ElectraNet

MAIN GRID SYSTEM STRENGTH PROJECT

Contingent Project Application

28 JUNE 2019

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Executive Summary

ElectraNet's Main Grid System Strength Project involves the installation of four high inertia synchronous condensers to address the gap for system strength in South Australia declared by the Australian Energy Market Operator (AEMO) in October 2017. The inertia capability of these machines also addresses the synchronous component of the inertia shortfall declared by AEMO on 21 December 2018.

To meet these requirements in the meantime, AEMO continues to direct synchronous generators to operate when needed to provide these services under its powers of market direction. However, this is a costly process involving compensation to directed generators and associated impacts on the wholesale electricity market, and in any event is not considered a viable ongoing option.

We conducted an economic evaluation equivalent to a Regulatory Investment Test for Transmission to investigate options for most efficiently meeting the ongoing need for system strength to ensure the secure and reliable operation of the power system in South Australia under foreseeable operating conditions.[1]

This economic evaluation demonstrated that installing synchronous condensers on the South Australian transmission network is the most efficient and least cost solution available in the short to medium term and results in significant generator direction cost savings for customers.

The estimated project cost included in this application is within the range tested in the economic evaluation. The customer benefit from the delivery of this project is an indicative net saving equivalent to $3 to $5 per year off a typical South Australian residential electricity bill.

The potential need for a transmission solution to meet the system strength requirement was identified in the Final Revenue Determination for the 2018-19 to 2022-23 regulatory period issued by the Australian Energy Regulator (AER) in April 2018. This decision accepted the Main Grid System Strength project as a contingent project, noting the high level of certainty on the need for expenditure by ElectraNet to address the system strength requirement, but noting the uncertainty regarding the costs associated with addressing this need at that time.

The project has also been identified as a Group 1 priority project in the Integrated System Plan issued by AEMO in July 2018, and has the benefit of recent Rule changes put forward by the Energy Security Board (ESB) and approved by the Australian Energy Market Commission (AEMC) to streamline the regulatory approval processes for these priority projects.

This contingent project application is submitted to the AER to amend the revenue determination that applies to ElectraNet in the current regulatory control period by determining the project timing, the amount of capital and incremental operating expenditure for each remaining regulatory year, the total capital expenditure and the incremental revenue required for the Main Grid System Strength contingent project in accordance with clause 6A.8.2 of the National Electricity Rules.

ElectraNet remains fully committed to deliver the synchronous condenser solution as soon as possible in the interests of electricity customers. We expect that these units will be installed by end 2020.

[1] ElectraNet, *Addressing the System Strength Gap in SA - Economic Evaluation Report*, 18 February 2019.

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1. Introduction

This application is submitted to the AER to amend the revenue determination that applies to ElectraNet in the current 2018-19 to 2022-23 regulatory control period and approve the total capital and operating expenditure forecast for the Main Grid System Strength contingent project in accordance with the provisions of clause 6A.8.2 of the National Electricity Rules (Rules).

ElectraNet's Main Grid System Strength Project involves the installation of four high inertia synchronous condensers to address the gap for system strength in South Australia declared by AEMO in October 2017. The inertia capability of these machines also addresses the minimum synchronous component of the inertia shortfall declared by AEMO on 21 December 2018.

To meet these requirements in the meantime, AEMO has identified various combinations of synchronous generators which must be operating in the South Australian region. AEMO currently directs these generators to operate when required under its powers of market direction. However, this is a costly process involving compensation to directed generators and associated impacts on the wholesale electricity market. Directing generators is an interim operational solution only, and not considered a viable ongoing option.

ElectraNet evaluated potential options to meet the system strength requirement, including the option of entering into contracts with the relevant generators. This involved a generator tendering process and advice from independent energy market experts.

On 18 February 2019, the AER approved the outcomes of this analysis and economic assessment, confirming the installation of high inertia synchronous condensers on the network as the most economic solution.

ElectraNet and AEMO have worked closely to confirm the system strength and inertia requirements of the required solution. On 8 March 2019, the proposed solution received technical approval from AEMO, following completion of detailed due diligence studies.

The potential need for a transmission solution to meet the system strength requirement was identified in ElectraNet's Revenue Determination for the 2018-19 to 2022-23 regulatory control period issued by the AER in April 2018.

This decision accepted the Main Grid System Strength project as a contingent project, noting the high level of certainty on the need for expenditure by ElectraNet to address the system strength requirement, but noting the uncertainty regarding the costs associated with addressing this need at that time.[2]

[2] AER, *Final Decision: ElectraNet transmission determination 2018 to 2023, Attachment 6 – Capital expenditure*, April 2018, p.16.

The trigger events approved by the AER in respect of the Main Grid System Strength contingent project, which have all now been satisfied, are as follows:

1. Confirmation by AEMO of the existence of a Network Support and Control Ancillary Services (NSCAS) gap relating to system strength, or other requirement for ElectraNet to address a system strength requirement, in the South Australian region.

2. Successful completion of the RIT-T[3] (or equivalent economic evaluation) including an assessment of credible options showing a transmission investment is justified.

3. Determination by the AER that the proposed investment satisfies the RIT-T (or equivalent economic evaluation).

4. ElectraNet Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.

The remainder of this application is structured as follows:

- Chapter 2 describes the proposed contingent project. It also provides a summary of the economic evaluation equivalent to a RIT-T that ElectraNet has completed in respect of the project;
- Chapter 3 sets out the regulatory requirements for the application;
- Chapter 4 sets out the forecast capital expenditure requirements;
- Chapter 5 sets out the forecast incremental operating expenditure requirement to the end of the regulatory control period; and
- Chapter 6 sets out the incremental revenue required to the end of the regulatory control period as a result of the contingent project, together with the expected benefits for electricity customers.

