
Comparison of ElectraNet's 2019 TAPR projects and the AER's revenue determination

August 2019

South Australian Advisory Functions

Important notice

PURPOSE

This document compares the projects proposed in ElectraNet's 2019 Transmission Annual Planning Report (TAPR) with the plan accepted by the Australian Energy Regulator (AER) for the current regulatory period of 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 2019 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 June 2019.

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ACKNOWLEDGEMENT

AEMO acknowledges the support, co-operation and contribution of all participants in providing data and information used in this publication.

VERSION CONTROL

Version	Release date	Changes
1	23 August 2019	Initial release

Executive summary

AEMO has undertaken this report as part of its advisory role for the South Australian jurisdiction. It compares the projects ElectraNet proposed in its 2019 Transmission Annual Planning Report (TAPR) against capital expenditure plans in the Australian Energy Regulator (AER) revenue determination for the current regulatory period (1 July 2018 to 30 June 2023).

Committed, pending and planned/proposed projects

In April 2018, the AER published the final decision on ElectraNet's revenue proposal for the regulatory period 2018-23. Within the committed, pending and planned/proposed category, ElectraNet's 2019 TAPR reported the following for the period of 2018-23:

- One connection project
- Seven security and compliance projects
- 22 asset replacement projects

These projects are consistent with the AER's revenue determination for the period 2018-23¹. However, several projects approved in the AER's revenue determination are missing from the TAPR or were noted as being no longer required:

- An augmentation project to improve existing reactive plant and voltage control facilities whilst managing system voltage levels, was unintentionally omitted from the TAPR.
- Three security and compliance projects are now within the scope of the Main Grid System Strength Project. The AER approved capital expenditure for this project on 20 August 2019².
- One security and compliance project and one asset replacement project has been deferred as a result of a risk based assessment and is subject to an ongoing review.

NCIPAP projects

The AER's revenue determination included seven projects under the Network Capability Incentive Parameter Action Plan (NCIPAP). In March 2017, AEMO reviewed and endorsed all these NCIPAP projects. ElectraNet's 2019 TAPR listed six of these seven NCIPAP projects. The project not listed in the TAPR is "improvement to constraint formulation" – an opex project. ElectraNet advised that this project is still planned for commencement in 2021.

Contingent projects

ElectraNet's 2019 TAPR reported five projects as contingent projects for the regulatory period of 2018-23. The AER's final decision included all these five projects as contingent projects in the regulatory period of 2018-23. The projects are:

- Eyre Peninsula upgrade (\$240 million) – RIT-T completed.
- Project EnergyConnect (\$380 million) – RIT-T pending assessment by the AER.
- Upper North-East transmission line reinforcement (\$60 million) – RIT-T not started.
- Upper North-West transmission line reinforcement (\$110 million) – RIT-T not started.

¹ One connection project reported in ElectraNet's 2019 TAPR, to construct a new 275kV line from Saltbush Hill to Mt Gunson South and upgrade to a 275/132kV connection point at Mt Gunson South for connection of the Prominent Hill mine, does not come under ElectraNet's prescribed services.

² AER. *AER approves ElectraNet spending on South Australia system strength*, available at <https://www.aer.gov.au/news-release/aer-approves-electranet-spending-on-south-australia-system-strength>.

- Main Grid System Strength Project to maintain minimum levels of system strength and inertia in South Australia (\$160-200 million) – Exempt from RIT-T (contingent project submitted and approved).

Each of the first four projects must satisfy successful completion of the Regulatory Investment Test for Transmission (RIT-T), and the preferred option should maximise positive net economic benefits or address a reliability corrective action. The fifth project is urgently required to meet system strength and inertia requirements and is exempt from the RIT-T. The capital expenditure for this project was approved by the AER on 20 August 2019³.

Project EnergyConnect and the Main Grid System Strength project were identified as priority projects in the Integrated System Plan⁴ issued by AEMO in July 2018. Recent rule changes⁵ put forward by the Energy Security Board (ESB) and approved by the Australian Energy Market Commission (AEMC) will help to streamline the regulatory approval processes for Project EnergyConnect. Similarly, the Main Grid System Strength project is being expedited in response to an urgent fault level shortfall under the new framework to manage power system fault levels (initiated by the South Australian Minister for Mineral Resources and Energy)⁶.

Conclusion

AEMO's review identified that augmentation, security and compliance, and asset renewal projects reported in ElectraNet's 2019 TAPR have a close correlation with the AER's revenue determination. The TAPR and recent RIT-Ts show evidence that ElectraNet has undertaken robust network planning.

³ AER. *ElectraNet – Main grid system strength contingent project*, available at <https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/contingent-projects/electranet-main-grid-system-strength-contingent-project>.

⁴ AEMO. *Integrated System Plan (ISP)*, available at <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Integrated-System-Plan>.

⁵ AEMC. *Early Implementation of ISP Priority Projects*, available at <https://www.aemc.gov.au/rule-changes/early-implementation-isp-priority-projects>.

⁶ AEMC. *Managing Power System Fault Levels*, available at <https://www.aemc.gov.au/rule-changes/managing-power-system-fault-levels>.

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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 to ElectraNet's revenue determination.
- Section 1.2 provides background information on ElectraNet's TAPR.
- Section 1.3 outlines the impact of any differences between the Australian Energy Regulator's (AER's) regulatory determinations and ElectraNet's 2019 TAPR⁷.
- 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 does have discretion to deviate, as circumstances may require, from the capital expenditure allowance determined by the AER when augmenting and maintaining their network. If this occurs, 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) consumers⁸.

Plan accepted by the AER for the current regulatory period

In April 2018, the AER made its final determination for ElectraNet's revenue allowance for the current regulatory period, 1 July 2018 to 30 June 2023.

Table 1 provides a timeline of the AER's regulatory determination process for this allowance.

⁷ ElectraNet. *South Australian Transmission Annual Planning Report*, available at https://www.electranet.com.au/wp-content/uploads/2019/06/2019-ElectraNet-TAPR_WEB.pdf.

⁸ AER. *Expenditure incentives guideline 2013*, available at <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/expenditure-incentives-guideline-2013>.

Table 1 Timeline of ElectraNet's 2018-23 regulatory determination

Date	Action	Document and link
28 March 2017	ElectraNet submits revenue proposal	ElectraNet. Transmission Network Revenue Proposal (2018-23). Available at https://www.aer.gov.au/system/files/ElectraNet%20E2%80%93%20ENET002%20E2%80%93%20ElectraNet%20E2%80%93%20Revenue%20Proposal%20Overview%20E2%80%93%20March%202017.pdf .
26 October 2017	AER releases draft decision	AER. Draft Decision – ElectraNet Transmission determination 2018-23. Available at https://www.aer.gov.au/system/files/AER%20-%20Draft%20Decision%20-%20Overview%20-%2026%20October%202017%20%28amended%203%20Nov%202017%29.pdf .
22 December 2017	ElectraNet submits revised revenue proposal	ElectraNet. Transmission Network Revised Revenue Proposal (2018-19 to 2022-23). Available at https://www.aer.gov.au/system/files/ElectraNet%20-%20Revised%20revenue%20proposal%20-%20December%202017%20-%20version2.pdf .
30 April 2018	AER releases final decision	AER. Final Decision, ElectraNet, Transmission Determination, 2018-19 to 2022-23. Available at https://www.aer.gov.au/system/files/D18-32266%20AER%20-%20Final%20decision%20ElectraNet%202018-23%20transmission%20determination%20-%20Determination%20-%20April%202018.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.
 - Replacement and refurbishment projects.
- Non-network capex:
 - Business information technologies (IT).
 - Buildings and facilities.

AEMO has reviewed ElectraNet's 2019 TAPR and compared it with network capex in the latest revenue determination (see Chapter 2). In summary:

- The following projects were approved by the AER in the revenue determination for the regulatory period of 2018-23:
 - One augmentation project.
 - Seven NCIPAP projects.
 - One connection project.
 - 21 security and compliance projects.
 - 30 asset renewal projects.

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 outcome of annual planning review which analyses the expected operation of each transmission network over an appropriate planning period, considering 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 TAPR requirements were amended in December 2018⁹ as a result of the connection and planning arrangements rule determination in May 2017¹⁰, which required the AER to publish TAPR guidelines. The guidelines contain direction on the specific information required relating to transmission connection points, transmission line segments and new generator connections, with the aim of ensuring generators and large transmission customers have the information required to make appropriate connection decisions.

The NER do not require the TAPR to comprehensively address all aspects of a TNSP’s capex program.

Table 2 lists the capex categories included in and excluded from ElectraNet’s 2019 TAPR. All these categories are considered as part of the AER’s revenue determination process.

Table 2 Capex categories reported in ElectraNet’s 2019 TAPR

Included in the TAPR† and the revenue determination	Included in the revenue determination but not in the TAPR
<ul style="list-style-type: none"> • Augmentation (including market benefit project proposals) • Connection • Security/compliance • Replacement/Refurbishment 	<ul style="list-style-type: none"> • Inventory and spares • Land and easement • Business information technologies (IT) • Buildings and facilities

† ElectraNet’s 2019 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 2019 TAPR, as this is not required by the NER.

