HV feeder upgrades

Regulatory proposal 2021–2026

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Contents

1 Overview

Localised areas of load growth continue to drive demand-related high voltage (**HV**) feeder investment throughout our network. The growth in these areas is being driven by factors including the development of Greenfield areas, conversion of existing low density residential to high density, and areas of commercial and industrial developments.

United Energy has one of the most utilised networks in Australia with an average utilisation of distribution feeders historically around 60%. While this is the average across the whole population, there are a significant number of feeders that are approaching 100% utilisation, with a number of these being located in the identified growth areas. As the existing distribution network in localised areas becomes fully utilised, capacity augmentation of the existing network and new distribution feeders are required to supply the new developments to avoid overloading the network.

This document describes our approach to forecasting feeder projects and sets out our assessment of feeder projects forecast with expenditure during the 2021–2026 regulatory period exceeding $1 million, as summarised in table 1.1.

Table 1.1 Key feeder projects: 2021–2026 regulatory period ($ million, 2019)

Feeder	Optimal year for commissioning	DM deferral period (years)[1]	Cost
Install new OE feeder	2020	2	1.1
Install new MGE feeder	2020	4	1.5
Install new HGS 11 feeder	2021	4	2.0
Install new OR feeder	2021	3	1.6
RBD 11 Feeder Extension	2022	2	2.1
Install new feeder FSH 24	2022	4	1.6
Install new feeder DSH 12	2022	-	1.0
Install new EB feeder	2024	1	1.5
Install new WD feeder	2024	1	1.0
Install new LD34 feeder	2025	2	1.5

Source: United Energy

1 As determined in UE-XXX-X-X-X material business case UE feeder demand management program.

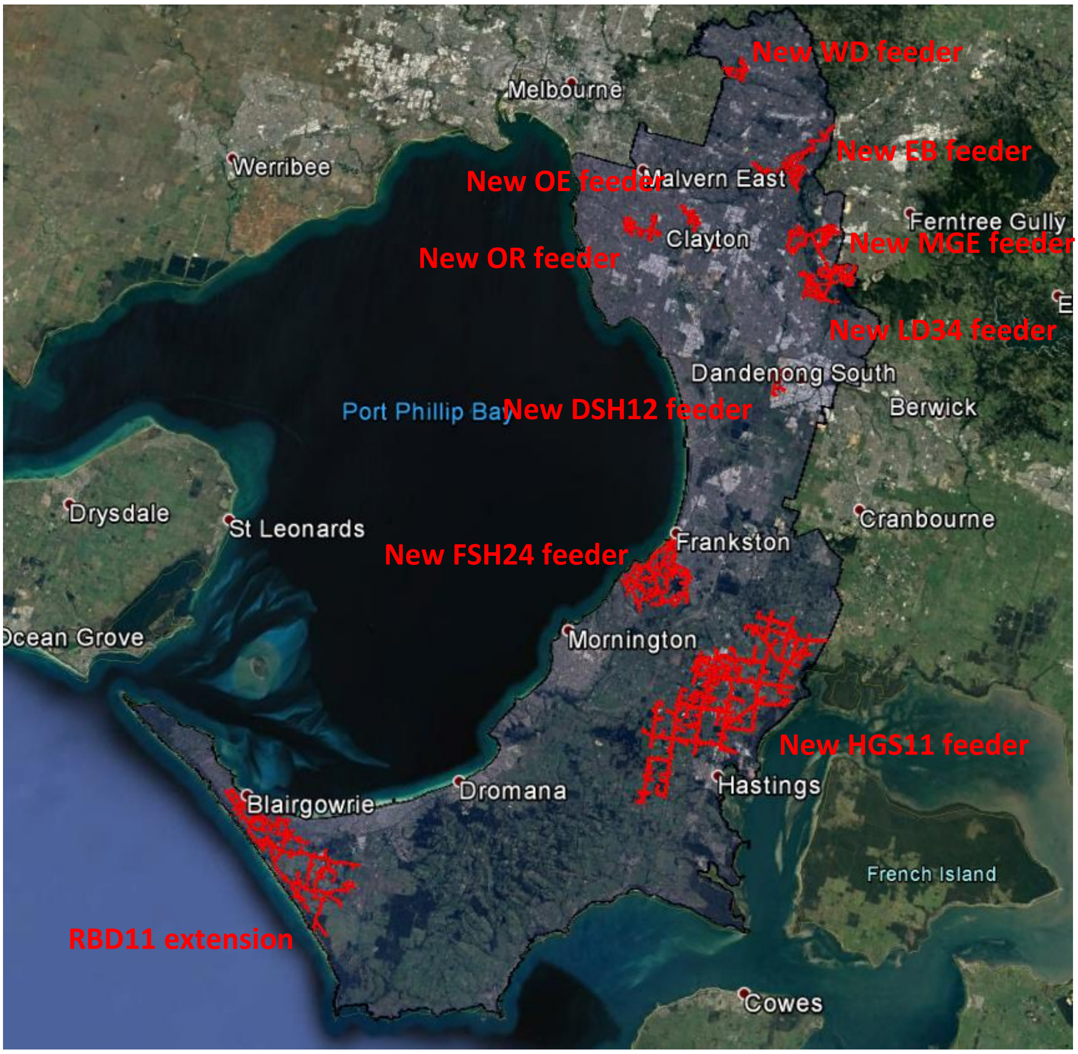
2 Forecast approach

This section sets out the type of constraints typically experienced across our HV feeder network and the process we undertake to forecast them.

Our customers are predominantly supplied by 445 distribution feeders operating at 22kV, 11kV and 6.6kV. Distribution feeders are arranged in a radial configuration, typically with open points between adjacent feeders to provide transfer capability. We have one of the most utilised networks with an average utilisation of distribution feeders historically around 60%. As outlined in our regulatory proposal, growth and utilisation vary significantly across our network. It is this localised growth where utilisation is approaching 100%, which is driving our augmentation plans. This is particularly relevant to HV feeders which typically only have one or two feeders supply growing areas.

The figure below shows the location and spread of constrained feeders with a project value over $1 million over the 2021–2026 regulatory period.

Figure 2.1 Constrained areas with key feeder projects during the 2021–2026 regulatory period



Source: United Energy

2.1 Feeder constraints

Forecast investment for HV feeders is derived on a per-constraint (project by project) basis. Our distribution feeder network predominantly experiences overload constraints, that is, the exceedance of conductor thermal limits. The conductor limits that are applied are the thermal limits of overhead and underground conductors that have been determined in accordance with Australian and international standards as detailed in document UE-X-XXX-XXX Network Planning Guidelines.

Under probabilistic planning, distribution feeders are generally loaded to greater than 85% utilisation before they are considered for an augmentation assessment as this represents a typical trigger-point at which feeder augmentations become economic based on the energy at risk under an outage condition. With increased distribution feeder utilisation, the transfer capabilities reserved for maintaining supply to our customers diminishes.