[3] The Regulatory Investment Test for Transmission (RIT-T) is a cost benefit assessment administered by the AER that applies to specific network investments.

2. Project Summary

2.1 Project Scope

The Main Grid System Strength contingent project involves the installation of four high inertia synchronous condensers on the South Australian transmission network.

Figure 1 below shows the proposed installation sites of the synchronous condensers at the Davenport and Robertstown substations.

Figure 1: Installation sites of synchronous condensers

The project scope includes:

- Procurement, installation and commissioning of four synchronous condensers and associated equipment, with two units to be installed at Davenport 275 kV substation and two units to be installed at Robertstown 275 kV substation, each unit providing 575 MVA nominal 275 kV fault capability and 1,100 MWs of inertia contribution.
- Substation works to integrate the synchronous condensers into the transmission network, including all associated civil, primary and secondary works, involving the extension of both substations to accommodate the relevant buildings and associated equipment, and requiring the further expansion of the Robertstown substation by two 275 kV diameters based on the current site layout.

- Purchase of land adjacent to the Robertstown substation to accommodate the installation of the synchronous condensers and the required expansion of the substation.

Further information is provided in a detailed scope of works document which accompanies this application.

2.2 Related projects

The installation of synchronous condensers at Davenport and Robertstown substations avoids or replaces the need for the following capital projects which were included in the ex-ante capital expenditure forecast approved within the Revenue Determination for the 2018-19 to 2022-23 regulatory control period issued by the AER in April 2018:

- Robertstown Circuit Breaker Arrangement
- Para Reactor
- Blyth West Reactor

The Robertstown Circuit Breaker Arrangement project involved the installation of a 275 kV circuit breaker and associated equipment between the 275 kV busses at Robertstown substation in order to relieve constraints on inter-regional flows when maintenance is planned for the existing circuit breakers.[4] The need for this project is replaced by the installation of the four 275 kV circuit breakers required to create the two new 275 kV exits to connect the two synchronous condensers at Robertstown.

The Para and Blyth West Reactor projects were required in order to maintain voltages under more complex power flows and thereby improve network security. The need for both of these projects is avoided by the installation of synchronous condensers, which will improve system strength and help to maintain stable voltage levels, as reported within our Economic Evaluation Report.[5]

The capital expenditure being sought to undertake the Main Grid System Strength contingent project is therefore limited to the additional expenditure to be incurred net of the cost of these three capital projects that are avoided or replaced.

[4] For details regarding this project, see Attachment 6 – Capital Expenditure (Appendix A14) of ElectraNet's Revenue Proposal for the 2018-19 to 2022-23 regulatory control period.

[5] ElectraNet, *Addressing the System Strength Gap in SA - Economic Evaluation Report*, 18 February 2019, p. 26. The Para and Blyth West Reactor projects were identified within Table 6-10 of ElectraNet's Revenue Proposal, Attachment 6 – Capital Expenditure.

2.3 Economic Evaluation

We conducted an economic assessment equivalent to a RIT-T to investigate options for most efficiently meeting the ongoing need for system strength to ensure the secure and reliable operation of the power system in South Australia under foreseeable operating conditions.[6] A brief summary of the outcomes of this assessment is set out below.

2.3.1 Identified need

On 13 October 2017, AEMO published a second update to its 2016 National Transmission Network Development Plan (NTNDP) and declared an NSCAS gap for system strength in South Australia requiring:[7]

- a minimum three phase fault level of 1,250 MVA at Davenport 275 kV bus;
- approximately 620 MVA of this fault level to be provided by synchronous machines within South Australia for the remainder of the current five-year NSCAS planning horizon and beyond; and
- any solutions to meet the declared gap to be validated through detailed Electromagnetic Transient (EMT) studies.

AEMO specified that system strength services were required on an ongoing basis from 30 March 2018 to meet this declared gap. ElectraNet is required under the Rules to use its reasonable endeavours to make the required services available in this timeframe.

On 29 June 2018, following detailed EMT studies, AEMO published the required minimum three phase fault levels at the relevant fault level nodes for South Australia, as shown in Table 2-1, and concluded that a fault level shortfall currently exists in South Australia at Para and Robertstown in addition to Davenport.[8] This represents the minimum need that must be met in order to address the NSCAS gap for system strength declared by AEMO.

Table 2-1: South Australian fault level nodes and minimum three phase fault levels

Region	Fault Level Node	Minimum Three Phase Fault Level (MVA)
South Australia	Davenport 275 kV	1150
	Robertstown 275 kV	1400
	Para 275 kV	2200

6 ElectraNet, *Addressing the System Strength Gap in SA - Economic Evaluation Report*, 18 February 2019.

7 AEMO, *Second update to the 2016 National Transmission Network Development Plan*, 13 October 2017, p.5.

8 AEMO, *System Strength Requirements Methodology, System Strength Requirements & Fault Level Shortfalls*, 29 June 2018, pp. 20-25.

On 21 December 2018, AEMO published its 2018 NTNDP[9] and declared an inertia shortfall in the South Australia inertia sub-network.[10]

Within its inertia shortfall declaration, AEMO notes that the inertia requirements for South Australia are currently being met by AEMO's direction of synchronous generation to maintain sufficient system strength. However, once ElectraNet has addressed this fault level shortfall by installing synchronous condensers (being the preferred option identified in our Economic Evaluation Report) AEMO projects that an inertia shortfall will arise as directions cease. The timeframe to meet the inertia shortfall therefore coincides with the indicative timeframe for delivery of a system strength solution.

