

Risk and Contingency Report

HumeLink Stage 2 Contingent Project Application

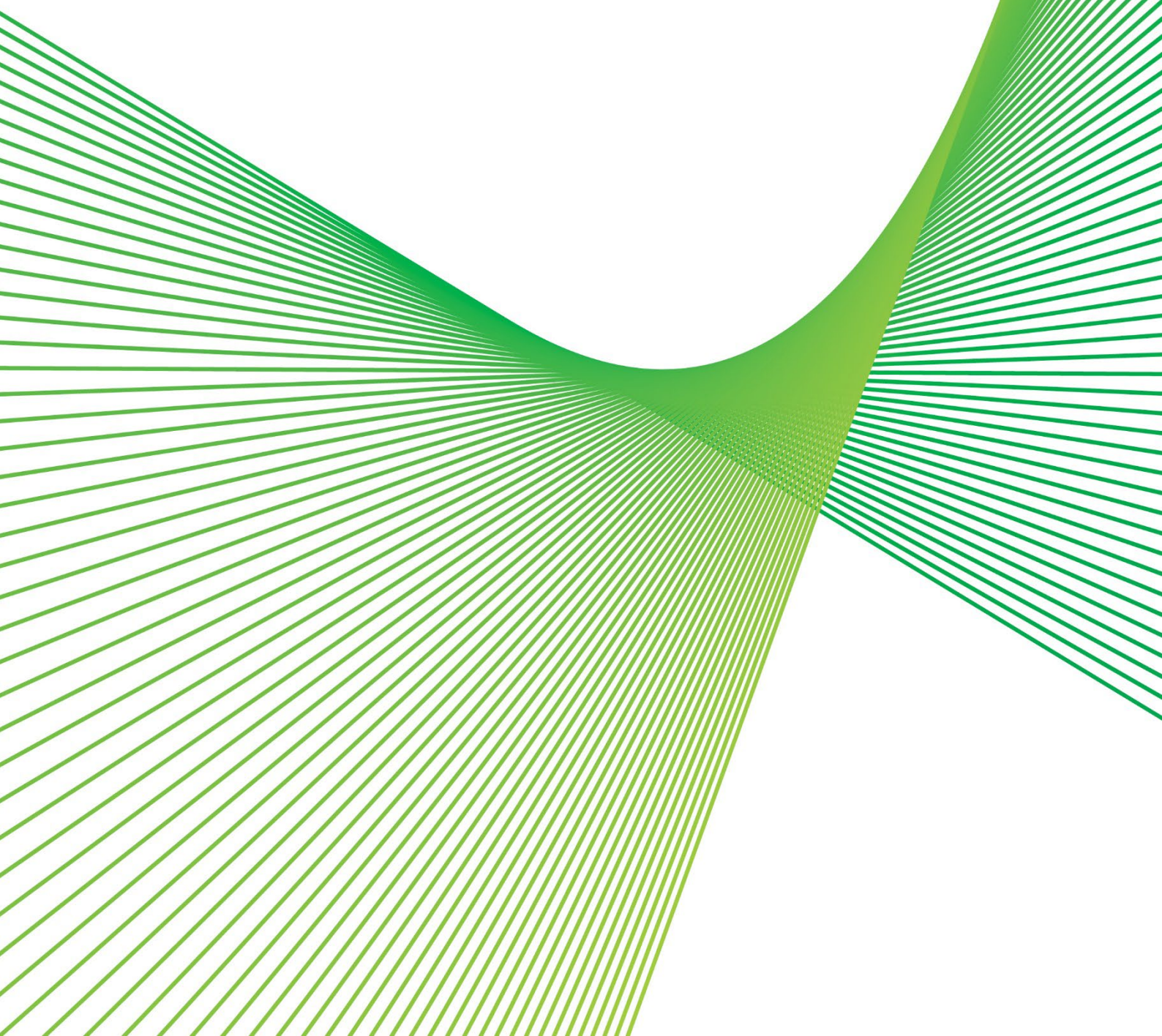


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1. Purpose and report structure

1.1. Purpose

The Australian Energy Market Operator's (AEMO) 2022 Integrated System Plan (ISP) has defined HumeLink (or the Project) as a staged actionable ISP project:

- Stage 1 is to complete the early works by 2024, and
- Stage 2 is implementation of the Project with a target delivery date of 2026-27.

This document explains and justifies the Other Construction costs that we have identified and costed for Stage 2 (Delivery) of HumeLink. These forecast costs are reflected in our Stage 2 forecast capex for HumeLink noting that these costs are:

- required to deliver HumeLink, and
- reflect the probability-weighted calculation of 'expected costs'.

The Australian Energy Regulator's (AER's) guidance note on the regulation of actionable ISP projects states that it can accept a project risk allowance in a contingent project determination by assessing the residual risks identified by the TNSP, and the efficiency of the associated cost estimates, ie, the consequential cost adjusted to reflect the likelihood of occurrence.¹

To inform its assessment, the AER expects TNSPs to comprehensively and transparently identify and assess the different project risks for which it is seeking a cost allowance.² In practice, this requires:³

- risk identification, i.e., clearly identifying the risk events for which a risk cost allowance is being sought, and
- risk cost assessment, i.e., estimating the potential cost impacts, estimating the likelihood of occurrence of the consequential costs being incurred and identifying any mitigation/management strategies.

Accordingly, this document:

- describes the nature and scope of the risks that will remain with Transgrid in the delivery phase of HumeLink. These risks are referred to as 'owners' risk' throughout this document, noting that it is either not possible or efficient for Transgrid to transfer these costs to the Delivery Partners;
- explains the overall process that we undertook to identify and determine the prudent and efficient cost for these risks;
- details the methodology that we have used to quantify the cost for each of these owners' risks including the inputs and assumptions that we have relied on, why the risk cannot be efficiently mitigated, transferred, or avoided, the proposed mitigants informing the residual risk cost and why these are reasonable; and
- explains how we validated and verified the Other Construction costs.

¹ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, pp 16-17.

² AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

³ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, pp 17-19.

This report is supported by the HumeLink QRA Risk Register provided as an attachment to the Stage 2 Contingent Project Application (Stage 2 Application of CPA-2).

1.2. Document Structure

The remainder of the document is structured as follows:

- Section 2 overviews the Other Construction costs that we will reasonably incur to deliver HumeLink.
- Section 3 set out the process that we have undertaken to identify and cost these risks.
- Section 4 describes each of the top 25 risk and how we have quantified their costs.
- Section 5 describes the remaining risks and how we have quantified these.
- Section 6 explains how we have verified and validated the Other Construction costs
- Appendix A – Owner’s Estimator base costs
- Appendix B – Risk assessment matrix.
- Appendix C – Risk Workshop Schedule

2. Overview of our HumeLink Other Construction costs

Forecast capex for Other Construction costs associated with the delivery of HumeLink is \$599 million. This section provides an overview of the top 25 Other Construction costs that may arise during the delivery phase of the Project. The top 25 risks comprise \$537 million or 90 per cent of the total Other Construction costs.

Table 1 overviews the top 25 risk and their associated forecast capex.

Table 1: Top 25 Other Construction costs for HumeLink delivery (\$Million, Real 2022-23)

No.	Risk name	Description	Risk Category	Forecast capex
1.	ID2 – EIS Delay	Delay and cost claims from the Contractors due to delay in receiving planning approval	Time	██████████
2.	ID49 – Owners' Cost	Transgrid Owner's Costs increase due to project duration extension. Note: Delivery Partner costs dealt with in specific risks.	Time	██████████
3.	ID68 – Delay Escalation	Contractor repricing arising from an employer driven delay to NTP2 requiring the contractors' subcontractors' quotes going out of validity	Variation	██████████
4.	ID13 – Inclement Weather	Claims for delay due to exceeding the inclement weather allowance in Contract plus disputes over what is inclement weather and what sites were impacted	Variation	██████████
5.	ID65 – Tower Foundations	Increase in costs associated tower footings with design and Geotechnical conditions being substantially different from the conditions expected following investigation works leading to increased costs and adjustment event under the Delivery Contract	Variation	██████████
6.	ID19 – Variations	Claims for variations due to changes in scope due to changes in design and construction manuals or Transgrid requirements	Variation	██████████
7.	ID 74 – Uncertainty of Biodiversity Offset costs	Risk of uncertainty of final biodiversity offset costs	Biodiversity	██████████
8.	ID5 – Site Access	Delays to and claims by the Contractor due to being unable to access the Site	Time	██████████
9.	ID47 – Inexperienced Workforce	Workforce is less experienced with this type of construction and not familiar with the Australian and local conditions.	Reimbursable	██████████

No.	Risk name	Description	Risk Category	Forecast capex
		Productivity less than planned and increase in rework		
10.	ID33 – Interface Contractor	Lack of coordination with Interface Contractors (OEM, East/West) resulting in design delays, construction delays, scope gaps, responsibility gaps and additional costs.	Variation	██████████
11.	ID42 – Increase in Plant	Reimbursable plant and equipment costs above estimate for Transmission Line Works	Reimbursable	██████████
12.	ID56 – Conductor Delay	Delays to Transgrid supplied conductor and OPGW from delayed overseas manufacturing and shipping timeframes	Time	██████████
13.	ID35 – Reactor and Transformer Delays	Delays to Transgrid supplied reactors and transformers due to delayed overseas manufacturing and shipping timeframe	Time	██████████
14.	ID37 – Social License	Project loses support (social licence) that results in disruptions such as blockades, protests, legal challenges and other means of obstruction including councils	Time	██████████
15.	D59 – Condition of Approval	Changes to Conditions of Approval from the baseline conditions are more onerous	Variation	██████████
16.	ID57 – Tower Design Growth	Design refinement and growth of towers occurs during detailed design	Reimbursable	██████████
17.	ID22 – Tower Steel Price	Increase in supply cost for fabricated steel	Variation	██████████
18.	ID27 – Exceptional Events	Exceptional Events such as bushfires, lockdowns, war, terrorism, or natural disaster	Time	██████████
19.	ID40 – Increase in Labour	Increase in Contractor reimbursable labour costs above EBA for Transmission Line Works	Reimbursable	██████████
20.	ID71 – Cost Estimate Changes	Assessment of uncertainty and inclusion of the calculation in contingency	Inherent	██████████
21.	ID6 – Reliance Info	Variation claims by Contractor due to changes in substation reliance information included in the Contract e.g. (General Arrangements, Single Line Diagrams, existing assets, geotech of substation sites UGL)	Time	██████████

No.	Risk name	Description	Risk Category	Forecast capex
22.	ID80 – Insolvency of JV	Contractor risk going insolvent	Time	██████████
23.	ID70 – Uncertainty of Owner’s costs for Labour and Consultants	Rates, numbers, employment ramp up and ramp down rates	Inherent	██████████
24.	ID41 – Local Area Works	Additional Local Area Works during construction leads to increase in reimbursable costs. High construction road use could result in damage and repair requirements and issues in dealing with Councils and non-project contractors	Reimbursable	██████████
25.	ID72 – Original Equipment Manufacturer cost uncertainty	Orders placed for transformers, but not reactors or the conductor. Design modifications may change the cost of each unit, transport costs may change due to directions by Transgrid	Inherent	██████████
			Total	\$537,144,419

3. Process for identifying Other Construction costs.

This section overviews:

- our approach to identifying and determining the Other Construction costs events for HumeLink Stage 2, noting that the Other Construction costs associated with the delivery of HumeLink are intrinsically linked to our choice of delivery contract model, and
- the process that we undertook to identify the owner's costs for HumeLink Stage 2,

3.1. Approach to identifying and costing Other Construction costs

3.1.1. Other Construction costs requirements for major projects

There is a level of complexity specific to HumeLink and additionally a complexity inherent to all major projects. Major projects are considered to have a higher risk profile due to the number of interfaces and complexities both internally to manage the delivery of the project and externally to manage key stakeholders.

The impact of these complexities is evident in the performance of recent major projects and often related to exposure of these projects to abnormal contractor delivery challenges, resulting in substantial claims including Westgate Tunnel, Melbourne Metro, Sydney Metro City and South-West, Inland Rail, WestConnex and NorthConnex.

The current market is characterised by:

- an unprecedented number of infrastructure projects (> 200B in NSW and VIC government infrastructure projects in 4 years to FY2027) including >20B pipeline of Australian transmission line projects to be delivered in the ISP target timeline.
- ongoing market challenges due to insufficient labour market capacity, global supply chain security and inflationary pressures on construction costs.
- contractor distress on recent traditional fixed price D&C lump sum projects which has shifted the risk appetite of the market including Snowy Hydro 2.0 and Project EnergyConnect.

HumeLink is a high voltage, very large-scale transmission project with a unique set of delivery challenges driven by accelerated program, specialised sector with limited capacity, volume of impacted property, difficult terrain and strong community opposition in some areas of the alignment. The risk contingency required for this major project must appropriately reflect the complexity, uncertainty, contract model selection and large variety of risks the Project has exposure to, and to ensure successful delivery for consumer benefit.

3.1.2. Overview of D&C ITC contract model

It is prudent to include contingency allowance in provisions for major projects that are aligned with the selected contract model for the project.

