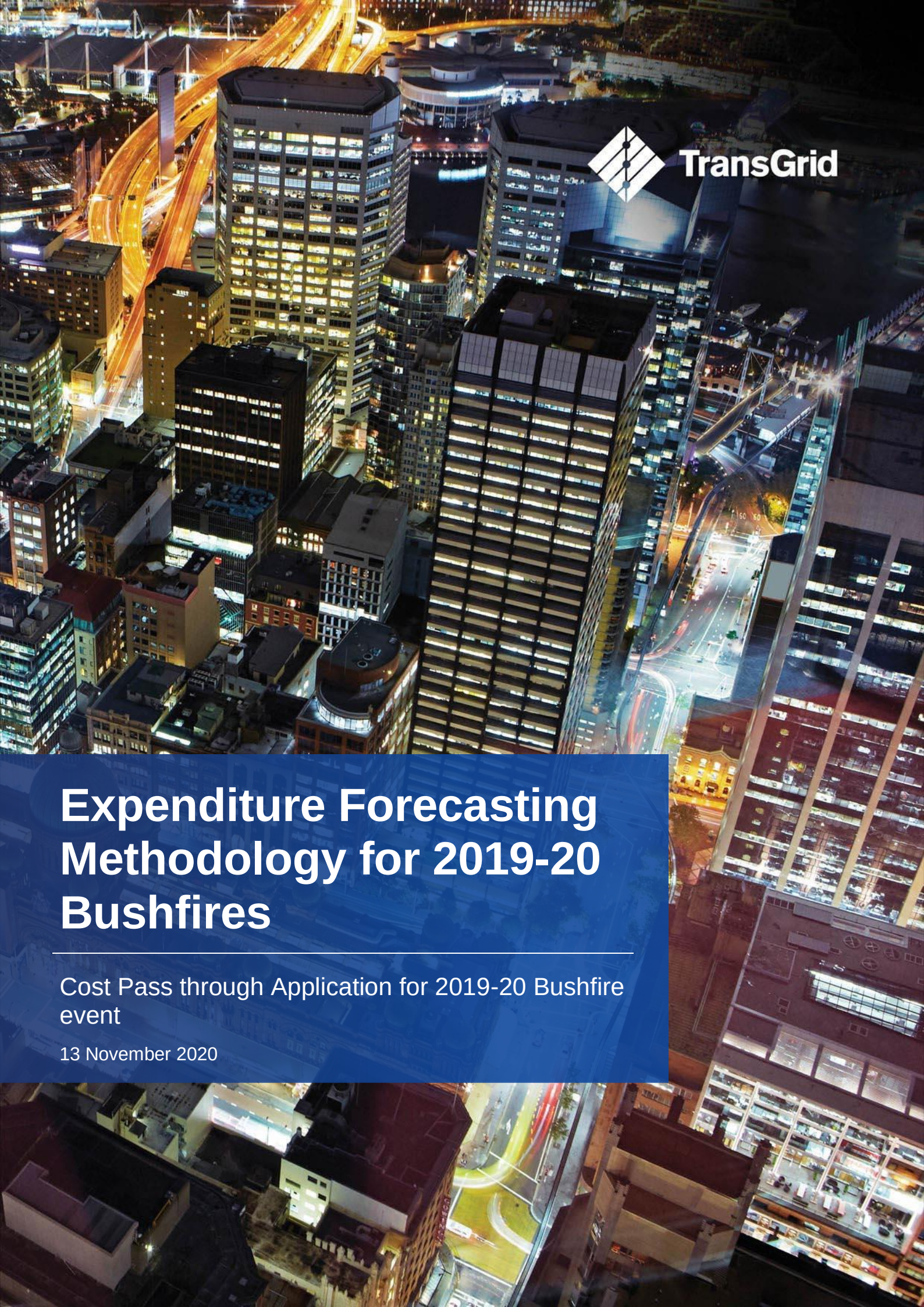

TransGrid

Expenditure Forecasting Methodology for 2019-20 Bushfires

Cost Pass through Application for 2019-20 Bushfire event

13 November 2020

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1. Purpose, scope and structure of this document

1.1 The impact of the 2019-20 bushfires on TransGrid's network

The 2019-20 bushfire season was the worst bushfire season in New South Wales (NSW) history. It resulted in 'devastating loss of life, property and wildlife, and environmental destruction across the nation'.[1] Given this, a number of inquiries to investigate the bushfires were initiated – these include:

- the NSW Bushfire Inquiry (NSW Inquiry)2
- the Senate Inquiry into lessons to be learned in relation to the preparation and planning for, response to and recovery efforts following the 2019-20 Australian bushfire season 3 (Senate Inquiry), and
- the Royal Commission into Natural Disaster Arrangements (Royal Commission)[4]

The Senate Inquiry Interim Report finds that "the 2019–20 bushfires had an unprecedented intensity, resulting in significant destruction of lives, property, flora and fauna". It also finds[5]:

> *the fires were catastrophic from both an environmental and public health perspective, and the worst in history for some jurisdictions, such as New South Wales (NSW), due to:*
>
> > *'… unprecedented extreme weather and cascading events including drought, heatwaves, dry thunderstorms, multiple days of Severe, Extreme and Catastrophic fire danger, and pyroconvective fires'*

The bushfire season first impacted our network on 6 September 2019 – our assets were within the active fire zones until the fire season finished in March 2020. During the 2019-20 bushfire season, there were three distinct bushfire locations in our network:

- **Northern NSW** – from September 2019 to November 2019, the bushfires were mainly in the north of the state. These fires predominately affected our 132 kV wood pole assets. Nine wood pole structures were destroyed, and a significant portion of North Coast NSW was being fed radially with a constant risk of supply loss while emergency repairs were being carried out at the time.
- **Central NSW** – from mid-November 2019 to the end of January 2020, there were a number of significant fires that interrupted supplies from the Hunter and Central Coast power stations and caused outages on our 500 kV and 330 kV assets. They also caused a loss of supply to the network communications services to Kangaroo Valley Switching Station resulting in urgent dispatch of staff and diesel generators to the impacted sites.
- **Southern NSW / Snowy Mountains** – from late December 2019 to January 2020, the Snowy Mountains fires took hold, resulting in 65 outages of 330 kV assets. On 4 January 2020, four of our 330 kV lines tripped within minutes of each other resulting in a NEM regional separation of NSW from Victoria. These fires in Southern NSW continued until the first week of March 2020.

The above impacts all resulted in emergency repairs being required on our network, as well as operational changes, which are reflected in the actual costs in this report. In addition to these emergency works, the bushfires have also damaged assets on our network which now require substantial repair works in order to

[1] The Federal Government, Lessons to be learned in relation to the Australian bushfire season 2019-20 (Federal Government Interim Report), p. 17 found at Link

[2] Found at Link

[3] Found at Link

[4] Found at Link

[5] The Federal Government, Lessons to be learned in relation to the Australian bushfire season 2019-20 (Federal Government Interim Report), p. 3 found at Link

manage safety and reliability risks. This repair work is where the bulk of our costs lie, with the Snowy Mountains location being the area of our network where we incurred the greatest damage.

Transmission line assets form the majority of our damaged infrastructure given their proximity and exposure to the 2019-20 bushfires across NSW and the ACT. Our transmission line assets within the active bushfire impacted zones included:

> 999km of transmission line route length (comprising over 9,000km of conductors and earth wires), or 9 per cent of our network, and

> 2,681 transmission line structures comprising 1,822 steel lattice tower and pole structures, 596 wood poles structures and 263 concrete structures.

The scope of the remaining work we are required to undertake due to the impact of the bushfires is as follows:

> major works on seven transmission lines within the Snowy Mountains region including [redacted] which involve significant conductor replacement

> minor works on transmission lines that were in the vicinity of fires and smoke outside of the Snowy mountains area

> hazard tree removals in our easements totalling 2,482 trees that were adversely impacted by the fires

> remaining track repairs totalling 445km as a result of fire (debris) and flood (erosion) damage, and

> minor works at Upper Tumut Substation, including circuit breaker maintenance and property facilities corrective maintenance.

1.2 Purpose of this document

The purpose of this document is to:

> overview the nature and scope of the operating expenditure (opex) and capital expenditure (capex) that we have incurred already and that we will incur as a direct result of the 2019-20 bushfires

> explain and justify the efficient costs incurred to date as a direct result of the 2019-20 bushfires

> explain and justify the methodologies we have used to determine our forecast expenditure for the 2019-20 bushfires, and

> overview how we verified and validated our actual and forecast capex for the 2019-20 bushfires.

This document forms part of our Cost Pass through Application (Application) to the Australian Energy Regulator (AER) for the 2019-20 Bushfire season. It should be read in conjunction with our Application and other supporting documents, in particular GHD's independent opinion on the scope of and forecast expenditure that we have incurred and will incur as a direct result of the 2019-20 bushfires. GHD confirms that both are reasonable and efficient.

1.3 Structure of this document

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

> chapter 2 overviews our actual and forecast expenditure as a direct result of the 2019-20 bushfires

> chapter 3 explains our actual costs that we have incurred to 30 September 2020

> chapter 4 explains our forecast expenditure for transmission lines

> chapter 5 explains our forecast expenditure for access and vegetation management (easements)

> chapter 6 explains our forecast expenditure for substations, secondary systems, and property

> chapter 7 explains how our actual and forecast expenditure has been verified and validated.

The appendix sets out how we have calculated labour related costs in further detail.

2. Overview of incremental expenditure

This chapter overviews our actual and forecast incremental expenditure that we will incur as a direct result of the 2019-20 bushfires.

2.1 Overview of our costs

As mentioned in our principal Application, the impact of the 2019-20 NSW bushfires and our response can be considered under four categories:

- **Network safety and restoration activities** – emergency works to make assets safe and restore supply to our customers as quickly as possible where it was safe to do so. These costs have already been incurred and are included in Chapter 3: Actual expenditure.
- **Condition assessments** – works to assess the damage caused to our equipment and surrounding areas, to identify where priority repairs are required. These costs have also already been incurred and are included in Chapter 3: Actual expenditure.
- **Network repairs** – works to repair the damaged parts of our network, where network safety risk is judged to be below tolerance levels or 'As Low As Reasonably Practicable' ('ALARP'), in accordance with our obligations. These proposed works are reflected in our forecast costs to repair the damage (mostly in the Snowy Mountains region) and are discussed in chapter 4: Forecast transmission lines expenditure and Chapter 6: Forecast other costs, and
- **Vegetation management and access works** – some of these works were required as a priority following the fire damage to provide and maintain access to our infrastructure, and so reflect costs already incurred. Some further works, in particular the removal of identified hazard trees and repair of access tracks, now being scheduled following subsequent inspections, is reflected in our forecasts. The costs which have been incurred are included in chapter 3: Actual expenditure whereas forecast costs are discussed in Chapter 5: Forecast access and vegetation management expenditure.

2.2 Actual expenditure

We incurred actual expenditure of $10.6 million (Real 2017-18) between 1 July 2019 and 30 September 2020 as a direct result of the 2019-20 bushfires. This expenditure is detailed in Table 2-1.

Our actual expenditure is based on transactions recorded in Ellipse, which is our enterprise resource planning (ERP) system. The relevant costs for each bushfire work activity were booked to work orders created specifically to record the costs of the 2019-20 bushfire event. This process ensured all incurred bushfire response costs were appropriately captured at a detailed level across the bushfire period and able to be easily separated and distinguished from business-as-usual network expenditure.

We have allocated and attributed actual expenditure for the 2019-20 bushfires in accordance with our cost allocation methodology (CAM) capitalisation policy.

Table 2-1 – 2019-20 bushfire event - Actual expenditure by capex and opex ($M, Real 2017-18)

Expenditure	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Actual opex	-	8.8	0.8	-	-	**9.6**
Actual capex	-	1.0	-	-	-	**1.0**
Total	**-**	**9.8**	**0.8**	**-**	**-**	**10.6**

2.3 Forecast expenditure

Our forecast expenditure between 1 October 2020 and 30 June 2020 is $39.2 million (Real 2017-18). This reflects the incremental expenditure that we expect to incur during this period as a direct result of the 2019-20 bushfires. That is, it represents the incremental costs to our business-as-usual expenditure.

Table 2-2 provides a breakdown of our forecast expenditure between capex and opex.

Table 2-2 – 2019-20 bushfire event - Forecast expenditure by capex and opex ($M, Real 2017-18)

Capex category	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Forecast opex	-	-	11.1	28.1	-	39.2
Total	**-**	**-**	**11.1**	**28.1**	**-**	**39.2**

2.4 Total expenditure

Table 2-3 shows the total incremental expenditure that we have and will incur as a direct result of the 2019-20 bushfires in terms of the nature of the expenditure. In total, we estimate that the total incremental expenditure we expect to incur will be $49.8 million (Real 2017-18).

Table 2-3 – 2019-20 bushfire event - Incremental expenditure by category ($M, Real 2017-18)

Expenditure	2018-19	2019-20	2020-21	2021-22	2022-23	Total	% of total
Opex							
Network safety and restoration	-	7.1	0.5	-	-	**7.5**	**15.1%**
Condition assessment	-	0.9	0.1	-	-	**0.9**	**1.8%**
Network repair	-	0.1	6.5	28.0	-	**34.6**	**69.4%**
Vegetation management and access	-	1.2	5.0	0.1	-	**6.2**	**12.5%**
Avoided costs (vegetation management)	-	(0.4)	(0.1)	(0.0)	-	**(0.5)**	**(1.1)%**
Pass-through Application	-	-	0.1	-	-	**0.1**	**0.2%**
Capex							
Network safety and restoration	-	1.0	-	-	-	**1.0**	**2.1%**
Total	**-**	**9.8**	**11.9**	**28.1**	**-**	**49.8**	**100.0%**

Table 2-4 shows the incremental expenditure that we will incur as a direct result of the 2019-20 bushfires by year and asset type.

