Response to AER Information Request

AER IR 001

Capital Project Supporting Documentation

19 April 2017

Security Classification: Confidential

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Company Information

ElectraNet Pty Ltd (ElectraNet) is the principal electricity transmission network service provider (TNSP) in South Australia.

For information about ElectraNet visit www.electranet.com.au.

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1. AER Information Request

The enclosed information is provided in response to the information request received on 7 April 2017 in relation to capital project supporting documentation (AER IR 001) as follows.

1. Forecast Capital Project Supporting Documentation

   ElectraNet's revenue proposal provides a summary of forecast major capital projects involving expenditure of greater than $5 million in Table 6.9 of Attachment 6. Further details of these projects are provided in Appendix A. In order to assess the prudency and efficiency of forecast capex in accordance with the requirements of the National Electricity Rules, the AER requires further evidence of the economic assessment undertaken and relied upon by ElectraNet to justify its forecast of required capex for these projects in the 2018–2023 regulatory control period.

   a) Please provide all relevant supporting documentation relied upon by ElectraNet to justify the prudency and efficiency of the forecast major capex projects listed in Table 6.9 of ElectraNet's revenue proposal. This is likely to include, but not be limited to:

      a. business case documentation
      b. cost benefit analyses
      c. NPV analyses
      d. project risk assessments
      e. options analyses
      f. supporting models, including details of relevant key inputs and assumptions.

   In responding to this information request, please identify any confidential information and provide public versions of any confidential documents as we will publish these on our website so that stakeholders may review this information.

2. Contingent project supporting documentation

   ElectraNet's revenue proposal provides a summary of proposed contingent projects in Table 6.10 of Attachment 6. Further details of these projects are provided in Appendix B. In order to assess whether these projects are reasonably required to be undertaken in order to achieve the capital expenditure objectives in accordance with the National Electricity Rules, the AER requires further evidence of the planning and assessment undertaken by ElectraNet.

   a) Please provide all relevant supporting documentation relied upon by ElectraNet to justify the projects listed in Table 6.10 of ElectraNet's revenue proposal. This is may include:

      a. business case documentation
      b. cost benefit analyses
      c. NPV analyses
      d. project risk assessments
      e. options analyses
      f. supporting models, including details of relevant key inputs and assumptions.

   In responding to this information request, please identify any confidential information and provide public versions of any confidential documents as we will publish these on our website so that stakeholders may review this information.

2. Response

2.1 Forecast Capital Project Supporting Documentation

ElectraNet provides the following supporting documentation relied upon to justify the prudency and efficiency of the forecast major capex projects, as listed in Table 6.9 of Attachment 6 of the Revenue Proposal. These projects comprise those in the capital expenditure forecast for 2018-19 to 2022-23 with a value exceeding $5m in the period, other than works in progress.

The value of these projects totals $265m ($2017-18) which represents 58% of the total capital expenditure forecast of $458m. It is noted that projects substantially in progress at the start of the forecast period comprise a further $70m (or 15%) of the total capital expenditure forecast.

The documentation enclosed with this response covers the following information.

Economic assessments

For all large projects, ElectraNet conducts an economic assessment to determine whether the benefits of undertaking the project exceed the costs, considering all feasible available options. This assessment also examines the optimal timing of each project to ensure that net benefits are maximised, and projects are deferred where this is more economic. Key inputs to this assessment for each of the options assessed include:

- Capital and operating costs of the alternative options;
- Reliability Benefits - where unserved energy is measured by the Value of Customer Reliability (VCR) estimates published by AEMO;
- Cost savings - for example avoided maintenance costs;
- Risk reduction - as measured by the quantified value of the risk reduced or avoided through the project (for example avoided safety risks);
- Standard discount rate assumptions – based on a range of estimates including commercial rates and the prevailing regulated rate of return; and
- Optimal timing – including the potential for deferral of an investment to a subsequent regulatory period.

For each of these assessments, an economic model is provided which contains a Net Present Value (NPV) assessment of the quantified costs and benefits for each project option. Sensitivity analysis is also undertaken to determine the robustness of the assessment to differences in input assumptions.