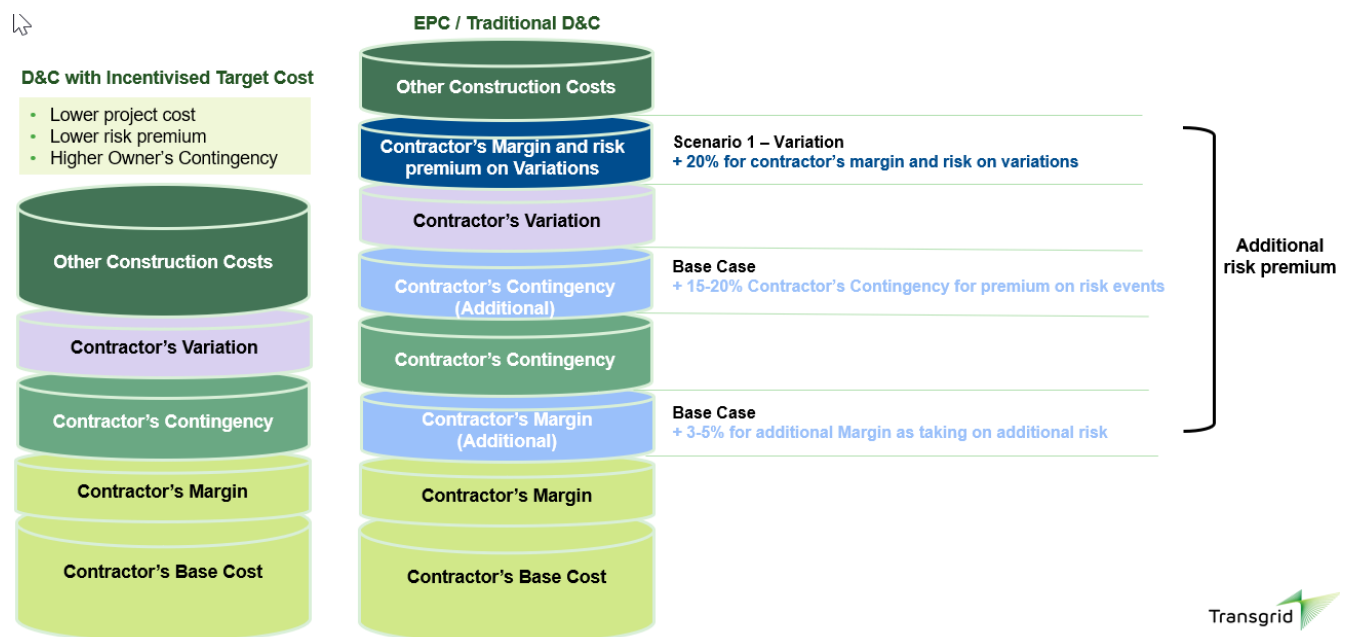
We have selected a design and construct (D&C) incentivised target cost (ITC) contracting model for delivery of each Project contract package that is tailored to the Project and the market conditions. The incentivised target cost commercial model seeks to achieve an appropriate allocation of fixed pricing, where there is high scope and cost certainty and reimbursable pricing with shared risk, where there is more uncertainty.

The D&C ITC contract model will enable us to achieve an efficient overall capex cost in the interest of consumers. This model addresses issues of additional risk premiums experienced in traditional D&C contract models by a shared risk approach.

Under a traditional D&C contract model, a contractor seeks to price contingency premiums to cover exposure to the risk with high confidence. The risk transfer can be regarded as desirable as it induces lower owners' risk contingency requirements as illustrated in Figure 1. However, the project will experience higher capital outturn costs to account for contractor risk premiums. To be efficient and benefit the consumer, the traditional D&C contract model is adopted when scope is well defined upfront, and the costs of the materials and labour can be estimated with reasonable certainty.

The D&C ITC contract model, whilst requiring a higher owner's contingency for risks allocated to the owner and shared under the contract, lowers risk premiums included in the contractor's cost. Under this approach contractors are incentivised to achieve cost savings, enabling a lower capital outturn cost that is most cost-efficient to consumers.

Figure 1: D&C ITC vs traditional D&C contract model

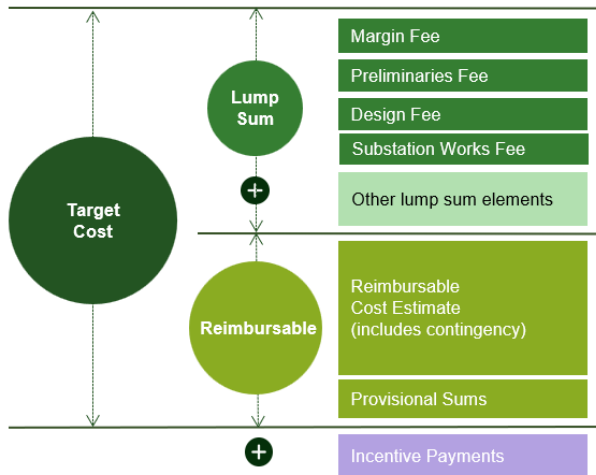


The addition of incentive payments in the commercial model results in an efficient and prudent contract price that aligns with the interests of consumers, as the Delivery Partners are incentivised to maximise collaboration and certainty through:

- cost incentives through a gain-share/pain-share mechanism whereby the Delivery Partner and Transgrid share the gain of total costs being lower (gainshare) or the risk of higher costs (painshare) than the total target cost, with the Delivery Partner painshare risk exposure capped at its margin fee (11% of the contract value);
- program incentives for the delivery of the project in the shortest possible duration, and by the AEMO target completion date of July 2026 (for main power); and
- incentive payments and abatements for the delivery of the Project in a high-quality manner, and achieving KPIs in safety, community engagement and legacy, and by exhibiting transparent and collaborative behaviours.

The D&C ITC contract payment model is illustrated in Figure 2.

Figure 2 D&C ITC contract payment model



The D&C ITC contract model selection responds to the heated market challenges where contractors are seeking alternatives to traditional contract models and risk profiles and is current market practice. Recent examples of major projects being delivered under a D&C ITC contract model include Western Harbour Tunnel, North East Link Program, (subcontract to PPP), Warringah Freeway Upgrade, Sydney Metro City & Southwest Line-wide Works, Central Station, West Eastern Tunnelling Package.

3.1.3. HumeLink Other Construction costs contingency requirements

The Other Construction costs contingency requirements for the residual risks not able to be efficiently transferred, avoided, or mitigated for the Project are categorised as illustrated in Figure 3.

Figure 3: Risk contingency categories



Inherent

This risk contingency is required for owner's inherent risks where there is cost uncertainty due to the information available at this stage of the Project. Transgrid has developed cost forecasts for each of the cost items in this category and there remains variability and uncertainty in the estimate which cannot be finalised until a later Project stage. For instance, procurement of conductors and reactors is not yet finalised and there remains variability in this final cost until design and final orders can be completed during the delivery phase.

Time

The owner's prolongation risk contingency is for the overall schedule delay component of a composite set of risks related to the Project. The risk contingency is for items such as planning approval delays, secondary approval delays, and construction delays which result in additional duration of owner's costs for labour resources and corporate overheads.

Variation

The allocation of risk under the D&C ITC contract model follows a typical D&C contract model where risk is allocated based on which party is best placed to bear and manage that risk and has the potential to lower the total outturn costs borne by consumers. The risk allocation is also reflective of current contractor market acceptance as determined during the market sounding conducted prior to the Early Contractor Involvement (ECI) stage of the Project.

The 'owner's allocated risk contingency' is required for those items allocated to Transgrid under each Delivery Partner contract, as set out in Figure 4. The HumeLink contract risk profile is considered broadly in line with, and in several respects are better than, market practice [DOC ID0.3].

Figure 4 Risks allocated to Transgrid

Key Risk	Adjustment to Target Cost*	Extension of Time	Key Risk	Adjustment to Target Cost	Extension of Time
Employer's acts of prevention (eg, failure to approve Hold Point, delaying tests)	✓	✓	Failure to provide Employer Supplied Materials	✓	✓
Site access delays / landholder acts of prevention	✓	✓	Variations	✓	✓
Planning / EIS approval delays	✓	✓	Cancellation of Track Possessions	✓	✓
Native Title	✓	✓	Artefacts / Aboriginal Cultural Heritage	✓	✓
Unforeseeable utilities	✓	✓	Force Majeure (other than natural catastrophes or bushfires)	✓	✓
Changes in Law	✓	✓	Failure to provide a required Transgrid Outage	✓	✓
Inclement weather > X days	✓	✓	Landholder Works exceed baseline	✓	✗
Interface Contractor acts of prevention**	✓	✓			

Reimbursable

This element of the risk contingency is required for the shared risks Transgrid retains under the D&C ITC contract which fall under the reimbursable component of the payment model (see Figure 2). These include costs for scope which are less certain relating to all transmission lines works. The scope for activities under these works is not fully defined due to the geographical span of the works, terrain and level of investigation possible at this stage of the Project. The risk contingency is required for variations to tower foundations, access track costs, productivity decreases in tower stringing, changes to labour rates due to inflation.

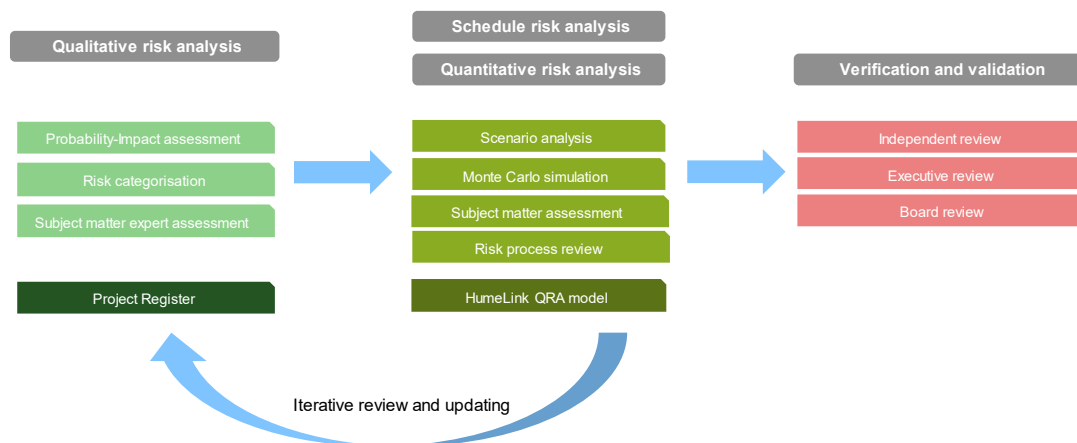
Delivery Partners are incentivised via the painshare gainshare regime to drive contractor and subcontractor performance of the reimbursable cost elements within the target cost allowance to avoid paying in the overrun for these costs which would unnecessarily increase capex and reduce the margin fee they earn for the project.

3.2. Approach and methodology to developing owners' risk contingency

The infrastructure industry over the past decade has matured in its approach to contingency estimating. It is now standard practice for organisations managing major projects to implement an integrated approach when calculating project contingency. We have adopted an integrated probabilistic approach to risk allocation and modelling, including inherent, contingent and schedule risk assessment. This is an industry-accepted approach.

An overview of the risk process we have adopted is illustrated in Figure 5.

Figure 5: Risk process overview



Risk Identification and qualitative assessment

Risks have been identified and qualified through a series of risk workshops attended by internal and independent subject matter experts (SMEs) and risk specialists from different disciplines as detailed in Appendix C.

For each risk identified, a qualitative assessment has been undertaken within the workshops to determine the risk's potential causes, consequences, scenarios, mitigation measures, controls and rating using the predefined scales to assess probability and impact of risk included in Appendix B. As part of the risk management process, each risk has been assigned a 'risk owner' who are SME for the identified risk related to the project including environment, land, stakeholder, commercial, planning and construction, transaction and procurement. For each risk that was identified, a qualitative assessment was performed to determine and assess:

- potential causes
- consequences scenarios
- controls
- treatments, and
- residual risk rating.

This risk register is stored in a CAMMS database and regularly updated as new risks are identified and existing risks treated or closed.

We have also examined the contracts in detail and identified further risks that impact cost or schedule. As part of the risk management process, each risk has been assigned a 'risk owner' and are responsible for developing and maintaining a risk treatment plan for each risk.

The method we have used to quantify risk extends the approach indicated in the AER Guidance Note: Regulation of actionable ISP projects March 2021, and ultimately provides an estimate of project contingency.

The model generated provides a risk-adjusted estimate that quantitatively accounts for the realistic effect of Project risks generally described by three-point estimates of the impacts and the probability of occurrence.

An iterative process has been undertaken in assessing each risk to maintain integrity and accuracy ensuring:

- No overlap or duplication of risk contingency; and
- Potential overstatement of cost risk impacts.

The model data has been regularly reviewed and updated with the involvement of the risk owners and specialists as better cost information is generated including pricing submitted by the Delivery Partners to ensure accuracy of pricing the likely impacts.

Risk modelling

We have utilised the project risk register and extracted the risks that significantly impact cost or schedule as part of developing an assessment of the required project contingency.

Each risk has been quantified individually by risk owners and specialists. This has focussed on assessing the likelihood of the risk as well as the expected cost impact based on experience from similar projects, SME experience, independent estimates, supplier, contract, design and program information.

In most cases, the impacts of each risk are not a single cost or schedule impact, but a range of possible impacts. In most cases the possible impact range can be assessed to have;

- (1) best case outcome;
- (2) worst case outcome;
- (3) most likely outcome.

For each risk, the best case, worst case and most likely case has been developed with supporting evidence. This process is often referred to as a “three-point estimate” of the impact and is an accepted, robust industry method. However, not every impact can be described using 3 points. In some cases, only a best case and a worst case can be determined, and there is no concentration around a most likely outcome. This becomes a two-point estimate. Other representations of impact are also possible.

The representation of the range of probable impacts is described in the risk models as a probability distribution. A probability distribution represents the likelihood that an indefinite quantity will take on any value within the range of values that can arise. The simplest way to describe a three-point estimate is to use a triangular distribution, however, this means that the best case and worst case are the absolute extremes, i.e. there is no possibility outside this range. Based on advice from Broadleaf Capital and as reviewed by E3 consultancy, a better distribution to use is a ‘Trigen’ distribution. The Trigen distribution considers the best and worst cases as a 1 in 10 type of outcome, i.e. if we performed the project many times 1 in 10 would have an outcome as good as the best case and 1 in 10 would have an outcome as bad as the worst case. We have adopted Trigen distribution for the three-point estimates to remove distortion of distribution driven by extreme events (absolute best and worst cases). This meant that during the workshops and discussions to derive the uncertainty data for each risk, we asked SME’s to consider a 1 in 10 plausible best case and 1 in 10 plausible worst case. The result is the inputs match the modelling.

