the TAPR against:

- The AER-approved revenue proposal for the current regulatory period, from 1 July 2013 to 30 June 2018.
- ElectraNet's revenue proposal for the next regulatory period, from 1 July 2018 to 30 June 2023.

AEMO used the demand forecasts from 2017 *Electricity Forecasting Insights*[14] for the comparison at a regional level, and the 2016 *Transmission Connection Point Forecasting Report for South Australia*[15] for the comparison at the connection point level. The assessment included, but was not limited to:

- A review of the need for each project, the project timing, and its scope. This considered power system and forecast changes, particularly changes in forecast demand that occurred since AER's revenue determination or ElectraNet's revenue proposal.
- A review of the reasonableness of adjustments (e.g. changes or cancellations) made to projects in relation to the AER's determination or revenue proposal.
- Consultation with ElectraNet regarding any mismatch in cost estimates between the TAPR and regulatory proposals. AEMO assessed the reasonableness of the clarifications obtained.

The assessments did not consider:

- Project cost assessments.
- Market modelling to assess the market benefits delivered by individual projects.
- Asset condition. For any asset condition-based replacement project, AEMO's assessment was limited to the capacity requirement.

Interpretation of differences between the revenue determination and TAPR

Differences between ElectraNet's TAPR and the capex forecasts submitted by ElectraNet as part of the AER's revenue determination may arise for any of the following reasons:

- The capex forecasts have different reporting coverage.
- ElectraNet responds to the incentives created by the regulatory framework.

[11] ElectraNet. *South Australian Connection Point Demand Forecast* 2017. Available at: https://www.electranet.com.au/wp-content/uploads/2017/05/2017-SA-Connection-Point-Forecast.pdf

[12] AEMO. 2016 *National Electricity Forecasting Report*. Available at: http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEFR/2016/2016-National-Electricity-Forecasting-Report-NEFR.pdf.

[13] As stated in ElectraNet's 2017 TAPR, the Main Grid is a meshed 275 kV network that extends from the Cultana substation near Whyalla to the South East substation near Mount Gambier.

[14] AEMO. 2017 *Electricity Forecasting Insights*. Available at: http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Electricity-Forecasting-Insights.

[15] AEMO. *Transmission Connection Point Forecasting*. Available at: http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Transmission-Connection-Point-Forecasting.

- Other change of circumstances.

TNSPs are not obliged to follow either their TAPR capex plan or the AER revenue determination capex plan, however, there is value in monitoring how the capex forecasts compare. Significant and consistent discrepancies between the TAPR and the capex forecasts set out in TNSPs' regulatory proposals may signal a need for improved planning processes or business practices.

1.4 South Australian transmission network planning

This section describes the extent to which AEMO and ElectraNet collaborate on transmission network planning.

1.4.1 Collaboration between AEMO and ElectraNet on transmission network planning

AEMO and ElectraNet joint planning studies

When the need arises, AEMO and ElectraNet carry out joint planning studies to identify the preferred solution to relieve limitations that may impact network planning in both Victoria and South Australia. Recently completed joint planning studies include:

- Heywood Interconnector Upgrade project.
- Special protection scheme – see "Implementation of recommendations from South Australia Black System report" in Section 1.4.2 for more details.
- Review of Regulatory Investment Test-Transmission (RIT-T) documents – see "AEMO review of ElectraNet's draft Regulatory Investment Test-Transmission documents" below for more details.

AEMO and ElectraNet joint planning meetings

AEMO and ElectraNet hold regular joint planning meetings on network planning-related issues. Regular meeting agenda items include updates and discussions on:

- Load and generator connections in South Australia and Victoria.
- South Australian and Victorian TAPRs.
- South Australian and Victorian RIT-Ts.
- The National Transmission Network Development Plan (NTNDP).
- Demand forecasts.
- Power system security.
- Other planning topics.

AEMO review of ElectraNet's draft TAPR

As part of its normal planning procedures, ElectraNet gives AEMO the opportunity to review and comment on the draft TAPR before publication. While AEMO conducts a high-level review and provides feedback for consideration, ElectraNet remains the sole author and owner of the document.

AEMO review of ElectraNet's draft RIT-T documents

As part of its normal planning procedures, ElectraNet gives AEMO the opportunity to review and comment on draft RIT-T documents before their publication. While AEMO reviews the draft documents and provides comments, ElectraNet remains the sole author and owner.

Recently AEMO reviewed the following RIT-T documents:

- SA Energy Transformation RIT-T – in November 2016 ElectraNet commenced the RIT-T process for this project by publishing a Project Specification Consultation Report (PSCR).[16] The consultation period for this document concluded in February 2017. AEMO formally submitted to the RIT-T consultation. AEMO and ElectraNet meet regularly to discuss the progress of this RIT-T.
- Eyre Peninsula Electricity Supply Options RIT-T – in April 2017 ElectraNet commenced the RIT-T process for this project by publishing a PSCR.[17] ElectraNet consulted AEMO before publishing the PSCR. The PSCR consultation for this RIT-T finished on 21 July 2017.

AEMO's Independent Planning Review of ElectraNet's capex projects for the next regulatory period

In September 2016, ElectraNet released information on its preliminary revenue proposal for the next regulatory period (2018–23) for early engagement with customers and stakeholders. In March 2017, ElectraNet submitted its revenue proposal to the AER. Prior to each of these two stages, AEMO provided independent reviews of ElectraNet's proposals.

- Stage 1 – In September 2016, AEMO published an independent review of ElectraNet's preliminary proposals provided for AEMO's review between May and June 2016.
- Stage 2 – In March 2017, AEMO published consolidated findings of its independent review of all ElectraNet's network capex projects provided to AEMO before 1 February 2017. This report superseded the report published in September 2016.

Forecasting and Planning Reference Group and the NTNDP

The Forecasting and Planning Reference Group[18] (FPRG) is a monthly forum with AEMO and industry forecasting and planning specialists. ElectraNet regularly attends FPRG meetings.

The FPRG is not a decision-making body, but seeks to facilitate constructive discussion on matters relating to gas and electricity forecasting, market modelling, and strategic network planning. It was been formed to combine the functions of the 2016 Forecasting Reference Group and the NTNDP Technical Working Group.

As the national transmission planner, AEMO is responsible for publishing the NTNDP, which provides an independent strategic plan and nationally consistent information about transmission capabilities, congestion, and investment options, for a range of plausible market development scenarios.

The NTNDP consultation was initiated in January 2017. Discussion on the progress of the NTNDP is a standing agenda item at FPRG meetings.

AEMO will work closely with ElectraNet in developing the NTNDP, through the FPRG meetings, formal and informal consultation. The NTNDP incorporates ElectraNet's current network and its committed development plans. It includes discussion on the key transmission network projects proposed in ElectraNet's TAPR and the impact of these projects on relevant transmission flow paths.

In accordance with NER requirements, ElectraNet considers the strategic plan outlined in the NTNDP in its TAPRs.

AEMO review of ElectraNet's Network Capability Incentive Parameter Action Plan (NCIPAP)

In December 2012, the AER introduced a network capability component in the Service Target Performance Incentive Scheme (STPIS) for transmission network service providers. It is designed to

[16] ElectraNet. South Australian Energy Transformation RIT-T: project Specification Consultation Report. Available at: https://www.electranet.com.au/wp-content/uploads/resource/2016/11/20161107-Report-SouthAustralianEnergyTransformationPSCR-1.pdf.
[17] ElectraNet. Eyre Peninsula Electricity Supply Options. RIT-T Project Specification Consultation Report. Available at: https://www.electranet.com.au/wp-content/uploads/2017/04/20170428-Report-EyrePeninsulaElectricitySupplyOptionsPSCR.pdf.
[18] AEMO. Forecasting and Planning Reference Group. Accessible at: http://www.aemo.com.au/Stakeholder-Consultation/Industry-forums-and-working-groups/Other-meetings/Forecasting-and-Planning-Reference-Group.

encourage efficient network capability from existing assets when and where most needed to improve customer or wholesale market outcomes. The STPIS requires TNSPs to submit a Network Capability Incentive Parameter Action Plan (NCIPAP) as part of its revenue proposal to the AER. As part of the process, they are required to consult with AEMO, prior to submitting the NCIPAP, about its review of the transmission circuits and injection points in its network and the potential priority projects which have been identified.[19] This includes consultation with AEMO regarding:

- The potential for co-ordinated projects with other TNSPs.
- Whether achieving the proposed priority project improvement targets will result in the proposed priority project having a material benefit.
- The classification of priority projects based on their likely benefit to consumers or wholesale market outcomes.
- The ranking of the priority projects.

As part of the NCIPAP process, AEMO collaborated with ElectraNet in 2014–15 and in 2017 to identify options and quantify market benefits of potential NCIPAP projects for implementation within ElectraNet's current regulatory period (2013–2018) and next regulatory period (2018–23) respectively. AEMO conducted independent analysis of network limitations, considering historical congestion, future network flows, and reliability and security implications. This has led to prioritising NCIPAP projects to deliver the best value for money for customers.

