Capex Forecasting Methodology for VNI Minor Upgrade Project

Contingent Project Application for VNI Minor Upgrade Project

November 2020

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1.1 About the VNI Minor Upgrade Project

The Victoria to New South Wales (NSW) Interconnector Minor Upgrade Project (the Project or VNI) is a joint TransGrid and Australian Energy Market Operator (AEMO) project, which involves increasing the transfer capacity of the existing interconnector between Victoria to NSW by approximately 170 MW during peak demand conditions in NSW.

VNI was included in the Australian Energy Market Operator's (AEMO):

> 2018 Integrated System Plan (ISP), as an 'urgent' investment that would provide substantive benefits to the National Electricity Market (NEM) as soon as it could be completed

> 2019 Electricity Statement of Opportunities (ESOO), which reconfirmed the importance of completing VNI before the forecast closure of Liddell Power Station, to manage the risk of supply-demand shortfalls which may lead to reliability standard breaches in Victoria in the short term if unplanned generator outages were to occur during extreme heat conditions, and

> Final 2020 ISP[1], published on 30 July 2020, that sets out an actionable whole of system plan for eastern Australia's power system to optimise consumer benefits. This ISP identifies an optimal development path, which includes VNI as a no-regret 'actionable ISP' project (i.e. it has no downside) that is 'critical to address cost, security and reliability issues' in the NEM.[2]

VNI comprises three key elements:[3]

> installation of a second 500/330 kilovolt (kV) transformer at South Morang Terminal Station.

> re-tensioning the 330 kV South Morang – Dederang transmission lines, as well as associated works (including replacement of series capacitors), to allow operation at thermal rating.

> installation of modular power flow controllers (MPFC) on the 330 kV Upper Tumut – Canberra and Upper Tumut – Yass lines to balance power flows and increase transfer capability.

The third element reflects the investments in NSW to be undertaken by us, and is therefore the focus of this Application. It involves:

> supply of Smart Wires MPFC – Smart Wires i3600 Unit

> major substation augmentation works within our Stockdill 330kV substation to facilitate installation of the Smart Wires i3600 unit

> installation and commissioning of the Smart Wires i3600 Unit at our Stockdill substation and the Smart Wires i2600 Unit SmartValves at our Yass substation

> minor transmission line augmentation works around our Stockdill 330kV substation, and

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1 AEMO, Final 2020 Integrated System Plan, July 2020 (Final 2020 ISP). Found at Link

2 AEMO, Final 2020 ISP, July 2020, page 14 and 84.

3 AEMO and TransGrid, *Victoria to New South Wales Interconnector Upgrade - Project Assessment Conclusions Report*, February 2020, p. 3. (VNI RIT-T PACR). See Link

> ancillary works including design, procurement and installation of secondary systems equipment at eight of our surrounding substations

The Regulatory Investment Test for Transmission (RIT-T) Project Assessment Conclusions Report (PACR)[4] found that VNI will deliver approximately $268 million in net benefits over the assessment period to 2033-34 (in net present values terms) by:

> reducing the dispatch costs, through more efficient dispatch of generation in Victoria and NSW, and

> reducing the capital costs associated with new generation in NSW.

The NSW Government and the Energy Security Board (ESB) requested that we accelerate the completion of VNI by December 2021 in advance of the Liddell Power Station closure in 2023[5].

We have now prepared a Contingent Project Application (CPA) for lodgement to the Australian Energy Regulator (AER). Our Application is the last step in the regulatory assessment process for VNI.

1.2 Purpose of this document

The purpose of this document is to overview:

> the nature and scope of the capital expenditure (capex) that we require to deliver VNI

> our approaches and processes for procuring external suppliers for VNI

> the outcomes, or status, of the procurement processes for VNI

> how we forecast internal capex for VNI (i.e. where we are not using external suppliers)

> our actual or forecast capex for VNI, by capex category, and

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

1.3 Scope of this document

This document is focussed on explaining and justifying our actual and forecast capex for VNI for the period 1 July 2018 to 30 June 2022, noting that VNI must be completed by 2022-23[6].

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

> explain or justify the scope of VNI. This is done in the PACR and CPA, which set out the top-ranked incremental network option, being “Option 2” – this is the option that we will deliver through the VNI Project. The capex discussed in this document gives effect to this “Option 2”

> address the requirements in clause 6A.6.7 of the National Electricity Rules (NER) as they relate to VNI. This is done in the separate document prepared by HoustonKemp entitled “Consistency of TransGrid’s proposed capital expenditure for VNI with the NER requirements”, and

> explain or justify our operating expenditure for VNI. This is done in a separate document entitled ‘VNI Opex Forecasting Methodology’.

Unless otherwise stated, all historical and forecast capex values in this document are presented in real 2017-18 dollars.

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4 The VNI RIT-T PACR was published on 14 February 2020. See Link

5 NSW Electricity Strategy, November 2019 p. 32. Found at Link

6 AEMO, Final 2020 Integrated System Plan, July 2020 (Final 2020 ISP), p. 14. Found at Link

1.4 Structure of this document

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

> section 3 explains the changes in our capex forecast for VNI in this Application from forecast included in the RIT-T PACR

> section 4 overviews our investment framework

> section 5 explains our capex on substations

> section 6 explains our capex on transmission lines

> section 7 explains our capex on secondary systems

> section 8 explains our internal labour costs and corporate and network overheads[7]

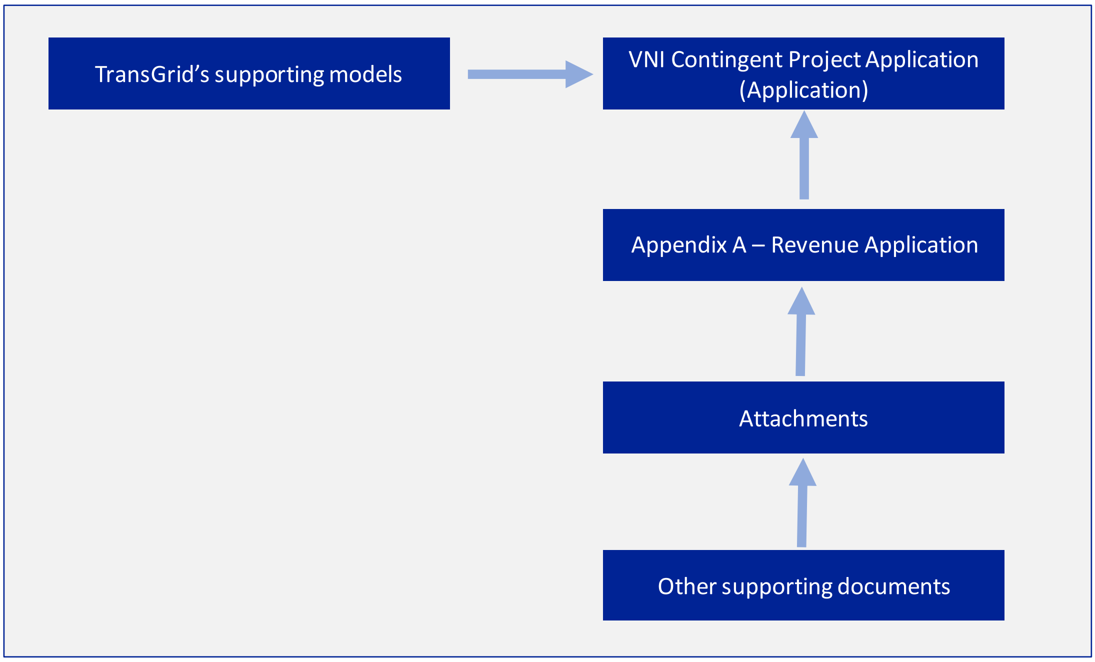
> section 9 explains our real input cost escalations, and

> section 10 explains how our capex for VNI has been verified and validated.