AEMO's Inertia Requirement and Shortfalls report[11] published in June 2018 specifies that the "minimum threshold level of inertia"[12] is 4,400 MWs and the "secure operating level of inertia"[13] is 6,000 MWs in South Australia. Consequently, AEMO has declared an inertia shortfall in South Australia and provided formal notice to ElectraNet requiring that it use reasonable endeavours to meet the inertia shortfall by the time at which ElectraNet meets the declared fault level shortfall through:

- procuring at least 4,400 MWs of synchronous inertia services (e.g. through the installation of synchronous condensers or contracting with synchronous generation) to meet the minimum threshold level of inertia; and
- considering generation contracting, batteries and other equipment capable of fast frequency response to provide inertia support activities beyond the minimum threshold up to the secure operating level of 6,000 MWs.

2.3.2 Options considered

The Economic Evaluation Report identified two credible options to address the fault level shortfall in South Australia. These options are summarised in Table 2-2, including the base case 'do nothing' option.

The economic evaluation demonstrated that installing high inertia synchronous condensers on the South Australian transmission network (Option 2) is the most efficient and least cost solution available in the short to medium term and results in significant generator direction cost savings for customers. This outcome was shown to remain robust across a range of cost sensitivities and assumptions.

9 AEMO, *2018 National Transmission Network Development Plan*, 21 December 2018.

10 Notice issued by AEMO under clause 5.20B.3(c) of the Rules.

11 AEMO, *Inertia Requirements Methodology: Inertia Requirements & Shortfalls*, 29 June 2018.

12 The "minimum threshold level of inertia" is determined by AEMO, and is the minimum level of inertia required to operate the inertia sub-network in a satisfactory operating state when the inertia sub-network is islanded.

13 The "secure operating level of inertia" is determined by AEMO, and is the minimum level of inertia required to operate the inertia sub-network in a secure operating state when the inertia sub-network is islanded.

Table 2-2: Summary of the credible options assessed

Option	Description
Base case	AEMO continues to source system strength services under the generator directions framework. Ongoing direction compensation costs are estimated to be approximately $34m per annum over the assessment period based on current annualised costs. There is also considerable risk and uncertainty as to how long this operational solution will remain viable from a practical perspective.
Option 1	ElectraNet sources system strength services from existing synchronous generators in South Australia. Ongoing annual generator contract costs are estimated to be $85m over the assessment period based on tender pricing.
Option 2	ElectraNet installs a number of synchronous condenser units at suitable network sites in South Australia at an indicative capital cost of $140m to $180m by end 2020.

2.4 AER Determination

On 18 February 2019, the AER determined that our Economic Evaluation Report performed a reasonable economic assessment that is equivalent to the RIT-T and proportionate to the nature of the identified need. Further, the AER determined that the proposed high inertia synchronous condenser solution, demonstrated to deliver the greatest net market benefit of the options assessed, satisfies an economic evaluation equivalent to a RIT-T.[14]

The AER's determination was not required to consider whether the estimated capital costs of the synchronous condenser solution represent efficient and prudent costs that reasonably reflect the capital expenditure criteria. That matter will be considered by the AER when assessing this contingent project application.

2.5 AEMO approval

We have worked closely with AEMO to validate the technical capability of our proposed solution to ensure power system security. On 8 March 2019, following the completion of detailed technical due diligence studies, AEMO confirmed that ElectraNet's proposed solution involving four high inertia synchronous condensers each with 575 MVA nominal 275 kV fault capability and 1,100 MWs of inertia contribution will:

- meet the declared system strength gap; and
- meet the 4,400 MWs synchronous inertia requirement (the minimum threshold level of inertia) of the declared inertia shortfall.

We will continue to work closely with AEMO to formalise the remaining technical specifications, performance standards and arrangements for enabling the system strength and inertia services, in accordance with the Rules.[15]

[14] AER, *Determination Letter to ElectraNet: SA System Strength Gap*, 18 February 2019.

[15] In accordance with clause 5.20C.4(e) and 5.20B.6(e) of the Rules.

ElectraNet will separately investigate potential options in order to determine the most economic solution to address the balance of the specified secure operating level of inertia of 6,000 MWs.

2.6 Next Steps

ElectraNet is now proceeding to deliver the approved high inertia synchronous condenser solution identified in our Economic Evaluation Report to address the identified need. The next steps involve:

- assessment of the required capital and operating expenditure by the AER;
- formalising the remaining technical specifications and operational requirements of the synchronous condenser solution in consultation with AEMO;
- concluding the competitive sourcing of the synchronous condensers and associated equipment from the relevant suppliers;
- finalising the remaining approvals required for the sites; and
- installation of the synchronous condensers by end 2020, with commissioning to be completed by early 2021.

3. Regulatory Requirements

The regulatory requirements for contingent projects are contained in clause 6A.8.2 of the Rules and in the AER's Process Guideline for Contingent Project Applications under the National Electricity Rules.[16]

The key requirements for this contingent project application are outlined in the following sections.

3.1 Recent amendments to lodgement timeframes

On 26 April 2019, the AEMC made a Rule that extends the period during which a Network Service Provider (NSP) may submit a contingent project application to the AER. The proposed Rule was submitted by the Energy Security Board (ESB) on 20 February 2019.

The new Rule removes previous restrictions on lodging a contingent project application within the last 90 business days of a regulatory year and allows a NSP to submit a contingent project application at any time during a regulatory control period up until the last 90 business days of the second last year of the regulatory control period. This amendment took effect on 2 May 2019.