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

2019 TAPR and connection point forecasts

ElectraNet’s 2019 TAPR¹¹ 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 planned/proposed transmission network developments in South Australia. In 2019, ElectraNet included connection point forecasts as a component of the TAPR in accordance with the AER’s new TAPR guidelines.

ElectraNet annually receives 10-year connection point demand forecasts from SA Power Networks and collaborates with AEMO to receive forecasts from direct connect customers. Also, ElectraNet has taken into consideration of AEMO’s connection point forecasts for South Australia, published in September 2018. ElectraNet compared its connection point forecasts against AEMO’s forecasts and reported that there are some differences between the two forecasts, but neither forecast has consistently higher or lower than the other. Further, the 2019 TAPR reported these differences have no impact on network limitations or development plans within the next ten years. The development plans presented in the 2019 TAPR are based on the connection point demand forecasts that are summarised in ElectraNet’s 2019 TAPR.

⁹ AER. *Final Decision: Transmission annual planning report guidelines*, available at <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/transmission-annual-planning-report-guidelines>.

¹⁰ AEMC. *Transmission Connection and Planning Arrangements*, available at <https://www.aemc.gov.au/rule-changes/transmission-connection-and-planning-arrangements>.

¹¹ ElectraNet. *South Australian Transmission Annual Planning Report*, available at https://www.electranet.com.au/wp-content/uploads/2019/06/2019-ElectraNet-TAPR_WEB.pdf.

Additionally, ElectraNet has used the forecast provided in AEMO's February 2019 update to the *2018 Electricity Statement of Opportunities (ESOO)*¹² to determine future needs for improved voltage control on the Main Grid¹³ at times of maximum and 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 2019 TAPR prior to its publication.

Assessment methodology

This review incorporated a comparison of the augmentation plan proposed in the TAPR against the AER revenue allowance for the current regulatory period, from 1 July 2018 to 30 June 2023.

AEMO used the demand forecasts from its February 2019 ESOO Forecasts¹⁴ for the comparison at a regional level, and the *2018 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 (such as 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.
- Other changed circumstances.

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

¹² AEMO. *2018 Electricity Statement of Opportunities (ESOO) update to auxiliary load for maximum and minimum demand*, available at <http://forecasting.aemo.com.au/Electricity/AnnualConsumption/Operational>.

¹³ As stated in ElectraNet's 2019 TAPR, the Main Grid is a meshed 275 kV network that is connected to two interconnectors and seven regional networks in South Australia.

¹⁴ AEMO. *2018 Electricity Forecasting Insights*, available at <http://forecasting.aemo.com.au/Electricity/AnnualConsumption/Operational>.

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/South-Australia>.

1.4 South Australian transmission network planning

1.4.1 Collaboration between AEMO and ElectraNet on transmission network planning

This section describes the extent to which AEMO and ElectraNet collaborate 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 South Australia and Victoria. Recent joint planning studies include:

- The *Integrated System Plan (ISP)* – The first ISP¹⁶, published in 2018, delivers a strategic infrastructure development plan, based on sound engineering and economics, which can facilitate an orderly energy system transition under a range of scenarios. AEMO now continues to work closely with ElectraNet on the development of the 2019-20 ISP.
- Special protection schemes – see “Implementation of recommendations from South Australia Black System report” in Section 1.4.2 for more details. As recommended in the 2018 Power System Frequency Risk Review, a Protected Event has now been declared by the Reliability Panel for loss of generation in the South Australian region during destructive wind conditions¹⁷. An upgrade to the System Integrity Protection Scheme (SIPS) was also endorsed as an Emergency Frequency Control Scheme. AEMO and ElectraNet continue to collaborate on the design and implementation of this enhanced control scheme.
- Review of Regulatory Investment Test for Transmission (RIT-T) documents – see “AEMO review of ElectraNet’s draft Regulatory Investment Test-Transmission documents” below for more details.
- System strength and inertia – Following the declaration of system strength and inertia gaps by AEMO for the South Australian Region, ElectraNet and AEMO have undertaken joint studies to determine the optimal design and location for synchronous condensers. Detailed studies are ongoing to updated determine operation requirements when the synchronous condensers are in place, and reliance on directions of synchronous gas plant is reduced.

AEMO and ElectraNet joint planning meetings

AEMO and ElectraNet hold frequent joint planning meetings on network planning-related issues. Agenda items include updates and discussions on:

- The ISP and *National Transmission Network Development Plan (NTNDP)*.
- Renewable Energy Zones.
- Load and generator connections in South Australia and Victoria.
- South Australian and Victorian TAPRs.
- Project EnergyConnect RIT-T (South Australia to Eastern States interconnector).
- South Australian and Victorian intra-regional RIT-Ts.
- Identification of Renewable Energy Zones (REZs) in South Australia.
- Demand forecasts.
- Options to address the system strength gap in South Australia.

¹⁶ AEMO. *Integrated System Plan (ISP)*, available at <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Integrated-System-Plan>.

¹⁷ AEMC. *Request for declaration of protected event – November 2018*, available at <https://www.aemc.gov.au/market-reviews-advice/request-declaration-protected-event-november-2018>

- Power system frequency risk review.
- Coordination of operational management of South Australian distributed energy resources.
- 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. AEMO's review is focused on augmentation RIT-Ts and not replacement RIT-Ts. While AEMO reviews the draft documents and provides comments, ElectraNet remains the sole author and owner.

Recently, AEMO reviewed the following RIT-T documents:

- South Australia Energy Transformation (SAET) RIT-T – in November 2016, ElectraNet commenced the RIT-T process for this project by publishing a Project Specification Consultation Report (PSCR). AEMO formally submitted to the PSCR consultation. AEMO and ElectraNet met regularly to discuss the technical and economic benefit assessment of network and non-network options. ElectraNet consulted AEMO before publishing a Project Assessment Draft Report (PADR) on 29 June 2018. AEMO also reviewed the Project Assessment Conclusions Report (PACR) prior to its publication on 13 February 2019¹⁸.
- Eyre Peninsula Electricity Supply Options RIT-T – in April 2017, ElectraNet commenced the RIT-T process for this project by publishing a PSCR. ElectraNet consulted AEMO before publishing a PADR in November 2017. AEMO have also reviewed the Project Assessment Conclusions Report (PACR) prior to its publication on 18 October 2018¹⁹.

Joint working groups

The following joint working groups, which seek to facilitate constructive discussion on matters relating to gas and electricity forecasting, market modelling, and strategic network planning, were in place in 2018 and 2019:

- Executive Joint Planning Committee (EJPC) – The EJPC coordinates effective collaboration and consultation between Jurisdictional Planning Bodies and AEMO on electricity transmission network planning issues so as to
 - Develop a framework for the Integrated System Plan (ISP).
 - Continuously improve current network planning practices.
 - Coordinate on energy security across the NEM.
- Joint Planning Committee (JPC) – The Joint Planning Committee (JPC) is a TNSP working committee, supporting the Executive Joint Planning Committee (EJPC) in achieving effective collaboration, consultation and coordination between Jurisdictional Planning Bodies, Transmission System Operators and AEMO on electricity transmission network planning issues.
- Market Modelling Working Group (MMWG) – The objective of the MMWG is a TNSP forum to share expertise, models, data, techniques, knowledge and methodologies for application in long-term future energy system planning studies.

¹⁸ ElectraNet. *South Australian Energy Transformation RIT-T*. available at <https://www.electranet.com.au/projects/south-australian-energy-transformation/>

¹⁹ ElectraNet. *Eyre Peninsula Electricity Supply Options RIT-T*, available at <https://www.electranet.com.au/projects/eyre-peninsula-electricity-supply-options/>

- Regulatory Working Group (RWG) – The RWG is a working group to support the EJPC in achieving effective collaboration, consultation and coordination between Jurisdictional Planning Bodies, Transmission System Operators and AEMO on key areas related to the application of the regulatory transmission framework and suggestions for improvement.
- Forecasting Reference Group (FRG) – The Forecasting Reference Group (FRG) is a monthly forum with AEMO and industry’s forecasting specialists. The forum seeks to facilitate constructive discussion on matters relating to gas and electricity forecasting and market modelling. It is an opportunity to share expertise and explore new approaches to addressing the challenges of forecasting in a rapidly changing energy industry.

ElectraNet regularly attends all these meetings.

As the national transmission planner, AEMO is required to review and publish advice on the development of the transmission grid across the NEM, to provide a national strategic perspective for transmission planning and coordination, and to publish an annual 20-year outlook for NEM transmission planning (the NTNDP). In June 2018, AEMO published an ISP, which, with associated material, met AEMO’s responsibilities and fulfilled the requirements of the NTNDP. AEMO is also in the process of developing the 2019-20 ISP.

ElectraNet is working closely with AEMO in developing the next ISP, through these working group meetings, and formal and informal consultation. The ISP will incorporate ElectraNet’s current network and its committed development plans. It will also include discussion on the key transmission network projects proposed in ElectraNet’s TAPR and the impact of these projects on relevant transmission flow paths. AEMO is consulting with ElectraNet on its findings of generation and transmission outlooks and modelling results.