1.5 Structure of VNI Application

Our Application comprises the attachments and models illustrated in Figure 1 as well as other supporting documents. This document references these attachments, models and other supporting documents and should be read in conjunction with them.

Figure 1: VNI Application document structure



[7] Corporate and network overheads are also referred to as indirect capex throughout this document.

2. Overview of VNI capex

This section overviews our actual and forecast capex for VNI.

The total forecast capex for VNI is $45.0 million (Real 2017-18) for the period 1 July 2018 to 30 June 2022.[8]

The capex for VNI is incremental to our business-as-usual capex.

Table 2-1 shows the incremental forecast capex for VNI by year and the total capex forecast of $45.0 million (Real 2017-18).

Table 2-1: Total forecast capex for VNI ($M, Real 2017-18, including indirect costs)

	2018-19	2019-20	2020-21	2021-22	Total
Total capex	0.3	3.5	13.7	27.5	**45.0**

There are six key capex categories for VNI, as detailed in Table 2-2.

We expect that at least 84 per cent of the capex for VNI will be based on market prices.

Table 2-2: Total forecast capex for VNI by category ($M, Real 2017-18)

Category of VNI capex	Basis of capex	Status	Capex $M	% of total capex
Substations (including Smart Wires)	Contract cost from Smart Wires Externally tendered (competitive) - construction and design contracts and directly procured asset approach	Executed August 2020 (For Smart Wires) Offers provided May and August 20 (For design and construction)	34.5	76.8%
Transmission lines	Externally tendered (competitive) - construction and design contracts and directly procured asset approach	Offers provided May and August 2020	0.4	0.9%
Secondary systems	Externally tendered (competitive) - construction and design contracts and directly procured asset approach	Offers provided May and August 2020	2.6	5.8%
Direct labour	Actual capex reflects records in Ellipse. Forecast capex internal bottom-up build.	Complete	3.6	8.1%

8 This excludes the value of any estimated equity raising costs. Although adding forecast expenditure for VNI to the latest version of the Post-tax Revenue Model for the 2018–23 regulatory period does not produce any estimated equity raising costs, it would do if the AER were to accept our recent contingent project application for Project EnergyConnect.

Category of VNI capex	Basis of capex	Status	Capex $M	% of total capex
Network and corporate overheads (including indirect labour)	Actual capex reflects records in Ellipse. Forecast capex internal bottom-up build.	Complete	3.6	8.0%
Real input costs	Internally bottom-up build using AER's forecast real labour cost escalators	Complete	0.2	0.4%
Total capex			**45.0**	**100%**

The capex forecasts:

- do not include any contingencies
- reflect the outcome of competitive procurement processes
- do not include any variation provisions – we will manage any actual variations that arise through efficiencies in other areas
- the tendered outcomes reflect fixed lump sum payments (rather than a cap on total costs) by the suppliers
- do not include the cost of any land or easement acquisitions (as VNI does not require any such acquisitions)
- reflect our acceptance of the lowest cost compliant offer from the competitive tender processes, and
- reflect procurement in accordance with our compliance and governance requirements.

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

- the rigorous, well-defined and transparent capex forecasting methodology set out in this document
- the application of our governance framework and process
- the reliance on market testing, and
- Independent engineering capex verification and assessment – Attachment A.7. This independent expert report prepared by GHD confirms that the scope of the Project is reasonable and realistic to meet the investment need and that our forecast capex is consistent with that which would be incurred by a prudent and efficient business, and
- Independent economic capex verification and assessment – Attachment A.8. This independent expert report prepared by HoustonKemp confirms that our capex forecast is prudent and efficient by reference to the NER requirements and that the project scope is justified and represents an efficient approach to meeting the Project's objectives.

3. Changes in capex forecast from RIT-T PACR

This section explains the differences between our final capex forecast for VNI in this Application and the capex forecast published in the RIT-T PACR on 14 February 2020.

As discussed in section 2, the final capex forecast is $45.0 million (Real 2017-18). The capex forecast published in the PACR was $40.5 million[9] (Real 2017-18). Our forecast capex in this Application has only increased by around 11 per cent compared to the cost estimate in the RIT-T PACR, which is within the ±30 per cent range tested at the time.

Our forecast capex in this Application reflects information on the prudent and efficient market-based costs of delivering VNI, which was not available at the time of publishing the PACR. This final forecast reflects the outcomes of further negotiations and refinement with Smart Wires for the MPFC and competitive procurement processes with multiple bidders for the sub-station, transmission line and secondary system works.

The $4.5 million (Real 2017-18) increase between the PACR and final capex forecast primarily relates to:

> Smart Wires MPFC — The final capex forecast is $21.3 million (Real 2017-18), a decrease of $0.1 million (Real 2017-18) from the PACR forecast of $21.4 million (Real 2017-18). This is a based on final executed contract cost with Smart Wires.

> Substations – The final capex forecast for substations is $13.2 million (Real 2017-18), an increase of $4.2 million (Real 2017-18) from the PACR forecast of $9.0 million (Real 2017-18). The final capex forecast is based on a competitive early contract involvement tender process section 5.

> Transmission lines – The final capex forecast for transmission lines is $0.4 million (Real 2017-18), a decrease of $2.1 million (Real 2017-18) from the PACR forecast of $2.5 million (Real 2017-18). The final capex forecast is based on a competitive early contract involvement tender process as discussed in section 6.

> Secondary Systems – The final capex forecast of $2.6 million (Real 2017-18) for secondary systems is an increase of $0.4 million (Real 2017-18) from the PACR forecast of $2.2 million (Real 2017-18). Secondary systems are required to enable the safe operation of the network. The final capex forecast is based on a competitive early contract involvement tender process discussed in section 7.

> Direct labour and corporate and network overheads – The final capex forecast of $7.4 million (Real 2017-18) for direct labour and overheads is $2.1 million (Real 2017-18) higher than the PACR forecast of $5.3 million (Real 2017-18). This reflects a bottom up build of the expected resource requirements for VNI using assumptions aligned to those included in our recent contingent project applications for the Queensland Interconnector Upgrade and Project EnergyConnect. This is discussed in section 8.

