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Consistency of TransGrid's proposed capital expenditure for Project Energy Connect with the NER requirements

Final report prepared for TransGrid

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1. Introduction

Project EnergyConnect (PEC) is the proposed new interconnector between New South Wales (NSW) and South Australia (SA) that is being developed jointly by TransGrid (for the investment within NSW) and ElectraNet (for the investment within SA).

The Australian Energy Market Operator's (AEMO) 2018 Integrated System Plan (ISP) first identified the new interconnector as an immediate priority that would deliver positive net market benefits as soon as it could be built.¹ ElectraNet has subsequently completed the SA Energy Transformation (SAET) Regulatory Investment Test for Transmission (RIT-T), which confirmed that the option now known as PEC was the preferred option that would maximise the net economic benefits provided across the National Electricity Market (NEM).²

AEMO's final 2020 ISP published 30 July 2020 confirmed that PEC remains in the optimal development path for the NEM and is a low regret 'actionable ISP' project. ElectraNet is currently in the process of updating its cost benefit analysis to verify that there has been no change in circumstances that would lead to PEC no longer being the preferred option identified under the RIT-T.³

PEC is now defined in the National Electricity Rules (NER) as the 'SA-NSW interconnector projects'. It has been identified as a priority project for early implementation under the NER.⁴

1.1 TransGrid's contingent project application

PEC was accepted by the Australian Energy Regulator (AER) as a contingent project in TransGrid's regulatory determination for the current regulatory control period.⁵

TransGrid lodged a contingent project application (CPA) with the AER (29 June 2020), to vary its current regulatory determination. TransGrid has subsequently completed its procurement process for the key components of PEC, and is providing additional information to the AER in relation to the prudent and efficient costs of the NSW portion of PEC

TransGrid's revised capex forecast is based on the Best and Final Offer (BAFO) from the preferred bidder for PEC. The BAFO capex forecast is \$1,894.6 million (\$2017-18) for the investments within NSW. This capital cost estimate comprises: ⁶

- \$1,410.4 million (reflecting the BAFO of the preferred bidder – bidder 2) to cover the costs of tendered works and large specialist equipment);
- \$58.2 million to cover 'other construction costs';
- \$121.5 million for property and easement costs;
- \$127.4 million for environmental offset costs;
- \$135.8 million to cover indirect costs, such as corporate and network overheads;
- \$38.2 million to cover biodiversity risks; and
- \$3.2 million to cover real labour cost escalation.

¹ AEMO, Integrated System Plan, July 2018, p 95.

² ElectraNet, SA Energy Transformation RIT-T, Project Assessment Conclusions Report, 13 February 2019.

³ As required by NER Ch 5.16.4(z3).

⁴ See Part ZZZP of the NER, and definitions in clause 11.114.1.

⁵ AER, TransGrid transmission determination 2018 to 2023 | Attachment 6 – Capital expenditure, Final decision, May 2018, pp 137-138.

⁶ Figures may not add up due to rounding.

The cost profile for the NSW portion of PEC over the three years proposed for construction, plus the early works already committed, is set out in Table 1. This reflects TransGrid's capex forecast of \$1,894.6 million plus \$16.2 million of equity raising costs.⁷

Table 1: Forecast capex for NSW components of Project Energy Connect 2018-23 (\$ millions, 2017-18, including overheads)⁸

Capex	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Total	19.7	23.3	222.7	914.6	730.6	1,910.9

The revised information provided by TransGrid also includes its revised estimate of the incremental opex it will incur over the current regulatory period associated with the NSW PEC investment.

1.2 Scope of this report

We have been asked by TransGrid to assess the consistency of its updated capex costs for PEC with the NER requirements against which the AER will evaluate TransGrid's CPA. Our assessment considers:

- project scope – specifically whether the proposed project is justified and whether it represents the efficient approach to meeting the objectives of the project; and
- the BAFO capex forecast - including how capex forecasts have been prepared and the assumptions adopted.

This report does not cover TransGrid's estimate of incremental opex or real labour cost escalation.

In preparing this report we have had regard to:

- the following TransGrid reports:
 - > Supplementary Capex Forecast Methodology for Project EnergyConnect – BAFO;
 - > Specification and Scope Description report;
 - > Corporate and Network Overhead Forecast for Project EnergyConnect; and
 - > EnergyConnect Tender Evaluation Report Phase B;
- WSP's memo on the revised estimate of EnergyConnect Offset Liability and Update to Strategy;
- Jones Lang LaSalle's (JLL) report on the Land and Easement Acquisition Forecast Costs for Project EnergyConnect; and
- the independent review by GHD of TransGrid's forecasting methodology and the reasonableness of the overall total and timing of the TransGrid's CPA capex forecast.

We note that TransGrid is submitting all of the above documentation to the AER.

The remainder of this report is structured as follows:

- section 2 sets out the NER requirements relating to the AER's determination on the PEC CPA, as well as the guidance provided by the AER as to how it will assess consistency of risk costs with the NER requirements;

⁷ Numbers do not add up to numbers in table due to rounding.

⁸ This includes equity raising costs and capex TransGrid has already incurred related to PEC, such as land purchases and easement acquisitions.

- section 3 assesses the justification for PEC, the appropriateness of the project scope and project timing;
- section 4 provides an overview of TransGrid's capex forecasts;
- section 5 assesses the PEC tendered works;
- section 6 considers the forecast property and easement capex;
- section 7 considers environmental offset costs;
- section 8 considers biodiversity offset risk;
- section 9 reviews corporate and network overhead costs; and
- section 10 summarises the consistency of TransGrid's proposed capex forecast for PEC with the requirements of the NER.



2. The regulatory framework applying to the AER's contingent project determination

This section sets out the regulatory framework that applies to the AER's consideration and determination of TransGrid's CPA for PEC.

2.1 Requirements under the NER

2.1.1 The basis for the AER's assessment of a contingent project application

When considering the appropriate amendment to a revenue determination in response to a CPA, the AER is required to determine the following:⁹

- the amount of capital expenditure (capex) and incremental operating expenditure (opex) that is reasonably required for each remaining regulatory year to undertake the contingent project;
- the total capex reasonably required for undertaking the contingent project;
- the likely commencement and completion dates for the contingent project; and
- the incremental revenue likely to be required by the Transmission network service provider (TNSP) for each remaining regulatory year of the current regulatory period as a result of undertaking the contingent project.¹⁰

In making the assessment above, the AER is required to accept the amounts and dates put forward by the TNSP if it is satisfied that the amounts of forecast capital expenditure and incremental operating expenditure:

- reasonably reflect the *capital expenditure criteria* and the *operating expenditure criteria* (as defined by the NER), taking into account
- the *capital expenditure factors* and the *operating expenditure factors* respectively (as defined by the NER), in the context of the contingent project.¹¹

2.1.2 Proposed expenditure needs to be prudent and efficient

The capital expenditure criteria and the operating expenditure criteria are defined in the NER.¹²

In making a determination on a CPA, the AER must be satisfied that the expenditure reflects:

- the efficient costs of achieving the capital (operating) expenditure objectives;
- the costs that a prudent operator would require to achieve the *capital (operating) expenditure objectives*; and
- a realistic expectation of the demand forecast and cost inputs required to achieve the *capital (operating) expenditure objectives*.

These criteria are the same that apply to the AER when approving TransGrid's capex and opex allowances as part of its full regulatory determination.

⁹ NER Ch 6A.8.2(e)(1).

¹⁰ This amount will differ from that implied from the total expenditure for the contingent project where the expenditure for the contingent project spans more than one regulatory period. This is not projected by TransGrid to be the case for the NSW PEC works.

¹¹ NER Ch 6A.8.2 (f)

¹² NER Ch 6A.6.7(c) and Ch 6A.6.6(c).

Assessment is against the capital (operating) expenditure objectives

The AER is required to consider a contingent project application on the basis of achieving the capital and operating expenditure objectives.

These objectives are defined in the NER as being to:

- meet or manage the expected demand for prescribed transmission services over that period;
- comply with regulatory obligations or requirements;
- maintain the quality, reliability and security of the network; and
- maintain the safety of the transmission network.

Assessment of compliance against the capital expenditure objective essentially requires an assessment of the reason why TransGrid is undertaking the project.

Normally this requires an assessment of the rationale for the project, as demonstrated by the application of the RIT-T. In the case of PEC there has been a number of developments since the finalisation of the RIT-T by ElectraNet in February 2019 (including an increase in the estimated costs associated with the project). This has led to ElectraNet conducting further analysis to demonstrate that the outcome of the RIT-T remains valid (and that there has been 'no material change in circumstance'¹³). This updated cost benefit analysis is being provided to the AER separate from, but in the same timeframe as, TransGrid's further cost information, and is relevant in determining the justification for the project.

Assessment of prudent and efficient costs

The AER is required to consider:

- the efficient costs of achieving the capital (operating) expenditure objectives;
- the costs that a prudent operator would require to achieve the capital (operating) expenditure objectives; and
- a realistic expectation of the [...] cost inputs required to achieve the capital (operating) expenditure objectives.

All of these requirements go to the question of whether the proposed expenditure is prudent and efficient

This requires an assessment of:

- whether the proposed scope of PEC represents the efficient approach to meeting the objectives of the project; and
- whether the costs TransGrid is proposing to meet this scope represent a realistic expectation of efficient costs.

Moreover, the AER is required to determine not only whether the total proposed costs are prudent and efficient, but also whether the costs proposed in each year of the current regulatory period are prudent and efficient. This requires consideration of whether the proposed works schedule for delivering PEC is consistent with that which would be adopted by a prudent and efficient TNSP.

¹³ NER Ch 5.16.4(z3).

Assessment against the relevant expenditure factors

In assessing whether the proposed costs are prudent and efficient, the AER is required to consider the relevant *expenditure factors*, as set in the NER.¹⁴

For PEC the following expenditure factors appear the most relevant:

- the relative prices of operating and capital inputs;
- the substitution possibilities between opex and capex in relation to the contingent project; and
- any relevant Project Assessment Conclusions Report (under the RIT-T).

2.1.3 Assessing the prudence of risk allowances

A relevant aspect of the prudence and efficiency of the costs put forward for PEC is the costs associated with the contingency allowances that have been made to cover risks that may increase the costs of delivering the project.

The AER has provided guidance on its approach to considering the assessment of the prudence of allowances for risk, in its earlier contingent project determination for ElectraNet's Main Grid System Strength project.¹⁵

The AER has defined '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 view is that it would be prudent or efficient for consumers to bear these costs through the ex-ante expenditure allowance only for risks that meet the following criteria:¹⁶

- risks that relate to a realistic latent condition with the site;
- risks associated with the actions or requirements of a third party not under contract to the TNSP and hence the risk cannot be addressed through enforcing contract terms; and
- excluding risks that:
 - > are under the TNSP's control;
 - > would normally be managed by the TNSP as part of its business as usual practices;
 - > are, or should be, reasonably covered by contract terms; or
 - > are, or should be, covered by insurance.

¹⁴ NER Ch 6A.6.7(e) and Ch 6A.6.6(e).

¹⁵ AER, *Final Decision - ElectraNet Contingent Project Main Grid System Strength*, August 2019.

¹⁶ AER, *Final Decision - ElectraNet Contingent Project Main Grid System Strength*, August 2019, p. 23.

3. The justification for PEC, the scope and timing

3.1 Project justification

3.1.1 The rationale for the project

AEMO's 2018 ISP identified PEC as an immediate priority that would deliver positive net market benefits as soon as it can be built.¹⁷

ElectraNet began the formal RIT-T process for PEC in 2016 (known at the time as the 'South Australian Electricity Transformation' (SAET) RIT-T). The RIT-T is an economic cost benefit test that is overseen by the AER and applies to all major network investments in the National Electricity Market (NEM).

The RIT-T was completed in February 2019, with the publication by ElectraNet of the Project Assessment Conclusions Report (PACR).¹⁸ Consideration of the PACR (where available) is one of the capex expenditure criteria set out in the NER.

The findings from the RIT-T process for PEC are:

- the preferred option ('option C.3') is a new interconnector between Robertstown in mid-north South Australia and Wagga Wagga in New South Wales, via Buronga; and
- at the time the project was expected to cost \$1.53 billion (\$2018-19) and to deliver net benefits of \$900 million (\$2018-19), based on an assumed energisation date of 1 July 2023.

The RIT-T found that PEC will reduce the cost of providing secure and reliable electricity to South Australia in the near term, while facilitating the longer-term transition of the energy sector across the NEM to low emission energy sources.

The RIT-T assessment assumed a targeted energisation date of 1 July 2023 for the new interconnector. This reflects the priorities of both the South Australian and NSW governments, who have each underwritten early works required to enable this date to be realised. Relevantly, as part of the New South Wales Transmission Infrastructure Strategy released in November 2018, the New South Wales government stated that it aims to accelerate the delivery of the new South Australia - New South Wales interconnector by 2023.⁸⁹ The RIT-T assessment demonstrated that there was a positive net market benefit associated with the investment, from the 2023 commencement date.

While the RIT-T is normally the primary justification for the need for a contingent project, there have been a number of major developments affecting PEC since the RIT-T was completed, including:

- the AER determination in January 2020 under clause 5.16.6 of the NER that concluded that the investment identified in ElectraNet's RIT-T satisfies the requirements of the RIT-T;¹⁹
- technical analysis by AEMO reported in May 2020 in relation to existing and emerging system security challenges in the SA system. These challenges are addressed by PEC but would require additional security measures if PEC did not proceed;
- an increase in the estimated cost of PEC, including as a result of responses to TransGrid's RFT Phase A tender;
- the release of AEMO's final 2020 ISP; and

¹⁷ AEMO, *Integrated System Plan*, July 2018. AEMO refers to this new interconnector as 'Riverlink' in the 2018 ISP.

