Reliable Provision of Electricity to the Kilkivan Supply Area

Draft Project Assessment Report

Publication Date: 06 September 2019

Consultation Period Starts: 06 September 2019

Consultation Period Closes: 3pm 18 October 2019

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1. Executive Summary

Ergon Energy Corporation Limited (Ergon Energy) has determined that there is not a non-network option that is a potential credible option, or that forms a significant part of a potential credible option to address the identified need at the Kilkivan bulk supply substation. Accordingly, Ergon Energy has published a Notice of No Non-Network Options under clause 5.17.4(d) of the NER on 05/09/2019.

This Draft Project Assessment Report (DPAR) has been prepared by Ergon Energy in accordance with the requirements of clause 5.17.4(i) of the National Electricity Rules (NER) as the next step of the RIT-D process.

This report includes information relating to the following matters:

- A description of the identified need Ergon Energy is investing in;
- The assumptions used in identifying the need;
- A description of each credible option assessed by Ergon Energy and their;
    - applicable cost, including breakdown of operating and capital expenditure;
- a detailed description of the methodologies used in quantifying each class of cost
- results of a net present value analysis of each credible option and supporting explanatory statements;
- identification of Ergon Energy's proposed preferred option, including:
    - details of the technical characteristics;
    - the estimated construction timetable and commissioning date;
    - indicative capital and operating cost;
    - a statement of accompanying detailed analysis that the proposed preferred option satisfies the RIT-D.

Under its Distribution Authority (DA) Ergon Energy is responsible for electricity supply to the Kilkivan area in Southern Queensland. The DA requires that Ergon Energy must:

- comply with the Guaranteed Service Levels regime notified by the Queensland Regulator which includes reliability of supply to customers;
- plan and develop its supply network in accordance with good electricity industry practice, having regard to the value that end users of electricity place on the quality and reliability of electricity services;
- use all reasonable endeavours to ensure that it does not exceed in a financial year the Minimum Service Standards (System Average Interruption Duration Index and System Average Interruption Frequency Index limits) applicable to its feeder types; and
- ensure, to the extent reasonably practicable, that it achieves its Safety Net targets.

Kilkivan 132/66kV (T12) bulk supply substation (KILK) is an Ergon Energy site with outdoor 132kV and 66kV assets. KILK substation was constructed in 1969 and supplies approximately 9000 customers at a peak load (indirectly) of approximately 18MVA in the normal network state. KILK substation is an integral node within the South Burnett sub transmission (66kV) network linking to six zone substations. There is minimal forecast load growth at the substation however many assets are approaching or at the end of service life, with some equipment greater than 55 years old. The nearby Kilkivan Town 66/11kV zone substation (KITO) was constructed in the 1950s and has a number of assets in very poor condition, approaching or at the end of service life. The continued operation of these aging assets at KILK and KITO is expensive and uneconomical, and poses a significant challenge in maintaining a reliable supply to the distribution area.

The primary objective of this RIT-D is to identify alternative cost-effective, reliable solutions for providing electricity to the consumers in the KILK and KITO supply areas. The key drivers requiring Ergon Energy to make further investments in the KILK and KITO supply areas are the reliability of assets that are at the end of their life, environmental risk and compliance with safety and current standards. In identifying the most cost effective solution, Ergon Energy must continue to meet its legal and regulatory requirements including the customer service standards (most notably the security and reliability of supply requirements of its DA listed above).

Ergon Energy is confident that no non-network option exists that is technically or economically viable to remove the need for replacing the aged assets at KILK substation within the required timeframe to ensure the safe, reliable and efficient supply of electricity to the customers in the Burnett region. Consequently, a Non-Network Options Report has not been prepared in accordance with rule 5.17.4(c) of the NER and a notice was published on 05/09/2019.

This is a Draft Project Assessment Report, where Ergon Energy provides both technical and economic information about possible solutions. Ergon Energy's preferred solution is Option A: Full substation rebuild of Kilkivan Substation (KILK) on the area adjacent to the existing substation site.

This option also removes the need to make further network investment in the Kilkivan Town (KITO) zone substation by decommissioning it and consolidating the supply to the township from the proposed new KILK substation. The aged assets at KITO zone substation are proposed to be recovered and disposed.

2. Submissions and Next Steps

Ergon Energy invites written submissions on this report from registered participants and interested parties. Ergon Energy will not be legally bound in any way or otherwise obligated to any person who may receive this RIT-D report or to any person who may submit a proposal. At no time will Ergon Energy be liable for any costs incurred by a proponent in the assessment of this RIT-D report, any site visits, obtainment of further information from Ergon Energy or the preparation by a proponent of a proposal to address the identified need specified in this RIT-D report.
All submissions and queries should be lodged to Ergon Energy's "Regulatory Investment Test for Distribution (RIT-D) Partner Portal". Submissions in writing are due by **3pm 18 October 2019**.

Following Ergon Energy's consideration of the submissions, the preferred option, and a summary of and commentary on any submissions received in response to this report, will be included as part of the Final Project Assessment Report. The Final Project Assessment Report represents the final stage of the consultation process in relation to the application of the RIT-D.
Ergon Energy intends to publish the Final Project Assessment Report no later than 31 October 2019.

Ergon Energy will use its reasonable endeavours to publish the Final Project Assessment Report by the above date. This may however not be achievable due to changing power system conditions or other circumstances beyond the control of Ergon Energy.

For further information please refer to the "Regulatory Investment Test for Distribution (RIT-D) Partner Portal".

https://www.ergon.com.au/network/network-management/network-infrastructure/regulatory-test-consultations

Inquiries about this RIT-D may be sent to:

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3. Maintaining Reliability of Supply within the Kilkivan Area

KILK substation is located in the Wide Bay-Burnett area of the Southern Region of Ergon Energy's Network. It provides a 66kV network injection point, supplying the zone substations of Woolooga (WOOL), Kilkivan Town (KITO), Murgon (MURG) and Proston (PROT).

KILK was constructed in 1969 and is now aged to a point where the continued operation of these assets is expensive and uneconomical, and poses a significant challenge in maintaining a reliable supply to the distribution area. A complete substation replacement is more prudent than ongoing reactive investments in assets that are at end of serviceable life. The substation standards and network protection standards to which these substations were designed are also antiquated, and cannot be maintained in their current form when significant plant replacements are carried out. A ROAMES overhead view of the Kilkivan Substation is seen below (Figure 1).

A substation condition assessment was completed on KILK in early 2018 with a Substation Condition Assessment Report (SCAR) published in July 2018. The report listed a number of assets that are identified as beyond their serviceable life and require replacement if reliable and safe supply for the area is to be maintained.

The nearby KITO 66/11kV zone substation was constructed in the 1950s and has a number of assets in very poor condition. The condition of the aging assets is causing a similar reliability and safety issues at KITO substation. Opportunity now exists to retire KITO and consolidate supply into one Kilkivan substation.