In one case there was no concentration of outcomes around a most likely value. The range was simply between a best case and a worst case. For this risk a ‘uniform’ distribution was used as it was a better representation of the input information. A uniform distribution means that the outcome is equally as likely anywhere between the best and worst cases.

Where the risk is associated with an uncertain event, we have analysed the risks and determined their range of impacts and the probability that these impacts will occur. In contrast, where the risk is associated with the uncertainty of the cost item estimated or the duration of an activity in the schedule, i.e. not arising due to an “event”, this risk is referred to as an inherent risk. The inherent uncertainty of the cost or schedule item usually has a most likely outcome as the estimated value or planned duration but may be both better and worse. Again, where appropriate we have considered this inherent uncertainty in the items costed or activity durations estimated.

The primary method we have used to combine this information is a Monte Carlo probability analysis. For this purpose, we have developed a cumulative cost risk model, 'HumeLink QRA Register', for the Project with assistance of E3 Advisory, Fission and Broadleaf Capital. This includes:

- a qualitative analysis of each risk and inherent uncertainty
- a quantified cost risk analysis of both inherent cost uncertainty sourced from our owner estimator (Fission) and SMEs, and contingent risks sourced from our risk register; and
- an assessment of the schedule delay risk, based on the schedule risk analysis developed by independent experts TBH.

For cross checking, we have also used a separate method of contingency analysis developed based on an empirical database of many projects and their outcomes in the power transmission sector. This model is known as the Hollmann model.

The Hollman model determines where in the database the project falls based on the answers to a detailed questionnaire. It also considers the top risks and uses a similar Monte Carlo analysis to ensure that larger risks specific to the project being analysed are not ignored. The Hollmann analysis outcome is considered more valuable when the project definition and associated risk identification is still in its infancy. Hollmann model was used during the early phase of HumeLink for the purpose of RIT-T PACR estimates.

The Hollmann modelling helps inform the appropriate level of contingency and has been used in the PADR stage of the Project where the design was conceptual. It consists of two parts. The first part considers the 'systemic' risk and the second part, the more conventional contingent risk. The contingent risk component considers the top 25 risks, assessing their range of consequences and their likelihood. The systemic risk uses a database of projects and a questionnaire that places the current project in its database with empirical values of cost and schedule uncertainty. At the PADR and subsequent PACR stages the Hollmann model was very applicable. The systemic risk component far outweighed the contingent risk component.

In the current stage of the Project where the final route and design is further defined, the 'systemic' risk component is reduced significantly and the advantages of the Hollmann model over the more conventional approach reduced. As such, the Hollmann model was used as a check of the output of the more detailed models.

Monte Carlo simulation enables generation of outcomes that show the overall effect of uncertainty on the cost estimate in the form of distributions. It can also show the individual sources of uncertainty the contribute most to the overall uncertainty. We have selected 10,000 iterations in the simulation of the project's contingency to provide a plausible outcome of risk outcomes.

A probability distribution represents the likelihood that an indefinite quantity will take on any value within the range of values that can arise. We have adopted Trigen distribution to remove distortion of distribution driven by extreme events (absolute best and worst cases). The data was developed for each risk item by considering a plausible best and worst cases, (P90 and P10 equivalents).

The Monte Carlo analysis also considers risks that are likely to occur together and other risks that are unlikely to occur together. Our model considers correlations for risks that have the same drivers of uncertainty. These include contractor performance as a driver and costs dependent on contractor

performance have been loosely correlated. The Monte Carlo analysis software used for both the cost and schedule analysis takes these dependencies into account by correlating the risks appropriately.

The result is a more realistic prediction of how the complete portfolio of risks may eventuate.

The schedule risk analysis outcomes have been used to detail the time dependent costs such as the Owner's labour costs and included in the cost risk analysis.

The Monte Carlo analysis uses a model that depicts each risk and the range of plausible impacts. The analysis starts with the software randomly selecting a value from each of the risk ranges in accordance with the three-point, two point or other distribution used to represent the risk. These values are totalled. The software then repeats the selection and summation process. This selection and summation process is repeated many times (the cost model uses 10,000 iterations). The sum from each iteration produces an output distribution of the likely schedule or cost outcomes as though the project itself was conducted many times.

The Monte Carlo analysis considers in each iteration the painshare/gainshare regime under the ITC contract model through a formula applied to the reimbursable risks to ensure that Transgrid is accounting for only its portion of the risk under the painshare/gainshare regime and not the full amount which is partially covered by the Delivery Partner.

The outcome of the Monte Carlo analysis is a range of likely cost and schedule outcomes for the project. The range can be examined to determine the central value where there is both a 50% chance it will be exceeded and a 50% chance it will not be exceeded, sometimes referred to as the P50. The value that represents a good outcome where 1 in 10 times the project may achieve this value or better, can be determined; often referred to as the P10. At the other extreme, where things have tended towards a worst-case outcome, we can determine a value where 90% of the time the outcome will be better, but 10% of the time it may be worse. 9 out of 10 times the project outcomes should be better than this number. It is often referred to as the P90.

We can also determine other values with different probabilities. The 'P' Value chosen is determined by the organisation's risk appetite. It is common for organisations to use P90 risk contingency as it provides its shareholders the greatest confidence. This practice is in line with industry good practice and guidelines.

We have continually reviewed and updated the data used in our modelling to ensure it reflects the latest and best available information including the outcomes D&C ITC contract packages for the east and west.

As a result of this analysis, we have identified risk costs that are:

- required to deliver HumeLink on time and within budget – these risk costs form part of the overall cost of the project, and
- reflect the probability-weighted calculation of 'expected costs'

We have grouped our Other Construction costs into the following three categories:

- reimbursable risk costs – these relate to the reimbursable component of the D&C contract whereby we are required to adjust the contractor’s payment against the target cost based on the incentive arrangements that apply under the contract
- variation risk costs – these relate to scope changes that may emerge during the delivery phase. These costs are not related to the reimbursable component of the project and are wholly our risk costs
- time (delay) risk costs – these relate to timing delays that may emerge during the delivery phase because of planning or secondary approval delays and construction delays, which result in additional labour resources and corporate overhead costs. These costs are not related to contractor and are wholly our risk costs.

4. Quantification of top 25 Other Construction costs

This section explains how we have quantified the cost of our top 25 Other Construction costs including the inputs and assumptions that we have relied on, our proposed mitigants and why these are reasonable.

4.1. Risk ID #2 – EIS delay

Description of the risk

This risk relates to delay and cost claims from the Delivery Partner due to a Transgrid delay in receiving statutory planning approval. The Delivery Partner is entitled to cost and time relief under the contract where there is a failure of Transgrid to obtain an EIS approval by July 2024, and is delayed in issuing Notice to Proceed 2 under the contract.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED], determined based on:

- Benchmarking of likely delay based on two recent and relevant major project delays with consideration of the current progress of the EIS and the relative complexity of the HumeLink project; and
- valuation of Delivery Partner delay rates under each contract.

The schedule risk analysis output and SME assessment of the planning approval program has indicated a 90% likelihood of this risk occurring. A most likely EIS approval delay is 4 months with a 10% chance of exceeding an 8-month delay. This is in consideration of:

- Project Energy Connect project, which experienced a 4.5-month delay to EIS approval;
- Snowy Hydro 2.0 project, which experienced a 12-month delay to EIS approval;
- SME review that HumeLink project is very large, very complex and covers more country that is sensitive to environmental issues and expected to attract a large number of submissions requiring responses; (DOC ID02.5);
- The information required to support the EIS such as studies and reports at the time of EIS submission may be insufficient;
- DPE is currently experiencing understaffing issues with the influx of energy projects; and
- The high profile and contentious nature of the HumeLink project means the Minister for Planning will have a low-risk appetite in determining the project and the level of rigour of assessment will need to be exceptionally high; and
- There being no precedent for a project like HumeLink to be assessed under the modern planning system.

The total Delivery Partner delay rate has been estimated as [REDACTED] per day which includes:

- Delivery Partner East estimated daily delay rate of [REDACTED] for preliminaries, design fee and margin (refer DOC ID02.1); and
- Delivery Partner West estimated daily delay rate [REDACTED] for preliminaries, design fee and margin (refer DOC ID02.3).

The Delivery Partner delay rates exclude escalation contingency allowance which is assessed separately Risk ID #68.

There is an owners' cost contingency allowance associated with this risk which is assessed separately and on a holistic basis with other relevant risks to ensure no overlap of contingency allowances.

The risk of EIS delay cannot be efficiently mitigated, transferred or avoided

EIS delay is a risk that is associated with the actions or requirements of a third party that are not able to be governed by contractual arrangements, ie, the risk is not able to be addressed through enforcing contract terms. Consistent with the AER's guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.⁴

Although this risk cannot be efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of EIS approval delay. These strategies, which have informed our estimate of the risk cost set out above, include:

- Ongoing consultation with relevant government departments;
- Resolution of any identified issues prior to publication of final EIS or via the amendment report;
- Offering assistance to the DPE for resource sponsorship through a memorandum of understanding;
- Developing mitigation measures to mitigate potential serious and irreversible impacts in response to feedback from DPE.

The risk of EIS delay is not covered by a cost pass through event

Consistent with the AER's expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of EIS delay is not covered by a cost pass through event in our current revenue determination.

4.2. Risk ID #49 – Other Construction costs

Description of the risk

This risk relates to the increase of owner's costs due to an extension in the Project's duration. It considers a composite set of risks that would extend a project duration including planning approval delays, secondary approval delays, and other Project delays arising from access constraints, equipment, and materials delivery challenges, and unobtained planned outages. These delays would result in additional expenses incurred for owner resources and overheads.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED], determined based on:

- Valuation of Transgrid's monthly owner's costs based on an average of owner's cost over a 12-month construction period; and
- CCI Index used to escalate client costs at 5% per year.

⁴ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

The schedule risk analysis output has been used to determine the likely prolongation of the project. A 100% likelihood of this risk occurring has been used to reflect the schedule risk analysis output. A most likely delay is 8.3-months, with a 10% chance of exceeding 11-months. This is in consideration of:

- Project Energy Connect project, which experienced a 4.5-month delay.
- Snowy Hydro 2.0 project, which experienced a 12-month delay.

The owner's cost has been estimated as [REDACTED]/month which includes:

- Estimated monthly Resource Burn-rate based on average for FY26 of [REDACTED].
- Estimated monthly Insurance costs of [REDACTED].
- Estimated monthly Legal advice costs of [REDACTED].
- Estimated monthly Software Costs of [REDACTED].
- Estimated monthly Disputes and Commercial Advisory costs of [REDACTED].
- Estimated monthly Support and Indirect costs of [REDACTED].

The risk of additional Owner's costs cannot be efficiently fully mitigated, transferred or avoided

Owner's cost is a risk that is associated several contributing factors however mainly with the actions or requirements of a third party such as the EIS approval that are not able to be governed by contractual arrangements, i.e., the risk is not able to be addressed through enforcing contract terms. Consistent with the AER's guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.⁵

Although this risk cannot be efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of additional Owner's costs. These strategies, which have informed our estimate of the risk cost set out above, include:

- Implementing effective management of client costs within the allocated budgeted allowance.
- Implementing early warning mechanisms to proactively address issues that may lead to delays.
- Effective risk management of all delay risk events under the contract.

The risk of additional Owner's costs is not covered by a cost pass through event

Consistent with the AER's expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of additional Owner's costs is not covered by a cost pass through event in our current revenue determination.

⁵ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

4.3. Risk ID #68 – Delay Escalation

Description of the risk

This risk relates to Delivery Partner repricing arising from a Transgrid driven delay to Notice to Proceed 2 (NTP2). The Delivery Partner is entitled to a cost and time relief under the contract where Transgrid is delayed in issuing NTP-2 under the contract.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED], determined based on valuation of escalation rates for each Delivery Partner under their respective contract.

The schedule risk analysis output has indicated 90% likelihood of this risk occurring. A most likely NTP-2 delay is 3.5 months with a 10% chance of exceeding 8.4 months. This is based on:

- Snowy Hydro 2.0 project, which experienced a 12-month connection planning approval delay, as per Risk ID #2; and
- Delivery Partner submissions indicating limited subcontractor availability and the expiration of subcontractor tender validity periods;

The total Delivery Partner delay rate has been estimated as [REDACTED] per day which includes:

- Delivery Partner East daily rate of [REDACTED] for escalation (refer DOC ID02.1);
- Delivery Partner West daily rate of [REDACTED] for escalation (refer DOC ID02.3).

The risk of delay escalation cannot be fully mitigated, transferred or avoided

Delay escalation is a Transgrid risk under the contract, i.e., the risk is not able to be transferred to the Delivery partner and relates to events that are outside Transgrid's control such as changes in market conditions and actions of a third party in relation to the approval of the EIS. Consistent with the AER's guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.⁶

Although this risk cannot be fully efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of delay escalation. These strategies, which have informed our estimate of the risk cost set out above, include:

- Mitigations in place for each individual Project delay risk;
- Schedule of rates and escalation allowances included within the contract to benchmark variations against.
- Responsibility for managing and mitigating the key delay risks for the Project.

The risk of delay escalation is not covered by a cost pass through event

Consistent with the AER's expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of delay escalation is not covered by a cost pass through event in our current revenue determination.