In accordance with NER requirements, ElectraNet considers the strategic plan outlined in the previous NTNDP in its TAPRs. In their development of the 2019 TAPR, ElectraNet also considered information from the inaugural Integrated System Plan²⁰.

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 encourage efficient network capability from existing assets when and where most needed to improve customer or wholesale market outcomes. The STPIS requires each TNSP to submit a NCIPAP as part of its revenue proposal to the AER.

As part of the process, TNSPs are required to consult with AEMO, prior to submitting the NCIPAP, about their reviews of transmission circuits and injection points in their networks, and the potential priority projects which have been identified²¹. 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 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 2017 to identify options and quantify market benefits of potential NCIPAP projects for implementation within ElectraNet’s regulatory period (2018-23). 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.

²⁰ AEMO. *Integrated System Plan (ISP)*, available at <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Integrated-System-Plan>.

²¹ AER. *Service target performance incentive scheme*, available at <https://www.aer.gov.au/system/files/AER%20-%20STPIS%20version%205%20%28corrected%29%20-%2030%20September%202015.pdf>.

In 2017, the AER accepted AEMO’s review of ElectraNet’s NCIPAP projects and the project ranking for the regulatory period 2018-23 and in April 2018 AER included NCIPAP projects in their final determination²². These NCIPAP projects are listed in Table 3.

Table 3 ElectraNet’s NCIPAP augmentation projects for the current regulatory period (in order of priority)

NCIPAP Project	Regulatory period	AEMO comments
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 No. 2 lines.	2018-23	Project included in 2019 TAPR as completed in March 2019.
Upgrading of limiting plants on Robertstown to Davenport 275 kV lines: Robertstown–Mokota–Belalie–Davenport 275 kV, Robertstown – Canowie – Mt Lock – Davenport 275 kV lines.	2018-23	Project included in 2019 TAPR with committed status and a timing of June 2019
Robertstown transformer management relay DR-E3 upgrading program.	2018-23	Project included in 2019 TAPR with planned status and a timing of June 2022.
Constraint formulation investigation: Improve SA network transient and voltage stability limits by improving constraints formulation.	2018-23	Not in 2019 TAPR (opex project). ElectraNet advised that this project is planned for commencement in 2021.
South East 275 kV capacitor bank: Install an additional 100 MVAR capacitor bank at South East substation.	2018-23	Project included in 2019 TAPR with planned status and a timing of 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 included in 2019 TAPR with planned status and timing of December 2019.
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 included in 2019 TAPR with planned status and a timing of January 2020.

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 2016²³. 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.

A number of projects listed in the 2019 TAPR address the recommendations of this report. Where there is potential relevance, AEMO has noted this in A1.

²² AER. *ElectraNet transmission determination 2018 to 2023*, available at <https://www.aer.gov.au/system/files/D18-32266%20AER%20-%20Final%20decision%20ElectraNet%202018-23%20transmission%20determination%20-%20Determination%20-%20April%202018.pdf>.

²³ AEMO. *Black System South Australia 28 September 2016*, 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.

Demand side management initiative with ARENA

In October 2017, the Australian Renewable Energy Agency (ARENA) and AEMO jointly announced 10 pilot projects had been awarded funding under a demand response initiative to help manage electricity supply during extreme peaks. Demand response involves paying an incentive for energy users to reduce their power consumption, switch to backup generation, or dispatch their energy storage, for short periods when electricity reserves reach critically low levels. Over three years, the pilot projects are being trialled in Victoria, South Australia, and New South Wales to free up temporary supply during extreme weather (such as prolonged summer heatwaves) and unplanned outages.

Meeting system strength gap

In October 2017, AEMO, in its update to the 2016 NTNDP, declared a gap in system strength in South Australia. To maintain and manage the security of the power system, the system strength that has been supplied by traditional synchronous generation sources now needs to be provided by other means.

ElectraNet's 2019 TAPR reported that they have been investigating options to address this fault level shortfall while also keeping costs down. Options included entering into contracts with existing conventional generators or installing synchronous condensers. In consultation with AEMO, ElectraNet has determined installation of synchronous condensers on the network be the most efficient and least-cost option²⁴. On 20 August 2019, the capital expenditure for this contingent project was approved by the AER²⁵.

Detailed studies are ongoing to determine operational requirements when the synchronous condensers are in place, as well as any ongoing reliance on synchronous generation.

Power system frequency risk review (PSFRR)

In June 2018, AEMO published the PSFRR which assessed frequency risks in each NEM region. This review was undertaken during 2017-18 in collaboration with Network Service Providers (NSPs)²⁶. Key insights for South Australia were:

- AEMO, in consultation with ElectraNet, recommended an upgrade to the recently commissioned SIPS, to further reduce the likelihood that a loss of multiple generators in South Australia will lead to separation and a black system. In the June 2018 PSFRR, AEMO recommended that this upgrade could be completed within two years. The project was approved by the Reliability Panel on 20 June 2019²⁷, and is currently targeted for completion in December 2021.
- AEMO, in consultation with ElectraNet, recommended the creation of a new protected event to manage risks relating to transmission line failure causing generation disconnection and subsequent islanding and black system during destructive wind conditions in South Australia. In November 2018, AEMO submitted this request to the Reliability Panel for the declaration of this as a Protected Event. In June 2019, this request was approved, and the Protected Event declared.

Other AEMO reports published under South Australian Advisory Function

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

- South Australian Fuel and Technology Report²⁸.

²⁴ ElectraNet. *Economic evaluation - Main grid system strength project (contingent project trigger)*, available at <https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/contingent-projects/electranet-economic-evaluation-main-grid-system-strength-project-contingent-project-trigger>.

²⁵ AER. *ElectraNet – Main grid system strength contingent project*, available at <https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/contingent-projects/electranet-main-grid-system-strength-contingent-project>.

²⁶ AEMO. *2018 Power System Frequency Risk Review*, available at <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Power-System-Frequency-Risk-Review>.

²⁷ Reliability Panel. *Request for declaration of protected event – November 2018*, available at <https://www.aemc.gov.au/market-reviews-advice/request-declaration-protected-event-november-2018>.

²⁸ AEMO. *2017 South Australian Fuel and Technology Report*, at http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/SA_Advisory/2017/2017_SAFTR.pdf.

- South Australian Electricity Report²⁹.
- Independent Planning Review – ElectraNet Capital Expenditure Projects³⁰.

²⁹ AEMO. 2018 South Australian Electricity Report, at https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/SA_Advisory/2018/2018-South-Australian-Electricity-Report.pdf

³⁰ AEMO. 2017 Independent Planning Review - ElectraNet Capital Expenditure Projects, at https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/SA_Advisory/2017/Independent_Planning_Review-ElectraNet_Capital_Expenditure_Projects.pdf.

2. Transmission network comparison and assessment

This chapter compares the projects listed in ElectraNet's 2019 TAPR with AER's revenue determination for the current regulatory period of 2018-23 and provides AEMO's view on any differences. It also considers differences between ElectraNet's 2017, 2018 and 2019 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 2019 TAPR (augmentation, security/compliance, and replacement). Details of the assessment methodology are summarised in Section 1.3.

As noted in Section 1.2, the TAPRs only include a subset of the TNSP's overall capex. This report does not include the capex project categories that are not reported in ElectraNet's 2019 TAPR (land and easement, inventory and spares, business information technologies (IT), and buildings and facilities).

The comparison takes into account:

- ElectraNet's 2017, 2018, and 2019 TAPRs.
- The AER's Final Decision on ElectraNet Transmission Determination for the regulatory period 2018-23, published in April 2018³¹.

ElectraNet advises in the 2019 TAPR that:

- Committed projects are projects where a RIT-T has been completed (where required), and approval has been given by the ElectraNet Board.
- Pending projects are projects which have passed the RIT-T but are not yet fully committed.

A1 provides detailed comments for each augmentation, connection, security and compliance, and replacement project included in ElectraNet's 2019 TAPR.

2.2 Augmentation projects

A comparison of augmentation projects with a direct impact on transmission network performance is provided in Table 4 of Appendix A. The table also contains comments where relevant.

Committed and pending projects

There are four augmentation projects which are reported as committed and pending from the current regulatory period of 2018-23, the first two of which are NCIPAP projects:

- The removal, replacement or changing of low-rated plant and secondary systems of the Davenport-Robertstown 275 kV transmission lines' thermal capacity.

³¹ AER. Final Decision on ElectraNet Transmission Determination from 2018-23, at <https://www.aer.gov.au/system/files/D18-32266%20AER%20-%20Final%20decision%20ElectraNet%202018-23%20transmission%20determination%20-%20Determination%20-%20April%202018.pdf>.

- Installation of modular power flow control elements on the Waterloo–Templers 132 kV line and upgrading the Robertstown–Tungkillo and Robertstown–Para 275 kV lines and Temples–Roseworthy 132 kV line.
- Construction of a double-circuit line from Cultana to Yadnarie energised at 132 kV, with the option to be energised at 275 kV with a rating of about 600 MVA, and the construction of a double-circuit 132 kV line from Yadnarie to Port Lincoln (Eyre Peninsula upgrade).
- Construct a new 330kV, 800MW interconnector from Robertstown in SA to Wagga Wagga in NSW via Buronga (Project EnergyConnect).

