Case For Investment (CFI): NPR-000070 (PR797) Box Hill ZS Load Constraint

August 2022

Endeavour Energy

Version Control and Approvals

Table 1 below is updated detailing key changes made between versions. The table is populated in descending order.

Table 1 – Version Control

Version #	Date of Issue	Description
0	8 August 2022	Original version.

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Contents

1. Executive Summary 1
   - 1.1 Need / Background 1
   - 1.2 Options Considered 2
   - 1.3 Recommendation and Next Steps 3

2. Project Proposal 4
   - 2.1 Identified Need or Opportunity 4
   - 2.2 Existing Infrastructure not capable to service the growth 7
   - 2.3 Related Projects 9

3. Options Considered 10
   - 3.1 Option 1: Base Case - No Proactive Intervention 10
   - 3.2 Credible Network Options (Long Term) 12
   - 3.3 Sensitivity and Scenario Analysis 19
   - 3.4 Non-Network Options to defer 2nd stage of Network Investment 22

4. Detailed description and costs of preferred option 24

5. Recommendations and Next Steps 29

Appendices 30

A. Listing of benefits, risks, and residual risks considered 31

B. Referenced documents and appendices 32

Investment Title	**Box Hill ZS Load Constraint**
<< project # / code >>	NPR-000070
Portfolio	Augex
CFI Date	08/08/2022
Pre RIT-D	☒
Final CFI	☐
Other	☒ Early Phase CFI (Documentation of need, scope and expenditure forecast for inclusion in IDST)

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1. Executive Summary

This Executive Summary sets out an overview of the proposed investment including the underlying need, our recommended solution, a discussion of the key drivers, and the options considered to address the need. These aspects are covered in detail in the body of the Case for Investment (CFI).

1.1 Need / Background

The Box Hill development area is comprised of Box Hill, Box Hill Industrial and Box Hill North precincts, will altogether deliver 14,000 new homes, two town centres and village centres, 133 hectares of employment land, 58 hectares of recreational and environmental space, new primary and high schools. The development will ultimately require an estimated capacity of 73MVA by 2041. Development has already begun in both locations, with new homeowners now starting to occupy the new residential subdivisions. Endeavour Energy established a staged delivery of 132/22kV Box Hill zone substation to supply the initial stages of the development. The initial investment was subject to a RIT-D process. Investment was granted for Stage 1 of the Box Hill zone substation (ZS), consisting of one 45MVA transformer and one transmission feeder from Vineyard BSP to Box Hill ZS, which is set to be commissioned in 2023 with a future transformer to be commissioned at a later date.

This CFI includes options to address the growing demand in this area which is set to exceed the capacity of Box Hill ZS (Stage 1) from 2027 onwards. From then, there will be a large amount of load at risk and ultimately sustained involuntary load shedding, resulting in considerable unserved energy and loss of supply. Investment into additional electrical capacity in this area is required to reduce this risk.

Figure 1 below is the decision rule from the growth servicing strategy. The identified need is such that it is sub-optimal for Endeavour Energy to do nothing because:

- Based on characteristics of growth, this investment is classified as **brownfield** because of the densification in the area due to growth in residential load.
- Significant net **market benefits**[1] can be achieved with investment options compared against the base case ('BAU activities').

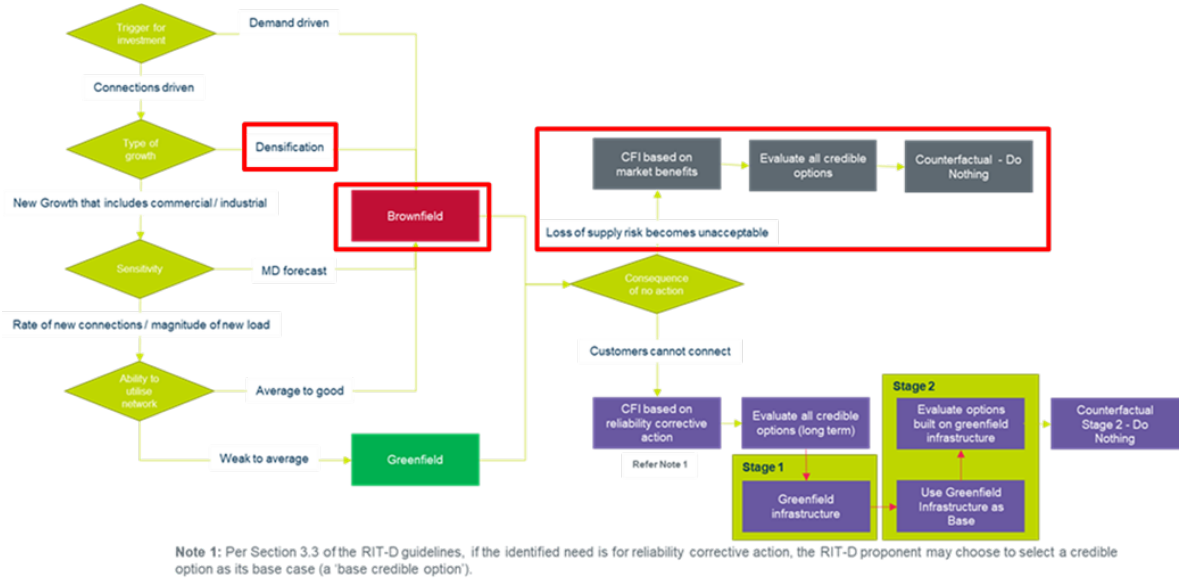


Figure 1: Decision Rule from Endeavour Energy's Growth Servicing Strategy

[1] Refer to Growth Servicing Strategy for definitions of greenfield and brownfield sites

1.2 Options Considered

1.2.1 Long Term Network Options

Table 2 outlines the options for the total scope of the project. Note that the network solutions build upon Stage 1 infrastructure at Box Hill ZS, consisting of 1x 45 MVA transformer and 1x 132kV transmission feeder from Vineyard BSP to Box Hill ZS. The table shows that Option 2A represents the highest value (economic benefit), being NPV positive of $1,328 Million compared to Option 2B, even with the sensitivity & scenarios considered in Section 3.3. This option provides significant market benefit by reducing the amount of involuntary load shedding (i.e., expected unserved energy) when compared to the BAU base case (Option 1). In addition to being the least cost option, Option 2A also offers the following benefits:

- Provides a secondary market benefit of providing a ring supply with alternate back-up to Box Hill ZS when compared to Option 2B
- Avoids the potential difficulties of the feeder route in Option 2B as detailed in Section 3.2.2.
- A connection application for a data centre in Rouse Hill has been received, requesting N-1 supply at 132kV. As there is only 1 spare circuit breaker at Mungerie Park ZS[2], the data centre customer must be looped between Mungerie Park ZS and Box Hill ZS. The cost of looping in the data centre customer has not been included within NPV calculations as the timing of the data centre is unclear at this stage. However, it is noted that Option 2A will allow Endeavour Energy to supply this customer by extending the proposed 132kV feeder by an additional 2.3km while Option 2B would require an additional 8.9km of cable.

For these reasons, **Option 2A** is the preferred long-term credible network configuration for the project's overall scope**.**

Table 2: Options for the Total Scope

Option	Description	Solution Type	Central NPV [1] $M	Weighted NPV[2] $M	Rank	Comments
2A	**Augment Box Hill ZS to a firm 45MVA 132/22kV ZS in FY29** **(1x 45 MVA Transformer & 1x 132kV feeder from Mungerie Park ZS)**	Network solution	1,327.8	1,585	1	**Best NPV, Preferred Long Term Network Option**
2B	Augment Box Hill ZS to a firm 45MVA 132/22kV ZS in FY29 (1x 45 MVA Transformer & 1x 132kV feeder from Vineyard ZS)	Network solution	1,325.7	1,583	2	Technically feasible, lower net benefits

Notes:
1: The NPV is based on the central demand scenario.
2: Weighted NPV as per Section 3.3. A weighted case has been calculated using a 50:25:25% weighting of the Central, Low and High demand forecast scenarios. This is a reasonable approach to incorporate the uncertainty in the timing of development across the three scenarios that form the basis of the demand forecasts

[2] Refer to Section 3.2.2

1.2.2 Non-Network Options

The New Technology Master Plan (NTMP) tool was used to evaluate credible non-network options with the constraint of Stage 1 Box Hill ZS consisting of only 1x 45 MVA transformer. The NTMP tool and the subsequent qualitative analysis found at least two credible non-network options (Battery Energy Storage System (BESS) & Behavioural Demand Response), which could defer network investment.

However, it should be noted that these non-network options do not provide transmission-level (132kV) N-1 supply security for Box Hill ZS, and hence there remains a load at risk at the transmission level.

1.3 Recommendation and Next Steps

Based on Endeavour Energy's RIT-D process (Figure 2), it is recommended that:

- A Non-Network Options Report be issued seeking submissions for non-network options prior to proceeding to the Draft Project Assessment Report (DPAR), given that there are credible non-network options available.
- If a feasible non-network option submission is received, the economic evaluation for this project will be revised to assess whether the non-network option will defer the preferred network option.
- The CFI will be finalised at the completion of the RIT-D process and a final approval will then be submitted to confirm if the scope will include a non-network option and if the recommended timing of investment of the preferred network option will change.
- If a feasible and cost-effective non network option is not received, the best Network Present Value (NPV) network solution is the augmentation of Box Hill ZS with a second 45 MVA transformer and a second 132kV feeder from Mungerie Park ZS (Option 2A) to supply the Box Hill area. Currently, this option represents a high value (economic benefit) being NPV positive $1,328 Million and represents the best option to meet the supply requirements for customers. This option is estimated to cost $17.6 Million plus a contingency of $1.7 Million for a total of $19.3 Million and is expected to be spread over two years from 2027 to 2028.
- It is recommended that the project value of $19.3 Million to be approved for consideration in the FY25-FY29 regulatory period.

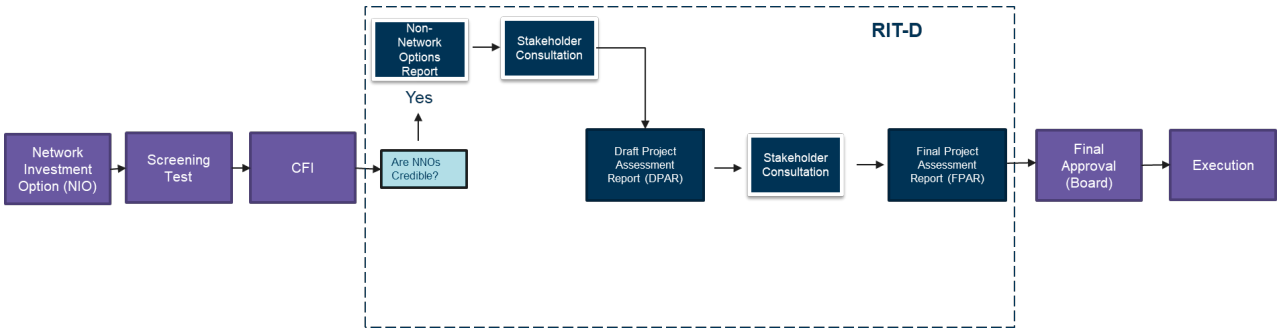


Figure 2: Endeavour Energy's RIT-D Process for this Project

2. Project Proposal

2.1 Identified Need or Opportunity

The Box Hill development area comprises the Box Hill, Box Hill Industrial and Box Hill North precincts, which will deliver 14,000 new homes, two town centres and village centres, 133 hectares of employment land, 58 hectares of recreational and environmental space, new primary and high schools. The development will ultimately require an estimated capacity of 73MVA by 2041. Development has already begun in both locations, with new homeowners now starting to occupy the new residential subdivisions.

