TransGrid

Capex Forecasting Methodology for Project EnergyConnect – RFT Phase A

Contingent Project Application for Project EnergyConnect

29 June 2020

Contents

1. Purpose, structure and scope of this document

1.1 Purpose of this document

The purpose of this document is to:

> overview the nature and scope of the capital expenditure (capex) that we require to deliver Project EnergyConnect (the Project or PEC)

> explain and justify the methodologies we have used to determine our forecast capex for PEC[1]

> explain the drivers of the difference between the capex forecast for PEC set out in this document (current capex forecast) and the capex forecast for PEC published in February 2019 in the Regulatory Investment Test for Transmission (RIT-T) Project Assessment Conclusion Report (PACR) (PACR capex forecast).

> overview how we verified and validated our actual and forecast capex for PEC.

This document forms part of our Contingent Project Application (Application) to the Australian Energy Regulator (AER) for PEC. It should be read in conjunction with our Application and other supporting documents, in particular GHD's independent opinion on the scope of and forecast capex required to deliver PEC. GHD confirms that both are reasonable and efficient.

Unless otherwise stated, all historical and forecast capex values in this document are presented in real 2017-18 dollars and include real input cost escalation.[2]

1.2 Scope of this document

This document explains and justifies our actual and forecast capex for PEC for the period 1 July 2018 to 30 June 2023, noting that the anticipated PEC completion date is June 2023.

Importantly, this document does not do any of the following:

> explain or justify the scope of PEC. This is done in the PACR and the "Specification and scope description" document provided as an attachment to this Application

> explain the capex forecast for PEC that is attributable to ElectraNet (i.e. the components of PEC in SA)

> explain or justify our operating expenditure for the PEC Project. This is done in a separate document entitled Opex Forecasting Methodology for Project EnergyConnect.

1.3 Structure of this document

The remainder of this Capex Forecasting Methodology is structured as follows:

> section 2 summarises our forecast capex for PEC

[1] Non-network costs include property and IT costs, network overheads costs include project management costs and corporate overheads include legal and regulatory costs.

[2] The financial values exclude *both* inflation and any real input cost escalation (e.g. labour) from 30 June 2018 onwards. Although many of the unit rates used applied from 1 July 2019 onwards, these were deflated by a year of actual inflation (from 30 June 2019 to 30 June 2018) and, where appropriate, de-escalated by a year of real labour cost escalation (using the rate allowed by the AER in its determination for the 2018-23 regulatory control period for the year to 30 June 2019).

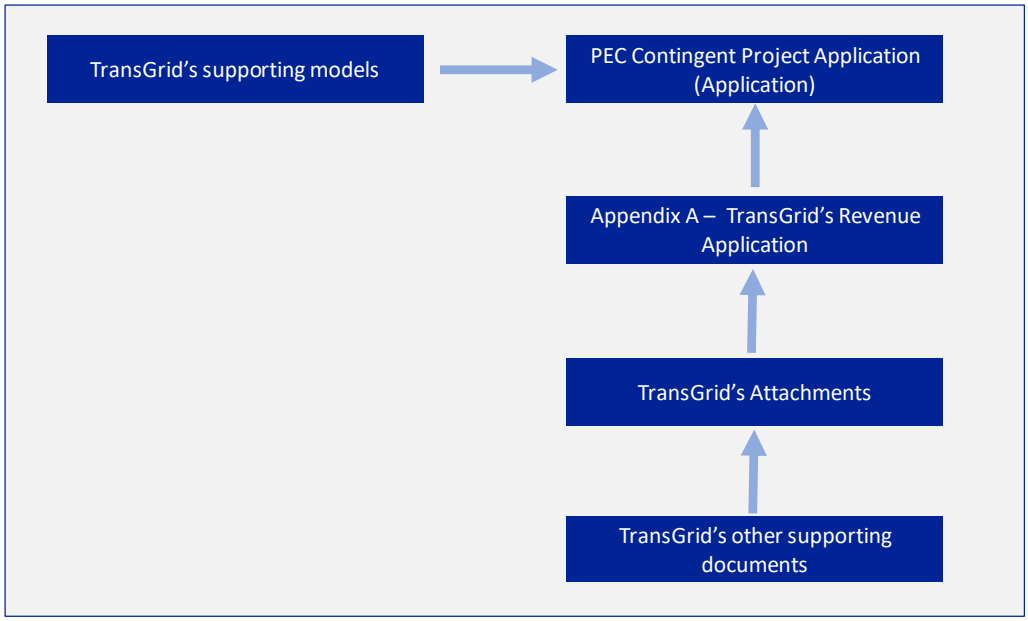
- section 3 describes the drivers of the difference between the PACR capex forecast and our current capex forecast
- section 4 overviews our investment framework
- section 5 overviews the processes that we used to procure tendered works
- section 6 explains our capex for tendered works
- section 7 explains our capex for property and easements
- section 8 explains our capex on corporate and network overheads (also referred to in this document as indirect capex)
- section 9 explains capex for risk events
- section 10 explains our real input cost escalations
- section 11 summarises our total capex forecast for PEC
- section 12 explains how our current capex for PEC has been verified and validated.

1.4 Structure of PEC Contingent Project Application Documents and Models

There are a number of other Attachments and models that support, and form part of, our Application for PEC. This document references these Attachments, models and other supporting documents for further detail and should be read in conjunction with all other documents comprising our PEC Application.

Our Application is structured as illustrated in Figure 1.1 to be as clear and accessible as possible to the AER, customers and other stakeholders.

Figure 1.1: PEC Application document structure



Attachments and supporting models comprising our Application are detailed in section 1 of the Application.

2. Summary of forecast capex for PEC

The total forecast capex for PEC in this Application is $2.3 billion to be undertaken over the remainder of the current regulatory period 2018-19 to 2022-23 (2018-23). Forecast capex for PEC is incremental to our business-as-usual capex and would not be incurred if PEC does not proceed.

Table 2.1 shows the capex for PEC by year and the total capex forecast of $2.3 billion.

Table 2.1: Forecast capex for PEC ($M, Real 2017-18, including overheads)

	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Total capex	23.5	64.5	776.3	843.1	583.6	**2,290.9**

2.1.1 Capex reflects status of current tender process

PEC is a large project with unique characteristics. It will be:

> the first interconnector to be built between any Australian states in 15 years, and

> a greenfield project where there has been no previous electricity infrastructure constructed (or construction occurred many decades ago), resulting in unknown environmental, biodiversity, geotechnical, land access and indigenous heritage risks.

The delivery of PEC is made more complicated because:

> there is currently significant demand for infrastructure delivery in the Australian market, particularly in NSW, leading to a shortage in available labour and construction resources, and

> government and other stakeholders have tight timing expectations.

These characteristics and delivery considerations present risks and uncertainties that need to be reflected in the capex forecasts for PEC.

We are committed to delivering the PEC at the lowest sustainable, whole of lifecycle cost to maximise benefits to customers.

We are using our best endeavours to forecast accurately the prudent and efficient capex of the Project. We therefore want as much of the forecast capex as possible to be market-tested. This will help to ensure that customers are paying no more than they should be for the services that they will receive.

At the time of submitting this Application, we are part-way through the tender process for the Project. The key milestones in this process are as follows. We:

> sent initial tender documents to the market on 3 October 2019

> received initial tender responses from five tenderers on 11 November 2019

> short-listed three tenderers for the next stage in December 2019

> issued final tender documents to the short-listed tenderers on 11 February 2020

> will receive final tender submissions and therefore binding offers on 29 June 2020

> intend to select a preferred tenderer by September 2020, and

> intend to execute a Commitment Deed in September 2020 and an engineering, procurement and construction (EPC) deed in December 2020, subject to receiving a satisfactory AER Determination on this Application.

Our capex forecast comprises:

> $1,826.8 billion (Real 2017-18) for tendered works. This capex reflects:
  - the average tender prices of the three short-listed tenders that we received on 11 November 2019 for substations and transmission lines, and
  - quotations from suppliers for the large specialist equipment, which we consider provides a more reasonable and realistic cost estimate than the tender prices, and
  - other construction costs not included in the current tender pricing. We are seeking to transfer these costs to the final contractor/s efficiently. However, we will not be able to transfer all of these costs to the final contractor/s and we will only know this once our tender process is complete
> $122.1 million (Real 2017-18) for project risks. These costs have been determined in accordance with the AER's risk cost methodology. The AER defines project risk costs as including both the cost of mitigating risks (mitigation costs) and the costs associated with bearing residual risks after mitigation (contingency costs), and
> $342.0 million (Real 2017-18) for other costs, including property and easements, corporate and network overheads (i.e. indirect costs), biodiversity offsets, real input escalators and equity raising.

Our current capex forecast is materially higher than the forecast that was included in the PACR. The reasons for the increase relate to refinements in both the project specification and the project costing as well as the risk and other construction costs arising from the greenfield nature of the project. These are discussed in section 3.

AEMO notes that, in relation to PEC, a "cost increase ... is not uncommon for a large project of this nature"[3]. AEMO's Final 2020 Integrated System Plan (ISP), which will be published shortly and will include PEC in its optimal development path, will reflect capex increases of about 30 per cent for transmission interconnector projects since the 2018 ISP.

We propose to provide additional information to the AER as it becomes available from our tender process during the second half of 2020. We expect to receive final tender submissions and binding offers from the three short-listed tenderers in late June 2020 and to select the preferred tendered by September 2020. We intend to provide the AER a revised capex forecast based on the final tender outcomes once this information is available. This will ensure that the capex forecast for the Project, and therefore our adjusted revenues and prices, reflect the best view of the market-tested costs that it will incur.

We therefore think it is in the long-term interests of consumers for the AER to continue to engage with us, and consumers, on this cost information as it becomes available. We encourage the AER to see this Application as providing the best estimate of our future costs at this point in time, albeit that they will be refined and improved during the second half of 2020, as the tender process is finalised.

2.1.2 Basis of forecast capex

We developed the capex forecasts based on a detailed scope of works using methods that reflect the specific nature of the costs, as shown in Table 2.2.

[3] AEMO, Minimum Operation Demand Thresholds, 19 June 2020, p.55. Found at Link

Table 2.2: Forecast capex for PEC by key category ($M, Real 2017-18)

Category of PEC capex	Description	Basis of capex forecast	Forecast capex	% of total capex
1. Tendered works	Substations and transmission lines, including access tracks	Forecast capex based on market pricing, including responses provided by tenderers and quotes from suppliers of large specialist equipment	1,315.2	57.4%
	Large specialist equipment		216.3	9.4%
	Other construction costs	Top-down assessment	295.3	12.9%
2. Property and easements	Property and easement acquisition and costs	Forecast capex based on project land prices and other costs associated with acquiring easements, including the cost of offsetting biodiversity and species loss	109.5	4.8%
	Environmental 'offset' costs		74.7	3.3%
3. Indirect costs	Corporate and Network overheads	Actual costs to March 2020 and forecast capex based on a bottom up-build of TransGrid's indirect costs, which have been determined using current available market rates and recent historical data.	122.4	5.3%
4. Risks	Biodiversity risk cost	Forecast capex calculated using the AER's risk cost methodology (detailed probabilistic risk assessment)	122.1	5.3%
5. Real input escalators	Real labour cost escalation	Forecast capex calculated by multiplying the projected labour components of forecast capex for tendered works, property and easements and indirect costs, by the real labour cost escalators approved in the AER's 2018-23 Revenue Determination for TransGrid.	15.5	0.7%
Subtotal (excluding equity raising costs)			**2,271.0**	
6. Equity raising costs	Equity raising costs	Forecast capex calculated using the AER's Post Tax Revenue Model	19.9	0.9%
Total capex			**2,290.9**	**100%**

Our capex forecast for PEC is prudent and efficient. This is demonstrated by:

> the rigorous, well-defined and transparent capex forecasting methodology set out in this document

> the application of our governance framework and process

> the reliance on market testing and expert reports, and

> external validation of both the capex forecast and deliverability.

3. Changes in the capex forecast since publication of the RIT-T PACR

The RIT-T PACR for PEC was published by ElectraNet on 13 February 2019. Since then work to firm up the project scope and specification, technical details and preferred design attributes has continued. Our Application contains our current capex forecast for PEC. The current capex forecast reflects information on the prudent and efficient costs of delivering PEC that was not available at the time of the RIT-T assessment.

This section explains the key drivers of the difference between:

> the initial capex forecast for PEC that we provided to ElectraNet

> the capex forecast published in the RIT-T PACR (PACR capex forecast), and

> the current capex forecast for PEC set out in this Application, which is based on the initial tender responses received on 11 November 2019.

3.1 Initial capex forecast for PEC - RIT-T PACR

For the purposes of the RIT-T PACR, we provided an initial capex forecast of $1.22 billion to ElectraNet in late 2018 (initial capex forecast). This forecast was a class 4 estimate[4] which did not account for route alignment, geotechnical considerations, substation configuration and market response.

ElectraNet adjusted our initial capex forecast of $1.22 billion to align certain assumptions between the two businesses. This resulted in a capex forecast of $1.15 billion ($2017-18) being published in the RIT-T PACR (PACR capex forecast) in February 2019.[5]

The PACR capex forecast for PEC was based on the information available at that time. Given the limitations and gaps in the available information, a number of simplifying assumptions were made:

> the specification of the new 330 kV line was based on a straight-line estimate of line length, ignoring any land use and other constraints, the impact of which could not be estimated with the information available at the time

> the specification of the new 220 kV line was based on a scaled down 330 kV tower design, because we did not have any current information on the installation of 220 kV assets

> the specification of reactive compensating equipment (synchronous condensers) and phase shifting transformers at Buronga was derived from manufactures' price lists

> minimal easement acquisition cost that did not account for landholder negotiations as this could not be estimated based on the information available at the time, and

> the PACR capex forecast did not include an allowance for environmental offset and other construction costs arising from greenfield nature of the Project as these were not adequately understood at the time of the PACR.

[4] A "Class 4" (under AACE International Recommended Practice and Estimate Classification) means that only 1% to 15% of project specifications are defined, resulting in a likely variation to final cost of between -30% to +50%.

[5] This value was reported in the PACR as $1.15 billion in 2018-19 dollars, however, the value was actually as at July 2018 which is treated for regulatory purposes as dollars as at June 2018 and so can be referred to as $2017-18.

3.2 Drivers of the change in the PEC capex forecast

The key drivers of the increase in the PACR capex forecast of $1.15 billion and the current capex forecast of $2.27 billion are shown in Figure 3.1.

These changes relate to the Project specification and costings as well as the risks and other construction costs arising from greenfield nature of the Project.

Figure 3.1: Key changes between PACR capex forecast and current capex forecast for PEC ($M, 2017-18)[6]

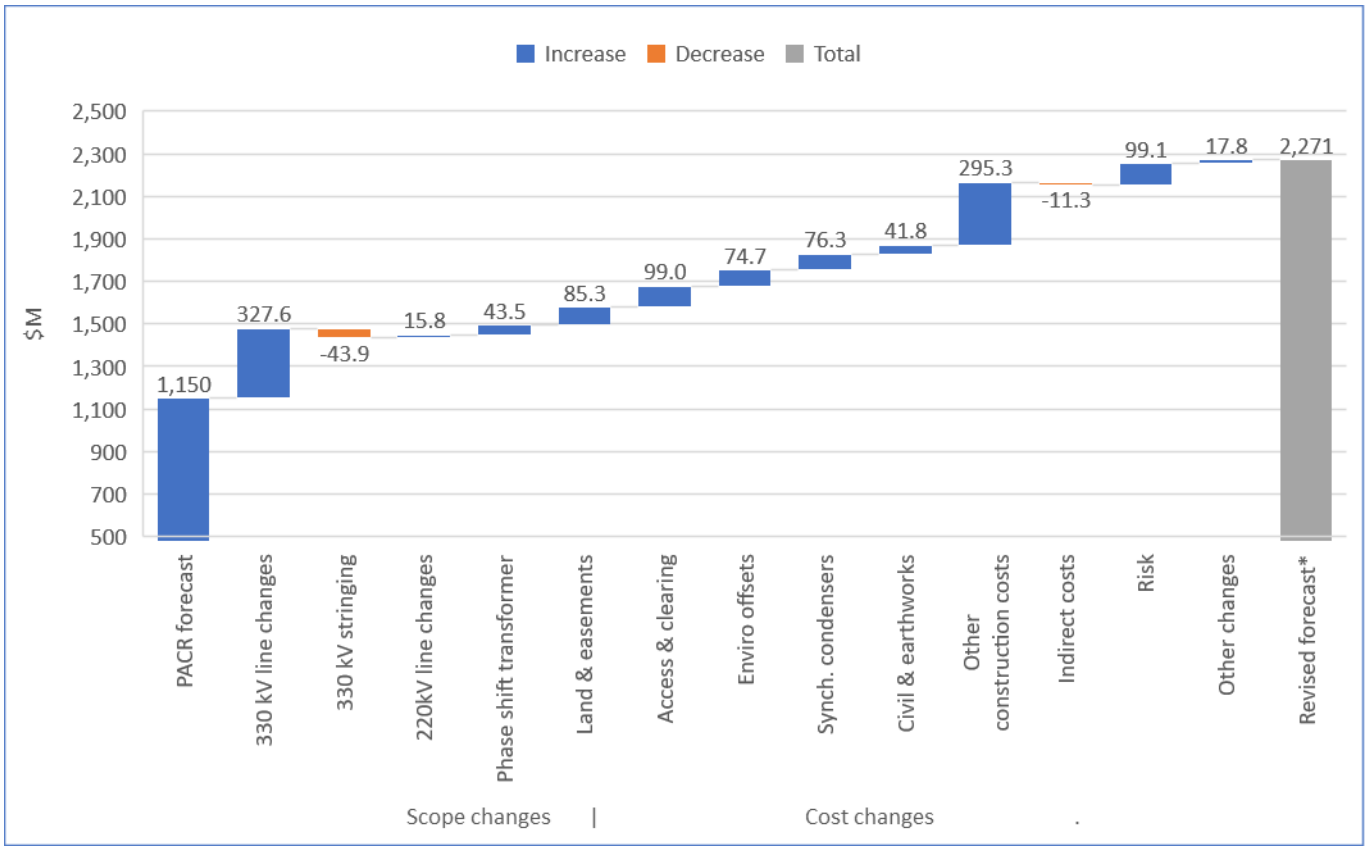


Figure 3.1 shows that the single largest increase in forecast capex for PEC is driven by changes to the standard 330 kV tower design to comply with the revised Australian Standard AS7000 (see section 3.3.1) and the inclusion of risk and other construction costs (see section 3.5.8). Each of the and the inclusion of risk and other construction costs.

3.3 Changes in forecast capex driven by initial changes to the specification

The PEC Scope and Specification Overview Paper, provided as an attachment to this Application, explains the changes to the Project's specification since the publication of the RIT-T PACR. As noted above, forecast capex in this Application is based on the tender prices received on 11 November 2019 (for substations and transmission lines) from the three short-listed tenders. These prices reflect the original route via Darlington Point as per the RIT-T PACR.

Subsequent changes to the specification, discussed in section 3.4, are not reflected in the initial tenderers' prices and are therefore not reflected in the forecast capex in this Application. Final tender submissions will provide prices for the updated project specification

[6] The changes to capex forecast are subject to final tender prices, except for land & easements, environmental offsets, indirect and risk/unforeseen costs. This excludes equity raising costs.

3.3.1 330 kV transmission line specification changes ($327.6 million increase)

Five interrelated changes have been made to the 330 kV line specification. We have reflected these changes in the current capex forecast. Forecast capex has also been updated to reflect market pricing. The combined impact of these changes has resulted in an overall increase in forecast capex of $327.6 million:

(i) Straight line route length - The straight-line route length from SA border to Buronga has been revised from 140 km to 135 km.

(ii) Line route deviations - The estimated volumes in the RIT-T PACR were based on a straight-line estimate of line length. An allowance for line deviations has now been included in the estimated volumes of towers and conductors. This has resulted in an increase of around five per cent in suspension structures.

(iii) 330kV tower structure design - A new standard for overhead construction design (AS7000) has now been incorporated in the project specification. This requires taller towers compared to those included in the RIT-T PACR.