The last two of the above projects are subject to the RIT-T process. The Project Assessment Conclusions Report (PACR) for Eyre Peninsula supply reinforcement was published in October 2018. In April 2019 the AER determined the preferred options identified in the PACR satisfies the RIT-T.

The PACR for Project EnergyConnect was published in February 2019. The AER is currently determining whether it satisfies the requirements of the RIT-T.

Final revenue approval from the AER relating to maintaining minimum levels of systems strength and inertia in South Australia is expected in 2019.

One of an accepted NCIPAP is not listed in the 2019 TAPR. This is an opex project for improvement to constraint formulation, and ElectraNet advised that this project is planned for commencement in 2021.

Planned and proposed projects

There are four augmentation projects that are planned or proposed in the current regulatory period, the first three of which are NCIPAP projects. All of these projects were accepted by the AER in the regulatory determination. These projects are:

- The addition of one additional diameter at Tungkillo 275 kV substation to connect the Taillem Bend – Cherry Gardens 275 kV line at Tungkillo substation.
- The installation of an additional 100 MVAR capacitor bank at South East substation.
- The installation of transformer management relays and bushing monitoring equipment to enable the application of short term ratings to the Robertstown 275/132 kV transformers
- The installation of a coordinated control scheme to better use existing reactive plant and voltage control facilities to minimise system constraints, whilst managing system voltage levels. ElectraNet have advised that this project should have been included in the 2019 TAPR but was unintentionally omitted.

Contingent projects

There are two augmentation projects reported as contingent in the current regulatory period of 2018-23:

- A rebuild of the Davenport to Pimba 132kV line and establishing associated substation assets (including reactive support).
- Upgrading of the Davenport – Leigh Creek 132 kV line and establish associated network assets to reinforce the Upper Northern Region eastern 132 kV line.

2.3 Connection projects

A comparison of transmission connection projects is provided in Table 5 of Appendix A. There are two connection projects:

- Construction of a new Davenport to Mount Gunson South 275 kV line and upgrade to a 275/132 kV connection point at Mount Gunson South to connect the Prominent Hill mine at 132 kV. This project does not come under ElectraNet’s prescribed services.

- Turn the Para to Roseworthy 132 kV line in at Gawler East and establish a 132 kV bus for a single SA Power Networks 132/11 kV transformer. AEMO understands that the need and timing of this project is still uncertain and is subject to a RIT-D analysis to be conducted by SA Power Networks.

2.4 Security and compliance projects

A comparison of security and compliance 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 two security and compliance projects which are reported as committed and continued from previous regulatory period of 2013-18:

- Implementation of an OFGS scheme for SA windfarms including a backup scheme on the network side of the wind farm connections.
- Installation of an automated regional voltage control schemes for the Eyre Peninsula and Upper North regions, to ensure that changing generation patterns that are resulting in complex voltage interactions do not lead to violations of voltage limits stipulated in the Rules and connection agreements.

A further project from the 2013-18 regulatory period, to install, upgrade or replace transformer oil containment systems and associated equipment at various sites, was unintentionally omitted from the TAPR. Planned completion for this is in December 2019.

Four projects were included in the revenue determination, but not in the TAPR. Three of these projects (Robertstown Circuit Breaker Arrangement, and Para and Blyth West 275 kV 50 MVar Reactors) will now be included within the scope of the Main Grid System Strength project. The project to upgrade transmission line access tracks at vulnerable locations across the network has been deferred as a result of a risk based assessment, and the project is subject to an ongoing review.

ElectraNet included two projects in the TAPR which are required in order to satisfy the requirements of AEMO's 2018 Power System Frequency Review. These are the Wide Area Monitoring Scheme pilot and Wide Area Protection Scheme. The scope for these has been revised since the revenue determination, and ElectraNet have advised that the decision as to whether the latter of these will go ahead depends on the outcomes of the former.

2.5 Replacement and refurbishment projects

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

There are two asset replacement projects which are reported as committed and continued from the previous regulatory period of 2013-18:

- Asset condition online monitoring equipment replacement.
- Program of unit asset replacements.

The TAPR contains 22 asset replacement projects classed as committed, pending or planned/proposed for the period of 2018-23.

AEMO notes that the timing of some projects reported in the 2019 TAPR is different from the proposed timing in the revenue determination. AEMO cannot comment on this because these projects are asset condition-based replacement projects, and ElectraNet, as the asset owner, is in the best position to adjust the project timing as necessary.

There is one project included in the AER's revenue determination which is not included. This is to implement a program to replace substation fences at selected substations. ElectraNet have advised this project has been deferred as a result of a risk based assessment, and the project is subject to an ongoing review.

2.6 Completed projects

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

- Taillem Bend substation upgrade.
- Templers West 50 MVA 275 kV reactor.
- Baroota substation asset replacement.
- System Integrity Protection Schemes (SIPS) Stage 1
- Dalrymple ESCRI Energy Storage.
- South East – Tungkillo 275 kV Dynamic Line Ratings
- Back Up Control and Data Centre.
- Davenport-Pimba 132 kV Line Low Span Upgrading.
- Uprate Riverland 132 kV lines.
- Para-Brinkworth-Davenport Hazard Mitigation.

2.7 Key differences between the 2018 and 2019 TAPRs

ElectraNet annually receives 10-year demand forecasts from SA Power Networks and collaborates with AEMO to receive forecasts from direct connect customers. ElectraNet's development plans presented in the 2019 TAPR are based on the connection point demand forecasts that were provided to ElectraNet by SA Power Networks in November 2018, as well as AEMO's February 2019 maximum and minimum demand forecasts for South Australia³². The maximum demand forecasts used to prepare the 2019 TAPR have generally changed little or remained consistent since the publication of the 2018 TAPR.

³² AEMO. *Update to auxiliary load forecasts, 2018 Electricity Statement of Opportunities*, available at http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/Demand-Forecasts/2019/Update-to-demand-forecasts-in-2018-Electricity-Statement-of-Opportunities.pdf.

A1. Project comparison and assessment details

Table 4 Augmentation projects in the 2019 TAPR and 2018-23 Revenue Determination

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost** (\$ million)	Regulatory Period	Timing*	Cost** (\$ million)	
Committed projects						
<u>Davenport-Robertstown 275 kV Removal of Plant Limits</u>	June 2019 [June 2019] (June 2019)	<5 [<5] (<5)	2018–23 NCIPAP	2018-19	1.3	This project improves the thermal ratings of the Robertstown–Davenport 275 kV lines to increase access to low cost generation.
Type: Augmentation						
Scope: Remove, replace or change low-rated plant and secondary systems that limit full utilisation of the Davenport-Robertstown 275 kV transmission lines' thermal capacity						

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)	Capex proposal or contingent project proposal				AEMO's comments
	Timing*	Cost** (\$ million)	Regulatory Period	Timing*	Cost** (\$ million)	
<p><u>Waterloo – Templers 132 kV power flow control</u></p> <p>Type: Augmentation</p> <p>Scope: Install modular power flow control elements on the Waterloo–Templers 132 kV line.</p> <p>Uprate the Robertstown–Tungkillio and Robertstown–Para 275 kV lines and Temples–Roseworthy 132 kV line.</p>	December 2019 [December 2019] (2020)	5.7 [3-6] (3-6)	2018–23 NCIPAP	2019-20	5.8	<p>The proposal increases the transfer capability of the Northern SA to Adelaide transmission corridor.</p> <p>This is an exploratory project. Benefit of this project is yet to be proved.</p>
Pending projects						
<p><u>Eyre Peninsula upgrade</u></p> <p>Type: Augmentation</p> <p>Scope: Construct a new double-circuit line from Cultana to Yadnarie initially energised at 132 kV with a rating of about 300 MVA per circuit, with the option to be energised at 275 kV with a rating of about 600 MVA if required in the future.</p> <p>Construct a new double-circuit 132 kV line from Yadnarie to Port Lincoln, rated to about 240 MVA per circuit</p>	December 2021 [December 2021] (December 2021)	240 [Not provided] (80-560 based on the range of options being considered)	2018–23	Subject to successful completion of RIT-T		<p>This project is driven by the asset condition of the existing transmission line from Cultana to Yadnarie to Port Lincoln and the potential net market benefit</p> <p>ElectraNet published a PACR on 18 October 2018,</p> <p>On 12 April 2019 the AER determined the preferred option.</p> <p>This project is now under implementation. Contingent project application is still to be completed.</p>
<p><u>Project EnergyConnect: South Australia to New South Wales interconnector</u></p> <p>Type: Augmentation</p> <p>Scope: Construct a new 330kV, 800MW interconnector from</p>	August 2023 [Between 2022 and 2024] (1-2 years RIT-T, 3-5 years delivery)	380 [200-500 (SA component only)] (250 - 500)	2018–23	Subject to successful completion of RIT-T		<p>This project is driven by net market benefits by lowering generation dispatch costs and enhancing security and reliability. AER agreed this project as a contingent project in the regulatory period of 2018-20123.</p> <p>ElectraNet published the PACR for the South Australian Energy Transformation RIT-T on 13 February 2019.</p>