¹⁸ As required by NER Ch 5.16.4(z3).

¹⁹ AER, *South Australian Energy Transformation | Determination that the preferred option satisfies the regulatory investment test for transmission*, Decision, 24 January 2020.

- ElectraNet's further analysis to determine whether there has been a material change in circumstances since the conclusion of the RIT-T that would change the outcome of the RIT-T.

Each of these developments are discussed below.

AER's 5.16.6 determination

ElectraNet requested formal confirmation from the AER that the RIT-T has been applied correctly for PEC.²⁰ This is one of TransGrid's contingent project triggers for PEC.

The AER issued its determination on ElectraNet's application on 24 January 2020.²¹ The AER confirmed that the preferred option identified in ElectraNet's application of the RIT-T provided a positive net benefit and was the credible option that delivered the highest net economic benefits across alternative inputs and assumptions.²²

However, in reaching its decision the AER identified a number of critical inputs and assumptions that have a material impact on the estimated benefits of the preferred option, specifically:

- the assumed minimum capacity factors (MCFs) of South Australian gas plants that determine their usage and retirements; and
- system security requirements, including the impact of system security obligations on the preferred option, the role of pumped hydro in addressing these requirements and the impact on the ranking of the credible options.

We note that ElectraNet and AEMO had adopted the same modelling software and MCF assumptions in the PEC RIT-T and the 2018 ISP.

Assuming costs for the preferred option of \$1.53 billion (\$2018-19) (in line with those assumed at the time of the RIT-T), the AER projected that:²³

... the net benefits in the central scenario may be significantly lower (about \$269 million rather than \$924 million) using the alternative inputs and assumptions.

The AER highlighted that the RIT-T indicated that the estimated costs of the preferred option was subject to a high degree of uncertainty. It follows that any significant increase in costs of the preferred option could have a material impact on the outcome of the RIT-T. The AER concluded that:²⁴

In the event that any updated assessment of the costs of the project (and/or any other updated assessment of the key variables that may affect market benefits) differs materially from those presented in ElectraNet's RIT-T assessment, we would expect ElectraNet to consider whether there is a change in circumstances such that the RIT-T should be reapplied, and to provide evidence of that consideration to the AER.

²⁰ ElectraNet, Letter to the AER entitled SA Energy Transformation RIT-T – Request for determination, 11 April 2019.

²¹ AER, South Australian Energy Transformation | Determination that the preferred option satisfies the regulatory investment test for transmission, Decision, 24 January 2020.

²² AER, South Australian Energy Transformation | Determination that the preferred option satisfies the regulatory investment test for transmission, Decision, 24 January 2020, p 45.

²³ AER, South Australian Energy Transformation | Determination that the preferred option satisfies the regulatory investment test for transmission, Decision, 24 January 2020, p 7.

²⁴ AER, South Australian Energy Transformation | Determination that the preferred option satisfies the regulatory investment test for transmission, Decision, 24 January 2020, p 11.

AEMO's Minimum operational demand thresholds in South Australia

In May 2020 AEMO released a technical report on the minimum operational demand thresholds in South Australia.²⁵ This report was prepared in response to a request from the Government of South Australia about the risks of electricity supply disruption associated with reducing minimum operational demand levels in South Australia. This concern arises from the past and forecast growth in distributed photovoltaic (PV) installations in South Australia and the consequent fall in operational demand levels.²⁶

AEMO identified that the current level and forecast growth in distributed PV in South Australia gives rise to the following two challenges:

- that a significant portion of current distributed PV inverters disconnect in response to voltage disturbances, and so a severe but credible fault (such as a loss of a large generation unit) could cause the disconnection of up to half the distributed PV in the South Australian region. To manage this risk and maintain system power security, imports from the Heywood interconnector will need to be limited in some periods;²⁷ and
- when South Australia is operating as an island, there is a need for sufficient demand to match the minimum output of the synchronous generating units needed to provide required levels of system strength, inertia, frequency control and voltage management. AEMO concluded that it is now essential for there to be a last resort mechanism to allow it to curtail distributed PV when extreme and unusual operational circumstances arise.

AEMO's recommended actions to address these challenges was to:²⁸

- improve DER performance standards, including enhancing the ability to sustain operation through power system disturbances (ie, riding-through capabilities);
- improving processes to ensure that inverters comply with current (and future) standards;
- introduce actively management of generation from all new distributed resources in real time; and
- guaranteeing that PEC proceeds, thereby connecting South Australia to New South Wales which would alleviate the most challenging system security issues and so avoiding extensive further measures necessary to maintain system security.

PEC will address a number of existing and emerging system security challenges in the South Australian system. This is because PEC will allow the South Australian system to be designed to remain connected to the rest of the NEM following a double circuit loss of either the Heywood interconnector or PEC. Further the increase in imports necessary to compensate for a loss of generation in Adelaide can be distributed across both interconnectors.

The May 2020 Technical Report did not cost the further security measures necessary if PEC did not proceed. However, AEMO in its 2020 ISP identified that if PEC does not proceed, additional investment in approximately 300 to 500 MW of fast frequency response will be needed to securely operate South Australia region as an island in 2025.²⁹

Further AEMO noted that:³⁰

²⁵ AEMO, *Minimum operational demand thresholds in South Australia*, Technical Report, May 2020.

²⁶ Operational demand is electricity used by residential, commercial and large industrial consumers, and supplied by scheduled, semi-scheduled and significant non-scheduled generating units. See AEMO, https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/Demand-Forecasts/Operational-Consumption-definition.pdf, accessed 1 September 2020.

²⁷ A preliminary constraint has been implemented, and ElectraNet is in the process of refining the network limit advice. See AEMO, *Minimum operational demand thresholds in South Australia*, Technical Report, May 2020, p 26.

²⁸ AEMO, *Minimum operational demand thresholds in South Australia*, Technical Report, May 2020, pp 7-8.

²⁹ AEMO, *2020 ISP | Appendix 7. Future Power System Security*, July 2020, p 57.

³⁰ AEMO, *2020 ISP | Appendix 7. Future Power System Security*, July 2020, p 57.

These system security challenges are in addition to the market benefits modelled in this ISP and are separate to the supply risk and fuel cost matters considered in Appendix 6.

...

AEMO's assessments indicate that the Project EnergyConnect will substantially reduce or potentially eliminate a large number of South Australia system security challenges.

For these reasons AEMO identified PEC as one of the essential 'no regrets' foundational measures that:³¹

... will underpin the future operability of the South Australian power system. They should all be progressed as a priority, as rapidly as possible. All other actions will be complementary to these foundational measures.

AEMO's Final 2020 Integrated System Plan (2020 ISP)

In July 2020, AEMO released its final 2020 ISP which sets out its actionable roadmap for eastern Australia's power system to optimise consumer benefits.³² The purpose of the ISP is to establish a whole of system plan for the efficient development of the power system for the long term interest of the consumers of electricity.³³

The key objective of the ISP is to deliver both power system and broader policy needs, including:³⁴

- existing state and federal environmental and energy policies, including emission reduction policies, state-based renewable energy targets, state-based policies for energy renewable energy zones;
- affordability, competition and consumer choice outcomes; and
- power system needs such as reliability standards and power system security.

The complexity and future uncertainties mean that the optimal development path is not a single static path. Instead the ISP is a dynamic roadmap that signposts events when the path may need to change to adapt to future developments in economic, trade, security and policy and technology environments.

Further, AEMO has adopted a 'least regret' decision-making framework to manage uncontrollable future risks. Consequently, AEMO uses the ISP to:³⁵

determine whether to invest now in the option with the least downside risk, or defer investment until there is more certainty, or stage investment or select options that retain flexibility, or invest in a way that hedges major risk.

The 2020 ISP identified PEC as one of six actionable transmission projects on the optimal development path for the NEM, from a large range of credible options and combinations.³⁶ AEMO concluded that:³⁷

a new 330 kV double-circuit interconnector to increase transfer capacity between South Australia and New South Wales by 750 MW, deliver fuel cost savings and unlock already stranded renewable investments. Recommended in the 2018 ISP and confirmed as low regret in this ISP.

³¹ AEMO, *Minimum operational demand thresholds in South Australia*, Technical Report, May 2020, p 55.

³² AEMO, *2020 Integrated System Plan*, Final Report, July 2020.

³³ NER Ch 5.22.2.

³⁴ AEMO, *2020 Integrated System Plan*, Final Report, July 2020, p 23.

³⁵ AEMO, *2020 Integrated System Plan*, Final Report, July 2020, p 27.

³⁶ We note that under the new Actionable ISP Rules, the inclusion of a project in the optimal development path will be the trigger for a RIT-T which can be expected to identify an option (the ISP option or a variant) for investment. In effect, contingent project application would no longer be required to substantiate the need for the investment if that investment has been included the ISP optimal development path.

³⁷ AEMO, *2020 Integrated System Plan*, Final Report, July 2020, p 61.

AEMO concluded that together these actionable transmission projects will strengthen the NEM and deliver gross market benefits of \$11.9 billion in present value terms in its central scenario.³⁸ This does not include the requirement for an additional investment in approximately 300 to 500 MW of fast frequency response in 2025 if PEC does not proceed, to enable secure operation of the South Australia region as an island.³⁹

Further, the 2020 ISP identified the commissioning of PEC in 2024-25 as being included in the least cost development path in all of its ISP scenarios except the slow change scenario (where no further interconnection would be required).⁴⁰

We understand that AEMO has considered the modelling concerns raised by the AER in its 5.16.6 decision for PEC (as discussed above), and updated its modelling in the 2020 ISP to include:⁴¹

- the adoption of variable heat rates (in place of MCFs) to more accurately model generator fuel costs;
- updated forecasts of gas, pumped hydro and battery storage prices;
- generator plant retirements, based on dates announced under provisions in the NER, which require scheduled generators to provide AEMO notice of 42 months for retirement of generating units;⁴² and
- new requirements necessary to ensure system security in South Australia, identified by AEMO to manage the increased risks from distributed PV, as well as new frequency response requirements to manage the risk associated with the 'islanding' of SA (both set out in the May 2020 technical paper).

The cost modelled by AEMO for PEC in its assessment of the optimal development path was \$1,999 million (2018-19).⁴³ This is substantively higher than the \$1.53 billion (\$2018-19) cost considered in the draft ISP,⁴⁴ and confirmed that PEC continues to provide positive net market benefits and form part of the optimal development path for the NEM at this higher cost. AEMO noted a potential cost range PEC of between \$1,393 million to \$2,587 million in the final 2020 ISP.⁴⁵ We understand however that AEMO did not undertake sensitivity tests on this cost range.

ElectraNet confirmation of 'no material change in circumstance'

In line with the AER's suggestion in its January 2020 decision and due to the anticipated increase in the estimated costs of PEC, ElectraNet has been undertaking a process to assess whether there has been a 'material change in circumstances' in the context of NER clause 5.16.4(z3)(3) that would change the outcome of the RIT-T assessment for PEC.

We understand that ElectraNet has updated its model to align with the inputs and assumptions adopted by AEMO in the final 2020 ISP, in light of the various issues raised by the AER. Further, ElectraNet has updated its modelling to reflect:⁴⁶

- committed generation projects in the NEM assumed by the 2020 ISP; and
- the actionable ISP projects identified by AEMO in the final 2020 ISP, including the accelerated timing of the VNI West project (2027/28).

The preliminary results of ElectraNet's further cost benefit analysis is that under AEMO's ISP central scenario, PEC is expected to continue to provide a positive net benefit, indicatively in the range of \$100

³⁸ AEMO, *2020 Integrated System Plan*, Final Report, July 2020, p 38.

³⁹ AEMO, *2020 ISP | Appendix 7. Future Power System Security*, July 2020, p 57.

⁴⁰ AEMO, *2020 Integrated System Plan*, Final Report, July 2020, p 64.

⁴¹ ElectraNet, *Project EnergyConnect Update | Stakeholder Webinar*, 20 August 2020, slide 18.

⁴² NER Ch 2.10.1(c2).

⁴³ Stated to be in \$June 2019.

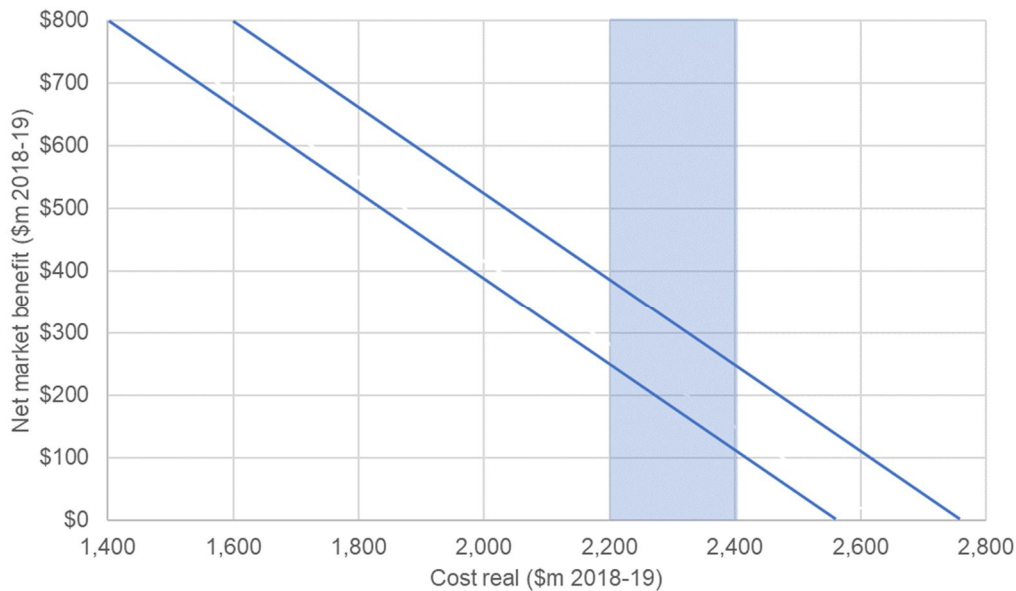
⁴⁴ AEMO, *Draft 2020 Integrated System Plan | Appendices*, 12 December 2019, p 145.