Table 2-4 – 2019-20 bushfire event - Incremental expenditure by asset type ($M, Real 2017-18)

Category	2018-19	2019-20	2020-21	2021-22	2022-23	Total	% of total
Opex							
Transmission lines	-	7.5	7.0	28.0	-	**42.5**	**85.4%**
Easements	-	0.9	4.8	0.1	-	**5.8**	**11.6%**
Substations	-	0.2	-	-	-	**0.2**	**0.4%**
Communication and protection	-	0.1	0.0	-	-	**0.1**	**0.2%**
Property	-	0.1	(0.0)	-	-	**0.1**	**0.2%**
Pass-through Application	-	-	0.1	-	-	**0.1**	**0.2%**
Capex							
Transmission lines	-	1.0	-	-	-	**1.0**	**2.1%**
Total	**-**	**9.8**	**11.9**	**28.1**	**-**	**49.8**	**100.0%**

3. Actual expenditure

We incurred an incremental actual expenditure of $10.6 million (Real 2017-18) between 1 July 2019 and 30 September 2020 as a direct result of the 2019-20 bushfires.

3.1 Overview of actual costs incurred

The major activities undertaken to date which form our incremental actual expenditure include:

> prioritising network safety, for which our expenditure is related to making safe our transmission lines and vegetation in our easements that were impacted by the bushfires

> prioritising supply restoration such as needing to provide diesel generators in impacted areas, and

> undertaking inspections, surveys, testing and preliminary designs to determine the extent of the damage to our network and to plan out the remainder of the repair works and to identify further required vegetation management, which together form our forecast expenditure.

Making assets safe by assessing and repairing damage was a key focus. This initially involved the emergency response that was required in the aftermath of the bushfires to make safe transmission lines which had been downed (for example) to allow for highways to be reopened.

We promptly restored supply and transmission services by remediating damage to substations and transmission lines. This included replacing sections of transmission line structures and conductors which had been damaged and/or destroyed by the bushfires. This rectification work ranged from taking several days at some locations to replace destroyed wood poles, to weeks and months where conductors were extensively damaged and required replacement in challenging terrain (such as the completed [redacted] Stage 1 works in the Snowy Mountains).

Supply restoration activities included operational network rearrangements to re-establish supply to customers where it has been lost due to bushfires damaging network elements. Temporary generators were also utilised to maintain auxiliary supplies to TransGrid's impacted switching stations and communications sites allowing the sites to be operational and supply electricity in the immediate aftermath of the bushfires.

This immediate safety and restoration work was followed by condition assessment of bushfire damaged components of the network to inform our forecasts of the ongoing remedial works warranted to ensure that the network can continue to be safely operated.

Vegetation removal and access track clearing was also required in the immediate aftermath of the fires in order to clear access tracks and make access to the impacted transmission lines safe. Initially condition assessment was performed via aerial inspection. Following this, work involved clearing access tracks providing safe access for crews to allow supply restoration and replacement work to take place. Clearing fallen and hazardous trees was a high priority activity in our bushfire emergency response. Extensive amounts of burnt out vegetation that was no longer structurally sound and could impact the transmission lines also required removal for the ongoing safe operation of the network.

Once the initial fire period had abated, efforts turned to scoping all impacted easement areas to understand the scale of activities required to manage fire affected hazard trees that had the potential to impact our network or to create OH&S issues for personnel.

Our incremental actual costs are efficient because we have:

> undertaken our emergency response in line with our internal policies relating to events that present a threat to our business-as-usual activities. These policies include our Corporate Response and Emergency Management Plans (CREMP) and Power System Emergency Response Plan (PSERP).[6]

[6] These policies are described in section 7 of our principal Application.

- only considered and delivered repairs that are required to manage the risk in line with our risk tolerance of As Low As Reasonably Practical (ALARP) in accordance with our Electricity Network Safety Management System (ENSMS)
- undertaken inspections, surveys, testing and preliminary designs to prudently determine the extent of the damage and the risks to the community and to the operation of our assets
- undertaken emergency repair works in cases where the risk of leaving the assets in their current state would not allow us to continue to provide a safe and secure transmission network
- collaborated with others to get the best outcome for customers. For example, we worked with distribution network service providers to access their wood pole stocks which facilitated expedited restoration of a transmission line when access to our pole stocks was cut-off by bushfire, and
- undertaken this work in accordance with our Corrective Maintenance Process – Document No. D2017/01717 (refer section 4.2.2) which forms part of our certified Asset Management System.

3.2 Breakdown of actual costs incurred

Table 3-1 below provides a breakdown of actual expenditure by expenditure type. As noted in Section 2.1, these costs mostly related to network safety and restoration, and vegetation management and access.

Table 3-1 – Actual expenditure by expenditure type ($M, Real 2017-18)

Category	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Opex						
Network safety and restoration	-	7.1	0.5	-	-	**7.5**
Condition assessment	-	0.9	0.1	-	-	**0.9**
Network repair	-	0.1	0.1	-	-	**0.2**
Vegetation management and access	-	1.2	0.2	-	-	**1.4**
Avoided costs (vegetation management)	-	(0.4)	-	-	-	**(0.4)**
Total opex	**-**	**8.8**	**0.8**	**-**	**-**	**9.6**
Capex						
Network safety and restoration	**-**	1.0	-	-	-	**1.0**
Total capex	**-**	**1.0**	**-**	**-**	**-**	**1.0**
Total		**9.8**	**0.8**			**10.6**

We have deducted from our incremental costs, avoided vegetation clearing costs for this regulatory period that would have been incurred had the bushfires not occurred. That is, vegetation clearing costs in locations where the fires have effectively eliminated the encroaching vegetation.

Table 3-2 below shows actual expenditure by cost category. These costs all reflect incremental increases in expenditure as a direct consequence of the 2019-20 NSW bushfire season.

The breakdown of actual costs is as follows:

> outsourced and contracted costs were $3.6 million (or 34 per cent of actual expenditure), representing the largest cost category for actual expenditure

> material plant, equipment and other external expenditure was $3.2 million (or 30 per cent of actual expenditure), representing the second largest cost category

> TransGrid internal labour costs was $2.8 million, with $0.7 million related to overtime and sustenance allowance, and

> capex for transmission line emergency repairs was $1.0 million.

Table 3-2 – Actual expenditure by cost category ($M, Real 2017-18)

Category	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Labour						
Normal time	**-**	0.5	0.1	-	-	**0.6**
Overtime	**-**	0.5	-	-	-	**0.5**
Labour oncost	**-**	0.4	-	-	-	**0.4**
Support costs	**-**	1.0	0.1	-	-	**1.1**
Sustenance allowances	**-**	0.2	-	-	-	**0.2**
Total Labour	**-**	2.6	0.2	-	-	**2.8**
Outsourced and contracted	**-**	3.3	0.3	-	-	**3.6**
Materials, plant, equipment and other expenses	**-**	2.8	0.4	-	-	**3.2**
Capex	**-**	1.0	-	-	-	**1.0**
Total	**-**	**9.8**	**0.8**	**-**	**-**	**10.6**

4. Forecast transmission lines expenditure

This chapter explains our expenditure forecast for repairs to our transmission lines that were damaged in the 2019-20 NSW bushfire season. The bulk of these repairs relate to damaged conductors in the Snowy Mountains region.

4.1 Nature and scope

Operating a safe, reliable and efficient transmission network is at the heart of what we do. The 2019-20 NSW bushfires resulted in considerable damage to our transmission line assets which has compromised the safety and condition of the sections of the transmission network affected.

Transmission line assets form the bulk of our damaged infrastructure given the proximity and exposure of this asset class to the 2019-20 bushfires across NSW. Our transmission line assets within the active bushfire-impacted zones included 999km of transmission line route length (9 per cent of our network) and 2,681 transmission line structures comprising 1,822 steel lattice tower and pole structures, 596 wood poles structures and 263 concrete structures.

The types of work required to undertake repairs in relation to our transmission lines involves:

> repairing and restringing damaged conductors and earth-wires

> replacing broken disc insulators

> replacing heat-compromised composite insulators

> repairing and replacing burnt-out wood poles

> repairs to joints and fitting

> replacing melted spiral vibration dampers, and

> replacing melted aerial marker balls.

If these works are not undertaken now, there is a substantial uncertain safety risk to the general public in the vicinity of the affected sections of these lines, and to our workers maintaining these transmission lines. For example, damaged aerial marker balls increase the risk of third parties making contact with our lines. Further, melted vibration dampers, annealed conductors and damaged joints increase the risk of mechanical failure or clearance breaches of the conductors.

The detailed scope of works for each of the significantly affected transmission lines in the Snowy Mountains region is presented below. This work is required to address the damage, otherwise if left unaddressed, this could lead to asset failure and safety risks.

4.2 Approach to determining expenditure

4.2.1 Ensuring that expenditure is prudent and efficient

Key elements of the approach used by us in preparing the scope of works used to forecast the 2019-20 bushfires rectification expenditures are as follows:

> we have identified the required network repair works necessary to continue to manage network safety risk to be below tolerance levels, or ‘As Low As Reasonably Practical’ (ALARP), consistent with our Electricity Network Safety Management System (ENSMS). This governance process is the same as our business-as-usual governance processes applied to our Prescribed Expenditure

- we have only considered the least lifecycle cost works needed to return the assets to an acceptable condition. For example, only the affected phases will be replaced rather than all the phases
- we have only included works where the risk of leaving the asset in its current state would compromise the safety or performance of the transmission network within the timeframe of the current regulatory control period. That is, damage which has been deemed non-urgent will continue to be monitored by TransGrid rather than repaired
- we have excluded from the scope any opportunistic replacement and maintenance activities where prudent. That is, the scopes of work only include activities for addressing damage directly caused by the 2019-20 NSW bushfires event, and
- we have based our forecast costs on what we believe is the best approach, using the best available information we had at the time of preparing this Application.

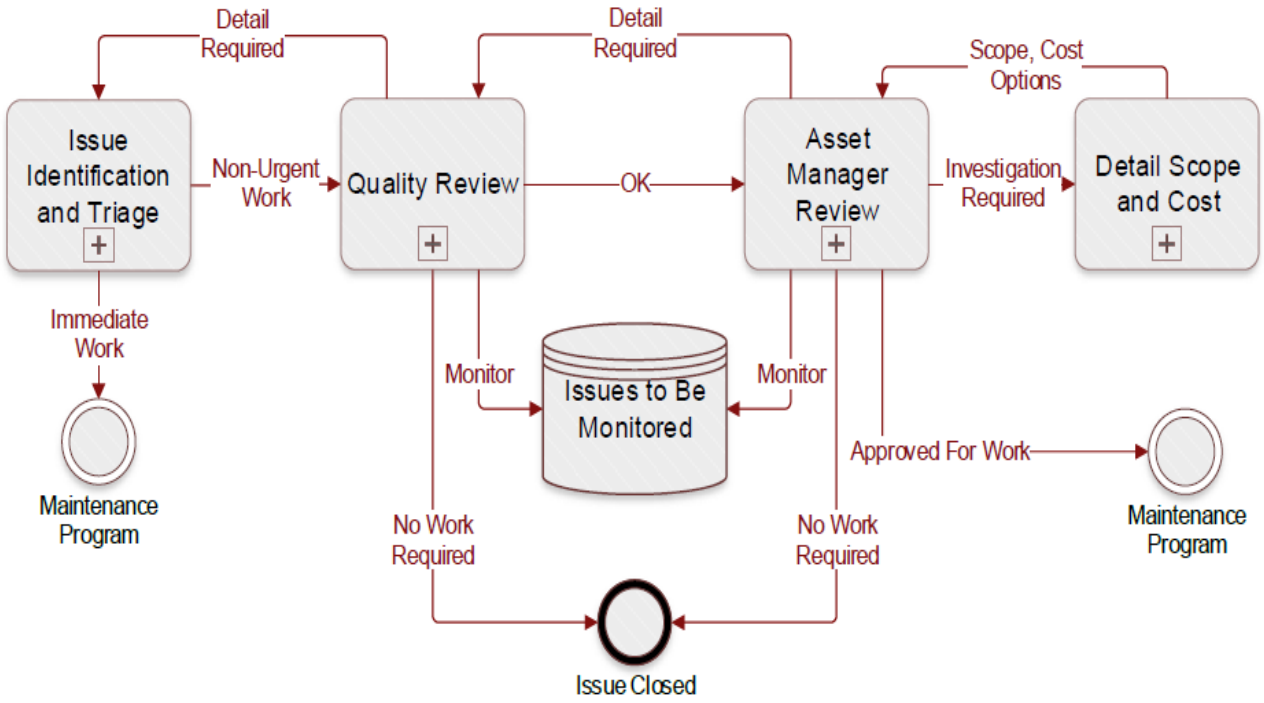
4.2.2 Identifying the required corrective work program

The process used for quantifying the forecast costs for the 2019-20 Bushfires event is the same as our business-as-usual cost estimation and governance processes applied to our Prescribed Expenditure. Our key supporting documents detailing this governance framework that are relevant to the assets that were damaged by the 2019-20 Bushfires include:

- Corrective Maintenance Process – Document No. D2017/01717
- Maintenance Plan – Transmission Line Assets - Document No. D2014/16598, and
- Maintenance Plan – Easement and Access Tracks - Document No. D2003/2398

Our Corrective Maintenance Process defines the governance arrangements and processes in place to identify, assess, review, scope and approve corrective actions to address a defect issue. This process is summarised below and has been applied to identifying and costing the scope of works for the 2019-20 Bushfires repairs.