The NER requires that any investment in network assets and associated infrastructure is subject to a RIT-D, provided that it has credible options costing greater than $6 million and is not exempted from RIT-D. This DPAR has been prepared by Ergon Energy in accordance with the requirements of clause 5.17.4(i) of the NER and summarises Ergon Energy's determination that no non-network option is, or forms a significant part of, any potential credible option to address the identified need. In particular, it sets out the reasons for Ergon Energy's determination, including the methodologies and assumptions used.

Figure 1: ROAMES image of Kilkivan Substation

4. Network Characteristics

4.1. Geographic Region

The geographic region covered by this RIT-D is Kilkivan Bulk Supply Substation (KILK) and connected zone substations. KILK is an Ergon Energy substation with outdoor 132kV and 66kV assets, which supplies approximately 9000 customers. KILK substation is geographically and electrically centred between Tarong and Maryborough.

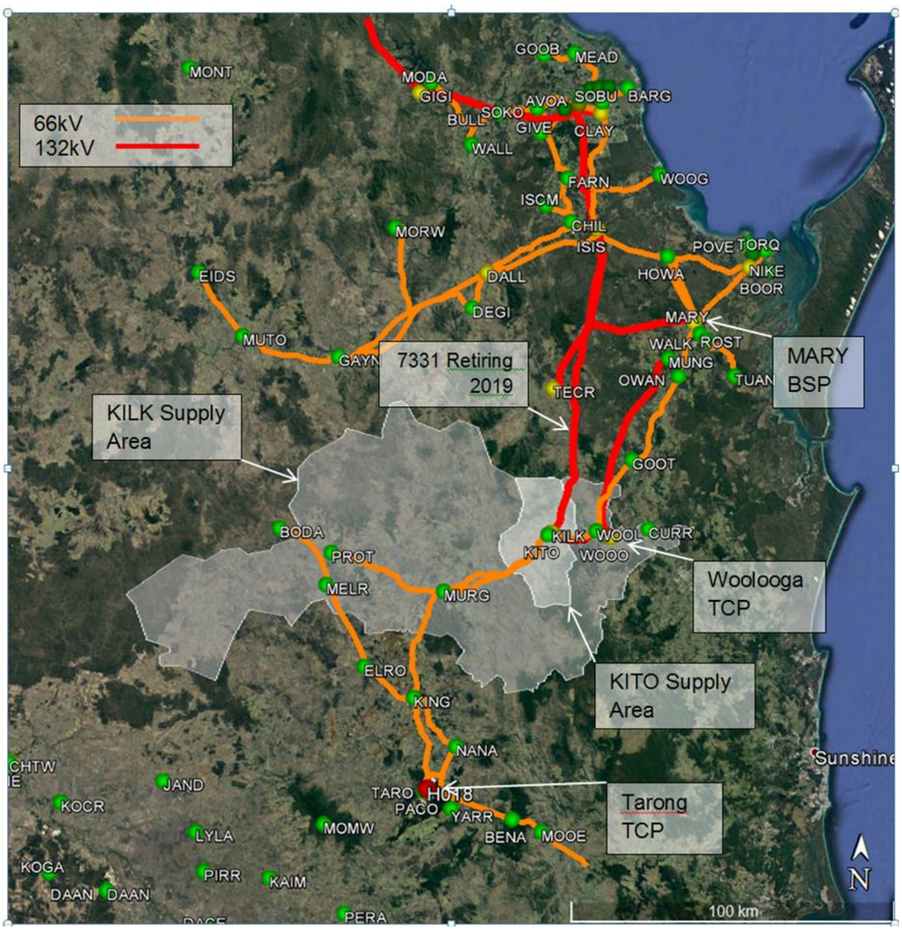

Figure 2: Kilkivan Geographic Sub transmission Network

Kilkivan Town Substation (KITO) supplies the Kilkivan township and surrounding rural area at 11kV. This zone substation has 66kV and 11kV assets and provides electricity to 692 residential and small industrial customers.

4.2. Existing Supply System

KILK is supplied from Powerlink's H005 Woolooga 275/132kV substation via two 132kV feeders 764 and 765. A third 132kV feeder 7331 extends from Aramara 132kV Switching Station (ARAM) to KILK substation. Feeder 7331 is left open at KILK to avoid Ergon Energy's 132kV network being operated in parallel with Powerlink's 275kV network between Woolooga and Teebar Creek Substations.

KITO, MURG, PROT and WOOL zone substations are supplied from KILK via three 66kV feeders (M008, M009, M011). Figure 3 shows the system diagram of the sub-transmission network surrounding KILK substation.

KILK also provides transfer capability from Maryborough 132/66kV substation (MARY), as it is able to supply Owanyilla substation and Gootchie substation in network contingency and maintenance scenarios.

