Keysborough supply area

UE BUS 6.04

Regulatory proposal 2021–2026

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Contents

1 Overview

Keysborough (**KBH**) zone substation was commissioned in December 2014 as a single transformer zone substation to support the rapid growth in the developing areas of Keysborough and Dandenong South. Keysborough is one of the fast growing suburbs in our supply area, and has a high public profile as one of Melbourne's major growth areas. With improved access through East Link, Dandenong Bypass and Dingley Arterial, the popularity of the suburb has increased substantially. This has stimulated rapid construction growth in both the residential and industrial sectors.

This business case assesses options to support the growing population and maximum demand in the KBH supply area. Our preferred network option to address the identified need includes the following:

- installation of a second transformer
- reconfiguration of the 22kV distribution network in the area with two new 22kV feeders.

The forecast capital and operating expenditure requirements for the preferred option are outlined in table 1. These forecasts have been developed in calendar year terms, and converted to financial years in our consolidated expenditure modelling following changes to our reporting period (as required by the Victorian Government and the Australian Energy Regulator).

Table 1 Expenditure forecasts for preferred option ($ million, 2019)

Expenditure forecast	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Capital expenditure	4.34	2.12	-	-	-	6.46
Operating expenditure	-	0.03	0.06	0.06	0.06	0.22
Total	**4.34**	**2.15**	**0.06**	**0.06**	**0.06**	**6.68**

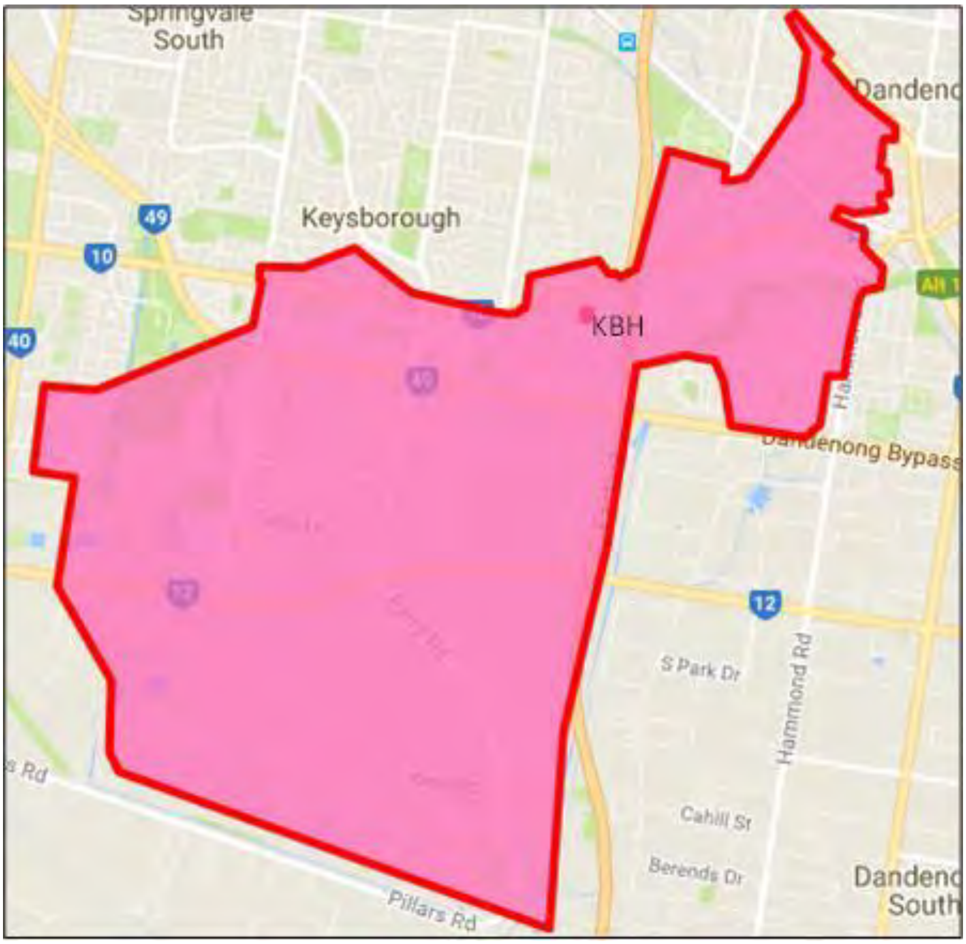
Source: United Energy
Note: Numbers may not add due to rounding

This project will also be subject to assessment as required under the regulatory investment test for distribution (**RIT-D**). We will initiate consultation well before the economic timing of the preferred network option in order to maximise the chance of a viable non-network solution being identified.

2 Background

KBH zone substation provides electricity supply to approximately 9,500 customers in Keysborough and Dandenong (as shown in figure 1). These customers are predominantly residential, with a mix of light industrial and commercial establishments.

Figure 1 KBH supply area



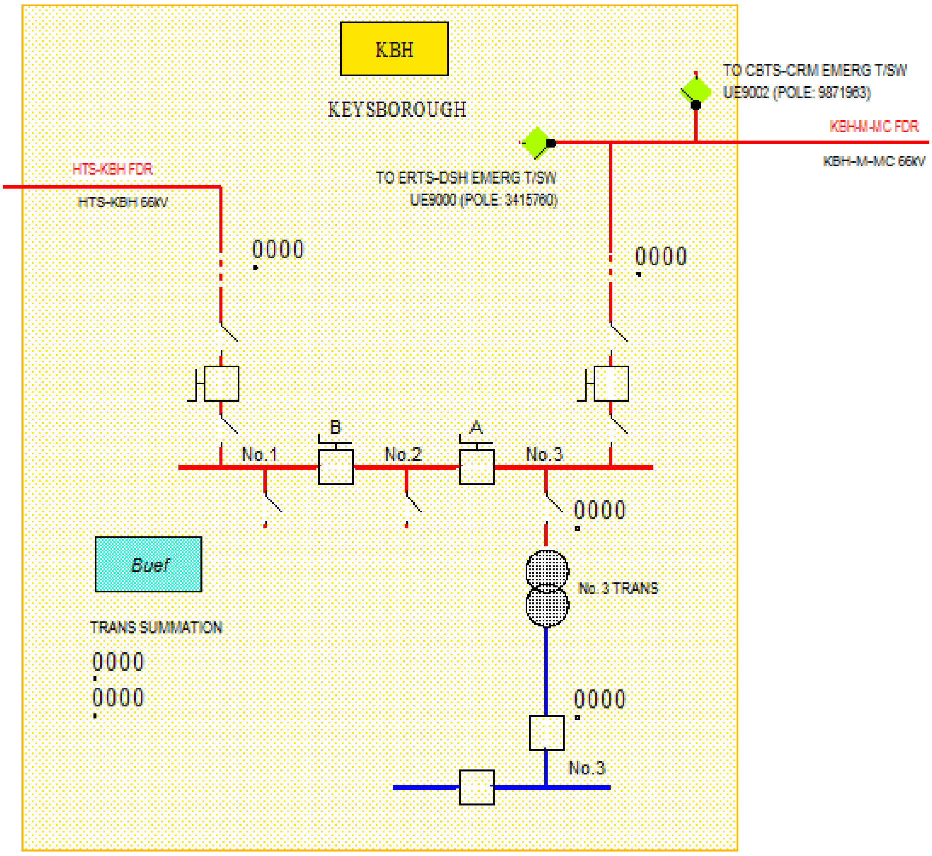
Source: United Energy

2.1 Existing network characteristics

2.1.1 Zone substation

KBH was commissioned in December 2014 as a single 66/22kV 20/33MVA transformer zone substation. The zone substation is designed to accommodate up to three transformers, and has the flexibility to host a relocatable transformer in the event of a major transformer outage. A single line diagram of KBH is shown in figure 2.