The Box Hill development area consists of three main precincts. These are Box Hill, Box Hill Industrial and Box Hill North. The Box Hill and Box Hill Industrial precincts are part of the NSW Government's North West Priority Growth Area. Both precincts will deliver approximately 10,000 new homes, employment lands and a new town centre. Box Hill North is being developed by a single private developer and will deliver approximately 4,000 new homes with a new town centre.

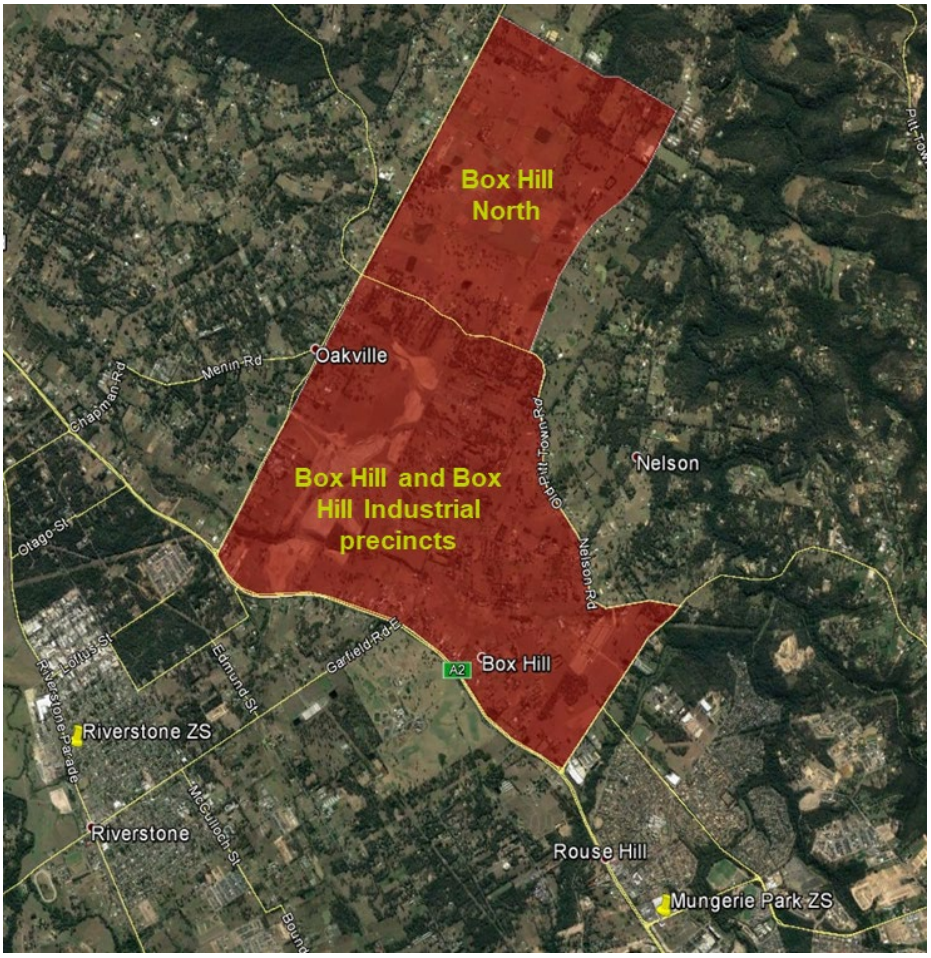


Figure 3 – Box Hill development area

Box Hill & Box Hill Industrial Precinct

The Box Hill and Box Hill Industrial precincts are part of the NSW Government's North West Priority Growth Area. The Indicative Layout Plan in Figure 4 illustrates these precincts' broad level development outcomes. NSW's Department of Planning and Environment's (DPIE) 2019 Sydney Housing Supply Forecast Package forecasted approximately 9,300 residential dwellings from FY19-39. Endeavour Energy uses this information and connection applications to develop its summer and winter load forecasts, which are revised twice a year.

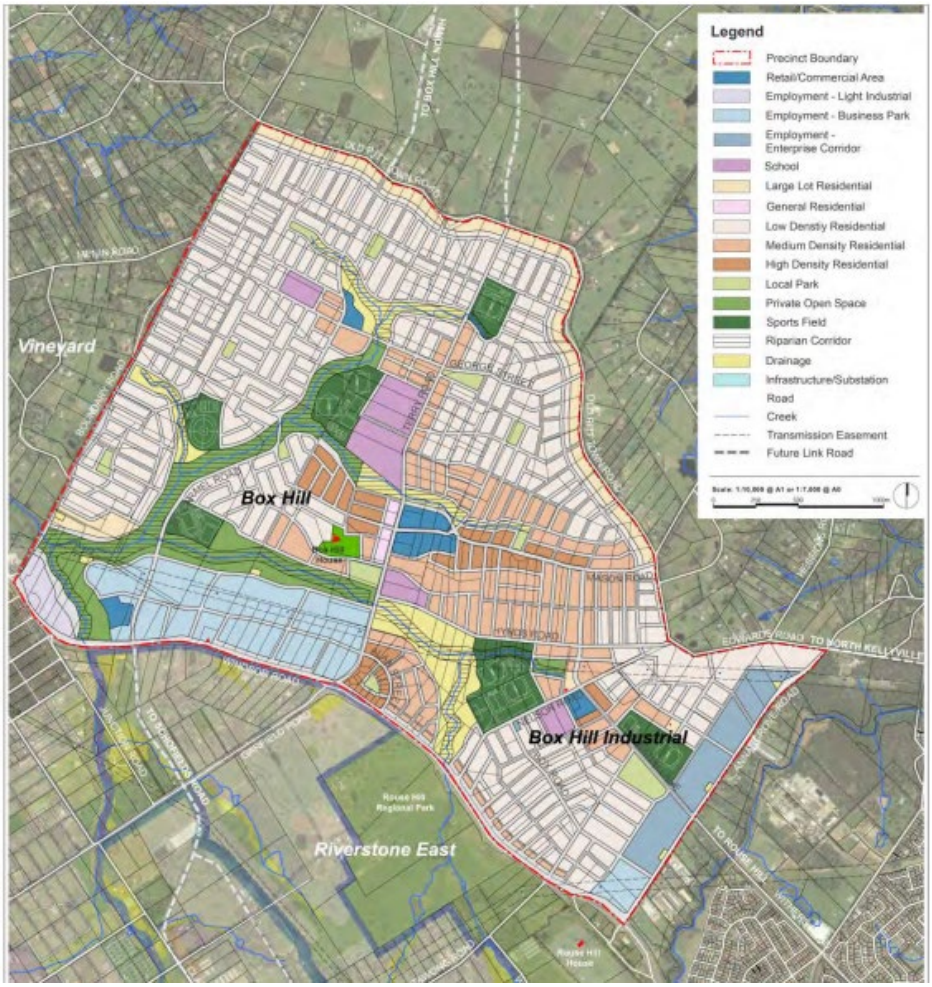


Figure 4: Indicative Layout Plan for Box Hill Precinct [2]

Box Hill North

Unlike the Box hill precinct, the Box Hill North development is facilitated by one developer. The load forecasts are based on forecasted lots which the developer provides to Endeavour Energy. The initial forecast provided by the developer was approximately 4,000 dwellings from FY17-FY25; currently, more than half of this masterplan has been developed or has a connection application with Endeavour Energy and so there is reasonable confidence in this forecast. Additionally, in 2022, the developer informed EE that more land was rezoned, resulting in an additional 1,500 dwellings from FY26-FY28. An Indicative Layout Plan for this development is shown in Figure 5.

Figure 5: Indicative Layout Plan for Box Hill North [3]

2.2 Existing Infrastructure not capable to service the growth

2.2.1 Existing Infrastructure: Box Hill Zone Substation (Stage 1)

In September 2021, to meet the initial stages of this development, Endeavour Energy submitted the Final Project Assessment Report (FPAR) per the requirements of Section 5.17.4 of the National Electricity Rules. The report described the application of the Regulatory Investment Test – Distribution (RIT-D) for addressing network limitations in the Box Hill development area. Two network options and one non-network option were determined to be credible to address the network need. The credible options are listed below:

- Do Nothing: Base case;
- Option 1: Staged implementation of 132/22kV zone substation;
- Option 2: Complete implementation of 132/22kV zone substation; and
- Option 3: Grid BESS solution to defer network investment (non-network option).

A summary of these credible options in the FPAR is presented in Table 3. While Option 3 was considered a credible option, a complete economic evaluation was not completed as no proponent could provide a binding offer.

Table 3: Options Considered in the FPAR for Box Hill Stage 1

Option	Description	Project NNO Opex nominal ($M)	Project capex nominal ($M)	PV of Market Benefits ($m)	PV of Costs ($M)	NPV ($M)	Rank
1	**Staged implementation of 132/22kV zone substation**	**0**	**44.8**	**141.8**	**31.4**	**110.4**	**1**
2	Complete implementation of 132/22kV zone substation	0	44.1	142.2	35.6	106.6	2

The selected option was Option 1, which is the staged implementation of the 132/22kV zone substation. This option is set to be commissioned by 2023 and will establish the Box Hill zone substation (ZS) consisting of one 45MVA transformer and one transmission feeder from Vineyard BSP to Box Hill ZS. The new Box Hill ZS establishment will increase the network firm capacity from 29MVA to 36 MVA.

2.2.1.1 Load Growth

There is an increase in the load growth, which is densification in the Box Hill & Box Hill Industrial Precinct and new zoning proposed by the developer in Box Hill North. Key developments increasing the demand are:

- Connection applications with a total demand of 25 MVA by FY25.
- Load Forecasts are based on lot projections from DPIE plans (Box Hill & Box Hill Industrial Precinct) and the developer (Box Hill North), which is incorporated into the 2022 Summer Demand Forecast.
- Load growth from an additional 1,500 dwellings from FY26-28 in Box Hill North informed by the developer due to rezoned land.

This has been used to develop a residential lot forecast within the Box Hill development area, as per Figure 6 below. Figure 6 compares the number of lots within received connection applications against the forecasted number of lots. Connection applications are estimated to realise their full load typically 2-3 years from receiving the connection application based on historical data. It is expected that the actual lot numbers for FY24 & FY25 will continue to rise as more applications are received.

Figure 6 shows that the lot forecast estimates a smoother growth, overestimating in FY21-23 while underestimating in FY24-25. Endeavour Energy will continue to monitor the lot growth as it progresses through the RIT-D process for this project.