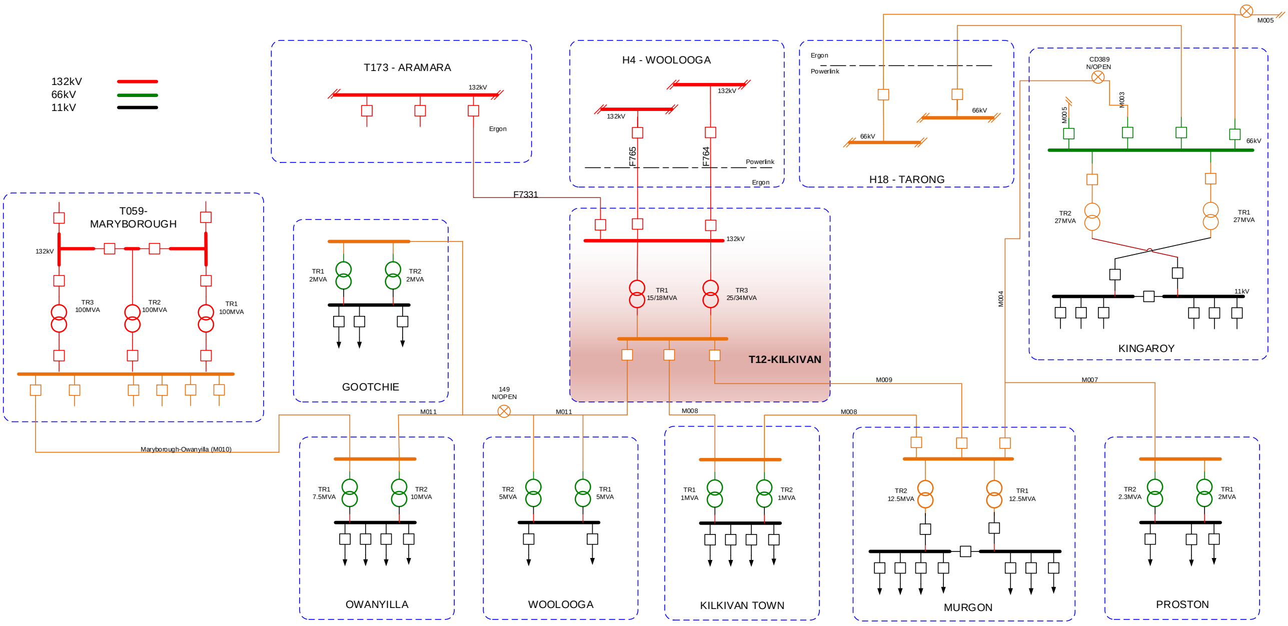

Figure 3: Kilkivan Schematic Sub-transmission Network

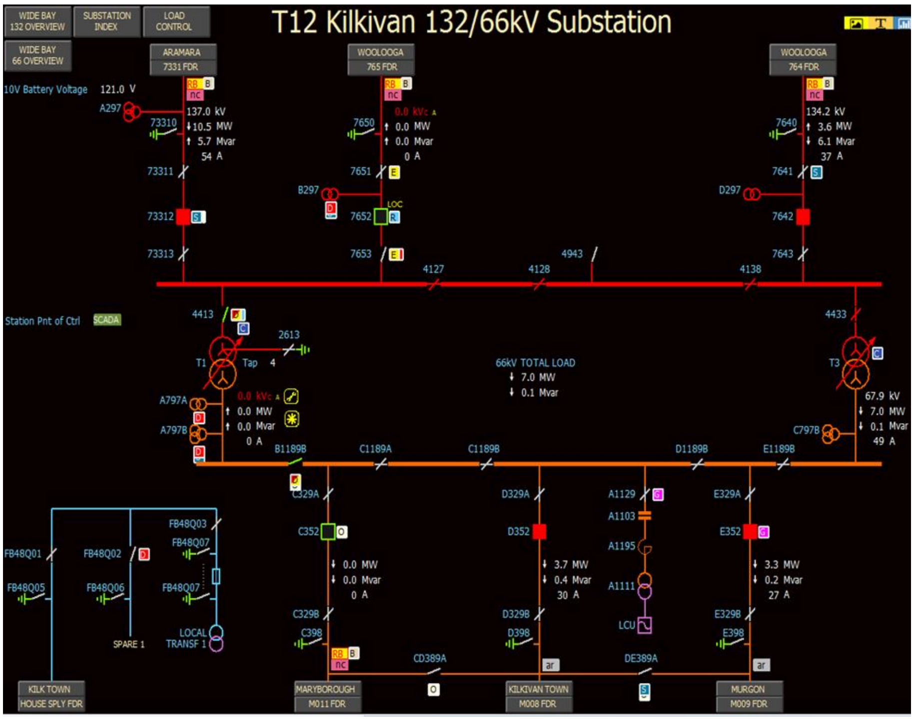

Figure 4: Kilkivan substation (KILK) SCADA Overview

4.3. Loading - Historical and Forecast

Figure 5 shows the individual and summed zone substation loads that are normally supplied from KILK, which indicates no appreciable reduction in underlying customer load. Figure 6 shows 10POE forecast peak load of KILK for the next 10 years.

Note that in the normal network state the peak loading is approximately 20MVA. The history and subsequent forecast does not reflect this due to Woolooga 66/11kV substation (WOOL) load being shifted off KILK onto MARY because of poor reliability of the 66kV circuit breaker C352 at KILK.

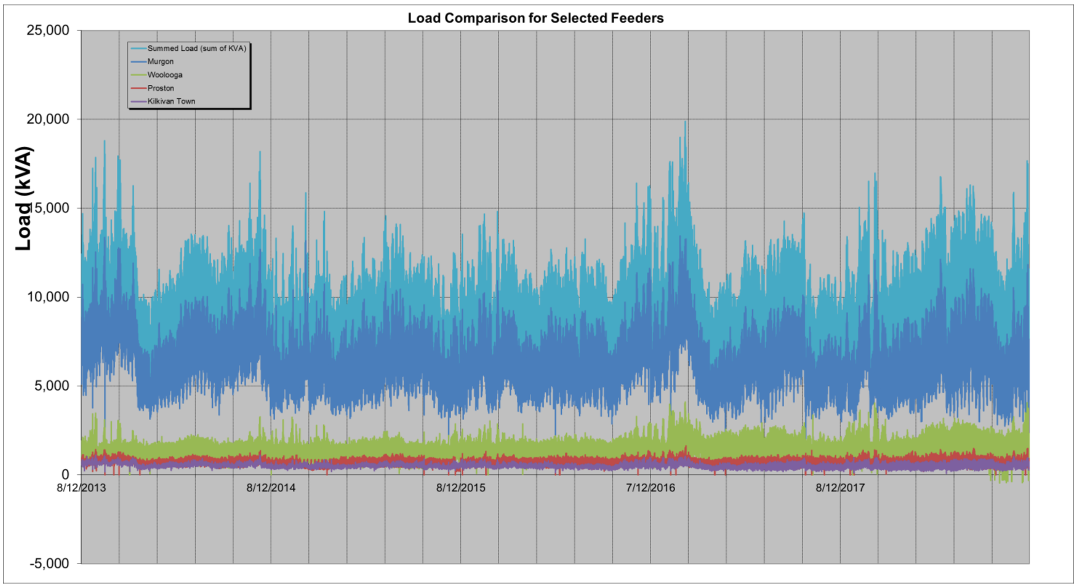

Figure 5: Kilkivan Load History

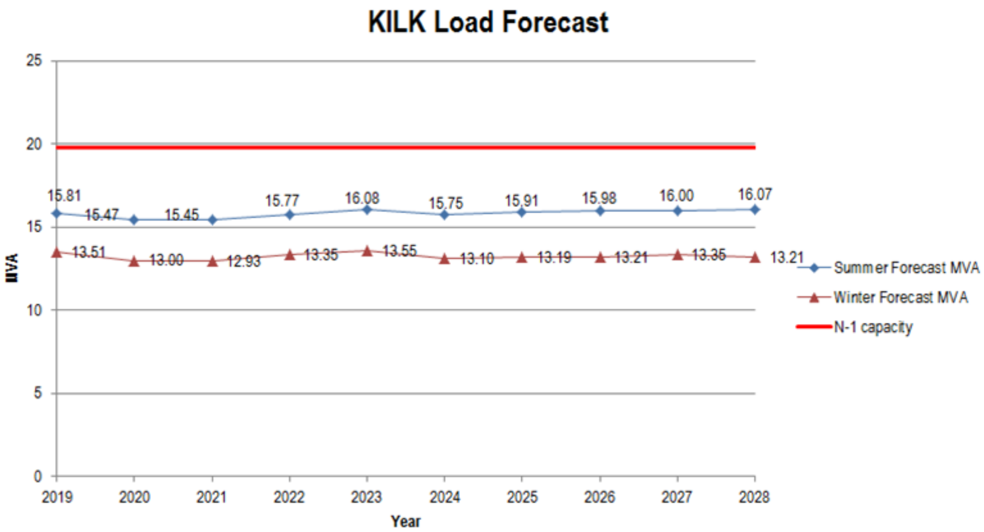

Figure 6: Kilkivan Load Forecast (WOOL supplied from MARY)

4.4. Network Limitations

4.4.1. Substation Limitations

KILK is equipped with two 132/66kV transformers. T1 is a 15/18MVA transformer and T3 is a 20/34MVA transformer (limited to 25MVA by the 66kV bushing CTs). T1 and T3 are not able to be run in parallel due to misaligned tapping ratios. If necessary, T1 and T3 can be run simultaneously with an open 66kV bus such that T1 supplies up to 19.8MVA towards Maryborough and T3 supplies up to 25 MVA towards Murgon.