Figure 2 KBH single line diagram



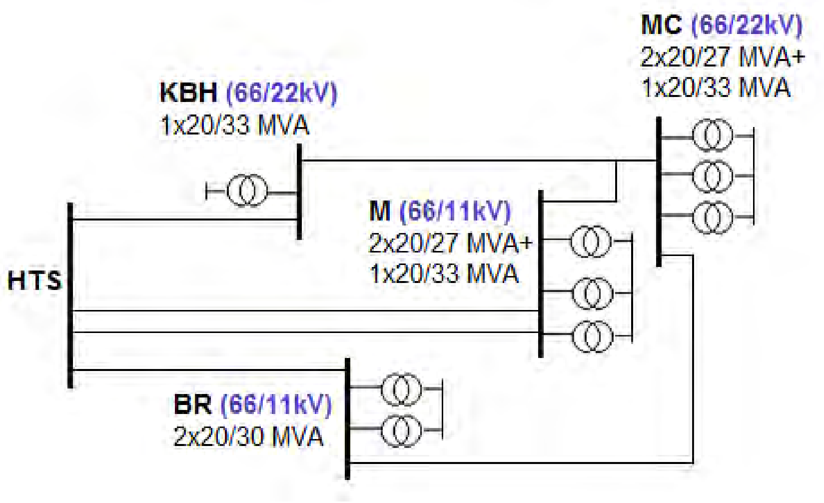
Source: United Energy

There are six adjacent zone substations to KBH geographically. They are Carrum (**CRM**), Dandenong (**DN**), Dandenong South (**DSH**), Dandenong Valley (**DVY**), Lyndale (**LD**) and Noble Park (**NP**) zone substations. However, there is no electrical connectivity (i.e. no distribution tie) between CRM and KBH given the existence of sparsely developed farm lands between the Peninsula Freeway and Pillars Road. The existing distribution network in that area is weak and rural in nature, and does not provide sufficient capacity to create any tie points between KBH and CRM. From a load transfer point of view, DN, DSH and NP are the three adjacent zone substations that can provide material load relief for KBH under emergency outage conditions given the topology of the distribution network and availability of spare capacity in adjacent feeders.

2.1.2 Sub-transmission network

KBH zone substation is connected to Heatherton Terminal Station (**HTS**) in a loop with Beaumaris (**BR**), Mentone (**M**), and Mordialloc (**MC**) zone substations, forming the HTS-BR-KBH-M-MC-HTS sub-transmission loop, as shown in figure 3.

Figure 3 Sub-transmission network around KBH



Source: United Energy

2.1.3 Distribution feeders

KBH zone substation has five 22kV feeders to support the rapid growth in the Keysborough and Dandenong areas. Commissioning of new KBH zone substation in 2014 enhanced the feeder capacities and maintained reliability performance in the area while offloading DSH, MC and NP zone substations. There are no spare circuit breakers available at KBH to establish further feeders for the rapidly developing area.

2.2 Planning approach

We apply a probabilistic approach to planning our zone substation, sub-transmission and primary distribution feeder asset augmentations. This approach involves estimating the probability of an outage occurring within the peak loading season, and weighting the costs of such an occurrence by its probability to assess:

- the expected cost that will be incurred if no action is taken to address an emerging constraint, and therefore
- whether it is economic to augment the network capacity to reduce expected supply interruptions.

The quantity and value of energy at risk is a critical parameter in assessing a prospective network investment or other action in response to an emerging constraint. Probabilistic network planning aims to ensure that an economic balance is struck between:

- the cost of providing additional network capacity to remove constraints
- the cost of having some exposure to loading levels beyond the network's capability.

In other words, recognising that very extreme loading conditions may occur for only a few hours in each year, it may be uneconomic to provide additional capacity to cover the possibility that an outage of an item of network plant may occur under conditions of extreme loading. The probabilistic approach requires expenditure to be justified with reference to the expected benefits of lower unserved energy for customers.

3 Identified need

The identified need is to maintain a reliable supply of electricity to customers in the KBH supply area as the level of energy at risk on the existing infrastructure continues to grow over time. The level of energy at risk is discussed below.

3.1 Forecast demand

KBH is a summer critical zone substation. From inception, KBH showed steady growth, with maximum demand reaching the nameplate rating of the transformer just four years after commissioning. Our current maximum demand forecast indicates an annual average compound growth of 2.7% in the area supplied by KBH up to 2028.

The demand growth in the KBH supply area is primarily due to the following:

- staged development of Somerfield residential estate and other residential sub-divisions in the area
- staged development of The Keys industrial area.

The drivers of electricity maximum demand growth in the KBH area are further discussed in appendix A. This appendix highlights the historical rapid growth in the area and amount of vacant land still available for development.

3.1.1 Zone substation maximum demand

KBH zone substation is a single transformer substation, and as such, it operates above its N-1 rating for 8,760 hours per annum. This risk is currently managed through available distribution feeder transfer capacity, and the readiness to host a relocatable transformer in the event of a major transformer outage.

As shown in figure 4, weather corrected actual demand at KBH zone substation now exceeds its nameplate rating (under 10% probability of exceedance (**PoE**) weather conditions).[1]

[1] PoE refers to weather in any given summer exceeding the specified reference level (or the percentile) based on the last 50 years of historical weather data.

Figure 4 KBH zone substation maximum demand forecast at 10% probability of exceedance (MVA)

Source: United Energy

The drop in actual demand experienced in the 2017–2018 summer was mainly a result of two factors:

- closure of a large plastic manufacturing facility supplied from KBH in September 2017
- the KBH maximum demand occurred at the end of a heatwave and with an early cool change arriving by midday; hence, the contribution of air conditioning load to maximum demand has not reasonably been represented in the observed demand.

Taking into account the weather correction, 2018 demand was identical to that experienced in 2017.[2] Hence, the impact of the closure of the large plastic manufacturing plant was to defer growth by one-year. Further, weather corrected observed maximum demand at our KBH zone substation in summer 2018–2019 was 34.6MVA, which reinforces the return to growth.