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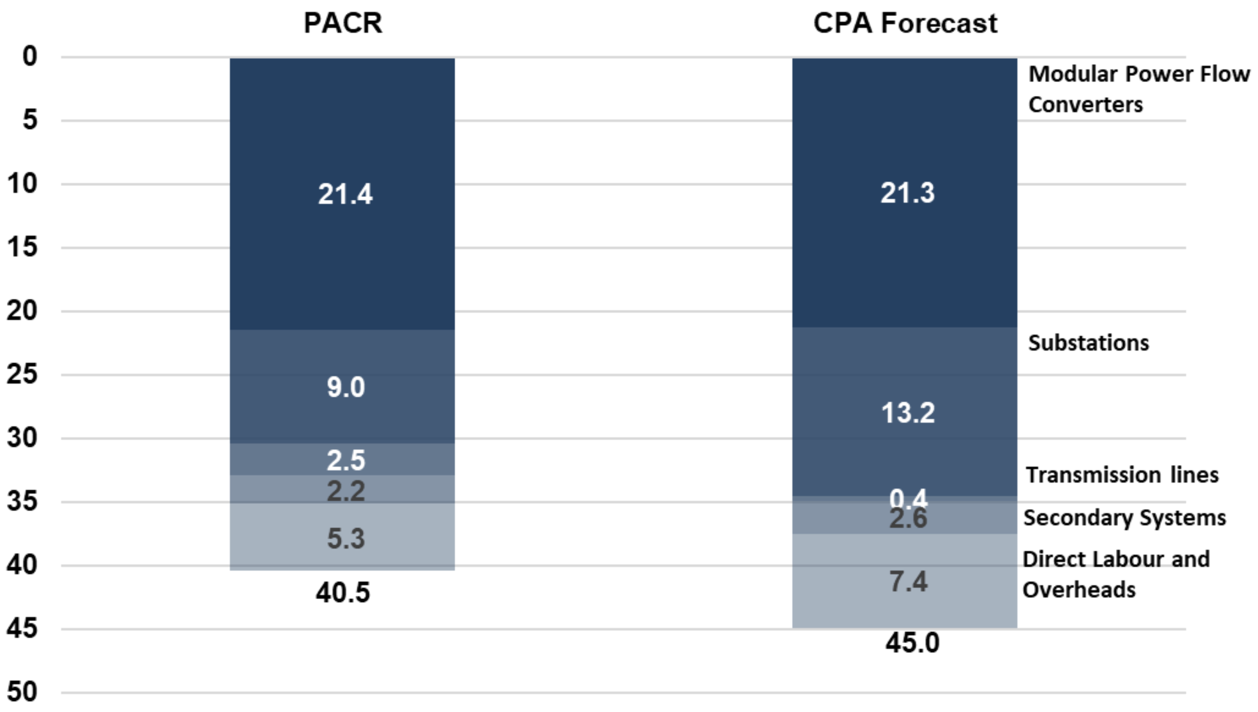
9 The PACR forecast capex of $41.0 million in Real 2019-20 which equates to $40.5 million in Real 2017-18.

Figure 2: Differences between the final capex forecast and the PACR capex forecast ($M, Real 2017-18)



4. Investment framework

This section overviews our investment framework.

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

The forecast capex for VNI:

> promotes our corporate objectives – there is a direct line-of-sight between those objectives and the capex forecast

> has been subject to appropriate capital governance

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

> reflects competitive, market-tested costs that have been obtained from external suppliers.

These matters are discussed in the following sections.

4.1 Aligned with corporate objectives

The capex forecast has been developed in-line with our vision and values to meet the needs of our customers to provide safe, reliable and efficient transmission services.[10] We have the following four overarching objectives for the delivery of VNI:

> deliver value for money

> effectively manage risk to prudently and efficiently deliver VNI

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

> continue a strong focus on safety.

Each of these overarching objectives is discussed below.

4.1.1 Value for money

Value for money is achieved by ensuring that the works are no more than is required to meet the need and that project costs are efficient. This is demonstrated by maintaining a rigorous capital governance process (see section 4.2) and ensuring project efficiency.

The optimal design for the substation and transmission line components of VNI is based on the current competitive design panel tender process. Our procurement process requires tenderers to determine the optimal design for VNI, subject to our overall design requirements.

4.1.2 Managing risk

Risk management is a critical aspect of VNI. This is because the nature and complexity of VNI increases procurement, delivery and commissioning risks significantly compared to business-as-usual capex. Our approach to risk management is aligned with our risk appetite. Our Risk Appetite Statement states that we have[11]:

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

11 TransGrid, 2019, TransGrid Risk Appetite Statement, pg. 3 and 4.

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

4.1.3 Delivering a fit-for-purpose asset

VNI is a large capacity interconnector between the Victoria and NSW. As such, it can impact on security of supply in both states. To ensure VNI continues to be a fit-for-purpose asset, we have:

- incorporated the outcomes of planning and engineering studies, allowing the for development of potential VNI options
- applied the relevant Australian and international standards in the specification of all materials and equipment required to deliver VNI
- applied our Safety in Design procedure (D2012/14473) to the design of new assets for VNI
- engaged qualified external parties to further develop and verify key aspects of the design and its implementation, and
- included appropriate protection, control and communications in the specification and scope of VNI.

We have undertaken design activities to inform the scope and technical requirements of VNI.

4.1.4 Safe work practices

Safety remains our first and highest priority for customers, the public, staff and contractors. All of our policies and safe work practices apply to VNI. These policies and practices are broad ranging and relate, amongst other things, to design principles (incorporating safety in design practices) and construction safety risk management, especially on existing in-service assets.

4.2 Appropriate governance framework

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

We have a separate capital portfolio for Major Projects (i.e. group 1 and 2 ISP projects).[12] These Major Projects are larger and more complex than business-as-usual capital projects. We have tailored our governance framework for these Major Projects so we are confident that we are making prudent and efficient investment decisions that will deliver satisfactory and sustainable returns on our assets in a compliant, safe and sustainable manner. This governance structure is applied to all Major Projects, including VNI.

The key principles underpinning our Major Project governance framework are to:

- provide consistent and rigorous approach to investment decisions
- ensure appropriate level of management scrutiny
- demonstrate to the Board, securityholders and key stakeholders that the forecast capex is efficient and prudent, and
- ensure that all investment accords with our compliance obligations and regulatory requirements.