Figure 1 – Corrective Maintenance Process



4.2.3 Establishing the forward efficient cost of the work program

The majority of our bushfire forecast costs for transmission line remediation works are based either on costs from similar recent works in similar terrain, or on existing competitively sourced panel contractor rates. Each of the components of the costs for transmission lines are discussed in further detail below.

4.2.3.1 Internal labour costs

The internal labour hours assume TransGrid will assume the role of Principal Contractor for the works and it is assumed that the delivery approach will be a combination of internal and contract labour, plant, and equipment.

Project and site management is based on resourcing required to manage works under our Health, Safety and Environment and technical procedures/guidelines as Principal Contractor which has informed our internal labour, sourced from our database.

Due to recall requirements on the transmission lines (switchers on hand), multiple work fronts where work on the transmission lines will require Field Access Authorities (TransGrid authorised personnel have to isolate, prove dead and implement earthing to ensure safety of workers), and our Principal contractor obligations, a number of resources have to be internal resources which have been included in the forecast. These are estimated based on the optimal program possible within the outage, terrain and safe works delivery constraints and objectives, noting detailed stakeholder and market assessments will need to be undertaken to secure outages.

4.2.3.2 Contracted labour and equipment

Contracted labour and equipment for delivery of the work and site establishment costs for transmission line repairs are based on the recent actual costs for the [redacted] bushfire remediation works, sourced from one of our panel contractors, who completed [redacted] Stage 1 repairs earlier in 2020. Rates are reflective of recent works completed in the Snowy Mountains area and are representative of the terrain, outage and ground/access conditions expected on the transmission lines requiring further works. These rates are considered by our estimation team as more reflective than utilising indicative database rates (not derived from works in this remote site geography).

Contract labour includes costs of personnel (other than our employees) that are directly involved in the delivery of the bushfires repair works. Examples of this include personnel from our design and construction contractors, and our vegetation management contractors. We have used panel contract rates (competitively market tested) for contract labour based on our panel contractors that have the capability and availability to be able to deliver the works. Contract labour is based on actuals incurred from our contractor in the [redacted] Stage 1 similar work for an average weekly rate.

Contract labour also includes labour that would otherwise be performed by our employees, but for the fact that there are insufficient internal resources to undertake the work, requiring the need to engage contractors. This only includes those activities where there are suitably trained contractors available to undertake the works, such as certain on-site activities. Activities that only our staff can do (including network switching, de-energising and making safe the transmission lines before they are worked on by the contractor), and activities for which we have available internal resources, instead have costs allocated to our internal labour.

Internal labour outsourced to contractors has been forecast based on the same method used for internal labour - based on the resource type required for the activity subcontracted, the estimated hours to undertake the task, and applying our internal labour rates.

4.2.3.3 Transmission line materials

Transmission line materials including fittings, insulators and conductor costs were derived from recent overhead/earth-wire upgrade projects, [redacted] Stage 1 invoiced costs, and TransGrid Stores Inventory pricing from our Ellipse inventory management system (average cost for previous purchase order history).

[redacted] Stage 1 costs for the specialised Jarrah conductor, which is utilised for high altitude alpine lines, were used. Rates for the replacement twin Bison lines were derived utilising the metric equivalent Mango rates sourced from historic TransGrid Stores orders/inventory pricing. Conductor replacement quantities are based

on single and twin conductor replacements depending on the transmission line configuration on the spans that need replacement, and based on span information sourced from existing as-built design line schedules.

Replacement quantities take into account route length and a factor allowance for conductor sag, tension arrangements for termination, distances to winch and brake sites for setup, wastage on drums and through winch bull wheels.

4.2.3.4 Access and track work allowance

Access and track work allowances are based on a lump sum allowance per kilometre of remediation work with the applicable unit rate from our internal estimating database (Success) system based on Tier 1 contractor rates depending on the nature and difficulty of the terrain. This access work is required to facilitate heavy machinery access to the work sites.

Due to the nature of the works and limited access, we have relied heavily on [redacted] Stage 1 works and desktop assessments. All of the lines are in the proximity of Lower and Upper Tumut substations and are located in the Snowy Mountains with similar terrain. [redacted]

4.2.3.5 Stone (gravel) costs

Stone (gravel) costs for track repair was informed by the costs incurred for [redacted] Stage 1 works based on the stone prices per tonne from the local quarry. Our network transmission line assets from our Asset Information Systems were overlaid on Google geospatial mapping to identify distances.

An engineering assessment of access track information available, factoring in terrain and vegetation surrounding the work sites was undertaken. From this a build-up of work scope was derived yielding likely quantum of access track works, and construction pad/bench requirements to facilitate heavy vehicle access and safe worksite setup.

4.2.3.6 Pad costs

Pad costs were derived utilising recent competitively sourced market rates on other outsourced Schedule of Rates contracts for similar terrain types, in conjunction with the engineering assessment for the EWP, crane, and winch sites nominated.

4.2.3.7 Site works costs

The site works required was assessed and a schedule prepared of activities to implement the remediation works for each transmission line. This included assessment of Safety and Environmental and access constraints (terrain, slopes, etc), termination structure locations and optimal pulling locations (premised on existing tension and termination structures), to optimise delivery of works in the safest manner with minimal impact to earth works, and the shortest duration of outages.

We assessed all access tracks, pad and stringing equipment locations and calculated the extent of bench work and remediation of tracks required to deploy equipment and resources for the works. The volume of earthworks for pads and track remediation in distance as well as volumes of stone materials was assessed in this manner. Aerial imagery was also used as a validation process to confirm the condition of track and vegetation locally surrounding the structures post the bushfire damage.

4.2.3.8 Summary of costing approach

In costing these components,

- The same method has been applied for the forecast costing of each transmission line
- [redacted] actual costs from Stage 1 were used whenever possible because the scope and geography of this recent project reflects the nature of the work on all the other major transmission lines affected
- We have used panel contract rates (competitively market tested) for contract labour based on our panel contractors that have the capability and availability to be able to deliver the works

- Due to the bespoke and unique nature of the works and its geography, we have only sourced costs from our Success Estimating system where there was no actual costs or contract costs to draw from
- Where access was limited due to snow cover, difficult terrain, dangerous trees and damaged access tracks, we used Google mapping geospatial asset overlays and post fire aerial photography of the damage to confirm the construction methodology and design, to inform the volumes for transmission line repairs. This information was overlaid onto our Asset Information Systems (geospatial information) for each of the transmission lines with an engineering assessment to confirm the scope and assumptions (such as confirming conductor pull lengths, the types of pads needed in each application, and results from the aerial photography of the damaged conductors and components)
- We have considered safety, environmental and access constraints (terrain, slopes, etc), termination and optimal pulling locations (premised on tension and termination structures), to optimise delivery of works in the safest manner with minimal impact to earth works and the shortest duration of outages. Climate considerations were also factored into the program as the worksites are highly affected by winter weather, inclusive of snow loading, and
- Consideration was given to the likely outage restrictions, as the affected lines are tied to Snowy Hydro generators, and heavily market constraining transmission lines. Therefore, work needs to be scheduled appropriately to manage the complexity around the delivery of the works, stability of the network and impact on generation availability and demand.

4.3 Risk costs

A risk assessment for repairing bushfire related damages has been undertaken to consider the issues that could pose a risk to the delivery of the project. For each risk, we consider:

- the likelihood of the risk occurring, which is based on whether the risk has historically occurred for projects involving similar types of work, and
- the cost consequence if the risk occurs, which is based on the expected increase in costs under the best, most likely and worst case scenario.

The likelihood of the risk occurring and the expected cost consequence if the risk occurs allows us to calculate the expected risk costs. Our capex forecasts (without risk costs) assume that these risks do not occur. In other words, our capex forecast plus the expected risk costs represent the expected costs we are likely to incur for this project.

Risk information was assessed as per our standard risk register for delivery of similar projects and individually assessed for each project. Risk costs have been derived utilising actual risk costs from previous projects, inclusive of [redacted] Stage 1 which is in the same geographical location.

The purpose of our Risk Register is to track project risks throughout the entire life of a project. It also provides a source for reporting on Project and Portfolio Risks across the business, and to support the Corporate Project Risk Procedure. It is used for calculating risk costs for project cost estimating purposes. Table 4-1 below provides further explanation of how risk costs are calculated, using weather delay risk for [redacted] as an example.

Table 4-1 – How we have calculated risk costs

Input	Description	2019-20
Likelihood of risk occurring	This represents the likelihood that a risk occurs. If a risk does not occur, then the expected incremental cost is zero.	Likelihood of weather delay risks for [redacted] have been derived using historical Bureau of Meteorology local weather station data for the time of the year in spring when work is expected to be undertaken. Based on this, we estimate that the likelihood of a weather event that could cause at least one delay is [redacted].

Input	Description	2019-20
Best-case scenario	This represents the situation where the risk occurs but has a worst reasonable cost impact.	[redacted], which is based on [redacted] days of delays.
Most likely case scenario	This represents the situation where the risk occurs and results in the most likely cost impact.	[redacted], which is based on around [redacted] days of delays.
Worse-case scenario	This represents the situation where the risk occurs and has a maximum cost impact.	[redacted] which is based on around [redacted] days of delays.
Expected costs if risk occurs	This is calculated assuming that there is a triangular distribution of cost outcomes, where: > the best-case scenario is the lower limit > the worse-case scenario is the upper limit, and > the most likely scenario is the mode.	[redacted]
Risk costs	The P50 risk cost is calculated as the likelihood of risk occurring multiplied by expected costs if risk occurs.	[redacted]

We have elected to quantify expected risk costs that are material to the project and add them to the base cost of the project rather than inflate the contractor costs (which would occur if we asked our contractors to absorb the risk). Based on our past experience, this has been the most efficient way to manage project risk.

4.4 Risks identified and quantified

We have identified and quantified the following risks:

> weather delay

> track condition uncertainty

> high content of hard rock

> external delays and restrictions

> costs of increased material risks

> pandemic risk (COVID-19)

> damaged OPGW on line

> networks access and outage restriction

4.4.1 Weather delay

Weather risk costs were derived using historic average statistics sourced from Bureau of Meteorology data (based on the relevant localised weather stations) for each month over the duration of the works using the project schedule. An assessment of the impact of weather was undertaken, identifying the works would be highly impacted by wet weather and wind events for the duration of access and stringing works. Both project

fixed costs and unit rate costs were utilised to derive the average daily running cost of the project and from this the impact cost was derived.

4.4.2 Track condition uncertainty

Access risk costs were calculated using an access assessment utilising the information from the geospatial and aerial photography. The program of delivery in conjunction with the inability to undertake detailed site assessment was factored into the assessment of risk and variability of the access scope. Quantum for access works based on the geography and terrain encountered on [redacted] Stage 1 were utilised as a basis for the engineering assessment.

4.4.3 High content of hard rock

Risk costs for rock encountered at Pad sites is included due to the absence of known geotechnical investigations. Engineering assessment and material encountered during the [redacted] Stage 1 works were utilised to inform the assessment.

4.4.4 External delays and restrictions

Risk costs for major stakeholder delays has been considered due to National Parks having been assessed as a major stakeholder for approval for access, and remediation works. From previous projects undertaken in National Parks, additional works can be requested to remediate the worksites as well as removal of Pads installed and potential offset planting to meeting the requirements of environmental approval.

4.4.5 Costs of increased material risks

Material cost variance risk was included with the basis for the sourcing of material subject to market constraints as well as to variability in the Australian dollar for transmission line components. Quantities of material for earthworks/access have also been assessed based on desktop engineering assessment as detailed site scoping was unable to be carried out due to snow cover on the ground.

4.4.6 Pandemic risk

Small risk costs have been assigned to mitigate the risk of isolation of employees due to COVID-19. It is assumed employees can be substituted with other employees if this risk materialises.

4.4.7 Damaged OPGW on line

The extent of the damage on the optic-fibre ground wire (OPGW) may be identified to be more significant once repair works are undertaken. A risk cost has been included for this where appropriate.

4.4.8 Networks access and outage restriction

Some lines are more difficult to schedule outages for undertaking planned works than others. A risk cost has been included for delays caused by cancelled or rescheduled outages.

4.5 Forecasting cost accuracy

We have developed the forecast cost estimates in a very careful and thorough manner, using the forecasting approach described above, with a view to providing a high degree of accuracy and reliability.

Key elements in the method we have used in the build-up of its forecast costs for the pass-through application and their accuracy include:

- works covered by the emergency activities are captured in our actual costs
- where works have been undertaken up until end of September 2020, we have used actual costs rather than forecast costs
- costs have been derived from similar recently delivered programs and projects
- no project or management contingency amounts are included in the base cost estimates

- labour includes contract labour costs, our incremental normal-time internal labour, our overtime and associated on-costs (sustenance and support costs), and
- risk costs[7] to achieve a balanced ±25% accuracy for each activity, with a net aggregate accuracy variance of 3%.

In June 2017, Energy Market Consulting Associates (EMCa) published a report for the AER titled "*Review of aspects of TransGrid's forecast capital expenditure*"[8]. In this report EMCa did not observe any material issues in the information they reviewed regarding our network cost estimating methodology. In testing the ±25% accuracy per activity, the variance across the aggregate of activities was -3% from the original estimates, and this was sufficient for EMCa to conclude that, in aggregate, the cost estimates are likely to be reasonable.

We had previously commissioned Evans & Peck to review and test our cost estimation process and found it to be "in accordance with what they consider best practice estimating". We have maintained this current practice since this time, supported by annual database updates and specific project blind costing by independent engineering consultants to ensure ongoing accuracy.

4.6 Timing and deliverability

The bulk of the value of work is captured in our forecast costs and applies to activities that are planned in the years up to and including 2022-23. This is the time period required to be able to realistically deliver activities to address the extent of the damage found. The planned program for transmission lines is shown below.