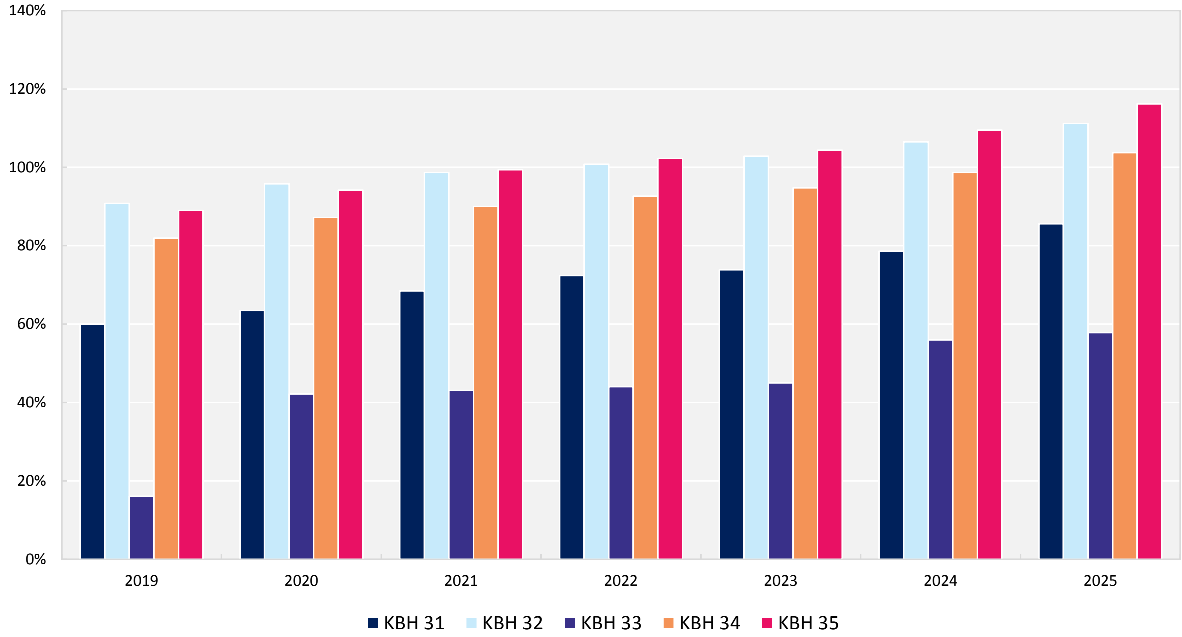
3.1.2 Feeder utilisation

As shown in figure 5, several KBH feeders are forecast to exceed, or become close to exceeding, their respective utilisation ratings in the near term. The ability to manage supply during both system-normal conditions and during emergencies (i.e. loss of a feeder due to unplanned faults) is further limited by the following:

- KBH32 feeder predominantly supplies part of Dandenong CBD. Given the existing topology of the distribution network and high utilisation of most of the feeders that supply Dandenong CBD, any material load relief to KBH32 is unable to be achieved without capital works.
- KBH34 and KBH35 are two adjacent feeders that supply Somerfield residential development and The Keys industrial area. Given the strong growth in these areas, there is limited remaining flexibility in the network for reconfigurations without undertaking substantial augmentation works. These two feeders have already been reconfigured to manage utilisation.

2 Weather correction is a common practice used to ensure maximum demand represents a median weather year.

Figure 5 Feeder utilisation: ratio of maximum load to feeder rating (%)



Source: United Energy

3.2 Energy at risk

Consistent with our probabilistic planning approach, the quantity and value of energy at risk is a critical parameter in assessing a prospective network investment or other action in response to an emerging constraint.

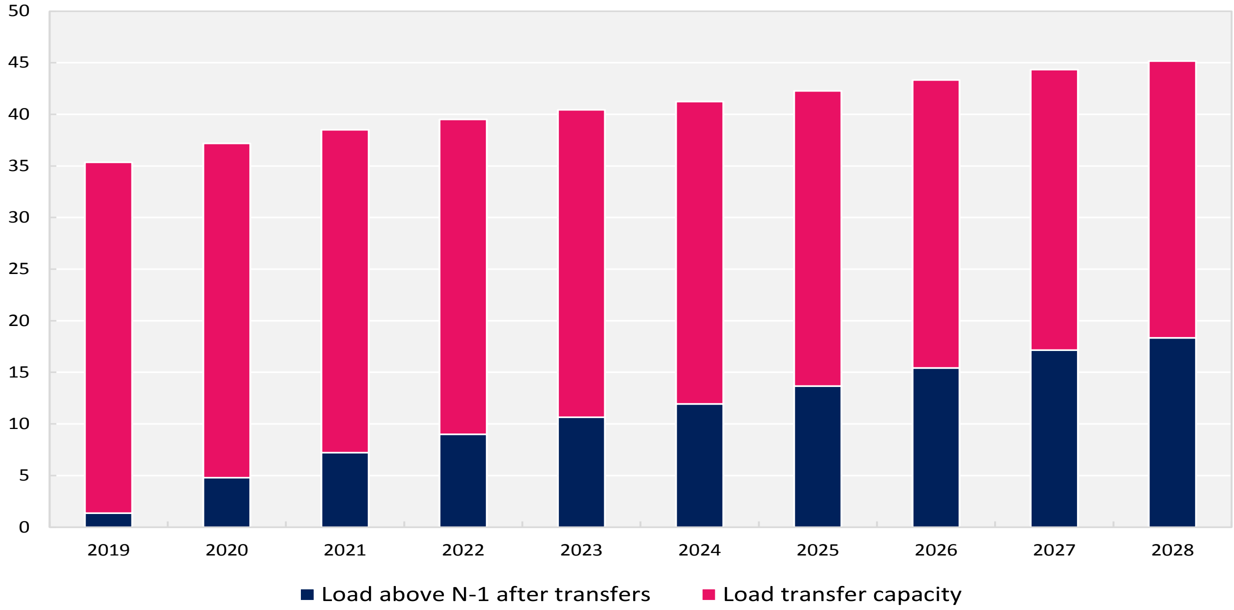
3.2.1 Load transfer capacity

The available load transfer capacity between KBH and surrounding zone substations is assessed to be 34MVA during the 2018–2019 summer (as shown in the attached business case model).[3] With forecast demand growth on the feeders in this area, the available load transfer capability is expected to reduce further. This will leave more customers exposed to the risk of supply interruptions for longer periods of time.

The expected energy at risk following a major outage of the KBH transformer during peak demand conditions is shown in the figure below. After load transfers are established, a shortfall in capacity of approximately 18MVA is forecast in 2028 (or loss of supply for approximately 3,750 customers).