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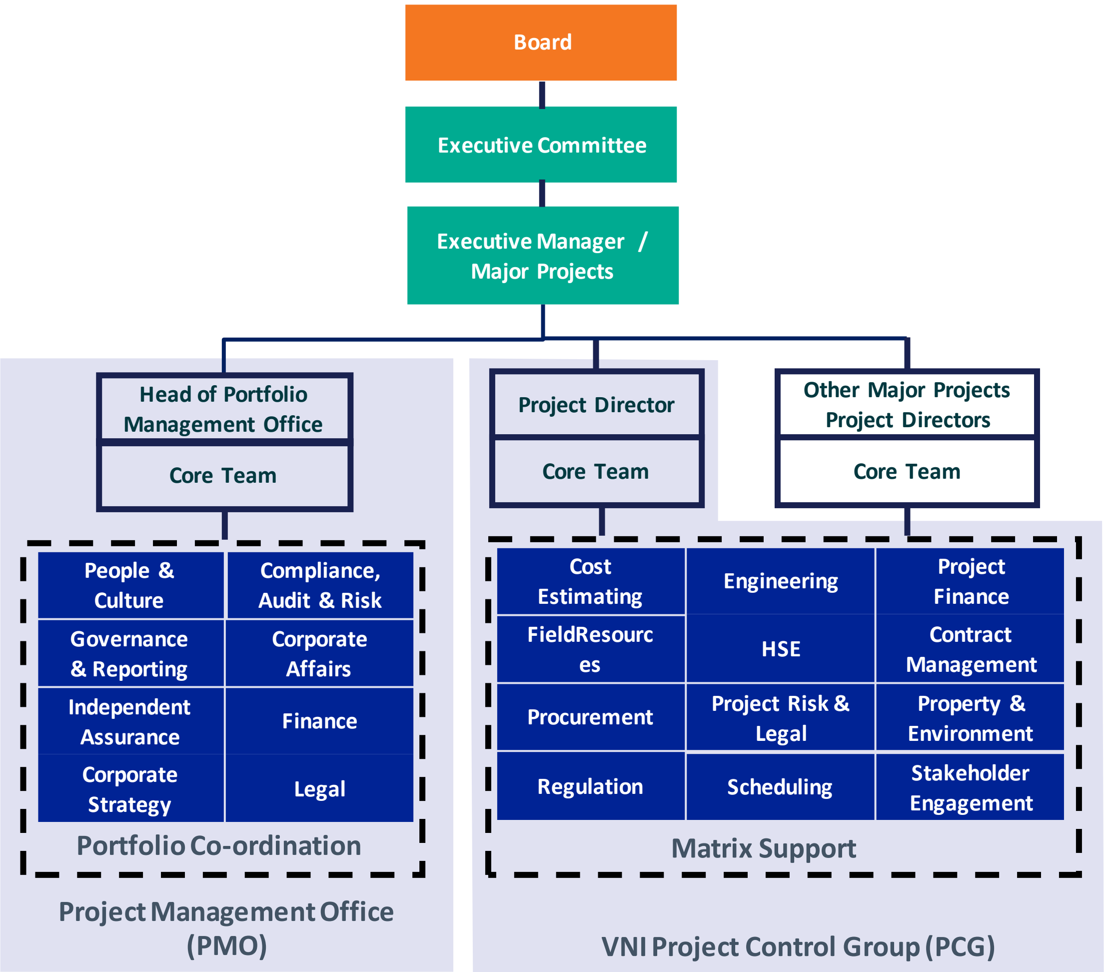
[12] Published by AEMO.

4.2.1 Governance Framework

VNI is governed in accordance with the Major Projects Governance Framework shown in Figure 3, which details the hierarchy of decision making and membership that support the Project.

Figure 3: Major Projects Governance Framework



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

4.2.2 Executive Committee

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

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

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

4.2.3 Portfolio Management Office

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

4.2.4 VNI Project Control Group

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

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

Functional responsibilities represented within the PCG include:

> project management, which is responsible for managing and co-ordinating project activities to efficiently deliver project tasks to the agreed scope, program and budget. This includes project scheduling, expenditure forecasting and reporting, and analysis of risk to mitigate the likelihood of undesirable outcomes from being realised

> health, safety and environment (HSE), which is responsible for establishing and overseeing HSE process and procedures, as well as auditing the resulting performance

> finance and regulation, which is responsible for managing the financial performance of VNI including cost budgeting and variance reporting, as well as ensuring that TransGrid addresses all regulatory compliance obligations

> engineering, which is responsible for the engineering technical input into VNI including in relation to power systems planning, design, operations and asset management, and cost estimating

> environment and property, which is responsible for managing the environment and land access approvals necessary to enable project construction and future operations and maintenance activities

> corporate affairs, which is responsible for fully understanding and responding to our customers' and other stakeholders' (Governments, market bodies, communities and landowners) needs and expectations and keeping them informed throughout the process

> procurement, which is responsible for supply chain management and contract administration during the delivery phase of works, and

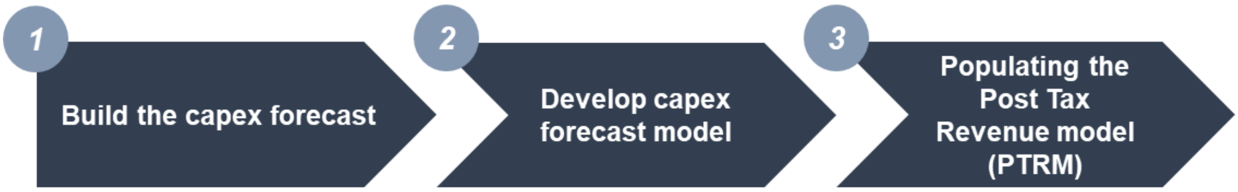
> construction, which is responsible for ensuring site works are appropriately planned and executed in accordance with HSE and operational requirements.

4.3 Well defined capex forecasting process

Our forecasting process for VNI involved the three steps as set out in Figure 4. These steps are to:

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

Figure 4: VNI capex forecasting process



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

- Step one – Build the capex forecast
  - prices obtained through tender processes have been used instead of historical costs from our cost estimating database, and
  - a bottom-up-build of our labour costs and indirect costs (network and corporate overhead costs) has been developed instead of applying historically derived percentage values from our cost estimating database.
- Step two – Develop capex forecast model

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

  This model adheres to the same principles as the Capital Accumulation Modes used for business-as-usual capital projects. The VNI capex forecast from step one was split by:

  - Financial year (project cash flows)
  - Regulatory asset category, and
  - Commodity type (real input cost escalators were applied to labour only).

  The VNI capex forecast model groups forecast expenditure into the regulatory asset classes approved in the AER's 2018-23 Revenue Determination. The asset classes relevant to VNI are shown in Table 4-1.

Table 4-1: Asset classes relevant to VNI

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

The AER approved real materials and labour cost escalators as part of the current 2018-23 Revenue Determination. For labour, this is the simple average of forecasts provided by Deloitte Access Economics and BIS Oxford Economics. The AER approved real material cost escalation rates of zero. Accordingly, materials are only escalated by inflation. The Application applies real input cost escalation as discussed in section 9.

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

> Step three – Populating the PTRM

The PTRM is populated from the VNI Capex Forecast Model (as well as the VNI Opex Forecast Model), rather than the Capital Accumulation Model.

5. Substation capex

This section explains our capex for VNI on substations. This excludes TransGrid labour costs, which are explained in section 8.

5.1 Nature and scope

VNI involves substation work at the Stockdill and Yass Substation site including:

- design, manufacture and supply and commissioning of the Smart Wires MPFC including:
  - Smart Wires i3600 unit to be erected and installed at the 330kV Stockdill substation. This will allow the 330 kV Upper Tumut – Canberra and Upper Tumut – Yass lines to balance power flows and increase transfer capability, and
  - the supply of additional valves for the Smart Wires i1800 to be installed at the Yass 330kV Substation.
- major substation construction (augmentation) works at Stockdill 330kV substation to facilitate installation of Smart Wires i3600 unit. This includes:
  - civil, site and structural works including: bulk earthworks; footings, trenching and conduits; and gantry structures, and
  - electrical and secondary system works including: the installation of the disconnector by-pass bay; all earthing connections and the modification of existing landing span structure and conductors.
- substation design work for Stockdill 330kV substation to facilitate installation of Smart Wires i3600 unit. This includes providing HV civil and structural design drawings and investigation reports and safety in design report and register.
- HV major plant, equipment and materials for Stockdill 330kV (a 330 kV disconnector and associated earthswitch, 330 kV vertical break pantograph disconnector and insulators and longrods). These will be provided as free issue items to the supplier who is undertaking the major substation construction work at the Stockdill 330kV substation.
- minor substation construction works at Yass. This will involve installation of an additional six SmartValves units to the proposed Yass Smart Wires i1800 product low voltage cabling to the control room with installation of trenches, HV connection work, the installation of Smart Wires antenna and other works associated with the installation and commissioning of the SmartBanks modules.
- design, supply of materials, installation, testing and commissioning of secondary systems works to include relay replacements, protection panel replacement, scheme changes and communications equipment replacement at eight remote end existing substation.