These economic assessments have been externally reviewed by economic experts Houston Kemp to ensure they are robust and reasonable.

A summary of the assessment outcomes and methodology applied is contained in the supporting document *ENET029-ElectraNet - Houston Kemp - Review of ElectraNet Economic Assessment Framework Application - March 2017*, which accompanies ElectraNet's Revenue Proposal.

Risk analysis

The decision to replace an asset is driven by asset condition, risk and reliability considerations, balanced against cost. A quantified risk analysis is undertaken for all large projects with a primary driver of managing risk. This risk assessment considers the:

- Probability of an asset failure
- Likelihood of adverse consequences
- Likely costs of the consequences

The cost-risk reduction calculated through these quantified risk assessments in turn forms a key input to the economic assessments undertaken through the NPV model. For each of these risk assessments, an explanatory memo is provided describing the specific inputs and assumptions to the assessment and the quantified outcomes, which are in turn applied in the economic assessment.

Cost estimates

For each capital project a cost estimate is produced from a defined scope of works through ElectraNet's estimating system, based on a range of information from internal and external sources. This includes estimates from contractors and suppliers, outturn costs for similar projects, and unit rates provided by independent sources. These estimates also incorporate efficiencies expected to arise through combining the delivery of related projects. A copy of the cost estimate is provided for each capital project.

For completeness, it is noted that the values incorporated in these estimates are expressed in nominal terms as at the date of estimation (2015-16) to which project timing and escalation are subsequently applied to arrive at the final costs included in the capital expenditure forecast (in $2017-18).

Check estimates

To verify the accuracy of the capital project cost estimates, ElectraNet has also obtained independent check estimates for a representative sample of projects from external experts including Aquenta and PSC. This analysis demonstrates that the variations in the individual check estimates are generally within the range of accuracy expected of the cost estimates. A copy of the check estimate obtained for each of the relevant projects is included with this response.

AEMO assessment

As part of its advisory role to the South Australian jurisdiction, AEMO conducts a detailed independent technical assessment of a portion of the network capital program relating to large network development projects. For each of these projects, AEMO has assessed that the need exists, the timing is appropriate, and the solution being proposed appears reasonable. AEMO has also reviewed the potential non-network alternatives considered in these assessments.

AEMO has also confirmed the consistency of the forecast with its National Transmission Network Development Plan (NTNDP) and concluded that, with the proposed developments, the network will remain compliant with the reliability requirements of the South Australian Electricity Transmission Code (ETC) at the end of the regulatory period.

The findings of AEMO's review are available in a separate report, *Independent Planning Review – ElectraNet Capital Expenditure Projects South Australian Advisory Functions* dated March 2017, which has now been published on the AEMO website[1].

Deep Dive workshops

A number of the projects subject to this information request were explored in detail during the technical workshops attended by representatives of the AER and the ElectraNet Consumer Advisory Panel Working Group during the course of ElectraNet's early engagement program. These workshops were held between 7 September 2016 and 14 February 2017.

Following their appointment to ElectraNet's revenue determination process, members of the AER's Consumer Challenge Panel also attended these sessions.

As outlined above, Table 2-1 provides an overall summary of the documentation provided with this response in relation to the projects that are the subject of this information request.

1 Available at http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/SA_Advisory/2017/Independent_Planning_Review-ElectraNet_Capital_Expenditure_Projects.pdf.

Table 2-1: Capital Project Supporting Information ($m 2017-18)