Table 4-2 – Bushfire damage outage plan (transmission line anticipated outage plans)

Line	Outage Details	Spring 20	Summer 20/21	Autumn 21	Winter 21	Spring 21	Summer 21/22	Autumn 22	Winter 22	Spring 22
[redacted]	Weekly continuous Mon-Sat. 48hr recall	4 weeks	4 weeks				6 weeks			
[redacted]	Weekly continuous Mon-Sat. 48hr recall			10 weeks						
[redacted]	Weekly continuous Mon-Sat. 48hr recall			4 weeks						
[redacted]	Weekly continuous Mon-Sat. 48hr recall					14.5 weeks				
[redacted]	Weekly continuous Mon-Sat. 48hr recall							3 weeks		

[7] Risk costs include provision for inclement weather, networks access restrictions, unforeseen environmental and cultural heritage requirements, geotechnical uncertainty around rock or unstable ground, and uncertainty around remote working.

[8] https://www.aer.gov.au/system/files/EMCa%20-%20Review%20of%20aspects%20of%20TransGrid%20s%20forecast%20capital%20expenditure%20-%20June%202017.PDF

Line	Outage Details	Spring 20	Summer 20/21	Autumn 21	Winter 21	Spring 21	Summer 21/22	Autumn 22	Winter 22	Spring 22
[redacted]	Weekly continuous Mon-Sat. 48hr recall							4 weeks		
[redacted]	Weekly continuous Mon-Sat. 48hr recall							5 weeks		
[redacted]	Weekly continuous Mon-Sat. 8hr recall			1 week						
[redacted]	Weekly continuous Mon-Sat. 8hr recall			1 week						

Where delivery is likely to significantly impact the operation of the NEM, or access to sites is limited by environmental conditions (such as snow in the alpine regions), works are scheduled in the shoulder periods where demand is considered likely lower. This is a preliminary outage sequencing and is subject to operations and stakeholder requirements as the lines are generation feeds.

The delivery models that we historically utilise includes alliance, early contractor involvement, design and construction, external construction, and internal delivery. Due to the nature of the works and requirement for TransGrid to be Principal Contractor an internal delivery model utilising internal and outsourced labour and equipment has been estimated. We have mature processes for developing, executing and monitoring project and program implementation against KPIs (including volume versus expenditure). We have in place a governance structure for monitoring on a monthly basis to ensure efficient and timely delivery of the works program.

4.7 Forecast expenditure for [redacted]

4.7.1 Forecasting methodology and assumptions

The method used for forecasting the costs to repair transmission line [redacted] is based on unitised costs (i.e. identified volumes * unit rates), built up in accordance with our standard cost estimation process.

Volumes have been identified through inspection and condition assessments and assessed as being suitable for repair through our Corrective Maintenance Process governance arrangements. This includes inputs from sources such as the:

> Asset Manager List of Workorders based on engineering condition assessments

> Post bushfire aerial photography of the defects

> Spatial Information, and

> Asset drawings and records, such as line schedules.

Where detailed site scoping was unable to be performed due to extensive snow cover in the winter limiting safe access to sites, costs have been derived from desktop assessment.

Unit rates for this transmission line have been modelled utilising unit rates from previous projects and contracts and hire rates for equipment.

4.7.2 Summary of Damage

Following the 2019-20 Bushfires, a significant number of spans on [redacted] have been identified with loose/broken conductor stranding, discoloration, and bird-caging. Defects are present on some phase spans as shown below. Highest priority defects are scheduled to be rectified within 3 months, with others within 12 months.

Table 4-3 – Bushfire damage summary [redacted]

Date Identified	Line	Span	Phase	Distance Along [9]Span (m)	Anomaly Category	Date Raised	Priority (Months)
14/05/2020	[redacted]	[redacted]	M	62	Multiple loose strands	17/07/2020	< 12
14/05/2020	[redacted]	[redacted]	M	61	Multiple loose strands	17/07/2020	< 12
14/05/2020	[redacted]	[redacted]	R	298	Loose strand minor	17/07/2020	< 12
06/05/2020	[redacted]	[redacted]	L	297	Loose strand major	18/07/2020	< 12
07/05/2020	[redacted]	[redacted]	R	137	Bulging	18/07/2020	< 3
07/05/2020	[redacted]	[redacted]	R	489	Conductor unwrap	17/07/2020	< 3
07/05/2020	[redacted]	[redacted]	R	128	Loose strand major and Discolouration	18/07/2020	< 12
07/05/2020	[redacted]	[redacted]	R	35	Multiple loose strands	18/07/2020	< 12
14/05/2020	[redacted]	[redacted]	M	93	Multiple loose strands	17/07/2020	< 12
06/05/2020	[redacted]	[redacted]	L	101	Conductor unwrap	18/07/2020	< 3
06/05/2020	[redacted]	[redacted]	M	20	Conductor unwrap	18/07/2020	< 3
06/05/2020	[redacted]	[redacted]	M	64	Caging	17/07/2020	< 12
14/05/2020	[redacted]	[redacted]	M	26	Multiple loose strands	17/07/2020	< 12
06/05/2020	[redacted]	[redacted]	L	333	Multiple loose strands	18/07/2020	< 12
06/05/2020	[redacted]	[redacted]	L	283	Multiple loose strands	18/07/2020	< 12
07/05/2020	[redacted]	[redacted]	L	137	Bulging	18/07/2020	< 3

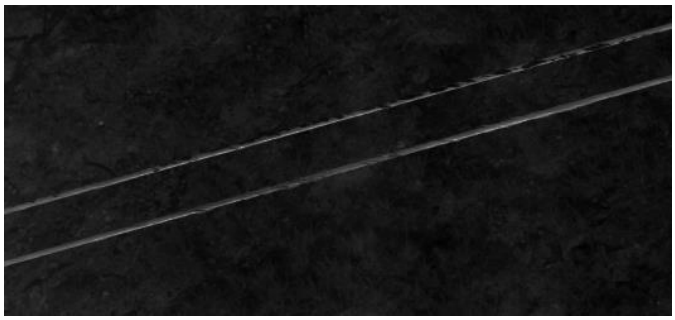
[9] The distances of the visible damage from the nearest tower. Conductor replacement is required for multiple spans due to annealing.

Date Identified	Line	Span	Phase	Distance Along [9]Span (m)	Anomaly Category	Date Raised	Priority (Months)
07/05/2020	[redacted]	[redacted]	L	7	Loose strand minor	18/07/2020	< 3
14/05/2020	[redacted]	[redacted]	L	102	Loose strand minor	17/07/2020	< 12

Utilising the results of metallurgical testing, work is required to address the damage which includes rectifying confirmed aluminium conductor annealing which has compromised the mechanical strength of the conductor. If left unaddressed, the compromised condition of the transmission line could, in the worst case, lead to failure.

Figures 2 – [redacted] Damaged sections and associated access

[redacted], RHS PHz Conductor Fire Damage



[redacted], LHS PHz Conductor Fire Damage

Locality Map of Damaged Area for [redacted]

Pad at Structure 51, no access track present, typical incline of terrain across most of the sites – heavy forest surroundings

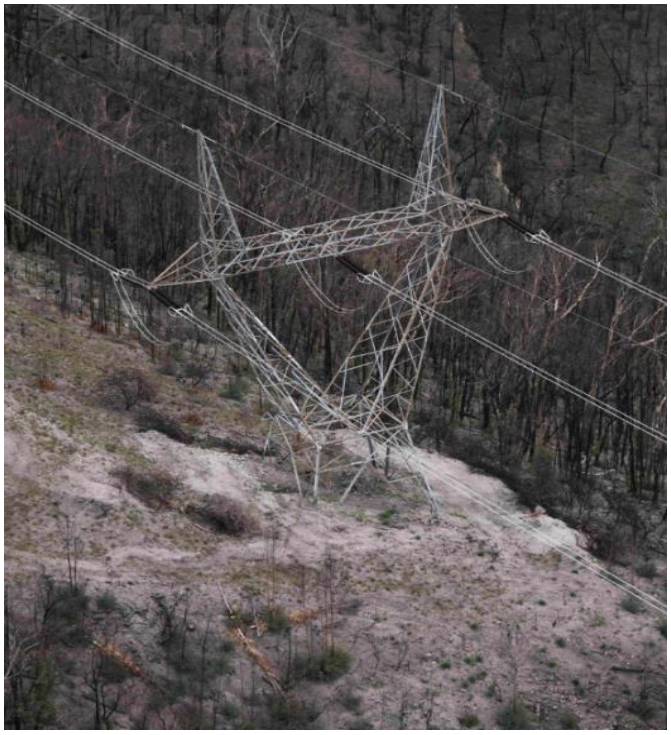
Typical side view showing in green Pad sites for winches and access issues

Pull from Structures 79-83, showing remoteness of sites

[redacted] Structure 41, looking at 42. Noting access limited / non-existent to Structure 41 for 4WD or heavy vehicle

[redacted] Structure 39 towards 40, limited 4WD access

[redacted] Structure 44 towards 45, limited 4WD access



[redacted] Structure 69 looking towards 68, Extreme access required

4.7.3 Scope of Repair Work

Costs to restring selective sections of the transmission line were identified for only the phases affected. The specific scope for [redacted] includes:

- structure 6-15: 2.3km, Replace Middle and Right Phase only
- structure 6-9: 0.6km, Replace Left Phase only
- structure 38-44: 2km, Replace Right and Left Phase only
- structure 68-72: 1.3km, Replace Left and Middle Phase only
- structure 79-83: 1.5km, Replace Middle Phase only
- structure 83-96: 4.3km, Replace Left Phase only
- structure 96-108: 4.5km, Replace Left Phase only
- structure 170-179: 3.3km, Replace Left Phase only

Conductor requirements for Mango to replace the existing damaged Bison conductors are based on twin bundles, and replacement of Jarrah is based on single configuration. The conductor lengths are calculated using the route length with allowance for conductor sag, waste, and tension arrangement jumpers: 1.3 (for sag) x no. of phases replaced x route length x 2 (for Mango, 1 for Jarrah).

4.7.4 Material Costs

Based on an engineering technical assessment of the identified damage and scope of repair works detailed above, the following volumes have been estimated to complete the repair works.

Combined with the unit rates from previous projects and contracts, the expected material costs for transmission line [redacted] (unitised and non-unitised) are as follows:

Table 4-4 – Unitised and Non-Unitised Costs [redacted]

Material Costs - [redacted]	Volume	Unit Cost	Total
Unitised Costs			
Conductor Twin Bison/Mango	[redacted]	[redacted]	[redacted]
Conductor Single Jarrah	[redacted]	[redacted]	[redacted]
Insulators	[redacted]	[redacted]	[redacted]
Insulators	[redacted]	[redacted]	[redacted]
Fittings	[redacted]	[redacted]	[redacted]
Pad setups - EWP	[redacted]	[redacted]	[redacted]
Pad setup - Winch	[redacted]	[redacted]	[redacted]
Creek Crossing	[redacted]	[redacted]	[redacted]
Gravel	[redacted]	[redacted]	[redacted]
Total			[redacted]
Non-Unitised Costs			
Nil			[redacted]

Material Costs - [redacted]	Volume	Unit Cost	Total
Total (Real $2020-21)			[redacted]
Total (Real $2017-18)			[redacted]

4.7.5 Labour Cost

Based on an engineering technical assessment of the scope of repair works and the volume of materials required to be installed as detailed above, the following timeframes and distances have been estimated to complete the repair works. Combined with the unit rates for the onsite work activities (e.g. project management, installation, mobilisation, testing, commissioning etc.), the expected labour costs for transmission line [redacted] are as follows:

Table 4-5 – Labour Cost [redacted]

Labour Costs - [redacted]	Volume	Unit Cost	Total
Contractor Costs			
Contract Labour	[redacted]	[redacted]	[redacted]
Medium Track and Access Work	[redacted]	[redacted]	[redacted]
Heavy Track and Access Work	[redacted]	[redacted]	[redacted]
Establishment cost per week (remote etc)	[redacted]	[redacted]	[redacted]
Total contractor costs			[redacted]
Internal and Outsourced Labour Cost			
Internal Normal Labour			[redacted]
Contracted Out Internal Labour			[redacted]
Internal Overtime Labour, Sustenance, and Expenses			[redacted]
Total labour costs			[redacted]
Total (Real $2020-21)			[redacted]
Total (Real $2017-18)			[redacted]

[redacted] is in a very remote area of our transmission network and access to site is difficult and requires lengthy daily mobilisation from assumed accommodation and 6 day working week. We therefore expect a significant amount of overtime being required for this site as illustrated in the table above in order to maintain daily productivity. Refer to our A.5 Expenditure Forecasting Model for the bottom-up build of internal labour.

4.7.6 Estimated risk costs for [redacted]

The table below shows the assumptions used to calculate the risk costs for each of the cost categories identified and, the expected risk costs for transmission line [redacted].

Table 4-6 – Risk Cost [redacted]

Risk Costs [redacted]	Likelihood	Best	Likely	Worst	Total
Weather delay	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Risk Costs [redacted]	Likelihood	Best	Likely	Worst	Total
Track condition uncertainty	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
High content of hard rock	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
External delays / restrictions	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Cost increase in materials risk	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pandemic (COVID-19) risk	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total (Real $2020-21)					[redacted]
Total (Real $2017-18)					[redacted]

4.7.7 Total Cost

Combining the labour, materials and risk costs of the repair works for [redacted], the expected total cost for transmission line [redacted] is as follows:

Table 4-7 – Bushfire damage total costing [redacted]

Cost Estimation Model - [redacted]	Total
Labour Cost	
Contractor Costs	[redacted]
Outsourced Labour	[redacted]
Internal Normal Labour	[redacted]
Internal Overtime Labour, Sustenance, and Expenses	[redacted]
Total	[redacted]
Materials	
Unitised Costs	[redacted]
Non Unitised	[redacted]
Total	[redacted]
Risk Cost	[redacted]
Direct Cost (excludes internal labour and risk)	[redacted]
Total Expected Cost (Real $2020-21)	**$10,785,062**
Total Expected Cost (Real $2017-18)	**$10,398,323**

4.8 Forecast expenditure for [redacted]

4.8.1 Forecasting methodology and assumptions

The same method and assumptions have been applied for the forecast costing of each transmission line. Refer to section 4.7.1 for information for more details.