A number of options are considered in identifying suitable mitigation measures to alleviate thermal capacity and transfer capacity issues on distribution feeders, including:

- permanent load transfers to neighbouring feeders
- feeder reconductoring
- thermal uprate
- reactive power compensation
- new feeder ties or extensions
- new feeders
- non-network alternatives.

The most appropriate option is selected based on practical feasibility and least lifecycle cost.

Once all deferment or low cost options (including non-network solutions) have been exhausted, major augmentations are required to maintain the feeder load within the thermal limit. At this point in time, there is significant customer load at risk because load shedding will be required under system normal conditions as well as outage conditions.

Major augmentations are typically only required in areas of growth, where there are multiple adjacent feeders that are highly utilised and/or the existing network topology prevents any substantial load relief for the highly utilised feeders, and lower cost solutions are not available.

2.2 Feeder growth forecasts

Our approach to forecasting feeder growth includes both top-down and bottom-up assessments to ensure all macro-economic and local variables are considered. This approach is consistent with our approach for assessing sub-transmission lines and zone substation constraints.

2.2.1 Bottom-up considerations

Historical demand is determined based on actual demand recorded across the network. Determining the actual peak demand for each station is first corrected for system abnormalities (e.g. load transfers) to ensure the true peak is captured.

The feeder historical demand values are trended forward using the underlying zone substation growth rate (weather corrected) and known or predicted block loads, load retirements and embedded generation that may be connected. Committed future transfers between feeders and any committed non-network solutions are also applied.

2.2.2 Top-down considerations

Our top-down approach first considers independent forecasts developed by the National Institute of Economic and Industry Research (**NIEIR**) and validated with AECOM's eViews model of our network. We reconcile our bottom-up forecasts with these top-down independent econometric forecasts to ensure historical trend is adjusted for changes at the macro-economic level and post-model adjustment disruptors.

NIEIR's forecasting approach is discussed in detail in their report, provided with our regulatory proposal.[2]

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[2] XXXXXX NIEIR

3 Feeder projects

This section outlines our assessment of feeder projects forecast with expenditure during the 2021–2026 regulatory period exceeding $1 million.

3.1 Oakleigh East supply area

The Oakleigh East (**OE**) zone substation has nine feeders supplying the residential and commercial areas of Huntingdale, Murrumbeena and Oakleigh. OE 4 is a highly utilised feeder at OE with growth.

3.1.1 OE 4 feeder constraint

OE 4 is a highly utilised 11kV feeder leading south west of OE zone substation. The feeder supplies predominantly residential load in the Oakleigh and Oakleigh South areas.

Due to on-going load growth in the area, the feeder exceeded 100% of its cyclic rating in summer 2017/18. As a result, OE 4 was permanently offloaded to adjacent feeders with load transfers, namely OE 14 and OR 35 from Ormond (**OR**) zone substation prior to summer 2018/19. With the transfers in place, OE 4 is forecast to become overloaded from 2021/22. Moreover, adjacent feeders OE 14 and OR 35 are also forecast to exceed 100% of their utilisation from 2025/26.

The forecast capacity and duration of unserved load on these feeders, under system normal conditions, in summer 2025/26 is set out in table 3.1. Even under system normal conditions, we will experience unserved load. In addition, given the high utilisation of several feeders in the area, there is little load transfer capacity available to offload the feeders in high demand periods, leading to significant load at risk in the event of an unplanned outage.

Table 3.1 Capacity and duration of unserved load above the thermal rating during system normal conditions

Feeder	Unserved load (MVA)	Unserved load (hours)
OE 4	0.5	12.0
OE 14	0.2	5.0
OR 35	0.3	4.0

Source: United Energy

To address the anticipated system constraints, a number of options were considered including thermal uprate and reconductoring of OE 4 and/or OE 14. However these options were high cost and unable to provide the capacity required given the ongoing load growth and the need to resolve the constraints on four highly utilised feeders supplying the area. The use of pole top capacitor banks was also found to be unviable as the power factor of these feeders is already close to unity. The preferred option to manage the unserved load is outlined in table 3.2.

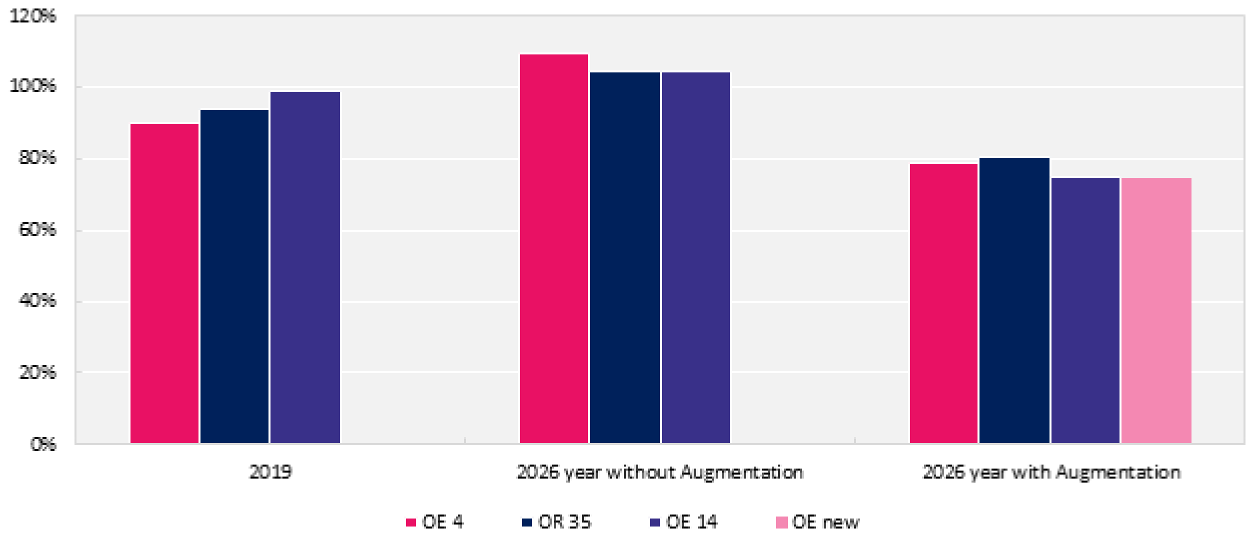
Table 3.2 Feeder options ($ million, 2019)

Option	Cost
Install new OE feeder	1.1

Source: United Energy

This is the lowest cost option to alleviate the four highly utilised feeders and serve the Oakleigh and Oakleigh South areas from 2020. A summary of the forecast feeder utilisation levels with and without this option are shown in figure 3.1.

Figure 3.1 Forecast feeder utilisations



Source: United Energy

A demand-side initiative that reduces the forecast maximum demand load by approximately 0.4 MW will defer the need for the capital investment by two years to 2022. See UE-XXX-X-XX-XXX material business case for more details on our feeder demand management program viability assessments and forecasting approach.

3.2 Mulgrave supply area

The Mulgrave (**MGE**) zone substation has twelve feeders supplying the residential and commercial areas of Mulgrave, Rowville, Scoresby and Wheelers Hill. MGE 12 is a highly utilised feeder at MGE with growth.