(iv) 330 kV tower foundations - Stronger steel structures for taller towers require firmer foundations. We have increased the capex forecast for foundations proportionally to the increase in steel weights.

(v) 330 kV tower span change - The additional weight of each structure means that the distance (span) between towers can be extended. The average suspension tower design span has been increased from 400 metres to 500 metres, resulting in a reduction in the number of structures required.

We received tender prices for tower foundations and steelwork in November 2019. These tender prices are reflected in the current capex forecast.

3.3.2 330 kV tower stringing ($43.9 million decrease)

The increase in the average suspension tower design span from 400 metres to 500 metres mentioned above has reduced the overall tower stringing costs by $43.9 million.

3.3.3 220 kV structure refined ($15.8 million increase)

The PACR capex forecast for 220 kV towers was based on our standard 330 kV towers scaled down to suit an operating voltage of 220 kV. This design did not incorporate the current requirements of AS7000 with regard to conductor and ground clearances. We have now completed 220 kV monopole designs that incorporate overhead construction design required by AS7000. This has resulted in an increase in forecast capex for 220 kV structures. Our capex forecast for 220 kV monopoles is now based on tendered prices received through the tender process discussed in sections 5 and 6.

3.3.4 Revised PST specification ($43.5 million increase)

The PACR capex forecast included three 3-phase 330 kV to 220 kV phase shift transformers (PSTs) to be installed at the Buronga substation. The unit cost underpinning the PACR capex was $15 million ($2018-19) per PST. We do not have experience installing PSTs of this size and therefore based our PACR capex forecast on a high-level estimate from suppliers. This estimate reflected very little information on the asset specifications.

Due to the weight of transporting 3-phase PSTs on loading constrained roads to Buronga substation, we have revised the scope from three 400 MVA 3-phase transformers to nine single phase transformers.

3.4 Changes to forecast capex due to final changes in the specification

Changes to the Project specification made subsequent to receiving initial tender responses on 11 November are:

> a revised 330 kV line route between Buronga and Wagga Wagga via Dinawan, and

> a change to the 220 kV scope to include a double circuit line rather than a single circuit.

> replacing nine single phase transformers with five 200 MVA 3-phase transformers

These changes are discussed below.

The forecast capex for Tendered Works, including large specialist equipment, in this Application does not reflect these changes to the project specification. Final tender submissions will provide prices for the updated project specification. We intend to provide the AER a revised capex forecast for Tendered Works including large specialist equipment and other construction costs based on the final tender outcomes once this information is available.

3.4.1 330kV line route change (to be confirmed by final tender price)

The original route for the 330 kV line evaluated in the RIT-T was from Buronga to Wagga Wagga via Darlington Point, with reactive control equipment located at the existing Darlington Point substation. We now intend to adopt a revised route for the project that goes via Dinawan. Bypassing Darlington Point and constructing a new switching station at Dinawan is expected to:

> reduce the line length by approximately 9km

> reduce easement acquisition cost by bypassing the intensive irrigation zones around Darlington Point (negotiating suitable easements and access rights through the intensive irrigation zones around Darlington Point township would be difficult and time consuming), and

> lower project delivery risks through the reduced number of landholders (i.e. reduce the risk of delays to project delivery).

The cost savings are largely offset by an increase in access costs and the additional costs of land acquisition and construction of a new switching station at Dinawan (with reactive control equipment) rather than expanding the existing Darlington Point substation.

Accordingly, the impact on forecast capex is expected to be cost neutral, however will be confirmed by the tender price which will be based on the revised Dinawan route. The final tender price will be reflected in the updated capex forecast provided to the AER following completion of the tender process.

3.4.2 Change in 220 kV scope (to be confirmed by final tender price)

The initial scope was for a double circuit 220 kV line strung one side only to provide a capacity of 417 MVA. The current specification is based on stringing both sides with twin Paw Paw conductor providing 800 MVA capacity on each circuit and decommissioning the existing 220 kV line.

Additionally, the 330/220 kV transformer specification at Buronga has be revised from 2 x 400 MVA to 3 x 200 MVA transformers.

The impact on the forecast capex will be confirmed by the final tender price which will be reflected in the updated capex forecast provided to the AER following completion of the tender process

3.4.3 Revised PST specification (to be confirmed by final tender price)

Following initial specification of nine single phase transformers, it has been identified that potential savings can be achieved with five 200 MVA 3-phase transformers. This change in specification is expected to

decrease the PST costs and increase the cost of associated switchgear, bus and civil works, which is to be confirmed when final tender prices are received.

3.5 Changes to forecast capex due to updated cost information

Since publication of the RIT-T PACR in February 2019, we have reviewed and refined our capex forecast for PEC to ensure it reflects prudent and efficient costs required to deliver the project. This section sets out changes to the forecast capex since the publication of the PACR.

These changes reflect the revised route via Dinawan to the extent relevant, however, they do not reflect other changes to the final specification discussed in section 3.4.

3.5.1 Land and easement acquisition ($85.3 million increase)

For the purposes of the RIT-T, ElectraNet engaged a consultant (JLL) to provide indicative costs for land and easement acquisition for each of the proposed route options.[7] We have now assessed the required land and easements and the associated costs and reflected these in the current capex forecast. This is discussed in detail in section 7.

The land required to establish the new assets at Buronga has now been increased to accommodate future new connections. The need for this increase in land and was not recognised at the time of the PACR forecast. The additional forecast capex associated with the additional land is not material.

The revised route via Dinawan requires a switching station in the vicinity of Dinawan to enable the accommodation of the synchronous condensers and 330 kV switchyard for PEC and future new connections. The additional forecast capex associated with the additional land is not material.

3.5.2 Access and clearing costs ($99.0 million increase)

There are two key drivers for the increase in forecast capex for access and clearing. These are:

(i) Wider easement - As discussed in section 3.3.1 above, wider easement for 330 kV lines are required to accommodate the changes in tower structure design and span length. The requirement for wider easements has resulted in an increase in access and clearing costs.

(ii) Tender price adjustment - We have now received tendered prices for access and clearing. The current capex forecast reflects market pricing based on responses from tenderers.

3.5.3 Environmental offsets ($74.7 million increase)

Environmental offset requirements are based on the *Biodiversity Conservation Act 2016 (NSW)* and the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*. These Acts apply to the easements that need to be acquired for the PEC transmission lines. As noted above, the PACR capex forecast did not include environmental offset costs.

We have updated our capex forecast to include costs associate with environmental offset requirements. Section 7.6 explains how forecast capex associated with these requirements has been determined.

3.5.4 Increased cost of synchronous condensers ($76.3 million increase)

The PACR capex forecast included an estimate for two synchronous condensers at both Buronga substation and Dinawan switching station. A unit cost of $22 million ($2018-19) per synchronous condenser (based on

[7] ElectraNet, Cost Estimate Report, S5.9

limited supplier information) was included in the PACR capex forecast. We do not have experience with installing synchronous condensers of the size required for PEC.

We have updated our unit cost to be approximately $30 million per synchronous condenser and reflected this in the current capex forecast. As discussed in section **Error! Reference source not found.**, the updated unit costs are based on:

> quotes from suppliers of large specialist equipment, and

> ElectraNet's recent experience with the supply and installation of synchronous condensers of a similar size.

3.5.5 Civil and earthwork costs ($41.8 million increase)

There are two key drivers of the increase in forecast capex for civil and earthwork being:

(i) Buronga and Darlington Point substation earthworks ($16.9 million increase)

The PACR capex forecast included a minimal amount of $8.7 million for earthworks at Buronga substation and Darlington Point substation (now the Dinawan switching station). This forecast was based on standard earthworks of using a 'cut and fill' approach. Earthworks are required to raise the substation above severe flood levels and allow for proper draining at the site. A cut and fill approach is a cost-effective construction method that uses nearby elevated earth as the source for the materials, thereby cutting down on transportation costs.

Since the PACR was published we have examined whether a cut-fill approach is possible. This analysis has found that that the surrounding land is very flat, limiting opportunities for a cut and fill approach which relies on elevated land nearby. This means that fill would need to be transported to Buronga and Darlington Point substations. We have therefore modified the civil works to reduce the amount of fill required by using a corrugated surface approach.

We have now received non-binding tender prices for civil works and have reflected these prices in our capex forecast. Based on these tender prices, the additional civil and earthworks at Buronga and Darlington Point substations have resulted in an increase of approximately $16.9 million in the capex forecast for PEC.

(ii) Civil works associated with PST and synchronous condensers ($26.6 million increase)

As discussed in section 3.3.4, due to the weight of transporting a 3-phase PST on loading constrained roads to Buronga substation, we have revised the scope from three 3-phase 400 MVA transformers to nine single phase transformers.

We have now updated the cost of the civil works associated with the synchronous condensers and PST. This results in an increase of $26.6 million in our forecast capex for PEC.

3.5.6 Other construction costs ($295.3 million increase)

Other construction costs are those costs that we expect to incur in the construction of PEC, but that are not currently included in the tender prices received to date. We are seeking to transfer these costs to the final contractor/s efficiently by including them in the final contract/s price or as a variation to the final contract/s price.

These costs, as set out in section **Error! Reference source not found.** include:

> Scope Development - design, development and specification risk of large specialist equipment (synchronous condensers and phase shift transformers)

> Remote area operation and logistics

> Adverse geotechnical conditions

- Tower spotting and micro-alignment
- Ecology, Indigenous and non-indigenous cultural heritage
- Contaminated soils
- Land access delays and disputes
- Commissioning and interface risks
- International Labour Mobilisation and Training.

3.5.7 Indirect costs (network and corporate overhead costs) ($11.3 million decrease)

The PACR capex forecast for indirect costs (i.e. network and corporate overhead costs) was derived using a top-down-estimate approach based on assumed rates per km of transmission line. We have now undertaken a detailed bottom-up build of indirect costs. This reflects current available market rates and recent historical data (up to March 2020) and is explained in section 8.

3.5.8 Risk costs ($99.1 million increase)

The PACR included a nominal amount of $22.9 million for risks, which were not specifically identified. Project risks event costs have now been included and are explained in section 9.

3.5.9 Other changes ($17.8 million increase)

The remaining $17.8 million increase is the aggregate of small changes of less than $10 million in the tender prices compared to the PACR cost estimate across numerous cost items.

4. Our investment framework

This section overviews our investment framework.

We consider our forecast capex for PEC is prudent and efficient. As discussed in section 3, we undertook further work since the publication of the PACR in February 2019 to refine the key assumptions underpinning the PACR capex forecast in order to reflect more up-to-date and accurate information. Our governance arrangements support optimised investment decisions.

The forecast capex for PEC:

> supports our corporate objectives (i.e. provides line-of-sight between those objectives and the capex forecast)

> has been subject to appropriate capital governance

> has been developed from a well-defined capex forecasting process, and

> reflects competitive, market-tested costs (i.e. competitive bids from contractors/suppliers).

These are discussed in the following sections.

4.1 Aligned with corporate objectives

The capex forecast has been developed in-line with our vision and values to meet the needs of our customers to provide safe, reliable and efficient transmission services.[8] We have the following four overarching objectives in relation to the delivery of PEC:

> deliver value for money

> effectively manage risk to prudently and efficiently deliver PEC

> deliver a fit for purpose asset that can be safely and efficiently operated over its design life, and

> continue a strong focus on safety.

Each of these overarching objectives is discussed below.

4.1.1 Value for money

Value for money is achieved by ensuring that the works are no more than is required to meet the need and that project costs are efficient. This is demonstrated by maintaining a rigorous capital governance processes (see section 4.3) and ensuring project efficiency.

The PEC “Specification and scope description document”, provided as an attachment to this Application, explains why we consider the scope and specification for PEC to be efficient.

4.1.2 Managing risk

Risk management is a critical aspect of PEC. This is because the scale and complexity of PEC increases construction and delivery risks significantly compared to business-as-usual capex. Our approach to risk management is aligned with our risk appetite. Our Risk Appetite Statement states that we have[9]:

[8] TransGrid, https://www.transgrid.com.au/who-we-are/about-us/mission-vision-values/Pages/default.aspx

[9] TransGrid, 2019, TransGrid Risk Appetite Statement, pg. 3 and 4.

- an overall medium risk tolerance across all business areas and functions, which requires the identification of risk treatments for any risk that is rated “High” or “Extreme”, and
- different levels of risk appetite for each key area such as very low risk appetite in relation to safety, moderate risk appetite in relation to prescribed growth activities and low in relation to regulatory compliance.

Risk costs are further discussed in section 9.

4.1.3 Delivering a fit-for-purpose asset

PEC is a large capacity interconnector between the existing power grids in South Australia (SA) and New South Wales (NSW). As such, it can impact on security of supply in both states. Additionally, it is a large asset that carries operational risks. To ensure PEC is a fit-for-purpose asset, we have:

- incorporated the outcomes of an engineering study on the transient stability in the design of PEC[10]
- applied the relevant Australian and international standards in the specification of all materials and equipment required to deliver PEC
- applied our Safety in Design procedure (D2012/14473) to the design of new assets for PEC
- engaged qualified external parties to verify key aspects of the design and its implementation (see section 12), and
- included appropriate protection, control and communications in the specification and scope of PEC.

We have undertaken design activities to inform the scope and technical requirements of PEC. The optimal design of PEC has been determined based on the current competitive tender process. Our procurement process requires tenderers to determine the optimal design for PEC, subject to our overall design and safety requirements.

4.1.4 Safe work practices

Safety remains our first and highest priority for our staff, contractors, customers and the public. All of our policies and safe work practices apply to PEC. Due to a helicopter fatality in SA in 2019, we have made changes to our work practices on the use of helicopters around towers. We have introduced a ban on the use of helicopters to string conductors, to improve the safety for our staff, service providers and the general public. This ban applies to PEC.

4.2 Indigenous people engagement

PEC is our first Major Project in development since the inception of its Reconciliation Action Plan (**RAP**). After launching its Innovate RAP in February 2020, we implemented an Aboriginal and Torres Strait Islander Engagement and Participation Strategy for Major Projects and engagement with Aboriginal communities on PEC is supported by both initiatives.

The PEC project team has traversed approximately 700 kilometres of Aboriginal land and has engaged with Aboriginal Elders, eight Local Aboriginal Land Councils, twelve nations (or language groups) as well as members from Native Title, Aboriginal Affairs and National Indigenous Australians Agency. Aboriginal community groups and stakeholders include the following:

- Dareton Local Aboriginal Land Council
- Native Title Broken Hill

[10] ElectraNet, June 2018, SAET-RIT-T-Network Technical Assumptions

- Barkindji Traditional Owners
- Balranald Local Aboriginal Land Council
- Barkindji Maraura Elders Environment Team
- Latje Latje Traditional Owners
- Hay Local Aboriginal Land Council
- Taru-Maraura Traditional Owners
- Kureinki Traditional Owners
- Deniliquin Local Aboriginal Land Council
- Barkindji-Maraura Elders Council
- Nari Nari Traditional Owners
- Griffith Local Aboriginal Land Council
- Lake Victoria Advisory Committee
- Wiradjuri Traditional Owners
- Cummeragunja Local Aboriginal Land Council
- Riverina Murray Regional Alliance
- Wadi Wadi Traditional Owners
- Narrandera Local Aboriginal Land Council
- Barkandji Native Title Group Aboriginal Corporation
- Yorta Yorta Traditional Owners
- Wagga Wagga Local Aboriginal Land Council
- Aboriginal Affairs
- Dadi Dadi Traditional Owners
- NSW Aboriginal Land Council
- National Indigenous Australians Agency
- Madi Madi Traditional Owners

We are committed to developing long-lasting relationships based on respect and mutual understanding. Through a lens of genuine positive engagement, we have worked with Aboriginal communities to enhance our cultural awareness and recognise the significance of the connection to Country. Project activities undertaken in consultation with Aboriginal community groups and Traditional Owners during the development phase include:

- preliminary introductions, meetings and project consultation
- undertaking field surveys identifying any constraints corridor and route identification
- construction pre-clearance surveys for geotechnical investigations
- registrations of Interest for Registered Aboriginal Parties
- EIS field studies for Aboriginal cultural heritage impacts
- TransGrid cultural awareness and on Country inductions.

The construction of PEC is a rare opportunity to positively impact Aboriginal communities as the route passes through their Country. As such, we are committed to capacity building and working with Aboriginal communities. Our commitment will be embedded in our delivery contract – the successful contractor/s will be required to spend a minimum of 2.5 per cent of the contract spend on Aboriginal owned businesses and Aboriginal employment and training across the entire supply chain. The successful contractor/s will also be responsible for developing and implementing an Aboriginal Participation Plan and will be required to commit at least 30 per cent of its/their minimum target spend on direct employment with its own project team (at least 30 full time jobs for Aboriginal and Torres Strait Islander people).

4.3 Appropriate governance framework

We have well-defined governance practices, inclusive of decision gates, which are documented in the Prescribed Network Capital Investment Process document. These practices are applied to business-as-usual capital projects that form part of the overall portfolio of capital projects in a five-year regulatory reset period (business as usual capital portfolio).

We have a separate capital portfolio for Major Projects (i.e. Group 1 and 2 Integrated System Plan (ISP) projects).[11] These Major Projects are larger and more complex than business as usual capital projects. We have tailored our governance framework for these Major Projects so we are confident that we are making prudent and efficient investment decisions that will deliver satisfactory and sustainable returns on our assets in a compliant, safe and sustainable manner. This governance structure is applied to all Major Projects, including PEC.

The key principles underpinning our Major Project Governance Framework are to:

> provide consistent and rigorous approach to investment decisions

> ensure appropriate level of management scrutiny

> demonstrate to the Board, securityholders and key stakeholders that the forecast capex is efficient and prudent, and

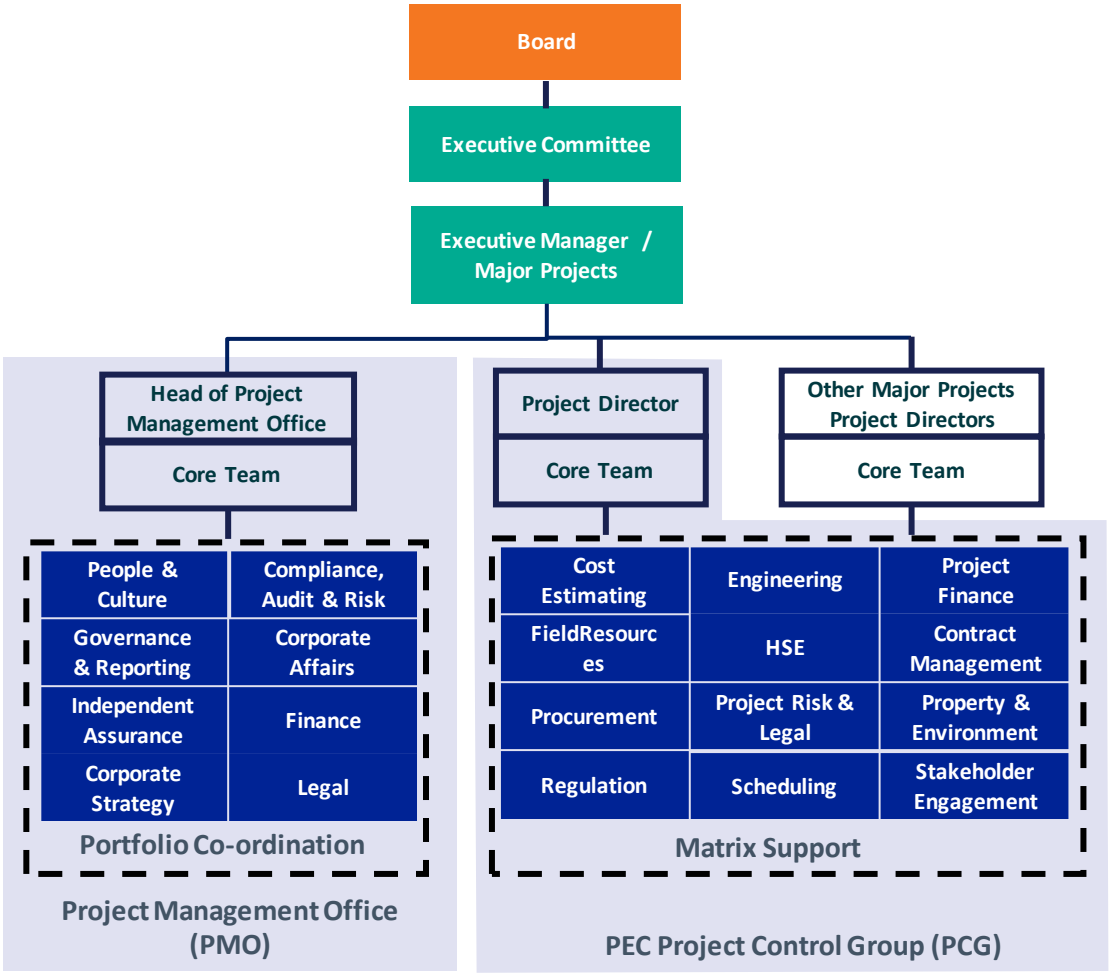
> ensure that all investment accords with TransGrid's compliance obligations and regulatory requirements.