⁶ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

4.4. Risk ID #13 – Inclement Weather

Description of the risk

This risk relates to delays due to a Delivery Partner exceeding the inclement weather allowance under the contract. Inclement weather events and the specific thresholds of inclement weather events are defined under the contract and include high temperatures, precipitation (rain, snow, or sleet), wind gusts, lightning and fog/dust storms. There is an allowance of 66 days (East) and 40 days (West) per zone for inclement weather and nominated thresholds for inclement weather events (wind, heat, precipitation) included in the Contractors programme and delivery Contract. Where this allowance is exceeded, the Contractor is entitled to a target cost adjustment and an EOT for a critical path delay.

Inclement Weather Event	Threshold / Definition	Allowance / Event	Activities Impacted	BOM Data Sources
Temperature	>37.5°C	0.5 day	- All transmission line and substation activities	- 2003 – 2022 - Daily maximum temperatures
Precipitation (rain, snow or sleet)	>5mm and <25mm / >10mm and <25mm	1 day	- Rain >5mm: tower assembly, erection and stringing - Rain >10mm: all transmission line and substation activities (other than site establishment clearance)	- 2003 – 2022 - Cumulative daily total
	>25mm	2 days	- Rain > 25mm: all transmission line and substation activities	
Wind Gust	> 37.4km/h (measured in 2-hour interval)	0.2 day*	- Tower assembly, erection and stringing, piling, and lifting operations	- 2003 – 2022 - Daily measurements at 30-minute intervals from 6.30am – 6pm - Concurrent rain events excluded (rain >5mm)
Lightning	Within 40km of Contractor's Activities / tower stringing (daylight hours in 2-hour interval)	0.2 day*	- Tower assembly, erection and stringing, piling, and lifting operations	- Annual lightning flash density (1995 – 2012) - 4 days allowance / year
Fog / Dust Storm	Restricts visibility to less than 100m (daylight hours in 2-hour interval)	0.2 day*	- Tower assembly, erection and stringing, and earthworks	Not Available

This is considered a prudent and efficient approach to managing the effects of inclement weather on a construction project as the allowance is based on what is expected in a typical year. The capex contingency allowance is to manage the risk of a non-typical year such as a La Nina or El Nino weather event and to cover actual costs rather than a contractor making an overly conservative allowance within the target cost to cover all possible outcomes they may be exposed to during construction.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED], determined based on:

- Historical weather analysis of best, most likely and worst-case delay scenarios based on inclement weather analysis undertaken by Transgrid and Delivery Partners (DOC ID13.1 & ID13.2); and
- Valuation of Delivery Partner escalation rates under each contract.

The inclement weather analysis output has indicated likelihood of 50% of the risk occurring as it is based on a typical year of weather, there is a 50% chance it could be better or worse. A most likely inclement weather delay is 23 days with a 10% chance of exceeding 55 days. This is based on inclement weather analysis undertaken by Transgrid and Delivery Partners.

The total Delivery Partner delay rate has been estimated as [REDACTED] per day which includes:

- Full delay preliminary cost - [REDACTED]/day
- Labour cost - [REDACTED]/day
- Plant costs - [REDACTED]/day
- Contractor margin of [REDACTED]

The risk of inclement weather cannot be fully mitigated, transferred or avoided

The impact of inclement weather on construction activities is a shared risk under the contract, ie, the risk is not able to be fully transferred to the Delivery Partner and relates to events that are outside Transgrid's control such as extended wet weather. Consistent with the AER's guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.⁷

Although this risk cannot be fully efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of increase in reimbursable plant and equipment costs. These strategies, which have informed our estimate of the risk cost set out above, include:

- Delivery partners to have wet weather management plans and contingency work fronts;
- Delivery partners are required to mitigate and re-sequence the works where possible and safe to do so;
- Plan works in high-risk areas outside of peak weather months for snow and wind, and;
- Transgrid to ensure Delivery partners meet their obligation to mitigate delays through strict site supervision and planning.

The risk of inclement weather is not covered by a cost pass through event

Consistent with the AER's expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of inclement weather is not covered by a cost pass through event in our current revenue determination.

4.5. Risk ID #65 – Tower Foundations

Description of the risk

This risk relates to the increase of costs associated with tower foundations because of geotechnical conditions, following investigation, being substantially different from the expected conditions. The Delivery Partner is entitled to a cost relief under the contract, where a tower identified in the Tower Foundation Schedule is solely affected by actual geotechnical conditions and requires a different foundation type and/or characteristics than the issued for construction design.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED], determined based on Delivery Partner tower foundation pricing and Tower Foundation schedules.

⁷ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

The SME assessment of the Delivery Partner baseline assumptions, geotechnical reports and tower foundation schedule has indicated a most likely tower foundation cost increase of [REDACTED]. This is based on:

- SME review of Delivery Partner baseline assumptions compared to geotechnical reports; and
- SME review of the Tower Foundation Schedule (DOC ID65.1)
- This risk has been peer reviewed by the Owner's Engineer (BECA) for the Project (DOC ID0.1).

As there is a contractual provision for this adjustment event to occur once the Delivery Partners have completed the geotechnical investigation and issued for construction tower foundation designs, a 100% likelihood has been adopted.

The risk of changes in tower foundations cannot be fully mitigated, transferred or avoided

Changes in tower foundations because of geotechnical investigations is a Transgrid risk under the contract, ie, the risk is not able to be transferred to the Delivery partner and relates to a realistic latent condition with the site. Consistent with the AER's guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.⁸

Although this risk cannot be fully efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of changes to tower foundations. These strategies, which have informed our estimate of the risk cost set out above, include:

- Delivery Partners have been provided with site investigation works undertaken by Transgrid during ECI period to inform baseline approach;
- Open book adjustment of tower foundations on an agreed schedule of rates and tower types;
- Adjustment based on demonstrating substantially different geotechnical information and Issued for Construction design; and
- Transgrid to review and approve each adjustment.

The risk of tower foundations is not covered by a cost pass through event

Consistent with the AER's expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of tower foundations is not covered by a cost pass through event in our current revenue determination.

4.6. Risk ID #19 – Variations

Description of the risk

This risk relates to the claims for variations due to the changes in scope in design, construction manuals or Transgrid's requirements. Problems may arise from the misinterpretation and misunderstanding of Transgrid's requirements. Also design information is always being updated and there is an earlier closure to a coal fire power generator which may increase grid stability and operability requirements.

⁸ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED].

The SME assessment of the status of the design and the potential for technical changes between contract award and construction commencement has indicated a most likely scenario of 2 weeks additional design work and [REDACTED] million work scope with a 10% of it exceeding 1 month with a [REDACTED] million scope. This is in consideration of:

- The design is currently at concept level and 500kV transmission lines have not been built by Transgrid or the Delivery Partners in Australia recently. It is very possible that the principles on which the design is based will change through design development. There are still challenges to overcome in the design including surge arrestors and general network planning requirements that could be enforced on the Project.
- A change in equipment ratings on the Project Energy Connect project resulted in a [REDACTED] variation to comply with the updated requirements. Whilst these lessons from Project Energy Connect have been captured in HumeLink requirements there is still a risk that additional changes in technology or factors outside of the Project scope could change and enforce a change to the Project scope and requirements.

The total Delivery Partner variation cost has been estimated based on additional design work at [REDACTED] per day (design fee adjustment) + cost of additional construction scope valued at [REDACTED] + contractor margin [REDACTED]

- This risk has been peer reviewed by the Owner's Engineer (BECA) for the Project (DOC ID0.1).

The risk of variations cannot be efficiently fully mitigated, transferred or avoided

Variations in the project scope and requirements is a risk that is associated with the actions or changes in the requirements of a third party such as the broader electricity network and impacts of projects outside of the Project that are not able to be governed by contractual arrangements, ie, the risk is not able to be addressed through enforcing contract terms. Consistent with the AER's guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.⁹

Although this risk cannot be efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of variations in scope and requirements. These strategies, which have informed our estimate of the risk cost set out above, include:

- Implementing a change control process for all scope and requirement changes that are to be approved by the Project director.
- Ensure technical team is well trained in the contract and understand the impact of changes including understanding the Delivery Partners design obligations and warranties over Transgrid's requirements prior to raising a change that could entitle a variation.
- Transgrid to continue to consult with asset management throughout the project to ensure a smooth handover and all requirements are captured during the design phase of the project.

⁹ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

The risk of variations is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of variations is not covered by a cost pass through event in our current revenue determination.

4.7. Risk ID #74 – Uncertainty of Biodiversity Offset Costs

Description of the risk

This risk relates to the uncertainty of the final cost for the Biodiversity offsets. The latest Biodiversity Offset Delivery Strategy (BODS) depends on utilising offset sites to decrease the costs, however a number of these sites may not be obtainable. Furthermore, desktop studies were required for a significant portion of the centreline as many landowners wouldn’t provide consent to enter thus the costs will change from our estimates as more rigorous surveys are completed when consent to enter has been provided.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is ██████████, determined based on Niche’s evaluation of best case and worst-case scenarios.

The schedule risk analysis output has indicated that the estimate is most likely correct ██████ with a 10% chance of exceeding ██████ above the estimate. This is based on:

- Niche’s Biodiversity Offset Delivery Strategy (BODS)

The risk of biodiversity offset cost uncertainty cannot be efficiently mitigated, transferred or avoided

The uncertainty of biodiversity offset costs is a risk that is associated with the actions or requirements of a third party that are not able to be governed by contractual arrangements, ie, the risk is not able to be addressed through enforcing contract terms. Consistent with the AER’s guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.¹⁰

The risk of an increase in biodiversity offset cost is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of an increase of biodiversity offset costs is not covered by a cost pass through event in our current revenue determination.

¹⁰ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

4.8. Risk ID #5 – Site Access

Description of the risk

The risk related to delays in providing adequate site access to a Delivery Partner resulting in time and cost claims. A delay to providing site access could be caused by delays obtaining property agreements under due process. Transgrid is obligated to provide each Delivery Partner with onsite access within the times specified in the Site Access Schedule, under each respective contract, and always after those dates. The Delivery Partner is entitled to a target cost adjustment and an extension of time for relocation, rescheduling or resequencing of activities to avoid any delay or disruption, if a critical path delay is demonstrated.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED].

The assessment of this risk was based on the current progress in obtaining agreements with landholders and in consideration of level of community resistance to the Project, as follows:

- 348 landowners are assessed as impacted by the Project including 50 brake and winch sites.
- As at June 2023, 39 landowners have signed agreements with another 77 agreements agreed in principle.
- A further 154 agreements are required to be executed prior to the commencement of construction.
- It is estimated that 86 landholders are unlikely to agree to compensation as shown in red along the alignment on the community sentiment maps (DOC ID5.1 and ID5.2) These properties may require compulsory acquisition process to commence to reach an agreement with a current forecast of 11 landholdings requiring compulsory acquisition.

HumeLink and Project Energy Connect SME review of these factors has indicated a likelihood of 70% of this risk occurring with a most likely site access delay is of 1 week. This period includes for Delivery Partner demobilisation and remobilisation of plant and equipment (3 days) and time for Transgrid to resolve issues with a landholder (4 days) with 10 instances (approx. 3% of landholders) occurring across the Project. This is in consideration of:

- Private landowners refusing to give access due to inclement weather;
- Delays to access due to cropping and livestock activities;
- Refusal for access from private landowners after compulsory acquisition;
- External biohazard issues; and
- Transgrid current experience of site access issues with landholders to complete track upgrades as seen on the 330kV YG29 transmission line near Yass.

The total Delivery Partner delay rate has been estimated as [REDACTED] per day which includes cost for:

- demobilisation and remobilisation;
- relocation of crane;
- contractors personnel;
- temporary works;
- brake and winch site relocation; and
- cable drums movement.

The risk of site access cannot be fully mitigated, transferred or avoided

Site Access is a Transgrid risk under the contract, ie, the risk is not able to be transferred to the Delivery partner and relates to events that are outside Transgrid’s control due to actions of a third party such as landholders. Consistent with the AER’s guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.¹¹

Although this risk cannot be fully efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of site access. These strategies, which have informed our estimate of the risk cost set out above, include:

- Ongoing community stakeholder engagement regarding notification and coordination of upcoming works and impacts to properties with landowners.
- Property specific property management plans have been developed for each landholding and are attached to the option deeds for each landholder.
- Rights for access under the Electricity Act could be used although not typically exercised by Transgrid.
- Develop community response plans for these types of instances and conduct lessons learnt.
- Contractors have the obligation to mitigate delay and resequencing under the contract and are required to plan for these occurrences.

The risk of site access is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of site access is not covered by a cost pass through event in our current revenue determination.

4.9. Risk ID #47 – Productivity

Description of the risk

This risk relates to lower productivity levels than planned and increased rework required in tower foundations and stringing for the Project. The Project is within a specialised sector where the current workforce is less experienced and amid skills shortage with many competing projects. The Project terrain is quite challenging for stringing activities as the alignment is not fully cleared between transmission towers requiring the use of specialised construction methods such as using drones to complete stringing over areas that do not have ground access due to dense vegetation.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED], determined based on SME Assessment of Delivery Partner productivities against benchmark productivities achieved on other Transgrid projects.

¹¹ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

The SME assessment has indicated a most likely prolongation of 3 months with a 10% likelihood to exceed a 6-month prolongation. This in consideration of:

- The workforce being less experienced with this type of construction and not familiar with the Australian and local conditions;
- Irregularity of 500kV line construction;
- Specialised and new construction methods such as drone stringing;
- High churn of resources due to competing projects; and
- Benchmark productivity rates.

The total additional Delivery Partner reimbursable costs are estimated at [REDACTED] per day. This is based on stringing crew rates of [REDACTED] per day per Delivery Partner.