Project No.	Project	Value	Economic assessment	Risk analysis	Cost estimate	Check estimate	AEMO assessment	Deep Dive workshop
EC.14081	Line Insulator Systems Refurbishment (1)	58.7	●	●	●	●		●
EC.14145	Yadnarie – Pt Lincoln F1811 132kV Line Conductor and Earthwire Refurbishment (2)	38.2	●	●	●	●		●
EC.14137	Cultana – Yadnarie F1810 132kV Line Conductor and Earthwire Refurbishment (2)	35.5		●	●			
EC.14031	Protection Systems Unit Asset Replacement	29.3	●	●	●	●		●
EC.14084	Line Conductor and Earthwire Refurbishment (3)	17.7	●	●	●			●
EC.14105	Brinkworth – Waterloo Bearer Replacement	11.1	●		●			
EC.14034	Isolator Unit Asset Replacement	11.0	●	●	●			
EC.14046	AC Board Unit Asset Replacement	9.6	*		●			
EC.14076	Line Support Systems Refurbishment	8.8	●	●	●			
EC.14209	Substation Improvements for System Black Conditions	7.5	●		●			●
EC.14047	Transformer Bushing Unit Asset Replacement	6.9	●	●	●	●		
EC.12115	Telecommunications Unit Asset Replacement	6.8	●		●			
EC.14071	Robertstown Circuit Breaker Arrangement	6.6	●		●		●	
EC.14133	Dalrymple ESCRI Energy Storage	6.4	**		**			●
EC.14085	Gawler East Connection Point	6.3	●		●		●	
EC.12330	One IP Substation Network – Stage 2	5.0	●		●			
TOTAL		**265.4**						

* As this project is driven by mandated safety obligations a separate qualitative business case has been developed for this project, which will be provided separately.

** Note that the economic assessment and cost estimate for the Dalrymple ESCRI Energy Storage project will be provided separate to this response through the ongoing engagement with the AER on this topic.

(1) This project represents a program of works comprising 18 individual sub projects, each of which is the subject of a separate economic assessment and risk assessment and single overall cost estimate which accompany this response. These sub projects are listed in Table 2-2 below.

(2) In relation to the Yadnarie – Pt Lincoln F1811 132kV Line Conductor and Earthwire Refurbishment project and Cultana – Yadnarie F1810 132kV Line Conductor and Earthwire Refurbishment project, individual risk assessments were undertaken which are summarised in the same explanatory memo. Incorporating these inputs, an integrated economic assessment was undertaken across the combined Cultana – Yadnarie – Pt Lincoln project.

(3) This project represents a program of works comprising 7 individual sub projects, each of which is the subject of a separate economic assessment and risk assessment and single overall cost estimate which accompany this response. These sub projects are listed in Table 2-3 below.

As noted above, the Line Insulator Systems Refurbishment Project and Line Conductor and Earthwire Refurbishment Project are each composed of a number of subprojects, as listed in Tables 2-2 and 2-3 below.

Table 2-2: Sub-projects comprising the Line Insulator Systems Refurbishment Project

Project No.	Sub Project	Value ($2017-18)
EC.14151	Waterloo – Mintaro F1805 132 kV Line Insulator Systems Refurbishment	11.1
EC.14152	TIPS - Cherry Gardens F1903 275kV Line Insulator Systems Refurbishment	9.3
EC.14158	NWB - Monash No1 F1820 132 kV Line Insulator Systems Refurbishment	6.2
EC.14154	Keith - Kincraig F1828 132 kV Line Insulator Systems Refurbishment	5.5
EC.14159	Kincraig - Penola West F1831 132 kV Line Insulator Systems Refurbishment	5.1
EC.14160	TIPS - Magill F1912 275 kV Line Insulator Systems Refurbishment	3.9
EC.14157	TIPS - Para No4 F1902 275 kV Line Insulator Systems Refurbishment	3.0
EC.14149	Para - Tungkillo F1921 275 kV Line Insulator Systems Refurbishment	2.5
EC.14161	PGW - Para F1940 275 kV Line Insulator Systems Refurbishment	2.3
EC.14153	South East - Mount Gambier F1829 132 kV Line Insulator Systems Refurbishment	1.8
EC.14150	Davenport - Leigh Creek F1813 132 kV Line Insulator Systems Refurbishment	1.5
EC.14156	Pelican Point – PGW F1901 275 kV Line Insulator Systems Refurbishment	1.3
EC.14146	Cherry Gardens - Happy Valley F1906 275kV Line Insulator Systems Refurbishment	1.3
EC.14162	Para – Robertstown F1945 275 kV Line Insulator Systems Refurbishment	0.8
EC.14155	MBHPS3-Kanmantoo-Back Callington F1850 132 kV Line Insulator Systems Refurbishment	0.8
EC.14147	TIPS - New Osborne No3 F1714 66 kV Line Insulator Systems Refurbishment	0.7
EC.14148	TIPS - New Osborne No4 F1715 66 kV Line Insulator Systems Refurbishment	0.7
EC.14163	Para – Munno Para F1956 275 kV Line Insulator Systems Refurbishment	0.6
TOTAL		**58.7**