⁴⁵ Stated to be in \$June 2019. AEMO, *2020 Integrated System Plan*, Final Report, July 2020, p 89.

⁴⁶ ElectraNet, *Project EnergyConnect Update | Stakeholder Webinar*, 20 August 2020, slide 18.

million to \$400 million in present value terms. Figure 3.1 below reproduces the indicative results presented by ElectraNet in a webinar in August 2020.⁴⁷

Figure 3.1: ElectraNet indicative results of updated cost benefit analysis for PEC (ISP central scenario)



Source: ElectraNet

Figure 3.1 shows that ElectraNet's indicative updated cost benefit analysis:

- has assumed that the cost of PEC ranges from \$2.2 billion to \$2.4 billion (\$2018-19); and
- indicates a range of net benefits based on AEMO's ISP central scenario, with the higher bound including the increase in benefits that PEC would provide if the VNI West project is deferred from the accelerated 2027/28 timing assumed in the final 2020 ISP.

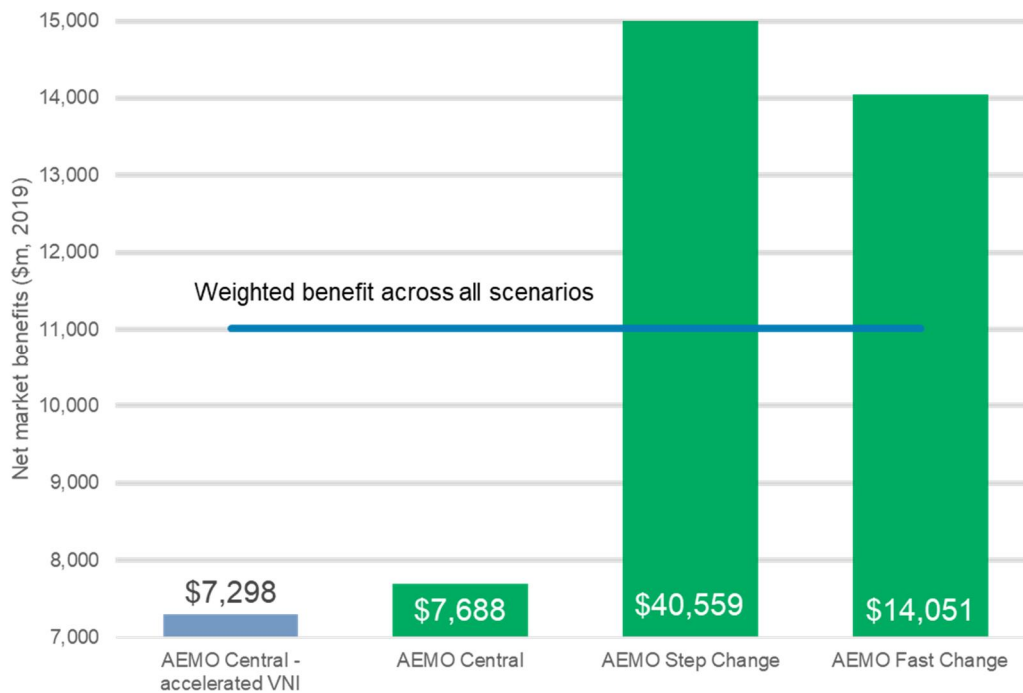
The inclusion of VNI West in 2027/28 as part of the base case (against which the benefits of PEC are assessed) reduces the incremental benefits identified for PEC (whilst still providing an increase in net benefits overall for the optimal development path). We note that the timing of VNI West is uncertain, and that this project has been identified in the ISP as one with a later 'decision rule' as to the appropriate timing. The final 2020 ISP notes that in most ISP scenarios the least-cost timing for VNI West is 2035/36, but that 'accelerating' the timing to 2027/28 provides option value, noting that future confirmation of this timing is conditional on the basis that project costs are appropriate and adequate market-based alternatives do not emerge as anticipated projects before construction commences.⁴⁸

While ElectraNet did not model the benefits of PEC under any of the other 2020 ISP scenario, it highlighted that it is reasonable to expect that the net benefits of PEC would be higher if the NEM moves more quickly towards a renewable future. Figure 3.2 shows that the 2020 ISP calculated that the net market benefits of the optimal development path would be substantially greater than the central scenario if there is greater investment in grid-scale technology (fast change scenario) or where consumer-led and technology-led transitions occur in the midst of aggressive global decarbonisation (step change scenario). Further the weighted benefits across all scenarios was over \$4 billion greater than the central scenario.

⁴⁷ ElectraNet, *Project EnergyConnect Update | Stakeholder Webinar*, 20 August 2020, slide 26.

⁴⁸ AEMO, *2020 Integrated System Plan*, Final Report, July 2020, p 79.

Figure 3.2: Final 2020 ISP net market benefits across different ISP scenarios



Source: ElectraNet

Further, we understand that ElectraNet has considered the impact of the changes in its modelling and the estimated project costs on the 'next ranked' investment option identified in the PEC RIT-T. ElectraNet's preliminary analysis is that the gap between the preferred option and the next highest option has widened,⁴⁹ confirming that these changes would not lead to an alternative option becoming preferred under the RIT-T.

We understand that ElectraNet will be submitting its updated cost benefit analysis of PEC to the AER, to demonstrate that PEC is expected to continue to provide a net benefit to consumers at the higher project cost, and to confirm that there has not been a material change in circumstances that would alter the outcome of the earlier RIT-T, in line with the requirements of the NER.⁵⁰

3.1.2 Our assessment

As discussed in section 2.1.2, the AER is required to assess the proposed expenditure in TransGrid's CPA by reference to achieving the capital expenditure objectives set out in the NER. This essentially requires an assessment of whether TransGrid and ElectraNet's rationale for undertaking the project is justified.

The RIT-T is the standard process under the NER for assessing transmission investments. Where a project is justified under the RIT-T, it can be assumed to be consistent with the capital expenditure objectives in the NER. However, there has been a number of significant developments since the conclusion of the RIT-T for PEC, specifically:

- the AER's January 2020 decision that the preferred option identified by ElectraNet's RIT-T satisfies the RIT-T, although concluding that:
 - > adopting different input and assumptions may mean that the modelled benefits of PEC are substantially lower than estimated by ElectraNet; and

⁴⁹ Comments by ElectraNet. *Project EnergyConnect Update | Stakeholder Webinar*, 20 August 2020.

⁵⁰ NER Ch 5.16.4(z3)(3).

- > a significant increase in costs of the preferred option could have a material impact on the outcome of the RIT-T;
- there have been minor changes to the scope of PEC since the RIT-T, see section 3.2;
- AEMO has undertaken further assessment of the system security risks in the event of 'islanding' of South Australia, and concluded that in the event of PEC not going forward there would be a requirement for extensive further measures such as utility-scale storage to provide fast frequency response, retrofit of a large number of distributed PV systems to improve disturbance ride-through capabilities or resistor banks for managing excess distributed generation;
- the release of AEMO's final 2020 ISP, which has considered the modelling concerns raised by the AER, and continues to identify PEC as an actionable ISP project within the optimal development path with limited and low probability of regret, and with potentially higher benefits if the step change and fast change scenarios eventuate; and
- an increase in the expected costs of PEC from an estimated a cost of \$1.53 billion (\$2018-19) in the RIT-T.

The updated cost estimate of the project, in the context of the wider developments noted above, have led to ElectraNet initiating a process to confirm whether:⁵¹

there has been a material change in circumstances which, in the reasonable opinion of the RIT-T proponent means that the preferred option identified in the project assessment conclusions report is no longer the preferred option

We understand that ElectraNet will shortly submit its cost benefit analysis of PEC to the AER to explain its reasons for concluding that a material change of circumstances has not occurred.

Based on preliminary analysis shared by ElectraNet at the public webinar in August 2020, it appears that this updated cost benefit analysis will confirm the outcome of the RIT-T for PEC and conclude that no material change of circumstances has occurred. The most recent cost estimates for PEC closely straddle the upper bound of the costs range modelled by ElectraNet (of between \$2.2 billion and \$2.4 billion (\$2018-19) for the total PEC project (ie, NSW and SA elements)) with:

- TransGrid's capex costs of \$1,894.6 million (\$2017-18), which is equivalent to \$1,924.7 million (\$2018-19);⁵²
- ElectraNet's updated estimated PEC costs expected to be around \$473 million (\$2017-18) or \$480.5 million (\$2018-19);⁵³ leading to
- total estimated PEC costs of \$2,367.6 million (\$2017-18) or \$2,405.2 million (\$2018-19).

On this basis, ElectraNet's preliminary analysis (as shown in figure 3.1) suggests a net benefit to consumers of between \$100 million to over \$200 million (in present value terms). Further, AEMO's ISP analysis suggests that the benefits from the overall optimal development path (including PEC) will be higher if the NEM moves quickly towards a renewable future.

We understand that the AER will be considering ElectraNet's updated cost benefit analysis for PEC and whether it is satisfied that there is a continuing justification for PEC. We understand the timing of this process will run alongside consideration of TransGrid's CPA, and so the AER will be able to consider the updated cost benefit analysis in conjunction with the CPA.

⁵¹ NER Ch 5.16.4(z3)(3).

⁵² Based on the CPI assumed in TransGrid's capex model of 1.59 per cent for 2019.

⁵³ We have been instructed by TransGrid that ElectraNet's current estimate of PEC is \$481 million (\$nominal) and \$473 million (\$2017-18). Applying the CPI assumed in TransGrid's capex model of 1.59 per cent this gives a cost for ElectraNet's component of PEC of \$480.5 million (\$2018-19).

3.2 Project scope

3.2.1 What TransGrid is proposing

TransGrid's project specification for PEC entails:⁵⁴

- construction of four new transmission routes from:
 - > South Australia border to Buronga;
 - > Buronga to Dinawan;
 - > Dinawan to Wagga Wagga; and
 - > Buronga to Red Cliffs in Victoria.
- construction of a Dinawan switching station;
- modification of three existing substations, namely:
 - > Buronga substation;
 - > Red Cliffs substation in Victoria; and
 - > Wagga substation.

The development of the project specification for PEC is set out in TransGrid's separate report 'Specification and Scope Description' (SSD). This report has also been independently reviewed by GHD.

TransGrid has highlighted the following in its SSD report as being consistent with the adoption of a prudent and efficient scope:⁵⁵

- **Route selection and length:** The selected route minimises capital works by capitalising on existing TransGrid's assets in the south west area of NSW. Sections of the route are along existing TransGrid lines, which will reduce access development costs for those sections. Where possible, new lines will terminate at existing substations, which require extensions of existing substations instead of establishment of new substations, which would cost more.
- **Voltage selection:** The RIT-T has identified that a new 330 kV interconnector is expected to deliver the highest net market benefit. Options for DC interconnection or alternate voltages were rejected. 330 kV also has lower operating costs (losses) than lower voltage options and minimises the number of new power transformers required.
- **Number of circuits:** The number of circuits required has been optimised:
 - > new double circuit from South Australia to Buronga to Dinawan, and Dinawan to Wagga Wagga – a single circuit line would not have sufficient capacity, necessitating that double circuit lines be used; and
 - > new double circuit 220kV line from Buronga to Red Cliffs (AEMO's assessment determined a double circuit line will provide additional net market benefits over a single circuit line by allowing for future expansion).
- **Line length optimisation:** By selecting the Dinawan switching station option over using Darlington Point, the overall line length between Buronga and Wagga Wagga has been reduced by approximately 39 km. Additionally, the two RFT B tenderers have made adjustments to optimise the route so as to minimise works on adjacent lines and to minimise the route length, thus lowering overall costs.
- **Conductor size:** The smallest conductor size (Mango) has been selected to deliver the required 800 MW.

⁵⁴ TransGrid, *Specification and Scope Description - BAFO*, Contingent Project Application for Project Energy Connect, 30 September 2020, section 3.2.

⁵⁵ TransGrid, *Specification and Scope Description - BAFO*, Contingent Project Application for Project Energy Connect, 30 September 2020, section 3.3.

- **Required reactive plant for network stability:** The reactive plant has been selected based on technical needs for transient stability as determined by ElectraNet.

TransGrid's SSD report also highlights how the scope in the CPA has changed since the RIT-T. Many of these changes are refinements or optimisations that TransGrid has identified over period since the RIT-T. For example, TransGrid has modified the tower design since the RIT-T so that it meets AS:7000 standards and is now intending to use five 200 MVA 3-phase units rather than three 400 MVA 3-phase due to road transport weight limitations.⁵⁶

One notable change TransGrid has made since the RIT-T is the proposed route for PEC. The original route identified in the RIT-T used the existing substation at Darlington Point to locate reactive control equipment. However, this route traverses land that is under intensive land use and irrigation. TransGrid's internal assessment on land use and line route options indicated that the costs of obtaining suitable easements and access to a line route adjacent is high and there is a high risk that negotiations with land owners may not be successful and require instances of compulsory acquisition.⁵⁷

TransGrid has identified an alternative southern route via Dinawan. TransGrid considers that adopting the southern route is an appropriate risk mitigation measure to minimise the risk of compulsory acquisition of land. TransGrid's internal assessment suggests that:⁵⁸

- the two routes have similar level of base capex, and so be cost neutral; and
- the southern route:
 - > has a lower risk profile, and so has a lower risk of delay;
 - > affects a lower number of recorded Aboriginal cultural heritage sites;
 - > avoids known property constraints and developments of the original route; and
 - > has greater connectivity in the Dinawan Region, and so increases the feasibility of future connection into Victoria to New South Wales Interconnector (VNI) West 500 kV transmission lines.