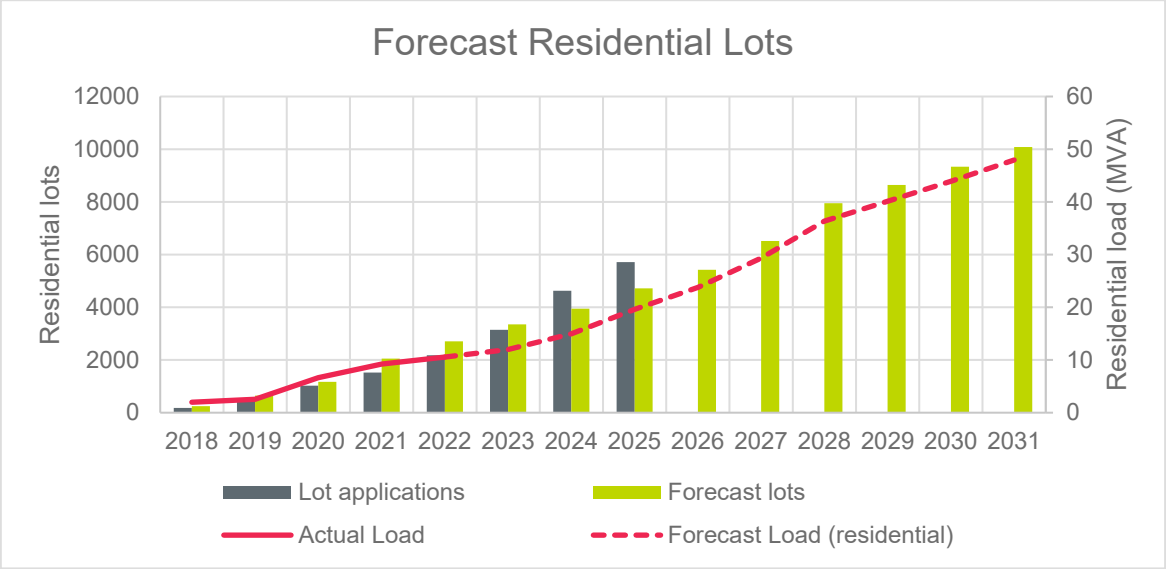


Figure 6: Residential Lot Forecast

2.2.1.2 Demand Forecast

Forecast residential demand is developed by applying an After Diversity Maximum Demand (ADMD) to the lot forecast as per Figure 6. ADMD is selected depending on the expected lot size, as per Technical Bulletin 0188A in Endeavour Energy standards MDI 0030.

As the Box Hill development area is a primarily residential area, commercial and industrial loads have been forecast to grow at a conservative rate of 1MVA per year. In addition, the adjacent Vineyard Precinct is expected to begin gradual development from FY25, as part of the NSW Government's North West Priority Growth Area, with an estimated growth of 200 residential lots (or 1MVA) per year. A further

"probability of load realisation" factor is applied (typically 80%) to the above values to develop the Summer Demand Forecast [4].

Following Stage 1, the available firm capacity to supply the Box Hill development area rises to 36 MVA. Based on the load forecast as shown in Table 4 and Figure 7, Box Hill ZS will have load at risk from 2027 with the total capacity of the substation exceeded by 2028. From then, there will be a large amount of load at risk and ultimately sustained involuntary load shedding, resulting in considerable unserved energy and loss of supply. Investment into additional electrical capacity in this area is required to reduce this risk. Consequently, this investment in increased capacity will deliver the market benefit by reducing the amount of involuntary load shedding in line with Section 5.17.1 of the NER.

Table 4: Box Hill development area Load Forecast

Demand Forecast (MVA)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2036	2041
Central Forecast	0	17.4	25.9	30.5	36.5	43.7	48.4	53.0	57.9	74.0	83.6
Low Forecast	0	15.6	23.3	27.4	32.8	39.4	43.5	47.7	52.1	66.6	75.3
High Forecast	0	19.1	28.5	33.5	40.1	48.1	53.2	58.3	63.7	81.4	92.0
Box Hill ZS (Total Capacity)	45	45	45	45	45	45	45	45	45	45	45
Box Hill ZS + Supporting 22kV Network (Firm Capacity)	36	36	36	36	36	36	36	36	36	36	36
Load At Risk (MVA)	0.0	0.0	0.0	0.0	0.5	7.7	12.4	17.0	21.9	38.0	47.6

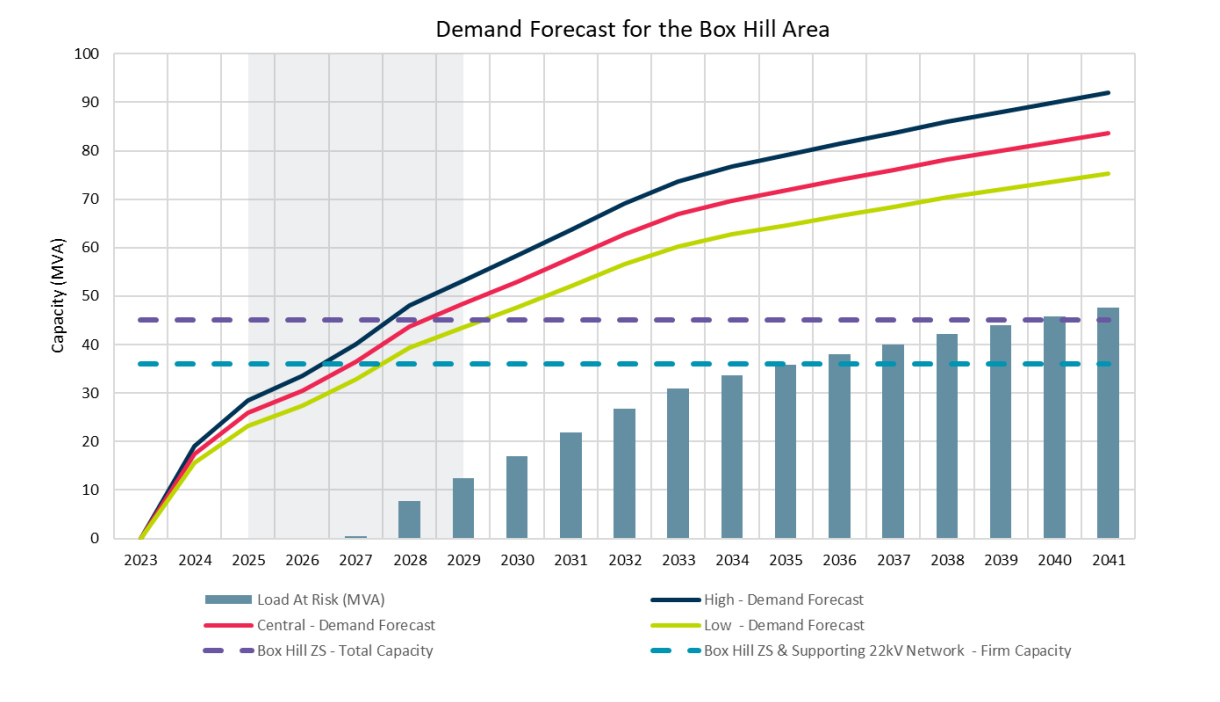


Figure 7: Box Hill Demand Forecast

2.3 Related Projects

NPR-000019 (PR713) establishes Box Hill ZS to supply the Box Hill development area and is set to complete in 2023.

3. Options Considered

Based on the decision rule outlined in the Endeavour Energy's Growth Servicing Strategy, the following are the characteristics of the area:

- Based on characteristics of growth, this investment is classified as **brownfield** because of the largely residential densification of the area.
- Identified need based on consequence of no action for the brownfield development is **market benefits**[3].

Figure 8 below (subset of the decision rule included in the Growth Servicing Strategy) has been utilised to outline the options.

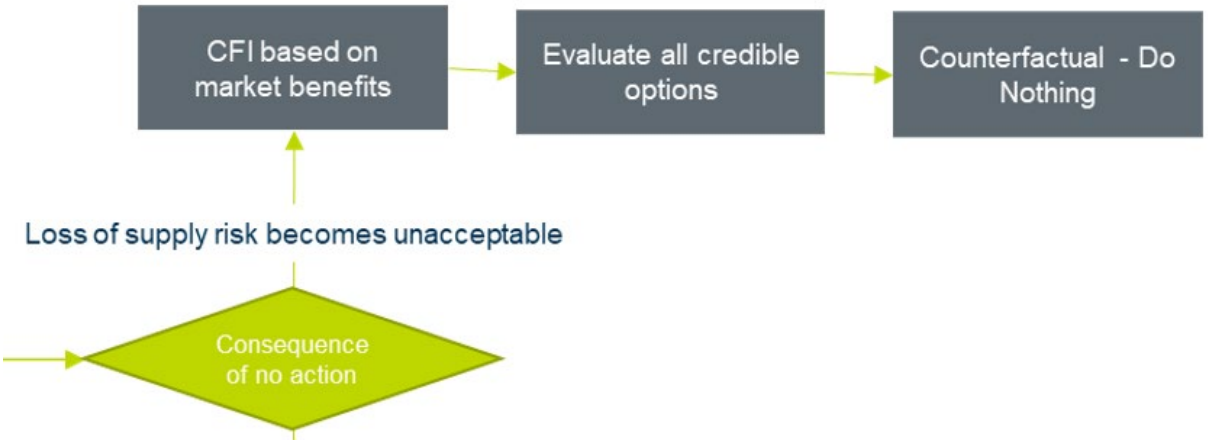


Figure 8 - Decision Rule from Endeavour Energy's Growth Servicing Strategy

3.1 Option 1: Base Case - No Proactive Intervention

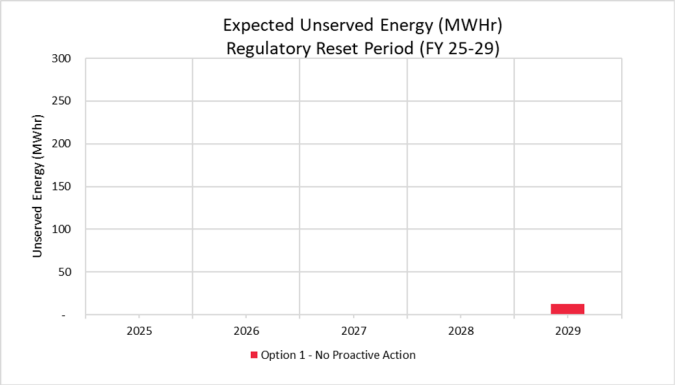
Box Hill ZS (Stage 1) consists of 1x 45 MVA transformer and 1x 132kV feeder from Vineyard (set to be commissioned in 2023), and the supporting 22kV infrastructure represents the base case infrastructure.

Figure 9 and Table 5 shows the expected unserved energy and value of the expected unserved energy. The option of 'No proactive intervention' will lead to load at risk from 2027 (Refer to Figure 7 above), resulting in significant unserved energy from 2029. There are also substantial reputational risks and stakeholder dissatisfaction if Endeavour Energy cannot meet supply requirements for this area.

In terms of Risk Cost assessment, the "No Proactive Intervention" option provides a base case where the risks are valued by applying a Value of Customer Reliability (VCR) to the forecast expected unserved energy. The VCR values used by Endeavour Energy in its modelling are the same as those published by AER. The AER endorsed this approach during the determination process

For a 30-year review period, no proactive intervention equates to a PV cost of $1,352M under the central scenario, which is a very high and unacceptably high-risk position and is therefore non-preferred.

[3] Refer to Growth Servicing Strategy for definitions of greenfield and brownfield sites.