4.3.1 PEC Governance Framework

PEC is governed in accordance with the Major Projects Governance Framework shown in Figure 4.1, which details the hierarchy of decision making and membership that support PEC.

[11] Published by the Australian Energy Market Operator (AEMO)

Figure 4.1: Major Projects Governance Framework



We will periodically review our Major Projects Governance Framework, which is overseen by the Chief Executive Officer (CEO) and the Board.

4.3.2 Executive Committee

The Executive Committee comprises our full Executive Management Team (EMT) and is chaired by the CEO. The Executive Committee meets monthly, is accountable to the Board and is responsible for overall management of TransGrid.

The Executive Committee provides oversight and strategic direction on all Major Projects, including PEC. This oversight and direction ensures that investment in Major Projects is prudent and efficient. Areas of focus include approving the governance structure, reporting cadence and enabling the availability of functional resourcing through matrix support arrangements.

The Executive Manager of Major Projects is a member of the EMT and is the Executive Sponsor for all Major Projects, including PEC. The Executive Manager of Major Projects is accountable for the successful completion of Major Projects, ranging from concept development through to commissioning and handover to the operations group. The position has delegated approval from the Board and Executive Committee to manage the strategic and operational activities required for project completion.

4.3.3 Portfolio Management Office

The Major Projects Portfolio Management Office (PMO) is accountable for governance, reporting and co-ordination across the Major Project capital portfolio. This ensures reporting consistency and that risk and benefits are managed on a whole of portfolio basis. The Head of PMO reports directly to the Executive Manager of Major Projects.

4.3.4 PEC Project Control Group

The Project Control Group (PCG) manages the tactical and day to day operational activities required to deliver PEC in accordance with the governance and reporting framework agreed by the Executive Committee. The group meets weekly and is led by the Project Director of PEC, who reports directly to the Executive Manager Major Projects.

The Project Director is supported by a small core team of project specific technical, commercial, administrative and project management staff. Functional expertise to deliver specific project activities is provided from the wider business, through the matrix support structure.

Functional responsibilities represented within the PCG include:

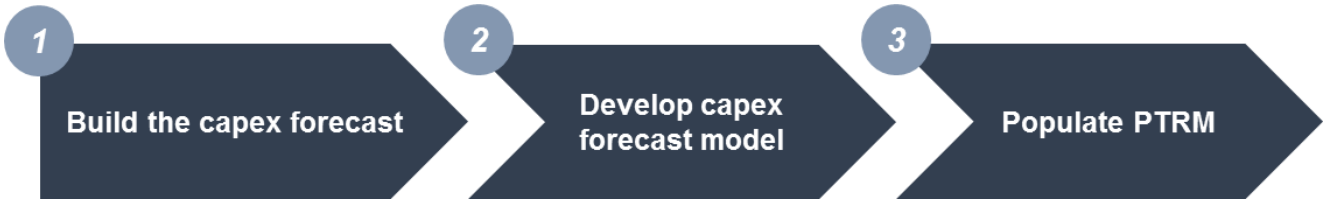
- project management, which is responsible for managing and co-ordinating project activities to efficiently deliver project tasks to the agreed scope, program and budget. This includes project scheduling, expenditure forecasting and reporting, and analysis of risk to mitigate the likelihood of undesirable outcomes from being realised.
- health, safety and environment (HSE), which is responsible for establishing and overseeing HSE process and procedures, as well as auditing the resulting performance.
- finance and regulation, which is responsible for managing the financial performance of PEC including cost budgeting and variance reporting, as well as ensuring TransGrid addresses all of its regulatory compliance obligations.
- engineering, which is responsible for the engineering technical input into the project including in relation to power systems planning, design, operations and asset management, and cost estimating.
- environment and property, which is responsible for managing the environment and land access approvals necessary to enable project construction and future operations and maintenance activities.
- corporate affairs, which is responsible for fully understanding and responding to our customers' and other stakeholder' (Governments, market bodies, communities and land owners) needs and expectation and keeping them informed throughout the process.
- procurement, which is responsible for supply chain management and contract administration during the delivery phase of works.
- construction, which is responsible for ensuring site works are appropriately planned and executed in accordance with HSE and operational requirements.

4.4 Well defined capex forecasting process

Our capex forecasting process for PEC is based on three steps as set out in Figure 4.2. These steps are:

- build the capex forecast
- develop the capex forecasting model
- populate the Post Tax Revenue Model (PTRM).

Figure 4.2: PEC capex forecasting process



The PEC capex forecasting process followed a similar process used for business-as-usual capital projects, with certain changes to account for the size and complexity of PEC:

> Step one – Build the capex forecast

- prices obtained through tender processes have been used instead of historical costs from our cost estimating database
- a bottom-up-build of indirect costs (network and corporate overhead costs) has been developed instead of applying historically derived percentage values from our cost estimating database, and
- site specific advice from consultants (Douglas Partners) on geotechnical considerations, easement and land acquisition and environmental offsets has been sourced to inform the capex forecast.

> Step two – Develop capex forecast model

A PEC Capex Summary and a PEC Capex Forecast Model (linked spreadsheets) have been developed to record the cost inputs, align costs to a common reference year and group the costs into a format suitable for input into the PTRM. This replaces the business-as-usual approach of using the Capital Accumulation Model, which would have required a significant revision to input outcomes from the tender process and to account for the new asset class for synchronous condensers. The PEC Capex Forecast Model, like the Capital Accumulation Model, allocates capex costs across years and regulatory asset classes and applies real input cost escalation.

> Step three – Populate the PTRM

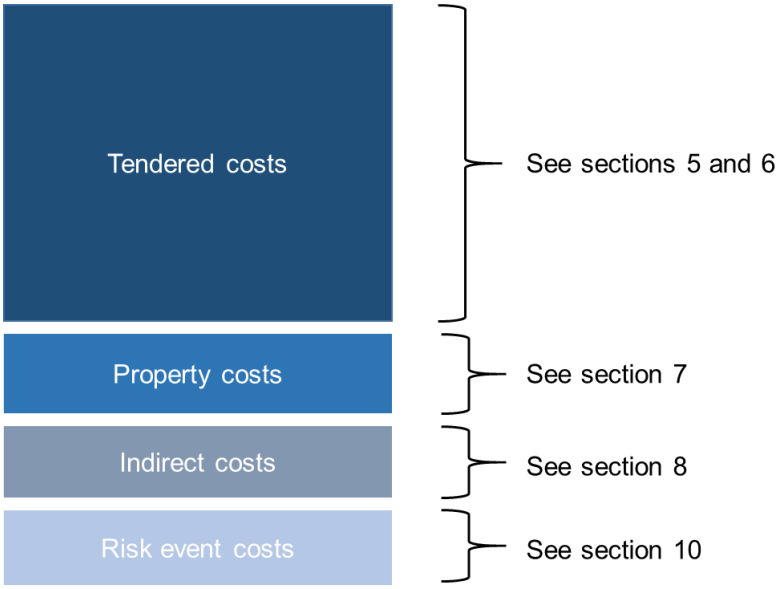
The PTRM is populated from the PEC Capex Forecast Model rather than the Capital Accumulation Model.

The remainder of this section is dedicated to detailing each step of the PEC forecasting process.

4.4.1 Step one – Build the capex forecast

The PEC Capex Forecast Model sets out the four key capex categories shown in Figure 4.3. Forecast capex for each category has been determined based on tender outcomes or using a bottom-up build.

Figure 4.3: PEC capex building blocks



Tendered works

Our historical costs stored in our cost estimating database are not relevant or applicable to PEC due to its scale, complexity and uniqueness. A tender process has therefore been undertaken to obtain current market prices that are a true reflection of the cost to construct and deliver PEC. The scope of the tender was based on the "Specification and Scope description for Project EnergyConnect" provided as an attachment to this Application. The procurement strategy and tender process is set out in section 5.

Forecast capex for tendered works is based on the outcomes from the tender process outlined in section 6. It also includes top down estimates for other construction costs that are currently not included in the current tender pricing. We are seeking to transfer these items to the final contractor/s efficiently by including them in the final contract/s price or as a variation to the final contract/s price.

Property costs

Historical property and easement costs in our estimating database are not relevant or applicable to PEC due to its scale, complexity and uniqueness as well as the site-specific nature of property costs.

We have therefore engaged expert consultants (Jones Lang LaSalle (JLL) and WSP) to provide advice and reports on property, easement and biodiversity costs for PEC. Section 7 explains and justifies how we have developed the forecast capex for property and easements using a bottom-up build approach.

Indirect costs

Normally, forecast indirect capex is determined by the Success estimating database as a percentage mark-up on the total project capex (i.e. using the design cost factor (DCF) and the network cost factor (NCF)). The DCF and NCF reflect historical projects and are therefore not expected to provide an accurate forecast of indirect costs for PEC given its scale, complexity and unique nature. A bottom-up build has therefore been used to determine forecast indirect capex. We have used the NCF and DCF to validate the bottom-up build.

Section 8 explains and justifies the forecasting methodology for indirect costs.

Risk costs

Forecast capex for risk associated with PEC has been determined in accordance with the AER's risk cost methodology. The AER defines project risk costs as including both the cost of mitigating risks (mitigation costs) and the costs associated with bearing residual risks after mitigation (contingency costs). The AER's

methodology involves using a detailed probabilistic risk assessment. Section 9 explains and justifies how we have developed the forecast capex for risks.

The prudence and efficiency of our capex forecast and forecasting methodology for PEC has been externally validated. An independent expert report from GHD is provided as attachment to this Application. Section 12 provides further details on the independent validation of the capex forecast for PEC.

4.4.2 Step two – Develop capex forecast model

The PEC Capex Summary and a Capex Forecast Model (linked spreadsheets) allocate the capex forecast from step one across years and regulatory asset classes, and apply escalation. The Capex Forecast Model adheres to the same principles as the Capital Accumulation Modes used for business-as-usual capital projects. The PEC capex forecast from step one was split by:

> financial year (project cash flows)

> regulatory asset category, and

> commodity type (real input cost escalators was applied to labour only).

The PEC capex forecast model groups forecast expenditure into the regulatory asset classes approved in the AER's 2018-23 Revenue Determination for TransGrid. A new regulatory asset class was added for 'Synchronous Condensers (2018-23)'. The asset classes relevant to PEC are shown in Table 4.1.

Table 4.1: Asset classes relevant to PEC

Asset class	Impacted by PEC
Transmission Lines (2018-23)	Yes
Underground Cables (2018-23)	No
Substations (2018-23)	Yes
Secondary Systems (2018-23)	Yes
Communications (short life) (2018-23)	Yes
Business IT (2018-23)	No
Minor Plant, Motor Vehicles & Mobile Plant (2018-23)	No
Transmission Line Life Extension (2018-23)	No
Land and Easements	Yes
Synchronous Condensers (2018-23)	Yes

The AER approved real materials and labour cost escalators as part of the current 2018-23 Revenue Determination. For labour, this is the simple average of forecasts provided by Deloitte Access Economics and BIS Oxford Economics. The AER approved real material cost escalation rates of zero. Accordingly, materials are only escalated by inflation. The Application applies real input cost escalation as discussed in section 10.

The outputs from the Capex Forecast Model was in a format suitable for input to the PTRM

4.4.3 Step three – Populate the PTRM

The PTRM is populated from the PEC Capex Forecast Model rather than the Capital Accumulation Model.

5. The procurement process for tendered works

The nature of a procurement process can impact the ability to leverage synergies and establish efficient cost structure and therefore impact the prudence and efficiency of the total cost of delivering a project. This section provides a summary of the procurement process for PEC. It provides:

> a high-level overview of the PEC procurement process

> a summary of the preparatory work undertaken in early 2019, before the formal tender process commenced, and

> a summary of the formal tender process, which is currently underway.

It should be read in conjunction with the more-detailed procurement documents being submitted with the Application:

> EnergyConnect Tender Evaluation Plan, November 2019

> EnergyConnect Tender Evaluation Report

> Rider Levell Bucknall, Project EnergyConnect Tender Evaluation Report, and

> O'Connor Marsden & Associates, Probity Report.

In addition, GHD has provided an independent review of the procurement process.

5.1 High-level overview of the procurement process

We have appointed two external procurement specialists to assist with developing and applying the procurement process for PEC. Specifically:

> the Calcutta Group has been engaged to fulfil the role of Transaction Manager and oversee the data room, and

> the MBB Group has been engaged to support the procurement project team with a focus on document drafting and preparation.

Both parties are well-experienced in procurement for large infrastructure projects like PEC and complement our internal procurement team. Throughout this document the relevant procurement personnel across the Calcutta Group, the MBB Group and TransGrid are referred to as the 'PEC procurement team'.

We have also engaged O'Connor Marsden & Associates as an external probity adviser to assist our legal team and ensure the integrity of the procurement process.

The PEC procurement team has developed a procurement process comprising two key stages, namely:

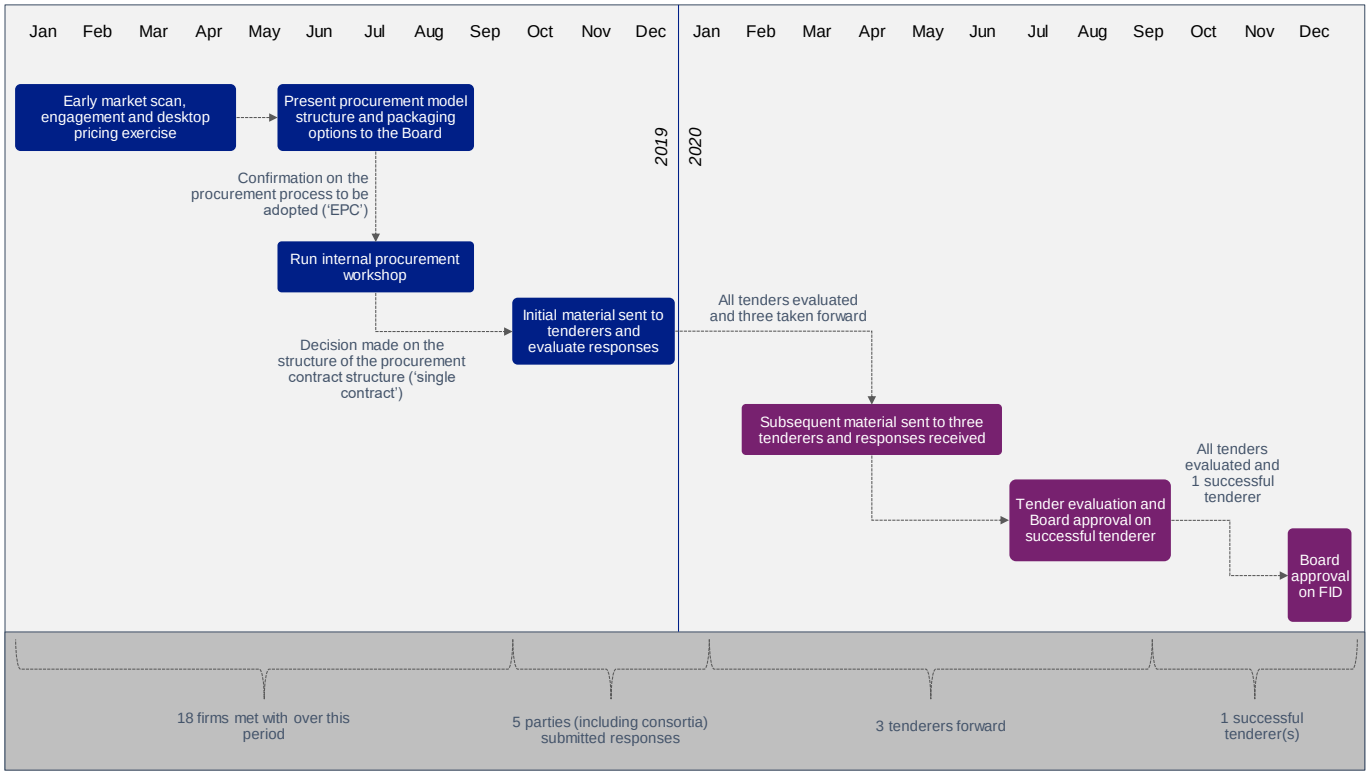
1. the initial preparatory tasks before the formal tender process commences, which includes a significant market sounding exercise, and
2. the formal tender process, which is designed to test capability, capacity and experience of tenderers and include pricing information.

The formal tender process is designed to be an interactive process and will result in the submission of binding tenders on 29 June 2020. Following the evaluation and clarification process, we anticipate that the successful tenderer will enter into a Commitment Deed with TransGrid by September 2020. The Commitment Deed will set out the terms of the EPC Deed to be entered into pending regulatory approvals and the final investment

decision (FID) by our Board. Our Board will make a FID subject to a satisfactory alignment between the AER's determination on this Application, the contract sum and our subsequent risk exposure. In the affirmative, contract execution with the preferred tenderer is expected to occur by the end of 2020.

Figure 5.1 summarises the key stages to the PEC procurement process, ahead of the expected FID. Each stage is covered in more detail in the following sections.

Figure 5.1: Key stages to the PEC procurement



In addition to the key steps summarised above, we held a number of interactive sessions and health checks with parties over October 2019 and April / May 2020 to test ideas and concepts. The interactive sessions provide opportunities for the tenderer to provide us with feedback on the design and construct ('D&C') package as well as other technical and commercial issues.

The key objectives of these interactions include:

> enabling tenderers to better understand issues affecting the D&C package and their tenders

> facilitating the transfer of information between us and tenderers

> enabling tenderers to advise us of their requirements, and

> providing equal opportunity for tenderers to communicate interactively with us.

Debrief meetings chaired by the PEC Project Director were held with members of the PEC project team after each interactive session. Details of these sessions are set out in the Rider Levell Bucknall "EnergyConnect Tender Evaluation Report" provided as an attachment to this Application.

Interactive sessions were conducted with each tenderer separately. Confidential information provided by a tenderer at, or in connection with, an interactive session between us and a tenderer is treated as confidential and will not be provided to other tenderers, unless we obtain the tenderer's written approval to do so.

All discussions during the interactive process are for the tenderer's information only, meaning that the overriding rule of engagement is that neither party can rely on anything said in the interactive sessions.

The PEC procurement team has developed a Tender Evaluation Plan (TEP) that sets out the guidelines, processes and procedures to evaluate tenders and ultimately identify a preferred tenderer. The TEP relates to the period from the tender close date to the recommendation of a preferred tenderer. The purpose is to:

> provide uniform evaluation processes and procedures

> ensure all tenders are evaluated fairly, and

> ensure that no tenderer is given an unfair advantage.

Tenders will be evaluated according to the TEP by an evaluation team comprised of the following proposed membership:

1. evaluation panel
2. tender review teams consisting of tender reviewers
3. specialist advisors, and
4. observer panel.

The roles and responsibilities of the evaluation team are described in the TEP.