The risk of productivity less than planned cannot be fully mitigated, transferred or avoided

Productivity of the Delivery Partner in completing the transmission line works is a shared reimbursable risk under the contract, ie, the risk is not able to be fully transferred to the Delivery Partner and relates to events that are outside Transgrids control such as changes in labour market conditions and competing projects. Consistent with the AER’s guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.¹²

Although this risk cannot be fully efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of productivity being less than planned. These strategies, which have informed our estimate of the risk cost set out above, include:

- Thorough review of programme, resourcing, and productivity rates during ECI stage to determine achievable productivities allowed in tender.
- Contract incentives reward improvements in productivity
- Benchmarking bids.
- Mix experienced and less experience site teams to ensure knowledge transfer and upskilling.
- Emphasis on QA system to minimise rework.
- Root cause analysis of why this might occur and ensure addressed in the contract and estimate.

The risk of productivity less than planned is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of productivity less than planned is not covered by a cost pass through event in our current revenue determination.

¹² AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

4.10. Risk ID #33 – Interface Contractor risk

Description of the risk

This risk relates to the lack of coordination between the Delivery Partners and interfacing contractors (OEM Contractor, Project Energy Connect Contractor) and existing Transgrid assets which result in design and construction delays, scope and responsibility gaps, and additional costs. The Delivery Partner is entitled to a cost and time relief under the contract if Transgrid instructs the addition or omission of any of the works and/or activities if there is a critical path delay. If an interfacing contractor Act of Prevention causes the Delivery Partner to be delayed in executing the works, the Delivery Partner is entitled to a cost and time relief where a critical delay is demonstrated.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED] determined based on valuation of Delivery Partner delay rates under each contract.

Interface, design, construction, and commissioning SMEs have indicated a most likely delay of 4 months with a 10% chance of a 6-month delay. This is based on:

- The current level of detailed design and interface documentation between East and West delivery partners and OEM contractor;
- Project Energy Connect being delayed by 1.5 years potentially resulting in interface occurring simultaneously at Wagga Wagga substation;
- Disturbed commissioning and construction sequence; and
- Construction on Humelink sections at Wagga are unable to commence without Project Energy Connect Issued for construction designs.

The total Delivery Partner delay rate has been estimated at [REDACTED] per day for substation crew stand down costs by the Owners Engineer Fission (DOC ID0.4)

- This risk has been peer reviewed by the Owner's Engineer (BECA) for the Project (DOC ID0.1).

The risk of interface contractors cannot be fully mitigated, transferred or avoided

The risk of interface contractors is a Transgrid risk under the contract, ie, the risk is not able to be transferred to the Delivery partner and relates to events that are outside Transgrid's control due to actions of a third party such as interface contractors. Consistent with the AER's guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.¹³

¹³ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

Although this risk cannot be fully efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of interface contractors. These strategies, which have informed our estimate of the risk cost set out above, include:

- Interface working groups to be established and a sharing of information between Delivery Partners, including programme to seek alignment and agreement; and
- Milestone dates included in Delivery Partner contracts for interface works with damages payable for failure to meet the dates.

The risk of interface contractors is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of interface contractors is not covered by a cost pass through event in our current revenue determination.

4.11. Risk ID #42 – Increase in reimbursable plant and equipment costs

Description of the risk

The risk relates to the reimbursement of additional plant and equipment hire and purchase cost which are required for the transmission line works. Plant and equipment costs include cranes, excavators, trucks. Variations to estimate costs for these are part of the reimbursable works and are likely to delivered under the control of the Delivery Partner as a part of our painshare-gainshare scheme.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED], determined based on:

- A total estimate of reimbursable plant of [REDACTED] million in the target cost [REDACTED] for east and [REDACTED] for west); and
- Independent expert assessment from Fission indicating there is a most likely outcome of a 7% increase on the reimbursable plant at 3% p.a. and a worst-case outcome of a 10% increase;
- This equates to 7% of [REDACTED] (plant and equipment costs) being [REDACTED] and 10% or [REDACTED] being [REDACTED].

The risk of increase in reimbursable plant and equipment costs cannot be fully mitigated, transferred or avoided

Reimbursable plant and equipment are a shared risk under the contract, ie, the risk is not able to be fully transferred to the Delivery Partner and relates to events that are outside Transgrid’s control such as changes in market conditions. Consistent with the AER’s guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.¹⁴

¹⁴ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

Although this risk cannot be fully efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of increase in reimbursable plant and equipment costs. These strategies, which have informed our estimate of the risk cost set out above, include:

- ensuring the Delivery Partner locks in agreements with suppliers for pricing, reducing the effect of market trends and unpredictable increases.
- full transparency over the costs incurred by the Delivery Partner and payment claims to be submitted on an open book basis.
- inclusion of pre agreed rates in the contract for plant and equipment.
- the cost element forms part of the pain share gain share regime creating an incentive for Delivery Partner to reduce costs through negotiation of better rates or being more efficient during delivery to minimise hire costs.

The risk of increase in reimbursable plant and equipment is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of reimbursable plant and equipment is not covered by a cost pass through event in our current revenue determination.

4.12. Risk ID #56 – Conductor Delays

Description of the risk

The risk relates to the delay of Transgrid’s supplied conductors and OPGW due to overseas manufacturing and shipping timeframes. This is due to the possibility of a delay in finalising the design, procurement, and delivery of Transgrid supplied equipment. Shipping costs and availability may be of concern as there are less suitable ships available for transportation due to large volume of materials being ordered.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED] determined based on Transgrid’s experience of shipping and production delays on numerous projects, with goods that are manufactured and shipped internationally.

The Transgrid Senior Equipment Engineers assessment of the situation based on experience in ordering materials and equipment from overseas indicates that there is a most likely outcome of a 2-month delay and a worst case of 3 months.

The total Delivery Partner delay rate has been estimated at [REDACTED] per day for preliminary costs.

The risk of conductor delays cannot be fully mitigated, transferred or avoided

Conductor delay is a risk that is associated with the actions or requirements of a third party that are not able to be governed by contractual arrangements with the TNSP to lock in delivery dates or obtain damages from the supplier large enough to cover the cost impact of delay to the project. Consistent with the AER’s guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.¹⁵

¹⁵ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

Although this risk cannot be fully efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of conductor delays. These strategies, which have informed our estimate of the risk cost set out above, include:

- Transgrid will look to book in manufacturing and shipping slots as early as possible which fit the timeframe and procuring early during the transaction phase to mitigate time risk.
- Early procurement ahead of critical path and provide storage locally.
- A small amount of equipment could be procured locally if required at an increase cost.
- Transgrid procuring directly from supplier with a program wide order to increase priority and quantity.

The risk of conductor delay is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of conductor delay is not covered by a cost pass through event in our current revenue determination.

4.13. Risk ID #35 – Supplier Delays for Reactors and Transformers

Description of the risk

This risk relates to delay to Transgrid supplied reactors and transformers due to delayed overseas manufacturing and shipping timeframes which results in claims of delay from the Delivery Partners and a delay to Transgrid achieving energisation.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED].

The SME assessment of the reactor and transformer procurement program has considered that the most likely cause of a delay to delivery would occur during the shipping and transportation of these units from China and South Korea. The analysis indicated a most likely delay scenarios of a ship reroute of 2 months, with a 10% chance of exceeding a 3-month delay. This is in consideration of:

- The design delay risk is evaluated to be low, attributed to the known supplier and effective testing measures;
- Potential factory issues are anticipated to carry minimal risk. However, the highest and most probable risk stems from shipping-related challenges. This includes the possibility of ships rerouting, particularly through New Zealand;
- Missing a designated shipping window could lead to a substantial one-month delay, as the frequency of shipments from China is limited to once per month; and
- Instances have been noted where transformer deliveries were held up in Japanese customs due to stink bugs, necessitating fumigation before progressing. The estimation of likelihood is grounded in the context of shipping 22 units. These units originate from diverse suppliers in China and South Korea, enhancing supply source diversity.

The total Delivery Partner delay rate has been estimated at [REDACTED] per day. This is based on:

- Full delay preliminary cost - [REDACTED]/day; and
- Contractor margin of [REDACTED]

The risk of reactor and transformer delays cannot be fully mitigated, transferred or avoided

Reactor and transformer delay is a risk that is associated with the actions or requirements of a third party that are not able to be governed by contractual arrangements with the TNSP to lock in delivery dates or obtain damages from the supplier large enough to cover the cost impact of delay to the project. Consistent with the AER’s guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.¹⁶

Although this risk cannot be fully efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of reactor and transformer delays. These strategies, which have informed our estimate of the risk cost set out above, include:

- Develop a specific risk management plan to plan for additional mitigations and actions that can be undertaken if a specific risk occurs such as securing additional transportation options via sea or air.
- Secure early manufacturing and shipping slots.
- Procure ahead of critical path.
- Incorporate contractor design inputs.
- Monitor design progress for timely production.
- Conduct factory visits for on-schedule production and shipping inspection.

The risk of reactor and transformer delay is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of reactor and transformer delay is not covered by a cost pass through event in our current revenue determination.

4.14. Risk ID #37 – Social Licence

Description of the risk

This risk relates to the Project losing community support (social licence), resulting in disruptions to Delivery Partner activities. Disruptions include blockades, protests, legal challenges, and obstruction through councils. Delivery Partners are entitled to a cost and time relief if relocation, rescheduling or resequencing the Delivery Partners’ activities and/or work to avoid any delay or disruption if a critical path delay is demonstrated, under the contract. The Delivery Partner is required to mitigate delay as part of the Extension of Time (EoT) test.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED], determined based on valuation of Delivery Partner delay rates under each contract.

¹⁶ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

The schedule risk analysis output has indicated a most likely delay due to ongoing protests and blockades of 30 days with a 10% likelihood to exceed a 90-day delay due to potential legal challenges or injunctions. This is based on:

- SME analysis of the level cost of community opposition;
- ANU Institute for Infrastructure in Society report indicating projects with a combined value of \$30b has been delayed by at least 12 months or cancelled because of community opposition; and
- HumeLink being subjected to a New South Wales Parliamentary Inquiry into undergrounding as a result of community sentiment against the Project;

The total Delivery Partner delay rate has been estimated at [REDACTED] per day. This is based on:

- Full delay preliminary cost - [REDACTED]/day; and
- Contractor margin of [REDACTED]

The risk of the project losing social licence cannot be fully mitigated, transferred or avoided

Social licence is a Transgrid risk under the contract, ie, the risk is not able to be transferred to the Delivery partner and relates to events that are outside Transgrid’s control due to actions of a third party such as community members. Consistent with the AER’s guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.¹⁷

Although this risk cannot be fully efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of losing social licence. These strategies, which have informed our estimate of the risk cost set out above, include:

- Ongoing community consultation and sharing of information and project updates;
- Dedicated community relationship managers assigned to landholders; and
- continued management of key project stakeholders.

The risk of losing social licence is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of social licence is not covered by a cost pass through event in our current revenue determination.

4.15. Risk ID #59 – Changes to EIS Conditions of Approval

Description of the risk

This risk relates to the EIS approval conditions being uncertain at contract execution impacting on cost estimates. Given potential resistance to the Project, numerous submissions may arise, leading to demanding conditions. Adjustments to the final planning approval conditions are anticipated to be more onerous than the baseline EIS approval conditions included in the contract.

¹⁷ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED].

The risk analysis output and SME assessment of the planning approval program has indicated a most likely additional time for a field work only to advise existing study/report of 1 month, with a 10% chance of a 3-month additional biodiversity study including field work and reports to be prepared. This is in consideration of:

- Historical experience that there was a [REDACTED] claim brought on PEC for West only (entitlement [REDACTED] likely, claim unsettled) for test pad excavations for indigenous deposits and additional changes in the planning conditions from the baseline included in the contract.
- Construction has not commenced so we have assessed that 50% of peak staff will be incurred of the Delivery Partner preliminaries cost during this period.

The total Delivery Partner delay rate has been estimated at [REDACTED] per day. This is based on:

- 50% of full preliminary cost – ([REDACTED]/day) x 50% = [REDACTED]/day.

The risk of changes of conditions of EIS approval cannot be efficiently mitigated, transferred or avoided

Changes in the conditions of approval in the EIS is a risk that is associated with the actions or requirements of a third party that are not able to be governed by contractual arrangements, ie, the risk is not able to be addressed through enforcing contract terms. Consistent with the AER's guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.¹⁸

Although this risk cannot be efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of changes in conditions of approval. These strategies, which have informed our estimate of the risk cost set out above, include:

- Incorporate technical reports into baseline conditions to support EIS submission and enhance understanding of anticipated planning scenarios and establish a measurable baseline for adjustments.
- Thoroughly review and update baseline conditions before awarding the contract with the latest known likely approval conditions through consultation with DPE.

The risk of changes in EIS approval conditions is not covered by a cost pass through event

Consistent with the AER's expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of changes in EIS approval conditions is not covered by a cost pass through event in our current revenue determination.

¹⁸ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

4.16. Risk ID #57 – Tower Design Growth

Description of the risk

This risk relates to required design adjustments and tower expansion during the detailed design phase, resulting in increases to reimbursable costs. The detailed design of towers, including precise tower placement and structural modelling, remains incomplete, and the tower design relies on assumed local conditions and geotechnical data. The final designs could result in elevated reimbursable costs due to an increased demand for steel resulting from the finer details of design and modelling.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is ██████████, determined based on the tower steel quantity totals 50,300 tons, with the impact calculated using an assumed cost of ██████████ per ton delivered to the site.

The SME assessment including a peer review by the Owners Engineer (Beca) has indicated a most likely design growth in detailed design stage by 10%, with a 10% chance of exceeding a 25% design growth during detailed design. This is in consideration of:

- At the concept design stage, adjustments are made based on subsequent studies involving wind, geotechnical factors, tower placement, and alignment. The ultimate strength of the tower will be determined in the final design phase. Notably, during the concept design phase led by Aurecon, which corresponds to stage 2 involving more intricate design work, there was a 10-15% increase in tower weights.
- The 500 kV tower weights on Project Energy Connect increased by 50% during detailed design from the concept design. HumeLink Tower weights are in line with what was the final design weights of Project Energy Connect however detailed design and final studies for wind, geotechnical, tower locations and structural modelling.