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost** (\$ million)	Regulatory Period	Timing*	Cost** (\$ million)	
Robertstown in SA to Wagga Wagga in NSW via Buronga.						The AER is currently determining whether Project EnergyConnect satisfies the requirements of the RIT-T.
Planned/Proposed projects						
<u>Tailem Bend to Cherry Gardens tie in</u>	January 2020	5.8	2018–23	2019-20	5.1	In March 2017, AEMO reviewed and agreed for ElectraNet's NCIPAP proposal. This project will increase the availability of full capability of Heywood interconnector. AER accepted this proposed project as a NCIPAP project for 2018-2023 regulatory period.
Type: Augmentation	[June 2021]	[3-6]	NCIPAP			
Scope: Add one additional diameter at Tungkillio 275 kV substation to connect the Tailem Bend – Cherry Gardens 275 kV line at Tungkillio substation.	(2020)	(4–8)				
<u>Reactive Plant Control Systems</u>	Not in 2019 TAPR	Not in 2019 TAPR	2018–23	2020	1.7	This project is to address the difficulty in effectively controlling the increasing number of reactive plant and voltage control facilities across the main grid in SA. ElectraNet have advised that this project should have been included in the 2019 TAPR but was unintentionally omitted.
Type: Augmentation	[2020]	[3-6]				
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)	(<5)				
<u>South East 275 kV capacitor bank</u>	June 2021	<5	2018–23	2020-21	3.5	In March 2017, AEMO reviewed and agreed with ElectraNet's NCIPAP proposal. This project will increase the availability of the full capability of Heywood interconnector. AER accepted this proposed project as a NCIPAP project for 2018-2023 regulatory period.
Type: Augmentation	[June 2020]	[<5]	NCIPAP			
Scope: Install an additional 100 MVAR capacitor bank at South East substation.	(2021)	(<5)				

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost** (\$ million)	Regulatory Period	Timing*	Cost** (\$ million)	
<p><u>Increase short-term rating of transformers at Robertstown</u></p> <p>Type: Augmentation</p> <p>Scope: Install transformer management relays and bushing monitoring equipment to enable the application of short term ratings to the Robertstown 275/132 kV transformers</p>	<p>June 2022 [June 2022] (When or if needed: potentially within 10 years)</p>	<p><5 [<5] (<5)</p>	<p>2018–23 NCIPAP</p>	<p>2021-22</p>	<p>0.4</p>	<p>In March 2017, AEMO reviewed and agreed for ElectraNet's NCIPAP proposal.</p> <p>AER accepted this proposed project as a NCIPAP project for 2018-2023 regulatory period.</p>
Contingent projects						
<p><u>Upper North-West 132kV line reinforcement</u></p> <p>Type: Augmentation</p> <p>Scope: Rebuild the Davenport to Pimba 132kV line and establish associated substation assets (including reactive support).</p>	<p>Uncertain [Timing subject to customer commitment to connect new additional load along the Davenport–Pimba 132 kV line] (As above)</p>	<p>110 [110] (110)</p>	<p>2018–23</p>	<p>Subject to successful completion of RIT-T</p>	<p>AEMO's agrees that the existing Davenport – Pimba 132 kV line needed to be augmented if there was a step load increase causing the line to exceed its thermal limit of 76 MVA. However, ElectraNet is progressing to install a new 275 kV line from Davenport to Mt Gunson. AEMO suggests, ElectraNet to consider utilisation of this 275 kV line to defer the augmentation of Davenport - Pimba 132 kV line.</p> <p>This project is subject to successful completion of RIT-T justifying the investment option. AER agreed this project as a contingent project in the regulatory period of 2018-2023.</p>	
<p><u>Upper North-East 132kV line reinforcement</u></p> <p>Type: Augmentation</p> <p>Scope: Uprate or rebuild the Davenport to Leigh Creek 132kV line and establish associated substation assets (including reactive support).</p>	<p>Uncertain [Timing subject to customer commitment to connect new additional</p>	<p>60 [60] (60)</p>	<p>2018–23</p>	<p>Subject to successful completion of RIT-T</p>	<p>AEMO's agrees that the existing Davenport – Leigh Creek 132 kV line needed to be augmented if there was a step load increase causing the line to exceed its thermal limit of 10 MVA.</p> <p>This project is subject to successful completion of RIT-T justifying the investment option. AER agreed this project as a contingent project in the regulatory period of 2018-2023.</p>	

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost** (\$ million)	Regulatory Period	Timing*	Cost** (\$ million)	
	load along the Davenport – Leigh Creek 132 kV line] (As above)					
Potential projects						
<u>Davenport – Robertstown 275 kV line uprating</u> Type: Augmentation Scope: Various line upratings, removal of plant limits and application of dynamic line ratings between Davenport and Robertstown or between Davenport and Para, depending on generator developments. Capacity increase would depend on location of generation and local network capability	1-2 years detailed design and delivery [2024-28] (2024–28)	1.6 [<5] (<5)	Beyond Regulatory period of 2018-23			This project would further increase transmission line capacity between the Adelaide and Port Augusta areas. Net market benefit is likely to arise from significant loads and/or generation development in the Northern South Australia region, especially in the Upper North and Eyre Peninsula areas. The need and timing are subject to market benefit analysis.

Table 5 Connection projects in the 2019 TAPR and 2018-23 Revenue Determination

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
Planned/Proposed projects						
<p><u>Mount Gunson South connection Stage 2</u></p> <p>Type: Connection</p> <p>Scope: In 2019-20, construct a new Davenport to Mount Gunson South 275 kV line and upgrade to a 275/132 kV connection point at Mount Gunson South Prominent Hill mine to be connected at 132 kV</p>	2020 [2020] (Not in 2017 TAPR)	Not provided [Not provided] (Not in 2017 TAPR)	Connection project is unregulated and is not part of regulatory proposal.			
<p><u>Gawler East connection point</u></p> <p>Type: Connection</p> <p>Scope: Turn the Para to Roseworthy 132 kV line in / out at Gawler East and establish a 132 kV bus SA Power Networks to establish a single transformer 132 / 11 kV distribution substation</p>	After 2025 (subject to request from SA Power Networks, and depending on local demand growth) [November 2023] (Nov 2022)	<5 [<5] (3-6)	2018-23	2019-2022	4.8	AEMO understands that the need and timing of this project is still uncertain and is subject to a RIT-D analysis to be conducted by SA Power Networks.

Table 6 Security and Compliance projects in the 2018 TAPR and 2018-23 Revenue Determination

Project description	2018 TAPR [2017 TAPR] (2016 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
Committed projects						
<p><u>Automatic over-frequency generator shedding (OFGS) scheme</u></p> <p>Type: Security and compliance</p> <p>Scope: Implement OFGS scheme for SA windfarms including a backup scheme on the network side of the wind farm connections.</p>	Mid-2019 [2018] (2017)	Not provided [<5] (<5)	Included in 2013-18 revenue determination			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. This project is required for compliance with regulatory requirements - Emergency frequency control schemes rule March 2017 and managing rate of change of power system frequency rule September 2017
<p><u>Refurbish transformer oil containment systems</u></p> <p>Type: Security and compliance</p> <p>Scope: Install, upgrade or replace transformer oil containment systems and associated equipment at various sites where assessment indicates a clear need.</p>	Not in 2019 TAPR [2018] (2017)	Not in TAPR [8-10] (8-10)	Included in 2013-18 revenue determination			ElectraNet have advised that this project should have been included in the 2019 TAPR but was unintentionally omitted. They have also advised this project is due for completion in December 2019.
<p><u>Spencer Gulf Emergency Bypass Preparation</u></p> <p>Type: Security and compliance</p> <p>Scope: Undertake preparatory site works and procure spares to support a rapid restoration of Spencer Gulf high tower crossings for the Davenport-Cultana 275 kV transmission lines, which supply the entire Eyre Peninsula region</p>	May 2020 [2020] (2018)	Not provided [<5] (<5)	2018–23	2018	3.4	ElectraNet reported Spencer Gulf high tower crossings for the Davenport-Cultana 275 kV transmission lines, supplying the entire Eyre Peninsula region, would prove difficult or impossible to restore to in a timely manner following an asset failure.

Project description	2018 TAPR [2017 TAPR] (2016 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
<u>Transmission line access track upgrade</u> Type: Security and compliance Scope: Upgrade transmission line access tracks at vulnerable locations across the network	Not in 2019 TAPR [2018] (2019)	Not in 2019 TAPR [<5] (<5)	2018–23	2019	3.7	ElectraNet reported risk based assessment has deferred project from 2018-2023 regulatory control period, and the project is subject to an ongoing review.
<u>High voltage switching training facility</u> Type: Security and compliance Scope: Create a high voltage switching training facility to improve training standards across all aspects of high voltage switching	September 2019 [2019] (2018)	7-10 [8-10] (4–8)	2018–23	2019	3.7	
<u>Upper North Voltage Control Scheme</u> Type: Security and compliance Scope: Install automated regional voltage control schemes for the Eyre Peninsula and Upper North regions, to ensure that changing generation patterns that are resulting in complex voltage interactions do not lead to violations of voltage limits stipulated in the Rules and connection agreements	December 2019 [2020] (2018)	3-5 [<5] (<5)	Included in 2013-18 revenue determination			ElectraNet 2019 TAPR reported this project to prevent potential violations of voltage limits in Eyre Peninsula and Upper North region with changing generation pattern.
<u>Robertstown Circuit Breaker Arrangement upgrade</u> Type: Security and compliance Scope: Extend the Taillem Bend substation to accommodate an additional 275 kV diameter with two circuit breakers, associated plant and secondary systems, and rearrange 275 kV line exits	Not in 2019 TAPR [June 2020] (2019)	Not in 2019 TAPR [5-8] (5-8)	2018-23	2020	7.1	ElectraNet have advised that this stand-alone project is no longer required as the rearrangement is included in the scope of the Main Grid System Strength project.
<u>Maintain minimum levels of system strength and inertia in South Australia</u> Install four synchronous condenser units, two at Davenport and two at Robertstown to provide system strength services and to	September 2020 - Davenport, February 2021 - Robertstown [2020]	160-200 [80-140] (60-80)	2018–23	Approved by AER on 20 August 2019.		In October 2017, AEMO declared a gap in the system strength in South Australia.