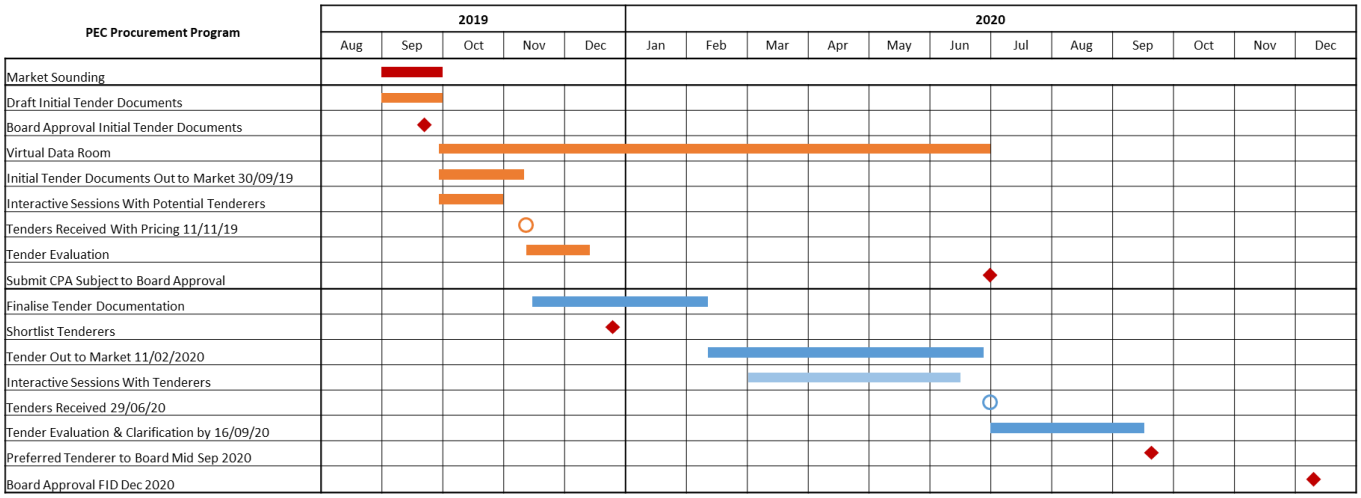
Recommendations from the evaluation team will be decided by the appropriate governance group, either an evaluation panel (with TransGrid Executives) or our Board.

The TEP is provided as an attachment to this Application.

5.2 Tender timeline

Figure 5.2 provides a detailed timeline for the PEC procurement process, which includes the various interactive sessions.

Figure 5.2: Tender program



Notes: The Large Specialist Equipment (LSE) portion of the contract program will be driven by the time required to finalise the LSE technical specification. This will be influenced by the result of network transient studies to be undertaken in conjunction with ElectraNet.

5.3 Preparatory work before the formal tender process

Over the first half of 2019, the PEC procurement team undertook two key sets of preparatory tasks, each of which is summarised below.

5.3.1 Early market scan, engagement and desktop pricing exercise

In early 2019, we conducted an initial market engagement and a desktop pricing exercise. Information was sought from the market detailing our five-year capital program.

This process involved approaching the members of our existing Construction Services panel (i.e. the Australian-based contractors we typically use to deliver our capital program) as well as a range of new potential contractors in Australia and overseas, because of the resources required to implement PEC. This process also involved approaching parties who are primarily civil engineering firms (since a large proportion of PEC's contract value relates to civil works) and may not ordinarily bid for work like PEC.

Building on this early market engagement, a further stage of intensive market sounding has been undertaken aimed at broadening the group of potential contractors and building interest for PEC outside of the contractors we typically use.

This market sounding involved one-on-one meetings to:

- update participants on our strategy, timetable and elicit participants' appetite and issues
- assist us to further understand participants' potential interest, capability, capacity and demonstrable experience delivering projects of a similar size and complexity to PEC, and
- test the emerging strategy around packaging, risk allocation and process.

Results of this initial process were reported back to our Board in September 2019, prior to the formal tender process commencing.

In total, this initial preparatory stage involved the identification of, and communication with, eighteen parties who could potentially tender for PEC.

5.3.2 Procurement model structure and packaging options

We have considered three procurement options for PEC, namely:

1. Engineer, Procure & Construct ('EPC') delivered by one contractor or consortium
2. Alliance, and
3. multiple packages delivered by at least three separate contractors with high level of technical input from us ('Business-as-usual Plus').

We evaluated each option using an assessment framework that looked at cost certainty, risks, timeliness, revenue adjustment mechanisms and other 'value drivers'. Based on the analysis carried out, it was determined that the EPC procurement model is the optimal procurement model structure.

A procurement workshop was held on 31 July 2019 to assess the relative capital cost and risks of the different contracting options. This workshop identified four packaging options within an EPC model based around one or two main contracts:

- single contract – Civils, Lines & Substations (CLS) + Large Specialist Equipment (LSE)
- two contracts – CLS + LSE
- two contracts – Transmission Lines + Substations (including LSE), and
- two contracts – geographical split at Buronga.

While it is acknowledged that the project may be split into more than two packages, the primary purpose of this exercise was to explore the strategic choices around packaging, and emphasis was given to the need to minimise interface and integration risks.

We evaluated each contracting option using an assessment framework similar to that used to determine that EPC is optimal and has resulted in a single contract being considered the best option.

5.4 The formal tender process

The PEC formal tender process is currently underway and is designed to test capability, capacity and experience of tenderers and include pricing information.

The initial stages of this process are intended to:

> define our expectations and requirements in relation to the relevant package

> allow the market to devise solutions and/or form joint ventures/consortia

> assess tenderers' capability, experience and capacity in relation the scope of works and services required

> enable tenderers to demonstrate their understanding of the scope of the project and range of issues, risks, challenges to be managed and present opportunities that may exist

> gain further feedback on the proposed project in general, commercial model and risk allocation, and

> provide us with a basis for shortlisting tenderers.

Eleven of the eighteen parties interacted with as part of the early preparatory stage outlined above actively registered their interest to submit to the formal tender process.

To ensure consistency in tender responses and facilitation of the subsequent tender evaluation, we developed well defined returnable schedules that tenderers had to complete in order to be a compliant tender response. We translated the project specifications (i.e. PEC components and associated volumes) into one of these schedules. Other schedules required responses on other aspects such as unit rates for labour and non-labour components and payment schedules.

On 27 September 2019, tenderers were provided secure access to an internet information portal separate from our existing e-tender platform (the 'data room'), from which they can access and download tender documentation and all related documents (there were seven separate returnable schedules tenderers needed to provide). Tenderers were able to submit questions as part of the data room, which the PEC procurement team also answered and shared with all tenderers through the data room, where appropriate. Ongoing management of the data room is carried out by the PEC procurement team.

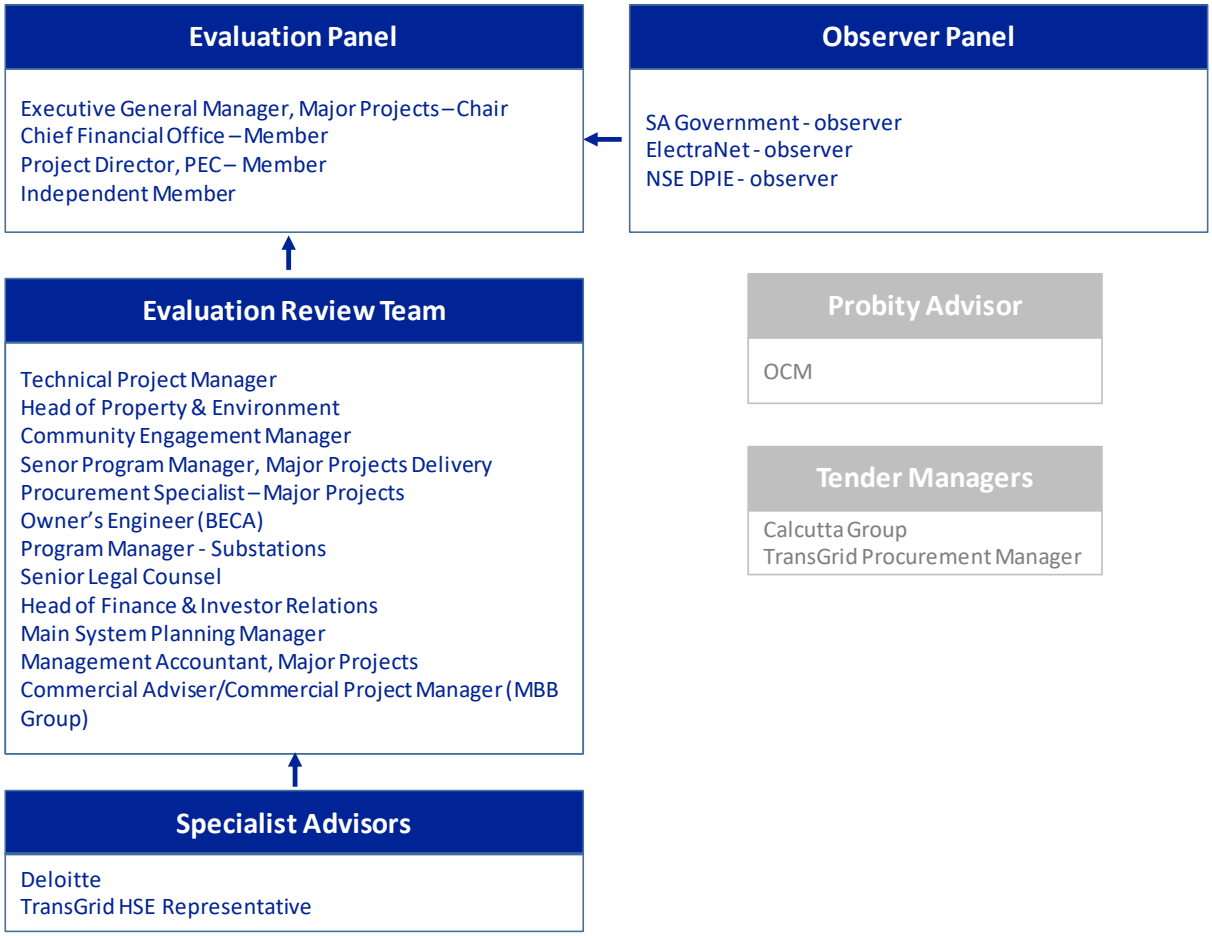
Six separate parties (which include consortia) were provided the tender 'returnable schedules' via the data room. Five of these parties ultimately submitted complying tenders by the due date of 11 November 2019.

We formed a tender evaluation team to assess the responses to the RFT for the design, construction and connection for the substation and transmission line work for PEC. The tender evaluation team comprised the evaluation panel, evaluation review team and Specialist advisors. The observer panel included observers from the South Australian Government, ElectraNet and the NSW Department of Planning, Industry and Environment.

The panel met on 28 November 2019 to assess each of the five responses based on an agreed criteria and weighting methodology.

The tender evaluation process is summarised in Figure 5.3.

Figure 5.3: Tender evaluation process



All five tenders received were assessed by a technical review panel with price given a zero per cent weighting on the assessment criteria. Three responses (Bidders two, four and five) were found to demonstrate the highest capacity, capability and experience to design and construct PEC and received higher total scores against the tender evaluation criteria. These three bidders were shortlisted for progression to the final tender process. The evaluation findings are discussed in the Tender Evaluation Report (provided as a confidential Attachment to this Application).

A suite of procurement documents for the shortlisted tenderers for the binding bid phase was approved by the Board and issued to the three shortlisted tenderers in February 2020. The project specification issued for the non-binding bid process was based on a route for the 330 kV line from Buronga to Wagga Wagga via Darlington Point as proposed in the RIT-T PACR. As set out in the PEC Scope and Specification Overview Paper, provided as an attachment to this Application, a revised route via Dinawan is now proposed and binding bids will be based on the revised route. The return date for binding bids is 29 June 2020. The intention at this stage is to ultimately award a single EPC, which includes the LSE scope, at the conclusion of the final tender process.

6. Forecast capex for tendered works

This section is superseded by the BAFO outcome for tendered works explained in section 5.1 of the Supplementary Capex Forecasting Methodology at attachment A.5A.

7. Forecast capex for property and easements

Our forecast capex for property and easement for PEC comprise five key categories:

1. easement costs
2. land costs
3. construction related costs
4. fees
5. environmental offset costs.

The forecasting methodology including key inputs and assumptions for each category of capex for property and easements is discussed in the following sections.

Our forecast capex for property and easement reflects the original route assessed in the RIT-T, which involves using the existing substation at Darlington Point to locate reactive control equipment. We believe that an alternative route, which involves constructing a new switching station at Dinawan, thereby bypassing Darlington Point, has the potential to result in lower overall property and easement costs and reduce the risks of project delay.

We have adjusted our capex forecast to account for the alternative route via Dinawan by reducing it (proportionally) where relevant to reflect the 9 km reduction in route length (from 711 km to 702 km) and the reduction in the estimated landholders impacted by the revised route (from 220 to 200). These reductions are largely offset by additional costs associated with access easements along the route Dinawan, the Dinawan substation land acquisition costs and associated stamp-duty.

7.1 Approach

We applied a “bottom-up-build” approach to derive forecast capex for each category of property and easement capex. This approach is appropriate given the site-specific nature of these costs as well as the uniqueness and scale of PEC.

Each of the five key capex category comprises a number of subcategory costs (i.e. line items). The “bottom-up-build” aggregates the cost of these line item, which are shown in Table 7.1.

Figure 7.1 overviews the key steps in the forecast methodology. In summary:

1. the bottom-up estimates for each category of capex have been developed based on desktop studies by independent experts and have also been informed by benchmarking (projects of a similar scale to PEC).
2. these estimates have been internally validated, and
3. the capex forecast for each cost category is then adjusted for real cost escalation prior to inclusion in the PTRM.

Figure 7.1: Forecasting approach – Our property and easement capex

Many of the capex forecasts in the following sections are in nominal dollars. This allows reconciliation to quotes and the “bottom-up-build” that is in current dollars. The totals and summary of costs in section 7.7 present these costs in $million, Real 2017-18.

Table 7.1: Cost category line items,

Capex category	Capex sub-category (i.e. line item)	Total capex $ Million	Basis of dollars
1. Easement costs	Easement acquisition cost	54.55	Real 2019-20
	Commercial negotiating costs	27.28	Real 2019-20
	Unforeseen and unanticipated property costs	3.51	Real 2019-20
	Access easement	2.04	Real 2019-20
	Options fee	4.00	Real 2018-19
	Professional fees compensation to landholders	5.00	Real 2019-20
	Property and easement surveys	1.05	Real 2018-19
2. Land costs	Additional land to extend Buronga substation	0.40	Real 2018-19
	Land for Dinawan substation	3.00	Real 2018-19
3. Construction related costs	Construction licence cost	4.00	Real 2018-19
	Laydown/staging area cost	0.90	Real 2019-20
	Damage/disturbance claims post construction	5.46	Real 2018-19
4. Fees	Aboriginal cultural heritage fees	1.55	Real 2018-19
	NSW government land registration fees	0.50	Real 2018-19
	Stamp duty	0.14	Real 2018-19
	Valuer Generals Fees	0.12	Real 2018-19
5. Environmental offset costs	Ecosystem biodiversity offset	64.81	Real 2019-20
	Species offset	12.96	Real 2019-20
Total cost ($M, Nominal)		**191.27**	
Total cost ($M, Real 2017-18)		**184.25**	

The remainder of this section details the capex forecast by sub-category.

7.2 Easement costs

7.2.1 Inputs

Table 7.2 lists the inputs used to forecast the capex required to acquire easement for PEC (NSW component only).

Table 7.2: Inputs for easement capex forecast

Item	Value	Comment
Jones Lang LaSalle (JLL) "Desktop Assessments of Compensation Border to Wagga Red Cliffs 20191206" report		This report (adjusted for reduction in route length) was used for easement acquisition cost.
JLL valuation report "PEC Land Acquisition Costs 20191206"		This report (adjusted for reduction in route length and landholders) was used for: > Commercial negotiating cost > Unforeseen and unanticipated property cost > Professional fees compensation to landholders
Line route length	702km	
Easement widths	80m and 50m for 330kV and 220kV lines respectively	
TransGrid documents	N/A	> TransGrid Property Acquisition Policy > TransGrid Landholder Easement and Compensation Guide > D2012/03522 Compulsory Acquisition Process for New South Wales > D2007/04700 Property Portfolio: Acquisition of Property and Property Interests > Guideline 6 - Community and Stakeholder Engagement (Draft) (NSW DP&E, 2017) > DFIS-2019-03-Property Acquisition Standard (NSW DFIS, 2019)
Number of NSW landholders impacted by PEC	200	

7.2.2 Forecasting methodology and assumptions

This section details the forecasting methodology and associated assumptions for each sub-category of easement capex.

7.2.2.1 Easement acquisition

The forecast capex of $54.55 million ($2019-20) for easement acquisition relates to the cost of acquiring property along the 702km route from the South Australian border to Wagga Wagga approximately and tee-off to Red Cliffs substation in Victoria. This represent the minimum expected easement acquisition cost.

Forecast capex for easement acquisition is based on an independent expert report from JLL that sets out the estimated compensation payable for the acquisition of easements for PEC. JLL's assessment is:

- a desktop assessment of compensation only, with no physical inspections of the affected properties, comparable sales nor any discussions with affected land holders in relation to the assessment
- in accordance with the *NSW Land Acquisition (Just Terms Compensation) Act 1991*
- based on route alignment from SA Boarder to Buronga, Buronga to Red Cliffs and Buronga to Wagga Wagga
- based on the proposed acquisition of a new 50 meter to 80 meter wide easement to accommodate the transmission line and towers, and
- based on a desktop review of horticultural and irrigation enterprises which may be impacted by PEC. However, there may be isolated instances where higher value horticultural and irrigation enterprises may be impacted and business disruption losses will be significantly higher than estimated.

Easement compensation costs have been estimated in accordance with the *NSW Land Acquisition (Just Terms Compensation) Act 1991*. Section 55 of the Act sets out the principles of compensation that need to be considered in determining the amount of compensation to be paid.

Section 6 of the JLL's report, titled "Desktop Assessments of Compensation Border to Wagga Red Cliffs 20191206" sets out the basis of the valuation. This explains that in accordance with the *Just Terms Compensation Act,* the following have been considered to determine compensation costs:

(a) the market value of the land on the date of its acquisition

(b) any special value of the land to the person on the date of its acquisition

(c) any loss attributable to severance

(d) any loss attributable to disturbance

(e) the disadvantage resulting from relocation

(f) any increase or decrease in the value of any other land of the person at the date of acquisition which adjoins or is severed from the acquired land by reason of the carrying out of, or the proposal to carry out, the public purpose for which the land was acquired.

Table 7.3 shows that JLL has determined the minimum compensation payable for the acquisition of easements for PEC is $55.25 million. JLL has estimated compensation for sections 55(A) and (F) (see rows one and seven in Table 7.3) to be 21 per cent above current rates. This takes into account the land value increases from the date of valuation to the date of compensation, which was estimated to be two years (i.e. to progress through the negotiation and approval process).

The JLL compensation determination was proportionally reduced by 1.3 per cent to take into account the 9km reduction in line length.

Table 7.3: Easement compensation ($M, 2019-20)

Item	Total capex
Section 55(A) – The Market Value of the land to be acquired	9.771

Item	Total capex
Section 55(B) – Special Value	0
Section 55(C) – Severance	0
Section 55(D) – Disturbance – General	0.701
Section 55(D) – Disturbance – Business/Construction Losses	5.690
Section 55(E) – Disadvantage resulting from relocation	0
Section 55(F) – Increase or decrease in value of other land adjoining the acquired land owned by the Claimants	38.38
Total	**54.55**

7.2.2.2 Commercial negotiating cost

The forecast capex of $27.28 million ($2019-20) for commercial negotiations is required to reach agreement with private landholders for the easements required for PEC. We will only use our compulsory acquisition rights as a last resort to meet the challenging timeframe for PEC. This means that we may be required to pay inflated compensation for easement acquisition to reach timely agreement with landholders to meet the challenging project timeframes.

Property acquisition for PEC will be conducted in accordance with our property acquisition policy. This provides that we:

> are committed to treating landholders with respect and negotiate property acquisitions in a fair way

> will make genuine attempts to reach agreement with private landholders within a minimum period of six months, and

> will only seek to rely on its compulsory acquisition rights where necessary to meet critical energy project timeframes.

The capex forecast for commercial negotiations is necessary for protracted negotiations with private landholders who are seeking higher compensation. This capex is additional to the minimum easement acquisition costs set out in section 7.2.2.1 above.