5.2 Procurement approach and process

5.2.1 Smart Wires

The scope of works to be carried out by Smart Wires includes the following six separable tasks:

- Portion 1a: design of the full MPFC installation – including support insulators – at Stockdill substation;
- Portion 1b: MPFC testing of contractor products to be installed at Stockdill substation;
  - 1b1: Stockdill mandatory testing;

– 1b2: Stockdill preferential testing;

> Portion 2: procurement and construction of the MPFC works to be carried out for/at Stockdill substation;

  – 2a: Stockdill equipment long lead time items;

  – 2b: Stockdill equipment supply and commissioning;

> Portion 3: design of the full MPFC installation at Yass substation and RTDS protection studies;

> Portion 4: procurement and commissioning of the design of the full MPFC works to be carried out for/at Yass substation; and

> Portion 5: development of a spares strategy and associated procurement for both Yass and Stockdill substations.

On 28 February 2020, we signed a letter with Smart Wires that agreed that, in order to keep VNI on track, the Smart Wires components would be completed under an overarching set of agreed terms and conditions ('Master Services Agreement') with work on each respective separable portion to commence following the issuing of a respective 'work order'.

Following the issuance of the letter, Smart Wires received a direction to proceed with separable portion 1a and separable portion 3 on 28 February 2020, with a total combined sum of $368,260.87 (Real 2019-20), by way of an issued work order.

Another direction was subsequently provided on 24 July 2020 to proceed with separable portion 1b1 with the authority for TransGrid to spend $750,000 (Real 2019-20) and the balance of the work order to be payable upon final contract consolidation.

On 4 August 2020, we executed a final contract with Smart Wires, which replaced the Master Services Agreement signed in February 2020. The contract involves a total cost of $21,586,983.27 (Real 2019-20) and includes all separable portions outlined above (including 1a, 3 and 1b1).

The final executed contractual cost has been included in this Application and is marginally lower than the $21.7 million (Real 2019-20) used in the RIT-T PACR analysis. This represents approximately 47 per cent of the overall projected total capital expenditure for the NSW portion of VNI, as set out in this Application.

We note that the MPFC solution is a proprietary technology that can only be provided by Smart Wires. The RIT-T concluded that the procurement of the Smart Wires MPFC resulted in the highest net benefits of all the credible options considered. Given the proprietary nature of the Smart Wires technology, the identification of this technology as forming part of the preferred option under the RIT-T (which is an open process that allows all potential proponents of alternative solutions to participate) means that this cost has already been market tested and further testing through competitive procurement is not feasible.

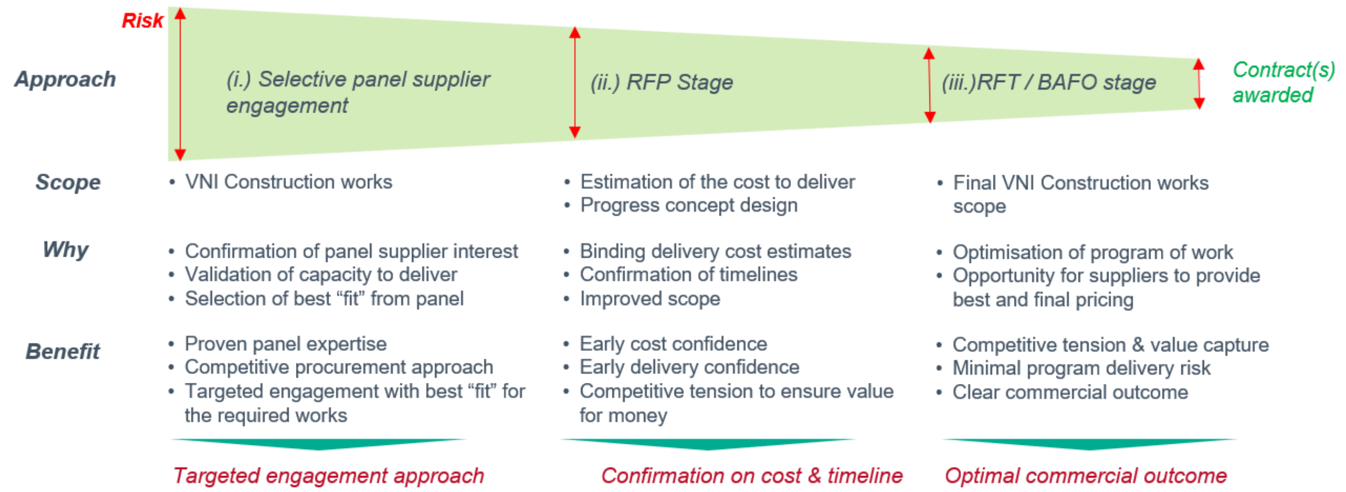
5.2.2 Major substation work at Stockdill and Minor substation work at Yass

5.2.2.1 Construction

We have used a competitive early contract involvement (ECI) tender process to procure the major substation works at the Stockdill substation and minor substation works at Yass utilising our existing provider panel (Construction Services Panel), along with the transmission line and secondary systems construction work outlined in sections 6.2.1.1 and 7.2.1.1 below, respectively. Consistent with general procurement practices of NSP businesses, we periodically competitively tenders for a panel of providers who then respond to specific requests during the period of the panel.

Figure 5 summarises the three-stage ECI process for procuring construction works services for VNI. The process involves an initial selective panel supplier engagement, followed by a selective Request for Proposal (RFP) and then a selective Request for Tender (RFT).

Figure 5: Summary of the three-stage construction procurement for VNI



While our existing panel for substation work has four suppliers on it (CPP, Downer, UGL and Zinfra), the decision was made in March 2020 to approach two members of the panel (Zinfra and Downer), both of whom are well-established suppliers of substation works. This decision was based on:

> an early filtering process based on the following data from our internal monthly panel scoring system for contractors:
  – past performance delivering projects for us, and
  – general capability and capacity in delivering the works required,

> the other suppliers on the Construction Services Panel currently facing resourcing constraints due to the number of projects currently being undertaken in the sector,

> our desire to minimise the risk associated with timing impacts on other projects that will be occurring over the same period (2021-22 and 2022-23), and

> the ability to have a deeper engagement with two suppliers compared to three or four suppliers, allowing a more prudent and efficient outcome and greater confidence in the subsequent delivery of VNI.

Zinfra and Downer were selected based on their capability both to undertake the works generally, as well as within the reasonably short time required.

We did not undertake an early engagement process on account of:

> the relatively high degree of certainty associated with the works and supplier capabilities, and

> the panel had already undergone an evaluation process when we established it.

The tenders were based on concept designs we prepared, which were supported by our Standard Design Manual and Standard Construction Manual. GHD has reviewed the scope of these works and concluded it is reasonable and realistic to meet the investment need.