Substation N Capacity (closed 66kV bus)	25MVA
Substation N Capacity (split 66kV bus)	44.8MVA
Substation N-1 Capacity	19.8MVA

4.4.2. Sub-transmission Network Limitations

The existing network has sufficient capacity to supply the nominated 66kV loads of Proston, Murgon, Woolooga and Owanyilla. Murgon is the most significant load centre with peak loading of 12MVA. KILK also provides transfer capability from MARY, as it is able to supply Owanyilla and Gootchie in network contingency and maintenance scenarios.

Retirement of KILK is not feasible as there would be insufficient capacity in the remaining network to supply loads between Kingaroy (KING) and Maryborough (MARY). Without the 66kV injection at KILK, it is not feasible to supply Kilkivan Town, Murgon & Proston from Tarong through 6/1/.186+7/.062 ACSR/GZ (Dog) designed at 50^{o}C due to thermal capacity constraints and voltage limitations. Similarly for a supply from Maryborough, the 7/.104 HDBC designed at 50^{o}C would experience thermal capacity constraints and voltage limitations.

4.4.3. Distribution Network Limitations

Kilkivan Substation is a 132/66kV bulk supply point therefore distribution network limitations are not applicable.

4.5. Substation Condition

A substation condition assessment report (SCAR) completed in 2018 listed a number of assets at Kilkivan that are identified as past their serviceable life and require replacement. Based on a Condition Based Risk Management (CBRM) analysis of the effect of current condition and ageing on the expected life of the asset, the following have been deemed to reach retirement age as follows:

Kilkivan T012 Assets recommended for replacement within 5 years			
Bay Description	**Asset Type**	**Asset IDs (refer to SLD in appendices B&C)**	**Estimated Asset Retirement Year**
132kV Feeder bay 764 (Woolooga-Kilkivan No. 1)	VT	VT D297 (all phases)	2020
	CT	CT D296 (all phases)	2020
	CB	CB7642	2022
132kV Feeder bay 765 (Woolooga-Kilkivan No. 2, currently out of service)	All failed assets (An RTS project already exists)	ISO 7650, CB 7652 VT B297 (all phases) CT B296 (all phases)	2018

66kV Feeder bay M011 (Maryborough-Kilkivan)	ISO/ES	Line ISO/ES C329B/C398	2020
	CB	CB C352	2020
	CT	CT C396A (all phases)	2022
66kV Feeder bay M008 (Kilkivan-Murgon No.1)	ISO/ES	Line ISO/ES D329B/D398	2022
	CB	CB D352	2020
	CT	CT D396A (all phases)	2020
66kV Feeder bay M009 (Kilkivan-Murgon No. 2)	ISO/ES	Line ISO/ES E329B/E398	2022
	CB	CB E352	2020
	CT	CT E396A (all phases)	2020
	Protection relays/schemes & panel	All CDG and similar vintage protection relays	2023 to advance UFLS replacement, otherwise 2027
66kV Main bus	UFLS scheme; Protection & aux. relays, panel	All relays; UFLS relays removed from service once M009 feeder relays are replaced and UFLS transferred to all 66kV feeder protection relays	2023 if replaced with Kilkivan-Murgon No. 2 relays; otherwise 2027
66kV Transfer bus	ISO	ISO DE389A	2022
Transformer No. 1 (132kV & 66kV bays)	Power Transformer	132/66kV Transformer No. 1	2022
	VT (existing RTS work)	VT A797B	2018
	Protection relays/schemes & panels	All relays	2022
	AVR relay	MVGC	2022
Transformer No. 3 (132kV & 66kV bays)	Power Transformer	132/66kV Transformer No. 3	2022
	Protection relays/schemes & panels	All relays	2022
	AVR relay	MVGC	2022

Kilkivan Town substation
Assets recommended for replacement ASAP within the next 5 years

Bay Description	**Asset Type**	**Asset IDs (refer to SLD in appendices B&C)**	**Recommended asset retirement year**
66kV Murgon feeder bay M008	66kV Bus ISO	B329	2022
66kV & 11kV T1 & AT1 bays	66kV Bus ISO	A629	2022
	Power transformer	T1 c/w OLTC, neutral ISO A722, all surge arresters	2022
	Auto transformer	AT1	2022
66kV & 11kV T2 & AT2 bays	66kV Bus ISO	B629	2022
	Power transformer	T2 c/w OLTC, VRR, neutral ISO B722, all surge arresters	2022
	Auto transformer	AT2	2022
11kV Local supply transformer (inside substation)	Distribution transformer & EDO fuses	SST1 & EDO Fuses	2022
11kV bus	Bus section ISO	A1298	2022
	Bus VT & EDO	VTB1297 & EDO fuse	2022

	fuses	B1207	
	Busbars & supports	Bus conductors, insulators, supporting steel structures	2022
11kV Town feeder bay	Bus ISO	ISO E429A	2022
11kV Cinnabar feeder bay	Bus ISO	ISO D429A	2022
11kV KILK T12 house supply feeder bay	Bus ISO	ISO C429A	2022
11kV Oakview feeder bay	Bus ISO	ISO B429A	2022
11kV spare bay	Bus ISO	ISO A429A	2022
N/A	LV AC board	Asbestos contaminated	ASAP
All 11kV bays & bus	Poles	All concrete poles in the yard	2022
N/A	Fence	Substation fence repairs	2022

Table 1: Recommended Asset Replacements

5. Restoration Timeframes and Safety Net

5.1.1. Safety Net Requirements

A fundamental requirement of Ergon Energy's DA D01/99 is to comply with Safety Net targets that seek to effectively mitigate the risk of low probability – high consequence network outages to avoid unexpected customer hardship and / or significant community or economic disruption. Table 2 shows the applied service standards for Ergon Energy's sub-transmission network.