[3] UE MOD 6.07 - KBH supply area - Jan2020 - Public

Figure 6 Load above N-1 after transfers (MVA)



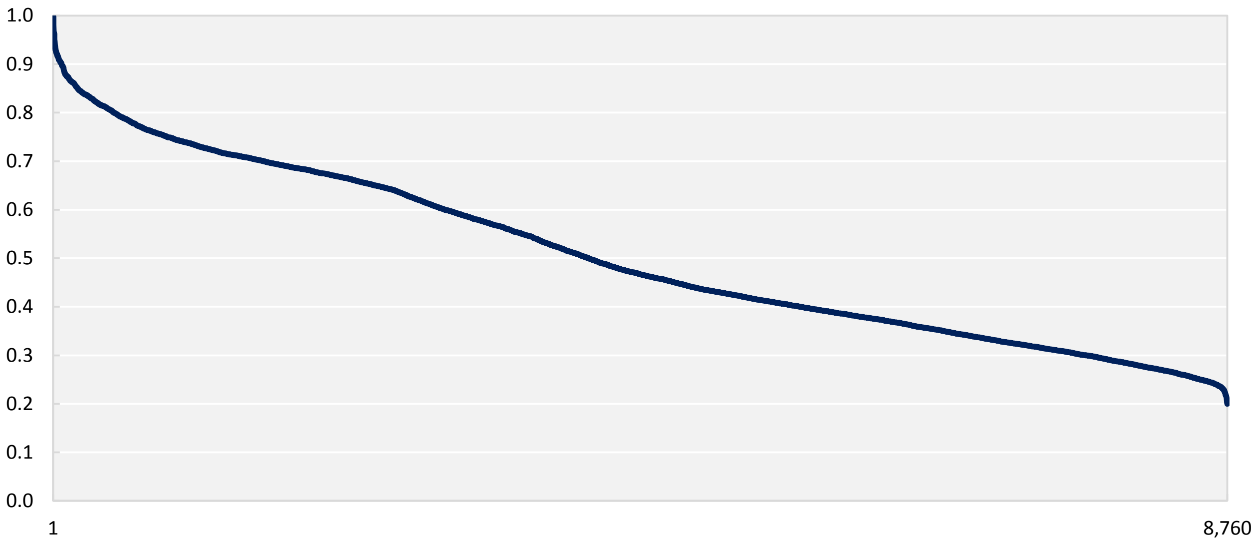
Source: United Energy

3.2.2 Energy at risk after load transfers

Our approach for calculating energy at risk is consistent with the probabilistic approach applied by the Australian Energy Market Operator (**AEMO**) to plan the Victorian shared transmission network.

A load-duration curve, based on historical load data, is used to determine the amount of energy at risk over the N and N-1 ratings each year. The load-duration curve for our KBH zone substation is shown in figure 7figure 7.

Figure 7 Load-duration curve (percentage of maximum demand)



Source: United Energy

The energy at risk is weighted by the probability of an outage to determine the expected unserved energy. The expected unserved energy is estimated using a 30:70 weighting of the 10% PoE and 50% PoE. The expected unserved energy and value of unserved energy (under a 'do-nothing' scenario) is shown in figure 8.

Figure 8 Do-nothing scenario: expected unserved energy (MWh) and value of unserved energy ($'000s)

Source: United Energy

Figure 10 demonstrates that the expected unserved energy levels for the supply area will increase significantly from current levels. This will result in deteriorating reliability of supply for the customers in this area, particularly during hot summer days. This business case demonstrates there is an identified need and an economic case to invest in the area to maintain reliability of supply at current levels.

The amount of energy at risk for a transformer failure at a single transformer station such as KBH is relatively high, as all the connected customers will be off supply until load transfers are established. Whilst the probability of a transformer failure is low, the energy at risk for such an event is high because customers will be affected for an extended period of time (e.g. until the transformer is repaired or replaced, a relocatable transformer is mobilised, or demand decreases to free up additional transfer capacity to adjacent zone substations).[4]

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4 KBH has been prepared to accommodate a relocatable transformer and we presently have two 66/22kV relocatable transformers (one at CDA and one at DSH). Given these relocatable transformers are in service and actually supplying customers (not spare transformers), the relocation is a complex process that needs coordination among several stakeholders. However, it is expected the relocatable transformer can be mobilised and connected at KBH within 48 hours.

4 Options analysis

Several options were considered to address the identified need in the KBH supply area. These options address the identified need to varying extents, and as such, the preferred option is that which maximises the net economic benefits. This assessment of net economic benefits is presented relative to a 'do-nothing' scenario.

As shown in table 2, the preferred network solution is option one—install two new feeders and a second transformer at KBH zone substation.

Table 2 Summary of net economic benefits ($ million, 2019)

	Option	Net economic benefits
Do-nothing	Maintain the status-quo	-
1	KBH second transformer and two new feeders	3.06
2	Permanent load transfer to adjacent zone substations via feeder works	1.94
3	Permanent load transfer followed by KBH second transformer and one new feeder	2.95
4	Improved load transfer followed by KBH second transformer and two new feeders	2.66
5	Non-network solution to defer preferred network option	2.95
6	Power factor correction	N/A

Source: United Energy

The options considered are discussed in further detail below. The analysis supporting our assessment of alternative options, including relevant assumptions, is included in the attached model.[5]

4.1 Assessment of credible options

4.1.1 Do-nothing: maintain the status-quo

Maintaining the status quo—that is, continuing to supply customers serviced by the KBH zone substation without any intervention to manage energy at risk—will lead to significant supply interruptions for a single transformer outage. This option, therefore, fails to address the identified need (as set out in section 3).

4.1.2 Option one: KBH second transformer and two new feeders

This option includes the installation of a second transformer at KBH, as well as two additional feeders to manage feeder utilisation constraints.

The existing KBH zone substation already has 66kV outdoor gas insulated switchgear (**GIS**) which is fully developed to accommodate the ultimate configuration of three 66/22kV transformers. Therefore, no additional 66kV switchgear or bus work is required as part of this option. There is also sufficient space for a second transformer within KBH switchyard and the control room has provision for a second 22kV indoor switchboard.

The scope of works for this option, therefore, includes the following:

- installation of a new 20/33MVA 66/22kV transformer

[5] UE MOD 6.07 - KBH supply area - Jan2020 - Public UE MOD 6.07 - KBH supply area - Jan2020 - Public.

- extension of the 22kV indoor bus with:
  - one 22kV transformer circuit breaker
  - five 22kV feeder circuit breakers
  - one bus-tie circuit breaker
  - one bus riser panel
- installation of second 100kVA 22/0.4kV station service transformer
- installation of 66kV and 22kV connections including connection to the existing neutral earthing resistor
- upgrading of existing protection and control schemes to accommodate the new configuration
- establishing two new feeders and transferring KBH33 feeder to bus #2 including the rearrangement of existing feeders.

A breakdown of the costs for this option is available in our Reset Regulatory Information Notice.[6]

This option addresses the identified need, and maximises the net economic benefits to the market. Therefore, this is our preferred network option. A summary of the market benefits and costs of this option relative to the do-nothing option is summarised in table 3.

Table 3 Option one: benefits assessment summary ($million, 2019)

Option	NPV costs	NPV benefits	Net economic benefits
KBH second transformer with two new feeders	-3.43	6.49	3.06

Source: United Energy

4.1.3 Option two: permanent load transfers to adjacent zone substations via feeder works

This option considers a permanent load transfer from KBH to NP and DSH zone substations. These zone substations are presently operating below their respective N-1 ratings and have some spare capacity to permanently absorb additional load from KBH.[7]

This option requires a new 22kV feeder from DSH along Greens Road to Ordish Road junction so that it can be connected to the existing cable from KBH35. DSH has an outdoor 22kV yard and does not have spare feeder circuit breakers. Therefore, additional 22kV bus works and outdoor switchgear would be required to enable this connection. The rating of the new feeder will be limited by the existing cable section under East Link, but would be sufficient to provide approximately 10MVA load transfer away from KBH. The permanent load transfer would increase the net maximum demand at DSH above its N-1 rating.

