

# Unlocking the Grid at Tūrangi - Contingency Key Value Drivers

The Lines Company, Z Energy and Kwetta



# Tūrangi Contingency Grid Unlock Overview

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Kwetta innovation solving  
grid challenges

Delivering Z Energy with cost effective, reliable and future proofed EV charging infrastructure, for cars, buses and trucks, enabled through real time flexibility services

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Contingency Grid Unlock  
at Tūrangi

Proving the value of dynamic operating envelopes to unlock and optimise existing network capacity, in real time, supporting grid contingency constraints

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Kwetta Tūrangi site installation

1 x 1MW 11 kV connected Prime Grid Gateway  
5 x 200kW CCS2 Sky Hooks  
1 x 100kW CHAdeMO Sky Hook

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Kwetta Grid Services

150 kVA fixed and 200 kVA flexible dynamic operating envelope (DOE) network connection

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Participants

Z Energy, The Lines Company and Kwetta

# Tūrangi Grid Challenge — Contingency Capacity

The Lines Company (TLC) recognised that the most complex problem facing the electrification of transport is the electricity infrastructure challenges of deploying and operating fast charging and heavy vehicle hubs in a safe, reliable and cost-effective manner, especially where constraints exist on the current distribution network. All while delivering the EV charging customer with a consistent fast charging experience, without negatively impacting other network customers.

Tūrangi is strategically located as the midpoint between Auckland and Wellington and is ideally located for an EV fast charging site, to support the growing demand for in-transit EV fast charging, for cars, buses and trucks.

The Lines Company (TLC) network supplies electricity to the Tūrangi region and has identified that the Tūrangi substation will be requiring significant near-term future investment, as forecast growth in the area is likely to surpass the N-1 contingency capacity of the existing transformers, through the addition of EV charging and organic growth, impacting intermittent winter peak demand. The TLC Asset Management Plan sees construction of a new substation within the next 5 years, with an overall substation replacement cost in the vicinity of \$10m.

As a result of these intermittent constraints and connection challenges, and a pipeline of other connection requests, TLC was only able to offer a 150kVA initial fixed capacity connection, which negatively impacted the EV customer charging experience at this busy journey charging site.

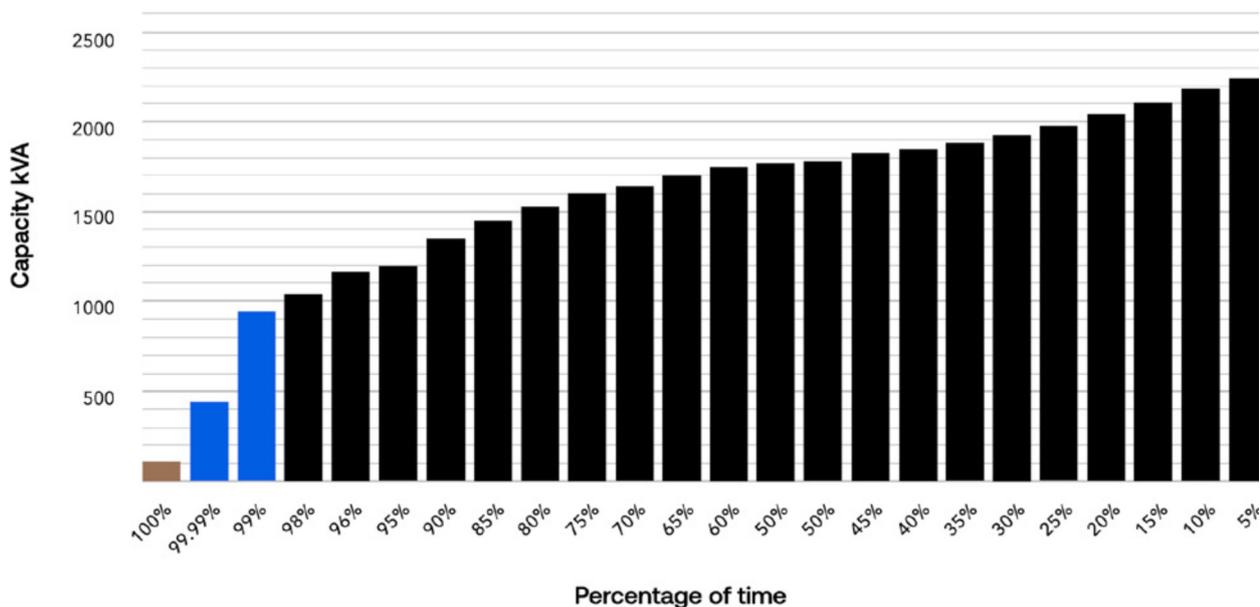
TLC recognised that any opportunity to investigate non-network solutions, to support and extend the Tūrangi substation, could present a very real energy affordability benefit to the communities within the TLC network.

# Grid Unlock Solution

To solve the N-1 contingency challenges and expedite an increase in capacity for the Z Energy Tūrangi site, without a significant capital contribution and delay, Kwetta and TLC implemented a dynamic operating envelope, providing a further 200kW of flexible capacity, which could be autonomously ‘flexed down’ by TLC, via SCADA control, when the Tūrangi feeder was genuinely constrained or reached the agreed upper limit of the operating envelope.