Given that ElectraNet is currently in the first regulatory year of the 2018-19 to 2022-23 regulatory control period, clause 6A.8.2 of the Rules as amended now allows ElectraNet to submit a contingent project application to the AER at any time prior to February 2022.

3.2 Amendment of Revenue Determination for Contingent Project

Clause 6A.8.2 of the Rules sets out the requirements for making an application to amend a revenue determination to include a contingent project.

Clause 6A.8.2(b) sets out the information that the application must provide, specifically:

- an explanation that substantiates the occurrence of the trigger event;
- a forecast of the total capital expenditure for the contingent project;
- a forecast of the capital and incremental operating expenditure, for each remaining regulatory year which the Transmission Network Service Provider (TNSP) considers is reasonably required for the purpose of undertaking the contingent project;
- how the forecast of the total capital expenditure for the contingent project meets the Rule threshold;
- the intended date for commencing the contingent project (which must be during the regulatory control period);

16 AER, *Process Guideline for Contingent Project Applications under the National Electricity Rules*, September 2007.

- the anticipated date for completing the contingent project (which may be after the end of the regulatory control period); and
- an estimate of the incremental revenue which the TNSP considers is likely to be required to be earned in each remaining regulatory year of the regulatory control period as a result of the contingent project being undertaken.

Clause 6A.8.2(f) requires the AER to accept the relevant amounts in the application if it is satisfied that the amounts of forecast capital expenditure and incremental operating expenditure reasonably reflect the capital expenditure criteria and operating expenditure criteria, taking into account the capital expenditure factors and operating expenditure factors, in the context of the contingent project.

Chapters 4 and 5 of this application set out the capital and incremental operating expenditure requirements for this contingent project respectively, together with the assumptions and methodology used to arrive at these forecasts.

The incremental revenue required for this project and corresponding benefit to be delivered to customers is set out in Chapter 6. The remaining regulatory requirements are addressed in the remainder of this section.

For convenience, Appendix A includes a checklist of the above regulatory requirements, with reference to the relevant sections of this application that address these requirements.

3.3 Trigger Events

Clause 6A.8.2(b)(1) requires ElectraNet to substantiate the occurrence of each trigger event relevant to a contingent project. A contingent project application must be lodged as soon as practicable after the occurrence of the applicable trigger event(s).[17]

The applicable trigger events approved by the AER in respect of the Main Grid System Strength contingent project have all been satisfied as outlined in Table 3-1 below.

[17] In accordance with clause 6A.8.2(a1) of the Rules.

Table 3-1: Status of Main Grid System Strength contingent project trigger events

Trigger event	Status
1. Confirmation by AEMO of the existence of a NSCAS gap relating to system strength, or other requirement for ElectraNet to address a system strength requirement, in the SA region.	**Complete.** This trigger event occurred when AEMO declared a system strength gap in South Australia on 13 October 2017.[18]
2. Successful completion of the RIT-T (or equivalent economic evaluation) including an assessment of credible options showing a transmission investment is justified.	**Complete.** This trigger event was satisfied by the publication of our Economic Evaluation Report, which presents an equivalent economic evaluation to a RIT-T assessment.[19]
3. Determination by the AER that the proposed investment satisfies the RIT-T (or equivalent economic evaluation).	**Complete.** On 18 February 2019, the AER made a determination that the proposed investment as set out in our Economic Evaluation Report satisfies an economic evaluation equivalent to a RIT-T.[20]
4. ElectraNet Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.	**Complete.** On 30 May 2019, the ElectraNet Board made a commitment to the complete solution to meet the system strength requirement, subject to the AER awarding incremental revenue commensurate with the capital and operating costs of the project, in accordance with the Rules (see Appendix B).

As these defined trigger events have now occurred, this application presents the required information for the AER to make a determination to approve the total capital expenditure for the project and amend ElectraNet's revenue determination under 6A.8.2 of the Rules.

3.4 Project Timing

For the purposes of this application, the applicable dates for commencement and completion of the contingent project are as follows:

- Date for commencement of the contingent project – 1 July 2018
- Anticipated date for completing the contingent project – 28 February 2021

The capital expenditure associated with the contingent project is contained within the current 2018-19 to 2022-23 regulatory control period.[21]

18 AEMO, *Second Update to the 2016 National Transmission Network Development Plan*, October 2017.

19 ElectraNet, *Addressing the System Strength Gap in SA: Economic Evaluation Report*, 18 February 2019.

20 AER, *Determination Letter to ElectraNet: SA System Strength Gap*, 18 February 2019.

21 Some minor expenditure of less than $100k incurred in 2017-18 associated with the project has been incorporated into the costs incurred in 2018-19. The approved opening RAB for the current regulatory period included no as incurred expenditure for this project, avoiding any double counting.

The commencement date reflects the work performed by ElectraNet to date to confirm the proposed synchronous condenser solution to address the system strength gap and the advanced stage of the procurement processes being undertaken to address this gap in a timely manner.

The anticipated completion date for the project is consistent with an installation date of end 2020 and time required to complete commissioning of the synchronous condensers.

3.5 Pre-lodgement Consultation

The AER's Process Guideline for Contingent Project Applications under the National Electricity Rules encourages transmission companies to engage with the AER prior to lodgement of a contingent project application to assist both the AER and TNSP to satisfy the requirements of the Rules.

ElectraNet undertook the pre-lodgement process prior to formal lodgement of this application with the provision of a range of background and supporting information to the AER together with a draft copy of this contingent project application following the occurrence of the relevant trigger events.

4. Forecast Capital Expenditure

This chapter presents the forecast capital expenditure for the Main Grid System Strength contingent project in accordance with clauses 6A.8.2(b)(2)-(4) of the Rules.