4.8.2 Summary of Damage

Following the 2019-20 Bushfires, a significant number of spans on [redacted] have been identified with, or a combination of loose/broken conductor stranding, discoloration, and bird-caging. Defects are present on some phase and some earth-wire spans as listed below.

Table 4-8 – Bushfire damage summary [redacted]

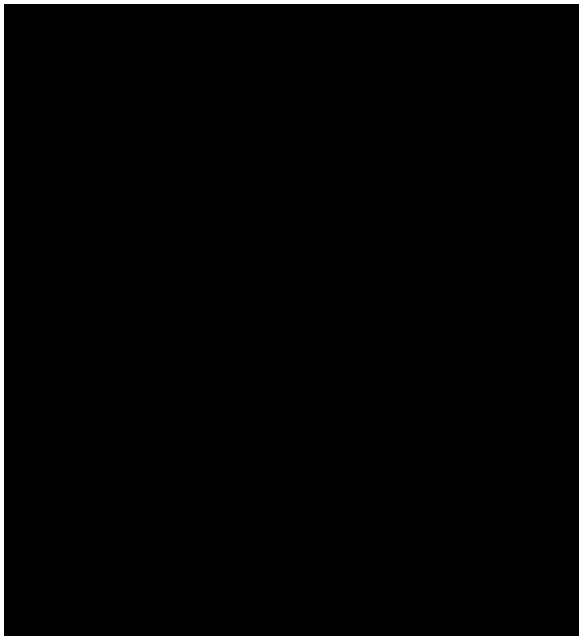
Date Identified	Line	Span	Phase	Distance Along Span (m)	Anomaly Category	Date Raised	Priority (Months)
08/05/2020	[redacted]	[redacted]	BR	196	Multiple loose strands	17/07/2020	< 12
08/05/2020	[redacted]	[redacted]	BL	108	Conductor unwrap	17/07/2020	< 3
08/05/2020	[redacted]	[redacted]	MR	8	Loose strand minor	17/07/2020	< 12
07/05/2020	[redacted]	[redacted]	BR	144	Multiple loose strands	17/07/2020	< 12
08/05/2020	[redacted]	[redacted]	ML	109	Multiple loose strands	17/07/2020	< 3
07/05/2020	[redacted]	[redacted]	BR	184	Loose strand major	17/07/2020	< 12
08/05/2020	[redacted]	[redacted]	ER	286	Loose strand major	17/07/2020	< 12
07/05/2020	[redacted]	[redacted]	M	860	Major loose strand	17/07/2020	< 12
07/05/2020	[redacted]	[redacted]	R	896	Conductor unwrap	17/07/2020	< 3
07/05/2020	[redacted]	[redacted]	L	86	Multiple loose strands	17/07/2020	< 12
07/05/2020	[redacted]	[redacted]	M	166	Conductor unwrap	16/07/2020	< 3
07/05/2020	[redacted]	[redacted]	R	111	Multiple loose strands	16/07/2002	< 12
07/05/2020	[redacted]	[redacted]	M	47	Conductor unwrap	16/07/2020	< 3
07/05/2020	[redacted]	[redacted]	R	40	Multiple loose strands	16/07/2020	< 12
07/05/2020	[redacted]	[redacted]	L	145	Multiple loose strands	17/07/2020	< 12
07/05/2020	[redacted]	[redacted]	M	56	Loose strand major	17/07/2020	< 12
08/05/2020	[redacted]	[redacted]	BL	277	Conductor unwrap	17/07/2020	< 3
07/05/2020	[redacted]	[redacted]	BR	274	Multiple loose strands	17/07/2020	< 12

Utilising the results of metallurgical testing, work is required to address the damage which includes rectifying confirmed aluminium conductor annealing which has compromised the mechanical strength of the conductor. If left unaddressed, the compromised condition of the transmission line could lead to, in the worst case, failure.

Figures 3 – [redacted] Damaged sections and associated access

[redacted], MLS PHz Multiple Loose Strands

[redacted], RHS PHz Conductor Unwrap



Locality Map of Damaged Area for [redacted]

Stringing from Structure 7-16, typical incline of terrain across most of the sites – heavy forest surroundings

[redacted] Structure 7 towards 8, Pad required

Structure 12 towards 13, Pad required

Structure 45 towards 46, Pad required

4.8.3 Scope of Repair Work

Costs to restring selective sections of the transmission line were identified for only the phases affected. The specific scope for [redacted] includes:

- structure 7-16: Replace 2.7km, Bottom and Middle Phase only (dual circuit)
- structure 12-16: Replace 1km, Earth-wire / OPGW only
- structure 35-41: Replace 2.3km, Bottom and Middle Phase (dual circuit)
- structure 44-60: Replace 6.67km, All Phase Conductors

Conductor requirements for Mango to replace the existing damaged Bison conductors are based on twin bundles, and replacement of OHEW is based on single configuration. The conductor lengths are calculated using the route length with allowance for conductor sag, waste, and tension arrangement jumpers: 1.3 (for sag) x no. of phases replaced x route length x 2 (for Mango, 1 for OHEW).

4.8.4 Material Costs

Based on an engineering technical assessment of the identified damage and scope of repair works detailed above, the following volumes have been estimated to complete the repair works.

Combined with the unit rates from previous projects and contracts, the expected material costs for transmission line [redacted] (unitised and non-unitised) are as follows:

Table 4-9 – Unitised and Non-Unitised Costs [redacted]

Material Costs - [redacted]	Volume	Unit Cost	Total
Unitised Costs			
Conductor Twin Bison/Mango	[redacted]	[redacted]	[redacted]
Conductor OHEW Single 7/0.144	[redacted]	[redacted]	[redacted]
Sag and clip-in materials 228-off Insulator Dead-ends	[redacted]	[redacted]	[redacted]
Pad setups - EWP	[redacted]	[redacted]	[redacted]
Pad setup - Winch	[redacted]	[redacted]	[redacted]
Total			[redacted]
Non-Unitised Costs			
Nil			[redacted]

Material Costs - [redacted]	Volume	Unit Cost	Total
Total (Real $2020-21)			[redacted]
Total (Real $2017-18)			[redacted]

4.8.5 Labour Cost

Based on an engineering technical assessment of the scope of repair works and the volume of materials required to be installed as detailed above, the following timeframes and distances have been estimated to complete the repair works. Combined with the unit rates for the onsite work activities (e.g. project management, installation, mobilisation, testing, commissioning etc.), the expected labour costs for transmission line [redacted] are as follows:

Table 4-10 – Labour Cost [redacted]

Labour Costs - [redacted]	Volume	Unit Cost	Total
Contractor Costs			
Contract Labour	[redacted]	[redacted]	[redacted]
Medium Track and Access Work	[redacted]	[redacted]	[redacted]
Establishment cost per week (remote etc)	[redacted]	[redacted]	[redacted]
Total contractor costs			[redacted]
Internal and Outsourced Labour Cost			
Internal Normal Labour			[redacted]
Contracted Out Internal Labour			[redacted]
Internal Overtime Labour, Sustenance, and Expenses			[redacted]
Total labour costs			[redacted]
Total (Real $2020-21)			[redacted]
Total (Real $2017-18)			[redacted]

4.8.6 Risk Cost

The table below shows the assumptions used to calculate the risk costs for each of the cost categories identified and the expected risk costs for transmission line [redacted].

Table 4-11 – Risk Cost [redacted]

Risk Costs - [redacted]	Likelihood	Best	Likely	Worst	Total
Weather delay	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Track condition uncertainty	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
High content of hard rock	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
External delays / restrictions	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Cost increase in materials risk	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Risk Costs - [redacted]	Likelihood	Best	Likely	Worst	Total
Pandemic (COVID-19) risk	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total (Real $2020-21)					[redacted]
Total (Real $2017-18)					[redacted]

4.8.7 Total Cost

Combining the labour, materials and risk costs of the repair works for [redacted], the expected total cost for transmission line [redacted] is as follows:

Table 4-12 – Bushfire damage total costing [redacted]

Cost Estimation Model [redacted]	Total
Labour Cost	
Contractor Costs	[redacted]
Outsourced Labour	[redacted]
Internal Normal Labour	[redacted]
Internal Overtime Labour, Sustenance, and Expenses	[redacted]
Total	[redacted]
Materials	
Unitised Costs	[redacted]
Non Unitised	[redacted]
Total	[redacted]
Risk Cost	[redacted]
Direct Cost (excludes internal labour and risk)	[redacted]
Total Expected Cost (Real $2020-21)	**$6,522,899**
Total Expected Cost (Real $2017-18)	**$6,288,996**

4.9 Forecast expenditure for [redacted]

4.9.1 Forecasting methodology and assumptions

The same method and assumptions have been applied for the forecast costing of each transmission line. Refer to section 4.7.1 for information for more details.

4.9.2 Summary of Damage

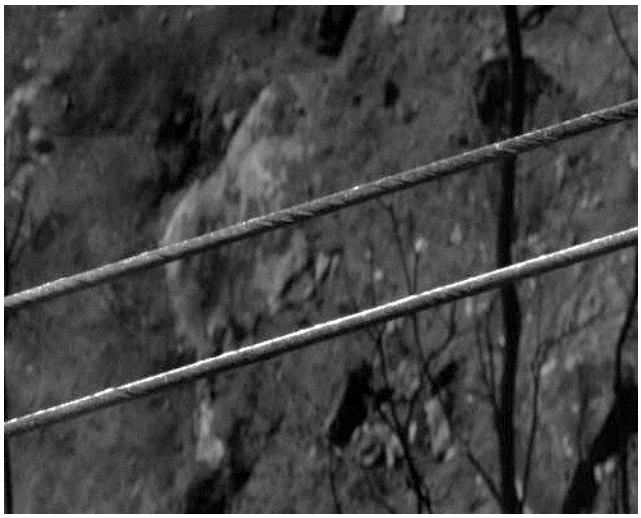
Following the 2019-20 Bushfires, a significant number of spans on [redacted] have been identified with, or a combination of loose/broken conductor stranding, discoloration, and bird-caging. Defects are present on some phase spans as listed below.

Table 4-13 – Bushfire damage summary [redacted]

Date Identified	Line	Span	Phase	Distance Along Span (m)	Anomaly Category	Date Raised	Priority (Months)
08/05/2020	[redacted]	[redacted]	L	255	Broken strand	17/07/2020	< 3
08/05/2020	[redacted]	[redacted]	L	81	Broken strand	17/07/2020	< 3
08/05/2020	[redacted]	[redacted]	L	33	Multiple loose strands and Discolouration	17/07/2020	< 12
08/05/2020	[redacted]	[redacted]	L	153	Loose strand minor	17/07/2020	< 12
08/05/2020	[redacted]	[redacted]	L	402	Broken strand	18/07/2020	< 3

Utilising the results of metallurgical testing, work is required to address the damage which includes rectifying confirmed aluminium conductor annealing which has compromised the mechanical strength of the conductor. If left unaddressed, the compromised condition of the transmission line could lead, worst case, to failure.

Figures 4 – [redacted] **Damaged sections and associated access**



[redacted], LHS PHz Conductor Fire Damage

[redacted]

Terrain at [redacted] Structure 46-47, top of wooded mountain

[redacted]

[redacted] damage marked in red, adjacent to [redacted]

[redacted]

[redacted] Damage marked in red

[redacted] Structure 47, noting high rock content of ground, looking up number

[redacted] Structure 46, looking down number

[redacted] (2010-year comparison), steep access, looking up number

[redacted] (2010-year comparison) winch site [redacted], winch site

4.9.3 Scope of Repair Work

Costs to restring selective sections of the transmission line were identified for only the phases affected. The specific scope for [redacted] includes:

- structure 44-48: Replace Left Phase only
- structures 35-39 Replace Left Phase Twin Bison
- drop phase at 89 to ground, cut in new section to replace Left Phase Twin Bison
- structure 106-113 to replace Left Phase Twin Bison

Conductor requirements for Mango to replace the old Bison conductors are based on twin bundles. The conductor lengths are calculated using the route length with allowance for conductor sag, waste, and tension arrangement jumpers: 1.3 (for sag) x no. of phases replaced x route length x 2 (for Mango).

4.9.4 Material Costs

Based on an engineering technical assessment of the identified damage and scope of repair works detailed above, the following volumes have been estimated to complete the repair works. Combined with the unit rates from previous projects and contracts, the expected material costs for transmission line [redacted] (unitised and non-unitised) are as follows:

Table 4-14 – Unitised and Non-Unitised Costs [redacted]

Material Costs - [redacted]	Volume	Unit Cost	Total
Unitised Costs			
Conductor Twin Bison/Mango	[redacted]	[redacted]	[redacted]
Sag and clip-in materials 8-off Insulator Dead-ends	[redacted]	[redacted]	[redacted]
Expected Pad setup	[redacted]	[redacted]	[redacted]
Total			[redacted]
Non-Unitised Costs			
Material Stone			[redacted]
Total			[redacted]
Total (Real $2020-21)			[redacted]
Total (Real $2017-18)			[redacted]

4.9.5 Labour Cost

Based on an engineering technical assessment of the scope of repair works and the volume of materials required to be installed as detailed above, the following timeframes and distances have been estimated to complete the repair works.