Project description	2018 TAPR [2017 TAPR] (2016 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
address the NSCAS gap for system strength in South Australia as declared by AEMO	(AEMO provision of system strength NSCAS gap details. Successful completion of the RIT-T justifying the investment option.)					In December 2018, AEMO declared a gap in system inertia in South Australia. AEMO understands that ElectraNet plans to install high-inertia synchronous condensers at Davenport and Robertstown in a staged approach.
<u>East Terrace, Northfield and Kilburn emergency transformer deployment preparation</u> Type: Security and Compliance Scope: East Terrace and Northfield substations both have 225 MVA 275/66 kV transformers that require direct connection to 275 kV Gas Insulated Switchgear (GIS), together with a variety of 66 kV connections (both cable and GIS). This project will identify and procure equipment and plant and put in place the procedure to enable rapid restoration of these transformers in the event that one of them should fail, to be able to meet the expectations of the best endeavours requirement specified in the ETC.	November 2020 [2020] (2019)	<3 [<5] (<5)	2018-23	2020	2.6	ElectraNet reported unavailability of Gas Insulated Switchgear (GIS) connection spares hinders restoration of supply following a 225 MVA 275/66 kV transformer failure at East Terrace, Northfield or Kilburn substation.
<u>Motorised Isolator LOPA Improvement</u> Type: Security and compliance Scope: Modify 876 isolators and replace 33 isolators to provide satisfactory mechanical and electrical isolation lock-off points on all motorised air insulated isolators identified as safety hazards by a Layer of Protection Analysis (LOPA)	March 2021 [March 2021] (2019)	Not provided [10-15] (10-15)	2018-23	2019	13.7	ElectraNet 2019 TAPR reports this project address safety hazards and is a committed project.

Project description	2018 TAPR [2017 TAPR] (2016 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
<p><u>Substation improvements for system black conditions</u></p> <p>Type: Security and compliance</p> <p>Scope: Provide alternative diesel generator supplies to critical substations (where not already provided), connection points for mobile generators to non-critical substations, and related AC and DC supply improvements, to improve ability to restore supply during black start or other abnormal operating conditions</p>	June 2021 [2020] (2019)	4-6 [5-10] (5-10)	2018-23	2020	7.8	ElectraNet reported loss of AC auxiliary supplies hinders restoration of supply during black start or other abnormal operating conditions.
<p><u>Capacitor bank infrastructure safety improvement</u></p> <p>Type: Improvement</p> <p>Scope: Implement a program of safety improvement activities for infrastructure associated with high voltage plant areas within substations, such as improvements to fencing, earthing, entry locking and surface treatment</p>	October 2021 [2018-21]	4-8 [<5]	Not included in 2018-23 revenue proposal or allowance			
Planned/Proposed projects						
<p><u>Wide Area Monitoring Scheme pilot</u></p> <p>Type: Security</p> <p>Scope: Undertake a pilot project to install a number of Power Monitoring Units (PMUs) and develop a Wide Area Monitoring Scheme to real time monitor and process system parameters and incorporate suitable new technologies to further enhance SA system security</p>	December 2020	3-5	2018-23	2020	5.4	
<p><u>Wide Area Protection Scheme</u></p> <p>Type: Security</p> <p>Scope: Enhance the existing SIPS to investigate the use of PMUs for event detection, and include dynamic arming of participating loads and battery energy storage systems, to enable a proportionate response to specific events</p>	December 2021	4-6	Not included in 2018-23 revenue proposal or allowance			ElectraNet have advised that this project will only occur if the Wide Area Monitoring Scheme pilot is successful.

Project description	2018 TAPR [2017 TAPR] (2016 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
<u>Install a switched 50 MVAr 275 kV reactor at Para</u> Type: Security and compliance Scope: Install a switched 50 MVAr 275 kV reactor at Para	Not in 2019 TAPR [Not in 2018 TAPR] (2023)	Not in 2019 TAPR [Not in 2018 TAPR] (<5)	2018-23	2023	4.4	ElectraNet has advised this project is now not required, due to committed installation of synchronous condensers at Davenport and Robertstown.
<u>Install a switched 50MVAr 275kV reactor at Blyth West</u> Type: Security and compliance Scope: Install a switched 50MVAr 275kV reactor at Blyth West	Not in 2019 TAPR [2025] (2021)	Not in 2019 TAPR [<5] (<5)	2018–23	2022	3.5	ElectraNet has advised this project is now unlikely, due to committed installation of synchronous condensers at Davenport and Robertstown. This finding will be reviewed after the specifications and parameters of the synchronous condensers have been finalised.
<u>Wide Area Monitoring Scheme</u> Type: Security Scope: Extend the roll-out of PMUs to real time monitor and process system parameters and incorporate suitable new technologies to further enhance South Australian system security, providing improved operational situational awareness and system monitoring and data for planning, benchmarking, fault and incident investigation and power system model validation	2024-2028	10-25 [Not in 2018 TAPR] (Not in 2019 TAPR)	Beyond next regulatory period of 2018-23			

Table 7 Asset replacement projects in the 2019 TAPR and 2018-23 Revenue Determination

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
Committed projects						
<p><u>Online asset condition monitoring equipment replacement</u></p> <p>Type: Replacement</p> <p>Scope: Replace or upgrade the majority of primary plant online condition monitoring equipment, which is at the end of its usable life and experiencing high failure rates.</p>	June 2019 [August 2018] (2018)	Not provided [7-10] (8-12)	Included in 2013-18 revenue determination			ElectraNet reported that many items of online condition monitoring equipment are now nearing the end of their usable lives and are exhibiting high failure rates. On-going need for these equipment needs to be assessed on a case-by-case.
<p><u>Substation lighting and infrastructure replacement</u></p> <p>Type: Replacement</p> <p>Scope: Replace substation lighting and associated infrastructure at the following 82 sites where safety hazards exist: Angas Creek, Ardrossan West, Back Callington, Baroota, Belalie, Berri, Blanche, Blyth West, Brinkworth, Bungama, Canowie, Cherry Gardens, City West, Clare North, Cultana, Dalrymple, Davenport, Dorrien, Dry Creek, East Terrace, Happy Valley, Hummocks, Kadina East, Kanmantoo, Keith, Kilburn, Kincaig, Lefevre, Leigh Creek South, Magill, Mannum, Mannum Adelaide Pump Station No. 1, Mannum Adelaide Pump Station No. 2, Mannum Adelaide Pump Station No. 3, Mayurra, Middleback, Millbrook, Mintaro, Mobilong, Mokota, Monash, Morgan Whyalla Pump Station No. 1, Morgan Whyalla Pump Station No. 2, Morgan Whyalla Pump Station No. 3, Morgan Whyalla Pump Station No. 4, Morphett Vale East, Mt Barker, Mt Barker South, Mt Gambier, Mt Gunson, Mt Millar, Munno Para, Murray Bridge Hahndorf Pump Station No. 1, Murray Bridge Hahndorf Pump Station No. 2, Murray Bridge Hahndorf Pump Station No. 3, Neuroodla, New Osborne, North West Bend,</p>	September 2019 [October 2018] (2019)	10.4 [10-12] (4-8)	2018-23	2018	10.3	

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
Northfield, Para, Parafield Gardens West, Pelican Point, Penola West, Pimba, Pt Lincoln Terminal, Pt Pirie, Redhill, Robertstown, Roseworthy, Sleaford, Snowtown, Snuggery, South East, Stony Point, Tailem Bend, Templers, Templers West, Torrens Island A, Torrens Island B, Torrens Island North, Tungkillo, Waterloo, Waterloo East, Whyalla Terminal, Whyalla Central, Wudinna, Yadnarie						
<u>Program of unit asset replacements</u> Type: Replacement Scope: Program of unit asset replacements at multiple substations to address high failure rates and safety risks.	August 2019 [2014-2019] (2013-18)	Not provided [40-50] (40-50)	Included in the 2013-18 revenue determination			ElectraNet has advised the total forecast cost of this project is \$57 million.
<u>AC Board Replacement 2013-18</u> Type: Replacement Scope: Replace and improve AC auxiliary supply equipment, switchboards and cabling at 11 substations. Brinkworth, Happy Velly, Hummocks, Magill, Mannum, Northfield, South East, Templers, Pt Lincoln Terminal, Snuggery, Whyalla Terminal	December 2019 [April 2019] (2018)	17.4 [12-14] (8-12)	2018-23	2022	8.4	
<u>Monash and Berri relay replacements</u> Type: Replacement Scope: Replace protection relays and a communications gateway at Monash and Berri substations to enable remote control and monitoring, to improve network reliability, maintainability and response following system events.	August 2019 [August 2019] (2018)	3.7 [<5] (<5)	2018-23	2019	1.5	