The forecast capital expenditure is considered by ElectraNet to be reasonably required to undertake this project, taking into consideration the capital expenditure criteria and capital expenditure factors set out in the Rules.[22]

4.1 Basis for estimates

The capital expenditure forecasts have been estimated by ElectraNet based on vendor pricing, current delivered costs and prevailing market rates. This information is drawn from a range of sources, including tender pricing, market information, recently completed projects, purchased equipment and current labour rates.

Project delivery costs have been forecast based on current costs, consistent with benchmarks accepted by the AER in previous revenue determination processes. An appropriate project risk allowance has been calculated based on the established project risk management methodology previously accepted by the AER. This methodology involves a detailed evaluation and probabilistic assessment of known risks at this stage of the project.

Table 4-1 below provides a summary breakdown of the cost components and the basis of the forecast costs.

Table 4-1: Breakdown of forecast capital expenditure and basis of estimation

Capex Item	Basis for Forecast Expenditure
Procurement and installation of synchronous condensers and associated equipment	Estimate based on tender pricing
Substation works	Estimate based on tender pricing
Project delivery costs	Estimate based on current delivered costs and benchmarks
Project risk	Detailed probabilistic risk assessment
Equity raising costs	Benchmark costs calculated using PTRM

4.2 Capex Forecast by Year

As explained in section 2.2, the Main Grid System Strength Project avoids or replaces the need for a number of projects that are already included within the scope of the approved ex ante capital expenditure allowance for the 2018-19 to 2022-23 regulatory control period.

[22] As required by clause 6A.8.1(b)(2)(ii) of the Rules.

Accordingly, the additional forecast capital expenditure required to undertake the Main Grid System Strength contingent project is limited to the expenditure to be incurred net of the cost of these projects as outlined in Table 4-2 below.

Table 4-2: Capital expenditure forecast ($m 2017-18)

	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Main Grid System Strength Project	18.8	125.9	40.5	0.0	0.0	**185.2**
Robertstown Circuit Breaker Arrangement	(3.0)	(3.9)	0.0	0.0	0.0	**(6.9)**
Para Reactor	0.0	0.0	(0.3)	(2.8)	(1.4)	**(4.5)**
Blyth West Reactor	0.0	(1.3)	(3.0)	(0.1)	0.0	**(4.4)**
Incremental contingent project capital expenditure	15.8	120.7	37.2	(2.9)	(1.4)	**169.4**

The expenditure profile above reflects the accelerated delivery schedule for the project based on the urgent need to address the system strength gap in South Australia, including financial commitments made to date in order to meet the targeted delivery dates.

4.3 Economic Evaluation comparison

This capital expenditure forecast (in $m 2018-19) is within the capital cost sensitivity range modelled in the Economic Evaluation Report, as shown in Table 4-3 below.[23]

Table 4-3: Forecast and Economic Evaluation capex comparison ($m 2018-19)

Forecast	Economic Evaluation Report	Contingent Project Application
Capex estimate	140-180	172

For the purposes of this contingent project application, the capital expenditure forecast is reduced by the cost of the capital projects which are avoided or replaced by the Main Grid System Strength project as detailed in section 4.2 above.

As noted in section 5.2 below, the operating expenditure forecast remains well within the range assumed in the economic evaluation.

[23] ElectraNet, *Addressing the System Strength Gap in SA - Economic Evaluation Report*, 18 February 2019, p. 21-22.

Consequently, the total costs of the synchronous condenser solution remain consistent with the sensitivity range modelled in the economic evaluation, and the overall outcomes of the assessment remain unchanged.[24]

4.4 Capital Expenditure Threshold

To qualify as a contingent project, the proposed capital expenditure at the time of the making of ElectraNet's revenue determination was required to exceed either $30m or 5% of the Maximum Allowed Revenue (MAR) for the first year of the regulatory control period, whichever is the greater.[25]

As the AER determined a maximum allowed revenue for ElectraNet for the first year of the current regulatory control period of $305.3m (smoothed), 5% of this total is approximately $15.3m. Therefore, the applicable threshold for a contingent project is $30m. As the total estimated cost of the Main Grid System Strength contingent project clearly exceeds this figure, the threshold requirements of clause 6A.8.2(b)(4) of the Rules are satisfied.

4.5 Capex Forecast for the CESS

The incremental capital expenditure above results in an increase in the ex ante capital expenditure forecast for the purposes of the Capital Expenditure Sharing Scheme (CESS) in accordance with the requirements of the scheme.[26]

The revised capital expenditure forecast to be used to calculate efficiency gains in the 2018-19 to 2022-23 regulatory period is as outlined in Table 4-4 below.

Table 4-4: Forecast capex for the CESS ($m 2017-18)

	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Target capex for the CESS	112.1	220.5	145.7	97.2	51.8	**627.3**

[24] Prior to this economic evaluation, ElectraNet's Revenue Proposal of March 2017 for the 2018-19 to 2022-23 regulatory period included an indicative capital expenditure estimate of $60-80 million for the main grid system strength contingent project, acknowledging that it was not possible to accurately define the scope of the project at that early stage. Following the completion of detailed studies by both AEMO and ElectraNet, confirmation of the number, size and capabilities of the synchronous condensers required to meet the declared system strength gap has allowed the preparation of a detailed project scope and estimate for this project, which forms the basis of this application.

[25] In accordance with clause 6A.8.1(b)(2)(iii).

[26] AER, *Better Regulation – Capital Expenditure Incentive Guideline for Electricity Network Service Providers*, November 2013, p.9.