In 2015, the AER accepted AEMO's review of ElectraNet's NCIPAP projects and the project ranking for the current regulatory period.[20]

The proposed NCIPAP projects for next regulatory period are still awaiting the AER's final decision. AEMO has reached agreement with ElectraNet on its assessment of project need, improvement targets, likely material benefits, and ranking of priority projects.[21]

ElectraNet's NCIPAP for the current regulatory period includes four network augmentation projects and two planning study projects. For the next regulatory period, ElectraNet has proposed four network augmentation projects and three planning study projects for its NCIPAP, with an estimated total capital cost of $15.7 million. Proposed augmentation projects for both regulatory periods (in order of priority for each period separately) are listed in Table 5.

In July 2017, AEMO reviewed ElectraNet's amendment to its NCIPAP proposal for the current regulatory period. ElectraNet proposed to substitute two uprating projects from its NCIPAP with one battery storage project (the Energy Storage for Commercial Renewable Integration in South Australia or "ESCRI-SA") of 30 megawatts (MW) and 8 megawatt hours (MWh) at Dalrymple.

After reviewing the proposed amendments to NCIPAP, AEMO has reached agreement with ElectraNet, for a given set of assumptions, on its assessment of project need, improvement targets, likely material benefits, and ranking of priority projects.

[19] AER. https://www.aer.gov.au/system/files/AER%20-%20STPIS%20version%205%20%28corrected%29%20-%2030%20September%202015.pdf. Viewed 19 July 2017.
[20] AER. Final decision - Early application of the network capability component of the service target performance incentive scheme for ElectraNet. Available at: http://www.aer.gov.au/system/files/AER - final decision - ElectraNet early application of the network capability component_0.pdf.
[21] AEMO. AEMO review of ElectraNet's Network Capability Incentive Parameter Action Plan (NCIPAP) for 1 July 2018 to 30 June 2023. Available at: https://www.aer.gov.au/system/files/ElectraNet%20%E2%80%93%20ENET050%20%E2%80%93%20ElectraNet%20%E2%80%93%20AEMO%20%E2%80%93%20Confirmation%20of%20ElectraNet%27s%20Network%20Incentive%20Parameter%20Action%20Plan%20%28NCIPAP%29%20%E2%80%93%20March%202017.pdf.

Table 5 ElectraNet's NCIPAP augmentation projects – current and next regulatory period (in order of priority for each period separately)

NCIPAP Project	Regulatory period	AEMO Comments
Upper South East uprating **Uprate Tailem Bend – Tungkillo 275 kV line and Tailem Bend to Mobilong 132 kV line**	2018–23	Project was originally planned for July 2016 in the current regulatory period. Now planned for June 2019 in the next regulatory period.
Riverland uprating **Uprate the Robertstown – North West Bend No. 2 132 kV line and the North West Bend to Monash No. 2 132 kV line**	2013–18	Project is committed and planned for June 2017.
Robertstown – Waterloo East 132 kV uprating	2013–18	Project is committed and planned for June 2018.
Lower South East uprating **Upgrade the Tailem Bend – South East No. 1 and No. 2 275 kV lines**	2013–18	Project was originally planned for July 2016 in the current regulatory period. Now planned for June 2019 in the next regulatory period.
Load model enhancements	2013–18	Not in 2017 TAPR. Not an augmentation project.
Distributed rooftop solar PV responses to frequency disturbances **This project examine the possible increased risk of severe frequency disturbances due to the response of distributed PV systems**	2013–18	Not in 2017 TAPR. Not an augmentation project.
South East dynamic line ratings **Tailem Bend – Mobilong 132 kV, Tailem Bend – Tungkillo 275 kV, Tailem Bend – Cherry Gardens 275 kV, South East – Tailem Bend 275 kV No.1 and 2 lines**	2018–23	Project is proposed for June 2019.
Uprating of limiting plants on Robertstown to Davenport 275 kV lines **Robertstown–Mokota–Belalie–Davenport 275 kV, Robertstown – Canowi – Mt Lock – Davenport 275 kV lines.**	2018–23	Project is proposed for June 2019.
Robertstown transformer management relay DR-E3 uprating program	2018–23	Project is proposed for June 2022.
Constraint formulation investigation	2018–23	Not in 2017 TAPR. Not an augmentation project.
South East 275 kV capacitor bank **Install an additional 100 MVAr capacitor bank at South East substation.**	2018–23	Project is proposed for June 2021.
Smart Wires Powerline Guardian trial (Waterloo–Templers) **Waterloo–Templers 132 kV, Robertstown–Tungkillo 275 kV, Robertstown–Para 275 kV lines**	2018–23	Project is proposed for June 2020.
Tailem Bend to Cherry gardens tie in **One additional diameter at Tungkillo by tying in the Tailem Bend – Cherry Gardens 275 kV line.**	2018–23	Project is proposed for June 2020.

ElectraNet is currently undertaking a RIT-T exploring efficient options to enable South Australia's energy transformation and improve power system resilience. The conclusions of AEMO's NCIPAP project assessment for the next regulatory period are subject to change if this RIT-T delivers outcomes that overlap with any of the proposed NCIPAP projects.

1.4.2 Other South Australian initiatives that may impact on transmission planning

Implementation of recommendations from South Australia Black System report

In March 2017, AEMO published its final report on the South Australian black system event of 28 September 2017.[22] This report outlined 19 recommendations to be implemented in South Australia to:

- Reduce the risk of islanding of the region.
- Increase the likelihood that, in the event of islanding, a stable electrical island can be sustained at least in part of South Australia.
- Improve the performance of the system restart process.
- Improve market and system operation processes required during periods of market suspension.

Several projects listed in the 2017 TAPR address the recommendations of this report. Where there is potential relevance, AEMO has noted this in Appendix A.

South Australian Government Energy Plan

The South Australian Government has undertaken initiatives to improve reliability within the region, and announced an Energy Plan[23] which includes:

- A grid-connected battery to provide the state with 100 MW of storage.
- Up to 250 MW of gas-powered generation (GPG), which can be switched on in times of emergency. At all times, the generator will make South Australia's electricity supplies more secure by offering the inertia that is needed to stabilise local supplies.
- In the intervening period, until new GPG is available, up to 200 MW of temporary generation at transmission and distribution level for use in emergency situations where supply shortfall cannot be met in other ways.

AEMO is assisting in the implementation of these initiatives, advising on technology requirements involved in each initiative, with a view to facilitating the connection of suitable technology to deliver the policy objectives and secure power system supplies.

ElectraNet believes that aspects of this plan have potential to significantly impact on the outcomes of the South Australian Transformation RIT-T that commenced in November 2016. ElectraNet is currently engaging with[24]:

- The South Australian Government to better understand the potential implications of the Plan for this RIT-T. Once this impact is understood, submissions to the PSCR stage of the RIT-T can be fully assessed.
- Non-network option proponents that provided consultation feedback during PSCR phase of the RIT-T to obtain additional technical and cost information about their proposals, so that an initial assessment of the feasibility and likely benefits of non-network solution options can be progressed.

Demand side management initiative with ARENA

The Australian Renewable Energy Agency (ARENA) and AEMO jointly announced plans to pilot a demand response initiative this summer to manage electricity supply during extreme peaks. The three-year program is to be trialled in South Australia and Victoria to free up temporary supply during extreme

[22] AEMO. Black System South Australia 28 September 2016. Available at: http://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/Integrated-Final-Report-SA-Black-System-28-September-2016.pdf.

[23] South Australian Government. South Australian power for South Australians Energy Plan. Available at: http://ourenergyplan.sa.gov.au/assets/our-energy-plan-sa-web.pdf.

[24] ElectraNet South Australian Transformation RIT-T. https://www.electranet.com.au/projects/south-australian-energy-transformation/

weather and unplanned outages.[25] Demand response involves paying consumers to reduce their energy consumption on request during peak periods or emergencies, relaxing the supply-demand balance.

AEMO Future Power System Security program

In 2016, AEMO established the Future Power System Security (FPSS)[26] program to formalise and accelerate the work it has undertaken to address operational challenges arising from the changing generation mix. The program focusses entirely on power system security and aims to adapt current processes to address immediate risks, while promoting solutions to maintain power system security over the next 10 years.

As part of this program AEMO collaborates with transmission network companies including ElectraNet. In February 2016, as a result of such collaboration, AEMO and ElectraNet jointly published an *Update to Renewable Energy Integration in South Australia*[27] investigating power system security in South Australia.

Other AEMO reports published under South Australian Advisory Function

Under the SAAF, AEMO has also recently published the following reports that may relate to South Australian transmission system:

- *South Australian Demand Forecasts*[28]
- *South Australian Fuel and Technology Report*[29]
- *South Australian Renewable Energy Report*[30]
- *South Australian Electricity Report*[31]
- Independent Planning Review - ElectraNet Capital Expenditure Projects[32]

[25] ARENA and AEMO pilot demand response program. Available at: https://www.aemo.com.au/Media-Centre/ARENA-and-AEMO-join-forces-to-pilot-demand-response-to-manage-extreme-peaks-this-summer

[26] AEMO. Future Power System Security. Available at: https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/FPSSP-Reports-and-Analysis.