Category	Safety Net – Load not supplied and maximum restoration times following a credible contingency	
	Regional Centre	Rural / Remote
(1)	Less than 20 MVA after one hour	Less than 20 MVA after one hour
(2)	Less than 15 MVA after six hours	Less than 15 MVA after eight hours
(3)	Less than 5 MVA after 12 hours	Less than 5 MVA after 18 hours
(4)	Fully restored within 24 hours	Fully restored within 48* hours

Table 2: Safety Net Timeframes

KILK complies with Safety Net requirement based on credible contingencies benchmarked against 50% PoE load in the present configuration.

Two scenarios have been taken into consideration for Safety Net analysis for KILK substation, which are loss of T3 at KILK, and loss of the 66kV bus at KILK.

For the loss of T3 at KILK, no automatic changeover is available as there are no 66kV or 132kV bus-section circuit breakers. The faulty transformer can be isolated and supply restored from the 2nd transformer within eight hours, but cannot be guaranteed within 1 hr.

For the loss of the 66kV bus at KILK, a similar duration outage and restoration would occur.

In the current configuration, with Woolooga (WOOL) supplied from Maryborough T059 (MARY), either contingency will result in loss of supply to Kilkivan Town (KITO), Murgon (MURG) and Proston (PROT) substations with a total load of under 15 MVA. Restoration would be within eight hours, hence supply restoration is Safety Net compliant.

However, it should be noted that in the normal system state, with WOOL supplied from KILK, and medium future load growth, the unsupplied load will be approaching 20 MVA. A project exists to consider installing motorised isolators at Gootchie (GOOT) to facilitate transfer of WOOL to MARY within 1 hr which will bring the restoration back within the Safety Net time-frames.

* 48 hours refers to the time required to restore supply using a transportable substation in rural locations. As per the Queensland Electricity Distribution Network Code Guaranteed Service Level (GSL), no group of customers should be off supply for more than 24hours during this 48 hour restoration time.

In addition KILK substation and the transfer capacity it provides allows safety net compliance to be met on the KILK-MARY feeder. This is achieved by allowing WOOL, GOOT, and OWAN to be transferred between MARY and KILK as network dependencies dictate.

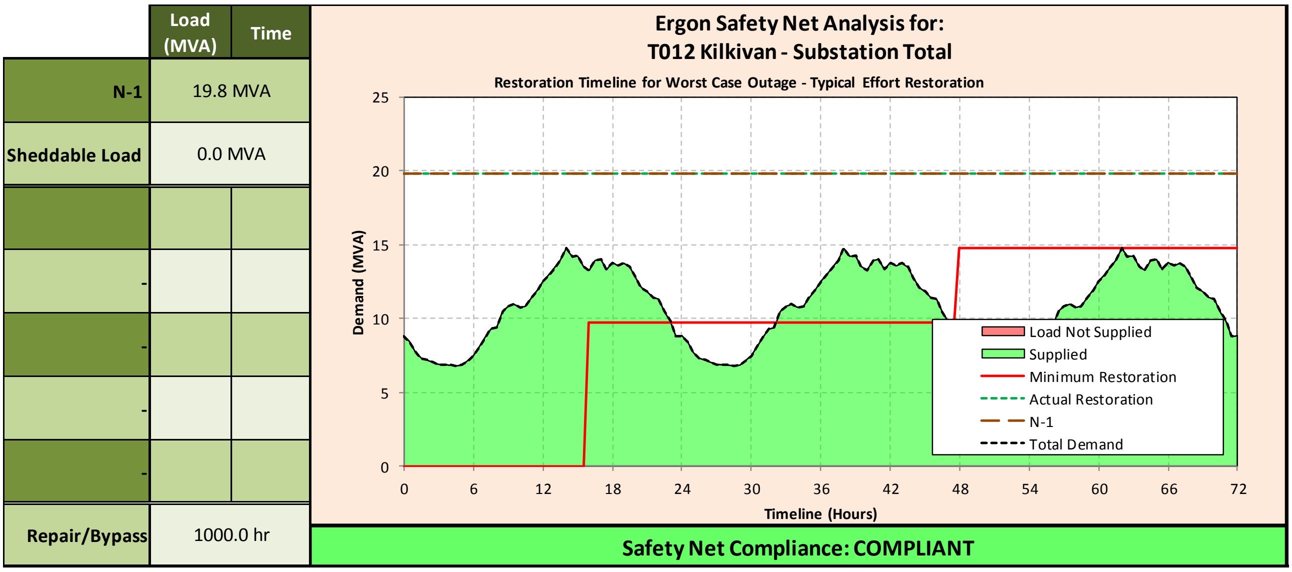

Figure 7: Safety Net Analysis for KILK (WOOL supplied from MARY)

5.1.2. Safety Net Contingency Plan

The following Table 3 outlines the Safety Net contingency plan for Kilkivan Substation.

Safety Net Contingency Plan

Note: This plan was developed to ensure Safety Net *compliance* for a *credible* event occurring on the day of (forecast) maximum demand for a normal (POE50) year. It does not necessarily represent the "best" contingency (i.e. the plan that results in the smallest number of lost customer minutes/ unsupplied load). Most events will occur when demand is less than the forecast MD. In these cases, some actions such as shedding large customers, deploying Nomads/Pegasus units, etc. will not be necessary to achieve SN *compliance* and it will be up to the co-ordinator to decide on what is best. Where the event occurs on a day where demand is higher than the forecast MD, SN compliance may not be possible – in which case, best endeavours is all that is required.

Scenario	Failure	Consequence	Actions	SN Minimum Timeline	Typical Timeline	Safety Net Compliance
1	Transformer T3 132/66 kV	Total loss of supply to KITO, WOOL, MURG and PROT substations (no 66 kV or 132 kV transformer or bus-section CBs); supply capacity limited to 20.7 MVA	1. Isolate faulty transformer and close 66 kV bus isolator for healthy transformer; close 132 kV and 66 kV feeder CBs to restore unsupplied load	8 hrs	8 hrs	YES
			Full supply restored:	8 hrs	8 hrs	YES
2	132 kV or 66 kV bus zone	Total loss of supply to KITO, WOOL, MURG and PROT substations (no 66 kV or 132 kV transformer or bus-section CBs); supply capacity limited to 20.7 MVA (worst case)	1. Isolate faulted bus sections and restore supply through healthy bus sections and transformer	8 hrs	8 hrs	YES
			Full supply restored:	8 hrs	8 hrs	YES

Table 3: T12 Kilkivan Substation Contingency Plan

6. Proposed preferred network option

The proposed preferred network option to rebuild KILK substation will address the primary objective of managing the end of life assets at KILK and KITO in the most cost effective manner, while at the same time meeting all of Ergon Energy's legal and regulatory customer service standards. It will do this by replacing the majority of high voltage plant and secondary systems, which are approaching the end of their serviceable life, at KILK. This preferred option is considered to present the lowest construction and outage risk, be the most cost effective, offer greater efficiency in delivery and minimise environmental impact. This option also has the added benefit of reducing the number of assets by decommissioning KITO and establishing supply to the Kilkivan township through the new KILK substation.