We released the initial Request for Proposal (RFP) in April 2020 and received non-binding RFP responses on 1 May 2020. We then held a number of workshops with each party's commercial and technical teams in order to further understand their offers, as well as to allow them to refine their offers as part of the subsequent RFT process. We received binding 'best and final offers' (BAFO) from Zinfra and Downer on 17 August 2020.

The RFP and RFT were for both substations as a package, as well as for the transmission line and secondary systems construction work outlined in sections 6.2.1.1 and 7.2.1.1 below, respectively. Separating these elements would have created significant interface risk and cost, resulting in a greater overall cost.

We then undertook a tender evaluation process to determine the preferred suppliers. This involved the following two assessments:

> a technical assessment for non-compliance, and
> a commercial assessment for any commercial departures.

The preferred supplier, [redacted], ranked highest on both the technical and commercial assessments and represents the lowest cost supplier of all capex procured through the competitive ECI process (i.e. all substation work, transmission line work and secondary systems work).[13]

On 17 August 2020, we executed a contract with [redacted] that includes a capex cost of $14,689,517.30 (Real 2019-20) for all major substation work at Stockdill and minor substation work at Yass. This represents 32 per cent of the projected total capital expenditure for the NSW portion of VNI.

5.2.2.2 Design

We used a competitive ECI tender process to procure design works for the Stockdill substation utilising our existing panel (Engineering Services Panel (ESP)), as well as the substation and secondary system design work outlined in sections 6.2.1.2 and 7.2.1.2 below, respectively. This panel had previously been established using a competitive process in accordance with our business-as-usual procurement policies.

We approached all three members of the existing panel (BECA, Aurecon and AECOM) plus the reserve panellist (APD), each of whom are each well-established suppliers of design works.

We did not undertake an early engagement process for the design works on account of:

> the relatively low level of capex and standard nature of the design work activities, and
> the panel had already undergone an evaluation process when we established it.

The RFT that we issued:

> was based on concept designs we prepared, which were supported by our Standard Design Manual and Standard Construction Manual. Suppliers were asked to provide detailed designs to achieve technical compliance, and
> required suppliers to provide their bids subject to the standard terms and conditions of the panel (i.e. as opposed to developing new, bespoke, terms and conditions).

GHD reviewed the scope of the concept design works and concluded it is reasonable and realistic to meet the investment need.

We released the RFT on 14 April 2020. We received RFT responses from all four suppliers on 16 April 2020.

We undertook a tender evaluation process to determine the preferred suppliers. This involved:

> a technical assessment for non-compliance, and
> a commercial assessment for any commercial departures.

The preferred supplier, [redacted], ranked highest on both the technical and commercial assessments and represents the lowest cost supplier. Further, [redacted] provided a 7.5 per cent discount on their existing panel rates (which had also previously been established using a competitive process).

On 5 May 2020, we executed a contract with [redacted] that includes a capex cost of $267,378 (Real 2019-20) for the design works for the Stockdill substation. This represents approximately 0.6 per cent of our projected total capital expenditure for VNI.

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[13] As outlined in sections 6 and 7 below, the competitive ECI process covered all three key asset works required, i.e. substations, transmission lines and secondary systems.

We note that it is common to use a different supplier for the design work compared to the actual construction. All panellists approached are closely familiar with our design standards and requirements.

5.2.2.3 HV plant and equipment

We have existing period agreements with suppliers for HV plant and equipment and there are generally multiple potential providers for each of these components. We have identified, through our existing period agreements, the lowest cost supplier for the provision of these major components for the Stockdill 330kV substation part of the VNI upgrade.

The major HV plant being supplied (in addition to the Smart Wires equipment) are:

> 330 kV disconnector and associated earthswitch

> 330 kV vertical break pantograph disconnector, and

> insulators and longrods.

The routine process we follow in selecting companies with whom to enter into period agreements is a competitive process in itself. Since these components involve relatively small capex, and are simpler to procure, the procurement process for these elements commenced in August 2020. We are consequently currently liaising with period agreement suppliers of each component and we expect to acquire the various required HV plant and equipment components from multiple panel members.

We will provide the HV plant and equipment as free issue items to [redacted] in their capacity as the supplier undertaking the associated substation works.

All HV plant and equipment for the Stockdill substation has now been ordered (but not yet delivered). The total capex cost of these components is $200,293 (Real 2019-20), which represents approximately 0.6 per cent of our projected total capital expenditure for VNI.

5.2.2.4 Cyber Security

We have a comprehensive Cyber Security Framework covering a number of Information Technology and Operational Technology systems. The Smart Wires i3600 unit is new innovative technology equipment and we are undertaking an assessment of the cyber security risk associated with the connection of this unit to our transmission network.

This assessment involves working closely with the equipment supplier, Smart Wires, internal staff, external consultants and possible third party testing of equipment to verify compliance with the Cyber Security Framework.

The total capex forecsast for Cyber Security at our substations is $280,000 (Real 2019-20)

5.3 Outcome and forecast

The final executed contractual cost with Smart Wires involves a capex cost of $21.3 million (once converted to Real 2017-18 dollars).

The outcomes of the tender processes for the substation construction and design works were that we engaged:

> a single supplier to provide major substation work at Stockdill and minor substation work at Yass, and

> a single (different) supplier to provide the design work.

The total value of the contract for the substation construction works is approximately $12.5 million (Real 2017-18).

The total value of the contract for the substation design work is approximately $0.3 million (Real 2017-18).

The total capex cost of the HV plant and equipment components is approximately $0.2 million (Real 2017-18) and of cyber security works is also approximately $0.3 million (Real 2017-18).

Overall, the total value of the contracts for substation works by the preferred suppliers is approximately $34.5 million (Real 2017-18) (77 per cent of our overall capex for VNI).

6. Transmission line capex

This section explains our capex for VNI on transmission lines. This excludes TransGrid labour costs, which are explained in section 8.

6.1 Nature and scope

VNI requires some transmission line works associated with stringing works from the existing transmission structures to the newly constructed substation gantry for TL (01). This will involve:

> transmission line construction work, including civil and structural works associated with conductor and OPGW stringing works,

> transmission design work including initial scoping, concept design and standard development, detailed design, and

> procurement of minor transmission line material (e.g. insulators and conductor). These are expected to be provided as free issue items to the suppliers who are undertaking transmission line construction work at the Stockdill 330kV substation.

We note that the scope of the transmission line work has reduced since the RIT-T PACR and no longer involves any new structures outside of the substation.

6.2 Procurement approach and process

6.2.1.1 Transmission line construction

The same competitive ECI tender process, utilising our existing provider panel (Construction Services Panel), has been used to procure the transmission line construction as we used for substation construction, i.e. that described in section 5.2.2.1 above. We have therefore not repeated the discussion of this process here.

Running separate procurement processes, and potentially having more than one successful tenderer across these two asset classes, would raise the interface risk and cost and so we do not consider it prudent or efficient, particularly when the cost of transmission line capex is taken into consideration.

As outlined in section 5.2.2.1, on 17 August 2020 we executed a contract with [redacted] that includes a capex cost of $364,075.30 (Real 2019-20) for all transmission line work. This represents 0.8 per cent of our projected total capital expenditure for VNI.