[27] AEMO and ElectraNet. Update to Renewable Energy Integration in South Australia. Available at: http://aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/-/media/CACEB2122362436DAC2CDD6E8D3E70D0.ashx.

[28] AEMO. 2017 South Australian Demand Forecasts. Available at: https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/SA_Advisory/2017/2017-South-Australia-Demand-Forecasts.pdf.

[29] AEMO. 2017 South Australian Fuel and Technology Report. Available at: http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/SA_Advisory/2017/2017_SAFTR.pdf.

[30] AEMO. 2017 South Australian Fuel and Technology Report. Available at: http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/SA_Advisory/2016/2016_SARER.pdf.

[31] AEMO. 2016 South Australian Electricity Report. Available at: http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/SA_Advisory/2016/2016_SAER.pdf.

[32] AEMO. 2017 Independent Planning Review - ElectraNet Capital Expenditure Projects. Available at: https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/SA_Advisory/2017/Independent_Planning_Review-ElectraNet_Capital_Expenditure_Projects.pdf.

CHAPTER 2. TRANSMISSION NETWORK COMPARISON AND ASSESSMENT

The 2017 TAPR includes projects proposed, committed and completed for the current and next regulatory period. As the current regulatory period closes, a larger proportion of projects are proposed for the next regulatory period. This chapter compares the projects proposed in ElectraNet's 2017 TAPR with the AER's revenue determination for the current regulatory period of 2013–18 and ElectraNet's revenue proposal for the next regulatory period of 2018–23, and provides AEMO's view on any differences. It also considers differences between ElectraNet's 2017, 2016 and 2015 TAPRs.

2.1 Scope and assumptions

AEMO's comparison and assessment focuses on the transmission network projects that fall into the project categories reported in ElectraNet's 2017 TAPR (i.e. augmentation, security/compliance, and replacement). Details of the assessment methodology are summarized in Section 1.3.

As noted in Section 1.2, the TAPRs only include a subset of the TNSPs' overall capex. This report does not include the capex project categories that are not reported in ElectraNet's 2017 TAPR (i.e. land and easement, inventory and spares, business information technologies (IT), and buildings and facilities).

The comparison takes into account:

- ElectraNet's 2015, 2016 and 2017 TAPR.
- AER's Final Decision on ElectraNet Transmission Determination from 2013–14 to 2017–18 published in 2013[33].
- ElectraNet's revenue proposal for the regulatory period 2018–23.[34]

ElectraNet advises in the 2017 TAPR that:

- Committed projects are projects where a RIT-T has been completed (where required), and approval has been given by the ElectraNet Board. Some of these projects had a contingent status in ElectraNet's revenue determination for current regulatory period.
- ElectraNet does not currently have any pending projects (i.e. projects which have passed the RIT-T but are not yet fully committed).

Appendix A provides detailed comments for each augmentation, connection, security and compliance, and replacement project included in ElectraNet's 2017 TAPR.

2.2 Augmentation projects

A comparison of augmentation projects with a direct impact on transmission network performance is provided in Table 6 of Appendix A. The table also contains comments where relevant.

There are five augmentation projects which are reported as committed and pending. These are:

- Implementation of control schemes to bypass the series capacitors under certain operating conditions to increase Heywood interconnector transfer capability.
- Install modern weather stations to facilitate the implementation of dynamic line ratings on critical circuits.

[33] AER. Final Decision on ElectraNet Transmission Determination from 2013–14 to 2017–18. Available at: https://www.aer.gov.au/system/files/AER%20-%20final%20decision%20for%20ElectraNet%27s%202013–18%20regulatory%20control%20period%20-%2030%20April%202013_0.pdf.

[34] AER. ElectraNet revenue proposal for 2018-13. https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/electranet-determination-2018–23/proposal. Viewed 1 August 2017.

- Two NCIPAP projects involving uprating the Robertstown – North West Bend No.2, North West Bend – Monash No.2, and Waterloo East – Robertstown 132 kV circuits.
- A grid-connected utility scale battery energy storage system at Dalrymple.

Twelve projects are reported as proposed augmentation projects.

- Six NCIPAP and two augmentation projects to release additional capability from the existing transmission network. AEMO reviewed all these NCIPAP projects in March 2017 and agreed with ElectraNet's assessment on improvement of transfer capability.
- A project to install a coordinated control scheme to better utilisation of voltage control facilities to minimise system constraints.
- Two projects to uprate Templers substation 132 kV primary plant and Davenport – Robertstown 275 kV transmission line.
- A project to establish a new 132 kV connection point on the Para – Roseworthy 132 kV line at Gawler East to provide supply to proposed 132/11 kV distribution substation. In March 2017, AEMO also reviewed the need for a new connection point at Gawler East and found the following:
  - Distribution network limitations are expected to arise by 2022–23 and increase thereafter.
  - Establishing a new 132/11 kV connection point at Gawler East is the preferred option based on preliminary findings in SA Power Networks' upcoming Regulatory Investment Test for Distribution (RIT-D).
  - AEMO produces independent demand forecasts at each of the connection points but does not have its own forecast for Gawler East. Demand growth is uncertain, and ElectraNet should consider non-network options to mitigate the risk of the new Gawler East substation becoming a stranded asset.
- A project to turn the Robertstown–Para 275 kV line into Tungkillo substation to increase the transient and voltage stability limit the Heywood interconnector.

There are four augmentation projects reported as contingent. These are:

- A project to reinforce the Eyre Peninsula transmission supply. This involves constructing a new double circuit line from Cultana to Yadnarie to Port Lincoln. This project will also address expiry of the existing contract for network support at Port Lincoln
- A new high capacity interconnector between South Australia and the eastern states, or a range of network solutions.
- Rebuild the Davenport–Pimba 132 kV line and establish associated network assets to reinforce the Upper Northern Region western 132 kV line.
- Uprating of the Davenport – Leigh Creek 132 kV line and establish associated network assets to reinforce the Upper Northern Region eastern 132 kV line.

These projects will be subject to the RIT-T process. ElectraNet is undertaking RIT-T for the first two projects. The upper Northern region eastern and western lines were assessed in March 2017 by AEMO, and it was agreed to include these projects as contingent period for next regulatory period of 2018–23. If pursued, these projects will also be subject to the RIT-T process.

2.3 Security and compliance projects

A comparison of security and compliance projects with a direct impact on transmission network performance is provided in Table 7 of Appendix A. The table also contains comments where relevant.

Two security and compliance projects, not in the plan accepted by the AER for the current regulatory period of 2013–18, are committed status in the 2017 TAPR. The two projects are:

- Implement Over-Frequency Generation Shedding (OFGS) scheme for SA wind farms, including a backup scheme on the network side of the wind farm connections.
- Refurbish transformer oil containment systems at various sites.

As part of the review of the South Australia black system event on 28 September 2016, AEMO identified a need for coordinated OFGS to trip excess generation in a controlled order to restore the supply and demand balance and allow the SA frequency to recover to within the frequency operating standards. This is a low cost option and AEMO supports ElectraNet's commitment to implement this project as early as possible.

The second project refers to transformer oil containment systems. The 2017 TAPR reported transformer oil containment systems need refurbishing in accordance with environment protection regulations.

Of the security and compliance projects proposed, 19 projects are proposed for the next regulatory period (2018–23) and four for the regulatory period beyond 2023.

ElectraNet submitted four 50 MVAr 275 kV reactor installations for Templers West, Blyth West, Para and the Mid North region, which AEMO assessed in the March 2017 capex proposal review. AEMO agrees with the need for over-voltage management and supports a combined RIT-T to ensure a robust solution is delivered.

The Main Grid System Strength Support project is a contingent project which is waiting for details of the system strength NSCAS gap identified in the 2016 NTNDP.

2.4 Replacement and refurbishment projects

A comparison of replacement and refurbishment projects with a direct impact on transmission network performance is provided in Table 8 in Appendix A. The table also contains comments where relevant.

Of the 17 committed asset replacement projects, 10 are in the current regulatory period and seven were not in the plan accepted by the AER. There are 19 proposed asset replacement projects reported in the 2017 TAPR. AEMO cannot comment on the timing of condition-driven asset replacement, due to lack of asset condition information.

In March 2017, AEMO published consolidated findings of its independent review of all ElectraNet's network capex projects provided to AEMO before 1 February 2017. ElectraNet considered AEMO's independent review and updated their proposal. ElectraNet's proposal in the 2017 TAPR include:

- Replace the existing two 5 MVA transformers at Leigh Creek South substation with a single new 5 MVA 132/11 kV transformer.
- Replace existing single 50 MVA transformer at the Mount Gambier substation with a new single 25 MVA 132/33 kV transformer.
- Replace the existing two 20 MVA transformers at Mannum substation with two new 25 MVA 132/33 kV transformers. ElectraNet reported 25 MVA is their standard transformer size.

2.5 Completed projects

ElectraNet has included a summary of the six recently completed projects. These are:

- The Heywood interconnector upgrade.
- SA water Morgan – Whyalla pump station #3.
- SA water Morgan – Whyalla pump station #1.
- Dalrymple substation upgrade.
- Para SVC secondary systems.
- Tailem Bend – Keith #2 132 kV line insulator replacement.