Table 2-3: Sub-projects comprising the Line Conductor and Earthwire Refurbishment Project

Project No.	Sub Project	Value ($2017-18)
EC.14141	MWPS2 – MWPS1 F1853 132 kV Line Conductor and Earthwire Refurbishment	4.2
EC.14139	MWPS3 – MWPS2 F1849 132 kV Line Conductor and Earthwire Refurbishment	4.2
EC.14144	Waterloo East - MWPS4 F1888 132 kV Line Conductor and Earthwire Refurbishment	2.7
EC.14142	Robertstown – MWPS3 F1847 132 kV Line Conductor and Earthwire Refurbishment	1.7
EC.14143	Waterloo – Waterloo East F1806 132 kV Line Conductor and Earthwire Refurbishment	1.7
EC.14140	MWPS4 - Robertstown F1855 132 kV Line Conductor and Earthwire Refurbishment	1.7
EC.14138	MWPS1 – NWB F1854 132 kV Line Conductor and Earthwire Refurbishment	1.6
TOTAL		**17.7**

A range of the detailed information which accompanies this response is commercially sensitive in nature. This includes for example detailed capital project cost information for projects that will later be subject to tendering processes and external contracting through ElectraNet's outsourcing arrangements.

Table 2-4 provides a summary of the status of the material enclosed with this request.

Table 2-4: Status of enclosed material

Documentation	Non-confidential	Confidential
NPV assessments	NPV summary sheets	Full NPV models
Risk assessments	None	Explanatory memos
Cost estimates	None	Cost estimates
Check estimates	Redacted versions	Full versions
AEMO assessment	AEMO assessment report	

2.2 Contingent project supporting documentation

The following information is provided in support of the contingent projects proposed by ElectraNet for the purposes of its 2019-2023 Revenue Proposal.

As expected, the need, cost or timing of these contingent projects is currently uncertain, and so it is not possible to undertake detailed business case assessment or economic evaluation at this time.

However, evidence of the planning and assessment undertaken to date in relation to these contingent projects, which further supports their inclusion as being reasonably required to be undertaken in order to achieve the capital expenditure objectives of the National Electricity Rules is provided below.

All of these projects have either been reviewed by or are based on triggers from AEMO.

2.2.1 Eyre Peninsula Reinforcement

ElectraNet has been actively exploring options to replace or upgrade the transmission lines serving the Eyre Peninsula. Our most recent assessment of the line condition indicates that components of the line are nearing the end of their functional life and will require replacement in the next few years.

To enable this work, ElectraNet has included in its Revenue Proposal (ex-ante capex) the replacement of major transmission line components on the Eyre Peninsula (projects EC.14137 and EC.14145).

Alternatively, the full replacement of the line (for example as a double circuit line) may be more cost effective and deliver greater net benefits to Eyre Peninsula customers through potentially improving supply reliability and avoiding the ongoing costs of network support at Port Lincoln.

This involves undertaking the Regulatory Investment Test for Transmission (RIT-T), which will assess the costs and benefits of alternative network and non-network solutions. A Project Specification Consultation Report (PSCR) represents the formal commencement of the RIT-T process to investigate electricity supply options for the Eyre Peninsula and is scheduled for release by end April 2017.

The economic NPV model which accompanies this response for projects EC.14137 and EC.14145 includes an assessment of the available options to address the condition of the line conductor, and concludes that the replacement of the conductor in the forthcoming regulatory period is the most economical solution (Option1) compared with a Base Case which involves maintaining the existing line and continuing grid support at Port Lincoln or an alternative (Option 2) involving deferred conductor replacement in the subsequent regulatory period (2024-2028).