Proposed Option: Full substation rebuild of Kilkivan Substation (KILK) on the area adjacent to the existing substation site.

The following equipment would be installed at the new Kilkivan substation:

- 2 x 132/66/11kV 32 MVA transformers, bunds and oil containment
- 2 x 132 kV transformer bays (transformer ended feeders)
- 2 x 66 kV transformer bays
- 3 x 66 kV feeder bays
- 1 x 66 kV AFLC bay
- 1 x 11 kV feeder bay (supplied from new TX tertiary)
- Station Services Supply
- 1 x Modular Control Building
- Control, protection and metering panels and cabling for all switchgear and plant
- Telecommunications link

Connection to the new substation will require rearranging the existing overhead 132kV & 66kV transmission lines:

- transfer and reconfigure the two existing incoming 132kV feeders (764 & 765) as transformer ended.
- transfer of the three existing 66kV feeders (M008, M009, M011)

Establish one 11kV feeder out of the new Kilkivan (KILK) from the 132/66/11kV transformer tertiary to supply the existing Kilkivan distribution network (township and surrounding rural area).

Decommission & recover the existing Kilkivan 132/66kV Substation.

Decommission & recover the existing Kilkivan Town 66/11kV Substation.

Figure 8 and Figure 9 provide geographic and schematic diagrams for the proposed option.

The project is required to be completed by **May 2023** at the latest. At the time of the publication of this document, the construction timetable had not been finalised. For any non-network options to be considered credible, they must be able to be commissioned by no later than May 2023.

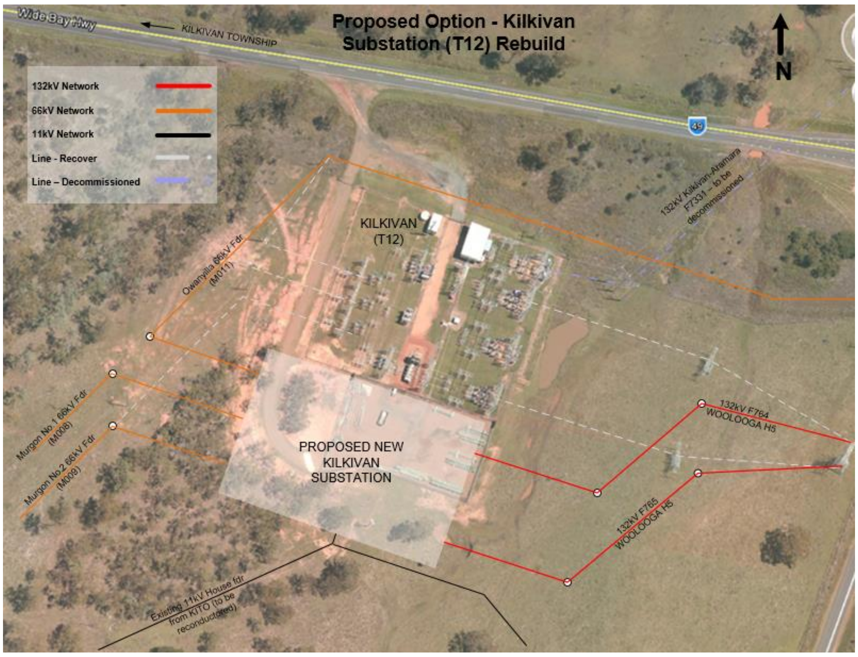

Figure 8: Geographic View of KILK Substation

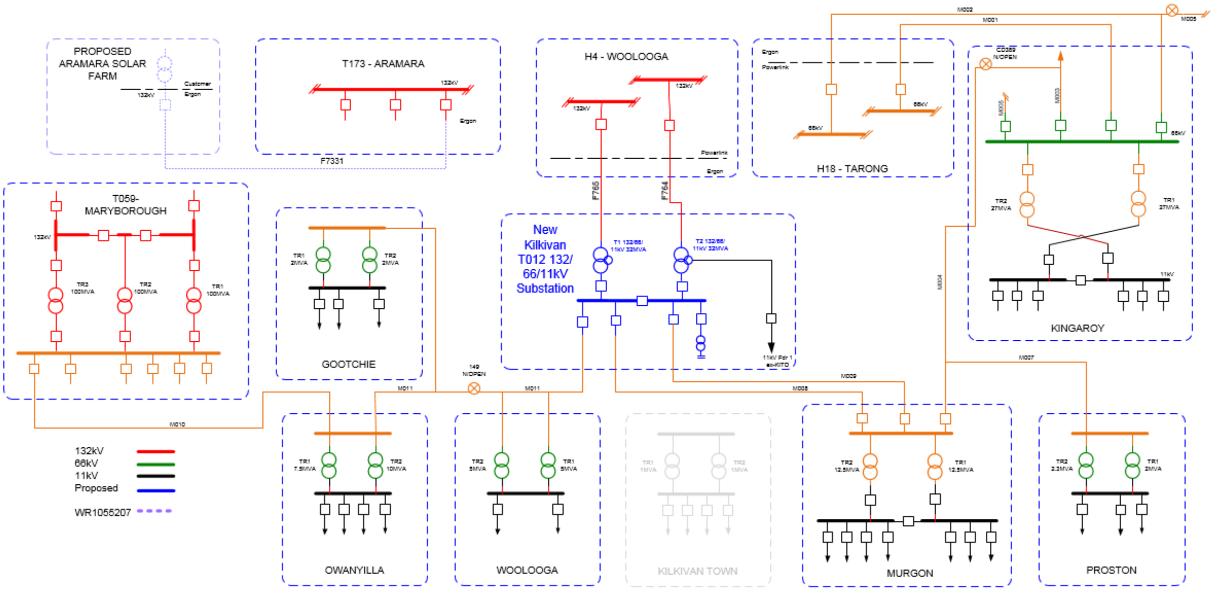

Figure 9: KILK Proposed Network Arrangement (Schematic View)

6.1. Cost of the proposed network option

The estimated total capital cost of this preferred network option is $27.4M. Three network options were costed. Option A being the lowest cost option is ranked 1 and is the network option proposed to be implemented.

Note that the figures in the table below are the discounted present values evaluated over a 20 year period. These direct costs do not include any interest, risk, contingencies or overheads.