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
<p><u>Westinghouse Remote Terminal Unit (RTU) replacement</u></p> <p>Type: Replacement</p> <p>Scope: This project will remove thirteen Westinghouse "Giant" type RTUs that are no longer supported by the manufacturer and have reached the end of their technical and economic lives, and replace them at various substations across the transmission network: Angas Creek, Blanche, Dorrien, Happy Valley, Heywood, Hummocks, Mount Barker, Mount Gambier, New Osborne, Northfield, North West Bend, Parafield Gardens West, Snuggery, Whyalla Terminal, South East</p>	October 2019 [Not in 2018 TAPR] (Not in 2017 TAPR)	2.4 [Not in 2018 TAPR] (Not in 2017 TAPR)	2018-23	2019	3.5	
<p><u>Line support systems refurbishment 2018-23</u></p> <p>Type: Refurbishment</p> <p>Scope: Refurbish transmission line support systems and extend the life of the Snuggery-Blanche-Mt Gambier 132 kV line by renewing line asset components</p>	April 2020 [December 2019] (2019-23)	6.1 [9-10] (8-10)	2018-23	2023	8.3	There is an on-going need for Snuggery-Blanche-Mt Gambier 132 kV circuit to connect local generation and substations.
<p><u>Line Insulator Systems Refurbishment 2018-23</u></p> <p>Type: Refurbishment</p> <p>Scope: Program to refurbish transmission line support systems and extend the life of 18 transmission lines by renewing line asset components, for the following lines:</p> <ul style="list-style-type: none"> • Torrens Island – New Osborne 66 kV No. 3 • Torrens Island – New Osborne 66 kV No. 4 • Davenport – Leigh Creek 132 kV • Keith – Kincaig 132 kV • Kincaig – Penola West 132 kV • Murray Bridge Hahndorf Pump Station No. 3 – Back Callington 132 kV • North West Bend – Monash 132 kV No. 1 	April 2022 [June 2023] (2024-28)	45.4 [45-60] (10-15)	Beyond current regulatory period of 2018-23			

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
<ul style="list-style-type: none"> • South East – Mt Gambier 132 kV • Waterloo – Mintaro 132 kV • Cherry Gardens – Happy Valley 275 kV • Para – Munno Para 275 kV • Para – Robertstown 275 kV • Para – Tungkillo 275 kV • Parafield Gardens West – Para 275 kV • Pelican Point – Parafield Gardens West 275 kV • Torrens Island – Cherry Gardens 275 kV • Torrens Island – Magill 275 kV • Torrens Island – Para 275 kV No. 4 						
<u>Remote Terminal Unit (RTU) product upgrades</u> Type: Replacement Scope: Older versions of GE D20 RTUs are no longer supported and are at the end of the technical and economic life This project will replace boards at 22 sites across the system. Doing nothing is not considered a viable alternative because sufficient spares are unavailable. The failure of one of these RTUs would mean that ElectraNet would not be able to operate plant and equipment remotely. The loss of system data would prevent the use of the state-estimators used by both ElectraNet and AEMO, and would also impact on response and restoration times after system events	November 2019	2-4	2018-23	2019	3.3	
Pending projects						
<u>Transformer Bushing Replacement 2018-2023</u> Type: Replacement Scope: Replace of transformer bushings that are at end of life on 18 transformers at 10 substations. This work will extend the life of the 18 transformers	June 2021 [2020]	7-10 [6-8]	2018-23	2021	7.4	

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
Planned/proposed projects						
<u>Magill to East Terrace 275 kV cable link box replacement</u> Type: Replacement Scope: The Magill - East Terrace 275 kV underground fluid-filled underground cable is one of two transmission lines supplying the Adelaide CBD. Condition of the earthing link boxes at cable joints has deteriorated to the point that replacement of the link boxes is required	July 2020 [Not in 2018 TAPR] (Not in 2017 TAPR)	4.1 [Not in 2018 TAPR] (Not in 2017 TAPR)	2018-23	2019	2.6	
<u>Mount Gambier 132/33 kV transformer No. 1 (50 MVA) replacement</u> Type: Replacement Scope: Replace the existing 50 MVA transformer with a new 25 MVA 132/33/11 kV at Mount Gambier substation.	January 2021 [2023] (2021)	2.2 [<5] (<5)	2018-23	2021	1.9	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.
<u>South East SVC computer control system replacement</u> Type: Replacement Scope: Replace the existing SVC computer control system at South East substation with a new fully supported system	May 2022 [2022] (2022)	3-6 [4-6] (4-8)	2018-23	2022	4.3	
<u>Substation and building security system replacement</u> Type: Replacement Scope: Replace and upgrade all existing substation fire and security systems to a new technology, as the existing	October 2021	4-6	Not included in 2018-23 revenue proposal or allowance			

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
systems are all end-of-life and no longer have manufacturer support						
<u>Transmission line conductor and earth wire refurbishment</u> Type: Refurbishment Scope: Program of projects to replace transmission line conductors and earth wire to extend the life of seven 132 kV transmission lines in the Mid North and Riverland: <ul style="list-style-type: none"> • Waterloo – Waterloo East • Waterloo East – Morgan Whyalla Pump Station #4 • Morgan Whyalla Pump Station #4 – Robertstown • Robertstown – Morgan Whyalla Pump Station #3 • Morgan Whyalla Pump Station #3 – Morgan Whyalla Pump Station #2 • Morgan Whyalla Pump Station #2 – Morgan Whyalla Pump Station #1 • Morgan Whyalla Pump Station #1 – North West Bend 	June 2022 [2019-2022] (2019-2023)	17.4 [15-20] (10-20)	2018–23	2023	16.4	
<u>Leigh Creek South transformer replacement</u> 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	July 2022 [2021] (2019)	4.2 [<5] (<5)	2018–23	2020	2.9	
<u>Mannum Transformer 1 and 2 Replacement</u> 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.	May 2023 [2023] (2022)	3 [<5] (<5)	2018–23	2022	2.4	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.

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
<u>Instrument Transformer unit asset replacement 2018-19 to 2022-23</u> Type: Replacement Scope: Replace 55 voltage transformers and 121 current transformers across the South Australian electricity transmission system that have reached the end of their technical or economic lives and have an increased likelihood of catastrophic explosion. We plan to initiate a RIT-T for this program of work early in the second half of 2019	June 2023 [2021]	10-15 [<4-6]	2018–23	2023	4.7	
<u>Circuit breaker replacements</u> Type: Replacement Scope: Implement a program to replace selected circuit breakers at various substations that are at the end of their technical and economic lives. This project includes the replacement of assets at the following sites: <ul style="list-style-type: none"> • Davenport (2x 275 kV circuit breakers) • Happy Valley (1x 66 kV circuit breaker) • Kinncraig (1x 132 kV circuit breaker) • Morphett Vale East (2x 275 kV circuit breakers) • Torrens Island A (2x 275 kV circuit breakers) • Torrens Island B (7x 275 kV circuit breakers) 	June 2023 [2023]	4.2 [4-6]	2018–23	2023	4.7	
<u>AC Board Replacement 2018 – 2023</u> Scope: Program to replace and improve AC auxiliary supply equipment, switchboards and cabling at seventeen substations across the South Australian electricity transmission system that have been assessed to be at the end of their technical and economic lives. This project includes the replacement of assets at the following sites: Berri, Blanche, Davenport, East Terrace, Hummocks,	August 2023 [2022]	23.4 [8-12]	2018–23	2021	8.4	ElectraNet have advised they plan to initiate a RIT-T for this program of work early in the second half of 2019

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
Kanmantoo, Kilburn, Kincaig, LeFevre, Leigh Creek South, Mobilong, Morphett Vale East, Monash, Mount Gambier, Murray Bridge-Hahndorf No. 1 Pump Station, Murray Bridge-Hahndorf No. 2 Pump Station, Murray Bridge-Hahndorf No. 3 Pump Station, Taillem Bend, Parafield Gardens West, Penola West, Pimba, Robertstown, Stony Point						
<u>Substation local control system replacements</u> Type: Replacement Scope: Implement a program to replace selected substation PC-based local control systems at various substations	February 2022 [2022]	2-4 [<5]	2018-23	2021	3.1	
<u>Asset Condition Online Monitoring Equipment Replacement</u> Type: Replacement Scope: Replace or upgrade the majority of primary plant online condition monitoring equipment, which is at the end of its usable life and experiencing high failure rates.	April 2023 [2019-2023] (2019-2023)	4-6 [4-6] (4-8)	2018-23	2021	5.1	ElectraNet reported that many items of online condition monitoring equipment are now nearing the end of their usable lives and are exhibiting high failure rates. On-going need for this equipment needs to be assessed on a case-by-case basis.
<u>Substation isolator replacements</u> Type: Replacement Scope: Implement a program to replace individual substation isolators	June 2023 [2019-2023]	8-12 [8-12]	2018-23	2023	10.6	Note: since publication of the 2019 TAPR, a RIT-T for this project has been initiated with publication of the PSCR on 4 July 2019. Submissions on the PSCR are open until 2 October 2019.
<u>Replace protection scheme relay assets</u> Type: Replacement Scope: Implement a program of unit protection relay and control system replacement projects at various substations.	June 2023 [2018-2023] (2019-2023)	25-35 [25-35] (25-35)	2018-23	2023	28.3	Note: since publication of the 2019 TAPR, a RIT-T for this project has been initiated with publication of the PSCR on 31 July 2019. Submissions on the PSCR are open until 29 October 2019.