For completeness, this model also includes an indicative assessment which indicates that a full 132kV double circuit rebuild of the line (Option 3) potentially offers even greater net benefits, followed by a deferred rebuild of the line (Option 4).

However, this potential needs to be confirmed through the RIT-T process. ElectraNet has, therefore, included the lowest cost replacement option (Option 1) in its ex ante capex forecast, and will more fully examine the potential range of options for delivering reliable electricity supply to the Eyre Peninsula, including augmenting the network to 275kV capacity, through the formal RIT-T process.

2.2.2 South Australian Energy Transformation

On 7 November 2016, ElectraNet commenced a Regulatory Investment Test for Transmission (RIT-T) process for the South Australian Energy Transformation project with the publication of a Project Specification Consultation Report (PSCR)[2]. The purpose of the RIT-T process is to explore the technical and economic feasibility of new interconnector and alternative non-network solution options.

The focus of this project is on addressing the following identified need:

- Improve wholesale market competition in South Australia and deliver positive price impacts for customers.
- Improve system security by reducing the risk of widespread loss of supply when South Australia becomes islanded from the NEM (through loss of the Heywood Interconnector).
- Provide access to a more diverse range of supply sources, allowing greater sharing of reserves across regions and improving fuel and supply security for South Australia.
- Open up access to more renewable generation to help Australia meet its renewable energy targets.

ElectraNet also published a Market Modelling Approach and Assumptions Report, and a Supplementary Information Paper to provide further information and opportunity for engagement for proponents of non-network options.[3]

The consultation period for these documents concluded on 27 February 2017.

There has been extensive feedback and input from electricity market participants, as well as from the wider community and other interested parties with a total of 35 submissions received. ElectraNet is currently working through these submissions.

In the meantime, ElectraNet is engaging with non-network option proponents that provided consultation feedback to obtain additional technical and cost information about their proposals so that an initial assessment of the feasibility and likely benefits of non-network solution options can be progressed.

2.2.3 Upper North-East Line Reinforcement

ElectraNet has received a number of recent load connection enquiries in the vicinity of the Davenport – Leigh Creek 132kV line due to interest in mineral exploration and resource development in the area.

[redacted]

2 https://www.electranet.com.au/projects/south-australian-energy-transformation/

3 Ibid.

[redacted]

In general the Upper North region is rich in mineral resources, with supportive government policy to allow development of potential mining projects in the region[4].

2.2.4 Upper North-West Line Reinforcement

ElectraNet has received a number of recent medium to large load connection enquiries in the vicinity of the Davenport – Pimba 132kV line due to interest in mineral exploration and resource development in the area.

[redacted]

In general the Upper North region is rich in mineral resources, with supportive government policy to allow development of potential mining projects in the region[4].

2.2.5 Main Grid System Strength Support

AEMO in its 2016 National Transmission Network Development Plan (NTNDP)[5] reported that based on currently available information, a Network Support and Control Ancillary Services (NSCAS) gap has been identified in South Australia relating to system strength.

4 South Australian Department of Planning, Transport and Infrastructure, Far North Region Plan, July 2010 https://www.sa.gov.au/__data/assets/pdf_file/0012/20334/Region_plan_Far_North.pdf

5 http://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NTNDP/2016/Dec/2016-NATIONAL-TRANSMISSION-NETWORK-DEVELOPMENT-PLAN.pdf. Refer Section 7.2.3 on page 98.

Based on preliminary analysis, AEMO has determined that at least two large synchronous generating units must be online in South Australia to maintain a secure operating state as defined in clause 4.2.2 of the Rules[6]. This is required to maintain system strength through the provision of adequate levels of fault current on the network.

AEMO is currently working with ElectraNet to confirm this requirement following completion of more detailed analysis, including the existence, size and trigger date of the NSCAS Gap. AEMO expects to publish its findings in the coming weeks once this analysis has concluded through an update to its 2016 NTNDP.