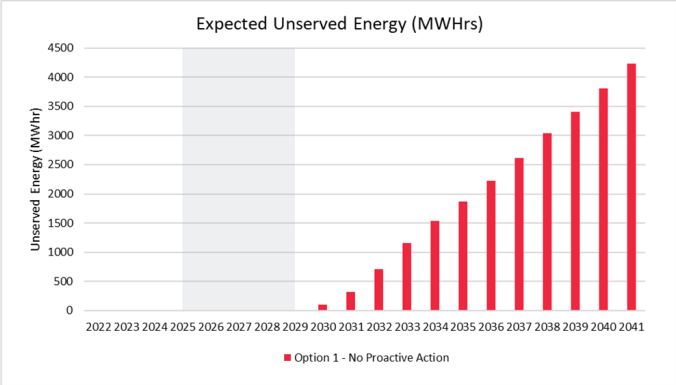


Figure 9: Expected Unserved Energy as a result of "no proactive intervention" based on Central Demand

Table 5: Value of Expected Unserved Energy as a result of "no proactive intervention"

	2025	2026	2027	2028	2029	2030	2031	2036	2041
Expected Unserved Energy (MWh)	0.0	0.0	0.0	0.3	12.7	101.7	323.3	2,226	4,234
Value of Unserved Energy ($M)	0.0	0.0	0.0	0.0	0.3	2.5	7.9	54.7	104.0

3.2 Credible Network Options (Long Term)

The National Electricity Objectives (NEO) as stated in the National Electricity Law (NEL) require Endeavour Energy to operate the networks in the long-term interests of consumers. The options in this section sets out the ***credible options*** that were considered, together with a counterfactual option: "*no proactive intervention"* to assist the overall comparison. These include all substantially differing commercially and technically credible options, including non-network solutions. Credible options (or a group of options) are those that meet the following criteria:

- addresses the identified need
- is (or are) commercially and technically feasible
- can be implemented in sufficient time to meet the identified need

Each credible network option is further elaborated in the subsequent chapter

3.2.1 Option 2A Augment Box Hill ZS to a firm 45MVA 132/22kV Zone Substation by FY29 with 132kV feeder from Mungerie Park ZS

3.2.1.1 Scope

This option is Stage 2 of the 2-staged implementation of Box Hill ZS, performing augmentation to provide N-1 security with firm capacity of 45MVA to be commissioned by FY29.

The zone substation infrastructure for Option 2A consists of the following:

- 1 x 132/22kV 45MVA power transformer
- 132kV bus bar with 1 x 132kV outdoor CB (1 x incomer)
- 22kV indoor switchgear and switchboard with 7 CB's
- Distribution works

Box Hill ZS will be supplied via a 132kV feeder for N-1 transmission supply from Mungerie Park ZS with an approximate length of 8.9km. Option 2A results in a firm capacity of 45 MVA by 2029. This option can meet the forecasted demand with N capacity until 2051. While the N-1 firm capacity is less than the forecasted load from FY30 onwards, there is minimal expected unserved energy to 2041 with the central scenario. A high level SLD can be found in Figure 11 and a proposed route for the transmission feeder in Figure 12.

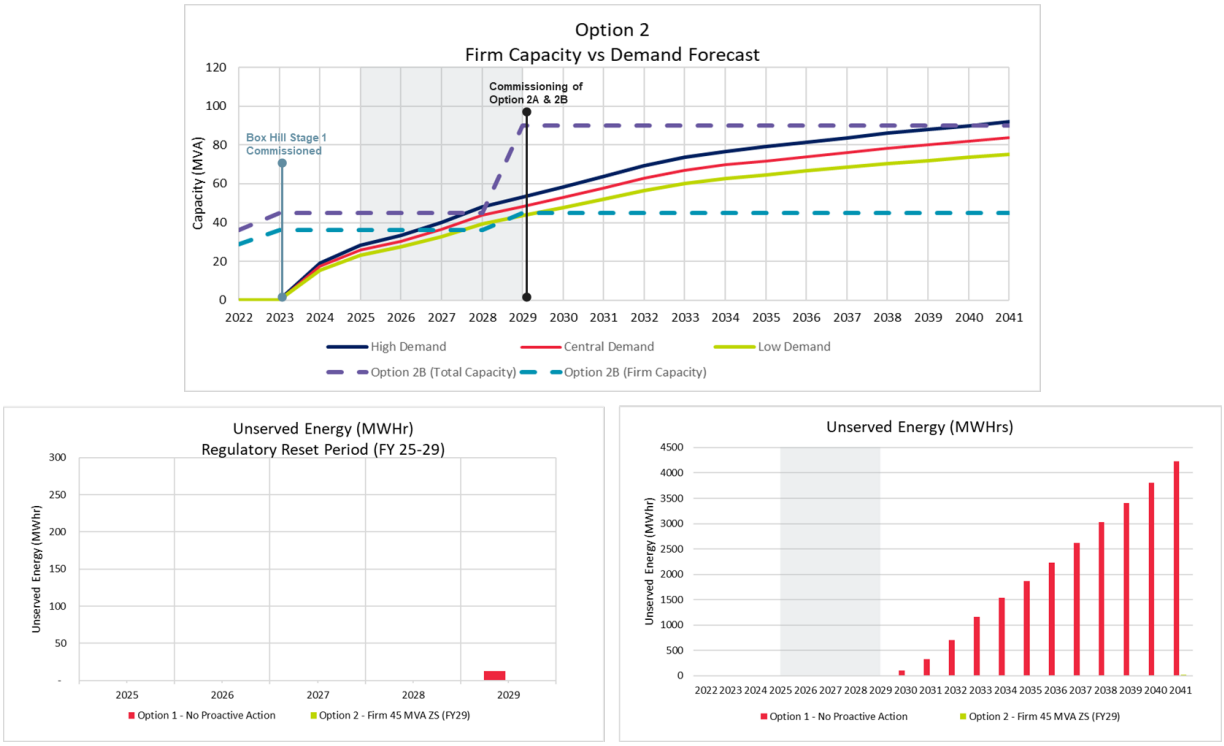


Figure 10: Summary of Option 2. Expected Unserved Energy based on "central" demand

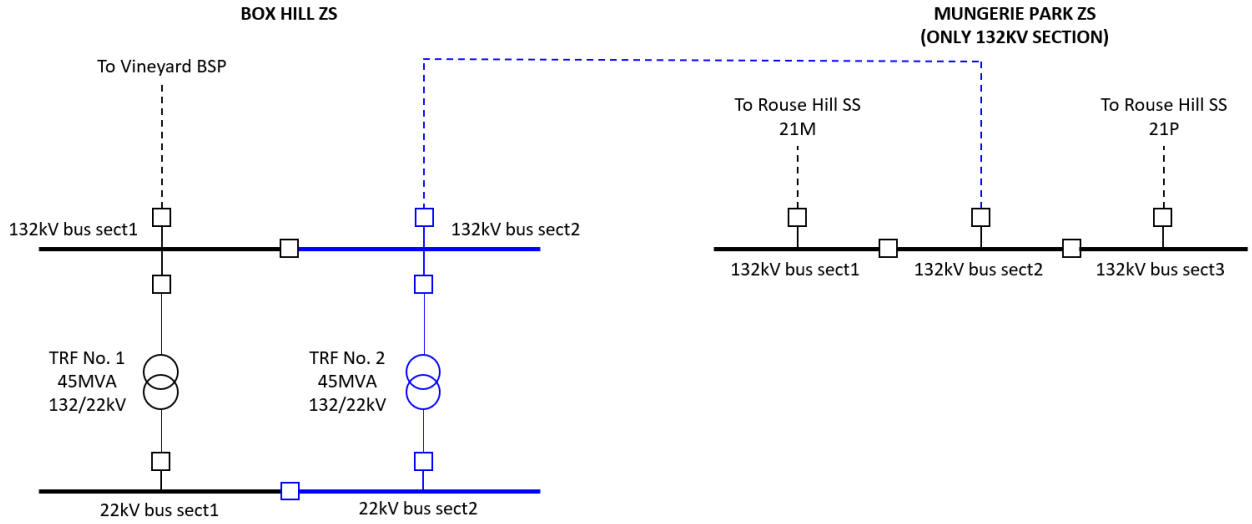


Figure 11: Option 2A Single Line Diagram

Figure 12: Proposed 132kV Transmission Line Route

3.2.1.2 Cost

Total estimated capital cost of Option 1 is **$17.6 M**. The cost is spread over two years to align with construction timelines, and it is based on estimates provided by Endeavour Energy's estimating team. A summary of the capital cost can be found in Table 6.

Table 6: Option 2A - Capital cost summary

Option	2026	2027
CAPEX for Box Hill ZS Augmentation	$9.7M	$7.9M

3.2.1.3 Benefits & NPV

The NER states that quantifiable economic market benefits (needs) include changes in involuntary load shedding. The costs and benefits analysis described in the following section included this benefit in determining the best option. Endeavour Energy's Unserved Energy Template was used to estimate the involuntary load shedding that can be prevented as a result of proactive action. The HK model utilised the involuntary load shedding along with a Value of Customer Reliability to calculate a market benefit. There were no other identified risks that were included in the costs and benefits analysis.

The assumptions used in the HK model are stated below, and the NPV summary is provided in Table 7.

- A study period of 30 years;
- The commercial discount rate was set to 3.26% based on the pre-tax real WACC for the 2025-29 determination period and ±1.04% for low and high sensitivities.
- A VCR of $24,565/MWh based on VCR of feeders MR2272 and MR2218 which currently supply the Box Hill development area.
- A maintenance cost estimate based on 0.4% of the project cost; and
- The benefits of options are based on the avoided unserved energy.
- NPV based on the weighted NPV as per the scenario analysis in Section 3.3.2

Table 7: NPV Summary - Option 2A (Central Scenario)

Option	PV "Market Benefits" ($M)	PV Costs ($M)	NPV ($M)
2A	1,340.4	12.6	1,327.8

3.2.2 Option 2B Augment Box Hill ZS to a firm 45MVA 132/22kV Zone Substation by FY29 with 132kV feeder from Vineyard BSP

3.2.2.1 Scope

This option is Stage 2 of the 2-staged implementation of Box Hill ZS, performing augmentation to provide N-1 security with firm capacity of 45MVA to be commissioned by FY29. The substation infrastructure for Option 2B is the same as Option 2A (Refer to Section 3.2.1.1)

Box Hill ZS will be supplied via a 132kV feeder for N-1 transmission supply from Vineyard TS with an approximate length of 10.9km. Option 2B results in a firm capacity of 45 MVA by 2029. This option can meet the forecasted demand with N capacity until 2051. With the same substation configuration and transmission reliability as Option 2A, Option 2B has the same expected unserved energy as Option 2A (Refer to Figure 10). A high level SLD can be found in Figure 13 along with a proposed line route for the proposed transmission feeders.

Different feeder routes were considered, and the proposed route was selected due to having the least difficulties in constructability and based on high-level estimates would likely be the lowest cost option. A summary of the different feeder routes that were investigated are in the table below.

Table 8 - Feeder routes considered for Option 2B

132kV feeder route	Length (km)	Identified issues
Selected route as shown in Figure 13	10.9km	• Bandon Rd is part of a RMS major road widening plan. There has been significant difficulty getting easements along this road for the Stage 1 feeder and there are still road sections that have not yet been released for Endeavour Energy's use. • Requires major underbore across railway on Bandon Rd. • Route likely to be more difficult than Option 2A
Same route as Stage 1 feeder	6.9km	• Same difficulties as selected route. • Very difficult, potentially infeasible, to fit two sets of 132kV feeders in the same road for the entire route. • Requires major underbore across creek on Chapman Rd which has had environmental concerns. • Single point of failure along this route: much more likely for an accident (e.g. digging into a cable) to take both feeders out. In this scenario, this could leave Box Hill ZS without any supply, so this option poses very high risk.
Travelling along Boundary Rd instead of Terry Rd	8.6km	• Same difficulties as selected route. • South of Windsor Rd from Boundary Rd, the roads have not yet been developed. Endeavour Energy would need to do the groundworks for the roads to continue the feeder route from Boundary Rd. This would be economically infeasible in comparison to running an additional 2.3km of cable.