Commercial Summary Cashflow

Base Case	Maintain Existing and defer KILK 5 years and KITO 10 years
Option A	Option 1 Rebuild KILK with Tertiary , retire KITO
Option B	Option 2 Rebuild KILK and a skid at KITO
Option C	Option 3 Rebuild KILK and 1TX KITO Area

Preferred Option Selected:	Option A	**Preferred Option is Rank 1**

$ Millions	Base Case	Option A	Option B	Option C
Capex	(14.32)	(14.94)	(16.81)	(16.19)
Opex	(0.88)	0.00	0.00	0.00
Direct Benefits	0.00	0.86	0.00	0.00
Commercial NPV	**(15.20)**	**(14.08)**	**(16.81)**	**(16.19)**
Ranking	*2*	*1*	*4*	*3*
Indirect/Risk	0.00	0.00	0.00	0.00
Commercial + Risk	**(15.20)**	**(14.08)**	**(16.81)**	**(16.19)**
Ranking	*2*	*1*	*4*	*3*

The preferred option has a NPV difference to the Base Case of :	**1.12**

7. Assessment of Non Network Solutions

7.1. Demand Management

Ergon Energy's Customer Interactions (CI) team has assessed the potential non-network alternative (NNA) options required to defer the Network option and determine if there is a viable demand management (DM) option to replace or reduce the need for the network options proposed.

Kilkivan (KILK)

Due to the integral nature of the Kilkivan bulk supply point to the network topography and the reliability, safety and standards compliance issues, the most recent being the issuing of a Network Access Restriction (NAR) and risk of catastrophic failure of a capacitive voltage transformer, it has been determined that there are no credible NNA's to the proposed investment.

Kilkivan Town (KITO)

CI has completed a review of the KITO customer base and considered a number of demand management technologies. Reliability of supply, environmental risks, safety and standards compliance are the key project drivers at KITO. The fact that the internal option is to retire KITO and consolidate supply into one Kilkivan substation, the DM goal would be to extend the life of the transformers by de-loading them at peak times.

There are 486 residential customers and 206 business customers connected to KITO (refer Figure 10).

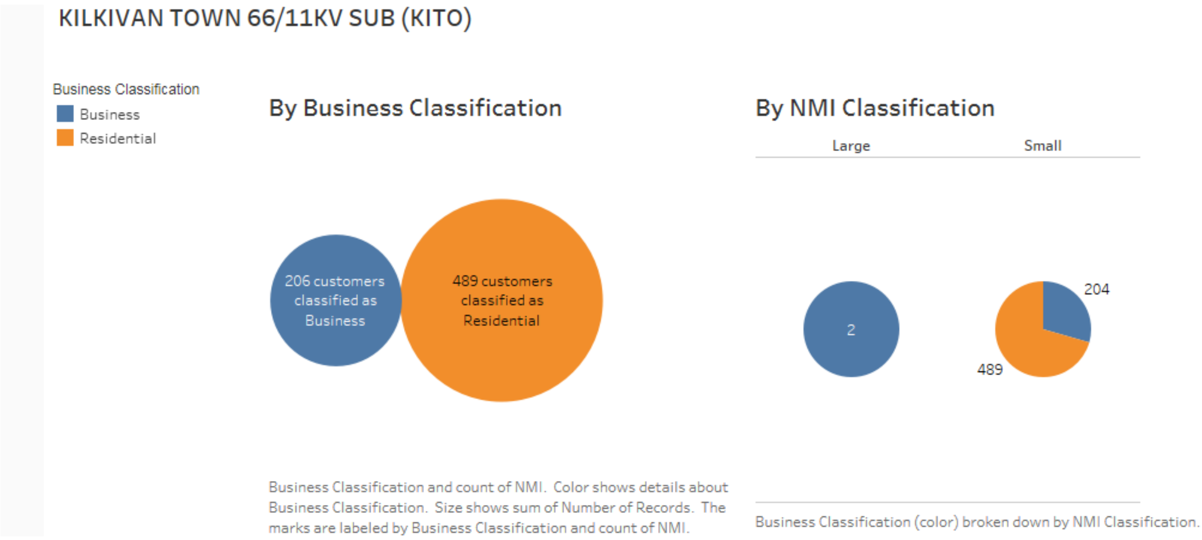

Figure 10: KITO Customer Classification

Residential

The residential customers appear to drive the daily peak demand which occurs generally between 6.30 -10.00 pm.

KITO has 323 customers on tariff T31 and T33 hot water load control (LC). An estimated demand reduction value is available of 194kVA[†]. The LC is dynamic (that is, it responds to exceedance settings not on a timetable) and the current control strategy only calls LC when KILK exceeds 18.2MVA. This strategy is unrelated to peaks experienced at KITO.

Business

Annual consumption of customers classified as Business (seen in Figure 11) is less than 30,000 kWh's p.a. with many having consumption and demand similar to residential customers. 25% of the registered business customers have zero usage.

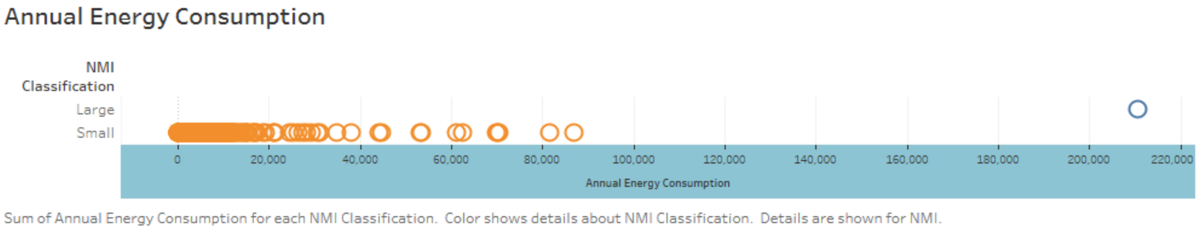

Figure 11: KITO Annual Energy Consumption

[†] Hot water diversified demand saving estimated at 0.6kVA per system

Solar

A total of 147 customers have solar PV systems for a connected inverter capacity of 609 kW's. Oakview, Cinnabar and Kilkivan feeders are registered as at risk of experiencing reverse power flows‡.

Summary

A total of 609 kW's of customer PV on the KITO Network is reducing the summer and winter daytime peaks, and three 11kV feeders are registered as at risk of experiencing reverse power flows.

196kVA of potential hot water load control is available but currently not utilised. This could be used as an option to de-load the zone substation (ZS) with a change to the LC protocol for the T31 and T33 hot water load. The current shedding hierarchy is set at KILK when 18.2 MVA is exceeded.

If the reverse power flows caused by PV was part of the problem we could investigate strategic use of the HW LC to "soak up" some of this flow.

Figure 12 and 13 shows KITO seasonal load profiles and indicate a well utilised substation where further demand reductions seem unlikely to provide any additional benefits to extending the life of a 74 year old substation for aged asset issues.