The proposed new DSH feeder would also supply The Keys industrial area and address the high feeder utilisation issues of KBH34 and KBH35. However, it would not provide a direct solution to KBH32 (i.e. the other highly utilised feeder in the KBH supply area). Accordingly, additional works would be required to extend KBH33 under East Link to offload KBH32, and to reconfigure the KBH distribution network to manage the feeder utilisation.

6 UE RIN001 - Workbook 1 - Forecast templates - Jan2020 - Public, template 2.3(a).

7 Load transfers to NP would result in KBH34 feeder being under-utilised and sub-optimally configured with minimal flexibility to assist the adjacent feeders. Notwithstanding these limitations, we have still considered this transfer viable for the purpose of this option.

In addition, NP14 can be uprated to 325A (limited by the feeder exit cable) by re-conductoring 1,100 route metres of the existing 6/0.186 7/0.062 ACRS conductor along Corrigan Rd with standard 19/3.25 AAC conductor. By creating a new tie under the Dandenong Bypass along Chapel Road, and installing a new manual gas switch, it is possible to use the spare capacity in NP14 and NP31 to permanently transfer 6MVA load away from KBH. The permanent load transfer would increase the net maximum demand at NP above its N-1 rating.

This option addresses only part of the demand at risk at KBH. Being a single transformer station, all the remaining customers (after the permanent transfers) will still be out-of-supply for a transformer outage until emergency load transfers are established. Therefore, despite a lower capital cost, this option does not maximises net economic benefits to the market.

A summary of the market benefits and costs of this option relative to the do-nothing option is shown in table 4.

Table 4 Option two: benefits assessment summary ($million, 2019)

Option	NPV costs	NPV benefits	Net economic benefits
Permanent load transfer to adjacent zone substations via feeder works	-1.60	3.55	1.94

Source: United Energy

4.1.4 Option three: permanent load transfers followed by KBH second transformer and one new feeder

This option considers permanent load transfers from KBH to DSH zone substation (approximately 10MVA) through a new feeder and internal reconfiguration of KBH33 feeder to temporarily defer the need for a second transformer by two years.

Given the new DSH feeder partially addresses the feeder capacity issues, only one new feeder is envisaged with the KBH second transformer. The estimated deferral benefit, however, is less than the cost of this option.

A summary of the market benefits and costs of this option relative to the do-nothing option is shown in table 5.

Table 5 Option three: benefits assessment summary ($million, 2019)

Option	NPV costs	NPV benefits	Net economic benefits
Permanent load transfer followed by KBH second transformer with one new feeder	-3.37	6.32	2.95

Source: United Energy

4.1.5 Option four: improved load transfer followed by KBH second transformer and two new feeders

Instead of permanent load transfers, another alternative is to improve the existing emergency load transfer capabilities.

At present, three of the NP feeders that participate in emergency load transfers away from KBH are rated to 260A in summer (due to 6/0.186 7/0.062 ACSR conductors in their backbones). Two of those feeders require extensive re-conductoring work to uprate the capacity. However, as discussed in option two, works on NP14 can enable the use of spare capacity on NP14 and NP31, and transfer load away from KBH in the event of a transformer outage.

The net effect of this work is an additional 6MVA load transfer capability away from KBH. This will defer the network option set out in option one by two years. However, the estimated deferral benefit is less than the cost of this alternative option.

A summary of the market benefits and costs of this option relative to the do-nothing option is shown in table 6.

Table 6 Option four: benefits assessment ($million, 2019)

Option	NPV costs	NPV benefits	Net economic benefits
Emergency load transfer followed by KBH second transformer with two new feeders	-3.41	6.07	2.66

Source: United Energy

4.1.6 Option five: non-network solution to defer preferred network option

Being a single transformer station, identifying technically adequate and economically viable non-network support to defer investment at KBH is likely to be difficult (since the entire station load is lost until load transfers can occur). Historically, we have not been able to obtain such solutions for our Langwarrin (**LWN**) and Dromana (**DMA**) second transformer projects (which have similar characteristics to KBH).

In any case, the following analysis considers the ability of a non-network solution to defer the preferred network option, assuming that a non-network solution could reduce the risk by supply load in the period until load transfers occur. For this assessment, we have estimated the cost of a non-network solution that would result in the energy at risk remaining at the same level as that forecast in the year immediately prior to the commissioning date of the preferred solution.

We have based the cost of a non-network solution on a benchmark rate of $87,000 per MW per annum. This rate is based on our recently implemented non-network solutions, and is supported by comparative analysis of other distributors experience provided by CutlerMerz.[8]

The estimated non-network support requirements are summarised in table 7. For example, a 1.6MW non-network solution would bring the station load at risk back to the previous year's level and defer by one year the need for two feeders and second transformer. The magnitude of the non-network support required to maintain this energy at risk level increases over time.

Table 7 Non-network support requirements (MW)

Year	2021	2022	2023	2024	2025
Demand at risk after load transfers	6.5	8.3	9.9	11.1	12.8
Non-network support	-	-	1.6	2.8	4.5

Source: United Energy

Based on the above, the full costs of a demand management solution is equal to the required network support multiplied by the benchmark rate, plus the annual costs of any residual unserved energy. In this case the net economic benefits of the demand management option are not as great as the preferred option, due in part to the lower residual unserved energy in the preferred option.

A summary of the market benefits and costs of this option relative to the do-nothing option is shown in table 8.

8 Attachment UE ATT102 - CulterMerz - Review of demand management - Feb2019 - Public, CutlerMerz, Review of demand management unit rates, February 2019.

Table 8 Option five: benefits assessment summary ($million, 2019)

Option	NPV costs	NPV benefits	Net economic benefits
Non-network solution to defer preferred network option	-3.29	6.24	2.95

Source: United Energy

This analysis shows that the non-network solution fails to economically defer the project. Irrespective of this high-level assessment, this project will be subject to assessment as required under the RIT-D. We will initiate consultation well before the economic timing of the preferred network option to maximise the chance of a viable non-network solution being identified.

4.1.7 Option six: power factor correction

Installing capacitor banks may be used to reduce reactive power, and as such, can sometimes be a cheaper alternative to defer augmentation. However, the operating power factor at KBH is close to unity during peak load, and as such, there is no requirement for any further reactive power compensation at present.

We expect the operating power factor will deteriorate slightly over time, and we will continue our practice of correcting the power factor at feeder levels to the extent it is technically and economically viable. Even with the expected deterioration of power factor over time, this option is only expected to provide marginal benefits. Therefore, the economics of this option have not been explored further.

4.2 Sensitivity analysis

A detailed sensitivity assessment was performed to assess the impact on the ranking of the options from varying the demand forecast, assumed discount rates, and the capital and operating expenditure forecasts. Two opposing scenarios were applied (equal to ±4% for demand forecasts, and ±10% for other variables), reflecting best and worst case scenarios.[9]

The results found the ranking of the preferred network option remains unchanged in either sensitivity scenario.