This risk has been peer reviewed by the Owner's Engineer (BECA) for the Project (DOC ID0.1).

The risk of tower design growth cannot be fully mitigated, transferred or avoided

The steel towers are part of the reimbursable component of the target cost which is a shared risk under the contract. To avoid Transgrid paying a high-risk premium on the transmission line towers as shown in Figure 1, Transgrid is not able to fully mitigate, transfer or avoid this risk. Consistent with the AER's guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.¹⁹

¹⁹ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

Although this risk cannot be fully efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of tower design growth. These strategies, which have informed our estimate of the risk cost set out above, include:

- Owner’s engineer and independent verifier responsible for reviewing designs to ensure tower efficiency.
- full transparency over the costs incurred by the Delivery Partner and payment claims to be submitted on an open book basis. Pre agreed rates have been included in the contract, this risk only relates to quantity of material for the steel towers.
- Comparative analysis of designs between contractors to ensure consistency has been undertaken.
- Painshare gainshare regime under the contract incentivises the Delivery Partner to keep within the design growth allowance in the target cost.

4.17. Risk ID #22 – Tower Steel Price

Description of the risk

This risk relates to the fluctuations in the price of steel. Tower steel is subject to a Target Cost Adjustment via a “Rise and Fall” index formula using the Billets and Booms steel indices between Execution and the Steel Tower Commitment Date. Adjustment is limited to rate only not tonnage.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED], determined on steel pricing received in tender submissions and current fluctuation in the Billets and Bloom Steel Indexes.

The schedule risk analysis output has determined that this is an inherent risk (100% likelihood). A most likely cost impact of an increase of [REDACTED]/t, with a 10% chance of exceeding an increase of [REDACTED] t. This is based on:

- Tower steel quantities and rates provided by owner’s estimator from Delivery Partner tender submissions.
- Ranges based on volatility of steel price indices over the past 10 years with the maximum 2.4 times the minimum.

The risk of delay escalation cannot be fully mitigated, transferred or avoided

Tower steel price is a Transgrid risk under the contract, ie, the risk is not able to be transferred to the Delivery partner and relates to events that are outside Transgrid’s control such as changes in market conditions. Consistent with the AER’s guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.²⁰

²⁰ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

Transgrid is planning to transfer this risk by exploring options to fix the price in the Delivery Partner contracts during the ECI stage. This will cost Transgrid a premium for the Delivery Partners to take on the risk if agreed. In the case that this control does not get implemented in the negotiations for the Delivery Partner's, Transgrid will implement the following strategies to mitigate the risk:

- Locking in early so that it can be fixed in the contract or included as part of the Not to Proceed 1.
- Secure order of raw materials.

The risk of tower steel price is not covered by a cost pass through event

Consistent with the AER's expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of tower steel price is not covered by a cost pass through event in our current revenue determination.

4.18. Risk ID #27 – Exceptional Events

Description of the risk

The risk relates to the possibility of exceptional events occurring such as lockdowns, war, terrorism, or natural disasters. The most likely exceptional event which will occur on the project is a bushfire given the project location and large geographic spread. The scenarios considered are based on this type of event.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED] determined based on:

- Assessment of alignment in relation to bushfire prone land and likely Project impact; and
- Valuation of Delivery Partner preliminaries fee for retaining the Project team and project facilities during the disruption and remediation.

The alignment runs through bushfire prone lands and a bushfire has occurred as recently in 2019/2020. The Project is to be constructed in several locations with Category 1, 2 and 3 bush fire prone lands plus buffer zones.

SME assessment indicates that there is a most likely outcome of a 6-month delay and a 10% likelihood of exceeding a 12-months delay. The risk of exceptional events has been peer reviewed by AON as Transgrid's insurance advisor based on the modelling undertaken to inform the contract works insurance policy (DOC ID27.1).

The total Delivery Partners full day preliminary fee is evaluated at [REDACTED] per day under the contract.

The risk of Exceptional events cannot be efficiently mitigated, transferred or avoided

Exceptional events is a risk that is associated with the events outside Transgrid's control, ie, the risk is not able to be addressed through enforcing contract terms. Consistent with the AER's guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.²¹

²¹ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

Although this risk cannot be efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate the impact of exceptional events. These strategies, which have informed our estimate of the risk cost set out above, include:

- Insurance solutions are implemented for the works from AON.
- Put protection measures in place to protect workers and the works and minimise damage from floods or fire.

The risk of Exceptional Events is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of Exceptional Events is not covered by a cost pass through event in our current revenue determination.

4.19. Risk ID #40 – Increase in Labour cost

Description of the risk

This risk relates to rise in Delivery Partner reimbursable labour costs. The allowance within the target cost for the transmission line works has the potential to result in supplementary reimbursable expenditures.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is ██████████, determined based on:

- Analysis of best, most likely and worst-case uplift on labour component, considering additional EBA increments beyond the reimbursable labour costs (████████ million for Delivery Partner (east), ██████ million for Delivery Partner (west), totalling ██████ million); and
- The strong demand for labour due to various ongoing energy projects is impacting this situation. It has been determined that there's a 70% likelihood that costs will exceed the target cost allowance due to challenging market conditions.

The analysis output and independent expert assessment provided by Fission (Owner’s Estimator) has indicated a most likely uplift on labour component by 3%, with a 10% chance of a 5% uplift on labour component. The independent expert has indicated that the % escalation allocations and ranging are acceptable based on current market conditions and benchmarking against other projects.

The risk of increase in labour costs cannot be fully mitigated, transferred or avoided

Reimbursable labour is a shared risk under the contract, ie, the risk is not able to be fully transferred to the Delivery Partner and relates to events that are outside Transgrid’s control such as changes in market conditions. Consistent with the AER’s guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.²²

²² AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

Although this risk cannot be fully efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of increase in labour costs. These strategies, which have informed our estimate of the risk cost set out above, include:

- Continual observation of market dynamics and competing projects to assess rates and work schedules.
- Transgrid to oversee Delivery Partner efforts in renegotiating EBAs.
- Delivery Partner have expressed the possibility of a site-specific EBA to manage and agree labour rates during delivery, but these will not be executed until during the construction period.
- Pain share/gain share regime in the Delivery Contract incentivises the Delivery Partner to efficiently manage labour rates within the target cost allowance.
- Open book nature of reimbursable costs regime, Delivery Partner is only entitled to actual costs incurred and must demonstrate these costs as part of their payment claim.

The risk of increase in reimbursable labour is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of increase in reimbursable labour is not covered by a cost pass through event in our current revenue determination.

4.20. Risk ID #71 – Uncertainty in Owner’s non-labour cost estimate

Description of the risk

This risk relates to the uncertainty in the estimate of Owner’s non-labour costs for support, travel, legal, etc. There is a level of uncertainty in the under or over run of the estimates for these non-labour costs.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED] determined based on:

- Analysis of best, most likely and worst-case deviations from estimate

The analysis output has indicated the most likely outcome is that the estimate is correct [REDACTED] with a 10% chance of exceeding an increase of 25% to the estimation.

The risk of uncertainty in Owner’s non-labour cost estimates cannot be efficiently mitigated, transferred or avoided

The uncertainty of Owner’s non-labour cost estimates is a risk that is associated with the actions or requirements of a third party that are not able to be governed by contractual arrangements, ie, the risk is not able to be addressed through enforcing contract terms. Consistent with the AER’s guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.²³

²³ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

The risk of uncertainty of Owner’s non-labour cost estimates is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the uncertainty of Owner’s non-labour cost estimates is not covered by a cost pass through event in our current revenue determination.

4.21. Risk ID #6 – Reliance Information

Description of the risk

This risk relates to a change to the Delivery Partner’s activities or the works due to inaccurate reliance information or actual conditions differ materially from those described in reliance information. The Delivery Partner is entitled to a cost relief under the contract if changes in substation reliance information included in the contract, including but not limited to general arrangements, single line diagrams, existing assets, geotechnical assessments, and substation sites.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED], determined based on:

- Analysis of best, most likely and worst-case scenarios, as determined by design and engineering SMEs; and
- Valuation of Delivery Partner delay rates under each contract.

The schedule risk analysis output has indicated a most likely delay of 2 weeks and [REDACTED] for scope and/or design change, with a 10% chance of a 1-month delay and [REDACTED] for scope and/or design change. This is based on:

- Interfaces with other projects such as PEC which do not have interface obligations included for the PEC contractor to interface with Humelink Delivery Partners;
- Multiple projects are currently occurring simultaneously at Wagga Wagga Substation; and
- Transgrid has not been able to verify as-builts on site during the ECI period.

The total incur delay cost rate has been estimated as [REDACTED] per day including margin for the cost of delay to a substation crew.

- This is risk has been peer reviewed by the Owner’s Engineer (BECA) for the Project (DOC ID0.1).

The risk of changes of inaccurate reliance information cannot be efficiently mitigated, transferred or avoided

Changes the reliance information provided in the contract is a risk that is associated with the actions or requirements of a third party such as the project energy connect design that are not able to be governed by contractual arrangements for HumeLink, ie, the risk is not able to be addressed through enforcing contract terms. Consistent with the AER’s guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.²⁴

Although this risk cannot be efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk of inaccurate reliance information. These strategies, which have informed our estimate of the risk cost set out above, include:

- implementation of a change management process that requires project director and above approvals to make any changes at the substations that may vary from the reliance information; and
- a detailed review of geotechnical differences at the substation locations is confirmed independently by the owners engineer prior to issuing target cost adjustment.

The risk of inaccurate reliance information is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of inaccurate reliance information is not covered by a cost pass through event in our current revenue determination.

4.22. Risk ID #80 – Insolvency of a Delivery Partner member

Description of the risk

This risk relates to one of the joint venture partners of the Delivery Partners going insolvent. If this risk occurs Transgrid will incur significant delays and cost increases to the project whilst the issue is resolved, and an alternative arrangement is put in place. This could range from the other joint venture partner taking over the other parties’ obligations or requiring overseas parent companies to step in and perform the works. It could in a worst-case scenario result in an alternative delivery strategy or commercial model for the Project requiring the procurement of further contractors to complete the works.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED], determined based on possible scenarios that have been benchmarked by real world examples of construction contractors such as:

- Project Energy Connect contractor - Clough (2022)
- Probuild (2022)
- Grocon (2020)

²⁴ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

This risk has been determined based on a range of potential theoretical scenarios including:

- Insolvency event occurs after contract award during design phase 3-month delay, but other JV partner takes over all obligations under contract such as CPB for UGL (Vice versa) or Acciona for Genus.
- Insolvency event occurs on construction commencement - 6-month extension and actual costs will increase (5%) due to parent company step in to perform works CIMIC or Acciona (Spain) take over performance obligations.
- Insolvency event occurs during peak construction period and parent company walks away from Australian market. Works split into construct only contracts with Transgrid taking over design responsibility. This incurs additional 25% premium on remaining 50% of the target cost to cover transaction costs, legal costs. Transgrid cashes securities at 10% of the target cost to cover a portion of the additional costs leaving Transgrid to cover the remaining 15%. Additional risk premiums required to cover escalation, design, and fit for purpose warranties and to attract market to take over the works from another Contractor.

The low likelihood of 5% has been determined based on the risk event occurring approximately once a year for the last 3 years in the Australian contractor market that contains many contractors and thorough financial capacity assessments were conducted by Equifax during the ECI tender period for all Delivery Partner entities. This risk was peer reviewed by the Commercial team from Project Energy Connect who have managed the insolvency event of Clough on that project and deemed the scenarios and risk premium allowances used to determine this risk reasonable.

The risk of insolvency of a Delivery Partner member cannot be efficiently mitigated, transferred or avoided

Insolvency of a Delivery Partner member is a risk that is associated with the actions or requirements of a third party that are not able to be governed by contractual arrangements, ie, the risk is not able to be fully addressed through enforcing contract terms. Consistent with the AER's guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.²⁵

The risk of insolvency of a JV member is not covered by a cost pass through event

Consistent with the AER's expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of insolvency of a JV member is not covered by a cost pass through event in our current revenue determination.

²⁵ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

4.23. Risk ID #70 – Uncertainty of Owner’s costs for labour and consultants

Description of the risk

This risk relates to the uncertainty of required personnel to adequately resource the project and the uncertainty labour rates. Currently, it is estimated with best estimates based on previous projects but due to the nature of HumeLink, it is difficult to extrapolate data for such a large and unique project.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED], determined based on evaluation of reasonable potential scenarios of the rates ramping up or down.

The risk analysis has indicated the most likely outcome is that the estimate is correct [REDACTED] with a 10% chance exceeding an increase of 10% in labour rates and personnel.

The risk of the uncertainty of Owner’s costs for labour and consultants cannot be efficiently mitigated, transferred or avoided

The uncertainty of Owner’s costs for labour and consultants is a risk that is associated with the actions or requirements of a third party that are not able to be governed by contractual arrangements, ie, the risk is not able to be addressed through enforcing contract terms. Consistent with the AER’s guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.²⁶

The risk of uncertainty of Owner’s costs for labour and consultants is not covered by a cost pass through event

Consistent with the AER’s expectations regarding the outcomes of a risk assessment, Transgrid confirms that the uncertainty of Owner’s costs for labour and consultants is not covered by a cost pass through event in our current revenue determination.