3.2.2 GHD's assessment

GHD has assessed the scope set out in the RFT Phase B tender and BAFO outcomes. This assessment had regard to key project elements, such as substations, towers and synchronous condensers to consider the reasonableness and appropriateness of these given the project objectives. The GHD review has also considered changes in scope since the RIT-T, including the new southern route, in its review.

Overall, GHD has concluded that:⁵⁹

- TransGrid's SDD report adequately defines the project investment scope originally defined in the PACR and that refinements since the PACR are considered efficient and reflect the minimum required to meet the asset performance requirements – the exception was an additional 20 km route required for realignment on the Dinawan to Wagga Wagga line, which GHD was not able to verify the justification for other than it is consistent with TransGrid's experience in developing the initial PACR solution near Darlington Point;
- the asset performance requirements were adequately and appropriately defined in TransGrid's Phase A and Phase B tender processes;

⁵⁶ TransGrid, *Specification and Scope Description - BAFO*, Contingent Project Application for Project Energy Connect, 30 September 2020, section 3.3.

⁵⁷ TransGrid, *Specification and Scope Description - BAFO*, Contingent Project Application for Project Energy Connect, 30 September 2020, section 3.3.

⁵⁸ TransGrid, *Specification and Scope Description - BAFO*, Contingent Project Application for Project Energy Connect, 30 September 2020, section 3.3.

⁵⁹ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 1.

- the specifications considered the need to operate reliability over the life expectancy of the transmission line; and
- the performance-based scope and specifications defined in the Phase B tender is consistent with the scope defined in TransGrid's SDD report and supplementary Capex Forecasting Methodology – BAFO report.

GHD estimates that the incremental costs of switching from the original route to the Southern route will increase base capex by \$19.8 million rather than be cost neutral as estimated by TransGrid.⁶⁰ However, GHD recognises that there are strategic benefits associated with the Southern route and so the Southern route is:⁶¹

... of interest to TransGrid and consumers in terms of long term network efficient solution.

Based on the above, GHD considers the scope:⁶²

... in TransGrid's CPA forecast are prudent and efficient having regard to National Electricity Rules capex criteria and objectives.

3.2.3 Our assessment

We note that the project scope and specifications have been through refinement and testing via multiple avenues, including:

- internal analysis by TransGrid, which has involved ElectraNet and AEMO where appropriate to remove assumptions and refine costs;⁶³
- external validation of key project elements by specialist consultants, including:⁶⁴
 - > desktop geotechnical assessments conducted by Douglas Partners
 - > access tracks, structures and foundations are based on design by Beca; and
 - > conductor selection based on an electrical and mechanical performance study by Beca;
- refinement and optimisation during the tender process, which led to further refinements to structures and foundations specifications;⁶⁵ and
- external verification from GHD to confirm that the scope is prudent and efficient, except for the 20 km route alignment allowance on the Dinawan to Wagga Wagga line but may still be reasonably required to complete PEC.

Further, we note that TransGrid's adoption of a route that now bypasses Darlington Point is consistent with the AER's approach to evaluating risk costs, in that TransGrid has chosen to mitigate the chance of this risk occurring, rather than quantifying the risk that actions by landowners, outside of TransGrid's control, may affect project timing and expose TransGrid to additional costs under its contract variation terms.

We note that TransGrid has considered the costs of bypassing Darlington Point to be cost neutral whereas GHD has estimated that the incremental costs are \$19.8 million. In our view, the size of the project and the associated benefits of PEC would mean that even a small delay would have significant economic costs. A

⁶⁰ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 5.9.

⁶¹ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 3.3.

⁶² GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 1.

⁶³ TransGrid, *Specification and Scope Description - BAFO*, Contingent Project Application for Project Energy Connect, 30 September 2020, section 3.4.

⁶⁴ TransGrid, *Specification and Scope Description - BAFO*, Contingent Project Application for Project Energy Connect, 30 September 2020, Section 3.3.

⁶⁵ TransGrid, *Specification and Scope Description - BAFO*, Contingent Project Application for Project Energy Connect, 30 September 2020, Section 3.3.

delay would mean that PEC commences operations later, and so would delay the benefits that are expected arise from PEC, and would likely increase the cost of completing PEC.

By way of example, TransGrid has advised us that a two month delay would increase tendered works capex by \$12.8 million and a five month delay would increase costs by \$55.5 million. There would also be loss of market benefit for each month of delay, as market benefits are expected to accrue immediately. In this light, the incremental cost to avoid delay appears reasonable.

Based on the tender process and GHD's review, we have concluded that the project scope reflects the approach a prudent TNSP would adopt. The exception is for the 20 km route alignment for the Dinawan to Wagga Wagga line, which GHD has not been able to verify its justification in the final scope but may be still reasonably required.

3.3 Efficient timing

3.3.1 The proposed timing for PEC

PEC is scheduled to commence detailed design and final investment decision in 2020, with a target energisation date of December 2022 and practical completion date of December 2023, followed by six months of testing with final completion in June 2024. Early works to meet this timeframe have already commenced and have been underwritten by the NSW government.

The timing for PEC is consistent with the 2020 ISP expected completion date of 2024-25 with the commissioning of PEC expected to occur in stages between late 2022 and late 2023 and then followed by 12 months of testing.⁶⁶ We note that the 2020 ISP indicates that this project is tracking to finish ahead of schedule, however, AEMO also indicates that it would be optimal and deliver benefits to consumers if PEC is able to be delivered earlier than expected.⁶⁷

As noted above, the timing for PEC also reflects expectations by the SA and NSW governments.

3.3.2 Our assessment

The targeted date for the completion of PEC is consistent with AEMO's estimated practical completion date. If PEC can be completed at an earlier date, without additional costs, AEMO has indicated that it would be optimal as the project provides a net benefit from the date that it is commissioned.⁶⁸

We also make the following observations:

- the project timing and schedule has been market tested – the tenderers have submitted bids that confirm that they expect to meet the proposed timing for PEC; and
- TransGrid or the successful tenderer bears a significant financial risk if the project timelines are not met – a delay to project completion will likely increase the overall costs of completing PEC. There are no provisions in the CPA to allow TransGrid to obtain additional funding, and so either TransGrid, the successful tenderer, or both will bear this overrun.

Notwithstanding the above, TransGrid has identified a number of 'other construction costs', including risks that could delay the completion of the project. The key risks identified are delays in the Environmental Impact Statement (EIS) approval process and delays in gaining track access. However, we understand that it is common for projects to factor in delays to the project schedules so that the project can still be completed on time even if there are some delays.

⁶⁶ AEMO, *2020 Integrated System Plan*, Final Report, July 2020, p 84.

⁶⁷ AEMO, *2020 Integrated System Plan*, Final Report, July 2020, p 84.

⁶⁸ AEMO indicates that it would be optimal if PEC could be delivered early which highlights that PEC delivers a net benefit from the date it is commissioned. See AEMO, *2020 Integrated System Plan*, Final Report, July 2020, p 84.

3.4 Overall assessment

PEC has satisfied the RIT-T, which is the basis for determining that a project is justified under the NER. The AER confirmed in January 2020 that the RIT-T has been applied correctly.

There have been a number of developments since the RIT-T was applied to PEC, that have affected both the estimated costs of the project and the project's anticipated benefits.

ElectraNet is currently concluding a process of investigating whether there has been a material change in circumstance that in its reasonable opinion may be expected to change the earlier RIT-T outcome. Preliminary indications are that this assessment will show that PEC will continue to deliver a positive net market benefit under the 2020 ISP central scenario based on the most recent cost estimates (including TransGrid's BAFO forecast which is being provided to the AER), even if the VNI West project is accelerated. Further, the benefits of PEC are reasonably expected to be higher if the VNI West project does not proceed at the accelerated pace in the 2020 ISP and/or if the NEM moves more quickly towards a renewable future in line with other of the ISP scenarios.

The formal assessment of whether there has been a material change in circumstance will be determined by ElectraNet's final updated cost benefit analysis, which the AER will assess in parallel with TransGrid's CPA. Where there has not been a material change in circumstance then PEC remains justified based on the RIT-T assessment (and continued inclusion in AEMO's ISP optimal development path).

4. Overview of TransGrid's capex forecast

In this section, we consider the consistency of TransGrid's updated BAFO capex forecasts for PEC with the NER requirements.

We set out the reports we have considered as part of our assessment in section 1.2. On the basis of these reports, we have assessed whether TransGrid's BAFO capex forecast reflects the expected average costs of completing the project that would be forecast by a prudent and efficient business.

All costs in this section are expressed in 2017-18 dollars unless otherwise stated.

4.1 Overview of how the capex forecast has been estimated

The BAFO capex forecast for PEC is \$1,894.6 million.⁶⁹ This comprises:

- tendered works capex costs of \$1,468.6 million, which covers works on substations and transmission lines, the cost of acquiring large specialist equipment, and other construction costs;
- property and easements acquisition costs of \$121.5 million;
- environmental 'offset' costs of \$127.4 million;
- biodiversity 'offset' risks of \$38.2 million;
- corporate and network overhead costs of \$135.8 million; and
- real labour costs escalation of \$3.2 million.

TransGrid's approach to deriving its capex forecast varies for each of the cost categories above, ie:

- tendered works capex is estimated based on the BAFO proposal of the preferred bidder;
- the majority of property and easement costs are estimated based on a report from an independent expert, JLL;
- the environmental 'offset' costs and biodiversity 'offset risk costs are estimated based on a report from an independent expert, WSP; and
- corporate and network overhead capex is estimated based on a bottom up approach, eg, labour costs are estimated based on the number of additional FTEs required and the standard rate for the FTE.

A summary of our assessment of TransGrid's BAFO capex forecast is presented in the table below. By way of summary, we consider the following costs to be reasonable and supported by the material presented by TransGrid alongside the revised forecast:

- the vast majority of tendered works for transmission lines, substations and large specialist equipment have been market tested and verified by GHD as reasonable in relation to their comparative estimates;
- the majority of property and easement acquisition costs are based on a report by independent experts, JLL, and so can be considered reasonable estimates;
- environmental offset costs are considered reasonable because:
 - > they are based on a report by independent experts, WSP; and
 - > GHD considers the approach used by WSP to be sound, albeit noting that it may be conservatively high; and

⁶⁹ Excluding equity raising costs that are a benchmark cost calculated in the AER's post-tax revenue model. Figures may not add up due to rounding.

- corporate and network costs have been verified by GHD to be reasonable.

The above costs represent \$1,746.2 million out of the \$1,894.6 million of TransGrid's capex forecast (or around 92 per cent).

We have not been able to conclude whether the following cost estimates are reasonable or appropriate:

- the 20 km allowance for route alignment on the Dinawan to Wagga Wagga line, which GHD has estimated to cost \$32.6 million;
- 'other construction costs', which is estimated to cost \$58.2 million;
- biodiversity offset risk costs, which is estimated to cost \$38.2 million; and
- the proportion of property and easement costs estimated internally by TransGrid, which totals \$19.4 million.

These categories generally represent costs which TransGrid can reasonably be expected to incur and therefore for which an allowance within the capex forecast is reasonable. However, we are not able to verify the proposed level of these costs, on the basis of the material we have reviewed.

Table 2: Summary of our assessment of TransGrid's capex forecast by capex category (\$2017-18)

Cost category	TransGrid's approach	GHD's assessment	Our observations
Tendered works, including transmission line, substation and large specialist equipment	TransGrid estimates this will cost \$1,410.4 m based on the BAFO of the preferred bidder (bidder 2).	GHD has assessed the BAFO outcome and found that TransGrid's capex forecast is 10 per cent lower than GHD's comparative estimate, supporting that the BAFO outcome has achieved efficient scope and costs for the project. However, GHD was unable to verify the need for an additional 20 km route for realignment on the Dinawan to Wagga Wagga line.	Competitive procurement and GHD verification provide confidence that the forecast is prudent and efficient, except for the additional 20 km route allowance made for realignment based on the material we have reviewed so far.
Tendered works – other construction costs	TransGrid estimates 'other construction costs' to be \$58.2 m.	GHD considers an allowance for the cost categories identified as reasonable. Many of these costs relate to risks and GHD considers the allowance of \$41.6 m to cover these risks as reasonable.	We do not have sufficient information on the basis for these cost estimates to separately verify the level of these costs as reasonable. Many of these costs relate to risks. Neither we nor GHD have reviewed the efficient allocation of these risks.
Property and easements capex – easement and land costs	TransGrid estimates that this will cost \$121.5 m. Most of these costs (84%) are based on JLL's estimate and TransGrid has estimated the remainder.	GHD has not opined on the reasonableness of this estimate.	The majority of property and easement acquisition capex (\$102.1 m of the \$121.5 m, or 84 per cent) is based on a report by independent experts, JLL. A small proportion of costs are based on TransGrid's internal estimates. These reflect costs TransGrid can be expected to incur, although we are not able to verify the amount proposed.
Environmental 'offset' costs	TransGrid estimates that this will cost \$127.4 m based on WSP estimates	GHD considered the approach used by WSP to be sound, particularly at this stage of the project. However, GHD notes that the estimate may be conservatively high.	Noting that it is very difficult to estimate accurate environmental 'offset' costs, WSP's approach appears to be reasonable and sound and is supported by GHD.
Biodiversity 'offset' risks	TransGrid estimates that this will cost \$38.2 m based on WSP estimates	GHD did not verify if biodiversity offset risks are reasonable and noted that they may be conservatively high.	It is reasonable for TransGrid to have an allowance for this cost category. However, we are not able to verify that the level proposed is prudent and efficient, based on GHD's findings.
Corporate and network overhead costs	TransGrid estimates that this will cost \$135.8 m based on a bottom up estimate.	GHD found that TransGrid's estimates are reasonable.	GHD verification provides confidence that the forecast is prudent and efficient

5. Tendered works

5.1 Overview of TransGrid's capex

TransGrid RFT CPA capex forecast for tendered works is \$1,468.6 million. The capex forecast for tendered works reflects the tendered price of the preferred bidder (bidder 2) identified in the BAFO process. 'Other construction costs' include the construction costs TransGrid expects to incur as well as costs which were not included by the preferred bidder in its BAFO proposal but which TransGrid expects to be incurred in the construction of PEC.