2.6 Key differences between the 2016 and 2017 TAPRs

ElectraNet annually receives 10-year demand forecasts from SA Power Networks, and collaborates with AEMO to receive forecasts from direct connect customers. The development plans presented in the 2017 TAPR are based on the connection point demand forecasts that were provided to ElectraNet by SA Power Networks in November 2016 and are detailed in ElectraNet's 2017 *South Australian Connection Point Forecasts Report*[35] and AEMO's 2016 NEFR[36]. For the 2016 TAPR, a similar demand forecast reports published in 2015 were used.

The 2017 maximum demand forecasts in South Australia have generally reduced or remained consistent since the 2016 SACPF. For example, Adelaide Metro was forecast to reach a maximum demand in 2019–20 of 2,026 MW, however the more recent forecasts adjusts this to 1,980 MW.

Since the 2016 TAPR, the Northern SA Voltage Control RIT-T has been cancelled based on revised dynamic characteristics and forecasts of customer demand.

[35] ElectraNet. *South Australian Connection Point Demand Forecast* 2017. Available at: https://www.electranet.com.au/wp-content/uploads/2017/05/2017-SA-Connection-Point-Forecast.pdf

[36] AEMO. 2016 *National Electricity Forecasting Report*. Available at: http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEFR/2016/2016-National-Electricity-Forecasting-Report-NEFR.pdf.

APPENDIX A. PROJECT COMPARISON AND ASSESSMENT DETAILS

Table 6 Augmentation projects in the 2017 TAPR

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Committed and Pending Projects						
Heywood interconnector upgrade Type: Augmentation Scope: The Heywood interconnector was augmented to raise nominal transfer limits from ±460 MW to ±600 MW. A third 500/275 kV transformer at Heywood terminal station was installed along with series compensation on the South East to Tailem Bend 275 kV lines and the existing 132 kV transmission system was reconfigured between Snuggery, Keith and Tailem Bend. This was shown to deliver market benefits using the RIT-T.	July 2016 [July 2016] (2016)	35–45 [35–45] (40–50)	2013–18	Not included in ElectraNet's capex proposal, but included in its contingent projects proposal. This project passed through RIT-T. AER's decision in 2014 excluded decommissioning of the Keith – Tailem Bend No 1 132 kV line and the Snuggery–Keith 132 kV line from the scope of the Heywood interconnector upgrade project.		Cost, timing and scope described in 2017 TAPR are consistent with the proposals. 2017 TAPR advises that minor works are still outstanding, including implementation of control scheme to bypass the capacitors under certain conditions. The cost estimates are for ElectraNet's scope of works.
Weather Stations for Dynamic Line Rating Type: Augmentation Scope: Install modern weather stations at various monitoring locations to facilitate the implementation of dynamic line ratings on critical circuits.	2017 [2016] (2016, 2018–23)	<5 [<5] (<5)	2013–18	2016	2.0	This project is for facilitating the future implementation of dynamic line ratings. It will not have any impact on the network until dynamic line ratings are applied. The implementation of dynamic line ratings likely to reduce network constraints under some system operating conditions.

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Robertstown – North West Bend #2 and the North West Bend − Monash #2 132 kV line uprating Type: Augmentation Scope: Uprate the Robertstown – North West Bend #2 and the North West Bend − Monash #2 132 kV lines to 100 ˚C line clearances.	June 2017 [June 2017] (Subject to market benefit analysis)	<5 [<5] (10–18)	2013–18	AER approved as a NCIPAP project for period 1 July 2015–30 June 2018.	4.4	AEMO agreed with this project as a NCIPAP project in March 2015. Upgrading of the supply capacity of the 132 kV lines between Robertstown and North West Bend will result in supply reliability in the Riverland region meeting ETC requirements in the medium term, and increases the availability of Murraylink transfers from South Australia to Victoria.[37]
Grid-connected battery at Dalrymple (ESCRI-SA) Type: Augmentation Scope: Install a nominal 30 MW, 8 MWh battery energy storage system at Dalrymple along with associated site establishment, high voltage switchgear, secondary systems and telecommunications equipment.	Summer 2017–18 [Not in 2016 TAPR] (Not in 2015 TAPR)	5-8 (ElectraNet cost only) [NA] (NA)	2018–23	2019	6.4	ElectraNet referred that the identified need for this project is a proof of concept demonstration that utility scale battery storage can support the integration of renewable energy and this project is subject to receipt of ARENA grant. This project is also accepted by AEMO in ElectraNet's proposed NCIPAP amendment for the current regulatory period
Waterloo East – Robertstown 132 kV line uprating Type: Augmentation Scope: Uprate the line to 100°C line clearances.	June 2018 [2018] (Not in 2015 TAPR)	<5 [<5] (Not in 2015 TAPR)	2013–18	AER approved as a NCIPAP project for period 1 July 2015–30 June 2018.	1.3	AEMO agreed with this project as a NCIPAP project in March 2015.

[37] Comparison of ElectraNet's 2015 TAPR Projects and the plan accepted by the AER. Available at: http://www.aemo.com.au/-/media/Files/PDF/COMPARISON-OF-ELECTRANETS-2015-TAPR-PROJECTS-AND-AUGMENTATION-PLAN-ACCEPTED-BY-THE-AER.pdf

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Proposed Projects						
Templers 132 kV substation bus and primary plant uprating Type: Augmentation Scope: Upgrade Templers 132 kV bus and primary plant to carry a minimum current of 1600 A.	2018 [Not in 2016 TAPR] [Not in 2015 TAPR]	<5 [NA] (NA)	2018–23	2019	0.5	
Reactive Plant Control Systems Type: Augmentation Scope: Install a coordinated control scheme to better use existing reactive plant and voltage control facilities to minimise system constraints, whilst managing system voltage levels.	2018 [2018] (2018)	<5 [<5] (<5)	2013–18	2018	3.9	The purpose of this project is to automate the switching of the reactors and capacitors and some relevant transformer tapping to improve voltage control in the transmission network. 2017 TAPR also indicated to replace protection relays and communication gateway at Monash and Berri substations by 2018.
Dynamic ratings to transmission lines between South East and Tungkillo Type: Augmentation Scope: Apply dynamic ratings to the key circuits that make up the Heywood interconnector in South Australia.	June 2019 [Within 10 years, 2018–23 period] (Subject to market benefit analysis)	<5 [<5] (<5)	2018–23 NCIPAP	2018-19	0.1	NCIPAP project for next regulatory period (South East – Tungkillo dynamic line ratings). In March 2017, AEMO reviewed and agreed for ElectraNet's NCIPAP proposal.
Robertstown – Davenport 275 kV line – upgrade of limiting substation plants Type: Augmentation Scope: Remove and replace plant that are rated lower than the design capability of the conductors on the 275 kV lines between Robertstown and Davenport, to release further transfer capacity.	June 2019 [Within 10 years] (Within 10 years)	<5 [<5] (<5)	2018–23 NCIPAP	2018-19	1.3	NCIPAP project for next regulatory period. In March 2017, AEMO reviewed and agreed for ElectraNet's NCIPAP proposal.

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Waterloo – Templers 132 kV power flow control Type: Augmentation Scope: Install Smart Wires Powerline Guardian devices on the Waterloo–Templers 132 kV line. Uprate the Robertstown–Tungkillo and Robertstown–Para 275 kV lines and Temples–Roseworthy 132 kV line as necessary.	2020 [Not in 2016 TAPR] (Not in 2015 TAPR)	3–6 [NA] (NA)	2018–23 NCIPAP	2019-20	5.9	NCIPAP project for next regulatory period. In March 2017, AEMO reviewed and agreed for ElectraNet's NCIPAP proposal. The proposal increases the transfer capability of the Northern SA to Adelaide transmission corridor. This is an exploratory project. Any increase in ratings and the application in real-time operation is yet to be proved. Market benefits are based on improved access to low cost generation.
Tailem Bend to Cherry Gardens tie in Type: Augmentation Scope: Populate one additional diameter at Tungkillo by tying in the Tailem Bend – Cherry Gardens 275 kV line.	2020 [Not in 2016 TAPR] (Not in 2015 TAPR)	4–8 [NA] (NA)	2018–23 NCIPAP	2019-20	5.3	NCIPAP project for next regulatory period. In March 2017, AEMO reviewed and agreed for ElectraNet's NCIPAP proposal. This project improves transient (rotor angle) and voltage stability along the Heywood transmission corridor.
South East 275 kV capacitor bank Type: Augmentation Scope: Install an additional 100 MVAr capacitor bank at South East substation.	2021 [Not in 2016 TAPR] (Not in 2015 TAPR)	<5 [NA] (NA)	2018–23 NCIPAP	2020-21	3.6	NCIPAP project for next regulatory period. In March 2017, AEMO reviewed and agreed for ElectraNet's NCIPAP proposal. This project improves voltage and transient stability limits along the Heywood interconnector transmission corridor.
Increase short-term rating of transformers at Robertstown Type: Install transformer management relays and bushing monitoring equipment to enable the application of short term ratings to the Robertstown 275/132 kV transformers	June 2022 [When or if needed: potentially within 10 years] (Subject to connection application)	<5 [<5] (<5)	2018–23 NCIPAP	2021-22	0.5	NCIPAP project for next regulatory period. In March 2017, AEMO reviewed and agreed for ElectraNet's NCIPAP proposal.