We conducted the following investigations to define the easement and acquisition constraints prior to JLL's engagement. The outcomes of these investigations have informed JLL's assessment of the costs.

SA border to Buronga

Over the past nine months, we completed preliminary investigations into transmission line corridor options, combining various selection criteria together with a broad range of environmental, heritage, land use and social constraints and opportunities. This process initially identified a 10 km wide preliminary alignment corridor between the SA/NSW Border and the existing Buronga substation within which more detailed environmental and social studies and community and landholder engagement were conducted.

Direct engagement with potentially affected landholders within the 10 km preliminary alignment corridor was a key driver of the corridor refinement process, with further constraints and opportunities analysis at a property level used to refine the 10 km corridor down to a 1 km proposal study area.

For the section of PEC between the SA/NSW Border and Buronga substation there are about 13 affected land holdings: a majority are Crown Western Land Leases (WLL, a perpetual leasehold) with the balance private freehold ownership.

Consultation with Crown Lands has confirmed that easements within Crown WLL will need to be acquired through a compulsory acquisition process. We will seek to negotiate and agree compensation values with property interest holders, to allow the Compulsory Acquisitions to be effected by agreement (rather than adverse).

Vic border to Red Cliffs

It is proposed that a 24 km transmission line is constructed between the Buronga substation and the Red Cliffs substation in Victoria, with about 95 per cent of this new line located in NSW with the balance in Victoria. It is proposed that we will acquire the planning approvals and 1.5 km of easement in Victoria which will be wholly situated within Kinga Billabong National Park. Work on this Victorian section (ourselves or another nominated party) will require property access and occupation rights for approximately a 20m widening of the existing easement.

It is expected that property rights will be secured by the granting of a lease/licence from the National Parks. We have previously been declared a public authority under the Victorian National Parks Act, which is a pre-requisite for this lease/licence acquisition.

Rights to build within the Red Cliffs substation will need further investigation.

No landholder consultation has commenced in Victoria.

Buronga to Wagga Wagga

Preliminary property tenure investigations along the 10 km wide corridor indicate that:

> between Buronga and Balranald, approximately 95 per cent of land holdings are Crown WLL, and

> east of Balranald to Wagga Wagga, approximately 90 per cent of land holdings are private freehold.

The Buronga to Wagga Wagga section represents a different risk profile as more private treaty negotiation increase both the cost of property and easement acquisitions and the risk of adverse compulsory acquisitions.

JLL estimation methodology

JLL has extensive experience negotiating land access agreements and compensation on large scale linear infrastructure projects and eventual commercial outcome over and above the valuation. JLL determined the percentage increase above the minimum compensation for the acquisition of easements in order to reach agreement with private landholders through commercial negotiations set out in section 7.2.2.1 having regard for:

> precedents set by renewable energy developers in the regions where PEC is being proposed:

– Origin Energy Power Limited in SA

Pieces 102 and 103 Woods and Forest Road, Stuart in South Australia comprises two contiguous parcels of land on one Certificate of Title. It is 947 hectares of cleared fenced grazing cropping land, which is positioned adjacent to an existing substation owned by Transmission Lessor Corporation. The property was purchased in an off-market transaction by Origin Energy Power for $1.375 million (i.e. $1,452 per hectare). This is approximately twice the prevailing market rates for land in the locality, which is approximately $750 per hectare based on comparable sales in the locality. Further investigations may be required to confirm whether the transfer amount included other payments such as compensation or other inducements.

– Edify Energy in NSW

Lot 160 Donald Ross Drive at Darlington Point in NSW comprises of 270 hectares of cleared fenced grazing cropping land. It is positioned adjacent to an existing substation and has transmission lines that bisect the property. The property was purchased in an off-market transaction by Edify Energy for

$2.86 million (i.e. $10,608 per hectare). This is approximately twice the prevailing market rates for land in the locality, which is approximately $5,000 - $6,000 per hectare based on comparable sales in the locality. Further investigations may be required to confirm whether the transfer amount included other payments such as compensation or other inducements.

- Neoen's Coleambally Solar Farm in NSW

  Lots 81, 82 and 83 Kooks Road Coleambally comprised 337 hectares of cleared grazing cropping land. In Dec 2017, the owner leased the land to Coleambally Solar for a term of 30 years at an annual rent of $850 (exc GST) per hectare per annum. Compare sales in the locality indicate land values ranging from $3,900 to $4,660 per hectare. A sale of 221 hectares of cleared grazing land close to this land sold for $4,363 per hectare in August 2018. Farm land in the locality generally leases with a yield of approximately 3.5 per cent to 5 per cent per annum. Based on the market land value rate of $4,660 per hectare, the lease terms of Coleambally Solar Farm derive a yield of 18 per cent.

> evidence from similar recent projects:

- Transpower North Island Grid Upgrade (NIGU) project

  Transpower exceeded their initial forecast estimate for property cost by 49 per cent for the NIGU project. Transpower estimated $125.7 million (P90) for property cost in October 2006 and paid $187.4 million by July 2013. This NIGU project is of a similar scale and scope to PEC. NIGU entailed the construction of a new 186km 400kV transmission line from Whakamaru in the central North Island to Brownhill in South Auckland. It involved negotiations with approximately 310 properties.

- Our experience at Buronga

  We secured verbal agreement for the acquisition of land and easements at the Buronga substation at the time of writing. The upper end of the negotiating range for this specific case was approximately twice the land valuation as we were aware of renewables and other development proponents approaching this landholder with options to purchase land.

- Queensland 60 km high pressure gas pipeline project

  The initial compensation estimates were very generous due to the very tight timeline of the project. However, the negotiated voluntary agreements settled at approximately twice the valuation.

- Northern Territory/Queensland 620 km high pressure gas pipeline

  This pipeline traversed predominately large cattle station properties. The initial compensation estimate did not adequately address business disruption and in particular the disruption to the normal operations of a cattle property. Due to lengthy land negotiations, time became a critical factor to meet project timelines and inflated land compensation was paid. The original total estimate for compensation was $840,000 with the final compensation payments of $2,760,000 which is approximately 329 per cent increase on the original estimate.

> Our commitment to maintain a social licence to operate in the areas in which it operates by limiting the use of compulsory acquisition. This means that we may need to pay compensation above valuation in order to reach voluntary agreement, and

> tight timelines to reach agreement with land owners.

JLL considers that it is reasonable and appropriate to allow a 50 per cent increase above the minimum compensation for the acquisition of easements in order to reach agreement with private landholders through commercial negotiations. This equates to $27.28 million (i.e. 50 per cent of $54.55 million valuation from section 7.2.2.1) in 2019-20 dollars.

7.2.2.3 Unforeseen and unanticipated property cost

The forecast capex for unforeseen and unanticipated property cost is $3.51 million ($2019-20) and is required to:

> remove hazards such as structures, and

> provide non-easement compensation for business disruption and losses that cannot be reasonably foreseen at this stage.

These costs cannot reasonably be anticipated at this stage in the project and will only become known once land owner engagement commences. It is therefore prudent to allow additional costs for unforeseen and unanticipated property costs above and beyond the estimate in section 7.2.2.1.

The disturbance compensation for business/construction losses in section 7.2.2.1 was based on the average gross margin for cropping and grazing land most likely affected by PEC. This estimate is, however based on desktop study only. The business disruption and subsequent losses are very difficult to determine without onsite inspection and/or dialogue with the landowner/manager responsible for running the enterprise. Accordingly, there may be isolated instances where business disruption is significantly higher than the forecast set out in section 7.2.2.1.

JLL's approach to determining unforeseen and unanticipated property cost is based on:

> Transpower NIGU project:

  – One of the factors cited for significantly higher property costs than originally forecast was due to a failure to include costs associated with the removal of buildings, trees and other hazards along the new transmission line route, compensation for the loss in business and value of land adjacent to the route

  – Transpower had to relocate a horse stud near Auckland as it was considered unviable to continue business whilst Transpower constructed the transmission line

> an assumption that five per cent of the total line length may be subject to unknown higher value productive land in the region to the east of Dinawan around Yanco Creek, Columbo Creek and Lockhart. This is based on desktop analysis that finds approximately 5 per cent of the alignment falls in and around potentially irrigated areas

> an assumption that 50 per cent of the easement width of higher value land will be disrupted. This assumes that 50 per cent of easements would need to cleared for construction and ongoing access. The remainder of the easement would be allowed to continue unaffected to minimise the impact on the land owners' operations, and

> an assumption high productive land gross margin is $25,000 per ha.

The forecast capex for unforeseen and unanticipated property cost is calculated on the following basis:

> PEC route length in NSW = 702 km

> proportion of total line length that may be subject to unknown higher value productive land = 5 per cent

> estimated easement length that may be subject to unknown higher value productive land = 702 km × 5 per cent = 35.10 km

> estimated easement area that may be subject to unknown higher value productive land = 35.10 × 0.08 = 2.808km2 = 280.8 ha

> proportion of easement area that may be disrupted = 50 per cent

> estimated area that may potentially be disrupted = 50 per cent × 280.8 ha = 140.4 ha, and hence

- estimated unforeseen business disruption and losses = 140.4 ha × 0.025 = $3.51 million in 2019-20 dollars.

7.2.2.4 Access easement

The revised route via Dinawan has immaterial impact on access easement cost. The forecast capex for access easement is $2.04 million ($2019-20) and is required to secure access rights (easements) across the PEC route to gain access to the towers. It has been determined using JLL's access easement calculator spreadsheet, which includes:

- value of access easement
- injurious affection from access tracks, and
- disturbance compensation to landholders.

The forecast value of access easement is $1.37 million ($2019-20) based on:

- access easement area – a desktop review estimated a total of 559 km of access track is required based on the distance of towers and monopoles from the nearest publicly accessible road. The Beca Basis of Design and Cost Estimation – Access Track for Dry Weather Access only report (2 Aug 2019) outlines the expected 6.2 meter width of the access track, which comprises of 4.2 meter width of road surface and 1meter on either side of the track for shoulder and drainage. This resulted in a total access easement area of 347 hectares.
- an estimate of $4,400 per hectare from JLL for the average land value across the PEC route
- a 90 per cent access easement diminution factor determined by JLL. This diminution factor recognised the change in land usage and land rights due to the creation of the access track, which provides us rights to the access tracks. It was estimated the remaining 10 per cent of the rights to the access easement will be retained by the landholder.

Injurious affection from access tracks is the compensation for the impact of vehicles traversing the access track on a land that would otherwise be undisturbed. The estimated cost of $0.62 million ($2019-20) has been estimated based on:

- area of influence – the area of influence/impact on the land by vehicles traversing the access track is estimated to extend to approximately 250 meters on either side of the access track for the entire length of the access track. This resulted in a total influence area of 27,988 hectares
- an estimate of $4,400 per hectare from JLL for the average land value across the PEC route
- a 0.5 per cent area of influence diminution factor determined by JLL. This diminution factor takes into account the minor impact from vehicles.

Disturbance compensation to landholders is the out of pocket expense for landholders impacted by the access easement due to activities such as interfacing with the PEC team and signing documents. The estimated cost of $0.05 million ($2019-20) has been calculated based on:

- JLL's estimate of 50 landholders, who will be impacted by the access easement
- JLL's estimate of $1,000 compensation per landholders.

The total access easement cost is summarised in Table 7.4

Table 7.4: Access easement capex cost ($M, 2019-20)

Item	Total capex
Value of access easement	1.37

Item	Total capex
Injurious affection	0.62
Disturbance compensation	0.05
Total	**2.04**

7.2.2.5 Option fees

The forecast capex for option fees is $4 million ($2018-19) and is required to pay fees associated with exclusive land negotiations with landholders. This assists us secure the land at the conclusion of negotiations. Forecast capex has been calculated as follows:

> 200 NSW landholders impacted by PEC, and

> $20,000 per option fee which is based on our industry knowledge and experience.

The forecast capex for option fees = 200 * $0.02 = $4.0 million in 2018-19 dollars.

7.2.2.6 Professional fees compensation to landholders

The forecast capex for professional fees compensation to landholders is $5 million ($2019-20).

Landholders' professional fees are not specifically compensable under the NSW *Land Acquisition (Just Terms Compensation) Act 1991.* However, our Landholder Easement and Compensation Guide states that we will reimburse reasonable landholders' expenses directly and reasonably incurred due to us acquiring property. These expenses include reasonable legal, valuation, agronomy and accountant fees. This capex forecast encompasses all landholders' fees related to property acquisition for PEC.

JLL has determined forecast capex for professional fees compensation using the following methodology:

> 200 NSW landholders impacted by PEC

> professional fee allowance for each landholder:

  – Whilst Network Service Provides (NSP) differ in their approach to reasonable professional fees, it is convention across the National Electricity Market (NEM) to include an allowance of between $20,000 to $30,000 per landholder to meet these reasonable costs.

  – JLL recommended an allowance of $25,000 per landholder which is broadly comprised of:

    - Legal fees - $10, 000
    - Valuation fees - $5,000
    - Agronomy advise - $5,000
    - Tax/accountancy advice - $5,000.

On this basis, forecast capex for professional fees = 200 * $0.025 = $5 million in 2019-20 dollars.

7.2.2.7 Property and easement surveys

The forecast capex for property and easement surveys is $1.05 million ($2018-19). This sub-category of capex incorporates costs associated with:

> Surveyors picking up required survey marks

> Drafting Officer preparing the easement plan, and

> Registered Surveyor verifying and signing off on the plan.

The capex forecast for these surveys was based on the historic average (external contractors) cost of $1,500 per km of transmission line. This resulted in a total capex cost of $1.05 million at 2018-19 dollars for the 702 km of PEC that we will build.

7.2.3 Forecast Model

The easement capex forecast is the sum of the costs of its constituent eight line items as summarised in Table 7.5. As each line item cost was estimated in nominal dollars in section 7.2.2, these costs were de-escalated to 2017-18 dollars.

Table 7.5: Easement capex forecast

Item	Total capex	Basis of dollars
Easement acquisition cost	54.55	2019-20
Commercial negotiating costs	27.28	2019-20
Unforeseen and unanticipated property costs	3.51	2019-20
Access easement	2.04	2019-20
Options fee	4.00	2018-19
Professional fees compensation to landholders	5.00	2019-20
Property and easement surveys	1.05	2018-19
Total cost ($M, nominal)	**97.43**	
Total cost ($M,2017-18)	**93.73**	

7.3 Land costs

7.3.1 Inputs

Table 7.6 lists the inputs used to forecast capex for land associated with PEC (NSW component only).

Table 7.6: Inputs for land capex forecast

Item	Value	Comment
Land acquisition cost for land adjacent to Buronga substation	$310,000 (2018-19)	This is based on the letter offer to the landholder
Land acquisition cost for Dinawan switching station	$2,500,000 (2018-19)	

7.3.2 Forecasting methodology and assumptions

This section details the forecasting methodology and associated assumptions for each sub-category of land related activities for PEC.

7.3.2.1 Additional land to extend Buronga substation

The forecast capex for additional land to extend Buronga substation is $0.40 million ($2018-19). This will enable the extension of the existing Buronga substation to accommodate the new 330 kV switchyard for PEC and future new connections (these will be located adjacent to the existing substation). We consider that:

> the extension is prudent because PEC is intended to facilitate the transition to lower carbon emissions (including via new technologies), and

> purchasing additional land to accommodate future new connections is efficient because it leverages the land purchasing process for PEC and ensures land at the most economic location is available for future expansion.

Forecast capex is based on land acquisition costs of $310,000 and the associated fees relating to the acquisition. These fees include our and land holder's legal fees, valuation fees, survey costs and conveyancing costs.

The total capex forecast for additional land at Buronga substation is $0.4 million.

7.3.2.2 Land for Dinawan switching station

The forecast capex for Dinawan switching station is $3 million ($2018-19). This will enable the accommodation of the synchronous condensers and 330 kV switchyard for PEC and future new connections.

Forecast capex is based on land acquisition costs of $2,500,000 and the associated fees relating to the acquisition. These fees include our and land holder's legal fees, valuation fees, survey costs and conveyancing costs.

The total capex forecast for Dinawan switching station is $3 million.

7.3.3 Forecast Model

The forecast capex for additional land is summarised in Table 7.7. As each line item cost was estimated in nominal dollars in section 7.3.2, these costs were de-escalated to 2017-18 dollars.

Table 7.7: Land capex forecast

Item	Total capex	Basis of dollars
Additional land to extend Buronga substation	0.40	2018-19
Land for Dinawan switching station	3.0	2019-20
Total cost ($M, nominal)	**3.40**	
Total cost ($M,2017-18)	**3.35**	

7.4 Construction related costs

7.4.1 Inputs

Table 7.8 lists the inputs used to forecast capex for construction related activities for PEC (NSW component only)

Table 7.8: Inputs for construction related capex forecast

Item	Value	Comment
JLL valuation report "PEC Land Acquisition Costs 20191206"		This report (adjusted for reduction in route length) was used for laydown/staging area costs.
Number of NSW landholders impacted by PEC	200	

7.4.2 Forecasting methodology and assumptions

This section details the forecasting methodology and associated assumptions for each sub-category of construction related activities for PEC.

7.4.2.1 Construction licences cost

The forecast capex for construction licences is $4.0 million ($2018-19). Construction licences are necessary to allow us to access landholders' properties prior to the registration of easements. Forecast capex is based on a nominal fee of $20,000 (i.e. $0.02 million) per licence and has been calculated as follows:

> 200 NSW landholders impacted by PEC

> $20,000 (i.e. $0.02M) per licence fee which is based on our industry knowledge and experience.

Forecast capex for construction licences is = 200 × $0.02 = $4.0 million in 2018-19 dollars.

7.4.2.2 Laydown/staging area cost

The forecast capex for equipment laydown and staging areas during construction is $0.9 million ($2019-20).

During construction of the transmission line, the contractor will require access to various temporary sites for equipment laydown purposes. These sites are typically leased/licensed with agreements made with landholders to occupy the requisite land with a make good clause at the end of the occupation period. Payments associated with securing these sites are usually not linked to valuation principles or local land value but are typically an amount agreed between the parties based on precedent and commercial terms. This laydown/staging area cost is the lease payment for these sites, which are secured by us in advance of construction commencement.

A laydown/staging area was estimated to be required at every 125 km interval along the PEC route. As PEC route length is approximately 702 km, five laydown/staging areas are required.

JLL has determined the forecast capex based on the following:

> Required sites will be occupied for a period of up to 24 months.

> Reasonable allowance to secure grazing land from a local land owner will be in the range of $5,000 to $10,000 per month. While this is in excess of approximately 10 per cent of the capital value of the land in typical grazing areas, it provides financial incentive to secure the necessary sites in a timely manner.

On this basis, the capex forecast for laydown/staging areas is $0.6 - $1.2 million (i.e. 5 sites × 24 months × $5,000 to $10,000 per month) in 2019-20 dollars.

We have included the median value of $0.9 million in its capex forecast for laydown/staging area.

7.4.2.3 Damage/disturbance claims post construction

The forecast capex for damage / disturbance post construction is $5.46 million ($2018-19).

Under the NSW *Land Acquisition (Just Terms Compensation) Act 1991*, we are liable to rectify any damage/disturbance claims after construction has been completed. Forecast capex for damage / disturbance is required to 'make good' where construction activity has caused damage to local and farm infrastructure that is not on the easement such as access roads/tracks, fencing and gates, cattle grids/ramps etc after construction has been completed and the contractor has demobilised.

Forecast capex is based on the following:

> easement acquisition cost set out in section 7.2.2.1, and

> assumed 10 per cent of easement acquisition cost.

On this basis, the capex forecast for damage/disturbance claims = 10 per cent × 54.55 = $5.46 million in 2018-19 dollars.

7.4.3 Forecast Model

The construction related capex forecast is the sum of the costs of its constituent three line items as summarised in Table 7.9. As each line item cost was estimated in nominal dollars in section 7.3.2, these costs were de-escalated to 2017-18 dollars.