Table 3 below provides a breakdown of the tendered capex cost forecast by cost category.

Table 3: Tendered works capex forecast (\$millions, 2017-18)⁷⁰

Cost category	Bidder 2 (preferred tenderer)
Substations and transmission lines, including access tracks	\$1,270.2
Large specialist equipment	\$140.2
Other construction costs	\$58.2
Total tendered works	\$1,468.6

We discuss TransGrid's approach to procurement and its tendered works capex forecast, GHD's assessment of TransGrid's approach and our assessment below.

5.2 TransGrid's approach to procurement and identifying the preferred bidder

TransGrid intends to outsource a significant proportion of the capex work for the NSW components of PEC to an outside contractor. A competitive tender process has been undertaken with the following key steps:

- Phase A – where TransGrid assessed each tenderer's proposed solution and capability, experience and capacity to deliver the works;
- Phase B – where TransGrid assessed the value for money of each bid and the tenderer's ability to deliver the project; and
- BAFO – where TransGrid evaluated the BAFOs put forward by the two shortlisted tenderers.

TransGrid has completed its tender process and has identified a preferred bidder to deliver PEC (bidder 2). An overview of TransGrid's procurement approach is provided in the box below.

⁷⁰ Figures may not add up due to rounding

Box 1: Overview of TransGrid's procurement approach⁷¹

TransGrid's approach to procuring services from external suppliers for PEC is as follows:

- establish a procurement team, including two external procurement specialists, ie, the Calcutta Group to act as the Transaction manager and MBB Group to support the procurement project team;
- engage an external probity adviser, O'Connor Marsden & Associates to ensure the integrity of the process;
- develop a Tender Evaluation Plan to ensure that all tenders are evaluated fairly;
- set up a tender evaluation team, with external advisers and observers from NSW government, SA government and ElectraNet;
- undertake early market scanning and engagement to identify potential tenderers, including overseas contractors and those who may not ordinarily bid for work like PEC – this process
 - identified 18 parties who could potentially tender for PEC; and
 - resulted in 11 parties registering their interest in participating in the formal tender process.
 - resulted in five tenderers participating in the Phase A tender;
- invite tenderers to submit a tender for the Phase A tender process:
 - the purpose of Phase A was to assess each tenderer's proposed solution and capability, experience and capacity to deliver the works; and
 - five tenderers participated and three were invited to participate in the phase B tender process
- invite tenderers to submit a tender for the Phase B tender process:
 - the purpose of Phase B was to assess the value for money of each bid and non-price factors (eg, quality of service offered and past experience and performance of tenderers etc);
 - all three bids were considered satisfactory on non-pricing factors; and
 - one tender involved significant greater costs than the other two – the tenderers with the two lower costs were invited to submit their BAFO.
- invite two shortlisted tenderers to submit a BAFO where tenderers are:
 - provided with the opportunity to revise their proposal in selected areas;
 - provided with clear instructions for preparing their response, including outlining the areas of their original proposal that must be addressed and may include submission of an updated cost proposal; and
 - given a briefing that sets out areas that each tenderer may wish to consider in revising their proposal based on TransGrid's analysis of each tenderer's original proposal.

⁷¹ Summarised from TransGrid, EnergyConnect | Summary of the Procurement Process, December 2019 & TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 3.

As discussed above, TransGrid invited the two shortlisted bidders from the Phase B tender process to submit a BAFO. The two BAFO proposals were evaluated based on: ⁷²

- the price proposed by the bidder; and
- five non-price criteria, including project solution, project delivery and commercial risk.

The BAFOs for bidder 1 and bidder 2 to complete PEC were █████ million and \$1,410.4 million, respectively. However, TransGrid identified that both bids had different assumptions and exclusions, and so did not incorporate the full costs of completing PEC.

To ensure that the two bids are assessed on a 'like for like' basis and reflect the full costs of completing PEC, TransGrid estimated 'other construction costs' associated with each bid. TransGrid's estimate of other construction costs for bidder 1 and bidder 2 is █████ million and \$58.2 million, respectively. Including other construction costs increases the overall tendered capex to \$1,481.9 million for bidder 1 and \$1,468.6 million for bidder 2.

In addition, TransGrid identified that the guyed tower proposed by bidder 2 would increase annual maintenance costs by around \$1.4 million per year, or around \$34.4 million in present value terms over the life of the asset. This increases the total cost associated with bidder 2's BAFO offer to \$1,503 million.

This is around \$21.1 million higher than bidder 1's bid, or less than two per cent of TransGrid's capex forecast for tendered works. Given this, TransGrid considered the overall price difference to be small and the preferred bidder was identified on the basis of non-price factors. ⁷³

Table 4: Estimated costs of BAFO by bidder (million, \$2017-18) ⁷⁴

Description	BAFO Bidder 1	BAFO Bidder 2 (preferred bidder)
Tendered costs – substations and transmission lines, including access tracks and large specialist equipment	█████	\$1,410.4
Other construction costs	█████	\$58.2
Total capex	\$1,481.9	\$1,468.6
Incremental maintenance costs of guyed towers	-	\$34.4
Total cost	\$1,481.9	\$1,503.0

TransGrid evaluated both BAFO offers against five non-price criteria. Bidder 2 had a higher overall score for non-price factors, particularly from a commercial risk perspective. This was considered to be important in the evaluation considerations as TransGrid is considered an inexperienced buyer and needs to manage risk by using an experienced contractor willing to take on more risks. Further, bidder 2 was ranked equal or ahead of bidder 1 for all five non-pricing categories evaluated.

⁷² TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 3.2.

⁷³ We note that the capex of the two BAFO proposal should also be discounted to a common year for a 'like for like' comparison. However, we expect that this is unlikely to have a material impact as the time profile of the capex are similar.

⁷⁴ TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 5.1.3.

Table 5: Comparative evaluation of the two BAFO proposal ⁷⁵

Criteria	Weight	BAFO Bidder 1	BAFO Bidder 2 (preferred bidder)
1. Project solution	30%	7	7
2. Project delivery	30%	8	8
3. Environmental, property, engagement and social sustainability	15%	6.5	8.5
4. Commercial risks	10%	5	8
5. Commercial certainty	15%	8	8
Total weighted score	100%	7.175	7.775

Based on the above, bidder 2 was identified as the preferred bidder because:

- the two bids involve similar overall costs once adjustments for risks and exclusions have been made; but
- bidder 2 had a higher overall score for non-price factors, particularly from a commercial risk perspective.

5.3 TransGrid's approach to estimating capex for tendered works

TransGrid's capex forecast of \$1,468.6 million for tendered works is based on the BAFO of the preferred bidder (bidder 2). This comprises:

- \$1,410.4 million to cover the costs of substations, transmission lines and large specialist equipment based on bidder 2's BAFO; and
- \$58.2 million of 'other construction costs' estimated by TransGrid.

5.4 GHD's assessment

TransGrid engaged GHD to undertake an independent verification and assessment of TransGrid's BAFO capex forecast. To assess the reasonableness of TransGrid's capex forecast, GHD developed comparative estimates, or estimated costs using historical project costs, publicly available data and other sources. ⁷⁶ A comparative estimate was developed for different project components, such as the costs of constructing individual transmission lines and substations. To ensure that GHD's estimate is 'like for like' with TransGrid's capex forecast, GHD reallocated 'other construction costs' to the different project components.

GHD considered TransGrid's capex forecast to be reasonable for a project component if it was within ± 20 per cent of its comparative estimate. For forecast capex categories that were not within ± 20 per cent, GHD then undertook a further review to explore if there were any known project specific reasons that resulted in this variation.

GHD's independent review provides support that TransGrid's forecast capex is consistent with what would be incurred by a prudent and efficient business. We refer to the findings of the GHD review in our detailed assessment below.

⁷⁵ TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 3.2.

⁷⁶ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section C.3.

5.5 Transmission lines

5.5.1 TransGrid's capex forecast and GHD's comparative estimate

PEC requires the construction of four new transmission lines, which are:

- a 330 kV double circuit steel tower (DCST) transmission line from the South Australian border to the Buronga substation;
- a 330 kV DCST transmission line from Buronga substation to Dinawan;
- a 330 kV DCST transmission line from Dinawan to Wagga Wagga; and
- a 220 kV single circuit safepath (SCSP) transmission line from Buronga to Red Cliff.

To examine the reasonableness of TransGrid's capex forecast, GHD has developed a comparable estimate for each transmission line and compared this against the tendered price put forward by bidder 2, the preferred bidder. Table 6 shows GHD's comparable estimate bidder 2's price for transmission lines.

Table 6: GHD's comparable estimate and bidder 2 pricing for transmission lines (\$millions, 2017-18) ⁷⁷

Transmission line	GHD's estimate	Bidder 2 (preferred bidder)	Variance with GHD's estimate
330 kV DCST SA border – Buronga	200.0	181.2	10%
330 kV DCST Buronga – Dinawan	586.4	470.2	25%
330 kV DCST Dinawan – Wagga Wagga	179.8	254.0	-29%
220 kV SCSP Buronga – Red Cliffs	29.4	48.5	-39%
Total	995.5	953.8	4%

TransGrid's capex forecast for the South Australian Border to Buronga transmission line is within ± 20 per cent of GHD's comparative estimate. Given this, GHD considers TransGrid has achieved efficient market tested capex costs for both these transmission lines.

For the other three transmission lines, TransGrid's forecast capex is outside of the ± 20 per cent range that GHD considers to be reasonable. For each line, GHD identified reasons for the variation, which are discussed in further detail below.

Buronga to Dinawan transmission line

GHD found that a relatively high variance for the Buronga to Dinawan transmission line, where GHD's estimate was 25 per cent higher than bidder 2. GHD identified the following reasons for this variation: ⁷⁸

- the BAFO submissions identified that the route distance is 376 km, which is 9.4 per cent less than the route distance of 401 km assumed by GHD;
- the BAFO capex civil and structural costs were much lower when compared to GHD's estimate; and
- other factors, such as more detailed knowledge of ground conditions, and the number of road and river crossings, not considered by GHD in its comparative estimate.

⁷⁷ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 5.4. Figures may not add up due to rounding.

⁷⁸ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 5.4.

Considering the above, GHD is satisfied that TransGrid has achieved efficient market tested capex for this transmission line.

Dinawan to Wagga Wagga transmission line

GHD's estimate for the Dinawan to Wagga Wagga line was 29 per cent lower than bidder 2's pricing. GHD identified the following reasons for this variation: ⁷⁹

- the BAFO submissions identified that the route distance is 157 km, which is 4 per cent higher than the route distance assumed by GHD;
- the BAFO costs has an allowance of 20 km of additional route length for realignment – GHD was unable to verify the need for this allowance and estimated that the cost of this alignment is \$32.6 million;⁸⁰
- the BAFO costs for the 20 km of additional route length was costed on the basis of 500kV pricing – GHD believes it would be more appropriate for this to be estimated on the basis of a 330kV line, which would lower the costs by around \$10 million (or \$0.5 per km)⁸¹; and
- difference in number of tower structures assumed.

Once the above adjustments have been accounted for, GHD is satisfied that TransGrid has achieved efficient market tested capex costs for this transmission line.

Buronga to Red Cliffs transmission line

GHD's estimate for Dinawan to Wagga Wagga line was 39 per cent lower than bidder 2's pricing. The primary reasons for GHD's lower estimate for the Buronga - Red Cliffs line are as follows: ⁸²

- the size and costs of supply and installation of the mono poles were underestimated by GHD;
- the number of steel poles included in the estimate was 50 compared with the BAFO design of 62;
- brownfield uplift costs were not included by GHD, particularly the need for 60 additional temporary poles and construction of the bypass line; and
- allowance for dismantling the existing line was not included by GHD.

One the above factors are accounted for, GHD is satisfied that TransGrid has achieved efficient market tested capex for this transmission line.

Overall assessment

Overall, GHD considers that TransGrid has achieved efficient pricing for the transmission line work scope through the procurement process undertaken. GHD also noted that TransGrid's aggregate capex forecast for transmission lines is within ± 20 per cent range of GHD's comparative estimate. ⁸³

5.5.2 Our assessment

We have the following observations regarding TransGrid's capex forecast for transmission lines:

- a significant proportion of capex reflects:
 - > the outcomes of a competitive tendering process where pricing has been a key factor; and

⁷⁹ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 5.4.

⁸⁰ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 4.7.

⁸¹ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 5.4.

⁸² GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 5.4.

⁸³ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 5.4.