4.6 Conclusion

The total forecast capital expenditure for the Main Grid System Strength contingent project is $185.2m ($2017-18).

The incremental contingent project capital expenditure sought for the delivery of the project (net of avoided or replaced projects) is $169.4m ($2017-18).

We are confident that this forecast is both efficient and prudent (in accordance with the capital expenditure criteria) and that it meets the required capital expenditure objectives set out in the Rules.

We have worked closely with AEMO to confirm the size and scope of the synchronous condenser solution required to meet the system strength gap declared in October 2017. Both the AER and AEMO accepted our proposed approach to install synchronous condensers on an expedited basis in order to meet this urgent need, supported by a robust economic evaluation.

This has enabled us to reach an advanced stage in our competitive procurement process before lodging this contingent project application. This has informed the detailed project scope and cost estimates upon which the expenditure forecasts in the application are based, providing greater confidence that the capital expenditure forecast reflects the efficient and prudent costs of delivering the approved system strength solution.

5. Forecast Incremental Operating Expenditure

This chapter presents the forecast incremental operating expenditure required for the Main Grid System Strength contingent project in accordance with the requirements of Clause 6A.8.2(b)(3) of the Rules.

The forecast incremental operating expenditure detailed in this chapter is considered by ElectraNet to meet the operating expenditure criteria and operating expenditure factors set out in the Rules.

5.1 Basis for estimates

ElectraNet has determined the incremental operating expenditure for the contingent project in a manner consistent with the methodology and models accepted by the AER in its revenue determination for ElectraNet for the current regulatory control period.

This methodology is based on an assessment of the incremental costs of managing the new assets. The operating expenditure forecast for the Main Grid System Strength Project is comprised of:

- routine maintenance costs for the synchronous condensers and substation assets (based on market pricing);
- internal costs associated with the additional specialist engineering resources required to manage the new assets (based on established rates);
- insurance costs (based on market pricing); and
- debt raising costs (based on benchmark costs calculated using the PTRM).

5.2 Incremental Opex Forecast

The incremental operating expenditure forecast for the contingent project is summarised as follows:

Table 5-1: Incremental operating Expenditure ($m 2017-18)

	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Controllable opex	-	-	0.7	1.0	1.0	**2.7**
Network support	-	-	-	-	-	**-**
Debt raising costs	-	-	0.1	0.1	0.1	**0.2**
Total opex	-	-	0.8	1.0	1.0	**2.9**

Totals may not sum due to rounding

This operating expenditure forecast lies well within the indicative estimate of 1% of total capital cost per annum that was included in the Economic Evaluation Report for modelling purposes (equivalent to a range of $1.4m to $1.8m pa).

5.3 Opex Forecast for the purposes of the EBSS

The incremental operating expenditure above results in an increase in the operating expenditure forecast for the purposes of the Efficiency Benefit Sharing Scheme (EBSS) in accordance with the requirements of the scheme.[27]

The revised operating expenditure forecasts to be used to calculate efficiency gains in the 2018-19 to 2022-23 regulatory period are as follows:

Table 5-2: Forecast opex for the EBSS ($m Jun 2018)

	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Total opex	90.4	90.9	92.5	93.5	94.0	**461.3**
Less debt raising costs	(1.3)	(1.3)	(1.3)	(1.3)	(1.3)	**(6.5)**
Less network support	(8.4)	(8.4)	(8.4)	(8.4)	(8.4)	**(41.9)**
Target opex for the EBSS	80.7	81.2	82.8	83.8	84.3	**412.9**

Totals may not sum due to rounding

5.4 Conclusion

The total incremental operating expenditure for the contingent project in the remaining years of the regulatory control period is $2.9m ($2017-18).

ElectraNet is confident that this forecast is both efficient and prudent (in accordance with the operating expenditure criteria) and that it meets the operating expenditure objectives of the Rules.

As discussed in section 4.6, the advanced stage of our competitive procurement process has informed the detailed project scope and cost estimates upon which the expenditure forecasts in the application are based, providing greater confidence that the operating expenditure forecast reflects the efficient and prudent costs of delivering the approved system strength solution.

[27] AER, *Better Regulation – Efficiency Benefit Sharing Scheme for Electricity Network Service Providers*, November 2013, p.9.

6. Incremental Revenue Requirements

Clause 6A.8.2(b)(7) of the Rules requires ElectraNet to provide an estimate of the incremental revenue likely to be required for each remaining regulatory year of the regulatory control period as a result of the Main Grid System Strength contingent project being undertaken.

The incremental revenue sought by ElectraNet is consistent with the actual capital expenditure incurred in 2018-19 to date and the forecast capital and incremental operating expenditure for the remaining regulatory years as described in Chapters 4 and 5 above.

ElectraNet has modelled the required incremental revenue on a nominal basis using the AER's Post Tax Revenue Model (PTRM) as used for the revenue determination for the current period (as most recently updated annually by the AER for the trailing average cost of debt) and based on the annual capital expenditure forecasts presented in this application. A copy of this PTRM accompanies this application.

In accordance with clause 6A.8.2(b)(7)(ii) of the Rules, the capital expenditure forecast has been classified in a manner consistent with the AER's roll forward model to allow for the calculation of the Regulated Asset Base at the close of the current regulatory control period.

6.1 WACC

Clause 6A.8.2(b)(7)(iii) of the Rules requires ElectraNet to model its incremental revenue requirements on the basis of the prevailing rate of return determined by the AER for the current regulatory control period. The WACC used by ElectraNet for this contingent project application satisfies this requirement of the Rules, and is provided in Table 6-1 below.