Table 7.9: Construction related capex forecast

Item	Total capex	Basis of dollars
Construction licence cost	4.0	2018-19
Laydown/staging area cost	0.9	2019-20
Damage/disturbance claims post construction	5.46	2018-19
Total cost ($M, nominal)	**10.36**	
Total cost ($M,2017-18)	**10.17**	

7.5 Fees

7.5.1 Inputs

Table 7.10 lists the inputs used forecast capex for land related fees associated with PEC (NSW component only).

Table 7.10: Inputs for fees capex forecast

Item	Value	Comment
Stamp duty	5% of land value	
Land acquisition cost for land adjacent to Buronga substation	$310,000	This is based on the letter offer to the landholder ($2018-19)
Land acquisition cost for Dinawan switching station	$2,500,000	$2018-19
Number of NSW landholders impacted by PEC	200	

7.5.2 Forecasting methodology and assumptions

This section details the forecasting methodology and associated assumptions for each sub-category of land related fees.

7.5.2.1 Aboriginal cultural heritage fees

The forecast capex of $1.55 million ($2018-19) for Aboriginal cultural heritage fees. This comprises:

> $0.288 million for meeting Aboriginal representatives, and

> $1.26 million for inspection of aboriginal cultural heritage artefacts currently on the land require for PEC prior to easement clearance.

The forecast capex of $0.288 million for meeting Aboriginal representatives has been calculated based on:

> 20 NSW councils will be engaged by PEC

> two full day meetings per council, and

> 12 representatives at each meeting at a cost of $600 per day per representative.

The forecast capex of $1.26 million for inspection of aboriginal cultural heritage artefacts prior to easement clearance is based on:

> 350 days for the entire PEC route, and

> six representatives at $600 per day per representative.

The total forecast capex is $1.55 million in 2018-19 dollars, which is a sum of the meeting and inspection costs.

7.5.2.2 NSW government land registration fees

The forecast capex for land registration fees is $0.5 million ($2018-19). This sub-category of capex relates the NSW government administrative fees for obtaining plans and official records from the NSW State Government agencies such as Crown lands and NSW Land Registry Services.

The methodology to determine forecast capex is based on:

> 200 NSW landholders impacted by PEC, and

> $2,500 (i.e. $0.0025M) per landholder which is based on industry knowledge and experience.

On this basis, the forecast capex for land registration fees = 200 × $0.0025 = $0.5 million in 2018-19 dollars.

7.5.2.3 Stamp duty

The forecast capex for stamp duty payable on substation land is $0.14 million ($2018-19) and is required to pay the NSW government stamp duty levy.

The stamp duty for Buronga substation land acquisition = 5 per cent × $0.31 = $0.02 million in 2018-19 dollars.

The stamp duty for Dinawan switching station land acquisition = 5 per cent × $2.5 = $0.125 million in 2018-19 dollars.

7.5.2.4 Valuer General's Fees

The forecast capex for Valuer General's fees is $0.12 million ($2018-19). It is required because the Valuer General may be involved in protracted/contested land negotiations to independently undertake valuations. The involvement of the Valuer General attracts a fee. This capex forecast encompasses all Valuer General's fee related to PEC property acquisition for complex valuations.

The methodology to determine this forecast was based on:

> assumed number of land owners involved in contested land negotiations = 10% of total number of landholders = 10% × 200 = 20, and

> $6,000 (i.e. $0.006M) of Valuer General's fee per contested negotiations, which is based on our experience with the Valuer General.

On this basis, forecast capex for Valuer General's fees = 20 × $0.006 = $0.12 million in 2018-19 dollars.

7.5.3 Forecast Model

The capex forecast for fees is the sum of the costs of its constituent four line items as summarised in Table 7.11. As each line item cost was estimated in nominal dollars in section 7.5.2, these costs were de-escalated to 2017-18 dollars.

Table 7.11: Fee capex forecast

Item	Total capex	Basis of dollars
Aboriginal cultural heritage fees	1.55	2018-19
NSW government land registration fees	0.50	2018-19
Stamp duty	0.14	2018-19
Valuer Generals Fees	0.12	2018-19
Total cost ($M, nominal)	**2.31**	
Total cost ($M,2017-18)	**2.27**	

7.6 Environmental offset costs

Forecast capex for environmental offsets is required to remediate the impact of PEC on the environment. This covers both the impact on plant and species and comprises of ecosystem biodiversity offset and species offset.

The complete payment of environmental offset cost is generally required by project approval (i.e. prior to construction) and only in exceptional cases within 12 months of project approval. Accordingly, environmental offset cost is considered to be a capex cost.

7.6.1 Inputs

Table 7.12 lists the inputs used to forecast capex required for environmental offsets costs PEC (NSW component only).

Table 7.12: Inputs for environmental offset capex forecast

Item	Value	Comment
WSP Memo for NSW State-listed Biodiversity Offset Liability Estimate – Project Energy Connect: South Australian border to Wagga Wagga via Darlington Point, PS113770-ECO-MEM-001 Rev D		This report (adjusted for reduction in route length) was used for: > Ecosystem biodiversity offset > Species offset

Line route length	702km	
Easement widths	80m and 20m for 330kV and 220kV lines respectively	The existing 220kV line 50m easement width will be re-used. However, a temporary easement width of 20m is required for the construction of the new 220kV line. This temporary easement will require clearing and will have an associated environmental impact.

7.6.2 Forecasting methodology and assumptions

This section details the forecasting methodology and associated assumptions for each sub-category of environmental offset capex. The difference in forecast environmental offset capex for the initial route via Darlington Point and the revised route via Dinawan as well as change in 220kV line specification is not material. We have reflected the expected adjustments to environmental offset capex forecast arising from the

> revised route via Dinawan by reducing capex proportionally with the 9km reduction in line length

> 220kV line specification changes by reducing capex proportionally with the reduction of easement width requiring clearing from 50m to 20m.

Our current capex forecast for environmental offsets is based on a desktop study. We are currently undertaking on-site studies to refine our biodiversity offset costs and will provide updated cost information to the AER as it becomes available during the second half of 2020.

7.6.2.1 Ecosystem biodiversity offset

We have based our biodiversity offset capex forecast on an independent expert report from WSP, which is provided as an attachment to this Application. The WSP report includes a capex forecast of $69.37 million ($2019-20) based on the original route via Darlington Point. We have proportionally reduced this capex forecast to $64.81 million ($2019-20) to reflect the:

> $0.88 million reduction due to the 9km reduction in line length associated with the revised route via Dinawan.

> $3.68 million reduction due to reduction in the 220kV easement width. This is due to an assumed reduction in Biodiversity Conservation Trust (BCT) payments, which is a reasonable assumption as BCT has a higher cost per credit than Biodiversity Stewardship Agreements (BSA).

WSP has calculated the biodiversity offset cost for PEC in accordance with the requirements of:

> *Biodiversity Conservation Act 2016 (NSW), and*

> *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*.

In 2015, the NSW and Commonwealth governments entered into a bilateral agreement relating to environmental assessment under the *Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act).* In March 2020, the NSW and Commonwealth governments signed Amending Agreement No. 1 (the amending agreement). It allows NSW to assess development applications on behalf of the Commonwealth Government, removing the need for separate assessment and reducing duplicative processes. The bilateral agreement ensures an efficient, timely and effective process for environmental assessment by accrediting certain NSW processes for assessment under the *EPBC Act,* including endorsing the NSW Biodiversity Offsets Scheme[12]. This accreditation and endorsement of NSW Biodiversity Offsets Scheme for delivering offsets for Commonwealth Matter of National Environmental Significance as listed

[12] https://www.planning.nsw.gov.au/Policy-and-Legislation/Government-Agreements-and-Forums

under the EPBC Act reduces duplication and ensures the capex for environmental offsets liability are reasonable.

Surveys will be required to determine the exact offset requirements.

Offset methods

The *NSW Biodiversity Conservation Act 2016* requires that developers who impact land must establish an 'offset' area of land to be protected. The protection prevents development of the land in perpetuity, therefore protecting the vegetation and/or animal species. The area of land that needs to be protected is determined by a credit system where credits are generated when land is disturbed and resolved when a protection area is established. The area of land required to be protected must contain the same species of flora and fauna as the impacted land. The credit system ensures that more land is preserved than disturbed by the development. The calculation of credits also considers the present condition of the land.

The two methods to offset the impact of a project on the biodiversity of the land are:

> **Method 1: Payment into Biodiversity Conservation Trust (BCT)**

This involves payment based on a dollar value per credit into the Biodiversity Conservation Fund which is administered by BCT.

The assumptions for BCT are:

- Conservation offset fund is at 30 credits per hectare for moderate to good condition vegetation
- Ecosystem credit prices for each Plant Community Type (PCT) were based on 31st October 2019 Biodiversity Offsets Payment Calculator (BOP-C).

> **Method 2: Establishing Biodiversity Stewardship Agreements (BSA)**

The BSA identifies and protects suitable candidate land. It can be established on land that we own or on land owned by another party (subject to that party's agreement). The BSA requires us to maintain the land that it owns or establish a trust that will then pay a perpetuity to the land owner to enable maintenance or improvement of the land.

The assumptions for BSA are:

> average land acquisition cost is $1,500/hectare. This BSA land acquisition cost is expected to be lower than the easement acquisition cost due to choice of suitable land options compared to the easement route

> approximately $2,500 / hectare for in perpetuity management of good condition vegetation. The management price is based on WSP's previous experience for large scale offsets sites in NSW. If the condition of the proposed offset sites vegetation is in poor to moderate condition, this will increase the cost significantly. This management cost is to be paid in full at the establishment of the BSA

> the BSA would generate approximately 3 credits per hectare

> a single BSA would be established

> excludes BSA identification, survey, reporting and legal establishment costs.

Clearing scenarios

The required offset depends on the construction and maintenance philosophy of PEC. Two clearing scenarios were developed to account for different construction and maintenance philosophy and capture opportunities in reducing offset liability.

The two clearing scenarios are:

(i) Full clearing

Complete vegetation clearing for the entire easement width and maintained in such a condition into perpetuity.

(ii) Limited clearing

Partial vegetation clearing based on high level assumptions, which need to be agreed by Department of Planning, Industry and Environment. These assumptions are:

- full clearing of a width of 10 meters centred on the line alignment for access track
- full clearing of 80 meter and 50 meter diameters at each 330 kV and 220 kV tower respectively at an average of 500 meter span intervals
- impact on the remaining areas was assumed to be discounted by 50% as only the location at the lowest sag point along a span requires maintenance to ensure vegetation do not exceed 2 meters height
- vegetation types within the easement that are very low growth form (i.e. < 2 meters high) such as low shrub lands, grasslands and wetlands are unlikely to be impacted by ongoing vegetation management of the transmission lines and only relatively minor impacts associated with the initial construction pads and maintenance of access tracks. These vegetation types have been excluded from the calculations.

Biodiversity offset calculations

WSP determined the most cost efficient way to meet the biodiversity offset requirements, based on desktop review for both offset methods and both clearing scenarios for the route from the South Australian border to Wagga Wagga and Buronga to Red Cliffs.

This review entailed:

1. determining the biodiversity impact area for each vegetation type for each clearing scenario
2. estimating the biodiversity credit liability for each clearing scenario
3. determining the biodiversity offset cost under each offset method.

The land biodiversity liability was calculated based on credit liability estimate calculation in accordance with the Biodiversity Assessment Method (BAM) 2017 that quantifies the residual impact on vegetation and potential habitat for threatened species. However, the accompanying calculator to the BAM (i.e. BAM-C version 15) was not directly used to calculate the biodiversity offset liability for PEC due to unavailability of field data at this early stage of the project. The biodiversity liability was estimated based on credit generation for the impact area by identifying each vegetation community (Plant Community Type) from broad scale vegetation that will likely be impacted by PEC.

Table 7.13 summarises the results of the review.

Table 7.13: Total biodiversity offset liability estimate ($M, 2019-20)

Clearing scenario	Credit liability	Estimated BCT cost	Estimated BSA cost
Limited clearing scenario	24,811	$148.33	$33.08 (8,271 ha of offset land area)
Full clearing scenario	129,967	$970.22	$173.29 (43,322 ha of offset land area)

Table 7.13 shows that limited clearing scenario under the BSA method yields the most cost effective biodiversity offset. However, it is unlikely to secure 8,271 ha that meets both the *Biodiversity Conservation Act 2016 (NSW)* and *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*.

WSP has advised that the project biodiversity offset liability is likely to be met by a combination of the two offset methods:

1. incorporating project-sourced offset areas of BSA establishment by targeting large high conservation property holdings with substantial areas of native PCTs, threatened species and communities impacted by the project (e.g. Tarreena and Big Bend Stations), and
2. for those species and PCTs that cannot be easily sourced through project-sourced BSA, payment into the BCT.

Therefore, the offset liability will incorporate a proportional cost from these two methods and is summarised in Table 7.14.

The BSA perpetuity management cost is a capex cost as it is to be paid in full on the establishment of the BSA, which is expected to occur prior to mobilisation. The BSA establishment and subsequent retirements of credits will require the perpetuity management cost to be paid in full into the Biodiversity conservation trust (BCT) (State Government) at establishment. The BCT will then draw down on this management fund and make annual payments to the landowner on completion of land management works.

Table 7.14 Biodiversity liability for limited clearing scenario

Sections of PEC	Offset method to meet credit liability		Total credit liability (credits)
	BSA (credits)	Payment into BCT (credits)	
Border to Buronga	9,000.00	959.24	9,959.24
Buronga to Wagga Wagga	7,500.00	6,108.98	13,608.98
Buronga to Red Cliffs	1,000.00	243.35	1,243.35
Total Credit Liability	**17,500.00[1]**	**7,311.57[2]**	**24,811.57**

Notes:
1) BSA credits incorporate predominately non-threatened PCTs in tables 2.1-2.3.
2) This cost is based on the price for PCTs in the BOP-C on 13/11/2019

Table 7.15 Summary of biodiversity offset capex for limited clearing scenario

Cost description	Offset method		Total cost
	BSA cost[1]	BCT payment	
Land Value ($M, 2019-20)	12.50	NA	12.50
In perpetuity land management ($M, 2019-20)	20.83	NA	20.83
Pay into BCT ($M, 2019-20)	NA	36.04	36.04
Total Cost ($M, 2019-20)	**33.33**	**36.04**	**69.37**

Notes:
1) 8,333 ha offset size based on BSA generating 3 credits per hectare with a residual 30% surplus land. It is unlikely that the calculated property size will provide the exact credits required. Hence, a larger property or holding is typically required to adequately conserve the size and type of the biodiversity offset requirements. The 30% factor was based on WSP's previous experience in establishing large offsets packages within the central west of NSW. These offsets packages typically have involved surplus land in the order of 30% the total land area required for offsetting.
2) Land value is based on $1,500 per hectare
3) In perpetuity management based on $2,500 per hectare

Although the BSA is a cost effective approach to environmental offsets, it poses timing risk as it requires significantly longer time to identify, negotiate and secure suitable land prior to commencement of construction.

7.6.2.2 Species offset

The capex forecast of $12.96 million ($2019-20) for species credits is based on an independent expert report from WSP which is provided as an Attachment to this Application. WSP has calculated the forecast capex in accordance with section 10.3 of the BAM.

Species credits are required to offset impacts to breeding habitat for threatened species. Threatened species considered to have breeding habitat within the Project area (also known as candidate species) are to be determined based on site investigations of the route and further BAM calculations. Highly accurate route alignment is required to determine impacted species.

Based on WSP's experience on offsets for similar large infrastructure projects, species offset is typically 20% of the biodiversity offset. The estimated species offset cost is thus $12.96 million (i.e. 20% × $64.81M).

Offset liabilities for species will be greater under the BCT compared to BSA method. This is because the establishment of a BSA is likely to provide both species and ecosystem offsets, subject to targeted surveys confirming their presence on the proposed areas.

7.6.3 Forecast model

The capex forecast for fees is the sum of the costs of its constituent two line items as summarised in Table 7.16. As each line item cost was estimated in 2019-20 dollars in section 7.6, these costs were de-escalated to 2017-18 dollars.

Table 7.16: Environmental offset capex forecast

Item	Total capex	Basis of dollars
Biodiversity offset	64.81	2019-20
Species offset	12.96	2019-20
Total cost ($M, nominal)	**77.78**	
Total cost ($M,2017-18)	**74.73**	

7.7 Forecast expenditure

The forecast expenditure for direct capex is set out in Table 7.17.

Table 7.17: Forecast expenditure for direct capex ($M, 2017-18)

Item	Forecast expenditure	Comments
Easements	93.73	
Land	3.35	
Construction related	10.17	
Fees	2.27	
Environmental offsets	74.73	
Total	**184.25**	

8. Indirect capex forecast

This section explains our capex for PEC on corporate and network overheads.

We will incur 'Corporate and Network Overhead' capex in the delivery of PEC (also referred to as 'indirect capex'). These costs are incremental to the capex approved in the AER's 2018-23 Revenue Determination, as they relate to activities that are additional to our normal business activities and would not be incurred if we did not proceed with PEC[13].

We have seven categories of indirect capex:

> historical indirect capex – this is capex that we incurred on PEC from 1 July 2018 to 31 March 2020

> forecast indirect capex – we have grouped this capex into six sub-categories:

  – project development – this capex relates to setting up and project managing PEC. Most of the project development costs relate to incremental labour. There will also be some non-labour costs for geotechnical studies, legal fees and consultant and professional fees

  – works delivery – this is capex associated with the construction of PEC. It reflects costs associated with incremental labour for project management, substation works delivery and transmission works delivery. There are no non-labour costs included in the works delivery capex forecast

  – land and environment – around 40 per cent of this capex relates to incremental labour. The remaining costs relate to non-labour costs for property consulting, environmental impact studies, surveys and legal and professional fees

  – stakeholder and community engagement – this capex relates to stakeholder and community engagement during the construction and commissioning phase of PEC. This is important given that PEC will impact many communities in NSW. Most of the stakeholder and community engagement costs relate to non-labour costs of community support, design and communication and community improvement. There will also be some incremental labour costs

  – insurance – this capex relates to insurance premiums to cover the risks associated with "construction" activities – this is incremental to our existing insurance cover, and

  – tender and bidder payments – this relates to payments to tenderers and facility costs. 'Under bidder payments' for unsuccessful tenders are required to encourage the competitive participation of multiple bidders. Facility costs cover fees incurred by tenderers to utilise the Ansarada tender portal and data room.

We have submitted a separate document to the AER entitled "Corporate and Network Overhead Costs" that provides further detail about the nature of these indirect capex categories and the capex forecasting methodology.

8.1 Approach to determining capex

This sub-section overviews the approach we have taken to determine our actual and forecast indirect capex for PEC. The document entitled "Corporate and Network Overhead Costs" provides further details about this approach.

[13] Corporate and network overhead costs are capitalised if they are sufficiently connected with the delivery of capital works – this is consistent with TransGrid's capitalisation policy.

We have applied a bottom-up-build to determine forecast indirect capex. This was based on the initial route via Darlington Point. The revised route via Dinawan is not expected to materially change the effort required and is therefore not expected to materially impact the forecast capex for indirect costs because:

> indirect capex for works delivery is not expected to materially change because it is driven by the construction period, which will remain unchanged for the revised route

> indirect capex for land and environmental will remain unchanged because the revised number of property acquisitions is within the initial range of 200-230 property acquisitions used to determine the initial land and environmental indirect cost

> indirect capex for stakeholder and community engagement is not expected to materially change because the increase in engagement effort due to the required new easement for the revised route is expected to be offset by the reduction in line length of the revised route

Normally, forecast indirect capex is determined by the Success estimating database as a percentage mark-up on the total project capex (i.e. using the design cost factor (DCF) and the network cost factor (NCF)). The DCF and NCF reflect historical projects and are therefore not expected to provide an accurate forecast of indirect costs for PEC given its scale, complexity and unique nature. On this basis, a bottom-up-build has been used to determine forecast indirect capex. We have used the NCF and DCF to validate the bottom-up-build (see section 12.1).

Historical and forecast indirect capex has been allocated and attributed to PEC in accordance with our Cost Allocation Methodology (CAM)[14].

8.2 Historical indirect capex

Historical indirect capex of $17.0 million has been incurred between 1 July 2018 and 31 March 2020 to progress PEC. This capex is detailed in Table 8.1 below.