- > the likely costs TransGrid will incur – the preferred bidder has provided a response consistent with the tender requirements and scope of the project and the capex forecast is based on the costs of the preferred bidder;
- GHD's comparative cost analysis suggests that most of TransGrid's capex forecasts (including 'other construction costs') are reasonable since:
 - > TransGrid's aggregate capex forecast for transmission lines is within a reasonable margin of GHD's comparative estimate;
 - > on a line by line basis:
 - TransGrid's capex costs for one of the transmission lines are within a reasonable range of GHD's comparative estimate; and
 - for transmission lines where TransGrid's capex forecast is outside the reasonable range, GHD has identified reasonable reasons for the variation;
- GHD was unable to verify the need for 20 km of additional route length for realignment for the Dinawan to Wagga Wagga line; and
- notwithstanding GHD's assessment, in the case of the 'other construction costs' that have been allocated to lines costs:
 - > we do not have sufficient detail on how these costs have been calculated to understand if these are reasonable and appropriate; and
 - > many of these costs have not been market tested.

We discuss our assessment of other construction costs in further detail below.

5.6 Sub-stations, including large specialist equipment

5.6.1 TransGrid's capex forecast and GHD's comparative estimate

PEC requires sub-station works, including installation of large specialist equipment, at the following sites:

- Buronga substation;
- Dinawan substation;
- Wagga substation; and
- Red Cliffs substation.

To examine the reasonableness of TransGrid's capex forecast, GHD has developed a comparable estimate for each substation and compared this against the tendered price put forward by bidder 2, the preferred bidder. Table 7 below shows GHD's comparable estimate and bidder 2's price for substations.

Table 7: GHD's comparable estimate and bidder 2 pricing for substations, including large specialist equipment (\$millions, 2017-18)⁸⁴

Substation	GHD's estimate	Bidder 2 (preferred bidder)	Variance with GHD's estimate
Buronga Substation	355.1	298.7	19%
Dinawan Substation	171.8	166.5	3%
Wagga Substation	6.4	43.4	-85%
Red Cliffs Substation	3.0	3.5	-16%

⁸⁴ GHD, PEC – *Scope and Independent Verification and Assessment*, 30 September 2020, section 5.5. Figures may not add up due to rounding.

Total	536.2	512.2	5%
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TransGrid's capex forecast for three of the four substations, namely Buronga, Dinawan, and Red Cliffs, is within ± 20 per cent of GHD's comparative estimate. Given this, GHD considered TransGrid has achieved efficient market tested capex costs for these sub-stations.

TransGrid's capex forecast for Wagga substation is significantly higher than GHD's comparative estimate. This prompted GHD to undertake a further investigation to identify possible factors for this difference. GHD's review found that:⁸⁵

The original TransGrid estimate specified limited information for what was originally to be a single feeder (1 330kV line bay). GHD also assumed that the existing Wagga 330 Substation would have sufficient spare space in the switchyard for this additional switchbay. The requirements for the substation were augmented for the Southern Alternative Route to accommodate two additional 330kV feeders. GHD's estimate allowed for the electrical, structural and civil works associated with the two incoming feeders within a 330 kV 1.5 CB layout bay however in reviewing the estimates an allocation of project management and design costs were overlooked and not included.

Adjusting for the change in scope and additional allowance for project management, design and other overheads, GHD concluded that:⁸⁶

... GHD's estimate would otherwise have been higher over \$10 million for the direct substation works and a further \$15 million for the allocated project management, design, overheads and contingency allowances – totalling over \$25 million.

After adjusting for the above, GHD found that bidder's 2 price of \$45.9 million is still outside of GHD's ± 20 per cent range. GHD has concluded that it:⁸⁷

... appears that the adjusted BAFO costs has a relatively high component for site management, site running costs, and other overheads and contingencies allocated to the Wagga 330kV substation project compared to the other larger substation projects.

If GHD adopted the adjusted BAFO costs of \$43.4 million, GHD's comparative estimates across all four substations would increase to \$573.2 million which is still only 12% above the total adjusted BAFO costs. Considering the total substation costs across the four substation projects balance out compared to GHD's comparative estimates, GHD considers the differences can be explained by the fact that GHD did not allow for sufficient scope of work and contingencies at the time of preparing the estimates and allocation of project overheads specifically for this substation.

GHD also noted that TransGrid's aggregate capex forecast for substations, including large specialist equipment, is within ± 20 per cent range of GHD's comparative estimate. Specifically, TransGrid's BAFO capex is \$24.1 million lower than GHD's estimate, or \$61.0 million lower after adjustments for Wagga station.⁸⁸

Overall, GHD concludes that TransGrid has achieved efficient pricing for the substation work scope through the procurement process undertaken.

⁸⁵ GHD, PEC – *Scope and Independent Verification and Assessment*, 30 September 2020, section 5.5.

⁸⁶ GHD, PEC – *Scope and Independent Verification and Assessment*, 30 September 2020, section 5.5.

⁸⁷ GHD, PEC – *Scope and Independent Verification and Assessment*, 30 September 2020, section 5.5.

⁸⁸ GHD, PEC – *Scope and Independent Verification and Assessment*, 30 September 2020, section 5.5.

5.6.2 Our assessment

We have the following observations regarding TransGrid's capex forecast for substation works, including large specialist equipment:

- a significant proportion of capex reflects:
 - > the outcomes of a competitive tendering process where pricing has been a key factor; and
 - > the likely costs TransGrid will incur – the preferred bidder has provided a response consistent with the tender requirements and scope of the project and the capex forecast is based on the costs of the preferred bidder;
- GHD's comparative cost analysis suggests that the TransGrid's capex forecasts (including an allocation of 'other construction costs') are reasonable since:
 - > TransGrid's aggregate capex forecast for substations, including large specialist equipment, is within a reasonable range of GHD's comparative estimate; and
 - > on a substation by substation basis:
 - TransGrid's capex costs for three of four the substations are within a reasonable margin of GHD's comparative estimate; and
 - for the other substation, GHD was able to identify reasonable reasons for the variation; and
- notwithstanding GHD's assessment, in the case of the 'other construction costs' that have been allocated to substation costs and large specialist equipment:
 - > we do not have sufficient detail on how these costs have been calculated to understand if these are reasonable and appropriate; and
 - > many of these costs have not been market tested.

We discuss our assessment of other construction costs in further detail below.

5.7 Other construction costs

5.7.1 TransGrid's capex forecast for other construction costs

As mentioned above, TransGrid has identified that bidder 2's BAFO proposal does not include all of the relevant construction costs to complete the NSW proportion of PEC. To estimate the total capex for tendered works, TransGrid has identified and estimated the 'other construction costs' not included in bidder 2's BAFO proposal.

Further details about other construction costs are set out in the table below.

Table 8: Other construction costs for bidder 2 (millions, \$2017-18) ⁸⁹

Cost category	Description	Bidder 2
Baseline planning conditions	Cost of addressing reasonably unanticipated planning conditions	0.9
Track possessions	Delays in gaining possession of track alignments and hence access to site	0.5
Micro-siting alignment issues	Resolving issues that arise during construction relating to the final location of towers	1.5
Commissioning costs	TransGrid costs to undertake commissioning activities in accordance with the preferred bidders commissioning schedule	11.9
Safety and quality	Independent safety and quality assurance required to meet Board and stakeholder expectations	4.7

⁸⁹ TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 5.1.3. Figures may not add up due to rounding.

assurance program	for the execution of the project works	
EIS approval delay	Bidder 2 has provided pricing based on the minimum State and Federal Environmental Impact Statement (EIS) approvals timeframes. However based on TransGrid's experience with other large infrastructure projects, TransGrid has estimated that the most likely outcome is a delay of 2 months.	11.9
Unforeseen environmental approval requirements	The BAFO tender price assumes a set of baseline environmental approval conditions based on advice from WSP. There is a risk that actual approval conditions are more onerous than the baseline	8.1
COVID-19	BAFO tender price assumes that current baseline of COVID-restrictions and a continuation of international travel quarantine restrictions until 31 December 2021. TransGrid will be financial responsible for the consequence of incremental Government action or in nominated locations for large specialist equipment manufacture.	8.0
Extreme weather	The BAFO tender price does not include an allowance for extreme weather events, principally 1-in-100 year flood event.	10.7
Total (\$M, 2017-18)		58.2

5.7.2 GHD's assessment

As mentioned above, GHD has reallocated 'other construction costs' to the different project components. GHD has done this to ensure that its comparative estimate is comparable with TransGrid's capex forecast the different project components.

GHD has also reviewed each cost category for 'other construction costs'. GHD points out that \$16.6 million is for commissioning and safety assurance program are specific costs for the project and the remaining \$41.6 million can be considered allowances for different risks. Further, GHD concludes that:⁹⁰

- it is prudent for there to be an allowance for all the cost categories TransGrid has identified – the categories identified are typical for a construction project except for COVID-19;
- the risk allowance of \$41.6 million (or 2.8 per cent of tendered capex works) is reasonable;
- for commissioning costs, the costs estimated by TransGrid is consistent with GHD's previous experience with the original Queensland – New South Wales interconnector project; and
- having a safety and quality assurance program is usual practice for large infrastructure projects.

5.7.3 Our assessment

The information provided to us was insufficient for us to understand whether the estimated other construction costs are reasonable. For example, the information did not allow us to understand how the costs have been calculated and the basis of the cost estimate.

Notwithstanding this, we provide our observations for each of the other construction cost categories TransGrid has identified in the table below. By way of summary, we conclude that:

- the majority of the cost categories appear to be reasonable, ie, these categories can reasonably be expected to increase the cost of completing PEC and do not appear to be covered elsewhere, indicating that some allowance should be made within the cost estimates for these categories;
- insufficient evidence was provided for us to conclude that it is reasonable to have a separate allowance for two of the cost categories, ie:
 - > the safety and quality assurance program may already be covered by corporate overhead costs, and so there could be double counting; and
 - > the NER contain pass through arrangements for extreme weather events, and no evidence has been provided relating to why these provisions may not be suitable (necessitating a separate cost allowance); and

⁹⁰ GHD, PEC – Scope and Independent Verification and Assessment, 30 September 2020, section 5.7.

- for cost categories where an allowance appears reasonable, we are unable to conclude if TransGrid's estimates are reasonable or reflect the expected costs of completing PEC, given a lack of supporting evidence.

Table 9: Our observations on other construction costs

Cost category	Our observations
Baseline planning conditions	This appears to be an asymmetric risk that is outside the control of TransGrid. In other words, planning conditions that are more onerous than expected could materially increase the costs of completing PEC but better than expected planning conditions are unlikely to materially decrease costs. However, this will depend on what Baseline planning conditions bidder 2 has assumed. That is, whether it already factors in a reasonable amount of 'unanticipated' planning conditions.
Track possessions	This appears to be an asymmetric risk that is outside the control of TransGrid. Given this, it appears reasonable for there to be an allowance for this risk.
Micro-siting alignment issues	This appears to be a likely cost that TransGrid will incur to complete PEC. Given this, it appears to be appropriate that an allowance be allowed, assuming that it is not covered elsewhere in bidder 2's BAFO proposal.
Commissioning costs	This appears to be a likely cost that TransGrid will incur and does not appear to be included elsewhere.
Safety and quality assurance program	We understand that corporate overhead costs have already factored in project management and quality assurance costs and these costs have been verified by GHD as reasonable for PEC. Given this, including an allowance for this cost category may represent double counting.
EIS approval delay	This is an asymmetric risk is not within TransGrid's control and is related to a latent condition of the site. Bidder 2 (the preferred bidder) has based their BAFO price on the minimum EIS approval time framework. TransGrid's previous experience indicates that 2 month delay is a the most likely outcome. TransGrid has estimated based on pricing submitted by bidder 2 through a competitive process, and so has been market tested. Given this, an allowance for this appears to be reasonable.
Unforeseen environmental approval requirements	This risk is not within TransGrid's control and is related to a latent condition of the site. Given this, it appears reasonable for there to be an allowance for this risk.
COVID-19	This risk is not within TransGrid's control and is related to a latent condition of the project. In our view, it is very difficult to develop expected average costs associated with the impact of COVID-19 on the costs of PEC, as there are no historical precedent or outcomes to rely on. Given this, it may be worth the AER considering a passthrough for this risk as a separate arrangement, to the extent that can be facilitated under the NER.
Extreme weather	We note that there are already pass through arrangements in the NER to deal with extreme weather events, which we would expect would cover this risk. It is therefore not clear that a separate allowance for PEC is required.

5.8 Total tendered work capex

5.8.1 TransGrid's capex forecast and GHD's comparative estimate

A summary of TransGrid's capex for tendered works by project component is shown in Table 10. This table includes capex related transmission lines, substations, and large specialist equipment mentioned above, as well as costs associated with special protection, communication and balance of works.

Table 10: GHD's comparable estimate bidder 2 pricing – tendered works capex forecast (\$millions, 2017-18)⁹¹

Component	GHD's estimate	Bidder 2	Variance with GHD's estimate
Transmission line	995.5	953.8	-4%
Substation	313.0	372.0	19%
Large specialist equipment	223.3	140.2	-37%
Special protection, communication and balance of works	2.5	2.6	4%
Total	1534.3	1468.6	4%

As mentioned above, GHD has allocated 'other construction costs' to the relevant project component. At an aggregate total cost level, GHD has found that its comparative estimate and the TransGrid's capex for tendered works to be four per cent, well within a reasonable range.⁹²

5.8.2 Our assessment

GHD has verified that TransGrid's capex forecast for tendered works, including 'other construction costs', is reasonable and well within a reasonable range of its comparative estimate.

Given the competitive procurement process adopted and GHD's findings, we consider TransGrid's capex forecast for tendered works (excluding the allocation of 'other costs') reflects those of a prudent and efficient TNSP. The only exception is the \$32.6 million allowance for an additional 20 km of route for realignment on the Dinawan to Wagga Wagga line, which GHD was unable to verify its justification.