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
<u>Surge arrester replacements</u> Type: Replacement Scope: Implement a program to replace selected porcelain surge arrester units at various substations	June 2023 [2021]	<3 [<5]	2018–23	2023	2.6	
<u>Replace protection scheme relay assets</u> Type: Replacement Scope: Implement a program of unit protection relay and control system replacement projects at various substations.	June 2023 [2024-2028] (2024-2028)	30-50 [30-50] (30-50)	Beyond next regulatory period of 2018–23			
<u>Magill substation fire suppression system</u> Type: Replacement Scope: Investigate, design and install refurbished or replacement fire suppression systems	2019 [2019]	<5 [<5]	2018–23	2019	1.7	
<u>Substation fencing replacements</u> Type: Replacement Scope: Implement a program to replace substation fences at selected substations	Not in 2019 TAPR [2023]	Not in 2019 TAPR [4-6]	2018–23	2021	3.8	ElectraNet reported risk based assessment has deferred project from 2018-2023 regulatory control period, and the project is subject to an ongoing review.
<u>Cultana–Yadnarie conductor and earth wire refurbish</u> Type: Refurbishment Scope: Refurbish conductor and earth wire and extend the life of the Cultana to Yadnarie 132 kV transmission line.	Not in 2019 TAPR 2019-2023 [2019-2023]	Not in 2019 TAPR 30-45 [30-45]	2018–23	2022	38.2	ElectraNet has advised these projects are no longer required due to the “Eyre Peninsular Upgrade” project.
<u>Yadnarie-Port Lincoln line refurbishment</u> Type: Refurbishment Scope: Refurbish conductor and earth wire and extend the life of the Yadnarie to Port Lincoln 132 kV transmission line.	Not in 2019 TAPR 2019-2023	Not in 2019 TAPR 30-45 [30-45]	2018–23	2023	35.4	

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
<u>Transmission line support system refurbishment</u> Type: Refurbishment Scope: Implement a program of transmission line support system refurbishment to renew line asset components and extend line life	2024-2028 [2024-2028] (2024-2028)	10-15 [10-15] (10-15)	Beyond next regulatory period of 2018–23			
<u>Transmission line insulator refurbishment</u> Scope: Implement a program of transmission line insulator system refurbishment to renew line asset components and extend line life	2024-2028 [2024-2028] (2024-2028)	50-80 [50-80] (50-80)	Beyond next regulatory period of 2018–23			
<u>Transmission line conductor and earth wire refurbishment</u> Type: Refurbishment Scope: Scope: Implement a program of transmission line conductor and earth wire refurbishment to renew line asset components and extend line life.	2024-2028 [2024-2028] (2024-2028)	70-100 [70-100] (70-100)	Beyond next regulatory period of 2018–23			
<u>Transformer and infrastructure replacements</u> Type: Refurbishment Scope: Replace selected transformers and associated infrastructure at specific sites that have been identified to be at end-of-life	2024-2028 [2024-2028] (2024-2028)	50-80 [50-80] (50-80)	Beyond next regulatory period of 2018–23			

Table 8 Recently completed projects in the 2019 TAPR and 2018-23 Revenue Determination

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
Recently completed projects						
<p><u>Tailem Bend Substation Upgrade</u></p> <p>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.</p>	Completed August 2018 [August 2018] (November 2017)	Not provided [9-10] (9-10)	2013-18	2018	16.9	<p>This project will minimise the impact of VIC-SA interconnector constraints and improve reliability and security.</p> <p>The 2019 TAPR indicates this project has now been completed.</p>
<p><u>Templers West 50 MVar 275 kV reactor</u></p> <p>Type: Security and compliance Scope: Install a 50 MVar 275 kV switched reactor at Templers West.</p>	Completed August 2018 [August 2018] (November 2018)	Not provided [4-6] (<5)	2018-23	2019	3.4	<p>The 2019 TAPR indicates this project has now been completed.</p>
<p><u>Baroota substation refurbishment</u></p> <p>Type: Replacement Scope: Maintain the reliability of Baroota substation by replacing assets that are at end of life.</p>	Completed September 2018 [June2018] (2017)	Not provided [5-8] (5-8)	2018-23	2018	9.5	<p>The 2019 TAPR indicates this project has now been completed.</p>
<p><u>System Integrity Protection Schemes (SIPS) Stage 1</u></p> <p>Type: Security and compliance Scope: Implement special protection schemes to mitigate risk to SA transmission system prior to SA islanding contingencies, utilising rapid transmission-level load tripping and injection from batteries where available</p>	Completed December 2018	Not provided	2018-23	2020	5.4	<p>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. ElectraNet completed SIPS and is working with AEMO to upgrade the SIPS to implement Wide Area Protection Scheme.</p> <p>Initial implementation of the scheme was completed in December 2017. The battery energy storage system component was rolled into the SIPS in December 2018.</p>

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
<u>Dalrymple ESCRI Energy Storage</u> Type: Augmentation Scope: Design and build a grid-connected, utility scale battery energy storage system at Dalrymple that will help to manage frequency related system security issues, as well as improve the reliability of supply for customers at Dalrymple connection point and provide other market benefits	Completed December 2018 [July 2018] (Summer 2017–18)	Not provided <6 (Cost of regulated component) (5-8 (ElectraNet cost only))	2013–18	2018	6.3	The 2019 TAPR indicates this project has now been completed. The Dalrymple energy storage project relates to the regulated component of a project to install a utility scale (30 MW) battery at Dalrymple as a 'proof of concept' to demonstrate the application of fast frequency response to address system security risks and local supply during an islanded operation. AER accepted regulatory component of this project and ElectraNet's proposal of advancing the timing of this project in the regulatory period of 2013-2018. The 2019 TAPR indicates this project has now been completed.
<u>South East – Tungkillio 275 kV Dynamic Line Ratings</u> Type: Augmentation Scope: Apply dynamic ratings within ElectraNet's SCADA system to the key circuits that make up the Heywood Interconnector corridor within South Australia to enable increased transfer under favourable conditions	Completed March 2019 [June 2019] (June 2019)	Not provided [<5] (<5)	2018–23 NCIPAP	2018-19	0.1	In March 2017, AEMO reviewed and agreed for ElectraNet's NCIPAP proposal. AER accepted this proposed project as a NCIPAP project for 2018-2023 regulatory period. The 2019 TAPR indicates this project has now been completed.
<u>Back up control and data centre</u> Type: Security and compliance Scope: Construct a new Backup Control and Data Centre to meet current physical and electronic security requirements.	Completed May 2019 [October 2018] (2018)	Not provided [7-9] (4-8)	2018–23	2018	6.2	The 2019 TAPR indicates this project has now been completed.

Project description	2019 TAPR [2018 TAPR] (2017 TAPR)		Capex proposal or contingent project proposal			AEMO's comments
	Timing*	Cost**	Regulatory Period	Timing*	Cost**	
<u>Davenport to Pimba 132 kV line low span uprating</u> Type: Replacement Scope: Treat low spans to achieve the designed nominal 65 °C design temperature rating for the Davenport to Mount Gunson section of the Davenport to Pimba 132 kV line.	Completed May 2019 [December 2018] (2018)	Not provided [12-15] (4-8)	2018–23	2022	8.2	The 2019 TAPR indicates this project has now been completed.
<u>Uprate Riverland 132 kV lines</u> Type: Augmentation Scope: Uprate the Robertstown to North West Bend No. 2 132 kV line and the North West Bend to Monash 132 kV line from 80°C design clearances to 100°C design clearances	Completed May 2019 [August 2018] (June 2017)	Not provided [<5] (<5)	2013–18	2019	5.6	The 2019 TAPR indicates this project has now been completed.
<u>Para – Brinkworth – Davenport Hazard Mitigation</u> 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.	Completed May 2019 [December 2018] (2018)	Not provided [50-60] (55–65)	2013–18	2018	81.9	The 2019 TAPR indicates this project has now been completed.

*Expected date of commissioning.

**Total Cost in 2019 dollar values.

Measures and abbreviations

Units of measure

Abbreviation	Unit of measure
kV	Kilovolt
MW	Megawatts
MVA _r	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, available at http://www.escosa.sa.gov.au/ArticleDocuments/1020/20160922-Electricity-TransmissionCode-TC09.pdf.aspx?Embed=Y .
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.