3.2.1 MGE 12 feeder constraint

MGE12 and MGE13 high-voltage 22kV feeders are highly utilised feeders which predominantly supply high-end commercial loads in Scoresby and Wheelers Hill. In particular these feeders support the developing Caribbean Park Estate area which is over 4 kilometres away from MGE zone substation. We have already received several new customer connection requests for load within the estate and more expected over the coming years.

Due to load growth, the MGE 12 feeder will exceed 100% of its cyclic rating resulting in unserved load even under system normal conditions. In addition, given the existing topology of the distribution network in this area and loading of the feeders, there is little load transfer capability in the network to supply the demand on MGE12 and MGE13 feeders in the event of an outage—leading to significant levels of load at risk in the event of an unplanned outage.

Our estimate of the forecast capacity and duration of unserved load on these feeders, under system normal conditions, in summer 2025/26 is set out in table 3.3.

Table 3.3 Capacity and duration of unserved load above the thermal rating during system normal conditions

Feeder	Unserved load (MVA)	Unserved load (hours)
MGE 12	0.1	1.0

Source: United Energy

The preferred option to manage the constraint is outlined in table 3.4. A number of alternative options were considered including thermal uprate and reconductoring of MGE 12 and/or MGE 13. However, these options had a higher lifecycle cost and did not provide the capacity required to meet load growth and resolve the constraints on both highly utilised feeders supplying the area. Both MGE 12 and MGE 13 feeders already have existing pole top capacitor banks and have fully compensated power factors.

Table 3.4 Feeder options ($ million, 2019)

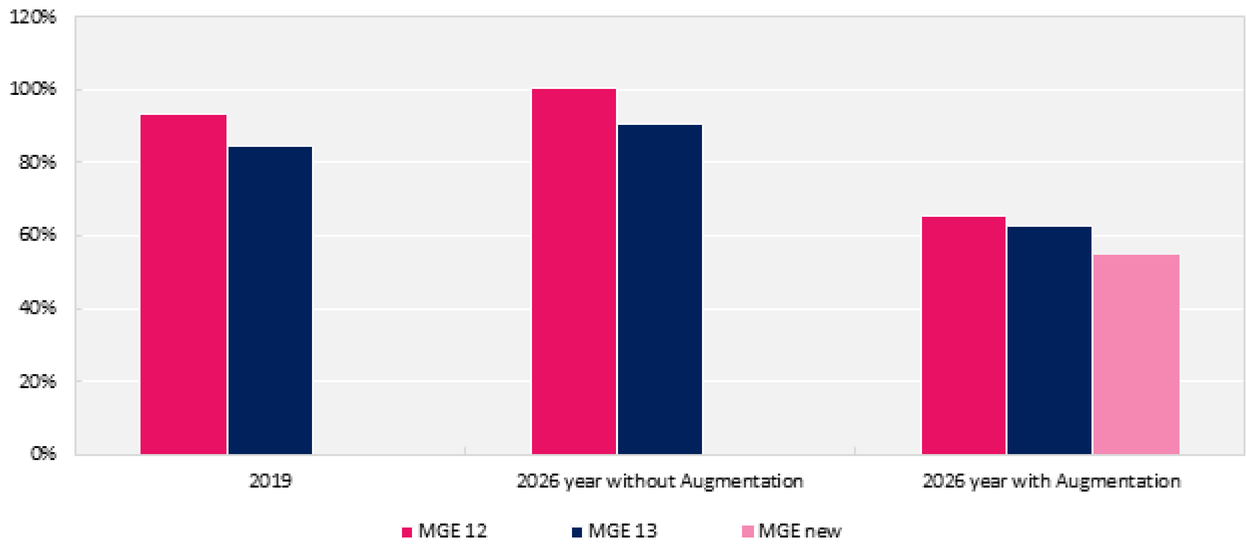
Option	Cost
Install new MGE feeder (including reconductoring part of MGE 13)	1.5

Source: United Energy

This is the lowest cost option to alleviate the two highly utilised feeders and serve the Caribbean Park, Scoresby and Wheelers Hill areas from 2020.

A summary of the forecast feeder utilisation levels with and without this option are shown in figure 3.2.

Figure 3.2 Forecast feeder utilisations



Source: United Energy

A demand-side initiative that reduces the forecast maximum demand load by approximately 0.6 MW will defer the need for the capital investment by four years to 2024. See UE-XXX-X-XX-XXX material business case for more details on our feeder demand management program viability assessments and forecasting approach.

3.3 Hastings supply area

The Hastings (**HGS**) zone substation has six feeders and supplies the predominantly residential areas of Hastings, Merricks, Balnarring, Somerville and Tyabb. HGS 33 is a highly utilised feeder at HGS with growth.

3.3.1 HGS 33 feeder constraint

HGS 33 is a long and highly utilised 22kV feeder leading north of HGS zone substation. The feeder supplies the growing, predominantly residential load in the Tyabb and Somerville areas.

Due to load growth in the area the feeder will exceed 100% of its cyclic rating by summer 2025/26 resulting in unserved load even under system normal conditions.

The adjacent feeder, HGS 22, which provides the main back up to HGS 33, is also highly utilised. Given this, there is little load transfer capacity to offload the feeder in high demand periods, leading to significant levels of load at risk in the event of an unplanned outage.

Our estimate of the forecast capacity and duration of unserved load on these feeders under system normal conditions in summer 2025/26, is set out in table 3.5.

Table 3.5 Capacity and duration of unserved load above the thermal rating during system normal conditions

Feeder	Unserved load (MVA)	Unserved load (hours)
HGS 33	0.1	1.0

Source: United Energy

The preferred option to manage the unserved load is outlined in table 3.6. A number of alternative options were considered including thermal uprate and reconductoring of HGS 22. However, particularly given the long length of theses feeders, these options were found to be uneconomic as they do not provide the required capacity to meet the ongoing load growth and resolve the constraints of both highly utilised feeders. The use of pole top capacitor banks on HGS 33, and/or HGS 22 which already has a pole top capacitor bank, was is unviable as the operating power factor is already close to unity.