6.2.1.2 Transmission line design

The same competitive ECI tender process utilising our existing panel (ESP) has been used to procure the transmission design works as for the Stockdill substation works, i.e. that outlined in section 5.2.2.2 above. We have therefore not repeated the discussion of this process here.

As stated above for the transmission line construction, running separate procurement processes, and potentially having more than one successful tenderer, would raise the interface risk and cost and so we do not consider it prudent or efficient, particularly when the cost of the transmission line design work is taken into consideration.

As discussed in section 5.2.2.2, on 5 May 2020 we executed a contract with [redacted] that includes a capex cost of $54,400 (Real 2019-20) for the transmission line design works. This represents approximately 0.1 per cent of our projected total capital expenditure for VNI.

6.2.1.3 Transmission line equipment

As outlined in section 5.2.2.3 above for HV plant and equipment, we have existing period agreements with suppliers for transmission line equipment and there are generally multiple potential providers for each of these components. TransGrid has identified, through its existing period agreements, the lowest cost supplier for the supply of these transmission line components for the VNI upgrade.

These components involve minor equipment such as insulators and conductors and will be provided as free issue items to [redacted] in their capacity as the supplier undertaking the associated transmission line works.

All transmission line equipment has now been ordered (but not yet delivered). The total capex cost of these components is approximately $100,000 (Real 2019-20), which represents approximately 0.2 per cent of our projected total capital expenditure for VNI. These costs are embedded within the substation equipment costs discussed in Chapter 5 above.

6.3 Outcome and forecast

The outcomes of the tender processes for the transmission line construction and design works were that we engaged:

> a single supplier to provide transmission line construction works at Stockdill, and

> a single (different) supplier to provide the design work.

The total value of the contract for the transmission line construction works is approximately $0.4 million (Real 2017-18).

The total value of the contract for the transmission line design work is approximately $0.1 million (Real 2017-18).

The total capex cost of the transmission line equipment costs is approximately $100,000 (Real 2019-20). These are embedded within the substation equipment costs discussed in Chapter 5 above.

Overall, the total value of the contracts for transmission line works by the preferred suppliers is approximately $0.4 million (Real 2017-18) (0.9 per cent of our overall capex for VNI).[14]

[14] Note that the values for transmission line construction costs and design works may not add exactly due to rounding. The $0.4 million (Real 2017-18) does not include transmission line equipment costs.

7. Secondary systems

This section explains our capex for the VNI secondary systems. This excludes TransGrid labour costs, which are explained in section 8.

7.1 Nature and scope

VNI requires the replacement of secondary system equipment (i.e. panels and relays) in order to manage the operational uncertainty relating to system reliability. We will replace and/or modify protection relays at eight substations including Yass, Upper and Lower Tumut, Gullen Range, Marulan, Canberra, Stockdill and Williamsdale. This will involve:

- secondary system construction work, including protection replacement works, subsequent testing and commissioning support
- secondary system design work, including relay notification forms, relay test instructions, automation design and bill of materials, and
- procurement of secondary system equipment, including supply of protection relays and associated equipment. This will be provided as free issue items to the suppliers who are undertaking the secondary system construction work.

The following table provides a breakdown of relays modification works at the respective substations.

Table 7-1: Proposed Location of Protection System Upgrade

Substation Name	Design Deliverables	RNFs	RTIs	Relays
Yass	330 kV Feeder 2 to Upper Tumut (New Relays)	1	2	2
	330 kV Feeder 3 to Lower Tumut (New Relays)	1	2	2
	Feeder 3J to Gullen Range (New Relays)	1	2	2
	Feeder 4 to Marulan (New Relays)	1	2	2
	Feeder 5 to Marulan (New Relays)	1	2	2
	Feeder 9 to Canberra (New Relays)	1	2	2
Upper Tumut	330 kV Feeder 2 to Yass (New Relays)	1	2	2
Lower Tumut	330 kV Feeder 3 to Yass (New Relays)	1	2	2
Gullen Range	330 kV Feeder 3J to Yass (New Relays)	1	2	2
Marulan	330 kV Feeder 4 to Yass (Scheme Change)	0	2	0
	330 kV Feeder 5 to Yass (Scheme Change)	0	2	0
Canberra	330 kV Feeder 9 to Yass (New Relays)	1	2	2

Substation Name	Design Deliverables	RNFs	RTIs	Relays
Upper Tumut	330 kV Feeder 01 to Stockdill (New Relays)	1	2	2
Williamsdale	330 kV Feeder 3C to Stockdill (New Relays)	1	2	2
Total		**12**	**28**	**24**

7.2 Safety in design procurement approach and process

7.2.1.1 Secondary system construction

The same competitive ECI tender process, utilising our existing provider panel (Construction Services Panel), has been used to procure the secondary system construction as we used for all substation construction, i.e. that described in section 5.2.2.1 above. We therefore do not repeat the discussion of this process here.

Running separate procurement processes, and potentially having more than one successful tenderer, would raise the interface risk and cost and so we do not consider it prudent or efficient, particularly when the cost of secondary system capex is taken into consideration.

As outlined in section 5.2.2.1, on 17 August 2020 we executed a contract with [redacted] that includes a capex cost of $1,704,141.93 (Real 2019-20) for all secondary system construction. This represents 3.7 per cent of the projected total capital expenditure for the NSW component of VNI.

7.2.1.2 Secondary system design

The same competitive ECI tender process utilising our existing panel (ESP) has been used to procure the secondary system design works as for the Stockdill substation design works, i.e. that outlined in section 5.2.2.2 above. We therefore do not repeat the discussion of this process here.

As stated above, running separate procurement processes, and potentially having more than one successful tenderer, would raise the interface risk and cost and so we do not consider it prudent or efficient, particularly when the cost of the secondary system design work is taken into consideration.

As discussed in section 5.2.2.2, on 5 May 2020 we executed a contract with [redacted] that includes a capex cost of $418,822 (Real 2019-20) for secondary system design works. This represents approximately 0.9 per cent of the projected total capital expenditure for the NSW component of VNI.

7.2.1.3 Secondary system equipment

As outlined in section 5.2.2.3 above for HV plant and equipment, we have existing period agreements with suppliers for secondary system equipment and there are generally multiple potential providers for each of these components. TransGrid has identified, through its existing period agreements, the lowest cost supplier for the supply of these components for the VNI upgrade.

These components include protection relays, communications equipment and control equipment and will be provided as free issue items to [redacted] in their capacity as the supplier undertaking the secondary system works.

All secondary system equipment has now been ordered (but not yet delivered). The total capex cost of these components is approximately $509,610 (Real 2019-20), which represents approximately 1.1 per cent of the projected total capital expenditure for the NSW component of VNI.

7.3 Status and forecast

The outcomes of the tender processes for the secondary system construction and design works were that we engaged:

- a single supplier to provide secondary system construction works, and
- a single (different) supplier to provide the design work.

The total value of the contract for the secondary system construction works is approximately $1.7 million (Real 2017-18).

The total value of the contract for the secondary system design work is approximately $0.4 million (Real 2017-18).

The total capex cost of the secondary system components is approximately $0.5 million (Real 2017-18).

Overall, the total value of the contracts for secondary systems works by the preferred suppliers is approximately $2.6 million (Real 2017-18) (5.8 per cent of the overall capex for the NSW component of VNI).