4.24. Risk ID #41 – Local Area Works

Description of the risk

This risk relates to increases in reimbursable costs because of volume of heavy truck movement requirements and condition of access roads during construction. The project involves a substantial volume of heavy truck movements for delivering equipment and materials through rural roads not adequately designed for such use. This heightened project-related traffic, encompassing personnel, equipment, and materials, carries the potential risk of necessitating extra local area works during construction, thereby elevating reimbursable costs. The intensified road usage during construction could also contribute to road damage and repair needs, alongside complexities in liaising with councils and external contractors not part of the Project.

Delays in identifying and implementing upgrades would also impact on delivery of materials and equipment, and lead to post-DNP (Defects Notification Period) works requested by the council, resulting in increased reimbursable costs.

²⁶ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED] determined based on:

- Valuation of Delivery Partner rates and quantities included in the target cost;
- SME assessment of level of uncertainty in design and information available to confirm costs for local area works currently; and
- The SME assessment of the risk has indicated a most likely 100 instances of damage and curbs requiring [REDACTED] of repairs, with a 10% chance of 150 instances requiring [REDACTED] of repairs and 5 serious instances of bridge damage requiring [REDACTED] of repairs.
- This risk has been peer reviewed by the Owner's Engineer (BECA) for the Project (DOC ID0.1).

The risk of increases in reimbursable costs associated with access tracks cannot be fully mitigated, transferred or avoided

The local area works are part of the reimbursable component of the target cost which is a shared risk under the contract. To avoid Transgrid paying a high-risk premium on the local area works as shown in Figure 1, Transgrid is not able to fully mitigate, transfer or avoid this risk. Consistent with the AER's guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.²⁷

Although this risk cannot be fully efficiently mitigated, transferred, or avoided, Transgrid has several strategies to mitigate risk increased reimbursable costs associated with access tracks. These strategies, which have informed our estimate of the risk cost set out above, include:

- Perform testing in areas with elevated risk, especially at bridges essential for heavy deliveries.
- Generate dilapidation reports for local roads.

Explore the possibility of compensating councils for extra maintenance, acknowledging the associated additional cost.

The risk of increase in reimbursable costs associated with local area works is not covered by a cost pass through event

Consistent with the AER's expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of increase in reimbursable costs associated with local area works is not covered by a cost pass through event in our current revenue determination.

²⁷ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

4.25. Risk ID #72 – Original Equipment Manufacturer (OEM) cost uncertainty

Description of the risk

This risk relates to the cost of OEM equipment fluctuating due to market conditions and design/transport modifications due to directions from Transgrid. The OEM equipment covered in this risk are transformers, reactors, and conductors. The orders for the transformers have been finalised but reactors and conductors have not.

Approach to calculating the expected risk costs

The forecast capex contingency allowance associated with this risk is [REDACTED], determined based on evaluation of reasonable potential scenarios of costs fluctuating including storage, transport, and installation.

The cost risk analysis conducted by the procurement team has indicated that the most likely outcome is that the estimate is correct ([REDACTED]) with a 10% chance of exceeding an increase of 15% to OEM equipment costs.

The risk of increases in OEM costs cannot be fully mitigated, transferred or avoided

The orders have been placed for transformers, but not reactors or the conductor which leaves uncertainty in the final cost for these items. Design development modifications may change the cost of each item and transport costs may change as current delivery ports are not confirmed. Transgrid is not able to fully mitigate, transfer or avoid this risk. Consistent with the AER's guidance, inclusion of a risk allowance for risks of this nature is generally reasonable.²⁸

The risk of increases in OEM costs is not covered by a cost pass through event

Consistent with the AER's expectations regarding the outcomes of a risk assessment, Transgrid confirms that the risk of increases in OEM costs is not covered by a cost pass through event in our current revenue determination.

²⁸ AER, *Regulation of actionable ISP projects*, Guidance note, March 2021, p 17.

5. Quantification of remaining Other Construction costs

Risk Name	Description	Cost Basis	Risk Category	Expected cost
ID9 - Native Claim Title	The Delivery Partner is instructed, ordered, or required to cease to perform all or part of the Delivery Partner's Activities (or to change the way it does so) because of a Native Title Claim	█/day + margin (stringing crew). ML: 3 - month delay	Time	█
ID3 – Challenge to EIS	Delay and modifications required due to legal challenge of planning approval	█/day + margin (Prelim costs). ML: 3 – month delay	Time	█
ID69 - Funds obtain delay	Transgrid fails to satisfy all conditions it is responsible for satisfying in connection with funding for the Project under subparagraph (c) (i) of Sub-Clause 4.1 [Conditions Precent] such that a final investment decision on the Project is not made, provided such failure was not connected with, and did not arise out of, any act or omission of the Delivery Partner or its Associates. Delay and cost claims from the Delivery Partner due to delay in obtaining funding for the Project	The delay to funding only becomes a risk if it comes later than the EIS approval in ID2. ML- 1 month delay (3-month total delay from April 2024) █ per day for UGL based on PAV rate (█ per month TOC adjustment), AKG (█ per day) as per PAV submission.	Time	█
ID64 - Transport of heavy items	Transport of heavy items (About 125te) requires bridge or road strengthening by Transgrid for supplied items	ML: 2 bridges require strengthening at █ each	Variation	█
ID79 – Insolvency of major contractor	A major contractor (supplier, delivery partner, etc) goes insolvent.	ML: tower steel supplier goes insolvent and Transgrid loses 20% deposit but causes no delay	Time	█
ID4 - Right of Access to the Site	Failure by Transgrid to give the Delivery Partner a non-exclusive right of access to the parts of the Site within the time (or times) and subject to the	█/day + margin (stringing crew). ML: 1 month	Time	█

	conditions stated in the Site Access Schedule and Sub-Clause 2.1 [Right of Access to the Site]			
ID61 - Acquire conservation covenant at Maragle (MA002)	Transgrid cannot compulsory acquire conservation covenant at Maragle (MA002) which potentially lead to Delivery Partner submits delay claim based on not receiving site access or changes to the alignment.	Delivery Partner submits a delay claim for not being able to access the site and Transgrid are in final negotiations for an alternative which has delayed site access. ML - 6 months, alignment change, cross 330kV twice Currently working with Transgrid to resolve issue.	Variation	██████████
ID66 – Access Tracks	Increase in reimbursable costs associated with access tracks above what is allowed in the Initial Target Cost.	Total cost between East and West is ██████████ BC: 10% decrease ML: no change WC: 20% increase	Reimbursable	██████████
ID38 - Fire Ban	Claims for delay because of a fire ban implemented during delivery phase	██████████ /day + margin (stringing crew). Most Likely - 14 days lost productivity 1 crew	Time	██████████
ID14 - Provide Outage	Transgrid notifies the Delivery Partner that the required Transgrid Outage duration is not available during the nominated preference period or fails to provide a Scheduled Outage as provided in Clause 8A [Outages]	██████████ per day + Contractor margin ML - 2 weeks	Time	██████████
ID30 - CEMP Delays	Delays in obtaining the CEMP caused by a Transgrid design or alignment change causing the Delivery Partner to submit a delay claim due to resubmission of CEMP	██████████ /day + margin (full day prelims cost). ML: 1 - month delay	Time	██████████
ID44 - Noise works claim	Provisional Sum - Substation and transmission line Noise Mitigation Measures	ML - ██████████	Variation	██████████

ID1 - Breach of the Contract	Breach of the Contract by Transgrid (excluding any events, acts or omissions which are the subject or topic of any Adjustment Event referred to below or any Extension Events)	Design rate █████ per day + margin (contractor margin for additional design work) ML - 1 month of additional design	Time	█████
ID8 - Artefact Excavation	Delay and cost claims due to discovery of artefact during excavation of footings or substation civil works that cannot be removed and requires protection. - Protection of Aboriginal Heritage items such as rock artwork that cannot be removed.	█████/day + margin (footing cost x4). ML: 1 - month delay	Time	█████
ID63 - Accommodation Requirements	Transgrid cannot secure accommodation sites for the labour required for the project to handover to the Delivery Partner in accordance with the site access schedule	50% of █████ per day full delay cost ML: 30 days delay	Time	█████
ID43 - Provisional Sum Work	Any Provisional Sum Work, if Transgrid directs the Delivery Partner to proceed	Scenario: Adjustment to Target Cost	Variation	█████
ID45 - Landowner costs	Provisional Sum - Unforeseen landowner costs. Additional compensation to landowners due to temporary restrictions placed on them during construction or changes to construction method or access	█████ scope (per property) ML: 50 properties	Land and Easement	█████
ID76 – Cultural heritage works	Provisional sum for cultural heritage works	ML: █████ allowance for cultural heritage works as advised by SME.	Variation	█████
ID46 - Lack of commissioning	Lack of commissioning resources - Transgrid take over for energisation - 2 months	█████/day + margin (full day prelims cost). ML: 2 - week delay	Variation	█████
ID28 - Track Possession cancel	The first, second and third preference dates for a Track Possession are cancelled except as provided in paragraph (l) of Sub-Clause 23.2 [Track Possessions]	█████/day + margin (stringing crew). ML - 1.5-month delay to	Time	█████

ID62 - Inefficient use of conductor	Delivery Partner uses more conductor than ordered by Transgrid due to inefficient use	Inefficient use of conductor (Total cost ██████ ML: additional 10% required for offcuts and wastage	Reimbursable	██████
ID20 - Acoustic treatments	Property acoustic treatments exceed provisional sum allowance	██████ scope (per property) ML: 40 properties	Variation	██████
ID12 - Suspension of works	Claims by the Delivery Partner due to suspension of part or all of the works by Transgrid	██████ /day + margin (full day prelims cost). ML: 1 - month delay	Time	██████
ID15 - Employer Delay	Claims for delay and costs due to Transgrid delaying tests for practical completion such as Transgrid does not attend hold points or have enough commissioning personnel to attend Tests for Practical Completion	██████ /day + margin (stringing crew). ML: 7 - days delay	Time	██████
ID29 - Storage cost	Increase in storage costs for the conductor	ML: ██████ (per month storage) 12 months delay	Variation	██████
ID51 - Undergrounding Request	Essential Energy requesting undergrounding rather than hurdling which potentially lead to additional cost to underground lines on behalf of EE.	Based on lessons learnt from PEC. ██████ incurred. ██████ per crossing, 110 crossings in total + margin	Variation	██████
ID25 - Occupation of works	Use or occupation of the works by Transgrid	ML: ██████ (additional works)	Variation	██████
ID58 - PMP changes	PMP changes post contract award or changes to baseline PMPs	Total PMP costs ██████ included in TOC, 352 holdings on the Site. ██████ per property. 37 PMPs signed, 233 yet to be agreed ML - 100 holdings increase by ██████ per property	Variation	██████
ID18 - Access difficulty	Delivery Partner cannot access part of the Works to investigate a defect or test failure prior to or after energisation	██████ /day + margin (commissioning crew). ML: 7 - days delay	Time	██████
ID7 - Discovery of artifact	Claims for costs associated with discovery of artefact during	██████ /day + margin (stringing crew).	Variation	██████

	excavation of footings or substation civil works	ML: 5 - days delay		
ID36 - Unauthorised site access	Unauthorised persons access the Site and are injured or cause damage post Delivery Partner practical completion	█/day + margin (stringing crew). ML: 7 - days delay	Variation	█
ID48 - Safety incident	Safety incident requiring Safe Work NSW investigation and site shutdown	ML: 3 day shutdown	Time	█
ID34 - Environmental Offset Delays	The acquisition of environmental offset sites delays construction commencement	█/day per cleaning crew. ML: 2-week delay with 2 clearing crews	Time	█
ID21 - Changes to Standards, Laws or Taxes	Changes to Australian standards, WHS or Environmental laws, levies/fees/taxes, custom duties	ML: 2% increase in import duty, and because of a change to Australian standards on transmission lines, 1 week delay and █ for design changes	Variation	█
ID10 - Rectification of Damage from Energisation	Rectification costs associated with an incident during energisation causing damage to equipment	Previous project experience. ML: █ + margin	Variation	█
ID39 - Discovery of Unknown Flora or Fauna	Delays caused by the discovery of unknown sensitive flora or fauna	█/day. ML: 1 week for flora relocation	Time	█
ID31 - Catastrophic or Fatal Incident	Catastrophic or fatal incident involving project personnel, Delivery Partner and site personnel or members of the community resulting in a cessation of works and claims by the impacted parties	ML: 61-day site shutdown and █ for legal fees	Time	█
ID11 - Compensation for Infrastructure Damage	Compensation to other infrastructure owners due to damage caused by the project and claims for costs and delay by the Delivery Partner.	Previous project experience. ML: █ + margin	Variation	█
ID23 - Failure to Adhere to Contract Conditions	Notice from the Delivery Partner to the Transgrid for no payment, failure to perform, prolonged suspension of the works,	Break Fee of █ of unpaid target cost + margin. ML: █ of target cost unpaid	Time	█

	insolvency, corrupt or fraudulent behaviour.			
ID60 - Additional Environmental Monitoring	Environmental monitoring requirements over and above what is currently captured	ML: [REDACTED] for additional monitoring or assessments	Variation	[REDACTED]
ID24 - Making Sites Safe	Making the site safe or protecting life/property upon Delivery Partner termination.	ML: [REDACTED] + margin for temporary fencing and removal of substation equipment	Variation	[REDACTED]
ID16 - Defect Rectification	Preventing access to rectify defects after practical completion	[REDACTED]/day + margin for 5 people. ML: 3-days additional labour	Time	[REDACTED]
ID17 - Defect Investigation	Claim for costs associated with searching for a defect and: <ul style="list-style-type: none"> defect is found to be caused by Interface Delivery Partner or third party Transgrid believes it's a defect and it is not a defect 	[REDACTED]/day + margin per crew. ML: 1-month	Variation	[REDACTED]
ID73 - Uncertainty in property valuations	Negotiations are continuing thus creating uncertainty as to the result. Those that go to compulsory acquisition will have costs determined by the Valuer General.	Inherent risk	Land and Easement	[REDACTED]
			Total	\$61,930,565

6. Validation and verification of owners' risk costs

Validation and verification of the owners' risk costs has been provided through internal and external review and endorsement processes including:

- Peer reviews via establishment of a risk review working group;
- External risk advisors such as E3 and Broadleaf embedded within team to support the risk identification and quantification of each risk
- Independent risk assessment from TBH
- Independent advice in specific areas by Fission and Beca
- Independent review by GHD
- Executive reviews through workshops
- Board review and endorsement

Peer review of owners' risk costs

Transgrid established a risk review working group, made up of experienced personnel from other projects, to provide peer review of the risk process.