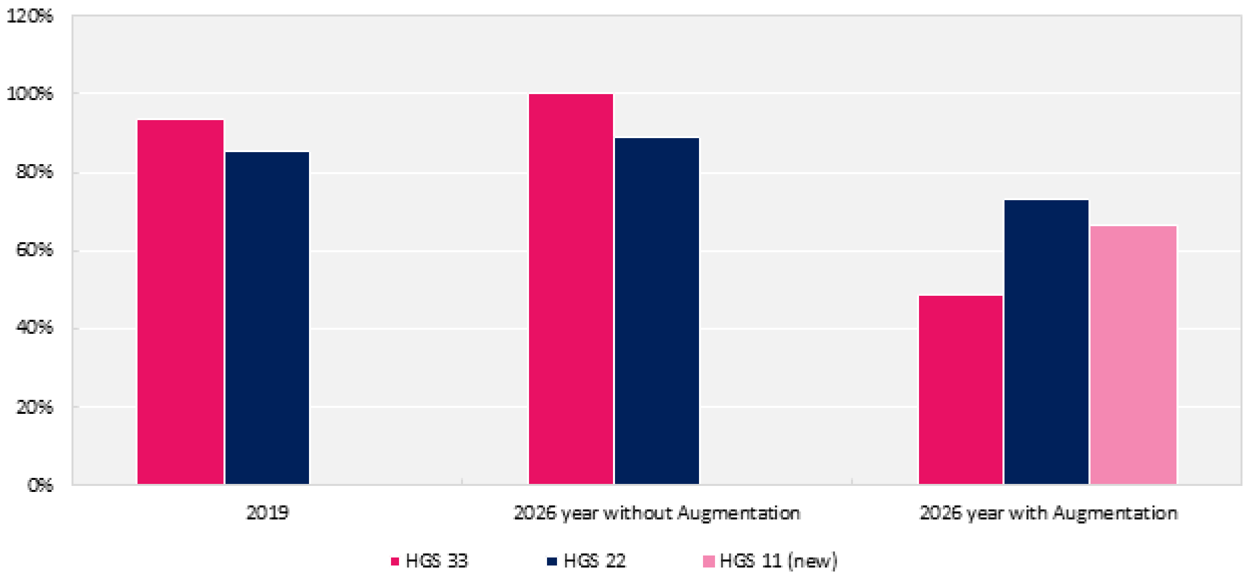
Table 3.6 Feeder options ($ million, 2019)

Option	Cost
Install new HGS 11 feeder	2.0

Source: United Energy

This is the lowest lifecycle cost option to alleviate the two highly utilised feeders and serve the Tyabb and Somerville areas from 2021. A summary of the forecast feeder utilisation levels with and without this option are shown in figure 3.3.

Figure 3.3 Forecast feeder utilisations



Source: United Energy

A demand-side initiative that reduces the forecast maximum demand load by approximately 0.8 MW will defer the need for the capital investment by four years to 2025. See UE-XXX-X-XX-XXX material business case for more details on our feeder demand management program viability assessments and forecasting approach.

3.4 Ormond supply area

The Ormond (**OR**) zone substation has nine feeders supplying the predominantly residential areas of Bentleigh East, Hughesdale and Murrumbeena. OR 24 is a highly utilised feeder with growth.

3.4.1 OR 24 feeder constraint

OR 24 is a highly utilised 11kV feeder leading south of OR zone substation. The feeder supplies residential and commercial load, including the local shopping centre and hospital in the Bentleigh East area. Due to ongoing load growth in the area, the feeder will exceed 100% of its cyclic rating under by summer 2019/20, resulting in unserved load even under system normal conditions. In order to avoid overload, we will permanently offload load to adjacent feeders. With this load transfer, OR 24 will exceed its cyclic rating under system normal conditions by summer 2022/23.

The adjacent feeders, BT 04 and BT 15 from Bentleigh (**BT**) zone substation, which tie into OR 24, are also highly utilised. The growth on these is driven by in-fill high density developments around the railway corridor. There is little load transfer capability available to offload these feeders during high demand periods, leading to significant levels of load at risk in the event of an unplanned outage.

Our estimate of the forecast capacity and duration of unserved load on these feeders, under system normal conditions, in summer 2025/26 is set out in table 3.7.

Table 3.7 Capacity and duration of unserved load above the thermal rating during system normal conditions

Feeder	Unserved load (MVA)	Unserved load (hours)
OR 24	0.8	11.0

Source: United Energy

The preferred option to manage the unserved load is outlined in table 3.8. To address the system constraints, a number of alternative options were considered including thermal uprate and reconductoring of OR 24 and/or BT 15 and BT 4. However, these options were found to be higher lifecycle cost without providing the capacity to meet the ongoing load growth and resolve the constraints on the three highly utilised feeders supplying the area. All three feeders OR 24, BT 04 and BT 15 feeders already have pole top capacitor banks.

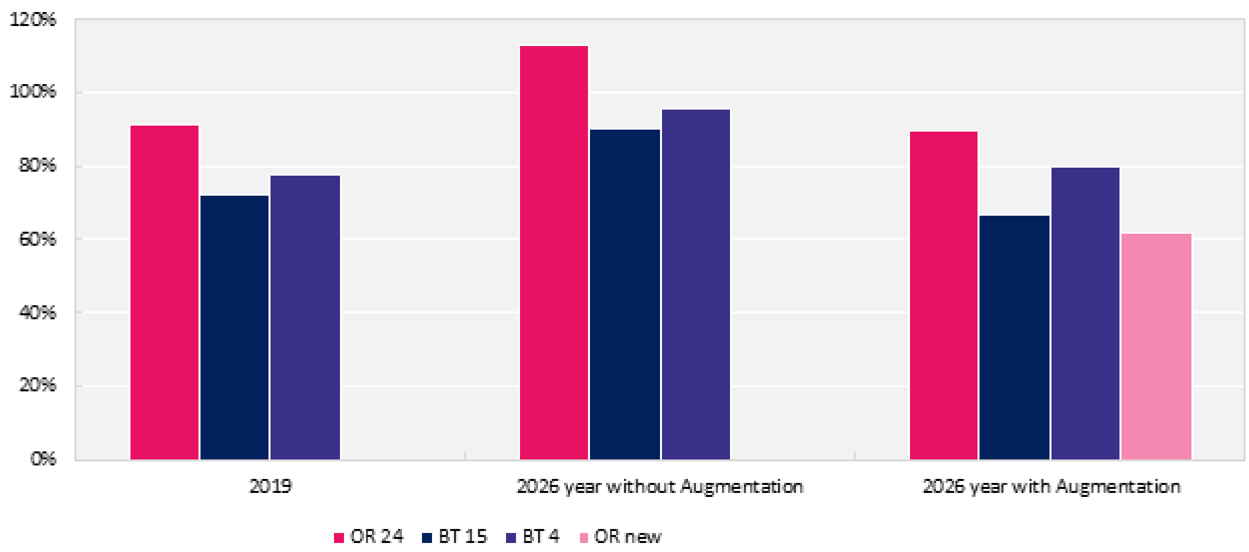
Table 3.8 Feeder options ($ million, 2019)

Option	Cost
Install new OR feeder	1.6

Source: United Energy

This is the lowest cost option to alleviate the three highly utilised feeders and serve the growing Bentleigh East area from 2021. A summary of the forecast feeder utilisation levels with and without this option are shown in figure 3.4.

Figure 3.4 Forecast feeder utilisations



Source: United Energy

A demand-side initiative that reduces the forecast maximum demand load by approximately 0.7 MW will defer the need for the capital investment by three years to 2024. See UE-XXX-X-XX-XXX material business case for more details on ourfeeder demand management program viability assessments and forecasting approach.

3.5 Sorrento supply area

The Sorrento (**STO**) zone substation has five feeders and supplies residential and holiday destinations on the tip of the Mornington Peninsula including the areas of Blairgowrie, Portsea, Rye, Saint Andrews Beach and Sorrento. STO 14 is a highly utilised feeder with growth.