8. TransGrid labour and indirect costs

This section explains our capex for VNI on TransGrid labour and indirect costs, which are split between direct costs and corporate and network overheads.

8.1 Nature and scope

We will incur TransGrid labour and indirect costs in the delivery of VNI. These costs are incremental to the capex approved in the AER's 2018-23 Revenue Determination, as they relate to activities that are additional to our normal business activities and would not be incurred if we did not proceed with VNI[15].

We have four categories of TransGrid labour and indirect capex:

> historical capex – this is capex that we incurred on VNI from 1 July 2018 to 30 September 2020

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

  - Works delivery capex – this is capex associated with the design and construction of those components of VNI that we will undertake internally. This includes:
    - project and contract management and project controls in accordance with our project management delivery model
    - civil, electrical, environmental and safety inspections to ensure the work, completed by the contractors, satisfies contractual requirements
    - oversight of contractors for pre-commissioning checks and in-service commissioning activities of new equipment, and
    - managing the interface between exiting equipment and systems and the new equipment and systems.
  - Project development capex – this capex relates to setting up and project managing VNI. Most of the project development costs relate to incremental labour. There will also be some non-labour costs for consultant and professional fees.
  - Other labour and indirect capex – which includes:
    - stakeholder and community engagement – a portion of one FTE working across the Major Projects division to undertake stakeholder and community engagement for VNI and other major projects
    - insurance costs – this relates to insurance to cover the risks associated with "construction" activities during the substation and transmission line uprating works – this is incremental to our existing insurance cover.

Consistent with TransGrid's cost allocation methodology and regulatory reporting, some TransGrid labour costs are treated as direct costs. Those that are not are instead treated as network overheads.

[15] TransGrid labour and indirect costs are capitalised if they are sufficiently connected with the delivery of capital works – this is consistent with our capitalisation policy.

8.2 Approach to determining capex

This sub-section overviews the approach we have taken to determine our actual and forecast labour and indirect capex. The document entitled "TransGrid Labour and Indirect Costs" provides further details about this approach.

8.2.1 Historical TransGrid labour and indirect capex

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

8.2.2 Works delivery capex forecast

We have forecast our works delivery capex based on the additional resources we require for project delivery, having regard for the timing of when FTEs are required and our standard labour rates. There are no non-labour costs included in the works delivery capex forecast. We have:

> estimated that 13 additional roles are required for this capex (peaking in July 2021). This has regard for our current practices, the complexity and timeframes of VNI and relevant legislative requirements

> phased the commencement of FTEs over the duration of VNI

> applied standard labour rates, effective from 30 June 2019, and converted these back to rates as at 30 June 2018. Real labour cost escalations have not been included in this part of the forecast – they are instead detailed in section 9, and

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

8.2.3 Project development capex

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

> estimated that 41 additional roles are required for this capex

> phased the commencement of FTEs over the duration of VNI

> applied standard labour rates, effective from 30 June 2018. Real labour cost escalations have not been included in this part of the forecast – they are instead detailed in section 9, and

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

In addition, we have estimated that capex is also required for consultant and professional fees.

8.2.4 Other labour and indirect capex

8.2.4.1 Stakeholder & community engagement capex

A portion of one FTE (a Media & Communications Manager) is required for the period 1 October 2020 – 31 March 2022. This new FTE will work across the Major Projects Division. We have therefore allocated two per cent of the cost of this FTE to VNI in line with the Major Projects allocation methodology.

We will leverage our existing community and stakeholder engagement team to undertake all other stakeholder activities.

8.2.4.2 Insurance costs

We have obtained estimates from our insurance provider for additional insurance to cover the risks associated with construction activities during the substation works and transmission line uprating works. Our insurance provider prepared its estimates based on information we provided.

8.3 Split of capex between direct and indirect

Some TransGrid labour costs are treated as direct expenditure for regulatory reporting purposes, with the rest treated as indirect expenditure – or network and corporate overheads.

Based on 2018-19 actual expenditure, we have assumed that 70 per cent of forecast labour and labour related costs are direct and 30 per cent is indirect. Applying these assumptions to our labour and indirect forecasts gives the split shown in Table 8-1.

8.4 Outcome and forecast

Forecast labour and indirect costs are set out in Table 8-1 split between direct labour costs and overheads.

Table 8-1: Split of labour and indirect costs by category ($M, Real 2017-18)

Category	Direct labour costs	Network and corporate overheads	Total
Actual labour and indirect costs	0.8	2.2	**2.9**
Works delivery	2.3	1.0	**3.4**
Project delivery	0.5	0.3	**1.8**
Other labour and indirect costs			
Stakeholder and community engagement	0.0	0.0	**0.0**
Insurance	-	0.1	**0.1**
Total	**3.6**	**3.6**	**7.2**

9. Real input cost escalations

This section explains our real input cost escalations for VNI.

9.1 Nature and scope

Labour costs make-up a large component of our forecast capex for VNI. These labour costs tend to increase over time by more than the rate of inflation. We have included the forecast impact of these real labour input escalation increases in our capex forecasts.

9.2 Approach to determining capex

Forecast real input cost escalation is calculated by multiplying the labour cost components of the tendered expenditure, property costs, and indirect expenditure by the forecast real labour cost escalators allowed by the AER in its revenue determination for the 2018-23 regulatory period.[16] Consistent with that determination, no real input cost escalation was included for non-labour components of the expenditure.

The real labour input cost escalators for 2018-19 to 2021-22 are set out in Table 9-1. These are converted into a cumulative index from the 2017-18 year.

Table 9-1: Real labour input cost escalator and cumulative index

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

Note: Values are rounded for presentational purposes. Unrounded values have been used in the calculations.

The approach is applied in our capex model.

9.3 Forecast

Applying this approach gives forecast real input cost escalation of $0.2 million (Real 2017-18) over the 2018-23 regulatory period, as set out in Table 9-2.

Table 9-2: Forecast real input cost escalation ($M, Real 2017-18)

	2018-19	2019-20	2020-21	2021-22	Total
Real input cost escalation	0.0	0.1	0.1	0.1	**0.2**

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

10. Forecast verification and validation

This section explains how our actual and forecast capex for VNI have verified and validated by independent experts.

10.1 GHD's engineering assessment

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

GHD verified that the scope development is reasonable for this type of complex project involving new technology and fast response control systems.

GHD developed comparative estimates, or estimated costs using historical project costs and publicly available data. A comparative estimate was developed for each of the forecast capex categories.

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

Overall, GHD concluded that our total forecast capex for VNI is within the nominal ±20% range, and is therefore reasonable and efficient.

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

GHD's report is provided as Attachment A.7 of our Application.

10.2 HoustonKemp's economic assessment

We engaged HoustonKemp to assess the consistency of our proposed capex for VNI with the NER requirements. HoustonKemp relied on GHD's engineering assessment in undertaking its economic assessment.

HoustonKemp concluded that our capex forecast of $45.0 million (Real 2017-18) is prudent and efficient because:

- 83 per cent of our capex forecast has been market tested, either via the RIT-T process or competitive tender processes
- we have selected the lowest cost provider where possible, and
- it reflects the expected costs we will incurred.

HoustonKemp note that GHD's concludes that:

- our capex forecast for tendered and procured capex is reasonable, and
- our capex forecast for other costs are also reasonable.