The first step of this process was for Kwetta to undertake analysis of the network feeder data, where Kwetta identified there was likely an additional 350kVA of capacity that would be available 99.9% of the time, while still allowing a 10% capacity buffer on the feeder. This amounted to a potential end customer ‘flex down’ impact of 8 hours per year. Further analysis showed that the EV charging and network constraint peaks were non-coincident, therefore the probability of end charging customer impact was significantly less than this.

The graph below demonstrates the feeder data modelling that supports the assessment of negative customer charging impact.



A traditional flexibility solution, to unlock additional capacity, could be the implementation of a static operating envelope, where the site would be required to flex down capacity for pre-defined times each day, to ensure there wasn't a breach of N-1 security requirements, however this approach does not provide the sub-second level of control and responsiveness TLC was seeking, and results in a sub-optimal customer experience, as for the majority of this time, there would not be a genuine network constraint.

Kwetta proposed a dynamic operating envelope as a significantly smarter optimisation solution, for both TLC and the end customer, providing TLC sub-second control to 'flex down' capacity when required, to support system reliability and availability, and unlocking valuable latent capacity when the system is not constrained, thereby optimising existing network infrastructure.

By securely connecting TLC's SCADA system to the Kwetta Prime Grid Gateway, with a Remote Terminal Unit (RTU), via a DNP3 communications interface, TLC and Kwetta were able to implement an autonomous, sub-second responsive, dynamic operating envelope, with a failsafe fallback to the fixed capacity limit, in the event of a loss of communications.

The implementation of the communications and control mechanisms was a quick and painless experience, with less than 3 months between the initial 'how might we' workshop, between the TLC and Kwetta teams on the 15th of July 2024, through to the successful SCADA integration, testing and DOE fully operational on the 3rd of October 2024.

From a commercial perspective there has been a material value 'unlock' for both TLC and Z Energy, which has been recognised through the implementation of a trial DOE network tariff. As TLC can now offer capacity that was previously unable to be allocated, due to network contingency requirements, there has been an uplift in the capacity component of the standard network tariff. As this flexible capacity is not guaranteed available 100% of the time, TLC has designed a trial tariff that reduced the capacity charge for the flexible capacity, effectively sharing the value of the optimisation outcome.

# Dynamic Flexibility in Action

Visualisation of this value unlock and optimisation outcomes for both TLC and Z Energy is demonstrated in the graph below.

The blue line shows total site power from the cumulative charging sessions, with the orange horizontal line showing the fixed capacity limit, and the green line showing the flexible capacity limit.



Cumulative charging sessions over time

A zoom in on a single day highlights the real value unlock:



Cumulative charging sessions

The graph below shows a 'flex down' event, which occurred over a night period, and therefore did not impact on the EV customer charging experience:



# Key Value Drivers – Z Energy

Metric	Value Stream
Improved business case metrics	Significant reduction in the network connection capital contribution to expedite network upgrade requirements Material upfront project savings
Enhanced network connection	Increase of network capacity with dynamic flexibility, without delays and cost  ~133% increase in network capacity
Improved customer charging experience	Increased access to higher charging speeds
Reduced operating costs	Operating savings with the implementation of a value shared trial DOE tariff  25% reduction in network lines charges
Future proofed installation	Optionality to lift flexible capacity, as EV charging demand increases and in-transit heavy transport charging comes onstream
Insights and Data	Data and insights providing invaluable understanding on the timing and capacity step changes required to balance customer experience and financial KPI's

“The use of the Kwetta charging units, utilising their dynamic connection functionality, allowed us to expand the capacity and speed offered to our EV charging customers, without incurring major grid augmentation costs or having to incur delays waiting for the infrastructure to be upgraded.”

Patrick Luxton  
General Manager Energy Value Chain,  
Ampol (Z Energy)

# Key Value Drivers – The Lines Company

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## Accelerated network connection

By unlocking capacity on a constrained feeder, TLC accelerated the network connection and increased available network capacity.

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## Optimised network utilisation

With the confidence to know there won't be a negative impact on network reliability and availability.

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## Deferral of capital expenditure

TLC has not only increased revenue from their existing assets, they've recognised the value of network optimisation with the implementation of a trial DOE flexible tariff, to value stack the benefit with the customer.

“By providing real time automated control of the charging technology, via Kwetta's grid services and TLC's DOE, there is potential to more than triple the available capacity on the TLC network feeder, without additional network investment”

Mike Fox  
Chief Executive, The Lines Company

# Key Value Drivers – Kwetta

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Demonstration and proof - technical and financial value of DOE's to:

- expedite new connections;
- reduce customer capital contributions for network strengthening;
- unlock network capacity; and
- optimise value streams, across project participants.

“Kwetta’s Contingency Grid Unlock enabled TLC to safely and reliably unlock contingent capacity for this site, without the significant investment of traditional network solutions.

Kwetta’s key technical features of sub-second, failsafe response and >99.9% reliability, combined to deliver a win/win for TLC and Z Energy”

Mike Lazelle  
Chief Growth Officer, Kwetta