Combined with the unit rates for the onsite work activities (e.g. project management, installation, mobilisation, testing, commissioning etc.), the expected labour costs for transmission line [redacted] are as follows:

Table 4-15 – Labour Cost [redacted]

Labour Costs - [redacted]	Volume	Unit Cost	Total
Contractor Costs			
Contract Labour	[redacted]	[redacted]	[redacted]
Medium Track and Access Work	[redacted]	[redacted]	[redacted]
Establishment cost per week (remote etc)	[redacted]	[redacted]	[redacted]
Total contractor costs			[redacted]
Internal and Outsourced Labour Cost Overheads			
Internal Normal Labour			[redacted]
Contracted Out Internal Labour			[redacted]
Internal Overtime Labour, Sustenance, and Expenses			[redacted]
Total labour costs			[redacted]
Total (Real $2020-21)			[redacted]
Total (Real $2017-18)			[redacted]

4.9.6 Risk Cost

The table below shows the assumptions used to calculate the risk costs for each of the cost categories identified and the expected risk costs for transmission line [redacted].

Table 4-16 – Risk Cost [redacted]

Risk Costs - [redacted]	Likelihood	Best	Likely	Worst	Total
Weather delay	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Track condition uncertainty	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
High content of hard rock	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
External delays / restrictions	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Cost increase in materials risk	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pandemic (COVID-19) risk	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total (Real $2020-21)					[redacted]
Total (Real $2017-18)					[redacted]

4.9.7 Total Cost

Combining the labour, materials and risk costs of the repair works for [redacted], the expected total cost for transmission line [redacted] is as follows:

Table 4-17 – Bushfire damage total costing [redacted]

Cost Estimation Model - [redacted]	Total
Labour Cost	
Contractor Costs	[redacted]
Outsourced Labour	[redacted]
Internal Normal Labour	[redacted]
Internal Overtime Labour, Sustenance, and Expenses	[redacted]
Total	[redacted]
Materials	
Unitised Costs	[redacted]
Non Unitised	[redacted]
Total	[redacted]
Risk Cost	[redacted]
Direct Cost (excludes internal labour and risk)	[redacted]
Total Expected Cost (Real $2020-21)	**$3,434,826**
Total Expected Cost (Real $2017-18)	**$3,311,657**

4.10 Forecast expenditure for [redacted]

4.10.1 Forecasting methodology and assumptions

The same method and assumptions have been applied for the forecast costing of each transmission line. Refer to section 4.7.1 for information for more details.

4.10.2 Summary of Damage

Following the 2019-20 Bushfires, a significant number of spans on [redacted] have been identified with loose/broken conductor stranding, discoloration, and bird-caging. Defects are present on some phase and some earth-wire spans as shown below.

Table 4-18 – Bushfire damage summary [redacted]

Date Identified	Line	Span	Phase	Distance Along Span (m)	Anomaly Category	Date Raised	Priority (Months)
14/05/2020	[redacted]	[redacted]	M	183	Multiple loose strands	17/07/2020	< 3
14/05/2020	[redacted]	[redacted]	L	17	Multiple loose strands	17/07/2020	< 12

Date Identified	Line	Span	Phase	Distance Along Span (m)	Anomaly Category	Date Raised	Priority (Months)
05/05/2020	[redacted]	[redacted]	R	100	Conductor unwrap	17/07/2020	< 3
14/05/2020	[redacted]	[redacted]	L	167	Multiple loose strands	17/07/2020	< 12
14/05/2020	[redacted]	[redacted]	R	149	Multiple loose strands	17/07/2020	< 12
06/05/2020	[redacted]	[redacted]	EL	215	Bulging and Caging	17/07/2020	< 3
06/05/2020	[redacted]	[redacted]	L	135	Conductor unwrap	17/07/2020	< 3
06/05/2020	[redacted]	[redacted]	R M L	108	Multiple loose strands	17/07/2020	< 12
06/05/2020	[redacted]	[redacted]	EL	0	Caging	18/07/2020	< 3

Utilising the results of metallurgical testing, work is required to address the damage which includes rectifying confirmed aluminium conductor annealing which has compromised the mechanical strength of the conductor. If left unaddressed, the compromised condition of the transmission line could lead to, as a worst case, failure.

Figures 5 – [redacted] Damaged sections and associated access

[redacted], RHS PHz Conductor Fire Damage

Terrain looking out from Upper Tumut Substation

Terrain, looking toward Upper Tumut Substation

Locality View: remoteness of site from accommodation and travel in and out

[redacted]

Locality Map: extent of damaged spans adjacent to Tumut substation (red indicates damage)

[redacted] Structure 9, looking at Structure 8 then 7. Noting access limited / non-existent to Structure 7 for 4WD or heavy vehicle

[redacted] Extreme access required

4.10.3 Scope of Repair Work

Costs to restring selective sections of the transmission lines [redacted] were identified for only the phases affected. The specific scope includes:

> [redacted] Structure 5-10: Replace Left Earth-wire, L M R Phases only

> [redacted] Structure 9-14: Replace L R Phases only

> [redacted] Structure 1-6: Replace L M R Phases only; 65 Structure 7-11: Replace R Phases only

Conductor requirements for replacement of Jarrah and OHEW is based on single configuration. The conductor lengths are calculated using the route length with allowance for conductor sag, waste, and tension arrangement jumpers: 1.3 (for sag) x no. of phases replaced x route length x 1 (for Jarrah and OHEW).

4.10.4 Material Costs

Based on an engineering technical assessment of the identified damage and scope of repair works detailed above, the following volumes have been estimated to complete the repair works. Combined with the unit rates from previous projects and contracts, the expected material costs for transmission line [redacted] (unitised and non-unitised) are as follows:

Table 4-19 – Unitised and Non-Unitised Costs [redacted]

Material Costs - [redacted]	Volume	Unit Cost	Total
Unitised Costs			
Conductor OHEW Single 7/0.144	[redacted]	[redacted]	[redacted]
Conductor Single Jarrah	[redacted]	[redacted]	[redacted]
Sag and clip-in materials 55-off Insulator Dead-ends	[redacted]	[redacted]	[redacted]
Pad setup - Complex	[redacted]	[redacted]	[redacted]
Total			[redacted]
Non-Unitised Costs			
Material Stone			[redacted]
Total			[redacted]
Total (Real $2020-21)			[redacted]
Total (Real $2017-18)			[redacted]

4.10.5 Labour Cost

Based on an engineering technical assessment of the scope of repair works and the volume of materials required to be installed as detailed above, the following timeframes and distances have been estimated to complete the repair works.

Combined with the unit rates for the onsite work activities (e.g. project management, installation, mobilisation, testing, commissioning etc.), the expected labour costs for transmission line [redacted] are as follows:

Table 4-20 – Labour Cost [redacted]

Labour Costs - [redacted]	Volume	Unit Cost	Total
Contractor Costs			
Contract Labour and Equipment	[redacted]	[redacted]	[redacted]
Medium Track and Access Work	[redacted]	[redacted]	[redacted]
Heavy Track and Access Work	[redacted]	[redacted]	[redacted]
Extreme Track and Access Work	[redacted]		[redacted]
Establishment cost per week (remote etc)	[redacted]	[redacted]	[redacted]
Total contractor costs			[redacted]
Internal and Outsourced Labour Cost			
Internal Normal Labour			[redacted]
Contracted Out Internal Labour			[redacted]
Internal Overtime Labour, Sustenance, and Expenses			[redacted]
Total labour costs			[redacted]
Total (Real $2020-21)			[redacted]
Total (Real $2017-18)			[redacted]

4.10.6 Risk Cost

The table below shows the assumptions used to calculate the risk costs for each of the cost categories identified and the expected risk costs for transmission lines [redacted].

Table 4-21 – Risk Cost [redacted]

Risk Costs - [redacted]	Likelihood	Best	Likely	Worst	Total
Weather delay	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Track condition uncertainty	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
High content of hard rock	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
External delays / restrictions	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Cost increase in materials risk	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pandemic (COVID-19) risk	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Damaged OPGW on line	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total (Real $2020-21)					[redacted]
Total (Real $2017-18)					[redacted]

4.10.7 Total Cost

Combining the labour, materials and risk costs of the repair works for [redacted], the expected total cost for transmission line [redacted] is as follows:

Table 4-22 – Bushfire damage total costing [redacted]

Cost Estimation Model - [redacted]	Total
Labour Cost	
Contractor Costs	[redacted]
Outsourced Labour	[redacted]
Internal Normal Labour	[redacted]
Internal Overtime Labour, Sustenance, and Expenses	[redacted]
Total	[redacted]
Materials	
Unitised Costs	[redacted]
Non Unitised	[redacted]
Total	[redacted]
Risk Cost	[redacted]
Direct Cost (excludes internal labour and risk)	[redacted]
Total Expected Cost (Real $2020-21)	**$8,369,327**
Total Expected Cost (Real $2017-18)	**$8,069,214**

4.11 Forecast expenditure for [redacted]

4.11.1 Forecasting methodology and assumptions

The same method and assumptions have been applied for the forecast costing of each transmission line. Refer to section 4.7.1 for information for more details.

4.11.2 Summary of Damage

In January 2020, [redacted] suffered extensive conductor damage between structures 10-13 due to the Dunn's Road bushfire. Emergency repair work was carried out in April 2020 to replace the damaged conductors with twin Olive Conductors. This was a transitionary arrangement to overcome delays in conductor delivery amid the COVID-19 pandemic and to restore Snowy Hydro to full generation on [redacted].

Damage caused between structures 5 – 8 has been identified as loose conductor stranding, caging and bulging of conductor, unwrapped conductor, broken disc insulators, and significant access track damage.

Metallurgical test results have determined that conductor damage is evident. Work is required to address the damage, otherwise if left unaddressed, this could lead to as a worst case, failure.

Table 4-23 – Bushfire damage summary [redacted]

Date Identified	Line	Span	Phase	Distance Along Span (m)	Anomaly Category	Date Raised	Priority (Months)
Q1 2020	[redacted]	[redacted]	R	293	Loose strand major	17/07/2020	< 12
Q1 2020	[redacted]	[redacted]			Caging and bulging	17/07/2020	< 3
Q1 2020	[redacted]	[redacted]	L	344	Conductor unwrap	17/07/2020	< 3

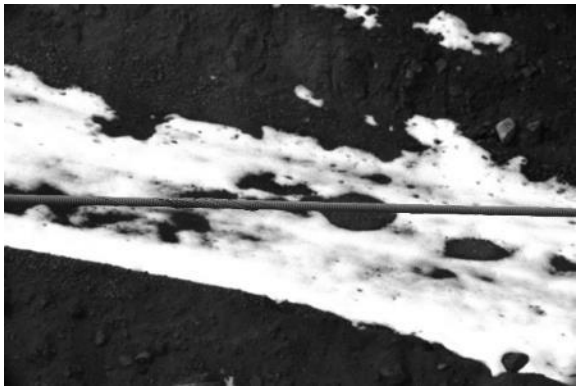
Figures 6 – [redacted] Damaged sections and associated access

Span 5 (loose strand-major)

Span 9 (loose strand-minor)

Span 8 (Caging & bulging conductor)

Structure 8 facing up numbers



Span 9 (unwrapped conductor)

Structure 5 facing up numbers

Structure 3 facing up numbers

Restring Section

Restring Schematic | Locality Map [redacted] Stage 2 Damaged Section

Restring Schematic | Locality Map [redacted] Stage 3 Damaged Section 3-10

4.11.3 Scope of Repair Work

Costs to restring selective sections of the transmission line [redacted] were identified for only the phases affected. The specific scope for Stage 2 includes:

- Earthworks for access track and pads
- Set up mobile plant and winches
- Disconnect and Drop-down temporary twin Olive conductors spans between structures 10 and 13 by releasing tension of conductors at Towers 10 and 13
- Install draw wire/rope using drone and then winching through steel draw wire, and
- Establish the permanent connection by stringing single Jarrah Conductor on all three phases between Towers 10 and 13.

The specific scope for Stage 3 includes:

- [redacted] span 5 - Replace loose strand (major). Right phase
- [redacted] span 5 - Replace loose strand (major). Middle phase
- [redacted] span 8 – Replace caging and bulging conductor. Left phase.

- [redacted] span 9 – Replace unwrapped conductor. Left phase.
- [redacted] span 9 – Replace loose strands (minor). Middle phase
- [redacted] structure 6 – Replace Broken disc. Middle phase.
- [redacted] structure 7 – Replace Broken disc. Left phase.
- [redacted] structure 7 – Replace Broken disc. Middle phase.
- [redacted] structure 8 – Replace Broken disc. Middle phase.
- Civil works for access tracks.

4.11.4 Material Costs

Based on an engineering technical assessment of the identified damage and scope of repair works detailed above, the following volumes have been estimated to complete the repair works.

Combined with the unit rates from previous projects and contracts, the expected material costs for transmission line [redacted] (unitised and non-unitised) are as follows:

Table 4-24 – Unitised and Non-Unitised Costs [redacted]

Material Costs - [redacted]	Volume	Unit Cost	Total
Unitised Costs			
Nil			[redacted]
Non-Unitised Costs			
Materials - line fittings, compression dead-ends etc. - Stage 2			[redacted]
Consumables / Miscellaneous - Stage 2			[redacted]
Earth works-including access, pad and winch sites - Stage 2			[redacted]
Materials - conductor, line fittings, compression dead-ends - Stage 3			[redacted]
Consumables / Miscellaneous - Stage 3			[redacted]
Earth works- access, pad and winch site, and equipment hire - Stage 3			[redacted]
Total			[redacted]
Total (Real $2020-21)			[redacted]
Total (Real $2017-18)			[redacted]

4.11.5 Labour Cost

Based on an engineering technical assessment of the scope of repair works and the volume of materials required to be installed as detailed above, the following timeframes and distances have been estimated to complete the repair works.