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Eyre Peninsula transmission supply reinforcement Type: Contingent Scope: Replace existing single-circuit 132 kV transmission Cultana–Yadnarie & Yadnarie – Port Lincoln lines with double-circuit, 132 kV or 275 kV lines. Timing contingent on successful completion of RIT-T justifying the investment option.	About 2022 [Within 10 years] (Subject to connection application)	200–550 [150–300] (150–300)	2018–23	Subject to successful completion of RIT-T	Contingent project 200	This project was originally included in the contingent project proposal for the current regulatory period (2013–18). AEMO supported to include this project as a contingent project for the regulatory period of 2018–23. ElectraNet has commenced a RIT-T and a PADR is expected to be published by the end of October 2017 which will include full options analysis.
Gawler East connection point Type: Connection Scope: Establish 132 kV transmission connection point at Gawler East (about 40 kilometres north of Adelaide) to address forecast distribution network limitation.	Nov 2022 [Nov 2019] (Not in 2015 TAPR)	3-6	2018–23	2022	6.3	SA Power Networks is proposing to establish a new substation at Gawler East to supply new residential developments in the area. ElectraNet's proposed project is to provide a 132 kV connection to a new 132/11 kV substation at Gawler East. A RIT-D for this project will be carried out by SA Power Networks.
Davenport – Robertstown 275 kV line uprating Type: Augmentation Scope: Uprate selected spans to achieve T120 rating, uprate protection and metering systems, and implement calculation of real-time ratings.	2024–28 [Not in 2016 TAPR] (Not in 2017 TAPR)	<5 [NA] (NA)	Beyond next regulatory period of 2018–23			Proposal beyond the scope of this review.

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Tie in Robertstown – Para 275 kV line at Tungkillo substation Type: Augmentation Scope: Populate one additional diameter at Tungkillo by tying in the Robertstown–Para 275 kV line.	2024–28 [Not in 2016 TAPR] (Not in 2017 TAPR)	4–8 [NA] (NA)	Beyond next regulatory period of 2018–23			Proposal beyond the scope of this review.
Potential Projects						
New Interconnector between South Australia and the Eastern States (2017 TAPR) Type: Augmentation Scope: ElectraNet proposed four interconnector options to connect South Australia with the Eastern states and non-network solutions.	1-2 years RIT-T, 3-5 years delivery [1–2 years RIT-T, 3-5 years delivery] (2 years RIT-T, 5 years delivery)	$250 - 500 million [300–700] (200–400) South Australia component only	2018–23	Contingent project proposal (South Australian Energy Transformation)		ElectraNet is undertaking a RIT-T for this project. Following options are being considered: • Central SA to Victoria interconnector (nominally Tungkillo to Horsham, and beyond) • Mid North SA to NSW interconnector (nominally Robertstown to Buronga, and beyond) • Northern SA to NSW interconnector (nominally Davenport to Mt Piper) • Northern SA to Queensland interconnector (nominally Davenport to Bulli Creek) • Non-network solutions
Upper Northern Region Western 132 kV line reinforcement Type: Contingent Scope: Rebuild the Davenport–Pimba 132 kV line and establish associated substation assets (including reactive support). Successful completion of RIT-T justifying the investment option.	Timing subject to customer commitment to connect new additional load along the Davenport–Pimba 132 kV line	110	2018–23	Contingent project proposal (Upper North-East Line Reinforcement)		AEMO's agrees that existing Davenport–Pimba line needed to be augmented if there was a step load growth which results in the total load exceeding 55 MW. Non-network solution is an alternative option. This project is subject to successful completion of RIT-T justifying the investment option.

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Upper Northern Region Eastern 132 kV line reinforcement Type: Contingent Scope: Rebuild the Davenport – Leigh Creek 132 kV line and establish associated substation assets (including reactive support).	Timing subject to customer commitment to connect new additional load along the Davenport – Leigh Creek 132 kV line	60	2018–23	Contingent project proposal (Upper North-West Line Reinforcement)		AEMO's agrees that the existing Davenport – Leigh Creek 132 kV line needed to be augmented if there was a step load growth which results in the total load exceeding 5 MW. Non-network solution is an alternative option. This project is subject to successful completion of RIT-T justifying the investment option.

Table 7 Security and compliance projects in the 2017 TAPR

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Committed and Pending projects						
Over-Frequency Generation Shedding (OFGS) Scheme Type: Security and compliance Scope: Implement Over-frequency Generation Shedding (OFGS) scheme for SA wind farms, including a backup scheme on the network side of the wind farm connections.	2017 [Not in 2016 TAPR] (Not in 2015 TAPR)	<5 [NA] (NA)	Not in AER's approved plan for 2013–18.	June 2017	0.3	As part of the review of Black System South Australia, AEMO identified a need for coordinated OFGS to trip excess generation in a controlled order to restore the supply and demand balance and allow the SA frequency to recover to within the frequency operating standards.
Tailem Bend Substation Upgrade Type: Security and compliance Scope: Extend the Tailem Bend substation to accommodate an additional 275 kV diameter with two circuit breakers, associated plant and secondary systems, and rearrange 275 kV line exits.	Nov 2017 [Jun 2017] (2016)	9–10 [9–10] (10–18)	2013–18	2018	8.9	2017 TAPR reports this project is committed and construction in progress.
Install, upgrade or replace transformer oil containment systems and associated equipment at various sites, where assessment indicates a clear need Type: Security and compliance Scope: Install, upgrade or replace transformer oil containment systems and associated equipment at various sites where assessment indicates a clear need.	2017 [2017] (2018)	8–10 [8–10] (5–10)	Not in capex proposal or contingent project proposal			ElectraNet 2017 TAPR refers transformer oil containment system need refurbishing in accordance with environment protection regulations. This is a committed project.

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Upper North Voltage Control Scheme Type: Security and compliance Scope: Install automated regional voltage control schemes for Eyre Peninsula and Upper North regions.	2018 [2017] (2016)	<5 [<5] (<5)	2013-18	2015	3.1	ElectraNet 2017 TAPR refers this project to prevent potential violations of voltage limits in Eyre Peninsula and Upper North region with changing generation pattern. This is a committed project. ElectraNet's proposed date for this project is 2015 in their current regulatory period.
Proposed projects						
Spencer Gulf Crossing Bypass Type: Security and compliance Scope: Undertake preparatory site works and procure spares to support a rapid restoration.	2018 [Not in 2016 TAPR] (Not in 2015 TAPR)	<5 [NA] (NA)	2018–23	2019	3.5	
Tailem Bend spare, second transformer Type: Security and compliance Scope: Install, connect and commission the spare 160 MVA 275/132 kV transformer as a second transformer on hot standby at Tailem Bend substation.	2018 [Not in 2016 TAPR] (Not in 2015 TAPR)	<5 [NA] (NA)	2018–23	2018	1.4	ElectraNet reported that the second transformer would remove the Heywood interconnector constrain during an outage of the single 275/132 kV Tailem Bend transformer.
Status indication on isolators and earth switches Type: Security and compliance Scope: Install status indication on isolators and earth switches where there currently is none	2018 [2019] (Not in 2015 TAPR)	<5 [<5] (NA)	2018–23	2019	1.8	

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
High voltage switching training facility Type: Security and compliance Scope: Create a high voltage switching training facility to improve training standards across all aspects of high voltage switching	2018 [2018] (2018)	4–8 [4–8] (5–10)	2018–23	2019	4.4	
Back up control and data centre Type: Security and compliance Scope: Construct a new Backup Control and Data Centre to meet current physical and electronic security requirements.	2018 [2018] (Not in 2015 TAPR)	4-8 [4-8] (NA)	2018–23	2019	3.1	
Installation of reactors at Templers West, Blyth West, and Para 275 kV substations Type: Security and compliance Scope: Install 3 x 50 MVAr reactors, to manage high voltages as the minimum demand continues to decline, at: • Templers West (2018) • Blyth West (2021) • Para (2023)	Templers West: Nov 2018 Blyth West: 2021 Para: 2023	<5 per each station	2018–23	Templers West: 2018 Blyth West: 2022 Para: 2023	Templers West: 3.2 Blyth West: 4.6 Para: 4.8	AEMO accepted this proposal during the capex proposal review in March 2017 and suggested combining all three reactor projects under a single RIT-T process to ensure an optimised, robust solution. The need for additional Mid North 50 MVAr reactor proposed for 2027 (beyond next regulatory period) in 2017 TAPR, should be considered under the same RIT-T process.
Motorised Isolator Improvement Type: Security and compliance Scope: Replace or refurbish mechanical and electrical isolation lock-off points on all motorised air insulated isolators.	2019 [Not in 2016 TAPR] (Not in 2015 TAPR)	10–15 [NA] (NA)	2018–23	2019	11.5	