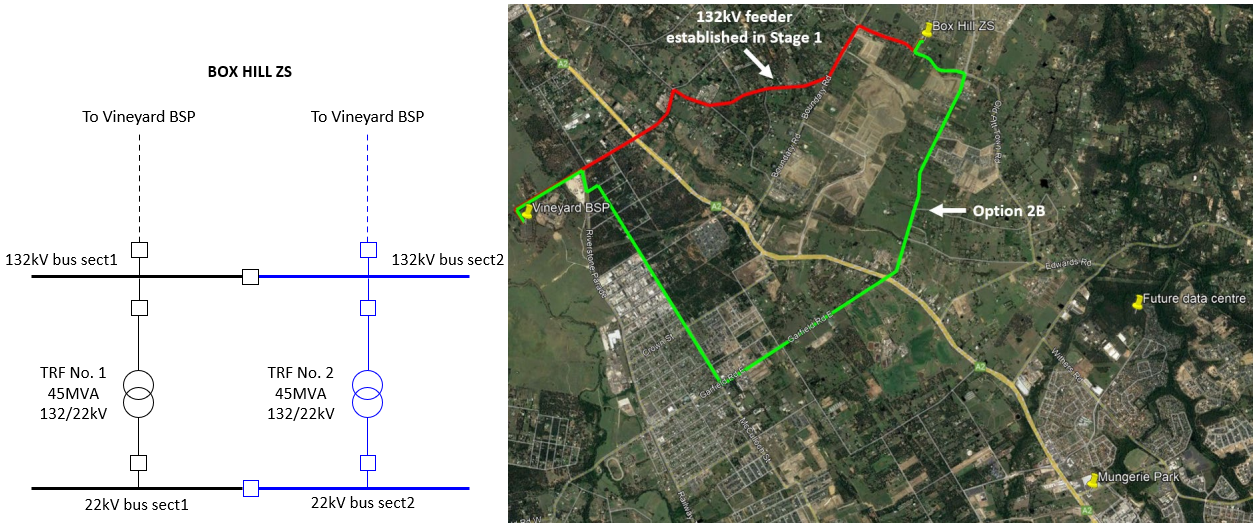


Figure 13 – Option 2B Single Line Diagram (Left) and Proposed 132kV Transmission Line Route (Right)

3.2.2.2 Cost

Total estimated capital cost of Option 1 is **$20.5 M**. The cost is spread over two years to align with construction timelines, and it is based on estimates provided by Endeavour Energy's estimating team. A summary of the capital cost can be found in Table 9.

Table 9: Option 2B - Capital cost summary

Option	2026	2027
CAPEX for Box Hill ZS Augmentation	$11.3M	$9.2M

3.2.2.3 Benefits & NPV

The NER states that quantifiable economic market benefits (needs) include changes in involuntary load shedding. The costs and benefits analysis described in the following section included this benefit in determining the best option. Endeavour Energy's Unserved Energy Template was used to estimate the involuntary load shedding that can be prevented as a result of proactive action. The HK model utilised the involuntary load shedding along with a Value of Customer Reliability to calculate a market benefit. There were no other identified risks that were included in the costs and benefits analysis.

The assumptions used in the HK model are stated in Section 3.2.1.3. The NPV summary is provided in the Table 10 below.

Table 10: NPV Summary - Option 2B (Central Scenario)

Option	PV "Market Benefits" ($M)	PV Costs ($M)	NPV ($M)
2B	1,340.4	14.7	1,325.7

3.2.3 Recommended Network Option

The options table below sets out the **long-term *credible options*** considered together with the option: *"no proactive intervention"* to assist the overall comparison. Table 11 shows that Option 2A represents the highest value (economic benefit), being NPV positive of $1,328 Million compared to Option 2B, even with the sensitivity & scenarios considered in Section 3.3. This option provides significant market benefit by reducing the amount of involuntary load shedding (i.e., expected unserved energy) when compared to the BAU base case (Option 1). In addition to being the least cost option, Option 2A also offers the following benefits:

- Provides a secondary market benefit of providing a ring supply with alternate back-up to Box Hill ZS when compared to Option 2B
- Avoids the potential difficulties of the feeder route in Option 2B as detailed in Section 3.2.2.
- A connection application for a data centre in Rouse Hill has been received, requesting N-1 supply at 132kV. As shown in Figure 11, there is only 1 spare circuit breaker at Mungerie Park ZS. Thus, the data centre customer must be looped between Mungerie Park ZS and Box Hill ZS. The cost of looping in the data centre customer has not been included within NPV calculations as the timing of the data centre is unclear at this stage. However, it is noted that Option 2A will allow Endeavour Energy to supply this customer by extending the proposed 132kV feeder by an additional 2.3km while Option 2B would require an additional 8.9km of cable.

For these reasons, **Option 2A** is the preferred long-term credible network configuration for the project's overall scope**.**

Table 11: Option summary table

Option	Description	Solution Type	PV residual risk[1] $M	PV Cost[2] $M	PV Benefits[3]	NPV [4] $M	Rank
1	No proactive intervention	Base case / counterfactual	1,352.4	-	-	-	3
2A	**Augment Box Hill ZS to a firm 45MVA 132/22kV ZS in FY29 (1x 45 MVA Transformer & 1x 132kV from Mungerie Park ZS)**	**Network solution**	**-**	**12.6**	**1,340.4**	**1,327.8**	**1**
2B	Augment Box Hill ZS to a firm 45MVA 132/22kV ZS (1x 45 MVA Transformer & 1x 132kV from Vineyard ZS)	Network solution	-	14.7	1,340.4	1,325.7	2

Notes:
1: PV residual risk cost (or savings for opportunities) post the investment. Further details on the risks considered can be found in Appendix A.
2: PV of total costs, both Capex and Opex. See Appendix C for further details.
3: PV of total quantified benefits, both risk mitigated and any forecast decrease in Capex or Opex arising as a result of undertaking the investment (opportunities).
4: PV Benefits less PV Investment Costs.
5: The breakdown of PV is based on the central demand forecast scenario

3.3 Sensitivity and Scenario Analysis

3.3.1 Sensitivity Analysis

Sensitivity tests have been applied to the economic evaluation of the network options and the results are shown below. The results show that Option 2A remains the most favourable option in all sensitivity tests as there was no tipping point found between the options. Details of the sensitivity analysis for various parameters are presented in the Figure 14 and Figure 15.

Figure 14 – Sensitivity testing completed using the HK model

Thresholds and tipping points

Rank	Option	Weighted NPV
1	Option 2a	1,584,845,723
2	Option 2b	1,582,774,767

Goal seek values

Parameters	Units	Value	Notes
Discount rate	Percent	3.26%	Users should provide the seed values for goal seek values, which can be the same value from the central scenario. Using extreme seed values may cause issues with the model.
Capital cost	Factor	1.0000	
VCR	$/MWh	24,565	
Risk costs	Factor	1.0000	

Rank 1 Option 2a for zero NPV

Parameters	Units	Value	Notes
Discount rate	Percent	53.05%	
Capital cost	Factor	137.5336	No reasonable capital costs can achieve zero NPV
VCR	$/MWh	260	
Risk costs	Factor	-335,543.3200	No reasonable risk costs can achieve zero NPV

Rank 2 Option 2b for zero NPV

Parameters	Units	Value	Notes
Discount rate	Percent	43.78%	
Capital cost	Factor	117.5273	No reasonable capital costs can achieve zero NPV
VCR	$/MWh	430	
Risk costs	Factor	##############	No reasonable risk costs can achieve zero NPV

Tipping points for Rank 1 to Rank 2

Parameters	Units	Value	Notes
Discount rate	Percent	#N/A	No tipping points were identified
Capital cost	Factor	#N/A	No tipping points were identified
VCR	$/MWh	#N/A	No tipping points were identified
Risk costs	Factor	#N/A	No tipping points were identified

Figure 15 – Summary of Sensitivity Analysis

3.3.2 Scenario Analysis

Scenario analysis has been carried out by the model. The parameters of the scenario analysis are presented below.

Table 12: Summary of scenarios investigated

Scenario settings				
Parameters		**S1**	**S2**	**S3**
General parameters	**Unit**	**Central**	**High**	**Low**
Commercial discount rate	Percent	3.26%	2.22%	4.30%
VCR for involuntary load shedding	$/MWh	24,565	31,935	17,196
VCR for voluntary load curtailment	$/MWh	24,565	31,935	17,196
Cost parameters	**Unit**	**Central**	**High**	**Low**
Capital cost	Factor	1.00	0.75	1.25
Planned routine maintenance and refurbishment	Factor	1.00	0.75	1.25
Unplanned corrective maintenance	Factor	1.00	1.25	0.75
Decommissioning costs	Factor	1.00	1.25	0.75
NNO proponent charges	Factor	1.00	0.75	1.25
Cost X	Factor	1.00	1.00	1.00
Risk cost parameters	**Unit**	**Central**	**High**	**Low**
Reliability and security risk costs	Factor	1.00	1.30	0.70
Safety and health risk costs	Factor	1.00	1.30	0.70
Environmental risk costs	Factor	1.00	1.30	0.70
Legal/regulatory compliance risk costs	Factor	1.00	1.30	0.70
Financial risk costs	Factor	1.00	1.30	0.70
Benefit parameters	**Unit**	**Central**	**High**	**Low**
Avoided involuntary load shedding	Factor	1.00	1.00	1.00
Avoided voluntary load curtailment	Factor	1.00	1.00	1.00
Avoided costs for non-RIT-D proponent parties	Factor	1.00	1.00	1.00
Differences in the timing of unrelated network expenditure	Factor	1.00	1.00	1.00
Changes in load transfer capacity	Factor	1.00	1.00	1.00
Additional option value	Factor	1.00	1.00	1.00
Changes in electrical energy losses	Factor	1.00	1.00	1.00
Scenario weightings	**Unit**	**Central**	**High**	**Low**
Weightings	%	0.50	0.25	0.25

The scenarios have been weighted as 50% for Scenario 1 (Central) being the most likely with Scenarios 2 (High) and 3 (Low) being given a weighting of 25%. This is a reasonable approach to incorporate the uncertainty in the timing of development across the three scenarios that form the basis of the demand forecasts. The weighted NPV for each option is shown below. Table 13 shows that Option 2A still has the highest NPV and is still the preferred option.

Table 13: Weighted net present value of options

Option	Scenario 1 (Central) NPV ($M)	Scenario 2 (High) NPV ($M)	Scenario 3 (Low) NPV ($M)	Weighted NPV ($M)	Option ranking
Option 2A	**1,328**	**3,247**	**436.9**	**1,585**	**1**
Option 2B	1,326	3,245	434.3	1,583	2

Proposed Investment Timing

The optimal timing where the value of unserved energy from the 'No Proactive Intervention' scenario exceeds investment costs is 2030 as per Figure 16.

In accordance with the National Electricity Rules, Endeavour Energy has an obligation to connect customers to the network. As such the timing of this investment is driven by network need and not the optimal timing from the economic modelling, which shows that there is load at risk from 2027 with involuntary load shedding expected by 2028.

Therefore, based on network need, the proposed investment timing is 2029 which is still NPV positive.