One potential solution to this gap could be the installation of synchronous condensers on the transmission network. The scope of this contingent project is based on the installation of 6 synchronous condensers on the network at various locations in order to meet this potential requirement, if confirmed.

6 Refer AEMO Market Notice 56089, available at: https://www.aemo.com.au/Market-Notices?currentFilter=&sortOrder=&searchString=56089.

3. Appendices

Appendix A Enclosed Material

Response to AER Information Request

Appendices

Capital Project Supporting Documentation

19 April 2017

Security Classification: Confidential

Appendix A Enclosed Material

A1 Listing of files attached

The following Table 3-1 provides a list and full file names of all documents and files submitted with this response:

Table 3-1: Full List of Supporting Documentation

Project Estimates
ElectraNet -IR001-EC.12115 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.12330 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.14031 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.14034 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.14046 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.14047 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.14071 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.14076 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.14081 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.14084 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.14085 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.14105 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.14137 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.14145 Project Estimate-20170412-Confidential.pdf
ElectraNet -IR001-EC.14209 Project Estimate-20170412-Confidential.pdf
Check Estimates
ElectraNet-IR001-Aquenta-Independent Estimate Review-20170412-Confidential.pdf
ElectraNet-IR001-Aquenta-Independent Estimate Review-20170412-Public.pdf
ElectraNet-IR001-PSC-Indpendent Estimate Review-20170412-Confidential.pdf
ElectraNet-IR001-PSC-Indpendent Estimate Review-20170412-Public.pdf
IRT Memos
ElectraNet-IR001-EC.14031 UAR IRT Memo-20170412-Confidential.pdf
ElectraNet-IR001-EC.14033 UAR IRT Memo-20170412-Confidential.pdf
ElectraNet-IR001-EC.14034 UAR IRT Memo-20170412-Confidential.pdf
ElectraNet-IR001-EC.14047 UAR IRT Memo-20170412-Confidential.pdf
ElectraNet-IR001-EC.14076 Line Support IRT Memo-20170412-Confidential.pdf
ElectraNet-IR001-EC.14081 Insulator EC.14146 IRT Memo-20170412-Confidential.pdf
ElectraNet-IR001-EC.14081 Insulator EC.14147 IRT Memo-12.04.17-Confidential.pdf
ElectraNet-IR001-EC.14081 Insulator EC.14148 IRT Memo-20170412-Confidential.pdf
ElectraNet-IR001-EC.14081 Insulator EC.14149 IRT Memo-20170412-Confidential.pdf
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ElectraNet-IR001-EC.14081 Insulator EC.14163 IRT Memo-20170412-Confidential.pdf
ElectraNet-IR001-EC.14084 Conductor EC.14138 IRT Memo-20170412-Confidential.pdf
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ElectraNet-IR001-EC.14145 EC.14137 IRT Memo-20170412-Confidential.pdf
Economic Models
ElectraNet-IR001- EC.12115 UAR Economic Model-20170413-Confidential.xlsx
ElectraNet-IR001- EC.12115 UAR Economic Model-20170413-Public.pdf
ElectraNet-IR001- 12330 One IP Substation Network Economic Model-20170413-Confidential.xlsx
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ElectraNet-IR001- EC.14034 UAR Economic Model-20170412-Confidential.xlsx
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ElectraNet-IR001- EC.14047 UAR Economic Model-20170412-Confidential.xlsx
ElectraNet-IR001- EC.14047 UAR Economic Model-20170412-Public.pdf
ElectraNet-IR001- EC.14071 Circuit Breaker Economic Model-20170413-Confidential.xlsx
ElectraNet-IR001- EC.14071 Circuit Breaker Economic Model-20170413-Public.pdf
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ElectraNet-IR001- EC.14081 Insulator EC.14147 Economic Model-20170412-Public.pdf
ElectraNet-IR001- EC.14081 Insulator EC.14148 Economic Model-20170412-Confidential.xlsx
ElectraNet-IR001- EC.14081 Insulator EC.14148 Economic Model-20170412-Public.pdf
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