The value of our historical indirect capex reflects transactions recorded in Ellipse, which is our enterprise resource planning (ERP) system. We have allocated and attributed these costs to PEC in accordance with our cost allocation methodology. We have also treated these costs in accordance with our capitalisation policy.

Table 8.1: Indirect capex – historical capex incurred to March 2020 ($M, 2017-18)

Item	2018-19	2019-20	Total capex to March 2020
Labour	1.4	2.9	4.3
Labour related costs:			
Travel	>0	0.1	0.1
Sustenance	>0	>0	>0
Non-Labour costs:			
Legal	0.1	1.0	1.1
Consulting	0.5	4.2	3.4

[14] TransGrid, Cost Allocation Methodology, 14 December 2016 (pg. 15)

Item	2018-19	2019-20	Total capex to March 2020
Engineering	1.0	2.3	3.4
Network/property	0.2	0.2	0.4
Other	0.1	2.9	3.0
Total	**3.4**	**13.7**	**17.1**

8.3 Project development capex

We have forecast our project development capex based on the additional resources required for the set-up and ongoing management of the Project.

8.3.1 Forecasting methodology and assumptions

We have forecast our project development capex based on the additional resources required for the set-up and ongoing management of PEC. We have:

- estimated that 50 additional roles are required for this capex (i.e. are incremental to PEC)
- phased the commencement of roles over the duration of PEC
- applied standard labour rates, effective from 30th June 2018. Real labour cost escalations have not been included in this part of the forecast – they are instead detailed in section 10, and
- included labour-related costs in the forecast, such as for travel and sustenance, training, recruitment, travel, office leases and IT.

The following assumptions have also been applied:

- all costs that have been determined as specifically relating to PEC will be 100 per cent allocated to PEC
- 46 per cent of all incremental costs associated with the Major Projects Division will be allocated to PEC[15]. This includes:
  - Labour – Major Projects Division Core and Support Team
  - Property and Facilities – Major Projects office (including office rental, maintenance and outgoing costs)
  - IT – support costs, licencing and hardware for the Major Projects Office
  - Expenses and Travel – Major Projects Division Staff
  - Training – Major Projects Division Staff
- where an existing FTE takes on a new role that is created as a consequence of PEC, it is assumed that their previous role will be backfilled using the existing standard labour rate and level, and

[15] We have established a Major Projects Division to coordinate and deliver PEC and other contingent projects including Hume Link (Snowy 2.0), Queensland-NSW Interconnector (QNI) and Victoria-NSW Interconnector (VNI). The cost estimates associated with the Major Projects Division have been allocated between each of the major projects based on the indicative total capex forecast for each project (until commissioning). The percentage allocation to PEC is 46 per cent.

> where an existing FTE spends more than 25 per cent of their time on PEC, it is assumed that their previous role will be backfilled and the cost is therefore incremental to business-as-usual.

Labour including internal staff, contractors, consultants and external labour hire have been classified into a series of salary bands and the corresponding labour rate has been used to determine forecast capex.

A labour on-cost rates have been applied to the base labour costs in line with Table 8.2.

Table 8.2: Labour on-costs

Type	Rate	Breakdown
Employees under Award – Enterprise Agreement	0.4	Annual Leave – 10% Long Service Leave – 7% Payroll Tax – 7% Superannuation – 16%
Employees on individual employment contracts – Contract Officers	0.24	Annual Leave – 10% Long Service Leave – 7% Payroll Tax – 7% *Superannuation is included in the base rate for Contract Officers

The rates applied for external contracted labour have been determined based on documentation provided by the external party detailing fees, rates and charges.

In addition, we have estimated that capex is also required for:

> geotechnical studies

> legal fees, and

> consultant and professional fees.

Costs in relation to consulting fees and legal advice have been determined, where possible, based on documentation from the external party detailing fees, rates and charges. All rates have been provided at current rates and do not include an escalation for CPI or real rate escalation.

The proposed office facility will house employees operating across the four major projects. Accordingly, all IT set up costs and network connectivity costs associated with the new office space will be attributed at 46 per cent to PEC. Consistent with our IT for Major Projects, we have assumed that no incremental IT support costs will be incurred.

8.3.2 Forecast model

Project development cost = $\sum FTE\ type\ x\ Rate\ x\ Percentage\ on\ PEC$

Forecast capex is derived based on the “Corporate and network overhead spreadsheets for Project EnergyConnect” provided as an attachment to this Application.

Quarterly FTE equivalents for each labour type were derived from the proposed project schedule.

The forecast expenditures are summarised in Table 8.3.

Table 8.3: Project development costs ($M, 2017-18)

Item	Forecast expenditure	Comments
PEC project management team	19.2	26 roles required to enable PEC 18 are expected to be resourced through fixed term contractors This includes owners engineering, technical writers as well as project management resources
Major Projects Team	3.8	5 FTEs working across 4 projects (46% attributable to PEC)
Other resources	7.2	19 FTEs across engineering, regulatory & spatial, procurement and support (46% attributable to PEC)
Labour related costs	6.2	Training - An allowance has been made for training costs at the current standard rate of $1,500 per person, per annum. Recruitment - based on historical experience and current market conditions. Office lease costs – Our current office space is at capacity and therefore new office space is required for the new Major Project Team. Note that the Works Delivery team will be predominantly based at sites and have not been factored in to the office requirement. Costs based on current available market rates – $500,000 per annum rent, plus $250,000 per annum office outgoings charge applied at 46% allocation to PEC. Office IT costs - Office Network Connectivity Data and Voice cost is based on a $1,200 monthly recurring fee as per similar arrangements currently in place. Costs for CISCO IT Desktop phones and Laptop and desktop set up are estimated for 50 workstations within the Major Projects Office (including the PEC Team). All IT set up costs and network connectivity costs will be attributed at 46% to PEC. PEC team travel – All travel, flights, accommodation and expenses for PEC team for the duration of PEC, excluding car hire.
Non-labour costs	4.8	Geotechnical studies – estimate based on costs incurred on projects of similar scope and nature System Planning Studies, Hydrological Studies - Cost is agreed rate provided by service providers EMF Study - Estimated cost based on projects of similar scope and nature Legal costs – estimate of fees to be incurred, based upon documentation provided by legal firm Allens detailing standard rates and services provided Consultants costs – Actual and consultant's estimated costs to support us prepare the cost estimates and regulatory submissions. These consultants have been

Item	Forecast expenditure	Comments
		necessary due to capacity constraints and to provide specialist knowledge and skills for specific tasks
Total cost	**41.3**	

8.4 Works delivery

Forecast capex for works delivery reflects incremental labour costs for project management, substation works delivery and transmission works delivery. Around 96 per cent of forecast capex for works delivery is labour costs, with a further 2 per cent relating to labour related costs (such as sustenance, training, recruitment, and travel). There are no non-labour costs included in the works delivery capex forecast.

8.4.1 Forecasting methodology and assumptions

We have forecast works delivery capex based on the additional resources (FTEs) required for project management, substation and transmission delivery. We have:

> estimated that 29 additional FTE are required (i.e. are incremental to PEC):

> phased the commencement of FTEs over the duration of PEC

> applied standard labour rates, effective from 30th June 2018. Real labour cost escalations have not been included in this part of the forecast – they are instead detailed in section 10, and

> included labour-related costs in the forecast, such as for travel and sustenance, training, recruitment, travel, office leases and IT.

No allowance for the following has been included in the capex forecast:

> additional office space – the works delivery team will largely operate on site or in site-offices, and

> IT hardware – no additional hardware is required for the works delivery team.

8.4.2 Forecast model

Works delivery cost = $\sum FTE\ type\ x\ Rate\ x\ Percentage\ on\ PEC$ + sustenance allowance + materials

Costs were calculated in the “Corporate and network overhead spreadsheets for Project EnergyConnect” provided as an attachment to this Application

Monthly FTE equivalents for each role were derived from the proposed project schedule.

The forecast expenditures are summarised in Table 8.4.

Table 8.4: Works delivery costs ($M,2017-18)

Item	Forecast expenditure	Comment
Labour	19.1	Based on project schedule
Labour on-costs:		
- Sustenance	0.5	Based on standard rates
- Travel	0.1	All flights for Works Delivery Staff Travel as per project schedule and Works Delivery Labour Assumptions
- Training	0.1	An allowance has been made for training costs at the standard rate of $1,500 per person, per annum
- Recruitment	0.4	Based on historical experience and current market conditions
- IT hardware	0.1	Based on a set IT hardware bundle required for Works Delivery FTEs (total calculated based on no. of FTEs requiring hardware phased across the lifetime of the project at current prices adjusted to $2017-18
Total cost	**20.2**	

8.5 Land and environment

Around 40 per cent of capex for land and environment relates to incremental labour. The remaining costs relate to non-labour costs for property consulting, environmental impact studies, surveys and legal and professional fees.

8.5.1 Forecasting methodology and assumptions

Forecast capex for land, environment and communications activities has been derived based on the project schedule. It is anticipated that 200-230 property easements or acquisitions will be required to deliver PEC. Because of the scale and impact of PEC, significant resource will be required to manage the property and environmental implications of the project.

We have:

> estimated that 11 additional roles are required over course of the project to assist with the following matters (i.e. are incremental to PEC):
  - land acquisition
  - environmental impact studies, and
  - resolution and property administration.

> phased the commencement of FTEs over the duration of PEC, and

> applied standard labour rates, effective from 30th June 2018. Real labour cost escalations have not been included in this part of the forecast – they are instead detailed in section 10.

Further details on phasing of labour and required roles is provided in “Corporate and Network Overhead Costs”. Non-labour costs for property consulting, environmental impact studies, surveys and legal and

professional fees are based on independent expert advice from JLL and WSP as well as a fee schedule provided by Clayton Utz.

8.5.2 Forecast model

Land, environment and communications cost = $\sum FTE\ type\ x\ Rate\ x\ Percentage\ on\ PEC$

Costs were calculated in the "Corporate and network overhead spreadsheets for Project EnergyConnect" provided as an attachment to this Application

Monthly FTE equivalents for each role were derived from the proposed project schedule. Labour rates for each labour role at July 2018 were used and escalated by the rates used in the 2018-23 Revenue Determination to obtain the real labour costs in each month of the project. These were then added to form the forecast labour costs in 2017-18 dollars. De-escalating by CPI then provided labour costs in 2017-18 dollars.

The forecast expenditures are summarised in Table 8.5.

Table 8.5: Land and environment costs ($M, 2017-18)

Item	Forecast expenditure	Comment
Labour	6.0	Based on 200-230 property easements or acquisitions
Labour related costs:		
-Travel	0.4	Based on allowance of $5,000 per month for 38 months until June 2023
-Training & Recruitment	0.2	An allowance has been made for training costs at the standard rate of $1,500 per person, per annum. Recruitment is based on historical experience and current market conditions
Non-Labour costs:		
- Property Consulting	2.7	Based on rates provided by JLL and future costs to be incurred based on projects of similar scope and nature.
- Environmental Impact Studies	5.2	Based on estimates provided by consultant WSP, who have drawn on their experience with projects of a similar nature and scale.
- Professional fees	1.4	Professional fees (legal, survey, property fees) are estimates based on costs incurred on projects of similar scope and nature.
Total cost	**15.9**	

8.6 Stakeholder and community engagement

Forecast capex for stakeholder and community engagement relates to engagement during the construction and commissioning phase required to deliver PEC in a sustainable way given that it will impact many communities in NSW.

8.6.1 Forecasting methodology and assumptions

Forecast capex for stakeholder and community engagement activities has been calculated based on a bottom-up-build. Seventeen incremental roles have been identified. These resources will be responsible for

land acquisition matters, environmental impact studies and issue resolution as well as property administration over the course of the project.

Further details on phasing of labour and required roles is provided in “Corporate and Network Overhead Costs”, provided as an attachment to this Application.

8.6.2 Forecast model

Costs were calculated in the “Corporate and network overhead spreadsheets for Project EnergyConnect” provided as an attachment to this Application. The forecast capex is summarised in Table 8.6.

Table 8.6: Stakeholder and community engagement costs ($M, 2017-18)

Category	Forecast expenditure	Comment
Labour	3.2	Based on bottom-up-build of activities
Labour related costs:		
Travel	0.7	Estimate of travel required
Non-Labour costs:		
Community engagement – External support	3.3	Based on costs provided by consultant KJA
Design / Communciation costs	1.0	Based on $25,000 per month over the course of the project. This rate is based on our experience and historical costs incurred for these activities
Community Improvement	0.4	Based on $100,000 cost per year over the course of the project. This rate is based on our experience and estimates based on scale and complexity of the PEC project
Total cost	**4.7**	

8.7 Project insurance costs

Forecast capex for PEC insurance premiums is required for the risks associated with “construction” activities.

8.7.1 Forecasting methodology and assumptions

During the construction phase of the project, we will require insurance to cover the risk associated with the construction activities within PEC. [redacted] These costs exceed our current operational insurance.

The provision of additional coverage has been scoped as Principal Arranged Insurance and includes construction works insurance, construction liability insurance and marine cargo insurance to cover the period from construction to commissioning.

[redacted] On completion of the project, the resulting assets will impact our ongoing insurance requirements. These additional ongoing costs are not included within the indirect capex forecast and are, instead, incorporated into the Opex Forecasting Methodology provided as an attachment to this Application.

8.7.2 Forecast model

The forecast expenditures are summarised in Table 8.7.

Table 8.7: Project insurance costs

Item	Forecast expenditure	Comment
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
Total cost ($M, nominal)	[redacted]	
Total cost ($M, 2017-18)	[redacted]	

8.8 Tender payments and facility costs

Forecast capex for tender payments and facility costs relates to:

> costs incurred to utilise a Tender Portal and Data Room, and

> compensatory payments to tender bidders.

8.8.1 Forecasting methodology and assumptions

We have used the Ansarda Tender Portal and Data Room, which enables us to view and query responses from prospective bidders in a secure data room and gain access to real time reporting to evaluate prospective options in an effective and efficient manner.

To secure an EPC contract that meets the scope and requirements of PEC, compensatory payments are provided to reimburse bidders for the time and effort associated with preparing submissions for the EPC tender. In order to determine the necessity of compensatory payments, we undertook early market soundings to analyse market appetite in accordance with the Major Infrastructure Projects Practice Note[16].

We have determined that bid cost contributions would enhance:

> the competitive participation of multiple bidders

> the quality and quantity of bidders and submissions provided, and

> the alignment of bidding processes with common industry practices and NSW government guidelines[17].

The costs associated with Tender and Bidder Payment have been determined in line with NSW Government policy, supporting the reimbursement of up to 50 per cent of the expected bid costs for projects exceeding $100 million. Given that PEC presents the first project of this nature and scope, we believe that the $12.5

[16] Major Infrastructure Projects Practice Note, Australian Constructors Association, 2019

[17] Bid Costs Contribution Policy, NSW Treasury, 2018

million forecast for this purpose, amounting to less than 25 per cent the actual bid cost, is a prudent and necessary expenditure.

Fees for tender portal and data room provided by Ansarada.

8.8.2 Forecast model

The forecast expenditures are summarised in Table 8.8.

Table 8.8: Tender and bidder payment and data room costs

Item	Forecast expenditure	Comment
Bidder Payment 1	0.5	Standard compensation amounts provided to unsuccessful bidders within tender process
Bidder Payment 2	12.0	Standard compensation amounts provided to unsuccessful bidders within tender process
Bidder expenses	>0	Based on invoice from bidder
Ansarada Tender Portal and Data Room	0.2	Quote
Total cost ($M, nominal)	**12.7**	
Total cost ($M, 2017-18)	**12.5**	

8.9 Forecast expenditure

The forecast expenditure for indirect capex is set out in Table 8.9.

Table 8.9: Forecast expenditure for indirect capex ($M, 2017-18)

Item	Forecast expenditure	Comment
Actual costs incurred	17.1	January 2019 to March 2020
Forecast costs:		
- Project development	41.3	
- Works delivery	20.2	
- Land and environment	15.9	
- Stakeholder and Community engagement	8.5	
- Insurance	6.9	
- Procurement bidders payments and data room	12.5	
Total cost	**122.4**	Excludes taxes, except for Payroll tax which has been included within labour on-costs

9. Forecast capex for project risks

9.1 Approach

The actual capex we will incur to deliver PEC is uncertain. Given the scale, complexity and uniqueness of PEC, there are numerous reasons (i.e. risks and other unforeseen events) that actual capex may exceed the forecast capex included in this Application.

We have only included forecast capex for risks that:

> exceed the materiality threshold of 0.5 per cent of the total forecast capex

> are not business as usual risks

> are not within our control

> cannot be covered by contract terms or insurance[18], and

> are not covered by pass-through provisions in the NER.

Only one risk meets these criteria:

> **Environmental offset risks** – that the liability that we face to offset lost biodiversity and species habitat resulting from PEC is higher than the current base case estimate included as an environmental offset cost in section 7.6. We have reflected the expected adjustments to environmental offset risks arising from the revised route via Dinawan and changes in the 220kV line specification in our capex forecast by reducing the maximum environmental capex proportionally with:

  – the 9km reduction in line length due to revised route via Dinawan

  – the reduction of the 220 kV line easement width requiring clearing from 50m to 20m.

Forecast capex associated with this risk has been determined based on information provided by independent expert WSP and has been calculated by multiplying the probability that the risk will occur (30 per cent) by the expected cost of the risk should it occur ($406.9 million). This results in forecast capex of $122.1 million.

9.2 Environmental offset risks

9.2.1 Description of Risk

Along the route length that the transmission line construction will traverse, we will be required to offset the impact of delivering PEC on vegetation and habitat for threatened species. WSP has estimated the cost of the offsets to be $74.7 million (or $77.8 million in Real $2019) based on the *limited* clearing scenario. This is discussed in section 7 which explains how capex for property and easements has been derived.[19]

The limited clearing approach must however be approved (via a formal decision) by NSW Department of Planning, Industry and Environment (DPIE). Discussions with the DPIE will occur in the later stages of the project once there is more clarity on the impact of biodiversity and species from site surveys and assessments. Environmental offsets must generally be acquired prior to project approval (i.e. prior to construction) and only in exceptional cases within 12 months of project approval.

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[18] Importantly, the exchange rate and commodity price risks can be contracted away once the tendered contract is awarded. However, until that point – and absent any hedges – TransGrid is exposed to the risk that exchange rates and commodity prices move in a way that increase the costs of the project.

[19] WSP, PS113770-ECO-MEM-001 Rev D, *Memo: NSW State-listed Biodiversity Offset Liability Estimate – Project Energy Connect: South Australian Border to Wagga Wagga*, Table 6.1.

DPIE may require us to purchase more offsets than the offsets determined under the limited clearing approach. Accordingly, there is a risk the capex forecast for the limited clearing will be insufficient to meet DPIE's decision.

WSP has estimated the maximum environmental offset costs under the full clearing scenario to be $481.6 million (or $501.3 million in Real $2019)[20] with a 20 per cent to 40 per cent probability of occurring. WSP have advised that:

> **Limited clearing scenario** (70 per cent likelihood) – DPIE will accept partial clearing along the transmission line route, and
> **Full clearing scenario** (30 per cent likelihood) – DPIE will reject limited clearing and require us to offset the effects of complete vegetation clearing for the entire easement width and maintain into perpetuity.

We have forecast capex for the environmental offset risk by multiplying the probability that full clearing will be required by DPIE (30 per cent) by the expected cost (i.e. the difference between the limited and full clearing scenarios (i.e. $481.6 million – $74.7 million = $406.9 million).

9.2.2 Assumptions in the Base Capex Estimate

The environmental offset liability estimate in the base capex is determined based on:

> a desktop review of the potential offset requirements for PEC of biodiversity listed under the NSW Biodiversity Conservation Act 2016, undertaken by WSP, and
> an assumption that the PEC biodiversity offset liability can be determined using a limited clearing scenario.

9.2.3 Uncertainty and Expected Cost of the Risk

There is a risk that the environmental offset costs will be higher than those reflected in the forecast capex for property and easements (see section 7). The cost of that risk was determined based on the following:

> probability of DPIE accepting the limited clearing approach, which was informed by:
  – the offset scheme based on limited clearing, and
  – DPIE decision on a recent project of similar scale to PEC.
> difference in the environmental offset costs between the full and limited clearing approaches.