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Transformer geomagnetic induced current monitoring Type: Security and compliance Scope: Install protective monitoring and alarming to enable affected transformers to be tripped prior to serious damage occurring.	2019	<5	2018–23	2019	0.4	
Kilburn 275 kV emergency bypass Type: Security and compliance Scope: Design, procure and have on standby the necessary line components to bypass Kilburn substation	2019 [Not in 2016 TAPR] (Not in 2015 TAPR)	<5 [NA] (NA)	2018–23	2019	0.14	AEMO's assessment in March 2017 considers ElectraNet's proposal to be reasonable. .
East Terrace, Northfield and Kilburn emergency GIS equipment Type: Security and compliance Scope: Design and procure plant and equipment required to support the rapid restoration of a failed GIS-connected 225 MVA 275/66 kV transformer at East Terrace, Northfield and Kilburn.	2019 [Not in 2016 TAPR] (Not in 2015 TAPR)	<5 [NA] (NA)	2018–23	2018	2.8	
Alternative diesel generator supply for critical substations Type: Security and compliance Scope: Provide alternative diesel generator supplies to critical substations, connection points for mobile generators to non-critical substations, and related AC and DC supply improvements.	2019 [Not in 2016 TAPR] (Not in 2015 TAPR)	5–10 [NA] (NA)	2018–23	2023	7.5	

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Transmission line access track upgrade Type: Security and compliance Scope: Upgrade transmission line access tracks at vulnerable locations across the network	2019 [Not in 2016 TAPR] (Not in 2015 TAPR)	<5 [NA] (NA)	2018–23	2020	3.7	
Special protection and wide area monitoring schemes Type: Security and compliance Scope: Implement a Special Protection Scheme (SPS) and Wide Area Monitoring Scheme (WAMS) utilising transmission-level load tripping and phasor measurement capabilities	2019 [Not in 2016 TAPR] (Not in 2015 TAPR)	4-8 [NA] (NA)	2018–23	2020	5.4	In AEMOs final report into South Australia black system event on 28 September 2016, AEMO recommended to develop a special protection scheme to prevent electrical separation of South Australia (Recommendation #6)[38].
Robertstown circuit breaker arrangement upgrade Type: Security and compliance Scope: Install a single 275 kV circuit breaker and associated equipment between the 275 kV buses at the Robertstown substation.	June 2020 [Not in 2016 TAPR] (Not in 2015 TAPR)	5–8 [NA] (NA)	2018–23	2020	6.6	AEMO's assessment in March 2017 considers ElectraNet's proposal to be reasonable.

[38] AEMO. Black System South Australia 28 September 2016. Available at: https://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/Integrated-Final-Report-SA-Black-System-28-September-2016.pdf

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Canowi circuit breaker arrangement upgrade Type: Security and compliance Scope: Install a 275 kV circuit breaker and associated equipment on the Robertstown exit at Canowi substation.	2021 [Not in 2016 TAPR] (Not in 2015 TAPR)	<5 [NA] (NA)	2018–23	2022	1.7	AEMO's assessment in March 2017 considers ElectraNet's proposal to be reasonable.
Installation of 50 MVAr reactor at Blyth West substation	See ***Installation of reactors at Templers West, Blyth West, and Para 275 kV substations***					
Main Grid System Strength Support Type: Contingent Scope: Upgrade existing protection devices and install six synchronous condensers at selected locations across the 275 kV transmission network. Specific triggers: AEMO's provision of the system strength NSCAS gap details, or other requirement for ElectraNet to address a system strength requirement in the South Australian region.	AEMO provision of system strength NSCAS gap details. Successful completion of the RIT-T justifying the investment option.	60–80	2018–23	Contingent project proposal (Main Grid System Strength Support)		AEMO supports the application of the RIT-T process.
Installation of 50 MVAr reactor at Para substation	See ***Installation of reactors at Templers West, Blyth West, and Para 275 kV substations***					

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Neutral earthing resistors and reactors Type: Security and compliance Scope: Install a monitoring and protection scheme for the neutral earthing reactor and resistor installations across the network	2023	<5	2018–23	2023	0.9	
Torrens Island North substation tie bus Type: Security and compliance Scope: Install a 66 kV circuit breaker and associated equipment to tie the two Torrens Island North lines in the Torrens Island North 66 kV switchyard	2023	<5	2018–23	2023	1.6	
Mid North 50 MVAr Reactor Type: Security and compliance Scope: Install a switched 50 MVAr reactor in the Mid North region.	2027 [Aug 2023] (Not in 2017 TAPR)	<5 [<5] (NA)	Beyond next regulatory period of 2018–23			ElectraNet's studies indicate that installing this reactor at a suitable location in the Mid North, along with the reactors proposed for Templers West in 2018, Blyth West in 2021, and Para will provide optimised benefits. The need for additional Mid North 50 MVAr reactor proposed for 2027 (beyond next regulatory period) in 2017 TAPR. AEMO suggests ElectraNet to consider this reactor along with other reactors under the same RIT-T process.
Blanche circuit breaker arrangement upgrade Type: Security and compliance Scope: Install an additional 132 kV circuit breaker and associated equipment at Blanche substation.	2024–2028 [Not in 2016 TAPR] (Not in 2017 TAPR)	<5 [NA] (NA)	Beyond next regulatory period of 2018–23			TAPR project timing beyond next regulatory period of 2018–23.

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Full single pole reclosing capability on the 132 kV circuits in the Mid North region Type: Security and compliance Scope: Implement full single pole reclosing capability on the 132 kV circuits in the Mid North region.	2024–2028 [2018–23] (2018–23)	<5 [<5] (<5)	Beyond next regulatory period of 2018–23			ElectraNet is considering this project under NCIPAP with the timing of 2024–28. 2017 TAPR reported that Mintaro and Angaston generators are constrained off during 132 kV outages that result in these generators being radialised.
Full single pole reclosing capability on the 132 kV circuits in the South East region Type: Security and compliance Scope: Implement full single pole reclosing capability on the 132 kV circuits in the South East region.	2024–2028 [2018–23] (2019–2023)	<5 [<5] (<5)	Beyond next regulatory period of 2018–23			ElectraNet is considering this project NCIPAP with the timing of 2024–28. 2017 TAPR reported that Ladbroke Grove and Snuggery generators are constrained off during 132 kV outages that result in these generators being radialised.

Table 8 Asset replacement projects in the 2017 TAPR

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Committed and Pending projects						
SA Water Morgan-Whyalla Pump Station #4 Type: Replacement Scope: Rebuild the Morgan to Whyalla pumping station #4 supply site to current day standards and replace the 132/3.3 kV transformers. Employ a standardised approach across all pumping station sites to realise design and operational efficiencies.	Sep 2017 [Nov 2016] (2016)	10–13 [10–13] (10–15)	2013–18	2017	12.9	AER's decision included replacement of SA water pumping stations over the 2013–18 regulatory period.
SA Water Mannum-Adelaide Pump Station #2 Type: Replacement Scope: Rebuild the Mannum to Adelaide pumping station #2 supply site to modern-day standards and replace the 132/3.3 kV transformers. Employ a standardised approach across all pumping station sites to realise design and operational efficiencies.	June 2017 [Jul 2017] (2017)	10–14 [10–14] (8–12)	2013–18	2018	15.6	AER's decision included replacement of SA water pumping stations over the 2013–18 regulatory period.

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
SA Water Mannum-Adelaide Pump Station #3 Type: Replacement Scope: Rebuild the Mannum to Adelaide pumping station #3 supply site to modern-day standards and replace the 132/3.3 kV transformers. Employ a standardised approach across all pumping station sites to realise design and operational efficiencies.	Sep 2017 [May 2017] (2017)	10–14 [10–14] (8–12)	2013–18	2018	11.8	AER's decision included replacement of SA water pumping stations over the 2013–18 regulatory period.
Battery charger units replacement Type: Replacement Scope: Replace battery chargers units on failure.	2017 [2018] (2018)	<5 [<5] (<5)	2018–23	2018	0.8	ElectraNet advises that a number of substation battery charger units have reached the end of their practical life and that the spare parts are not available.
Baroota substation refurbishment Type: Replacement Scope: Replace plant in poor condition at Baroota substation and implement flood mitigation measures. Retain only the existing single 10 MVA 132/33 kV transformer.	2017 [2017] (Nov 2017)	5–8 [5–10 ElectraNet's cost only] (5–10)	2018–23	2019	5.8	This project was de-scoped from the current regulatory period proposal as a result of the RIT-T assessment.