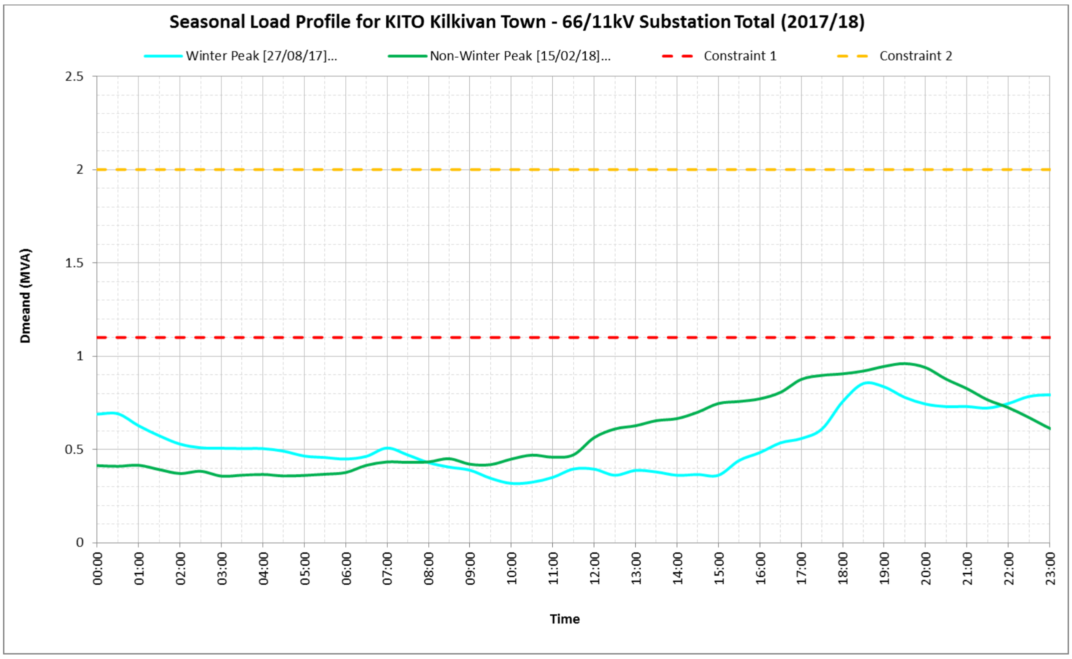

Figure 12: KITO Seasonal Load Profile

‡ Using the total installed capacity of Micro EG Units (with 20% diversity) and Estimated Light Load (20% of Daily Maximum Demand) a rough estimate can be made as to whether generation will exceed the consumption on a feeder.

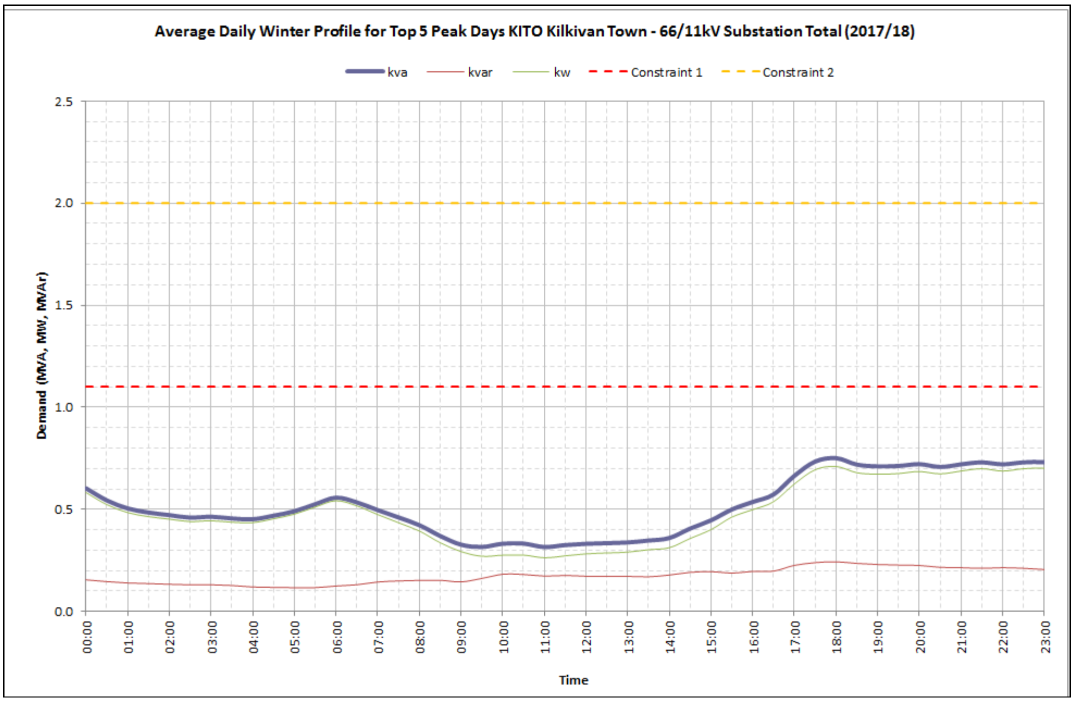

Figure 13: KITO Average Daily Winter Profile

7.1.1. Demand Management (Demand Reduction)

Kilkivan (KILK)

Energy efficiency and other demand reduction measures such as power factor correction, high efficiency lighting etc. have been assessed as not technically viable as it will not address the reliability, environmental risk or standard compliance issues.

Kilkivan Town (KITO)

The customer base is largely residential and small business. Demand savings in these customer market segments are characterised by very small demand saving increments with a slow rate of uptake. The most cost effective demand reduction measure for this market in a short timeframe could be increased utilisation of the existing LC by Ergon Energy.

7.1.2. Demand Response

Demand response through customer embedded generation, call off load and load curtailment contracts have been assessed as technically not viable as:

- it will not address reliability, environmental risk or standards compliance issues at KILK and KITO substations; and
- customer types supplied from KITO substation are predominantly residential and small business with only one large customer. The demand reduction potential of these customers is not of sufficient value to be attractive enough to contract to “call off” or curtail.

7.1.3. Large Scale Customer Generation (LSG)

LSG generation sites such as renewable energy generation, solar or wind farms of multiple MW's capacity constitute an opportunity to support ZS investment by reducing demand on, and potentially providing reactive power support for substation assets.

This option could potentially reduce future demand, but has been assessed as technically not viable as there is no known existing or proposed LSG demand response available.

8. Conclusion

Based on the demand management options considered above, it is deemed that sufficient demand management measures could not be feasibly implemented to technically and economically defer the network investment required at KILK or KITO substations, particularly as the key investment driver is the safe and reliable supply of electricity to consumers through an asset base which is at its end of life. The aged asset replacement will address issues with security and reliability customer service standards, environmental risk, safety and substation design standards compliance.

If deemed that de-loading KITO transformers could significantly extend their life, a change to Ergon Energy's hot water LC strategy without further customer engagement could cost effectively help de-load or alleviate some issues caused by reverse power flows.

Beyond these few points it is unlikely there are any financial benefits from seeking expressions of interest from the market for a Non Network Alternative to replacing KILK and decommissioning KITO.

Consequently, a Non-Network Options Report has not been prepared in accordance with rule 5.17.4(c) of the NER. This document is being published as the Draft Project Assessment Report under NER clause 5.17.4(i), following the publication of the Notice of No Non-Network Options on 05/09/2019.