As mentioned above, we do not have sufficient information to understand if the level of 'other construction costs' are reasonable or appropriate. However, many of the cost categories appear to be reasonable, ie, these categories can reasonably be expected to increase the cost of completing PEC but do not appear to be covered elsewhere.

⁹¹ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, Section 5.6. Figures may not add up due to rounding.

⁹² GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, Section 5.6.

6. Assessment of property and easements capex

TransGrid's capex forecast for property and easement is \$121.5 million (2017-18), excluding biodiversity offset costs.⁹³ These costs can be grouped into three key categories:

- \$108.2 million for easement and land costs;
- \$10.8 million of construction related costs; and
- \$2.4 million to cover various fees.

Biodiversity offset costs are discussed in section seven.

6.1 TransGrid's approach to estimating property and easement costs

6.1.1 Easement and land costs

TransGrid's capex forecast for easement and land costs is \$108.2 million. The majority of these costs have been estimated by Jones Lang LaSalle (JLL). JLL were commissioned by TransGrid to provide a desktop assessment of estimated costs of acquiring land and easements. JLL's assessment is undertaken in accordance with the Land Acquisition (Just Terms Compensation) Act 1991 (NSW). In addition, the assessment:

- was a desktop assessment of compensation only, with no:
 - > physical inspections of the affected properties or comparable sales; nor
 - > discussions with affected land holders in relation to the assessment; and
- was based on the Southern Alternative route; and
- has considered outcomes of the actual acquisition negotiations TransGrid has undertaken so far.

The JLL report covers six cost categories with a total cost of \$101.2 million:

- \$59.8 million for easement acquisition costs, which includes the market value of the acquired land and losses to adjoining land owners etc;
- \$29.9 million for negotiation margin, which recognises that TransGrid will need to pay landowners a price above market value to acquire easement rights;
- \$3.4 million to cover unforeseen and unanticipated property costs;
- \$4.9 million to cover the costs of reasonable professional fees incurred by landowners, eg, legal, valuation, agronomy and accounting advice; and
- \$3.2 million to acquire land for Buronga substation extension and land for the switching station at Dinawan.

JLL has also noted that in developing its estimate, it has assumed that TransGrid will implement a sound land and easement acquisition strategy.

In addition, TransGrid has developed its own estimate for other easement and land related costs totalling \$6.9 million. These costs cover:

- \$3.9 million options fees to obtain exclusive land negotiations with landholders;

⁹³ We note that figures may not add up because of rounding.

- \$2 million to acquire access easement; and
- \$1 million for property and easement surveys.

A description of the basis of these costs is provided in Table 11 below.

Table 11: Breakdown of easement and land capex forecast (million \$2017-18) ⁹⁴

Cost component	Forecast capex	Comments
Easement acquisition costs	\$59.8	JLL's estimated compensation to cover the market value of the land acquired, increases or decreases in value of other land adjoining the acquired land owned by claimants, and losses attributable to disturbance. These have been completed in accordance with the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> and also court precedent. It should be interpreted as the minimum amount that TransGrid will need to pay.
Commercial negotiating costs	\$29.9	JLL's estimate of a negotiation margin that is above the easement acquisition costs that is reasonable and likely. JLL opinion is that a negotiating margin will be in the order of 50 per cent of the easement acquisition costs valuation.
Unforeseen and unanticipated property costs	\$3.4	JLL's estimate of the disturbance allowance (which is incorporated in easement acquisition costs) is based on the average gross margin for predominantly cropping and grazing land. However, PEC may impact higher horticultural and irrigation enterprises. JLL has estimated an additional allowance to capture this.
Professional fees compensation to landholders	\$4.9	TransGrid's policy is to reimburse reasonable landholder's expenses directly and reasonably incurred due to TransGrid acquiring the property. JLL's estimate based on an allowance of \$25,000 per landowner (\$24,500 in real \$2018) has been made and that 200 discrete landholders may seek third party advice.
Land for Buronga substation extension	\$0.3	This is based on negotiation outcomes.
Land for Dinawan switching station	\$2.9	This is based on negotiation outcomes.
Option fees	\$3.9	An option fee is required to obtain exclusive land negotiations with the landholder and will help TransGrid secure the land at the conclusion of negotiations. TransGrid has estimated this by assuming that 200 landholders will be impacted by PEC and the cost per landholder will be \$20,000 (or \$19,500 in real \$2018).
Access easement	\$2	TransGrid has estimated this using JLL's access easement calculator spreadsheet. This covers the value of access easement, injurious affection from access tracks, and disturbance compensation to landholders.
Property and easement surveys	\$1.0	TransGrid will need to undertake property and easement surveys as part of PEC. TransGrid's estimate based on average historical costs of \$1,500 per km of transmission line for external contractors.
Total	\$108.1	Most (\$101.2 million) of costs are based on independent assessment of JLL.

6.1.2 Construction related costs and fees

TransGrid is expected to incur construction related costs of \$10.8 million (2017-18) for PEC. This comprises:⁹⁵

- license fee of \$3.9 million, which is calculated as 200 landowners multiplied by the \$20,000 (\$19,500 in \$2018) cost per license based on TransGrid's previous experience;
- laydown/staging costs of \$0.9 million, based on JLL's report estimate of the costs of \$0.6 to \$1.2 million; and
- damage/disturbance claims post construction costs of \$6.0 million, which TransGrid has assumed to be 10 per cent of easement acquisition costs discussed above.

⁹⁴ TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 5.2.

⁹⁵ TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 5.2.

In addition, TransGrid expects to incur \$2.4 million in total fees, covering:⁹⁶

- \$1.5 million of aboriginal cultural heritage fees;
- \$0.5 million to cover NSW government land registration fees;
- \$0.3 million to cover stamp duty; and
- \$0.1 million to cover valuer generals fees.

6.2 GHD's assessment

GHD has noted that it has not undertaken or is qualified to undertake a detailed analysis from a land valuation perspective of the easement/land acquisition estimate prepared by the registered land valuers JLL. Without taking a detailed assessment, GHD's view is that TransGrid's forecast capex would cover probable eventualities in the land /easement acquisition process.

6.3 Our observations

We have not undertaken a detailed assessment of property and easement costs and are not qualified to do so. We are therefore not able to draw a firm conclusion on the prudence and efficiency of those costs.

However, we make the following observations.

- the vast proportion (84 per cent of property and easement costs) of easement and land costs are based on JLL report estimations of \$101.2 million for easement and land costs and \$0.9 million for laydown/staging costs – these would appear to be reliable estimations as JLL are experts in the field; and
- the remaining \$19.4 million (16 per cent of property and easement) have been estimated by TransGrid based on historical outcomes – these have not been validated externally but reflect costs which TransGrid can reasonably be expected to incur and therefore for which some allowance in the capex forecast is reasonable. These represent a small proportion of TransGrid's overall RTF Phase B capex forecast of PEC (around 1 per cent).

⁹⁶ TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 5.2.5.

7. Environmental offset costs

TransGrid's capex forecast for environmental offset costs is \$127.4 million (2017-18).

7.1 TransGrid's approach to estimating environmental offset costs

The NSW Biodiversity Conservation Act 2016 and the Commonwealth Environmental and Biodiversity Conservation Act 1999 requires that developers that impact land establish an 'offset' area of land to be protected. TransGrid has estimated that the costs associated with environmental offsets for PEC is \$127.4 million, comprising:⁹⁷

- \$113.1 million for biodiversity offset; and
- \$14.3 million for species offsets.

7.1.1 Biodiversity offset

The NSW Biodiversity Conservation Act 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, thereby protecting the vegetation and/or animal species. The area of land that needs to be protected is determined using a credit system. That is, projects that disturb a larger area of land generate more credits, which the developer is required to offset by protecting areas of land.

The area of land required to be protected must also contain the same species of flora and fauna as the impacted land. The credit system is designed to ensure that more is preserved than disturbed by the development, factoring the current condition of the land.

The number of offset credits that PEC will generate will depend on the size of land it will disturb. This will depend on the clearing scenario for PEC, ie, PEC could involve:⁹⁸

- a full clearing scenario, where TransGrid will be required to undertake complete vegetation clearing for the entire easement width and maintain this in perpetuity; or
- a limited clearing scenario, where TransGrid is required to undertake partial vegetation clearing, and so the land disturbed, and thereby credit liability, will be substantially lower.

There are two methods to offset the biodiversity impact of a project, namely:

- payment into a biodiversity conservation trust (BCT), where the developer pays a dollar amount per credit; or
- establishing biodiversity stewardship agreements (BSA), which involves TransGrid identifying and protecting suitable areas of land.

TransGrid engaged WSP to determine the most cost efficient way to meet the biodiversity offset requirements for PEC. WSP estimated the ways in which TransGrid could meet its environmental obligation and concluded the cost-efficient approach would cost \$113.1 million under the limited clearing scenario.

⁹⁷ TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 5.2.5.

⁹⁸ TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 5.2.5.

7.1.2 Species offset

TransGrid will also need to offset the species credit associated with PEC to offset the impact to breeding habitat for threatened species.

WSP estimated the species offset costs based on the increase in biodiversity offset costs. On this basis TransGrid has estimated that the costs of species offset will be \$14.3 million.

7.2 GHD's assessment

In assessing TransGrid's biodiversity offset costs, GHD considered JLL's reports on land acquisition costs and WSP's reports on PEC biodiversity offset liability. Based on its review, GHD noted support for a number of important assumptions WSP has used, including:⁹⁹

- it supports the use of the biodiversity offsets price calculator (BOPC) to estimate potential offset costs;
- it considers the use of 22-25 credits per ha for moderate good vegetation as suitable and in accordance with Biodiversity Assessment Method (BAM);
- it supports the use of credit impact range of 8-11 per ha associated with the 'maintenance areas';
- the use of 4 credits generated per ha as a suitable credit generation rate and in line with results GHD has obtained when using the BAM;
- it supports the assumptions at this stage for a per ha in perpetuity cost associated with stewardship site maintenance (\$2,500 per ha) – however, GHD was unable to comment on the average land value cost per ha listed in the WSP memo (\$1,500 per ha) as part of this review; and
- concurs it is very difficult to provide an estimate for species credit offsets at this stage and that the contingency approach by WSP is reasonable.

Based on the above, GHD has concluded that:¹⁰⁰

WSP has completed the analysis using a sound methodology and approach, especially at this stage of the project.

Notwithstanding this, GHD also noted that the using the BOPC may result in an estimate that is conservatively high because:¹⁰¹

- it is unlikely the project will have native vegetation in moderate/good condition throughout the entire area of the proposed easement as assumed in the estimate; and
- the BOPC is currently referencing credit sales from other parts of NSW (including Western Sydney) where credit prices are considerably higher than in the South West and Riverina.

7.3 Our observations

We do not have the relevant expertise to independently validate the reasonableness of TransGrid or WSP's approach to environmental offset costs.

However, we make the following observations:

- it has been developed by an independent expert, WSP, who has developed their estimates using the New South Wales Government's calculator and certificate prices as of 31 July 2020; and
- GHD's report verifies that WSP has used a sound methodology and approach, albeit noting that the estimate may be conservatively high.

⁹⁹ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 7.

¹⁰⁰ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 7.

¹⁰¹ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 7.

We further note that WSP has used certificate prices from 31 July 2020 as the likely price that TransGrid will pay for PEC. Although GHD has noted that WSP has used credit prices from other parts of NSW, which have higher than South West and Riverina, it is possible that credit prices in South West and Riverina will increase as a result of PEC. This is because TransGrid may need to purchase a large number of credits, which would increase credit prices, and so the environmental offset costs TransGrid will incur.

8. Risk allowance (biodiversity offset risk)

TransGrid's capex forecast has included allowance for only one risk, biodiversity offset risk. TransGrid's capex forecast for this risk is \$38.2 million (2017-18).

8.1 TransGrid's approach to estimating biodiversity risk

8.1.1 TransGrid has only considered risks that are material

TransGrid has undertaken a review of the risks associated with the construction and delivery of PEC. TransGrid has create an allowance for risks that:¹⁰²

- are not business as usual risks;
- are not within TransGrid's control;
- cannot be covered by contract terms or insurance; and
- are not covered by pass-through provisions in the NER.

Based on the above, the only risk TransGrid has made an allowance for is for biodiversity offset.

8.1.2 How the contingency cost allowance has been calculated

As discussed in section 7.1.1, TransGrid's estimate costs of meetings its biodiversity obligation is based on a limited clearing scenario, where there is only partial clearing of vegetation. However, the limited clearing scenario assumes that approval from NSW Department of Planning, Industry and Environment (DPIE) is obtained. Discussions with DPIE will occur in the later stages of the project, once there is more clarity on the project's impact on biodiversity and species.

There is a risk that DPIE will require TransGrid to purchase more offsets than under the limited clearing approach, which would increase the costs of completing PEC. TransGrid has calculated the contingency amount to cover the higher than expected biodiversity costs based on:¹⁰³

- a 30 per cent likelihood that DPIE will reject TransGrid's proposed approach of limited clearing and require TransGrid to undertake full clearing – this is based on WSP's estimate that there is a 20 to 40 per cent probability that a full clearing scenario will occur; and
- the maximum biodiversity offset costs under full clearing scenario is \$254.7 million (2017-18) – this is \$127.3 million (2017-18) higher than the limited clearing scenario.

TransGrid's estimated contingency allowance is therefore \$38.2 million (ie, 0.3 multiplied by \$127.3 million, the costs difference between the full clearing scenario and limited clearing scenario).

8.2 GHD's assessment

GHD considers that is very difficult to estimate an actual final biodiversity cost. Notwithstanding this, GHD notes that WSP's estimates for the 'full clearing scenario' and the using the BOPC may result in an estimate that is conservatively high because:¹⁰⁴

¹⁰² TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 5.4.