3.5.1 STO 14 and STO 21 feeder constraint

STO 14 and STO 21 are long and highly utilised 22kV feeders leading east of STO zone substation. The feeders supply the growing residential load in the Blairgowrie, Rye and St Andrews Beach areas. In addition to the increasing holiday load in the area, the number of permanent residents is increasing as holiday homes are being converted into permanent dwellings, residential developments and retirement villages.

Due to load growth, STO 14 will exceed 100% of its cyclic rating by summer 2023/24 leading to unserved load even under system normal conditions. In addition, with STO 21 as the primary supporting feeder for STO14, there is little load transfer capacity to offload the feeders in high demand periods, leading to significant levels of load at risk in the event of an unplanned outage.

Our estimate of the forecast capacity and duration of unserved load on these feeders under system normal conditions in summer 2025/26 is set out in table 3.9.

Table 3.9 Capacity and duration of unserved load above the thermal rating during system normal conditions

Feeder	Unserved load (MVA)	Unserved load (hours)
STO 14	0.6	2.0

Source: United Energy

The preferred option to manage the unserved load is outlined in table 3.10 which involves establishing a new tie to the lightly utilised feeder RBD 11 from Rosebud (**RBD**) zone substation. As a deferment option to the emerging capacity constraints, STO21 was augmented in 2016 (a lower cost option) and reconfigured to offload STO14. Presently both the feeders are fully rated and have no further provision for augmentation. Both STO 14 and STO 21 already have pole top capacitor banks. Establishment of a new feeder was also found to be higher cost given the long length required to support the constraint.

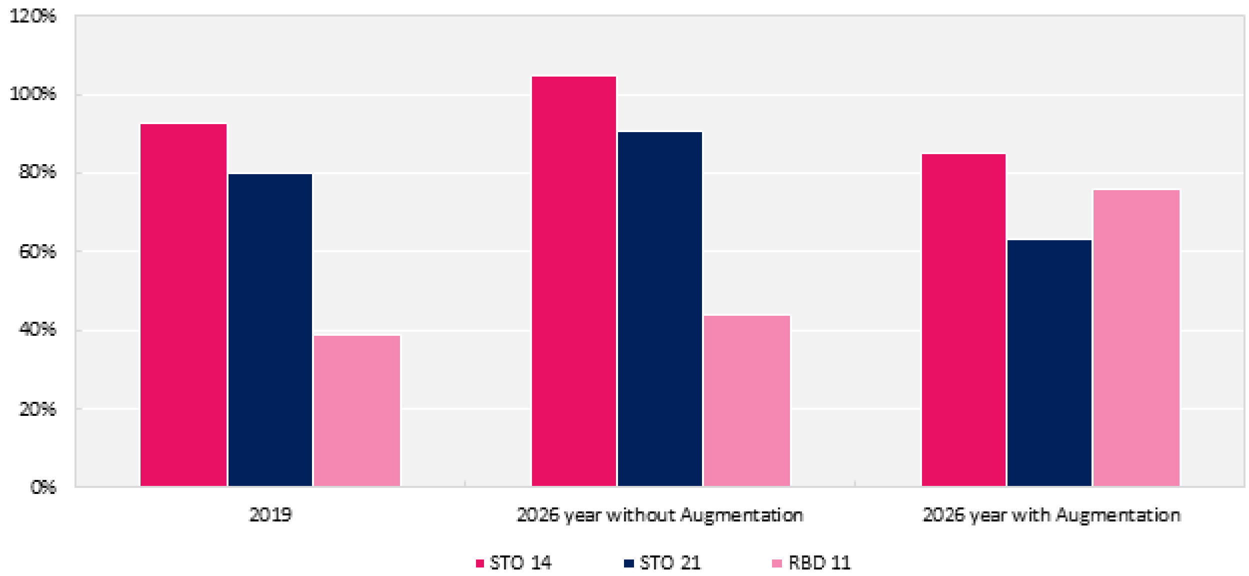
Table 3.10 Feeder options ($ million, 2019)

Option	Cost
RBD 11 Feeder Extension	2.1

Source: United Energy

This is the lowest lifecycle cost option to alleviate the capacity constraints on the two STO feeders that serve the growing Blairgowrie, Rye and Rosebud West areas from 2022. A summary of the forecast feeder utilisation levels with and without this option are shown in figure 3.5.

Figure 3.5 Forecast feeder utilisations



Source: United Energy

A demand side that reduces the forecast maximum load by approximately 0.8 MW will defer the need for the capital investment by two years to 2024. See UE-XXX-X-XX-XXX material business case for more details on our feeder demand management program viability assessments and forecasting approach.

3.6 Frankston South supply area

The Frankston South (**FSH**) zone substation has ten feeders and supplies the predominantly residential areas of Baxter, Frankston, Frankston South, Mount Eliza and Somerville. FSH13 and FSH33 are highly utilised feeders with growth.

3.6.1 FSH 31 and FSH 33 feeder constraints

FSH 31 and FSH 33 are highly utilised 22kV feeders leading west of FSH zone substation. The feeders supply predominantly residential load in the Frankston South and Mount Eliza areas.

Due to load growth, FSH 31 and FSH 33 will exceed 100% of their cyclic ratings by summer 2020/21 and summer 2024/25 respectively resulting in unserved load even under system normal conditions.

The adjacent feeder, FSH 13, which provides the main back up to FSH 31 and FSH 33, is also highly utilised. Given this, there is little load transfer capacity to offload the feeders in high demand periods, leading to significant levels of load at risk in the event of an unplanned outage.

The forecast capacity and duration of unserved load on these feeders, under system normal conditions, in summer 2025/26 is set out in table 3.11.

Table 3.11 Capacity and duration of unserved load above the thermal rating during system normal conditions

Feeder	Unserved load (MVA)	Unserved load (hours)
FSH 31	0.6	4.0
FSH 33	0.1	2.0

Source: United Energy

The preferred option to manage the unserved load is outlined in table 3.12. As a deferment option to the emerging capacity constraints, FSH12 was augmented in 2015 (a lower cost option) and we reconfigured the network to offload FSH33. To address the anticipated system constraints, a number of alternative options were considered including thermal uprate and reconductoring of FSH 31. However, these options were found to be uneconomic and they do not provide the required capacity to meet the ongoing load growth and resolve the constraints of the three constrained feeders. All three feeders already have existing a pole top capacitor banks and are operating close to unity power factor.