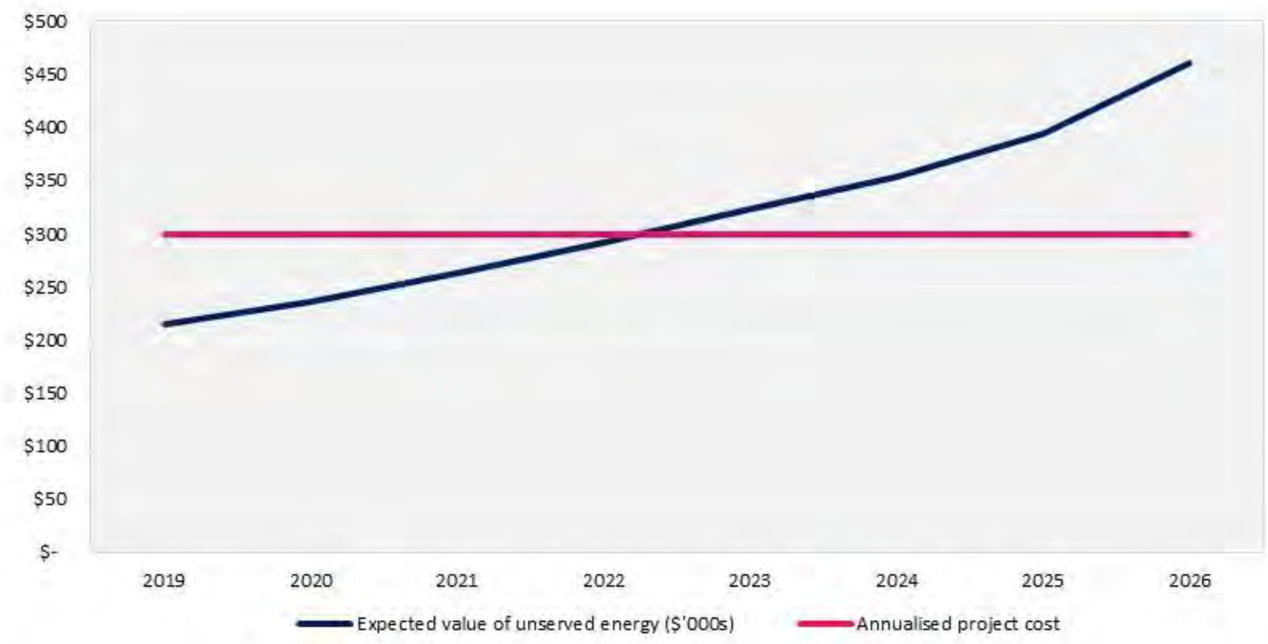
[9] The sensitivity variance for demand forecasts (±4%) is consistent with the difference in growth between NIEIR's base, high and low forecast scenarios.

5 Recommendation

The preferred network option, as set out in section 4, is to install two new feeders and a second transformer at KBH. The required changes to the KBH zone substation and distribution feeder network are shown in appendix B.

A detailed economic assessment was also performed to evaluate the optimum timing of the preferred network option. As shown in figure 9, the net market benefits of the preferred option exceeds the annualised costs of the two new feeders and a second transformer in 2023. This demonstrates that the optimal timing for commissioning the two new feeders and a second transformer is 2022.

Figure 9 Timing of preferred option ($'000s, 2019)



Source: United Energy

The forecast capital and operating expenditure requirements for the 2021–2026 regulatory period are outlined in table 9. These forecasts have been developed in calendar year terms, and converted to financial years in our consolidated expenditure modelling following changes to our reporting period (as required by the Victorian Government and the Australian Energy Regulator).

Table 9 Expenditure forecasts for preferred option ($ million, 2019)

Expenditure forecast	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Capital expenditure	4.34	2.12	-	-	-	6.46
Operating expenditure	-	0.03	0.06	0.06	0.06	0.22
Total	**4.34**	**2.15**	**0.06**	**0.06**	**0.06**	**6.68**

Source: United Energy
Note: Numbers may not add due to rounding

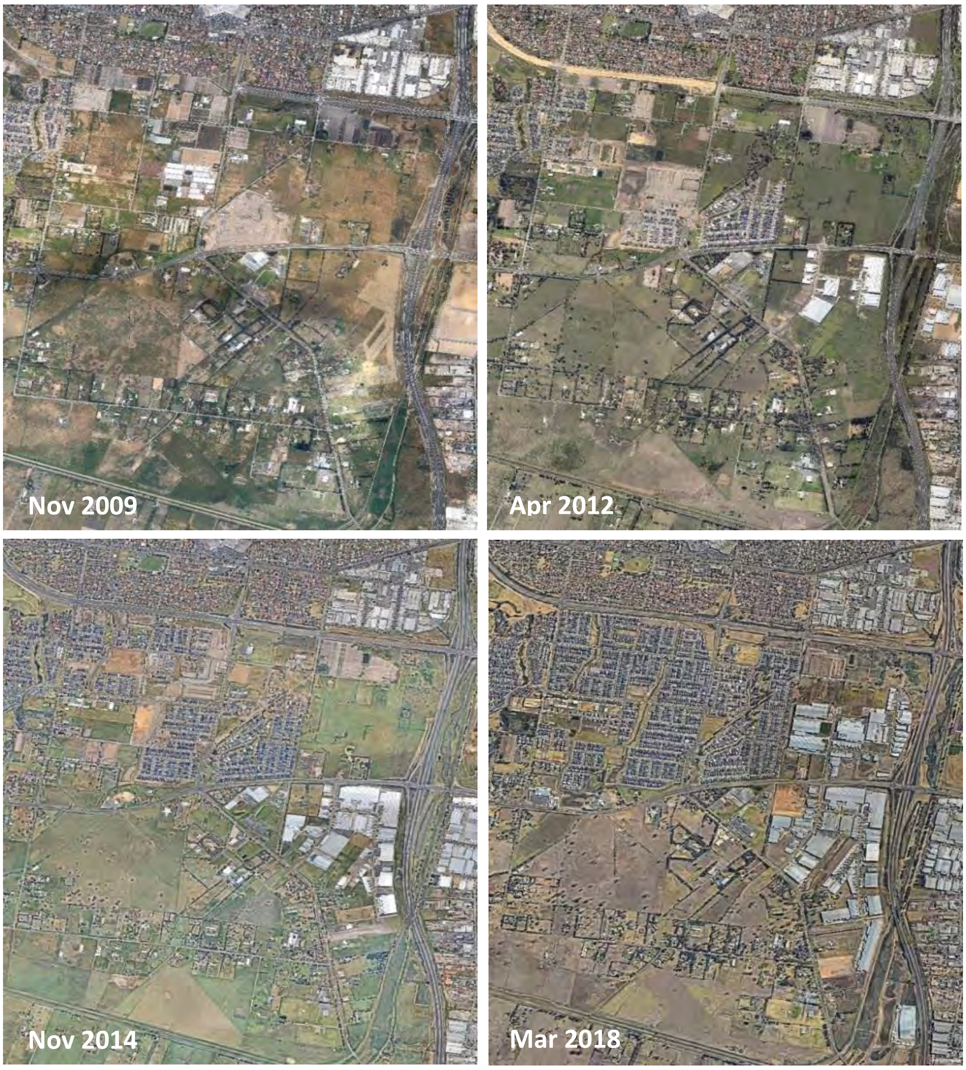
A KBH area demand growth

Somerfield, which is supplied from KBH, is currently the largest residential development in our supply area. It includes approximately 2,000 houses.