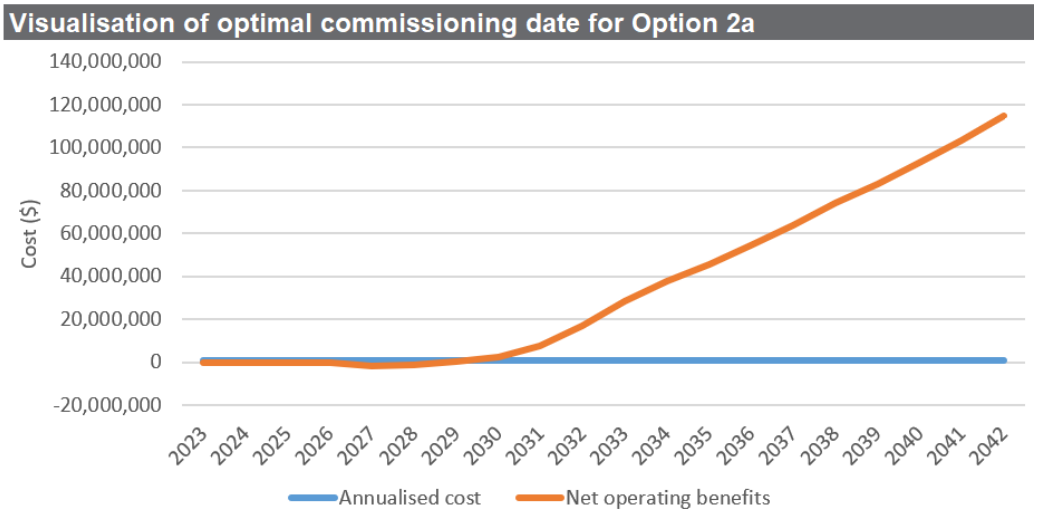


Figure 16 - Houston Kemp optimal timing output

3.4 Non-Network Options to defer 2nd stage of Network Investment

3.4.1 Scope

Electricity Distributors in NSW operate under the licence requirement (under the NSW Electricity Supply Act 1995) to investigate non-network alternatives to network augmentation for specific capital expenditure projects. The National Electricity Rules (NER) require Distribution Network Service Providers (DNSP) to investigate non-network options by utilising a consultation process as part of planning for major network augmentations.

The New Technology Master Plan (NTMP) tool was used to evaluate credible non-network options with the constraint of Stage 1 Box Hill ZS consisting of only 1x 45 MVA transformer. Figure 17 shows the comparison of non-network solutions and network solutions against the base case ("no proactive intervention"), while Figure 18 compares non-network solutions against the network solution.

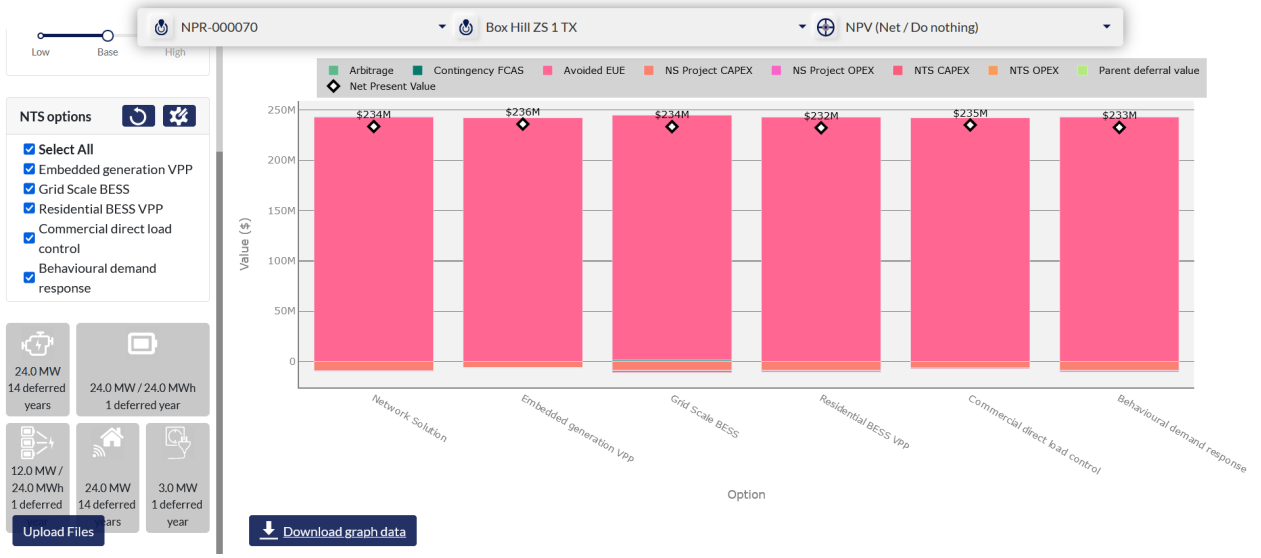


Figure 17: NTMP Output for Non-Network Options when compared to the Base Case ("no proactive intervention")

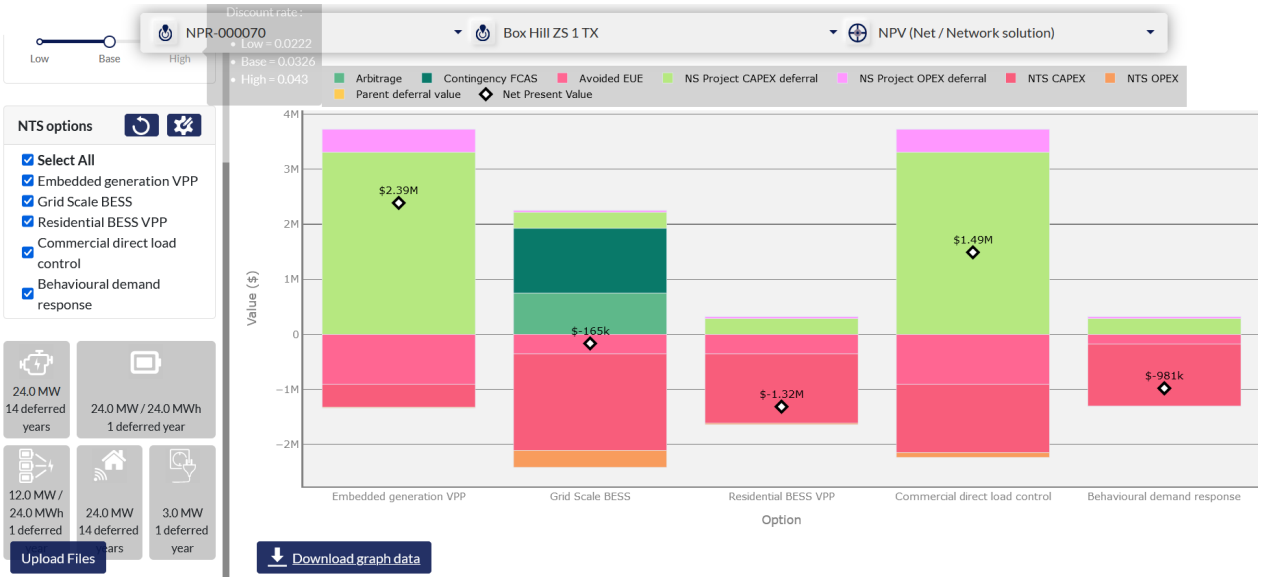


Figure 18 :NTMP Output for Non-Network Options when compared to the Network Solution

Table 14 provides an overview of the outputs from the NTMP tool and overlays with qualitative assessment.

Table 14: Non-Network / New Technology Options

Non-Network Options	Outcomes	Qualitative Assessment	Comments
Grid-Scale Storage (24 MW/24 MWh)	Potentially defer the network investment by 1 year	✔	Grid-Scale storage can potentially be explored and connected to existing feeder and substation. However, this option only provides a minimal deferral of 1 year.
VPP (24 MW)	Potentially defer the network investment by 14 years	✕	Not a feasible option as this is a new development. Additionally, the proposed capacity is approximately 45% of the forecasted load in FY29 and would require a significant uptake of new technology from customers.
Residential BESS VPP (12 MW /24 MWh)	Potentially defer the network investment by 1 year	✕	Not a feasible option as this is a new development requiring significant uptake from customers. Additionally, it is NPV negative when compared to the network option and provides minimal deferral of network investment
Commercial Direct Load Control (24 MW)	Potentially defer the network investment by 3 years	✕	Not applicable as it is largely residential load, and the proposed capacity is approximately 45% of the forecasted load in FY29 and would require a significant uptake from customers.
Behavioural Demand Response (3.0 MW)	Potentially defer the network investment by 1 years	✔	Demand side management could be explored. However, this option only provides a minimal deferral of 1 year.

3.4.2 Summary

The NTMP tool and the subsequent qualitative analysis found at least two credible non-network options (BESS & Behavioural Demand Response). These options need to be further evaluated using the screening test in the RIT-D process.

However, it should be noted that these non-network options may only provide a minimal deferral of network infrastructure. Additionally, the non-network options do not provide transmission-level (132kV) N-1 supply security for Box Hill ZS, and hence there remains a load at risk at the transmission level.

4. Detailed description and costs of preferred option

The preferred option proposes to augment Box Hill ZS to a firm 45MVA 132/22kV ZS. The scope of works for the preferred network option includes:

Zone substation:

- 1 x 132/22kV 45MVA power transformer
- 132kV outdoor busbar with 1 x 132kV outdoor CB (1 x incomer)
- 22kV switchboard and indoor switchgear with 7 CB's

Transmission lines:

- 1 x subtransmission feeder from Box Hill ZS to Mungerie Park ZS with 1600mm2 cables and estimated length of 8.9km.
- Communication works: fibre along new subtransmission feeder route

Distribution works:

- To be determined.

A proposed single line diagram is shown in Figure 19. Figure 20 shows cost estimates for zone substation works. Transmission line costs are estimated based on PR713 Box Hill ZS Establishment costs, shown in Figure 21, then adjusted proportionally by line length. Distribution works hare also based on PR713 costs.

The recommended option establishes a new 132kV feeder from Box Hill ZS to Mungerie Park ZS and is to be underground for its entire route. An overhead option was not considered due to difficulties in obtaining easements, design concerns, environmental and visual impact concerns. The estimated route is 8.9km, along Old Pitt Town Rd, Terry Rd, Mason Rd, The Water Lane, Withers Rd and Commercial Rd. A geographic view of the transmission route is shown in Figure 22.

The nominal project cost is estimated to be $17.6M. A contingency amount of $1.72 million (approx. 10% of the project costs) has been built into the cost estimates covering unforeseen site conditions which may arise and cause delays. The forecast zone substation construction expenditure will occur from 2027 to 2028 as shown in the table below.

Table 15: Project expenditure spread

Estimated Cost	2026/27	2027/28	Total
Zone substation cost (nominal) ($)	2,420,000	1,980,000	4,400,000
Transmission line cost (nominal) ($)	7,077,770	5,790,903	12,868,673
Distribution works	188,650	154,350	343,000
Contingency ($)	-	-	1,718,769
Total ($)	**9,686,420**	**7,925,523**	**19,330,442**