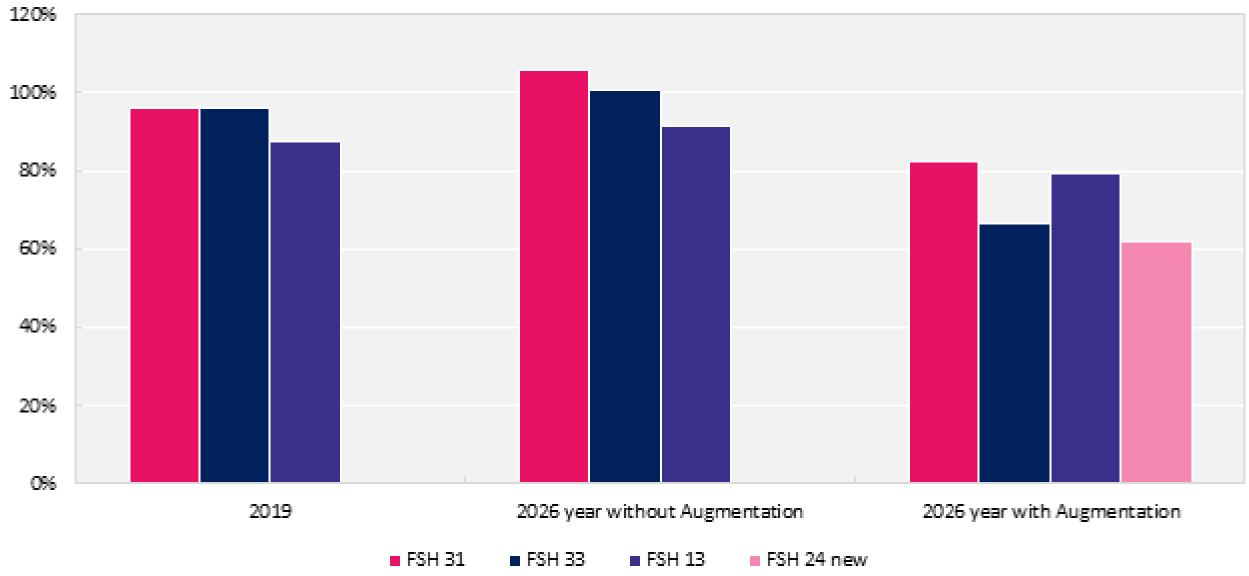
Table 3.12 Feeder options ($ million, 2019)

Option	Cost
Install new feeder FSH 24	1.6

Source: United Energy

This is the lowest lifecycle cost option to alleviate the three highly utilised feeders and serve the Frankston South and Mount Eliza areas from 2022. A summary of the forecast feeder utilisation levels with and without this option are shown in figure 3.6.

Figure 3.6 Forecast feeder utilisations



Source: United Energy

A demand side initiative that reduces the forecast maximum demand load by approximately 0.6 MW will defer the need for the capital investment by four years to 2026. See UE-XXX-X-XX-XXX material business case for more details on our feeder demand management program viability assessments and forecasting approach.

3.7 Dandenong South supply area

The Dandenong South (**DSH**) zone substation has ten feeders and supplies the predominantly commercial and industrial areas of Dandenong and Dandenong South. DSH 33 is a highly utilised feeder at DSH with growth.

3.7.1 DSH 33 feeder constraint

DSH 33 is a highly utilised 22kV feeder leading west of DSH zone substation. The feeder supplies the growing commercial and industrial estate areas in Dandenong South.

Due to load growth in the area the DSH 33 feeder will exceed its cyclic rating from summer 2022/23 resulting in unserved energy even under system normal conditions. Due to the existing topology there are few feeder ties to DSH 33 and limited opportunity to support the new sizeable industrial loads. Additionally, given the limited feeder ties for DSH 33, and the high utilisation of the adjacent feeders, there is little load transfer capacity to offload the feeders in high demand periods, leading to significant load at risk in the event of an unplanned outage.

The forecast capacity and duration of unserved load on these feeders, under system normal conditions, in summer 2025/26 is set out in table 3.13.

Table 3.13 Capacity and duration of unserved load above the thermal rating during system normal conditions

Feeder	Unserved load (MVA)	Unserved load (hours)
DSH 33	0.5	5.0

Source: United Energy

The preferred option to manage the constraint is outlined in table 3.14. A number of alternative options were considered including upgrading of the cables of the DSH 33 feeder backbone. However, these options were found to be uneconomic and they do not provide the required capacity to meet the ongoing load growth and resolve the constraints of DSH 33. The DSH 33 feeder already has an existing pole top capacitor bank and operates close to unity power factor.

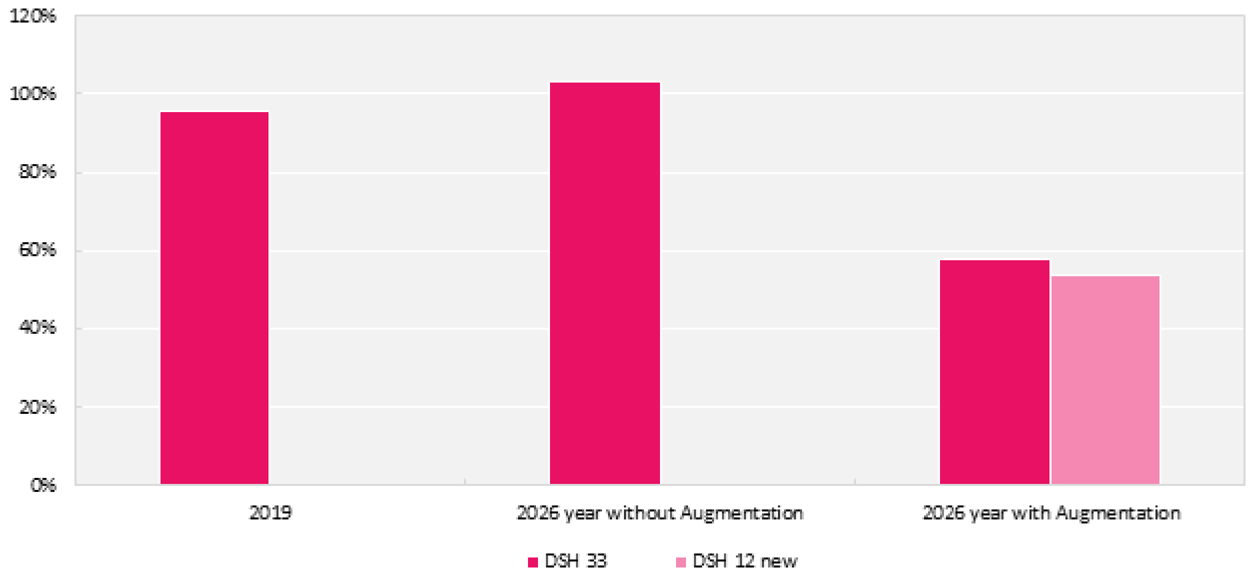
Table 3.14 Feeder options ($ million, 2019)

Option	Cost
Install new feeder DSH 12	1.0

Source: United Energy

This is the lowest lifecycle cost option to alleviate the highly utilised feeder and serve the commercial and industrial estate areas in Dandenong South area from 2022. A summary of the forecast feeder utilisation levels with and without this option are shown in figure 3.7.

Figure 3.7 Forecast feeder utilisations



Source: United Energy

A demand-side initiative would need to reduce load by approximately 0.6MW to defer the preferred solution by one year, however, this is not economically viable when compared with the augmentation works. See UE-XXX-X-XX-XXX material business case for more details on our feeder demand management program viability assessments and forecasting approach.