[C. Beater, C. Gent, C. Mayer, C. Jenner, C. Kroon, J. Roberts, M. Dunkley, R. Page and R. Matthews (E3). Met May 9th, 12th 18th and 31st, and July 6th and 14th].

At each of these review meetings the risk process and many of the main risks were reviewed and discussed. Recommendations were taken advantage of and incorporated into the process.

External Risk Advisors

To enable sufficient rigour, support and ensuring industry best practice is applied, external Risk specialists such as Broadleaf, along with E3 have been engaged in the risk development process. Both parties have been embedded within the teams to ensure there is adequate checks and balances across a number of key workstreams.

Independent Risk Assessment by Tracey Brunstone Hammond (TBH)

TBH are a well regarded entity that have strong industry standing in the area of project controls. TBH have particular expertise in schedule development and Quantitative Schedule Cost Risk Analysis (QCSRA). TBH have led the schedule development process, ensuring proper schedule hygiene is maintained in the master schedule, as well undertaking thorough review of Delivery Partner schedules. Transgrid has relied on TBH to provide outputs from Quantitative Schedule Risk Analysis (QSRA). Further to undertaking QSRA, and for comparison Transgrid has engaged TBH to undertake an independent Quantitative Cost Risk Analysis (QCRA). This will allow outputs to be compared adding further weightage to the contingency process undertaken.

Independent advice in specific areas by Fission and Beca

Fission is an independent cost estimator that Transgrid has engaged. In addition to providing cost scrutiny of Delivery Partner pricing schedules, Fission have been engaged to provide top down benchmarking in various cost categories, including contingency, that will provide additional validation of how contingency number being put forward by Transgrid is benchmarked against similar projects in the industry.

Beca is an external owners engineer that have provided support and validation in the assessment of various technical risk items.

Independent review of risk process by GHD.

This a complete independent review of the risk process undertaken by Transgrid and others to date.

Executive review

Several presentations to the executive have been held to provide executive review and oversight. Reviews have been carried out in presence of Executive General Manager for Major Projects and Chief Financial Officer. Furthermore, multiple board workshops have been conducted through the months of July-Sep 2023 – 3 specifically – to review risk process, basis and quantification.

Appendix A – Owner’s Estimator base costs – Confidential



Fission Technical
Memo.pdf

Appendix B - Risk Matrix

Consequence						Likelihood				
	Cost	Time	Reputation, community & media	Work health & safety	Environment	Rare 0%-5%	Unlikely 5%-30%	Possible 30%-50%	Likely 50%-90%	Almost certain >90%
Catastrophic	Capex budget change >\$200m	Major project milestone overrun: >6 months	Serious public outcry, heightened government concern or media coverage with extensive national coverage	Single fatality or any type of irreversible disability. Major injury to >10 people, unable to return to work	Permanent irreversible environmental impact or significant damage across multiple sites	Medium 4	High 3	High 2	Extreme 1	Extreme 1
Major	Capex budget change \$20m - \$200m	Major project milestone overrun: 3 - 6 months	Significant adverse national media reporting and public attention	Major or reversible injury, requires long term ongoing treatment and rehabilitation. Significant safety breach with immediate impact on operations at worksite	Serious, long term, widespread environmental damage	Medium 5	Medium 4	High 3	High 2	Extreme 1

Moderate	Capex budget change \$2m - \$20m	Major project milestone overrun: 1 - 3 months	Adverse one-off attention from media or heightened concern by a local community and government	Serious injury requiring medical or hospital treatment resulting in need for alternate working or lost time injury	Limited, moderate extent of environmental damage, which can be rectified over the medium-term	Medium 6	Medium 5	Medium 4	High 3	High 2
Minor	Capex budget change \$200k - \$2m	Major project milestone overrun: 1 week - 1 month	Minor adverse local public, government or media attention and complaints	Minor injury requiring medical treatment or moderate 'safe working' breach likely to impact operational activities	Minor, localised environmental impact, which can be rectified in the short term	Low 8	Low 7	Medium 6	Medium 5	Medium 4
Minimal	Capex budget overrun <\$200k	Major project milestone overrun: <1 week	Public concern restricted to local complaints or local media enquiry or minor reports	Minor injury requiring first aid treatment or minor 'safe working' breach unlikely to impact operational activities	Minimal, localised environmental impact, which is able to be immediately rectified	Low 8	Low 8	Low 8	Low 7	Low 7

Appendix C - Risk workshop schedule

Date	Meeting	Facilitated By	Included
25/11/2022	HumeLink QRA risk identification Workshop A	Risk Manager/Commercial Advisor	Property, Planning Approvals, Commercial, Legal
1/12/2022	HumeLink QRA risk identification Workshop B – Part 1	Risk manager/Commercial Advisor	Design & Engineering, Construction, Environmental, Commissioning and Energisation
7/12/2022	HumeLink QRA risk identification Workshop B – Part 2	Risk manager/Commercial Advisor	Design & Engineering, Construction, Environmental, Commissioning and Energisation
01/02/2023	ECI Stage 1 Price Adjustment and Risk Workshop	Commercial	Fission, Transaction team, Risk Manager
01/02/2023	Schedule review workshop	TBH	TBH, planning and Risk Manager
10/02/2023	Environmental and approvals risk assessment	Geoffrey Raymond	S. Osman, C Tucker, M. Moroney, planning
13/02/2023	Environment Inherent Risk	Planning	Environmental, planning and Risk Manager
13/02/2023	Land Acquisition Inherent Risk	Planning	John Miles, planning and Risk Manager
14/02/2023	Construction Inherent Risk	Planning	Construction, planning, Risk Manager
15/02/2023	PID Inherent risk	Planning	Engineering, planning, Risk Manager
17/02/2023	CSE Inherent risk	Planning	CSE, planning, Risk Manager
20/02/2023	Commercial Inherent Risk	Planning	Commercial, planning, Risk Manager
21/02/2023	Risk Assessment - Project mgt, Control and safety	Risk Manager	Team Leads, Risk Manager
22/02/2023	Risk Assessment - Property	Risk Manager	Property, Risk Manager
23/02/2023	Risk Assessment - Construction	Risk Manager	Construction, Risk Manager
23/02/2023	Regulatory Inherent Risk	Planning	Commercial, planning, Risk Manager
23/02/2023	Risk Assessment - Commercial and Procurement	Risk Manager	Commercial, Procurement, Risk Manager

Date	Meeting	Facilitated By	Included
24/02/2023	Risk Assessment - Technical, Engineering & Design	Risk Manager	Engineering, planning, Risk Manager
01/03/2023	Risk Assessment - Interfaces	Risk Manager	Construction, planning, Commercial, Risk Manager
02/03/2023	Risk Assessment C&S Engagement	Risk Manager	CSE, planning, Risk Manager
14/03/2023	ECI Stage 2 Risk Workshop - East	Commercial	Fission, Transaction team, Controls Manager, Risk Manager
15/03/2023	Risk and Opportunity Workshop - contractors	Commercial	Fission, Transaction team, Controls Manager, Risk Manager
18/04/2023	West Insurable risk workshop	Commercial	Fission, Transaction team, Controls Manager, Risk Manager
19/04/2023	Risk and Opportunity Workshop UGL Quantitative	Commercial	Fission, Transaction team, Controls Manager, Risk Manager
26/04/2023	Lessons Learned Workshop	Risk Manager	Transaction team, Controls Manager, Risk Manager
26/04/2023	AKG Risk and Opportunity Workshop	Commercial	Fission, Transaction team, Controls Manager, Risk Manager
27/04/2023	Lessons Learned Workshop	Risk Manager	Transaction team, Controls Manager, Risk Manager
28/04/2023	Lessons Learned Workshop	Risk Manager	Transaction team, Controls Manager, Risk Manager
01/05/2023	Lessons Learned Workshop	Risk Manager	Transaction team, Controls Manager, Risk Manager
02/05/2023	Risk estimation workstream meeting	Risk Manager	Team Leads, Risk Manager
02/05/2023	Lessons Learned Workshop	Risk Manager	Transaction team, Controls Manager, Risk Manager
03/05/2023	Risk and Opportunity Modelling Planning	TBH	Planning, Cost Control, Controls Manager, Risk Manager
09/05/2023	Contingency Estimation Process Review	Risk Manager	Project Director, C. Gent, C. Mayer, R. Page, C. Kroon, C.Jenner, R.Matthews +

Date	Meeting	Facilitated By	Included
10/05/2023	AKG Risk and Opportunity session	Commercial	Transaction team, Controls Manager, Risk Manager
12/05/2023	Review of scenarios	Commercial	Commercial, Controls, Risk Manager
12/05/2023	Contingency Estimation Process Review	Risk Manager	Project Director, C. Gent, C. Mayer, R. Page, C. Kroon, C.Jenner, R.Matthews +
16/05/2023	Review of contractors' Risk and Opportunity input	Commercial	Commercial, Controls, Risk Manager
17/05/2023	QRA Review meeting	TBH	Controls Manager, Cost control, Planning, Risk Manager
18/05/2023	Contingency Estimation Process Review	Risk Manager	Project Director, C. Gent, C. Mayer, R. Page, C. Kroon, C.Jenner, R.Matthews +
22/05/2023	Contingency Review Meeting	Risk Manager	Controls Manager, Risk Manager
24/05/2023	HumeLink Risk Scenarios	Commercial	Commercial, Controls, Risk Manager
31/05/2023	HumeLink Contingency Assessment Update	Risk Manager	Project Director, C. Gent, C. Mayer, R. Page, C. Kroon, C.Jenner, R.Matthews +
09/06/2023	Review of AKG Pricing and Contingency	Commercial	Commercial, Controls Manager, Risk Manager
14/06/2023	AKG/Transgrid contingency alignment	Commercial	Commercial, Controls Manager, Risk Manager
27/06/2023	QRA Risk Register Review	Risk Manager	Commercial, Controls Manager, Risk Manager
03/07/2023	HumeLink Risk Review session	Controls Manager	Commercial, Controls Manager, Risk Manager
06/07/2023	Risk Presentation Review	Controls Manager	Commercial, Controls Manager, Risk Manager
06/07/2023	CPA2 HumeLink Peer Review - Owners' Risk	Nicholas Wall	Commercial, Cost Control, Controls Manager, Risk Manager
07/07/2023	Schedule Risk Analysis - check in	TBH	Controls Manager, Planning, Risk Manager

Date	Meeting	Facilitated By	Included
10/07/2023	Risk Register Review - response to queries	Risk Manager	Commercial, Controls Manager, Risk Manager
11/07/2023	Risk Inputs for Exec/Board workshop	Meredith Butler	Commercial, Controls Manager, Risk Manager
11/07/2023	Risk Review - Environmental	Risk Manager	Environmental, Controls Manager, Risk Manager
11/07/2023	Risk review - Delivery	Risk Manager	Construction, Risk Manager
11/07/2023	Risk Review - Design	Risk Manager	Engineering, planning, Risk Manager
11/07/2023	Risk Review - Property	Risk Manager	Property, Risk Manager
13/07/2023	HumeLink Risk Register Review	Commercial	Fission, Commercial, Controls Manager, Risk Manager
14/07/2023	HumeLink Contingency Assessment Update	Risk Manager	Project Director, C. Gent, C. Mayer, R. Page, C. Kroon, C.Jenner, R.Matthews +
17/07/2023	Contingency Calculation review	Risk Manager	Commercial, Controls Manager, Risk Manager
17/07/2023	Executive General Manager of Major Projects Risk Review – Part 1	Project Director	Commercial, legal, project controls, GM Origination, Chief Risk Officer, GM Finance
18/07/2023	Executive General Manager of Major Projects Risk Review – Part 2	Project Director	Commercial, legal, project controls, GM Origination, Chief Risk Officer, GM Finance
19/07/2023	Land Owner Risk	Planning	Planning, Property, Commercial, Risk Manager
19/07/2023	HumeLink Risk Approach	Commercial	Commercial, Controls Manager, Risk Manager
19/07/2023	Update EIS Approval Risk	Risk Manager	Environmental, Planning, Risk Manager
20/07/2023	Risk Catch up and QCSRA draft results review	TBH	Planning, Controls Manager, Risk Manager
21/07/2023	Land and Compulsory Acquisition risk strategy workshop	TBH	Planning, Cost Control, Controls Manager, Risk Manager

Date	Meeting	Facilitated By	Included
24/07/2023	Land Compulsory Acquisition Risk Confirmation	Planning	Planning, Property, Risk Manager
25/07/2023	OEM and conductor delay risk treatment workshop	Risk Manager	Procurement, Risk Manager
26/07/2023	Compulsory Acquisition - Tower location strategy workshop	Planning	Planning, Property, Risk Manager
28/07/2023	OEM and conductor delay risk treatment planning	Risk Manager	Procurement, Risk Manager
28/07/2023	Transgrid Board – Risk Deep Dive Workshop	Project Director	Transgrid Board
03/08/2023	Interface risk assessment workshop	Construction	Construction, planning, Risk Manager
04/08/2023	Compulsory Acquisition - Tower location workshop	Planning	Planning, Property, Risk Manager
08/08/2023	BECA peer review of technical risks	Risk Manager & Commercial Advisor	Design & Engineering, Construction, BECA