Combined with the unit rates for the onsite work activities (e.g. project management, installation, mobilisation, testing, commissioning etc.), the expected labour costs for transmission line [redacted] are as follows:

Table 4-25 – Labour Cost [redacted]

Labour Costs - [redacted]	Volume	Unit Cost	Total
Contractor Costs			
Contract Labour	[redacted]	[redacted]	[redacted]
Internal and Outsourced Labour Cost			
Internal Normal Labour			[redacted]
Contracted Out Internal Labour			[redacted]
Internal Overtime Labour, Sustenance, and Expenses			[redacted]
Total labour costs			[redacted]
Total (Real $2020-21)			[redacted]
Total (Real $2017-18)			[redacted]

4.11.6 Risk Cost

The table below shows the assumptions used to calculate the risk costs for each of the cost categories identified and the results of the expected risk costs for transmission line [redacted].

Table 4-26 – Risk Cost [redacted]

Risk Costs - [redacted]	Likelihood	Best	Likely	Worst	Total
Weather delay	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Track condition uncertainty	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
High content of hard rock	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
External delays / restrictions	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Cost increase in materials risk	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pandemic (COVID-19) risk	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Networks outage restrictions	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total (Real $2020-21)					[redacted]
Total (Real $2017-18)					[redacted]

4.11.7 Total Cost

Combining the labour, materials and risk costs of the repair works for [redacted], the expected total cost for transmission line [redacted] is as follows:

Table 4-27 – Bushfire damage total costing [redacted]

Cost Estimation Model - [redacted]	Total
Labour Cost	
Contractor Costs	[redacted]

Cost Estimation Model - [redacted]	Total
Outsourced Labour	[redacted]
Internal Normal Labour	[redacted]
Internal Overtime Labour, Sustenance, and Expenses	[redacted]
Total	[redacted]
Materials	
Unitised Costs	[redacted]
Non Unitised	[redacted]
Total	[redacted]
Risk Cost	[redacted]
Direct Cost (excludes internal labour and risk)	[redacted]
Total Expected Cost (Real $2020-21)	**$5,672,546**
Total Expected Cost (Real $2017-18)	**$5,469,136**

4.12 Forecast expenditure summary

The total forecast costs for transmission lines remediation works (excluding easement-related expenditure which is detailed in the next section) is presented as follows:

Table 4-28 – Bushfire damage summary costing – Transmission Lines

Transmission Line	Total
[redacted]	$10,785,062
[redacted]	$6,522,899
[redacted]	$3,434,826
[redacted]	$8,369,327
[redacted]	$5,672,546
Other Lines (Note 1)	$800,000
Total (Real $2020-21)	**$35,584,660**
Total (Real $2017-18)	**$34,308,639**

Note 1: Forecast costs associated with general minor repair works required to be undertaken on lines other than the lines with major damage (detailed in this section), are included under 'Other Lines' category. The costs associated with 'Other Lines' has been derived from the work orders generated for the minor repairs on these lines based on historical average cost rates. Also included in this category are the forecast costs associated with the implementation of some operational controls through summer 2020-21 to monitor the conductors for early signs of failure, based on discussions we have been having with AEMO regarding the urgency of the bushfire damage on the conductors in the Snowy region. The work involves three conductor aerial thermographic monitoring surveys at $100k each. The cost is expenses for competitively outsourced helicopter hire and thermographic analysis by our contracted aerial service provider, and comparison with laboratory test result by an outsourced test lab.

5. Forecast access and vegetation management expenditure

This chapter explains our expenditure forecasts for reinstating easement access tracks and vegetation clearance. Access and vegetation expenditure that has already been incurred is included in actual expenditure (discussed in chapter 3).

5.1 Nature and scope

The 2019-20 Bushfires in NSW resulted in considerable damage to access tracks and vegetation within (and adjacent to) our transmission line easements which compromised the ability for construction and maintenance crews to safely access and work in the affected areas.

The types of work required to undertake repairs in relation to our easements involves:

> inspections and condition assessments

> repairing eroded or destroyed access tracks from heavy rain after the fires

> removing debris across tracks

> re-establishing creek crossings, and

> removing dangerous trees and branches.

The detail of the damage is presented below. Remediation work is required to address the damage, otherwise if left unaddressed, the hazards in the area could lead to significant OH&S safety incidents, or the inability to continue to maintain the assets in the area. Such incidents could involve trees falling onto our assets or onto maintenance crews, or rollovers of vehicles due to damaged access tracks in our easements.

Approximately 9% of the network route length and over 830 kilometres of access track, have been impacted by the 2019-20 NSW bushfires. A review of potential in-fall or hazard trees impacted by bushfires is critical to identifying risk of vegetation failure causing unplanned outages or unsafe access to our transmission network infrastructure. The scale and intensity of the bushfires has required a coordinated strategy to assess the impacts of the fires on asset condition, accessing assets and future impacts from failing defective trees.

Numerous damaged trees also required trimming or removal to mitigate the risk of subsequent falls impacting the safety of the public and response workers and to protect existing or newly replaced network assets from further damage.

Clearing fallen and hazardous trees was a high priority activity in our bushfire emergency response. Initially condition assessment was performed via aerial inspection. Following this, work involved clearing access tracks providing safe access for crews to allow supply restoration and replacement work to take place. Once the initial fire period had abated, efforts turned to scoping all impacted areas to understand the scale of activities required to manage fire affected hazard trees that had the potential to fall onto the electricity network or to create OH&S issues for personnel. The extensively changed environment and ongoing heavy rains following the bushfires continued to impact on access, resulting in significant soil erosion, tree failure, and in some instance exposing naturally occurring asbestos, making the access tracks unsafe for operations.

In efforts to identify potential hazard trees, we engaged suitably qualified arborists from various vegetation management contractors (Active, ETS and Asplundh) to perform visual tree assessment on hundreds of trees. Initially these trees were identified for their in-fall potential via LiDAR. The assessment looked for evidence of structural defects that may compromise, whether whole or part, tree stability or structural integrity.

Whilst it has been difficult to access all heavily burnt areas, evidence of the trees that have been assessed indicates that fire had further compromised their structural integrity. That is, trees were burnt beyond their

capacity to remain structurally viable, with fire having taken advantage of already altered structural wood - further hollowing major limbs, stems, structural roots, and live tissue, to the point that failure is likely.

The intense fires incinerated soil protecting leaf litter, vegetative debris, live understory and the tree canopy, all of which protect and provide essential nutrients to the trees and soil biota - this will continue to impact on tree stability and structural integrity well into the future.

The fires were followed by heavy, consistent rain events and this has resulted in significant access constraints. Furthermore, on-going variable weather conditions and changes in the growing environment, mean trees will continue to fail presenting challenging OH&S situations and ongoing assessments.

By September 2020, 80% of impacted spans had been inspected and scoped. On-site inspections identified that on average an additional 14% of hazard trees (over and above business-as-usual levels) are 'unacceptable', requiring management to limit the risk to the electricity network and personnel safety.

Figures 7 – Examples of damaged vegetation and access tracks

5.2 Approach to determining expenditure

Cost estimates have been derived from both desktop assessment and the site visits and detailed tree assessments in many areas (80% of spans scoped through detailed site inspections as described above). Detailed site scoping was unable to be performed where there was limited safe access to the sites.

It has been identified that some of the condition maintenance works planned in 2019-20 and 2020-21 (part of the on-going cost of maintaining the network), has been avoided. This is because the bushfires destroyed vegetation, and this has reduced the work required to maintain affected spans this year. The avoided vegetation management cost adjustment has been calculated by multiplying hazard tree removal costs by the volume of trees where subsequent regrowth (if any) will have little to no impact on the future maintenance works.

The bushfire forecast costs for easement remediation works are based on current vegetation contractor rates for management of hazard trees and access tracks. All works are undertaken by contractors. Each of the components of the costs for easements were sourced as follows:

- access track costs were based on [redacted] (Real $2020-21) using our current standard competitively sourced panel contractor rate, and
- hazard tree costs were based on [redacted] (Real $2020-21) per tree removed also using our current standard competitively sourced panel contractor rate.

In costing these components:

- we systematically used aerial inspections, after-fault patrol site inspections and priority LiDAR inspections to inform the volume of hazard trees and access tracks to address, with ongoing on-site proofing
- where access was limited due to snow cover, difficult terrain and damaged access tracks, we used Google map overlays and post aerial photography of the track damage to confirm the construction methodology and inform volumes for the length of access track repairs, and
- we applied engineering judgement to confirm our assessments and assumptions, and to forecast volumes that are still undergoing on-site proofing.

5.3 Forecast expenditure summary

The table below summarises the volumes and costs of hazard trees required to be cleared (in addition to those already cleared during emergency works) and the cost of access track remediation. A total of 445km of access track repairs is remaining, and 2,482 hazard trees need addressing.

Table 5-1 – Bushfire damage summary costing – Hazard Trees and Access Tracks

Line	Span	Quantity of Hazard Trees Impacted	Quantity of Hazard Trees to Remove	Quantity of Access Tracks to Restore (km)	Hazard Tree Cost	Access track Cost
Easement		**17,717**	**2,482**	**445**	[redacted]	[redacted]
5A1/5A2	Central region of TL5A1/5A1 up to str. 152	10	1	0.5	[redacted]	[redacted]
31/32	393-472	299	42	15.3	[redacted]	[redacted]
76/77	Northern region of 76/77 up to str. 226	1173	164	67.8	[redacted]	[redacted]
5A3/5A4	Central region of TL5A3/5A4 up to str. 228	26	4	1.3	[redacted]	[redacted]
5A3/5A5	426-443	57	8	1.8	[redacted]	[redacted]
5A6/5A7	Mt. Piper to Bannaby Str 279 to str 295	26	4	0.0	[redacted]	[redacted]
76/77	Central region of 76/77 from str. 105	45	6	2.3	[redacted]	[redacted]
5A1/5A2	Northern region of TL5A1/5A1 from str. 92	79	11	30.8	[redacted]	[redacted]

Line	Span	Quantity of Hazard Trees Impacted	Quantity of Hazard Trees to Remove	Quantity of Access Tracks to Restore (km)	Hazard Tree Cost	Access track Cost
5A3/5A4	Northern region of TL5A3/5A4 from str. 170	8	1	1.4	[redacted]	[redacted]
22	16-19 & 113-137	29	4	2.7	[redacted]	[redacted]
25/26	103-168A/168B	0	0	0.0	[redacted]	[redacted]
31/32	103-267	319	45	54.2	[redacted]	[redacted]
87	Armidale to Coffs Harbour	394	55	4.0	[redacted]	[redacted]
96C	Armidale to Coffs Harbour	274	38	4.5	[redacted]	[redacted]
96L	Tenterfield to Lismore	990	139	8.5	[redacted]	[redacted]
89	550-603	703	98	13.8	[redacted]	[redacted]
963	Tomago to Taree 428-473	720	101	0.0	[redacted]	[redacted]
964	PMQ-232	34	5	3.5	[redacted]	[redacted]
965	186-353	991	139	1.5	[redacted]	[redacted]
966	Armidale to Koolkhan	2,600	364	0.0	[redacted]	[redacted]
967	103-193	320	45	13.4	[redacted]	[redacted]
51	LTSS-125	239	33	12.3	[redacted]	[redacted]
2	UTSS-159	477	67	24.2	[redacted]	[redacted]
3	LTSS-60	171	24	4.6	[redacted]	[redacted]
7	LTSS-40	0	0	0.0	[redacted]	[redacted]
U1	UTSS-T1	125	18	0.0	[redacted]	[redacted]
U3	UTSS-T1	18	3	0.0	[redacted]	[redacted]
U5	UTSS-T1	192	27	0.0	[redacted]	[redacted]
U7	UTSS-T2	1465	205	5.6	[redacted]	[redacted]
3W	Capital WF (Str 278) to KVSS	340	48	0.0	[redacted]	[redacted]
39	Bannaby to Sydney West	514	72	0.0	[redacted]	[redacted]
L1	Entire Line	0	0	0.0	[redacted]	[redacted]

Line	Span	Quantity of Hazard Trees Impacted	Quantity of Hazard Trees to Remove	Quantity of Access Tracks to Restore (km)	Hazard Tree Cost	Access track Cost
L3	Entire Line	0	0	0.0	[redacted]	[redacted]
L5	LTSS-Tumut5	0	0	0.0	[redacted]	[redacted]
YY	Entire Line	11	2	0.0	[redacted]	[redacted]
97D	Str 251 to 296	152	21	0.0	[redacted]	[redacted]
978	Str 248 to 342	22	3	0.0	[redacted]	[redacted]
64	Entire Line	1283	180	39.3	[redacted]	[redacted]
65	Entire Line	1286	180	43.6	[redacted]	[redacted]
66	Entire Line	2017	282	72.2	[redacted]	[redacted]
993	49-92	112	16	5.6	[redacted]	[redacted]
1	UTSS-96	196	27	10.0	[redacted]	[redacted]
Direct Cost					[redacted]	
Risk Cost					[redacted][10]	
Total Cost (Real 2020-21)					**$5,006,563**	
Total cost (Real 2017-18)					**$4,872,034**	

[10] An 8% risk applied for the expected uncertainty around unforeseen tree removals and track access repairs (volume and degree of difficulty).

6. Forecast other costs

This chapter explains our expenditure forecasts for repairing bushfire damage incurred on:

> primary plant, civil and structural assets within our transmission substation sites, and

> buildings within our properties.