3.8 East Burwood supply area

The East Burwood (**EB**) zone substation has eleven feeders and supplies the residential and commercial areas of Burwood East and Forest Hill. EB 32 is a highly utilised feeder at EB with growth.

In addition, we have six 22kV feeders out of Ringwood Terminal Station (**RWT**) which supply the residential and commercial areas of in Mitcham, Nunawading and Vermont to the east of EB. RWT 34 is also a highly utilised feeder with growth.

3.8.1 RWT 34 and EB 32 feeder constraint

RWT 34 is a highly utilised 22kV feeder leading south west of RWT zone substation. The feeder supplies the growing, predominantly residential load in the Vermont and Vermont South areas on the fringe of our network. Due to load growth, the feeder will exceed 100% of its cyclic rating from summer 2025/26 resulting in unserved even under system normal conditions.

EB 32, which also supplies the Vermont South area is also highly utilised and will exceed 100% of its cyclic rating from summer 2026/27, resulting in unserved load even under system normal conditions.

The forecast capacity and duration of unserved load on these feeders, under system normal conditions, in summer 2025/26 is set out in table 3.15. In addition, given the high utilisation of the feeders, there is little load transfer capacity to offload the feeders in high demand periods, leading to significant levels of load at risk in the event of an unplanned outage.

Table 3.15 Capacity and duration of unserved load above the thermal rating during system normal conditions

Feeder	Unserved load (MVA)	Unserved load (hours)
RWT 34	0.1	1.0

Source: United Energy

The preferred option to manage the constraint is outlined in table 3.16. A number of alternative options were considered including thermal uprate and reconductoring EB 32. However, these options have a higher lifecycle cost without providing the required capacity to meet the ongoing load growth and solve the constraints on both feeders supplying the area. Both RWT 34 and EB 32 feeders already have existing pole top capacitor banks to fully compensate the power factor on each feeder.

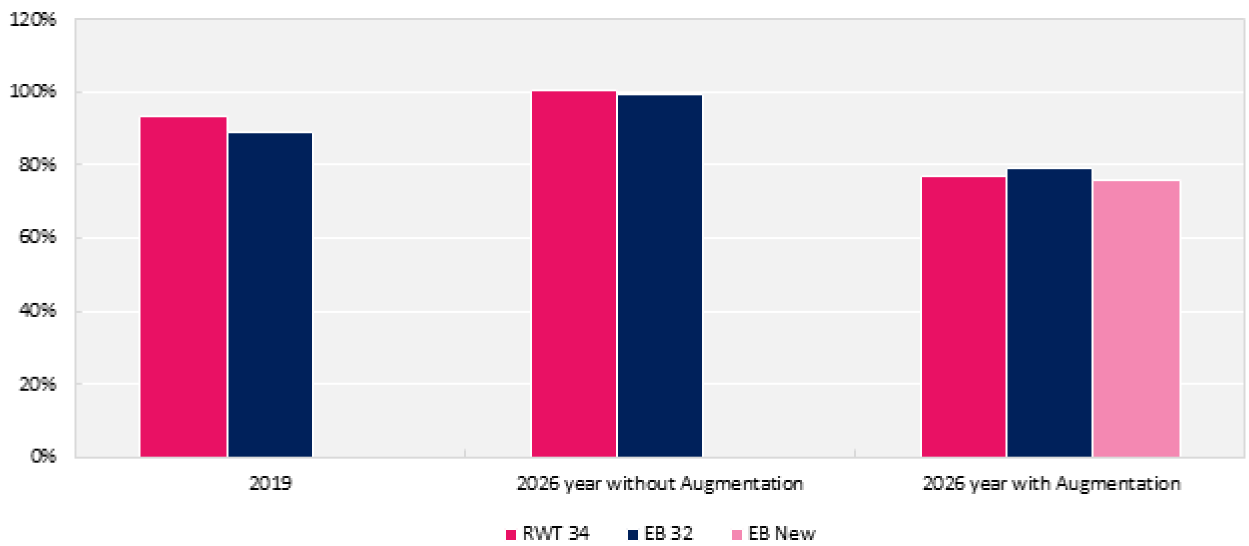
Table 3.16 Feeder options ($ million, 2019)

Option	Cost
Install new EB feeder	1.5

Source: United Energy

This is the lowest lifecycle cost option to alleviate the two highly utilised feeders and serve the Vermont South area from 2024. A summary of the forecast feeder utilisation levels with and without this option are shown in FIGURE 3.8.

Figure 3.8 Forecast feeder utilisations



Source: United Energy

A demand-side initiative that reduces the forecast maximum demand load by approximately 0.5 MW will defer the need for the capital investment by one year to 2025. See UE-XXX-X-XX-XXX material business case for more details on our feeder demand management program viability assessments and forecasting approach.

3.9 West Doncaster supply area

The West Doncaster (**WD**) zone substation has twelve feeders and supplies the residential and commercial areas of North Balwyn, Doncaster and the Doncaster Hill precinct. WD 14 has recently had customer connection requests and will be a highly utilised feeder with ongoing growth.

3.9.1 WD 14 feeder constraint

WD 14 will be a highly utilised 11kV feeder leading south east of WD zone substation. The feeder supplies the growing, predominantly residential load in the Doncaster and Doncaster Hill areas where recent customer connection requests have been received.

Due to load growth in the area, in particular establishment of high density residential apartments in the Doncaster Hill precinct, the feeder will exceed 100% of its cyclic rating from summer 2024/25 resulting in unserved energy even under system normal conditions.

With the surrounding area to the south supplied by 22kV from Doncaster Zone substation, WD 14 has ties to only one feeder to north, WD 23.

The forecast capacity and duration of unserved load on these feeders, under system normal conditions, in summer 2025/26 is set out in table 3.17. In addition given the high utilisation of the feeders, there is limited load transfer capacity to offload the feeders in high demand periods, leading to significant levels of load at risk in the event of an unplanned outage.

Table 3.17 Capacity and duration of unserved load above the thermal rating during system normal conditions

Feeder	Unserved load (MVA)	Unserved load (hours)
WD 14	0.7	8.0

Source: United Energy

The preferred option to manage the constraint is outlined in table 3.18. A number of alternative options were considered including thermal uprate and reconductoring WD-14. However, these options are unable to provide the required capacity to meet the ongoing load growth and resolve the constraints across both feeders. Both WD 14 and WD 23 already have pole top capacitor banks.