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Brinkworth–Mintaro 132 kV line remediation and insulator replacement Type: Replacement Scope: Replace all porcelain disc insulators, along with defective poles and cross arms, on the Brinkworth to Mintaro 132 kV line to achieve a 15-year life extension.	Nov 2017 [Nov 2016] (2015)	6–8 [6–8] (5–7)	2013–18	2018	5.0	
SA Water Mannum-Adelaide Pump Station #1 Type: Replacement Scope: Rebuild the Mannum to Adelaide pumping station #1 supply site to modern-day standards and replace the 132/3.3 kV transformers. Employ a standardised approach across all pumping station sites to realise design and operational efficiencies. Replace associated line assets that are in poor condition.	Nov 2017 [Jul 2017] (2017)	15–20 [15–20] (10–15)	2013–18	2018	17.2	AER's decision included replacement of SA water pumping stations over the 2013–18 regulatory period.
East Terrace gas monitoring system replacement Type: Replacement Scope: Replace existing combined phases gas monitoring system with isolated per phase systems.	2018 [Not in 2016 TAPR] (Not in 2015 TAPR)	<5 [NA] (NA)	2018–23	Sep 2018	1	

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Asset Condition Online Monitoring Equipment Replacement Type: Replacement Scope: Replace obsolete online asset condition monitoring equipment.	2018 [2018] (2018–23)	8–12 [8–12] (8–12)	2013–18	2018	11.8	ElectraNet reported that many items of online condition monitoring equipment are now nearing the end of their usable lives (12–20 years old) and are exhibiting high failure rates. On-going need for these equipment need to be assessed on a case-by-case.
Millbrook Pump Station Type: Replacement Scope: Rebuild the Millbrook pumping station supply site to modern-day standards and replace the 132/3.3 kV transformers. Employ a standardised approach across all pumping station sites to realise design and operational efficiencies.	2018 [2018] (2017)	12–16 [12–16] (10–15)	2013–18	2018	13.2	AER's decision included replacement of SA water pumping stations over the 2013–18 regulatory period.
Program of unit asset replacements Type: Replacement Scope: Individual unit assets, such as circuit breakers, voltage transformers, current transformers or protection relay sets that have reached end of life will be replaced at 36 substations.	2013–18 [2013–18] (2013–18)	40–50 [45–55] (20–30)	2013–18	2018	36.1	2015 – 2017 TAPRs advise the replacement of assets that have reached end of life at 36 substations. There is also a similar project that has been proposed for the next regulatory period.
AC board unit asset replacement Type: Replacement Scope: Replace AC auxiliary supply equipment, switchboards and cabling at 11 substations	2018 [2018] (2018)	8-12 [<5] (<5)	2018–23	2022	10.1	

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Monash and Berri relay replacement Type: Replacement Scope: Replace protection relays and communication gateway	2018	<5	2018–23	2018	1.8	
Murraylink control scheme Type Replacement Scope: Redesign and replace the Murraylink control scheme owned by ElectraNet.	2018 [2018] (2018)	<5 [<5] (<5)	2018–23	2019	0.9	
Para – Brinkworth – Davenport Hazard Mitigation Type: Replacement Scope: Replace load-releasing cross arms and all porcelain disc insulators on Para–Brinkworth–Davenport 275 kV line to achieve a 15-year life extension.	2018 [Sep 2017] (2018)	55–65 [46–60] (40–60)	2013–18	2017	33.7	
Substation lighting and infrastructure Type: Replacement Scope: Replace substation lighting and associated infrastructure at sites where hazards exist.	2019	4-8	2018–23	2019	5.6	
Magill/East Terrace cable joint monitoring Type: Replacement Scope: Replace degraded underground fluid instrumentation and associated telecommunications and infrastructure.	2019	<5	2013–18	2018	4.3	

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Proposed Asset Replacement Projects						
Davenport – Pimba 132 kV line operational improvements Type: Replacement Scope: Treat low spans to achieve the designed nominal ratings for Davenport – Mt Gunson section.	2018	4-8	Not provided			
Magill substation fire suppression system Type: Replacement Scope: Investigate, design and install refurbished or replacement fire suppression systems	2019	<5	2018–23	2019	1.8	
Leigh Creek South transformer replacement Type: Replacement Scope: Replace the existing two 5 MVA transformers with a single new 5 MVA 132/11 kV transformer and associated plant at Leigh Creek South substation	2019 [2016] (2018–23)	<5 [<5] (10-15)	2018–23	2020	3.0	In March 2017, AEMO considered the demand at Leigh Creek South to be uncertain and suggested consideration of deferring the replacement (if the condition of the asset permits) and replacing with a smaller transformer or non-network options to mitigate the risk of the new transformer becoming stranded. In 2017 TAPR ElectraNet advises the Leigh Creek South transformers 1 and 2 have been assessed to be at the end of their technical lives and at high risk of failure necessitating the replacement.

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Mount Gambier 132/33 kV transformer No. 1 (50 MVA) replacement Type: Replacement Scope: Replace the existing 50 MVA transformer with a new 25 MVA 132/33/11 kV at Mount Gambier substation.	2021 [2018–23] (2018–23)	<5 [3-5] (4-8)	2018–23	2021	2.1	In March 2017, AEMO assessed that an ongoing need exists for maintaining the supply capacity in Mount Gambier substation. ElectraNet advised that the existing 50 MVA transformer is in poor condition and the poor asset condition needs to be addressed in the next regulatory period. ElectraNet proposed replacing the existing 50 MVA transformer in poor condition with a new 25 MVA transformer. AEMO considers ElectraNet's proposal reasonable.
Mannum Transformer 1 and 2 Replacement Type: Replacement Scope: Replace the existing 20 MVA transformers with two new 25 MVA 132/33 kV transformers (nearest ElectraNet standard transformer size) at Mannum substation.	2022 [2018–23] (2018–23)	<5 [<5] (10-15)	2018–23	2022	2.9	AEMO's assessment in March 2017 agreed the proposal is reasonable, however replacing the existing transformers with two 15 MVA transformers should be investigated in detail prior to committing to an investment.
South East SVC computer control system replacement Type: Replacement Scope: Replace the existing SVC computer control system at South East substation with a new fully supported system	2022	4-8	2018–23	2022	4.5	

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Snuggery – Blanche – Mt Gambier 132 kV line – life extension Scope: Refurbish transmission line support systems and extend the life of the Snuggery – Blanche – Mt Gambier 132 kV line by renewing line asset components.	2019-23	8-10	2018–23	2023	8.8	
Transmission line conductor and earth wire refurbishment Scope: Implement a program of transmission line insulator system refurbishment to renew line asset components and extend line life	2019-23	50-70	2018–23	2023	58.7	
Transmission line insulator refurbishment Scope: Implement a program of transmission line conductor and earth wire refurbishment to renew line asset components and extend line life	2019-23	10-20	2018–23	2023	17.7	
Cultana–Yadnarie conductor and earthwire refurbish Type: Refurbishment Scope: Refurbish conductor and earthwire and extend the life of the Cultana to Yadnarie 132 kV transmission line	2019-23	30-45	2018–23	2023	35.5	

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Yadnarie – Port Lincoln conductor and earthwire refurbish Type: Refurbishment Scope: Refurbish conductor and earthwire and extend the life of the Yadnarie to Port Lincoln 132 kV transmission line	2019-23	30-45	2018–23	2023	38.2	
Program of unit asset replacements at various substations Type: Replacement Scope: Implement a program of unit asset replacement projects at various substations.	2019–2023 [2018–23] (2019–2023)	50–65 [30–45] (20–30)	Included in 2018-23 capex proposal as a variety of substation unit asset replacement programs			
Replace protection scheme relay assets Type: Replacement Scope: Implement a program of unit protection relay and control system replacement projects at various substations.	2019–2023 [2018–23] (2018–23)	25–35 [30–40] (30–40)	2018–23	2023	29.3	
Asset Condition Online Monitoring Equipment Replacement Type: Replacement Scope: Replace obsolete online asset condition monitoring equipment.	2019–23	4-8				

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Transmission line support system refurbishment Type: Refurbishment Scope: Implement a program of transmission line support system refurbishment to renew line asset components and extend line life	2024-28	10-15	2023-28	Beyond next regulatory period of 2018–23		
Transmission line insulator refurbishment Type: Refurbishment Scope: Implement a program of transmission line insulator system refurbishment to renew line asset components and extend line life	2024-28	50-80	2023-28	Beyond next regulatory period of 2018–23		
Transmission line conductor and earth wire refurbishment Type: Refurbishment Scope: Implement a program of transmission line conductor and earth wire refurbishment to renew line asset components and extend line life.	2024-28	70-100	2023-28	Beyond next regulatory period of 2018–23		
Infrastructure replacements Type: Replacement Scope: Implement a program of unit asset and infrastructure replacement projects at various substations	2024-2028	50-80	2023-28	Beyond next regulatory period of 2018–23		
Substation protection and control systems replacements Type: Replacement Scope: Implement a program of unit protection relay and control system replacement projects at various substations	2024-2028	30-50	2023-28	Beyond next regulatory period of 2018–23		

Table 9 Recently complete, intra-regional market benefit and inter-regional market benefit projects in the 2017 TAPR

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Recently completed projects						
See *Heywood interconnector upgrade*						
SA Water – Morgan Whyalla Pump Station #3 Type: Replacement Scope: Rebuilt the Morgan to Whyalla pumping station #3 supply site to current day standards and replaced the 132/3.3 kV transformers. Employed a standardised approach across all pumping station sites to realise design and operational efficiencies.	Completed August 2016 [July 2016] (2016)	Not provided [10–13] (10–15)	2013-2018	2017	12.5	AER's decision included replacement of SA water pumping stations over the 2013–18 regulatory period. 2017 TAPR indicates this project is completed.
SA Water – Morgan Whyalla Pump Station #1 Type: Replacement Scope: Rebuilt the Morgan to Whyalla pumping station #1 supply site to current day standards and replaced the 132/3.3 kV transformers. Employed a standardised approach across all pumping station sites to realise design and operational efficiencies.	Completed Sep 2016 [Sep 2016] (2016)	Not provided [10–14] (12–16)	2013-2018	2017	23	AER's decision included replacement of SA water pumping stations over the 2013–18 regulatory period. 2017 TAPR indicates this project is completed.