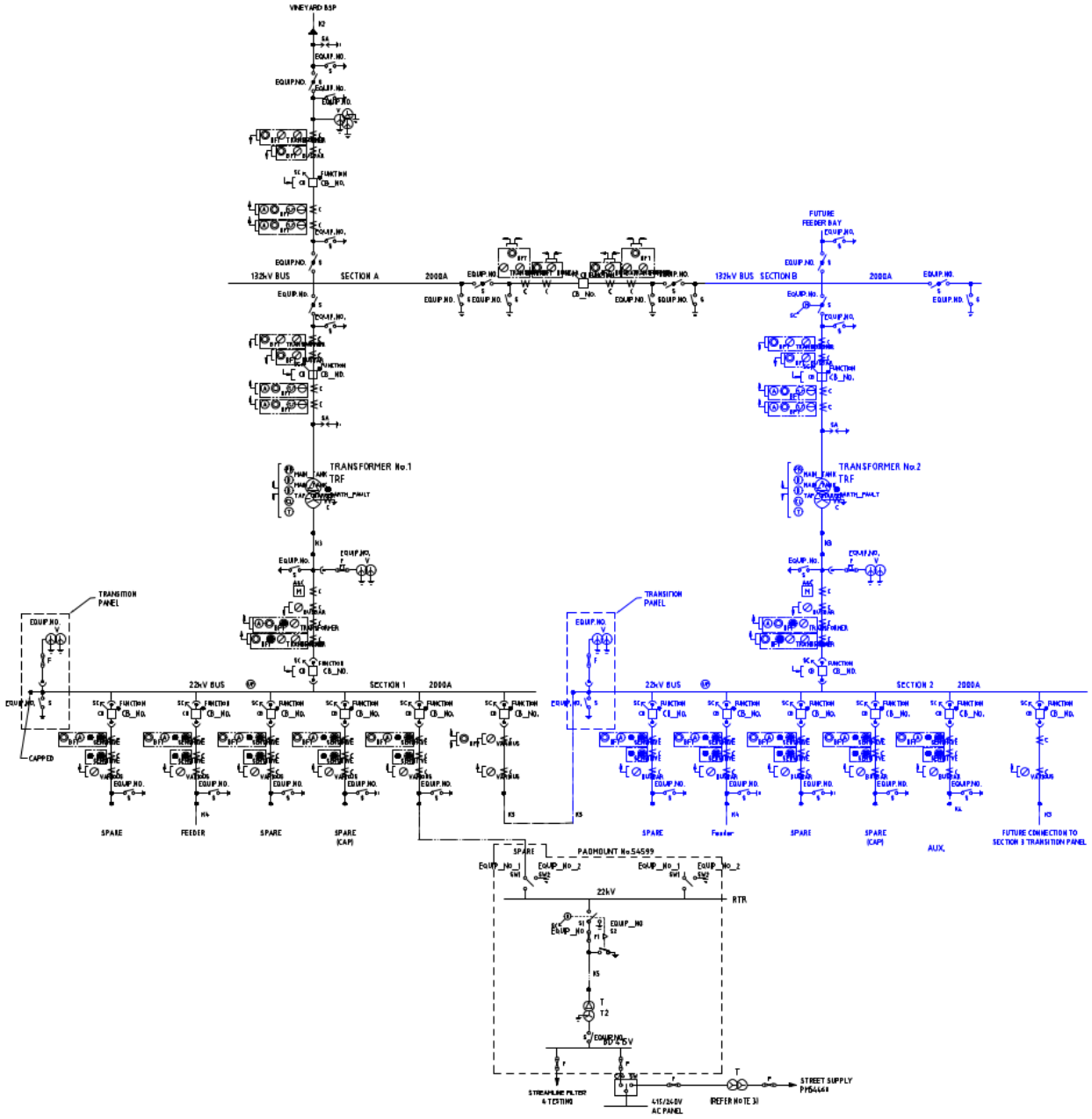


Figure 19 – Proposed Box Hill ZS single line diagram, Stage 2 in blue [5]

TOTALS	Work Packet	Labour Cost	Actual	Store Costs	Actual	Plant Costs	Actual	Direct Charge	Actual	Total Costs	Total Actual	Contingency		Reason For Contingency
Planning & Development	1	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 25,000	$ -	$ -	0%	
NIOs & PDs	1.1	$ 20,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 20,000	$ -	$ -		
Environmental Requirements	1.2	$ 5,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ -		
Substation Design	2	$ 193,331	$ -	$ -	$ -	$ -	$ -	$ 80,000	$ -	$ 273,331	$ -	$ 12,067	4%	
Elect./Mech./Prot./SCADA	2.1	$ 193,331	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 193,331	$ -	$ 9,667		Allow 5% for design modifications
Architect	2.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
Earthing Design	2.3	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,000	$ -	$ 80,000	$ -	$ 2,400		Allow 5% for design modifications
Project Management	3	$ 240,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 240,000	$ -	$ -	0%	
Substation Procurement/ Subcontract	4	$ 392	$ -	$ 50,696	$ -	$ 20,874	$ -	$ 2,296,443	$ -	$ 2,368,405	$ -	$ 199,077	8%	
Major Equipment	4.1	$ -	$ -	$ 10,000	$ -	$ 5,391	$ -	$ 2,096,900	$ -	$ 2,112,291	$ -	$ 190,106		Allow 3% for contract variations
Minor Equipment	4.2	$ -	$ -	$ 36,169	$ -	$ 12,335	$ -	$ -	$ -	$ 48,504	$ -	$ 7,276		Allow 5% per year for copper & foreign exchange
Steelwork & Busbars/Fittings	4.3	$ -	$ -	$ 3,947	$ -	$ 750	$ -	$ 6,606	$ -	$ 11,303	$ -	$ 1,696		Allow 5% per year for steel prices
Major Equipment Storage	4.4	$ -	$ -	$ -	$ -	$ -	$ -	$ 62,907	$ -	$ 62,907	$ -	$ -		
On Site Security	4.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
Landscaping	4.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
Control Panels	4.7	$ -	$ -	$ 580	$ -	$ 208	$ -	$ 11,300	$ -	$ 12,088	$ -	$ -		
SCADA Hardware	4.8	$ -	$ -	$ -	$ -	$ 691	$ -	$ 21,474	$ -	$ 22,165	$ -	$ -		
Protection Relays	4.9	$ 392	$ -	$ -	$ -	$ 1,498	$ -	$ 97,256	$ -	$ 99,146	$ -	$ -		
Trans Subs Construction	5	$ 179,970	$ -	$ 6,071	$ -	$ 10,873	$ -	$ 9,600	$ -	$ 206,514	$ -	$ 10,326	5%	
Electrical Works	5.1	$ 53,564	$ -	$ 2,707	$ -	$ 9,655	$ -	$ -	$ -	$ 65,927	$ -	$ 3,296		Allow 5% for design modifications
Protection & Control	5.2	$ 90,586	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 90,586	$ -	$ 4,529		Allow 5% for design modifications
HV Test	5.3	$ 35,169	$ -	$ -	$ -	$ 963	$ -	$ -	$ -	$ 36,132	$ -	$ 1,807		Allow 5% for design modifications
Metering	5.4	$ 651	$ -	$ 3,364	$ -	$ 255	$ -	$ 9,600	$ -	$ 13,870	$ -	$ 693		Allow 5% for design modifications
Trans Mains Construction	6	$ -	$ -	$ -	$ -	$ -	$ -	$ 345,700	$ -	$ 345,700	$ -	$ 34,570	10%	
Transformer Mains	6.1	$ -	$ -	$ -	$ -	$ -	$ -	$ 305,700	$ -	$ 305,700	$ -	$ 30,570		Allow 10% as there are no 22kV cable contract
Aux Cable	6.2	$ -	$ -	$ -	$ -	$ -	$ -	$ 40,000	$ -	$ 40,000	$ -	$ 4,000		Allow 10% as there are no 22kV cable contract
Civil Works	6.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
Material Procurement	6.4		$ -		$ -		$ -	$ -	$ -	$ -	$ -	$ -		
Construction	6.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
Restorations	6.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
Distribution Construction	7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	0%	
Civil & Building Works	8	$ -	$ -	$ -	$ -	$ -	$ -	$ 950,544	$ -	$ 950,544	$ -	$ 190,109	20%	Allow 20% for rock & modular building approach
Additional Costs:	9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	0%	
	9.3	$ -						$ -		$ -		$ -		
	9.4	$ -		$ -		$ -		$ -		$ -		$ -		
	9.5	$ -		$ -		$ -		$ -		$ -		$ -		
	9.6	$ -		$ -		$ -		$ -		$ -		$ -		
	9.7	$ -		$ -		$ -		$ -		$ -		$ -		
	9.8	$ -		$ -		$ -		$ -		$ -		$ -		
	9.9	$ -		$ -		$ -		$ -		$ -		$ -		
Totals		$ 638,694	$ -	$ 56,767	$ -	$ 31,747	$ -	$ 3,682,287	$ -	$ 4,409,494	$ -	$ 446,148	10%	

Assumed CPI =	2.5%	YEAR					
		1st	2nd	3rd	4th	5th	Total
	% Spend	55%	45%	0%	0%	0%	100%
	Cost Breakdown	$ 399,964	$ 327,243	$ -	$ -	$ -	$ 727,207
	CPI	$ -	$ 8,181	$ -	$ -	$ -	$ 8,181

(Note: CPI is not applied to direct charge above)

= Assume no CPI for 1st Year

= Only change percentages

Total (inc CPI):	$ 4,400,000

Contingency:	$ 450,000

Figure 20 – Cost estimate for Box Hill ZS Stage 2 [6]

TOTALS	Work Packet	Labour Cost	Actual	Store Costs	Actual	Plant Costs	Actual	Direct Charge	Actual	Total Costs	Total Actual	Contingency		Reason For Contingency
Planning & Development	1	$ 100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 100,000	$ -	$ 6,500	7%	
NIOs & PDs	1.1	$ 35,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 35,000	$ -	$ -		
Environmental Requirements	1.2	$ 65,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 65,000	$ -	$ 6,500		Allow 10% for additional reports
Substation Design	2	$ 193,331	$ -	$ -	$ -	$ -	$ -	$ 250,000	$ -	$ 443,331	$ -	$ 28,667	6%	
Elect./Mech./Prot./SCADA	2.1	$ 193,331	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 193,331	$ -	$ 9,666.56		Allow 5% for design modifications
Architect	2.2	$ -	$ -	$ -	$ -	$ -	$ -	$ 150,000	$ -	$ 150,000	$ -	$ 15,000		Allow 10% for design modifications
Earthing Design	2.3	$ -	$ -	$ -	$ -	$ -	$ -	$ 100,000	$ -	$ 100,000	$ -	$ 4,000		Allow 5% for design modifications
Project Management	3	$ 468,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 468,000	$ -	$ -	0%	
Substation Procurement/ Subcontract	4	$ 3,396	$ -	$ 117,454	$ -	$ 38,815	$ -	$ 3,398,575	$ -	$ 3,558,239	$ -	$ 278,703	8%	
Major Equipment	4.1	$ -	$ -	$ 10,000	$ -	$ 8,798	$ -	$ 2,487,860	$ -	$ 2,506,658	$ -	$ 225,599		Allow 3% for contract variations
Minor Equipment	4.2	$ -	$ -	$ 85,093	$ -	$ 21,760	$ -	$ 180,000	$ -	$ 286,853	$ -	$ 43,028		Allow 5% per year for copper & foreign exchange
Steelwork & Busbars/Fittings	4.3	$ -	$ -	$ 20,621	$ -	$ 4,256	$ -	$ 42,296	$ -	$ 67,173	$ -	$ 10,076		Allow 5% per year for steel prices
Major Equipment Storage	4.4	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,036	$ -	$ 80,036	$ -	$ -		
On Site Security	4.5	$ -	$ -	$ -	$ -	$ -	$ -	$ 150,000	$ -	$ 150,000	$ -	$ -		
Landscaping	4.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
Control Panels	4.7	$ -	$ -	$ 1,740	$ -	$ 625	$ -	$ 32,000	$ -	$ 34,365	$ -	$ -		
SCADA Hardware	4.8	$ 3,004	$ -	$ -	$ -	$ 948	$ -	$ 274,297	$ -	$ 278,249	$ -	$ -		
Protection Relays	4.9	$ 392	$ -	$ -	$ -	$ 2,429	$ -	$ 152,086	$ -	$ 154,907	$ -	$ -		
Trans Subs Construction	5	$ 281,738	$ -	$ 7,766	$ -	$ 17,341	$ -	$ 49,600	$ -	$ 356,445	$ -	$ 17,822	5%	
Electrical Works	5.1	$ 113,536	$ -	$ 4,402	$ -	$ 15,572	$ -	$ 40,000	$ -	$ 173,510	$ -	$ 8,676		Allow 5% for design modifications
Protection & Control	5.2	$ 120,232	$ -	$ -	$ -	$ 150	$ -	$ -	$ -	$ 120,382	$ -	$ 6,019		Allow 5% for design modifications
HV Test	5.3	$ 47,319	$ -	$ -	$ -	$ 1,364	$ -	$ -	$ -	$ 48,683	$ -	$ 2,434		Allow 5% for design modifications
Metering	5.4	$ 651	$ -	$ 3,364	$ -	$ 255	$ -	$ 9,600	$ -	$ 13,870	$ -	$ 693		Allow 5% for design modifications
Trans Mains Construction	6	$ -	$ -	$ -	$ -	$ -	$ -	$ 9,924,560	$ -	$ 9,924,560	$ -	$ 992,456	10%	
Transformer Mains	6.1	$ -	$ -	$ -	$ -	$ -	$ -	$ 244,560	$ -	$ 244,560	$ -	$ 24,456		Allow 10% as there are no 22kV cable contract
Aux Cable	6.2	$ -	$ -	$ -	$ -	$ -	$ -	$ 40,000	$ -	$ 40,000	$ -	$ 4,000		Allow 10% as there are no 22kV cable contract
Civil Works	6.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
Transmission Mains	6.4		$ -		$ -		$ -	$ 9,640,000	$ -	$ 9,640,000	$ -	$ 964,000		Allow 10% for design and contract variations
Construction	6.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
	6.6	$ -	$ -	$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -		
Distribution Construction	7	$ -	$ -	$ -	$ -	$ -	$ -	$ 343,000	$ -	$ 343,000	$ -	$ -	0%	
Civil & Building Works	8	$ -	$ -	-$ 336	$ -	$ -	$ -	$ 6,894,125	$ -	$ 6,893,789	$ -	$ 689,379	10%	Allow 10% for rock & modular building approach
Additional Costs:	9	$ -	$ -	$ -	$ -	$ -	$ -	$ 279,000	$ -	$ 279,000	$ -	$ 13,950	5%	
Fibre - Includes Vineyard BSP	9.4	$ -		$ -		$ -		$ 279,000		$ 279,000		$ 13,950		Allow 5% for design change
	9.5			$ -		$ -		$ -		$ -		$ -		
	9.6	$ -						$ -		$ -		$ -		
	9.7	$ -		$ -		$ -		$ -		$ -		$ -		
	9.8	$ -		$ -		$ -		$ -		$ -		$ -		
	9.9	$ -		$ -		$ -		$ -		$ -		$ -		
Totals		$ 1,046,465	$ -	$ 124,884	$ -	$ 56,156	$ -	$ 21,138,860	$ -	$ 22,366,364	$ -	$ 2,027,477	9%	