Table 6-1: WACC Parameters

Parameter	AER Approved Value[28]
Risk-free rate	2.80%
Forecast inflation	2.45%
Market risk premium	6.5%
Gearing	60.0%
Equity beta	0.7
Nominal pre-tax return on debt	4.53%
Nominal post-tax return on equity	7.40%
Nominal vanilla WACC	5.68%

[28] As last annually updated by the AER for the trailing average cost of debt in February 2019.

6.2 Asset Lives

In its Final Revenue Determination for the 2018-19 to 2022-23 regulatory control period, the AER determined that it will set the asset life for the new asset class for the synchronous condensers once the contingent project trigger for the project is met.[29]

This followed the Draft Decision in which the AER did not accept ElectraNet's proposed standard asset life of 30 years for the proposed "synchronous condensers" asset class at that time because the assets related to a contingent project and potential revenue impacts would not occur until the contingent project was triggered. ElectraNet accepted this decision to defer consideration of the standard asset life in its Revised Revenue Proposal.

The reasons for not accepting the proposed asset life for the synchronous condensers also included the uncertainty regarding both the final design of the project and the frequency of operation. Accordingly, the AER deferred its decision as to the appropriate asset life for the synchronous condensers until after the contingent project trigger was met and greater certainty existed regarding the project scope and operation.[30]

For the purpose of this contingent project application and to address the issues raised by the AER in its Draft Decision and subsequent enquiries, we obtained further expert advice regarding an appropriate regulatory asset life for the synchronous condensers based on the new information now available on the project scope and expected operation of the machines. That advice recommends that 30 years is an appropriate regulatory asset life for the synchronous condensers to be installed. This advice is included in the supporting material submitted with this application.[31]

ElectraNet therefore proposes a new asset category for synchronous condensers with a standard asset life of 30 years as shown in Table 6-2.

Table 6-2: Asset Life

Asset Category	Standard Life	Average Remaining Life
Synchronous condensers	30	30

The same tax asset life is also proposed for this new asset category for the purposes of the corporate income tax allowance.

The capital expenditure directly associated with the installation of the synchronous condenser assets has been allocated to the new asset category above and the costs of the remaining components and other works associated with the project (such as substation works) have been allocated to the respective existing asset classes.

29 AER, *Final Decision: ElectraNet transmission determination 2018 to 2023, Attachment 5 – Regulatory depreciation*, April 2018, p.7.

30 AER, *Draft Decision: ElectraNet transmission determination 2018 to 2023, Attachment 5 – Regulatory depreciation*, October 2017, p.7.

31 GHD, *Economic life for ElectraNet synchronous condensers*, 28 June 2019.

6.3 Depreciation

Clause 6A.8.2(b)(7)(iv) of the Rules requires that the calculation of the estimated incremental revenue be consistent with the manner in which depreciation is calculated under clause 6A.6.3.

The incremental annual regulatory depreciation shown in Table 6-3 below has been calculated using the PTRM as applied by the AER in its revenue determination for ElectraNet applicable to the current regulatory control period.

Table 6-3: Incremental Regulatory Depreciation ($m nominal)

	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Regulatory Depreciation	0.0	(0.4)	(3.8)	2.0	2.3	**0.1**

The updated total regulatory depreciation forecast for the 2018-19 to 2022-23 regulatory period will be applied in calculating ElectraNet's opening RAB at the commencement of the following regulatory control period, consistent with the forecast depreciation approach approved by the AER in the current revenue determination.[32]

6.4 Tax allowance

The incremental annual net tax allowance shown in Table 6-4 below has been calculated using the PTRM as applied by the AER in its revenue determination for ElectraNet applicable to the current regulatory control period.

Table 6-4: Incremental Net Tax Allowance ($m nominal)

	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Net Tax Allowance	0.0	0.0	0.2	0.2	0.2	**0.6**

6.5 Incremental revenue requirements for each year to end of period

Based on the estimates provided above and using the PTRM, ElectraNet has calculated incremental annual building block revenue requirements for the contingent project as shown in Table 6-5.

[32] AER, *ElectraNet transmission determination 2018 to 2023*, April 2018, p13.

Table 6-5: Incremental Revenue Requirement ($m nominal)

	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Return on capital	0.0	0.9	8.4	10.9	10.6	**30.8**
Regulatory depreciation	0.0	(0.4)	(3.8)	2.0	2.3	**0.1**
Opex allowance	0.0	0.0	0.9	1.2	1.2	**3.2**
Net tax allowance	0.0	0.0	0.2	0.2	0.2	**0.6**
Unsmoothed revenue requirement	**0.0**	**0.5**	**5.6**	**14.3**	**14.3**	**34.8**

Totals may not sum due to rounding

6.6 Amended maximum allowed revenue

The AER's final decision on the annual building block revenue requirement for the current regulatory control period is set out in Table 6-6 (as revised by the AER in February 2019 for the annual trailing average cost of debt update) together with the calculation of the amended MAR required for the contingent project.

Table 6-6: Amended annual building block revenue requirement ($m nominal)

	2018-19	2019-20	2020-21	2021-22	2022-23	Total
AER annual building block revenue requirement	286.1	314.1	324.9	339.1	341.3	1,605.4
Main Grid System Strength Project revenue requirement	0.0	0.5	5.6	14.3	14.3	34.8
Amended annual revenue requirement (unsmoothed)	**286.1**	**314.6**	**330.5**	**353.4**	**355.6**	**1,640.2**

Totals may not sum due to rounding

Recovery of the incremental revenue approved by the AER will commence in the 2020-21 regulatory year, in accordance with ElectraNet's approved Transmission Pricing Methodology.