Although we have already incurred some expenditure on secondary systems rectification (which are reflected in our actual costs), we do not expect to incur any further and so none have been included in our forecasts.

6.1 Nature and scope

The 2019-20 NSW bushfires resulted in some damage to equipment within our transmission substations (ancillary equipment, secondary systems assets and property) which has compromised the ability for these assets to continue to meet safety and performance expectations.

6.1.1 Substations

The types of work required to undertake repairs in relation to ancillary equipment within our substations involves:

> inspections and condition assessments

> maintenance activity brought forward due to minor impacts from the Bushfires

> fencing and earth lead repairs

> remediation of smoke and soot damage within the VESDA fire-protection units and pipes, and

> remediation of fire and heat damaged air conditioning units.

Apart from the remediation work required to address the identified damage, inspections did not reveal any other substantial fire, smoke, heat or water damage to primary electrical plant or structures with our substations that would warrant including additional forecast expenditure in this pass-through application.

6.1.2 Communication and Protection

The types of work required to undertake repairs in relation to secondary systems assets within our substations used for communication and protection involves:

> inspections and condition assessments

> maintenance activity brought forward due to minor impacts from the Bushfires, and

> replacing failed battery cells in battery banks whose failure was accelerated by the fires.

Apart from the remediation work required to address the identified damage, inspections did not reveal any other substantial fire, smoke, heat or water damage to secondary and communication equipment with our substations and repeater-stations that would warrant including additional forecast expenditure in this pass-through application.

6.1.3 Property

The types of work required to undertake repairs in relation to building assets within our transmission substations involves:

> inspections and condition assessments, and

> maintenance activity brought forward due to minor impacts from the Bushfires.

6.2 Approach to determining expenditure

Cost estimates have been derived from the inspection of the condition of buildings through site visits to each affected transmission substation and communications repeater-station. A unit rate approach has been applied to build up the forecast cost based on the activities identified below.

6.3 Forecast expenditure summary

The bulk of the substation and property remedial works have already been completed and costs are incurred in our actual expenditure. The costs below present the remaining forecast expenditure.

Table 6-1 – Bushfire damage summary costing – Substations and Property

Substation	2020-21	2021-22	2022-23	Total
Upper Tumut – UTSS				
Substations – minor circuit breaker maintenance	$383	$0	$0	$383
Property – facilities corrective maintenance	$1,500	$0	$0	$1,500
TOTAL	**$1,883**	**$0**	**$0**	**$1,883**

7. Verification and validation of actual and forecast expenditure

This chapter explains how our expenditure for the 2019-20 bushfire event has been verified and validated by independent experts.

7.1 GHD's engineering assessment

We engaged GHD to undertake an independent engineering verification and assessment of our 2019-2020 bushfires expenditure.

In their report titled "*Bushfire Cost Pass Though Application – Independent Verification and Assessment*", dated November 2020, GHD's independent review confirmed that:

- We have experienced a positive change event elevating costs materially higher than Business as Usual (BAU) than it would have incur but for that event
- the quantum of the incremental expenditure incurred and forecasted, exceeds the regulatory threshold for materiality
- GHD's selection testing confirms that expenditure incurred and forecasted relates to the positive change event and is incremental to BAU, and
- nothing has come to GHD's attention that would suggest that the expenditure contained in TransGrid's bushfire pass through application relates to contingent projects or an associated trigger event.

GHD's conclusions regarding our expenditure forecast were as follows:

- GHD examined the expenditure decision by reviewing the basis such as evidence of damages to the asset, the impact of those damages to its functional performance and the corrective maintenance process which is aligned to ISO55001 certified asset management system. GHD reviewed the photographs of damaged assets, metallurgical test report of damaged conductors that formed the basis of TransGrid's engineering condition assessments, and the records of defect work order prioritisation process. GHD were satisfied that the expenditure decision made by TransGrid is reasonable
- GHD reviewed the proposed timeline and duration of the repair work considering the nature of work, geographical location, resource availability / constraints (including internal, outsourced and contractor), outage window constraints due to Snowy Hydro generation, and the seasonal demand profile of Southern NSW and Northern Victoria. GHD were satisfied that the expenditure timeline and duration proposed by TransGrid is reasonable
- GHD reviewed the build-up of cost items from past project records, competitive market quotes and unitised cost information saved in TransGrid's Success Estimation database used in formulating the contractor costs (for e.g. weekly labour rate, per km track access rate and weekly establishment rate) and material unitised rates (for e.g. conductor rate, insulator rate, fittings, construction pad set-up rate and gravel). GHD also reviewed hourly labour rates of various types of skill-sets (managers, engineers, switching, HSE etc.), penalty rates, allowance and expenses in delivering these damage repair works. GHD were satisfied that the cost estimates and their underlying build-up used in forecasting the expenditure are reasonable.
- GHD reviewed the build-up of material and duration quantities (km, unit item, weeks) and their respective basis such as geo-spatial inputs, asset condition assessment, engineering judgement and assumption, outage and operational constraints, HSE requirements, and the proposed workforce capability. GHD also reviewed the build-up of internal and outsourced labour hours and its basis such as scope of work, type of activities, project team set-up, need for multiple site work-fronts, and TransGrid's construction risk and HSE system requirements. GHD were satisfied that the volumetric or quantity estimate, and the underlying basis used in forecasting the expenditure are reasonable.

- GHD reviewed the risk costs. Based on their experience of brownfield transmission line restringing work with multiple work fronts, on mountainous terrains, and on environmentally sensitive national park land, GHD believes this level of risk allowance is reasonable in TransGrid's expenditure forecast, and
- GHD reviewed the scope of proposed work and the Asset Manager work order priority in proposing the repair work with assigned level of varying urgency (and therefore the proposed timelines) to appreciate the amount of work and risk based repair decision included in the expenditure forecast. GHD examined the scope for over-engineered solution, duplication of work with BAU maintenance practice, and opportunity to deliver these repair works in an efficient manner with weighing against the residual risks. GHD were satisfied that the proposed repair works are prudent.

Appendix A Labour Costs

A.1 Contract labour

Contract labour includes costs of personnel (other than our employees) that are directly involved in the delivery of the 2019-20 Bushfires repair works. Examples of this include personnel from our design and construction contractors, and our vegetation management contractors.

Contract labour costs have been forecast for each major repair based on contract labour costs for work undertaken on recent similar projects and programs.

Contract labour also includes labour that would otherwise be performed by our employees, but for the fact that there are insufficient internal resources to undertake the work, requiring the need to engage contractors. This only includes those activities where there are suitably trained contractors available to undertake the works, such as certain on-site activities. Activities that only our staff can do (including network switching, de-energising and making safe the transmission lines before they are worked on by the contractor), and activities for which we have available internal resources, instead have costs allocated to our internal labour.

Contract labour has been forecast based on the same method used for internal labour (see below) - based on the resource type required for the activity subcontracted, the estimated hours to undertake the task, and applying our internal labour rates.

A.2 Internal labour

Our delivery methodology is premised on us running the project as Principal Contractor and engaging relevant contractors to deliver work as the work is on in-service lines and the delivery method as per our Construction risk methodology as Principal Contractor. Furthermore, Power System Safety Rules requirements apply where multiple site locations will require direct supervision and provisioning of Earthing and Field Access Authorities to provide safe access for outage sanctioned construction works.

As such, we have included costs for our internal labour. These internal labour costs include our normal time, overtime and associated on-costs (sustenance and support costs) directly related to the 2019-20 Bushfires event excluding labour that is undertaken by contractors.

Table 7-1 – Actual and forecast internal and outsourced labour costs for the 2019-20 bushfires ($M, Real 2017-18)

Internal Labour	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Normal time	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Overtime	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Labour Oncost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Support Costs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sustenance Allowances	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Our activities covered by internal labour include contractor management, program management, principal contractor, safety compliance, environmental compliance, network switching and isolation, communications, commissioning supervision, engineering inputs and, design reviews and site auditing.

Our internal labour requirements have been developed up by using the cost of the resource type (our internal normal and overtime hourly labour unit rates) for the particular activity to be performed, multiplied by the quantity of hours required for each activity for each of the major works forecasts which form the bulk of the forecast cost. Where there are insufficient internal resources to deliver the works, we have moved these internal costs to contract labour. An assessment was undertaken to determine what internal labour activities could be

outsourced. Activities that only our staff can do (including network switching, de-energising and making safe the transmission lines before they are worked on by the contractor), and activities for which we have available internal resources, have costs allocated to our insourced internal labour. All our staff (including managers) who work on our projects (including the ones herein) are required to bill their time to the specific projects rather than to corporate overheads.

A.2.1 Normal time

Normal time labour rates and role classifications are aligned to our 2019 Standard labour rates[11] and our Employee's Agreement.[12] These are consistent with the approved 2018 determination allowances. The labour rates were restated to 30 June 2018 labour rates using a discount factor. Escalation rates have not been applied to subsequent years.

Labour for our internal staff have been classified into a series of salary bands and the corresponding normal time labour rate has been used to forecast normal time labour costs.

The normal time component represents our employees incremental time to reprioritise their business-as-usual activities during normal business operating hours to work on activities directly related to the 2019-20 Bushfires repair works.

A.2.2 Overtime

Overtime labour rates and role classifications are aligned to our 2019 Standard labour rates[13] and our Employee's Agreement.[14] These are consistent with the approved 2018 determination allowances. The labour rates were restated to 30 June 2018 labour rates using a discount factor. Escalation rates have not been applied to subsequent years.

Labour for our internal staff have been classified into a series of salary bands and the corresponding overtime labour rate has been used to estimate overtime labour costs.

The business assessed that the works would place a significant burden on internal resourcing and part of the internal labour costs would need to be undertaken as overtime or outsourced to contractors. The overtime component represents plans to work longer days and weekends to facilitate efficient delivery and reduce the overall timeframe of the work, particularly given its urgency and the outage constraints.

Remoteness of the sites is another factor contributing to overtime, where the Project Manager and other resources involved in the scoping are required to attend site (as required) during delivery and to maintain a presence and responsibility for the site. Utilising labour overtime is also efficient as it improves site productivity by allowing longer work days to take place which reduces the duration of the works and the associated costs, such as site establishment costs.

A.2.3 Labour Oncost

Our total Labour Oncost on the overtime portion of labour is calculated using Labour Oncost rates for each year. Labour Oncost for 2019-20 (A) has been calculated using the actual Labour Oncost rate of 40% for Award staff. Labour Oncost actual for 2020-21 (A) has been calculated using the actual Labour Oncost rate of 39.5% for Award staff for the periods July 2020 to September 2020. Labour Oncost forecasts have been calculated using the budgeted Labour Oncost rate of 39.5% for Award staff from 2020-21 (F) to 2022-23(F).

A.2.4 Support costs

[11]

[12] TransGrid Employees Agreement 2016

[13] Labour and Support Cost Rates Effective July 2019

[14] TransGrid Employees Agreement 2016

Our total Support Costs on the overtime portion of labour is calculated using Support Cost rates for each year. Support Costs for FY2019-20(A) has been calculated using the actual Support Cost rate of 1.02. Support Costs actual and forecast for 2020-21 have been calculated using the budgeted Support Cost rate of 0.99, and a Support Cost rate of 0.96 for 2021-22(F) and 2022-23(F).

A.2.5 Sustenance Allowances

We have forecast a total sustenance allowance for works delivery staff. This relates to work related travel expenses such as food and accommodation. Sustenance is premised on anticipated time away from base due to the works program and largely for resourcing from our area centres. For example, site managers need to be on site for the duration of works and overnight stay is normally required due to work/travel time combined to manage fatigue, and to ensure start/end times of work during day is efficient. For each resource this is assessed and in our PPM system we forecast the total days expected. The sustenance rates are standard rates from our Ellipse system and area.

Payment of sustenance allowance is in line with the Australian Tax Office (ATO) Reasonable Allowance amounts based on a salary of $108,810 and below.

Sustenance allowances are provided under the following conditions under our Enterprise Agreement:

- Overnight Absences from home – when employees are transferred to a temporary headquarters and the temporary transfer requires them to be absent from their usual place of residence overnight, we must provide them with accommodation wherever practicable at our own expense. For each night's absence, employees must be paid an allowance of
  - $15.80 when interstate, or
  - $12.70 when intrastate
- Where accommodation is not provided employees may arrange their own accommodation in which case we will pay for the following allowances:
  - Capital Cities – ATO reasonable allowance amounts set out below based on a salary of $108,810.
  - Other than Capital Cities – Relevant ATO reasonable allowance amount for High Cost Country Centre, Tier 2 Country Centre or Other Country Centre as per ATO Ruling[15].

Table 7-2 – Sustenance Allowance rates, Rates applicable at 30 June 2018[16]

Location	Overnight Breakfast	Overnight Lunch	Overnight Dinner	Overnight All meals
City ($)	25.90	29.15	49.65	104.70
Country ($)	23.20	26.50	45.70	95.40

All sustenance expenses are claimed through expense timesheets, with the provision of tax receipts and require formal approval by a line manager.

The sustenance allowance applies only to Works Delivery staff. A different allowance applies to Project Development, Land Environment, Major Projects Division staff and Stakeholder Engagement staff, in accordance with the allowances per salary band within the ATO Guidelines and assumptions regarding sustenance requirements for these teams.

Our forecast of Sustenance Allowances for the 2019-20 Bushfires repairs for our internal labour is in line with similar recent types of works where the Sustenance Allowance has been approximately 10.25% of internal labour costs including on-costs and support costs.

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15 ATO, TD 2019,11

16 Corporate and network overhead forecast capex for Project EnergyConnect BAFO - Contingent Project Application for Project EnergyConnect 30th September 2020