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Dalrymple Substation Upgrade Type: Connection Scope: Installed an additional 25 MVA 132/33 kV transformer at Dalrymple substation, with associated switchyard reconfiguration, to upgrade Dalrymple supply from ETC category 1 to category 2.	Completed Nov 2016 [Nov 2016] (2016)	Not provided [12–14] (14–16)	2013-2018	2017	24.1	This project was required to be commissioned by 2016 to upgrade Dalrymple supply from ETC category 1 to category 2. 2017 TAPR indicates this project is completed.
Para SVC Secondary Systems Type: Replacement Scope: Replaced Para SVC secondary systems and installed and integrated a 50 MVAr switched 275 kV reactor.	Completed Nov 2016 [Nov 2016] (2016)	Not provided [20–25] (12–20)	2013-2018	2018	16.4	2016 TAPR advises that following the announcement of the closure of Northern Power Station inductive reactive power support may be needed at Para substation during the required SVC outages, with Northern Power Station out of service. The optimal solution was to bring forward the installation of a 50 MVAr reactor at Para substation which was previously planned for the 2018–23 period. Project was expedited to 2016 in 2015 TAPR. 2017 TAPR indicates this project is completed. There is another project to install a second reactor at Para proposed for August 2023 to address the voltage control issues.
Tailem Bend – Keith #2 132 kV line insulator replacement Type: Refurbishment Scope: All porcelain disc insulator assemblies that had reached end of life on the Tailem Bend to Keith #2 132 kV transmission line were replaced to extend the life of the transmission line by at least 15 years.	Completed Jan 2017 [Nov 2016] (2015)	Not provided [5–8] (5–10)	2013-2018	2018	5.8	2017 TAPR advises that the project was completed.

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Potential inter-regional market benefit projects						
See the following project, contingent to RIT-T ***New Interconnector between South Australia and the Eastern States (2017 TAPR)*** ***New Interconnector between South Australia and New South Wales or Victoria (2016 TAPR)*** ***Strengthen Riverland transmission corridor (2015 TAPR)***						
Upper South East network augmentation Type: Augmentation Scope: String vacant 275 kV circuit between Tailem Bend and Tungkillo and install dynamic reactive support at Tailem Bend	1-2 years RIT-T, 2 years delivery [1-2 years RIT-T, 2 years delivery] (2 years RIT-T, 2 years delivery)	40–60 [40–60] (40–60)	2019-2023	Contingent project as part of South Australian Energy Transformation project		As part of the assessment that is being done for the South Australian Energy Transformation RIT-T, ElectraNet is evaluating the net market benefit of stringing this vacant circuit.
Potential intra-regional market benefit projects						
Davenport – Brinkworth – Para line Type: Augmentation Scope: Rebuild the line as a high capacity 275 kV AC double circuit line with twin conductors.	6-7 years from commencement of RIT-T [Same as in 2017 TAPR] (7 years subject to RIT-T)	300–600 [300–400] (300–400)	Not included in ElectraNet's capex proposal or its contingent project proposal.			Driver: Increase in renewable generation and loads through the Mid North and Eyre Peninsula. This project will go through a RIT-T assessment.
Tie Davenport–Robertstown 275 kV line at Belalie substation Type: Augmentation Scope: Tie Davenport–Robertstown 275 kV line at Belalie substation.	3–4 years subject to RIT-T [3–4 years subject to RIT-T] (Subject to market benefit analysis)	10–20 [10–20] (10–20)	Not included in ElectraNet's capex proposal or its contingent project proposal.			Driver: Increase in renewable generation Mid North network. This project will go through a RIT-T assessment.

Project description	2017 TAPR [2016 TAPR] (2015 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing***	Cost****	Regulatory Period	Timing***	Cost****	
Strengthen the Mid North 275 kV network Type: Augmentation Scope: Various line uprating and application of dynamic line ratings depending on generator developments.	2–3 years [2–3 years] (Subject to market benefit analysis)	<5 [<5] (<5)	Not included in ElectraNet's capex proposal or its contingent project proposal.			These projects would facilitate the connection of future generation connection to the transmission network in the mid-north region. AEMO supports further investigations into the market benefit of these proposals. AEMO notes that the two proposals are conceptual in nature. AEMO expects ElectraNet to clarify the proposals in future TAPRs.
Reconfigure Mid North 275 kV network Type: Augmentation Scope: Various potential reconfiguration options depending on generator and load developments.	2015 & 2016 & 2017 TAPRs: Dependent on location of generation and load (Subject to market benefit analysis)	2015 & 2016 & 2017 TAPRs: Dependent on location of generation and load (<5)	Not included in ElectraNet's capex proposal or its contingent project proposal.			

*The 2017 TAPR provides two cost estimates for the Main Grid System Strength Support project (40-70 & 60-80 million dollars)
** Category 4 connection points – required to have N-1 equivalent transmission line and transformer capacity to meet 100% of maximum demand.
*** Expected date of commissioning.
**** Total Nominal 2017–2023 Cost as submitted to AER in ElectraNet's final proposal for non-contingent projects. Indicative cost from the Revenue Proposal Overview for contingent projects

MEASURES AND ABBREVIATIONS

Units of measure

Abbreviation	Unit of measure
kV	Kilovolt
MW	Megawatts
MVAR	Megavolt Amperes Reactive
MVA	Megavolt Amperes

Abbreviations

Abbreviation	Expanded name
AC	Alternate Current
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
capex	Capital Expenditure
ETC	South Australian Electricity Transmission Code
ICT	Information Communication Technologies
ESCOSA	Essential Services Commission of South Australia
NCIPAP	Network Capability Incentive Parameter Action Plan
NEFR	National Electricity Forecasting Report
NER	National Electricity Rules
NTNDP	National Transmission Network Development Plan
POE	Probability of Exceedance
RIT-T	Regulatory Investment Test for Transmission
RIT-D	Regulatory Investment Test for Distribution
SACPFR	South Australian Connection Point Forecasts Report
SAAF	South Australian Advisory Functions
STPIS	Service Target Performance Incentive Scheme
SVC	Static VAR Compensator
TAPR	Transmission Annual Planning Report
TNSP	Transmission Network Service Provider

GLOSSARY

This document uses many terms that have meanings defined in the National Electricity Rules (NER). The NER meanings are adopted unless otherwise specified.

Term	Definition
annual planning report	An annual report providing forecasts of gas or electricity (or both) supply, network capacity and demand, and other planning information.
black system	The absence of voltage on all or a significant part of the transmission system or within a region during a major supply disruption affecting a significant number of customers.
category 1/2/3/4 connection point	Refer to Essential Services Commission of South Australia's (ESCOSA) Electricity Transmission Code[39]
committed projects	Generation that is considered to be proceeding under AEMO's commitment criteria.
constraint	A limitation on the capability of a network, load, or generating unit such that it is unacceptable to either transfer, consume, or generate the level of electrical power that would occur if the limitation was removed.
limitation (electricity)	Any limitations on the operation of the transmission system that could give rise to unserved energy or to generation re-dispatch costs.
maximum demand	The highest amount of electrical power delivered, or forecast to be delivered, over a defined period (day, week, month, season, or year) either at a connection point, or simultaneously at a defined set of connection points.
minimum demand	The lowest amount of electrical power delivered, or forecast to be delivered, over a defined period (day, week, month, season, or year) either at a connection point, or simultaneously at a defined set of connection points.
reactive power	Reactive power, which is different to active power, is a necessary component of alternating current electricity. It is predominantly consumed in the creation of magnetic fields in motors and transformers. Management of reactive power is necessary to ensure network voltage levels remain within required limits, which is in turn essential for maintaining power system security and reliability.
unserved energy	The amount of energy that cannot be supplied because there is insufficient generation or network capacity to meet demand.

[39] ESCOSA's Electricity Transmission Code. Available at: http://www.escosa.sa.gov.au/ArticleDocuments/1020/20160922-Electricity-TransmissionCode-TC09.pdf.aspx?Embed=Y

LIST OF COMPANY NAMES

The following table lists the full name and Australian Business Number (ABN) of companies that may be referred to in this document.

Company	Full company name	ABN/ACN
AEMO	Australian Energy Market Operator	92 072 010 327
ElectraNet	ElectraNet	41 094 482 416
SA Power Networks	SA Power Networks	13 332 330 749