Assumed CPI =	2.5%	YEAR					
		1st	2nd	3rd	4th	5th	Total
	% Spend	15%	45%	40%	0%	0%	100%
	Cost Breakdown	$ 184,126	$ 552,377	$ 491,002	$ -	$ -	$ 1,227,504
	CPI	$ -	$ 13,809	$ 24,550	$ -	$ -	$ 38,360

(Note: CPI is not applied to direct charge above)

= Assume no CPI for 1st Year

= Only change percentages

Total (inc CPI):	$ 22,400,000

Contingency:	$ 2,000,000

Figure 21 – Cost estimate for PR713 Box Hill ZS Establishment [7]

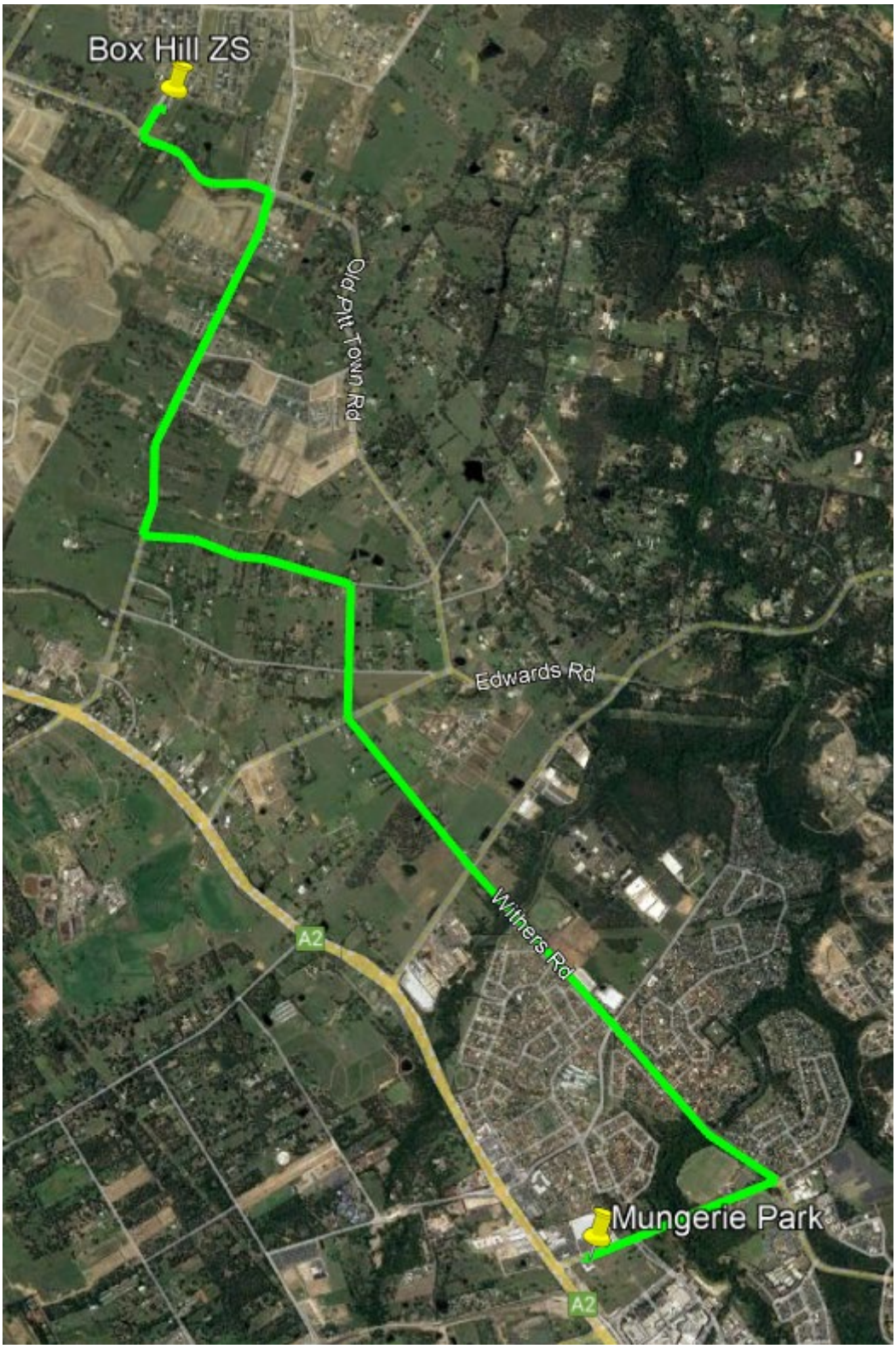


Figure 22 – Box Hill ZS to Mungerie Park ZS proposed feeder route (indicative only)

5. Recommendations and Next Steps

Based on Endeavour Energy's RIT-D process (Figure 23), it is recommended that:

- A Non-Network Options Report be issued seeking submissions for non-network options prior to proceeding to the Draft Project Assessment Report (DPAR), given that there are credible non-network options available.
- If a feasible non-network option submission is received, the economic evaluation for this project will be revised to assess whether the non-network option will defer the preferred network option.
- The CFI will be finalised at the completion of the RIT-D process and a final approval will then be submitted to the confirm if the scope will include a non-network option and if the recommended timing of investment of the preferred network option will change.
- If a feasible and cost-effective non network option is not received, the best Network Present Value (NPV) network solution is the augmentation of Box Hill ZS with a second 45 MVA transformer and a second 132kV feeder from Mungerie Park ZS (Option 2A) to supply the Box Hill area. Currently, this option represents a high value (economic benefit) being NPV positive **$1,328 Million** and represents the best option to meet the supply requirements for customers. This option is estimated to cost **$17.6 Million** plus a contingency of **$1.7 Million** for a total of **$19.3 Million** and is expected to be spread over two years from 2027 to 2028.
- It is recommended that the project value of **$19.3 Million** to be approved for consideration in the FY25-FY29 regulatory period.

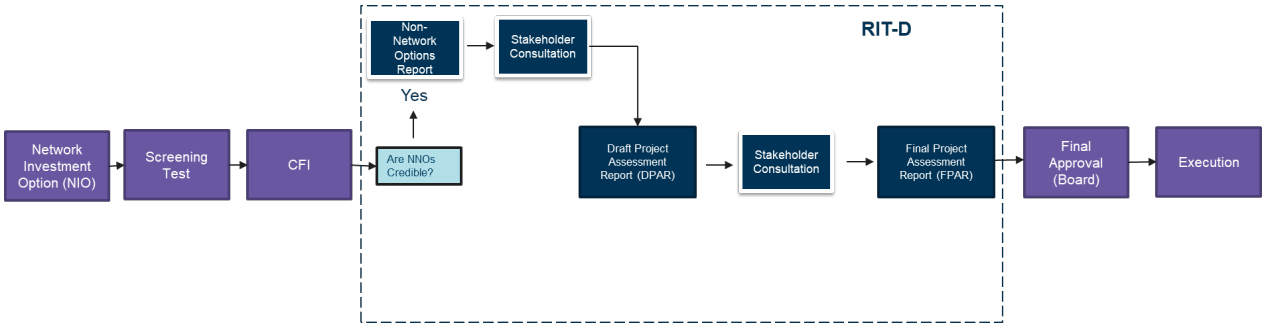


Figure 23 - Endeavour Energy's RIT-D Process

Appendices

A. Listing of benefits, risks, and residual risks considered

The NER states that quantifiable economic market benefits (needs) include changes in involuntary load shedding. The costs and benefits analysis described in the previous section included this benefit in determining the best option. Endeavour Energy's Unserved Energy Template was used to estimate the involuntary load shedding that can be prevented as a result of proactive action. The involuntary load shedding was utilised by the HK model along with a Value of Customer Reliability to calculate a market benefit. The captured benefit is listed in the table below.

Table 16: Benefits

Benefit	Description	Model	Option 1 PV $M	Option 2A, 2B PV $M
Value of avoided unserved energy	The NER states that quantifiable economic market benefits (needs) include changes in involuntary load shedding.	Endeavour Energy's Unserved Energy Template was used to estimate the involuntary load shedding that can be prevented as a result of proactive action. The involuntary load shedding was utilised by the HK model along with a Value of Customer Reliability to calculate a market benefit.	-	1,340.4

There were no other identified risks that were included in the costs and benefits analysis.

B. Referenced documents and appendices

[1] Capacity Planning, *PR713 Supply to Box Hill Development Area Case for Investment*. Endeavour Energy: 2020.

[2] DPIE, Box Hill Growth Centre Precincts, March 2018

[3] Champion Homes, The Gables Box Hill, https://www.championhomes.com.au/house-and-land-packages/estates/the-gables-box-hill#1568615426900-9c86fe86-2610

[4] Network Demand Forecasting, *Summer Demand Forecast 2022-2031*. Endeavour Energy, 2021.

[5] Substation Design, *Box Hill Stage 2 Design SLD*. Endeavour Energy: 2019.

[6] Substation Design, *PR713 Estimate Stage 2 Portable*. Endeavour Energy: 2019.

[7] Substation Design, *PR713 Estimate Stage 1 Portable*. Endeavour Energy: 2019.

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