With the massive success of Somerfield development, adjacent properties east of Chandler Road have now been subdivided for residential use. Further, the area demarcated by East Link, Bend Road, Greens Road and Perry Road has been categorised as an industrial zone, called The Keys. A substantial amount of this industrial pocket has already been developed and businesses have started to move into this area.

These growth activities in the KBH supply area have not shown any signs of slowing down and are expected to continue until the entire area is built up. The steady growth in the area from 2009 is shown in figure 10.

Figure 10 KBH area growth: 2009–2018



Source: Google Maps

A list of the contestable projects commissioned in 2018, or under construction, is also shown in table 10. For greenfield developments, capacity is installed ahead of the load materialising. When new businesses move in and residences are built in new subdivisions, we see the increase in demand. That means within the next few years approximately 6MVA of new load will gradually be connected through those contestable works.

Table 10 Contestable projects under construction

Project name	Expected completion	Estimate load (kVA)
KBH, 21-31 Bend Rd - Stg 2	01/01/2018	120
KBH, 21-31 Bend Rd - Stg 1	01/01/2018	120
Keysborough Somerfield St 29B	01/01/2018	40
Keysborough, Somerfield Estate - Stg. 47	01/02/2018	120
KBH, 16-22 Bend Rd - URD	01/03/2018	150
KBH, Industrial Estate - Stage 7	01/03/2018	1,800
Keysborough, Somerfield Estate Stage 38A	01/04/2018	80
KBH, 283-293 Perry Rd - Stage 3	01/05/2018	520
Keysborough, 140 Chapel Rd - URD	01/05/2018	90
KBH, 175 Chapel Rd URD - Stg 2	01/05/2018	80
KBH, Industrial Estate - Stg. 8	01/05/2018	500
KBH, 42 Homeleigh Rd - URD	01/05/2018	40
Keysborough, 241 Perry Rd - Industrial Estate	01/07/2018	600
KBH, Somerfield Estate, Stg. 44B1	01/07/2018	40
Keysborough, Somerfield Estate - Stage 42	01/08/2018	120
Keysborough 283-293 Perry Rd Subdiv	01/08/2018	80
KBH, 295-321 Perry Rd - S/Div	01/08/2018	250
Keysborough, 175 Chapel Rd S/Div	01/09/2018	120
Keys 5 Newson St URD	01/09/2018	80
KBH, 66 Stanleys Rd - URD	01/09/2018	180
KBH, 313 Greens Rd - Inc Supply	01/10/2018	300
KBH, Lot 85 Indian Dr - Inc Supply	01/11/2018	300
KBH, 21-31 Bend Rd - Stg 4	01/02/2019	120
KBH, 21-31 Bend Rd - Stg 3	01/02/2019	120

Source: United Energy

In addition to the contestable works above, new connection applications for installing additional capacity in the KBH supply area are presented in table 11. Similar to contestable projects, the demand at these new connections has not yet fully materialised and new loads are expected to be connected progressively as the sites are occupied over time.

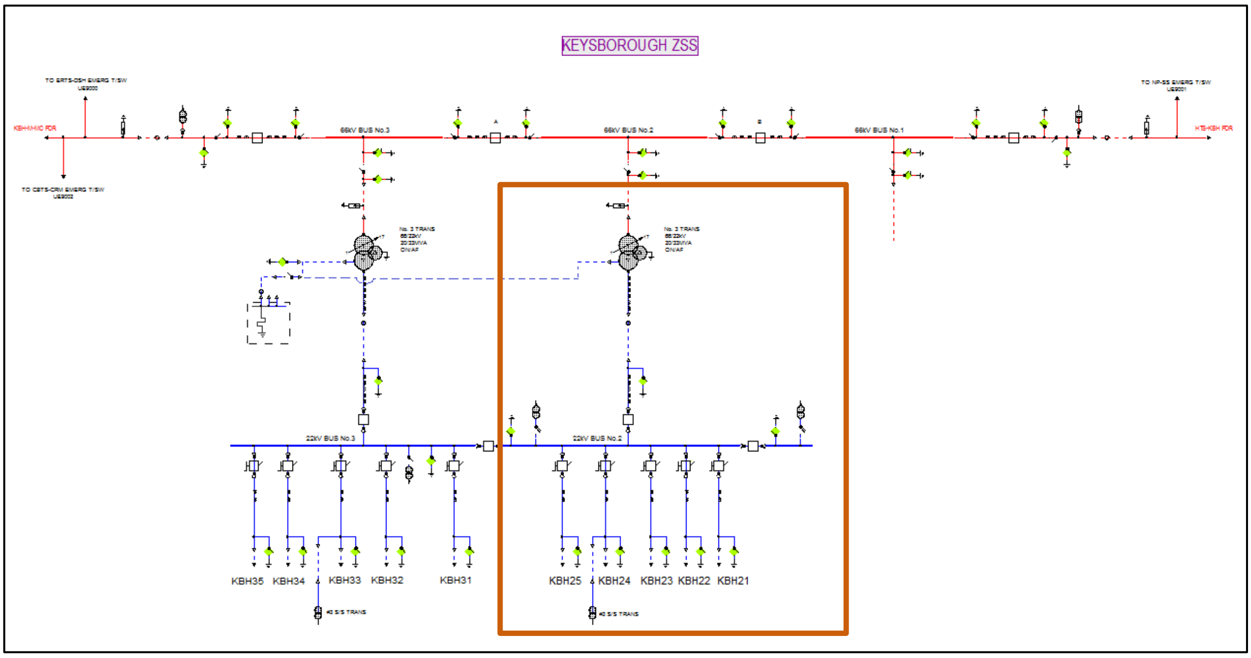
Table 11 New connection applications (kVA)

Connection application	2017	2018
Substation capacity	3,130	3,445
Estimated load	2,460	2,993