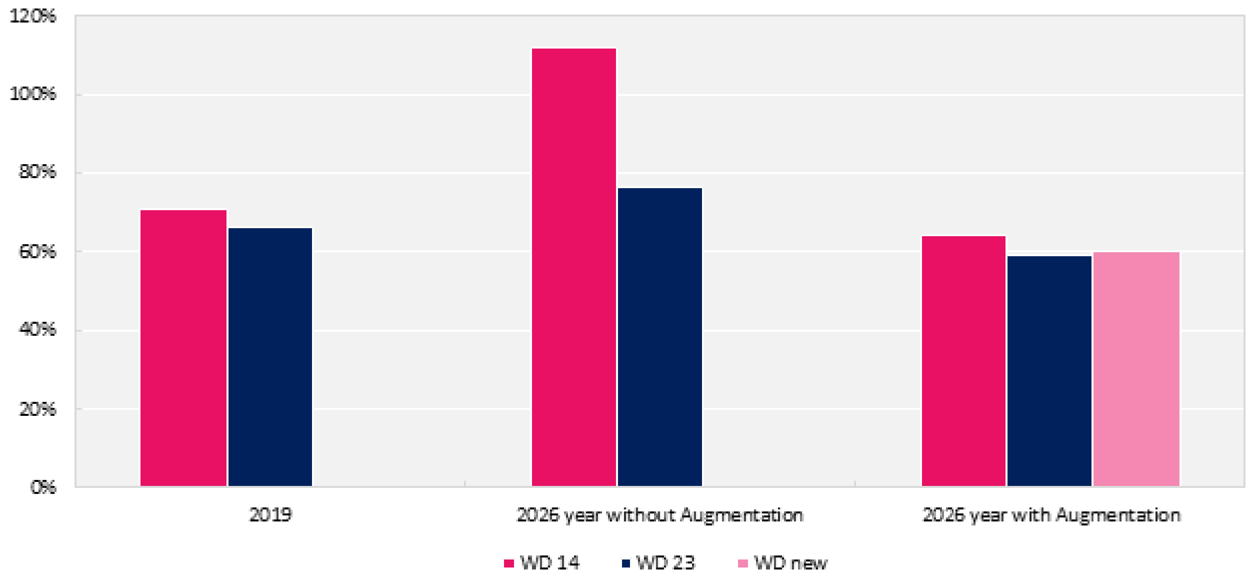
Table 3.18 Feeder options ($ million, 2019)

Option	Cost
Install new WD feeder	1.0

Source: United Energy

This is the lowest lifecycle cost option to alleviate the two highly utilised feeders and serve the Doncaster and Doncaster Hill areas from 2024. A summary of the forecast feeder utilisation levels with and without this option are shown in figure 3.9.

Figure 3.9 Forecast feeder utilisations



Source: United Energy

A demand-side initiative that reduces the forecast maximum demand load by approximately 0.2 MW will defer the need for the capital investment by one year to 2025. See UE-XXX-X-XX-XXX material business case for more details on our feeder demand management program viability assessments and forecasting approach.

3.10 Lyndale supply area

The Lyndale (**LD**) zone substation has nine feeders and supplies the residential and commercial areas of Dandenong, Dandenong North, Endeavour Hills and Rowville. LD 6 is a highly utilised feeder at LD with growth.

3.10.1 LD 6 feeder constraint

LD 6 is a highly utilised 22kV feeder leading north east of LD zone substation. The feeder supplies the growing, predominantly residential load in the Dandenong North area, and The Valley Hospital.

Due to load growth in the area, the feeder will exceed 100% of its cyclic rating from summer 2021/22, resulting in unserved energy even under system normal conditions. The other feeder supplying the area, LD 33, is also highly utilised.

The forecast capacity and duration of unserved load on these feeders, under system normal conditions, in summer 2025/26 is set out in table 3.19. Given the high utilisation of both feeders, there is limited load transfer capacity to offload the feeders in high demand periods, leading to significant levels of load at risk in the event of an unplanned outage.

Table 3.19 Capacity and duration of unserved load above the thermal rating during system normal conditions

Feeder	Unserved load (MVA)	Unserved load (hours)
LD 6	0.3	1.0

Source: United Energy

The preferred option to manage the constraint is outlined in table 3.20. A number of alternative options were considered including thermal uprate and reconductoring LD 6 and/or LD 33. However these are uneconomic as they do not provide the capacity required to meet the ongoing load growth and resolve the constraints of both feeders. LD 6, and LD 33 already have pole top capacitor banks and the power factor is already close to unity.

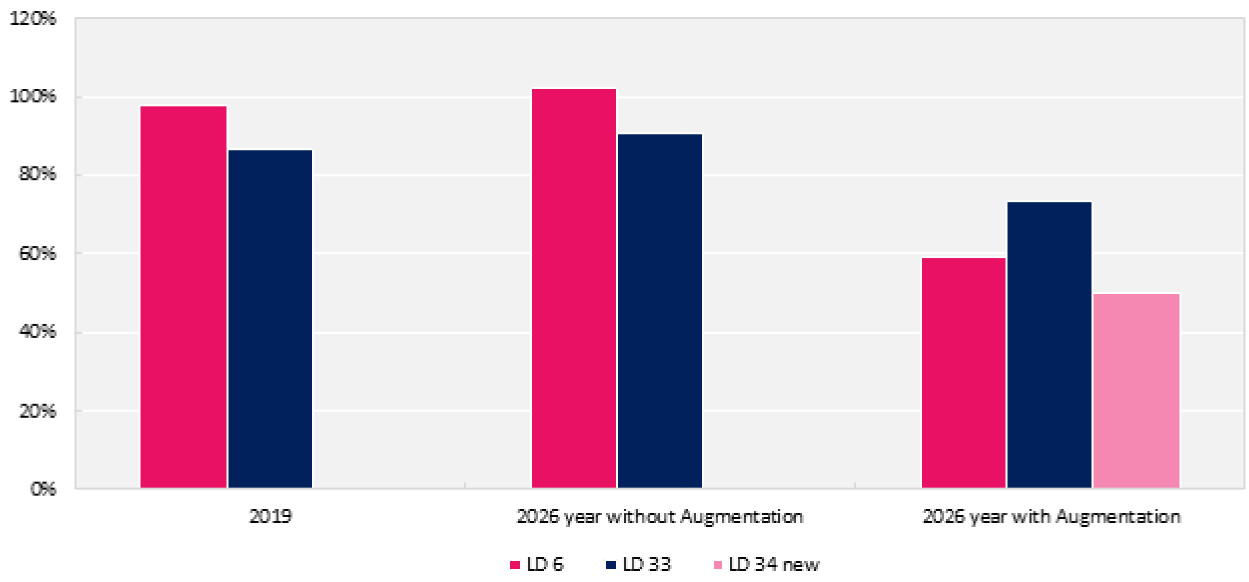
Table 3.20 Feeder options ($ million, 2019)

Option	Cost
Install new LD34 feeder	1.5

Source: United Energy

This is the lowest lifecycle cost option to alleviate the two highly utilised feeders and serve the Dandenong North area from 2025. A summary of the forecast feeder utilisation levels with and without this option are shown in figure 3.10.

Figure 3.10 Forecast feeder utilisations



Source: United Energy

A demand-side initiative that reduces the forecast maximum load by approximately 0.5 MW will defer the need for the capital investment by at least 2 years to 2027. See UE-XXX-X-XX-XXX material business case for more details on our feeder demand management program viability assessments and forecasting approach.