Each of these is discussed below.

Offset scheme design

The offset scheme design allows for partial vegetation retention within impact zones. Since 2008, the BAM (implemented in 2017) and its predecessor system – BioBanking – have allowed adjustment of the likely end vegetation condition of impacted areas to be more than zero.

For example, both BioBanking and BAM provide for management zones to be differentiated, depending on what impacts are likely to occur within each zone. A management zone could be classified as an asset protection zone for bushfire protection, where some clearing of vegetation is required, but some trees, shrubs and groundcovers can be retained. Classifying a management zone in this way allows the assessor to reduce the credit requirement for that zone, as not all vegetation is required to be cleared. In contrast, a management zone where all vegetation is completely cleared would generate a full number of credits per hectare for that area.

[20] WSP, PS113770-ECO-MEM-001 Rev D, *Memo: NSW State-listed Biodiversity Offset Liability Estimate – Project Energy Connect: South Australian Border to Wagga Wagga*, Table 6.2.

Both BAM and BioBanking provide flexibility for other reduced impact outcomes such as from transmission easements. For instance, Table 1 of the BAM Operational Manual Stage 2 (DPIE 2019) includes specific guidance, which is repeated below Figure 9.1. It is evident from the table that the system has been designed to allow for partial vegetation retention within impact zones (i.e. limited clearing).

Figure 9.1: Extract from the BAM Operational Manual Stage 2

Table 1 Examples of partial vegetation clearing within the development footprint and associated future vegetation integrity scores for relevant attributes

Type of clearing activity	Attributes affected	Attributes not affected
Asset Protection Zone – example is slashing or mowing understory vegetation to a specified height	Tree cover and species richness attributes will be retained but could decline due to ongoing vegetation thinning from maintenance work (score above 0 but below current condition). Attributes relating to shrubs and other growth form groups that generally occur in the mid storey will be cleared (score 0).	Cover attributes for grass and forb growth form groups and functional attributes such as large trees could retain current condition score if unaffected by Asset Protection Zone work and managed appropriately. Specific habitat features (e.g. hollow bearing trees) or specific threatened species may be targeted for retention.
Easements for services (e.g. electricity transmission lines, telephone lines) – example is removal of large shrubs and trees	Trees and shrubs cleared resulting in these growth form groups' richness and cover attributes scored at 0, along with functional attributes such as number of large trees, tree regeneration, tree stem size class. Functional attributes such as litter cover and fallen logs may be partially retained, leading to a decrease in score.	Grass and forb richness and cover could retain current condition scores if unaffected by easement clearing or digging. Where no clearing or digging is required in sections of the easement it may be possible to retain current scores. Vegetation would require ongoing management, particularly to ensure that maintenance of the easement does not increase exotic cover in the retained areas.

Recent experience

A search of the NSW major projects website by WSP revealed that there were no known examples of implementation of this approach for new transmission lines for major projects in NSW under the BAM system. The biodiversity assessment for Snowy 2.0 interconnector at the time of writing has not been approved. However, the agreed approach with the regulator for Snowy 2.0 is consistent with our approach and the following example, Darlington Point Solar Farm.

However, there is a recent project of similar scale to PEC approved for limited clearing under the predecessor BioBanking system that is relevant to PEC. This project is the large Darlington Point Solar Farm (DPSF), which was approved in December 2018 by DPIE as a Major Project. DPSF was chosen due to its similarity to PEC in terms of its environmental impact. It has a partial impact on the environment as the native understorey beneath the solar panels have been predominately maintained but all trees and shrubs have been removed.

The DPSF is one of the largest solar farms currently under construction in Australia. The 2018 biodiversity assessment report for DPSF contained a justified analysis for each management zone. It included some forested and grassland communities only having a partial loss of vegetation condition for management zones within the solar panel footprint. This yielded significant credit reduction for the DPSF project. The original biodiversity offset credit liability estimate assuming *full* impact was approximately 25,000 ecosystem credits. The final approval by DPIE resulted in a *minimum* ecosystem credit liability of 3,736, with a *maximum* liability

– depending on post-construction monitoring outcomes – of 7,274 ecosystem credits.[21]

Whilst the approval for the DPSF project was based on the predecessor BioBanking system, a very similar principle is expected to be applicable under the BAM in accordance with the BAM Table 1. Hence, the probability of this discounted (i.e. limited clearing) approach being accepted is deemed to be relatively high.

Although it is challenging to estimate the likelihood of a DPIE approval for the discounted approach, WSP has estimated the likely level of success of the discounted approach via the limited clearing scenario would be in the order of approximately 60 per cent to 80 per cent based on its experience and the following assumptions:

> project impact and maintenance of vegetation within the easement outside of the direct footprint and tracks will not impact on the ground layer vegetation and is subject to confirmation from DPIE, and

> DPIE will accept the discounted approach to BBAM credit generation from previous projects examples such as the DPSF provided consistently with the credit generation using BAM.

Estimated risk cost

The environmental offset costs can range from the limited clearing cost of $74.7 million to the full clearing cost of $481.6 million. This yields a difference in cost of $406.9 million. There *is* a risk that DPIE may require the full clearing scenario to determine the PEC offset liability. WSP has estimated that there is a 60 per cent to 80 per cent probability that the limited clearing scenario will apply. On this basis, we have estimated that there is 30 per cent probability that the full clearing scenario will apply. Accordingly, forecast capex for the environmental offset risk is calculated by multiplying the probability that full clearing will be required (30 per cent) by the expected cost (i.e. the difference between the limited and full clearing scenarios i.e. $481.6 million – $74.7 million = $406.9 million)[22].

Table 9.1: Biodiversity offset risk estimate

Biodiversity estimate	Value	Basis
Limited clearing scenario (used in base capex)	$77,777,915	Assumes that something less than full clearing is required to install the PEC assets, based on various project level assumptions This scenario is reflected in the capex forecast for property and easements
Full clearing scenario	$501,248,538	Assumes complete vegetation clearing in the entire nominated easement widths
Difference	***$423,470,624***	***Calculated as the difference between the limited and full clearing scenario offset values***
(x) Likelihood	x 30%	WSP estimates that there is a 60% – 80% probability that the discounted approach would apply to determining the offset liability, which leaves a 20% – 40% chance that the full clearing scenario will apply[23]. We used 30% as a mid-point of that range.
Risk cost ($,2019-20)	**$127,041,187**	Calculated by multiplying the difference between the limited and full clearing scenario offset values by 30%
Risk cost ($,2017-18)	**$122,062,320**	

[21] Note these 'ecosystem credits' are in the predecessor BioBanking currency (credit value), which is different to the current BAM currency (credit value).

[22] WSP, PS113770-ECO-MEM-001 Rev D, *Memo: NSW State-listed Biodiversity Offset Liability Estimate – Project Energy Connect: South Australian Border to Wagga Wagga*

[23] Ibid, p.5

Table 9.1 shows the calculation used to determine the biodiversity offset risk cost.

9.3 Forecast capex

The forecast capex for project risks is set out in Table 9.2.

Table 9.2: Forecast capex for project risks events ($M, 2017-18)

Item	Forecast expenditure	Comment
Project risk	122.1	

10. Real input cost escalation

Labour costs make up a large component of our forecast capital expenditure for PEC – and those costs tend to increase over time by more than inflation. To recognise that, we have included the forecast impact of these costs, which are commonly referred to as real input cost escalation.

10.1.1 Approach

Forecast real input cost escalation is calculated by multiplying the labour cost components of the tendered expenditure, property costs, and indirect expenditure by the forecast real labour cost escalators allowed by the AER in its 2018-23 Revenue Determination.[24] Consistent with that determination, no real input cost escalation was included for non-labour components of the expenditure.

The real labour input cost escalators for 2018-19 to 2022-23 are set out in Table 10.1. These are converted into a cumulative index from the 2017-18 year.

Table 10.1: Real labour input cost escalator and cumulative index

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Real labour input cost escalator	N/A	0.81%	0.95%	1.21%	1.46%	1.49%
Cumulative index	1.000	1.008	1.018	1.030	1.045	1.061

Note: Values are rounded for presentational purposes. Unrounded figures were used in the calculations.

The approach is applied in our PEC Capex Model, which is included as an attachment to this Application.

10.1.2 Forecast expenditure

Applying this approach gives forecast real input cost escalation of $15.5 million over the 2018–23 regulatory period, as set out in Table 10.2.

Table 10.2: Forecast real input cost escalation ($M, 2017-18)

	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Real input cost escalation	>0	0.1	2.7	6.0	6.6	15.5

[24] See, Australian Energy Regulator, May 2018, *AER - Final decision TransGrid transmission determination - Capex model - May 2018*. The labour escalators adopted by the AER are at cells H23:H27 of the 'Input_Fixed' sheet.

11. Summary of forecasts

A summary of the capex for PEC is shown in the following tables.

Table 11.1: Capex forecast by category ($M, 2017-18)

Type	Item	Capex	Basis
Tendered capex	Transmission line	1,258.9	Market pricing based on responses provided by tenderers and top down estimates for other construction costs
	Substation	433.0	
	Secondary systems	11.9	
	Communication systems	2.0	
	Synchronous condensers	121.1	Quotes from suppliers of large specialist equipment
Property capex	Easements	93.7	Independent expert report from JLL
	Land	3.3	Independent expert report from JLL
	Construction related	10.2	Independent expert report from JLL
	Fees	2.3	Based on historic costs
	Environmental offsets	74.7	Independent expert report from WSP
Indirect capex	Indirect costs incurred to March 2020	17.1	From Ellipse, our ERP system
	Project development	41.3	Bottom-up-build approach. Incremental labour costs (i.e. FTEs are based on standard labour rates
	Works delivery	20.2	
	Land and environment	15.9	
	Stakeholder and Community engagement	8.5	Our internal experience and historical costs for these activities and on-costs provided by consultant
	Insurance	6.9	[redacted]
	Procurement bidders payments and data room	12.5	Based on industry practices
Escalation	Real input cost escalation	15.5	Forecast real labour cost escalators allowed by the AER in its 2018-23 Revenue Determination for TransGrid
Risk events	Risk cost	122.1	Based on information provided in consultants' reports (WSP)
Subtotal (excluding equity raising)		**2,271.0**	
Financing	Equity raising costs	19.9	Using approach and assumptions adopted by the AER for the 2018-23 Revenue Determination for TransGrid
Total		**2,290.9**	

Table 11.2: Capex forecast mapped to regulatory asset class ($M, 2017-18)

Regulatory asset class	2018	2019	2020	2021	2022	2023	Total
Transmission Lines (2018-23)	-	2.3	-	422.3	582.8	396.7	1,404.1
Underground Cables (2018-23)	-	-	-	-	-	-	-
Substations (2018-23)	-	0.8	-	146.4	189.7	146.7	483.6
Secondary Systems (2018-23)	-	0.0	-	4.0	5.5	3.7	13.2
Communications (short life) (2018-23)	-	0.0	-	0.7	0.9	0.6	2.2
Business IT (2018-23)	-	-	-	-	-	-	-
Minor Plant, Motor Vehicles & Mobile Plant (2018-23)	-	-	-	-	-	-	-
Transmission Line Life Extension (2018-23)	-	-	-	-	-	-	-
Land and Easements	-	0.3	64.5	163.3	-	6.0	234.1
NSCAS Assets	-	-	-	-	-	-	-
Synchronous Condensers (2018-23)	-	0.2	-	39.6	64.1	29.8	133.8
Equity raising costs	-	19.9	-	-	-	-	19.9
Total	**-**	**23.5**	**64.5**	**776.3**	**843.1**	**583.6**	**2,290.9**

12. Forecast verification and validation

To provide the AER, customers and other stakeholders with a high level of confidence that the forecast costs for PEC are prudent and efficient we commissioned independent assessments of its costs.

12.1 Capex build-up validation

The capex build up was validated several times as the design specification was firmed up. This process ensured that appropriate scrutiny was made throughout the initial stages of the project.

Beca – Initial design (July – September 2019)

The initial design specification for the NSW portion of PEC was undertaken by Beca. Draft reports were provided to us and ElectraNet who undertook an internal design verification.

WSP – Cost Review (September 2019)

WSP undertook a critical review of the cost estimation methodology undertaken by TransGrid (including calculations). The cost estimation methodology reviewed was that used to produce the Basis of Estimate (BOE) on which the Tender schedules and the initial cost forecasts were based, prior to the Tendering process. The cost estimation methodology was based on TransGrid's cost estimation database (Success).

WSP found that the cost estimating methodology was sound and without error. It made six recommendations to improve the costing methodology, as follows:

> OFS Version 3 to be updated to match present scope, as the overhead line scope has changed.

> Additional visibility of estimating process required between OFS scope development and Success estimate. Key quantities difficult to verify for substation equipment.

> Focus on revalidating TransGrid supplied equipment costs for Specialist equipment and ensure pricing is on FY2018 basis.

> Scope risk should be removed from the base estimate

> The BOE has gone through multiple evolutions. Not all are clearly documented. Change log would be helpful for future projects.

> DCF/NCF need to be validated (bottom up).

TransGrid subsequently adopted each of these recommendations. Note that Indirect costs are now forecast using a bottom up build, rather than being based on DCF and NCF percentages of project costs.

12.2 Independent technical and economic assessment

The current capex forecast was validated though an independent technical and economic assessment.

GHD – Independent engineering capex assessment

We engaged GHD to undertake an independent engineering verification and assessment of our capex forecast.

GHD verified that the scope of PEC is reasonable and realistic to meet the investment needs.

GHD developed comparative estimates, or estimated costs using historical project costs and publicly available data.

Overall, GHD concluded that our forecast capex for Tendered Works for PEC is within a reasonable margin of GHD's comparative estimate.

GHD also concluded that our:

> forecast capex for property and easement would cover probable eventualities in the land /easement acquisition process

> approach to Biodiversity offset costs are based on sound methodology and approach, especially at this stage of the project, and

> indirect costs are within an acceptable range for projects of equivalent size and complexity.

GHD's independent review therefore supports the consistency of our forecast capex with that which would be incurred by a prudent and efficient business.

GHD's report is provided as an attachment to this Application.

12.3 Deliverability

Deliverability was validated through market testing. The procurement process for Tendered Works, as described in section 5, included that Tenderers should consider:

> corporate capability

> key risks and opportunities

> resourcing strategy and management

> financial capacity and contractual structure.

Applicants were instructed that they should provide a list of opportunities to improve value for money.

12.4 Accuracy of forecast expenditure

The accuracy of the capex forecast is difficult to quantify, given the unique nature of PEC. Rather than seek to express the likely inaccuracy as a number, we have identified risks associated with:

> potential changes in scope due to ground conditions, outcomes of stakeholder consultations, refinement of tenderers submissions etc.

> unforeseen costs

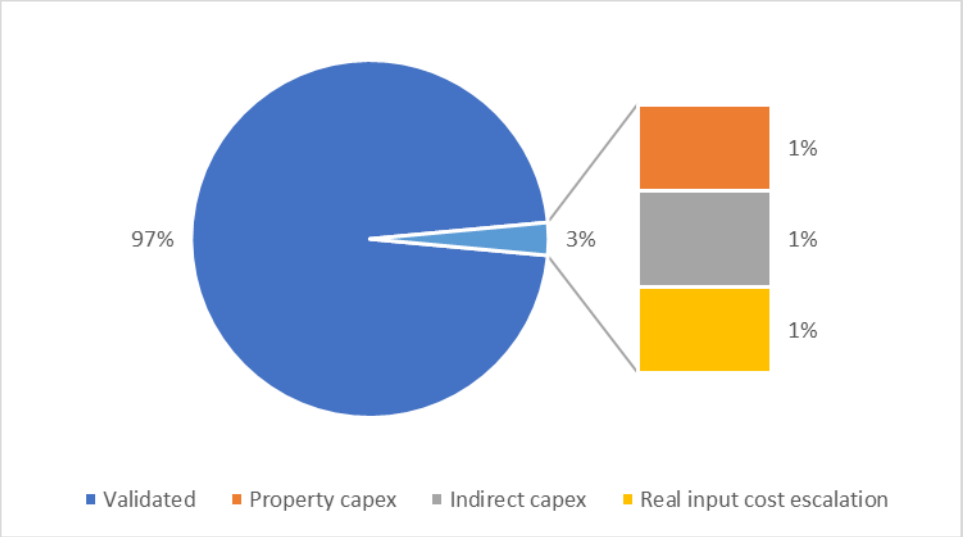
> project risks to timing and delivery.

A process of identifying risk mitigations and management was undertaken. The result is that most risks individually are not material (less than 0.5% of project total capex). Material risks are identified in section 9.

Further, Figure 12.1 shows that 97% of the forecast capex (excluding risk and unforeseen costs) has been obtained from manufacturers' quotes, consultants' reports and market testing. The remaining 3% is from our estimates, based on current or historic prices. This high portion of external validation supports that the forecast capex is appropriate for PEC.

The capex forecast in this document reflects the best available information we currently have. We expect to receive final tender submissions and binding offers from the three short-listed tenderers in late June 2020 and to select the preferred tendered by September 2020. We intend to provide the AER updated capex forecasts based on the final tender outcomes once this information is available.

Figure 12.1: Portion of capex forecast validated by consultants and market testing



Appendix A Supporting documents

Beca, EnergyConnect - Foundations Concept Design Summary Report, July 2019

Beca, EnergyConnect - Basis of Design and Cost Estimation - Access Tracks for Dry Weather Access Only, August 2019

Beca, EnergyConnect - Structure Concept Design Report - 220kV Double Circuit, September 2019

Beca, EnergyConnect - Structure Concept Design Report - 330kV Double Circuit, September 2019

Beca, EnergyConnect - Structure Concept Design Report - 330kV Single Circuit, September 2019

Beca, EnergyConnect - Structure Selection Study Buronga to RedCliffs, September 2019

Becca, SAET Interconnector - Conductor Selection Study, May 2019

Beca, Transmission Line Project Specific Design Criteria Rev0.0

Douglas Partners, July 2019, Report on Preliminary Geotechnical Investigation

- 2019 DP 86737.R.001.Rev0 Stage 1 Phase 1
- 2019 DP 86737.R.002.Rev1 Stage 1 Phase 2
- 2019 DP 86737.R.004.Rev0 Stage 2 Memo
- 2019 DP 86737.0.R.003.Rev0.Stage 2 Phase 1
- 2019 DP Combined - Phase 1 & 2 - Geology Overview - Drawing A Rev0
- 2019 DP Combined - Phase 1 & 2 - Geology Overview - Drawing B Rev0

ElectraNet, SAET-RIT-T-Network Technical Assumptions, June 2018

GHD, PEC - Scope Independent Verification and Assessment, June 2020

Jacobs, Transmission Line Cost Review, February 2019

Jacobs, Capex Estimating Database Independent Verification, September 2019

Jones Lang LaSalle, Desktop Assessment of Compensation, October 2019

NSW Government DP&E, Guideline 6 - Community and Stakeholder Engagement (Draft), 2007

NSW Government, Department of Finance, Services and Innovation, 2019, 2019-03-Property Acquisition Standard

O'Connor Marsden & Associates Pty Limited, Probity Advice: Assessment Method for Stage 1 Tenders for Project Energy Connect Expression of Interest, November 2019,

RBC Capital Markets, FX and Raw Materials Costs for EnergyConnect Project, December 2019

Rider Levell Bucknall, Project EnergyConnect Tender Evaluation Report, December 2019

TransGrid, Cost Allocation Methodology, December 2016,

TransGrid, EnergyConnect Tender Evaluation Plan, November 2019,

TransGrid, Risk Management Framework procedure D2004/3733

TransGrid, Option Feasibility Study (OFS)

TransGrid, Basis of Estimate (BOE)

TransGrid, Safety in Design procedure D2012/14473

TransGrid, Property Acquisition Policy

TransGrid, Landholder Easement and Compensation Guide

TransGrid, Compulsory Acquisition Process for New South Wales D2012/03522

TransGrid, Property Portfolio: Acquisition of Property and Property Interests D2007/04700

WSP, NSW State-listed Biodiversity Offset Liability Estimate – Project EnergyConnect: South Australian Border to Wagga Wagga, via Darlington Point October 2019,