¹⁰³ TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 5.4.

¹⁰⁴ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 7.

- it is unlikely the project will have native vegetation in moderate/good condition throughout the entire area of the proposed easement as assumed in the estimate; and
- the BOPC is currently referencing credit sales from other parts of NSW (including Western Sydney) where credit prices are considerably higher than in the South West and Riverina.

8.3 Our observations

We have reviewed TransGrid's approach to calculating the contingency cost allowance. We have assessed:

- what allowance (if any) is made for this risk as part of TransGrid's base cost estimate;
- whether there should be a contingency cost allowance for the risk;
- if so, whether the contingency cost allowance made is appropriate; and
- if not, our assessment of why there shouldn't be a contingency cost allowance.

We make the following observations:

- this appears to be an asymmetric risk – a 'limited clearing' scenario appears to represent the scenario where TransGrid is required to purchase the least amount of credits, or a best case scenario. However, there is a risk that the DPIE will require TransGrid to purchase more credits than under the 'limited clearing' scenario;
- the risk relates to a realistic latent condition with the site – the number of credits will be determined based on the actual condition along the route;
- this risk is uncertain and outside of TransGrid's control – the number of credits will be determined at a later date and will be subject to discussions with DPIE; and
- there is no reasonable and efficient way for TransGrid to pass on the risks to the contractor or cover through insurance.

The above suggests that it is appropriate for TransGrid to have a capex allowance to cover the residual risks of higher than expected biodiversity offset costs. That said, GHD was unable to validate either the approach or the amount estimated by WSP, and noted that some of the input assumptions key in estimating this risk may be conservatively high. Given this, we consider that an allowance would be appropriate but are unable to verify that TransGrid's estimate is consistent with a prudent and efficient TNSP.



9. Corporate and network overhead capex (indirect capex)

TransGrid will incur corporate and network overhead capex in the delivery of PEC, ie, indirect capex. Indirect capex can be grouped into the following key categories:

- historical indirect capex
- forecast indirect capex, to cover:
 - > works delivery;
 - > project development;
 - > land and environment;
 - > stakeholder and community engagement;
 - > insurance; and
 - > tender and bidder payments.

TransGrid has estimated total forecast indirect capex using a bottom-up approach. For example, labour cost has been estimated based on the number of additional full time equivalent (FTE) staff required and TransGrid's standard rates per FTE.

TransGrid's forecast for corporate and network overhead capex is \$135.8 million (2017-18) in total.

9.1 TransGrid's approach to estimating forecast capex

9.1.1 Historical indirect capex

Historical capex relates to expenditure that TransGrid has incurred between July 2018 and June 2020 to progress PEC. TransGrid's enterprise resource planning system (Ellipse) records transactions and staff time that TransGrid has incurred. TransGrid has followed its cost allocation methodology and capitalisation policy when allocating and attributing costs to the PEC as capex.¹⁰⁵

TransGrid estimates the historical capex is \$27.8 million for PEC.

9.1.2 Forecast indirect capex – works delivery

TransGrid will need to hire additional staff to undertake work delivery activities, eg, undertake project and contract management and inspect work completed by suppliers and contractors.

The estimated costs of works delivery capex are \$19.9 million.¹⁰⁶ Work delivery costs have been calculated based on the need for an additional 29 FTEs, TransGrid's standard rates and costs for these FTEs, and TransGrid's estimate of the likely duration required for each role.¹⁰⁷

¹⁰⁵ TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 5.3.

¹⁰⁶ TransGrid, *Supplementary Capex Forecasting Methodology for Project EnergyConnect - BAFO*, Contingent Project Application for Project EnergyConnect, 30 September 2020, section 5.3.

¹⁰⁷ TransGrid, *Corporate and Network Overhead Forecast for Project EnergyConnect*, Contingent Project Application for Project EnergyConnect, August 2020, p. 7.

9.1.3 Forecast indirect capex – project development

The estimated costs of project development \$39.4 million.

Labour related costs

TransGrid is scheduled to construct several major capex projects over the coming years. For example, in addition to Project EnergyConnect, TransGrid will also be constructing the QNI minor upgrade, HumeLink and the NSW portion of the VNI interconnector.

To help coordinate these projects and integrate these upgrades into the existing network, TransGrid has established a major projects division.

Some of these FTEs will be working specifically on the PEC whereas some will be working across the different major projects. TransGrid estimated that the costs that are attributed to the PEC are around \$34.2 million for labour and labour related costs. This cost has been estimated based on the expectation that:¹⁰⁸

- there would be 26 FTEs dedicated specifically to PEC – all of these costs have been allocated to PEC; and
- 24 FTEs would be in roles that are not specific to an individual major project, and so are common costs across all major projects – these costs have been allocated to PEC based on the expected proportion of capex for PEC compared to the total capex for all major projects. In total, 46 per cent of shared costs are allocated to PEC.

Non-labour related costs

TransGrid estimates that it will incur around \$5.2 million of non-labour project development capex, comprising:¹⁰⁹

- \$0.6 million to cover the costs of undertaking geotechnical studies, system planning studies, hydrological studies and electric and magnetic studies for PEC;
- \$3.4 million in legal fees to support the procurement process and legal support during course of the project; and
- \$1.2 million to hire specialist consultants to help prepare the contingent project application.

These estimates have been based on historical costs of undertaking similar projects or estimates from potential suppliers.

9.1.4 Forecast indirect capex – Land and environment

TransGrid expects that around 200 to 230 property or easement acquisitions will need be required to deliver PEC. In addition, PEC is a greenfield project and so TransGrid will need to carefully manage any environmental impact that may arise from the project.

TransGrid's capex forecasts for land and environment capex is \$19.6 million. This is based on the following:¹¹⁰

- \$5.8 million cover labour and labour related costs of hiring 11 additional FTEs during the earlier phases of the project;

¹⁰⁸ TransGrid, *Corporate and Network Overhead Forecast for Project EnergyConnect*, Contingent Project Application for Project EnergyConnect, August 2020, p. 11.

¹⁰⁹ TransGrid, *Corporate and Network Overhead Forecast for Project EnergyConnect*, Contingent Project Application for Project EnergyConnect, August 2020, p. 10-11.

¹¹⁰ TransGrid, *Corporate and Network Overhead Forecast for Project EnergyConnect*, Contingent Project Application for Project EnergyConnect, August 2020, p. 20.

- \$4.5 million for property consulting required during the project;
- \$5.5 million to undertake environmental impact studies; and
- \$3.8 million to cover survey, legal and other professional fees.

9.1.5 Forecast indirect capex – stakeholder and community engagement

TransGrid considers that stakeholder and community engagement is an essential part of managing and delivering EPC in a sustainable manner. The scale, nature and scope of PEC will also mean there will be many affected communities in New South Wales.

TransGrid's capex forecast for stakeholder and community engage for PEC is \$8.2 million to cover the following items:¹¹¹

- \$3.5 million to cover labour and labour related costs to cover four additional staff;
- \$3.1 million to hire external assistance to help with engagement;
- \$0.3 million to help deliver community improvement programs; and
- \$1.4 million to help with other communication related costs, eg, develop website and social media, research and testing project messages, and video and animations production etc.

9.1.6 Forecast indirect capex – insurance and tender/bid costs

TransGrid will incur other indirect capex as a result of PEC. TransGrid's estimated capex forecast for these other costs is \$20.9 million, comprising:¹¹²

- \$8.6 million for incremental insurance costs during construction – this is based on estimates of insurance premiums [REDACTED]; and
- \$12.3 million for bidder payments to encourage participation of multiple bidders and improve the quality of tender submissions – these payments are in-line with common industry practice and NSW government guidelines.

9.1.7 GHD's assessment of indirect capex forecasts

GHD noted that TransGrid's indirect capex represents seven per cent of total costs of PEC. GHD further noted that in general, the larger the project, the smaller the project development and management owner costs will be as a percentage of total costs. In other words, the fixed overhead costs will be spread across a larger cost base, and so total overhead costs will represent a smaller proportion total costs for larger projects.

GHD also states that project overheads for transmission projects can typically range from 5% to over 20% depending on scale and complexity of the project. GHD further concludes that PEC is likely to have overheads at the lower end of the range given the scale of the project.¹¹³

To assess the reasonableness of TransGrid's proposed overhead capex, GHD undertook an assessment of what a reasonable overhead allowance would be for PEC given the nature and size of the project. GHD's report points to work undertaken by Ernst and Young, which examined data from eight road and rail

¹¹¹ TransGrid, *Corporate and Network Overhead Forecast for Project EnergyConnect*, Contingent Project Application for Project EnergyConnect, August 2020, p. 25. Figures may not add up due to rounding.

¹¹² TransGrid, *Corporate and Network Overhead Forecast for Project EnergyConnect*, Contingent Project Application for Project EnergyConnect, August 2020, p. 31, 33. Figures may not add up due to rounding.

¹¹³ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 1.

authorities in Australia for projects with a total cost between \$0.5 and 1 billion. Overall, Ernst and Young found that owner costs (excluding design costs) were: ¹¹⁴

- on average 11 per cent for a typical road projects, ranging from eight to 14 per cent; and
- on average 16 per cent for rail projects.

GHD considered that road projects were a more comparable benchmark given the brownfield nature of the QNI upgrade. GHD also noted that most of the design work (90 per cent) has been outsourced to contractors, and so already incorporated in the lump sum payments to contractors. GHD estimated that an 11 per cent allowance for project management and overhead costs was appropriate amount for a \$250 million project. GHD then considered how overhead costs would change when the project size increased and estimated overheads of 5.9 per cent for a \$2 billion project. ¹¹⁵

In conclusion, GHD's view is: ¹¹⁶

... that the 7% margin included by TransGrid in the CPA is within an acceptable range of owner cost margins for projects of this large relative size and complexity.

9.1.8 Our assessment

We do not have the relevant expertise to independently validate the reasonableness of TransGrid's bottom up approach to calculating corporate and overhead costs. However, we consider TransGrid's capex forecast for corporate and network overheads to be prudent and efficient on the basis of GHD's assessment.

¹¹⁴ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 8.2.

¹¹⁵ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 8.2.

¹¹⁶ GHD, *PEC – Scope and Independent Verification and Assessment*, 30 September 2020, section 1.

10. Consistency of TransGrid's proposed expenditure for PEC with the NER

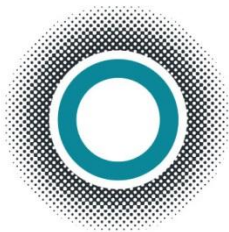
We have considering the following:

- consistency of PEC with the capital and operating expenditure objectives;
- whether the proposed capex amounts proposed by TransGrid as part of the updated information being provided to the AER reasonably reflects (both in total, and on an annual basis):
 - > the efficient costs of achieving the expenditure objectives;
 - > the costs that a prudent operator would require to achieve the expenditure objectives; and
 - > a realistic expectation of the demand forecast and cost inputs required to achieve the expenditure objectives.

Our conclusions are summarised in the following table.

Table 12: Consistency of TransGrid's CPA capex forecast for PEC with the NER

Assessment criteria	Assessment
How does the project meet the capital and operating expenditure objectives?	The project has been subject to a RIT-T and is expected to deliver benefits that exceed costs. ElectraNet's updated cost benefit assessment is anticipated to confirm that at the costs reflected in this CPA there would be no change in the RIT-T outcome. The project therefore meets the capital and operating expenditure objectives. GHD has verified that the project scope is reasonable and realistic to meet the investment needs.
Does the proposed expenditure reflect the efficient and prudent costs of achieving the expenditure objectives?	<ul style="list-style-type: none"> • Tendered capex for transmission, substation and specialist large equipment (\$1,410.4 m) is the largest cost category for PEC. These costs reflect the BAFO of the preferred bidder, and so have been determined through a competitive procurement process. In addition, GHD's verification provides support for these cost estimates being prudent and efficient. The only exception is the \$32.6 million allowance for route realignment on the Dinawan to Wagga Wagga line, which GHD was unable to verify its justification. • We do not have sufficient information to undertake a detailed assessment of the reasonableness of 'other construction costs' (\$58.2 m). • The majority of property and easement acquisition capex (\$102.1 m of the \$121.5 m, or 84 per cent) is based on a report by independent experts, JLL. • Environmental offset capex (\$127.4 m) is based on a report by independent experts, WSP. GHD considers WSP's approach and methodology to be sound, particularly at this stage of the project. However, GHD did note that the estimate may be conservatively high. • Biodiversity offset risks capex (\$38.2 m) are based a report by independent experts, WSP. However, GHD has not been able to verify the approach of the level of these costs and have noted that it may be conservatively high. In our opinion, it is reasonable for TransGrid to have an allowance to cover biodiversity offset risk but we are not able to assess whether TransGrid's estimate is prudent and efficient. • TransGrid's capex forecast for overhead and corporate costs (\$135.8 m) is considered to be prudent and efficient based on GHD's assessment.
Does the proposed expenditure reflect a realistic expectation of the demand forecasts and cost inputs to achieve the capital expenditure objectives?	The RIT-T for PEC considered multiple demand and cost scenarios and has identified PEC as the preferred option. Further refinements that have been made since the RIT-T, including the ISP and ElectraNet's updated modelling, will confirm if the proposed expenditure reflect realistic expectations of demand and cost inputs.
Is the amount of capital required each remaining regulatory year reasonable?	We have no information on which to separately verify that the proposed timing in each year of the regulatory period is prudent and efficient.
Is the likely commencement and completion dates reasonable?	The likely commencement and completion dates are reasonable, have been market tested through the procurement process and are consistent with the ISP conclusion that the completion of PEC as soon as practicable would be optimal.



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