Table 6-7 below sets out the updated MAR and X factors for the current regulatory control period.

Table 6-7: Amended maximum allowed revenue ($m nominal)

	2018-19	2019-20	2020-21	2021-22	2022-23	Total
MAR (smoothed)	305.3	312.5	325.8	339.6	354.0	**1,637.1**
X Factor	n/a*	0.08%	-1.75%	-1.75%	-1.75%	-

* ElectraNet is not required to apply an X factor for 2018-19 as the MAR for this year was fixed by the AER in its Revenue Determination for 2018-2023

The incremental revenue requirement has been smoothed in order to minimise impacts on customer prices over time, in a manner consistent with the requirements of the Rules that:

- Provides an equivalent revenue outcome in net present value terms; and
- Ensures the revenue to be recovered in the last year of the regulatory period is as close as reasonably possible to the unsmoothed revenue requirement.[33]

Under the approach above, the smoothed incremental revenue requirement does not commence until 2020-21, aligning with the first year in which revenue recovery can commence under the annual transmission pricing process.[34]

6.7 Customer bill impact

The analysis within our Economic Evaluation Report showed that the installation of synchronous condensers could be expected to result in an indicative net cost saving equivalent to $3 to $5 per year off a typical South Australian residential electricity bill upon commissioning of the units as a result of avoided generator direction compensation costs.[35]

Our updated analysis based on the latest cost estimates prepared for this application confirms that the total project costs (comprising capital and operating expenditure) remain within the range modelled in the economic evaluation, and that the estimated net cost savings for customers remain unchanged.

[33] In accordance with clause 6A.6.8(c).

[34] Noting that transmission prices have already been published under the Rules for 2019-20.

[35] Assumes avoided direction compensation costs of $22m per annum and avoided reactor investment costs of $10m.

7. Conclusion

This contingent project application for the Main Grid System Strength project has been prepared in accordance with the requirements of clause 6A.8.2 of the Rules. It requests the AER to amend the revenue determination that applies to ElectraNet in the current regulatory control period from 2018-19 to 2022-23 to include the incremental revenue for the contingent project and approve the total capital expenditure forecast for the project.

The incremental revenue set out in this application is based on capital expenditure which is reasonably required for the contingent project in each year of the current regulatory control period.

The installation of high inertia synchronous condensers on the South Australian transmission network has been accepted by the AER and AEMO as the most economically and technically suitable solution to meet the declared system strength gap and the synchronous component of the declared inertia shortfall in South Australia.

The costs and risks of directing synchronous generation to remain online for system strength purposes continue to grow, reinforcing the need for the timely installation of synchronous condensers.

While helping to maintain a stable power system, installing synchronous condensers will also avoid the need for costly generator direction by AEMO which is expected to result in a net cost saving equivalent to $3 to $5 per year on a typical South Australian residential electricity bill, after allowing for the cost of the synchronous condensers.

AEMO, the AER and the South Australian Government support the urgent need to meet the system strength shortfall. We will continue to work closely with all parties to deliver the synchronous condenser solution in the best interests of electricity customers, with installation targeted by end 2020.

APPENDICES

Appendix A Requirements Checklist

The purpose of this table is to demonstrate compliance with the contingent project application information requirements specified in clause 6A.8.2(b) of the Rules.

Rule 6A.8.2(b) requirements	Reference in Application
(1) an explanation that substantiates the occurrence of the *trigger event*;	Section 3.3 and Appendix B
(2) a forecast of the total capital expenditure for the *contingent project*;	Section 4.2
(3) a forecast of the capital and incremental operating expenditure, for each remaining *regulatory year* which the *Transmission Network Service Provider* considers is reasonably required for the purpose of undertaking the *contingent project*;	Sections 4.2 and 5.2
(4) how the forecast of the total capital expenditure for the *contingent project* meets the threshold as referred to in clause 6A.8.1(b)(2)(iii);	Section 4.4
(5) the intended date for commencing the *contingent project* (which must be during the *regulatory control period*);	Section 3.4
(6) the anticipated date for completing the *contingent project* (which may be after the end of the *regulatory control period*); and	Section 3.4
(7) an estimate of the incremental revenue which the *Transmission Network Service Provider* considers is likely to be required to be earned in each remaining *regulatory year* of the *regulatory control period* as a result of the *contingent project* being undertaken as described in subparagraph (3), which must be calculated: (i) in accordance with the requirements of the *post-tax revenue model* referred to in clause 6A.5.2; (ii) in accordance with the requirements of the *roll forward model* referred to in clause 6A.6.1(b); (iii) using the *allowed rate of return* for that *Transmission Network Service Provider* for the *regulatory control period* as determined in accordance with clause 6A.6.2; (iv) in accordance with the requirements for depreciation referred to in clause 6A.6.3; and (v) on the basis of the capital expenditure and incremental operating expenditure referred to in subparagraph (b)(3).	Section 6.5 and 6.6

Appendix B Board Approval

ElectraNet

I certify that the following is an extract from the minutes of a duly authorised resolution of the Board of Directors of ElectraNet Pty Limited ABN 41 094 482 416 (**Company**) dated 30 May 2019.

SUBJECT: CAPITAL PROJECT APPROVAL - PROJECT NO. EC.14219 - MAIN GRID SYSTEM STRENGTH SUPPORT

The Board of ElectraNet Pty Limited (ABN 41 094 482 416) RESOLVED to commit to proceed with Capital Project No. EC.14219 Main Grid System Strength Support, subject to the AER awarding incremental revenue commensurate with the capital and operating costs of the project.

Sam Dighton
COMPANY SECRETARY

ElectraNet