Source: United Energy

B Design of preferred option

Figure 11 Proposed KBH zone substation arrangement

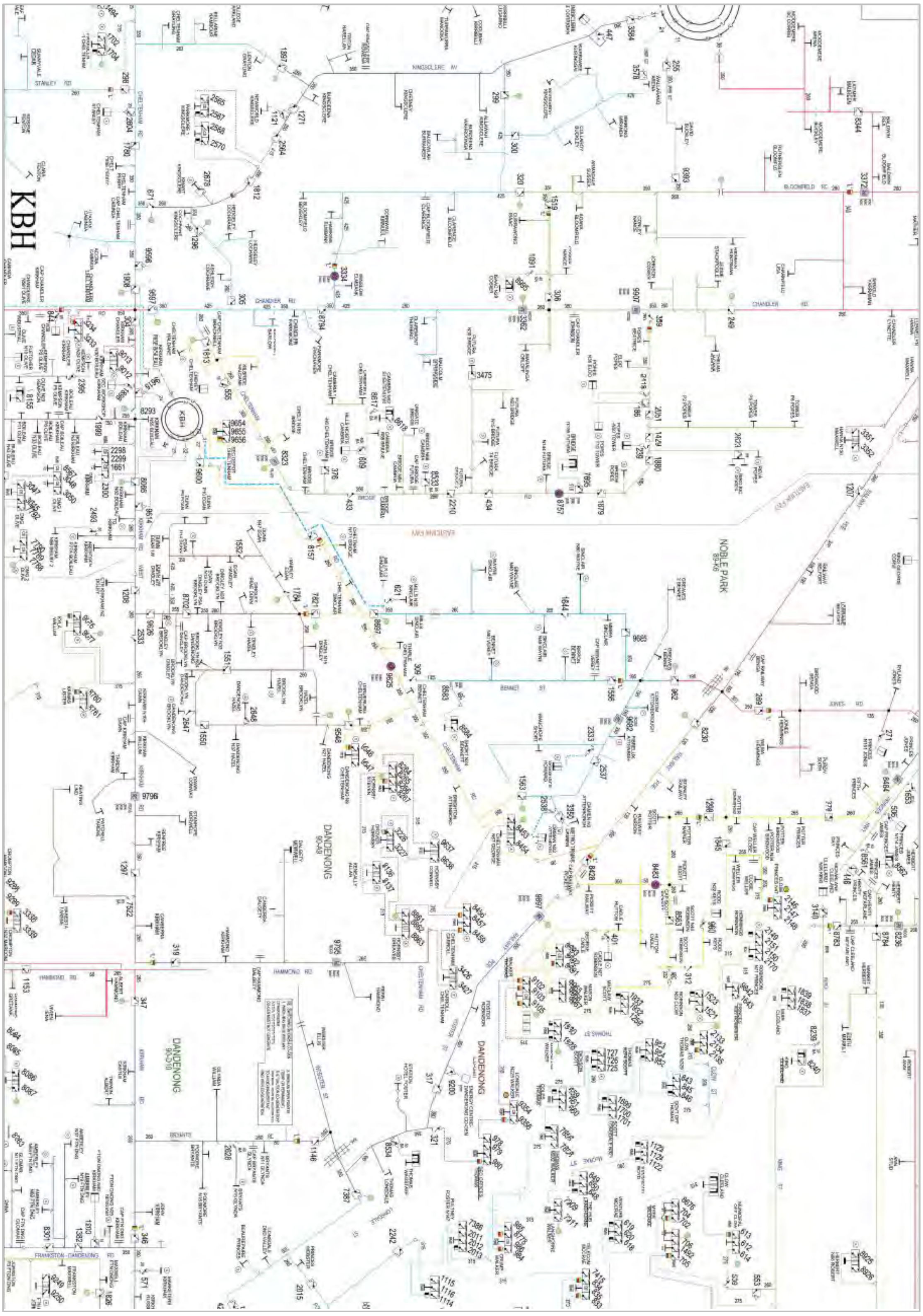


Source: United Energy

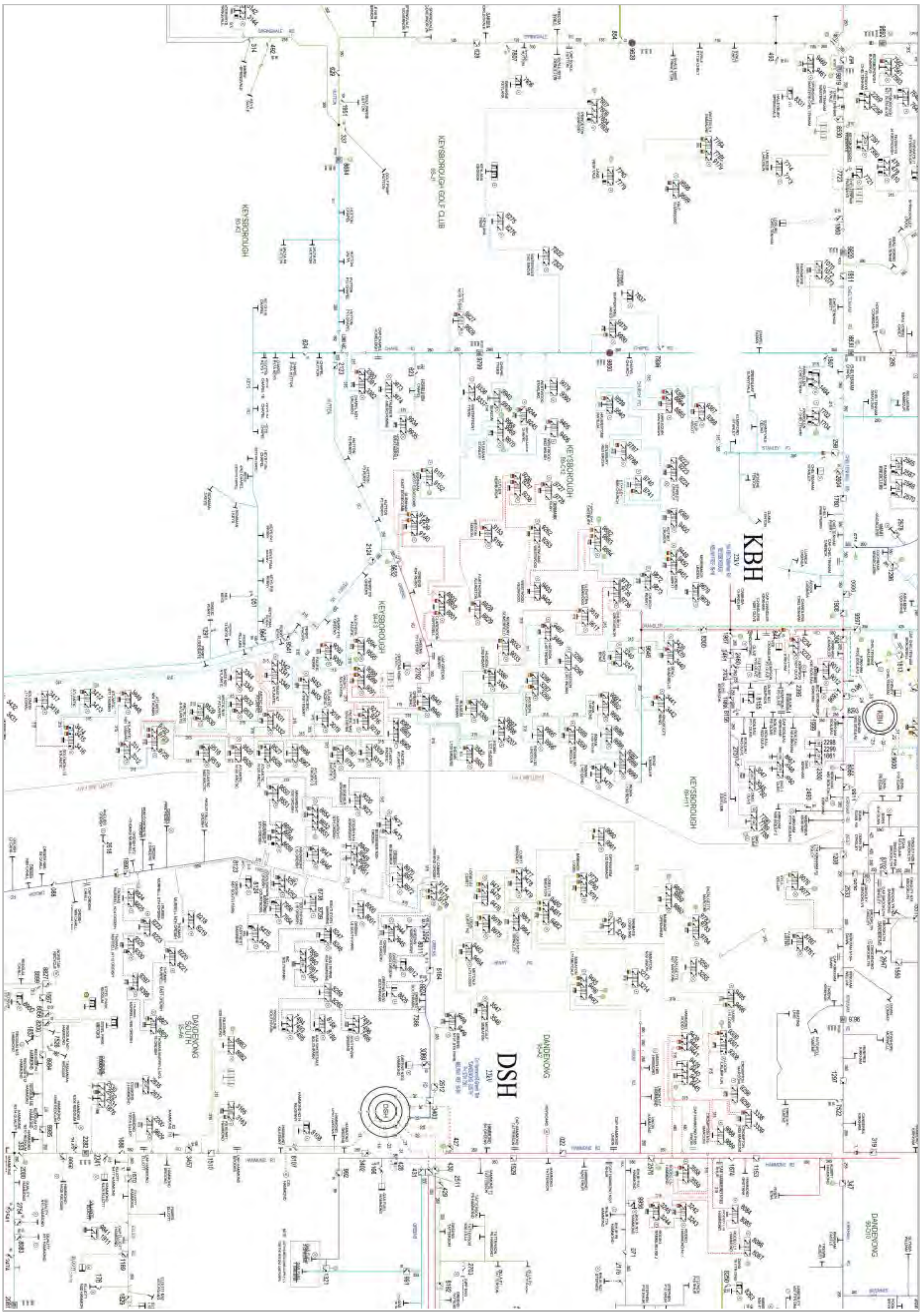
Figure 12 Proposed location for KBH second transformer (shown in pink shaded area)

Source: United Energy

Figure 13 Proposed KBH distribution network after the project



Source: United Energy



Source: United Energy