



The Journey to Improve LV Network Efficiency

POWERCO LV NETWORK VISIBILITY AND MONITORING PROJECT

Kevin Chang | 30 / 9 / 2021

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Our Networks

Powerco is a leading New Zealand electricity and gas infrastructure business providing distribution services to around 1.1 million* customers across 452,000* connections throughout the North Island.

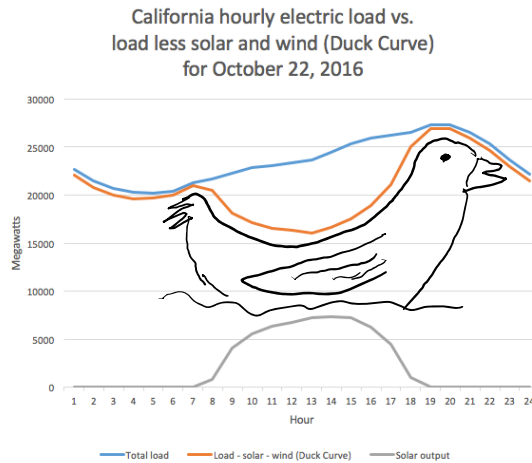
- Gas networks
- Electricity networks
- Electricity & Gas networks

*based on FY19 figures

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Why Do We Need LV Monitoring?

- 38% of the Powerco network is LV
- More and more distributed energy resources (DERs)
- More and more electric vehicles (EVs)
- Understand the performance of the LV network
- Developing a more proactive approach towards problems



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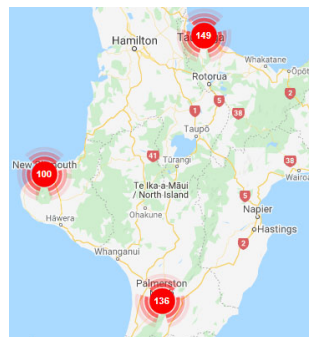
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Eneida EWS DTVI Monitor and DeepGrid Platform

- The project was to install 450 monitors in some urban area transformers
- Project areas: New Plymouth, Palmerston North, and Tauranga
- Capable of real time monitoring up to 6 LV feeders
- Easy installation: Rogowski coil sensors and magnetic mounting
- DeepGrid is a cloud-based system consisting of DeepGrid Server, Web App and Mobile App.

Meet the EWS DTVI-g

1. Antenna
2. Antenna connector
5. Screws
6. Wall mount lugs
7. Rogowski connectors
8. Magnets
9. Voltage connector

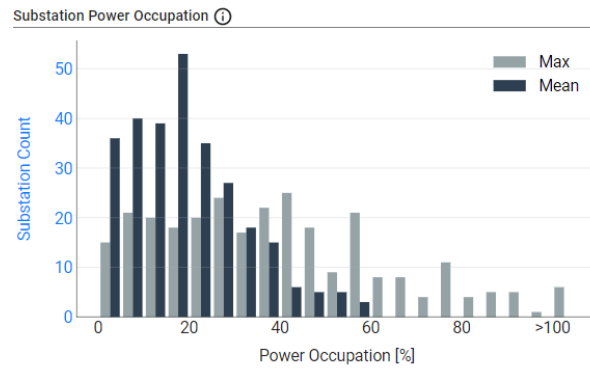


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Some Outcomes – Congestion Visibility

- Power Occupation (%) = Apparent Power / Transformer Nominal Power
- Result: Most of the monitored distribution substations have congestion < 50%.

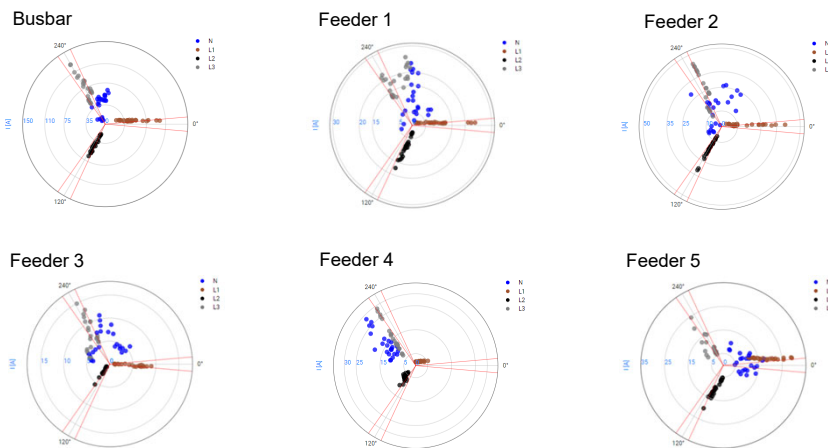


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Some Outcomes – Current Vector

- An example of a transformer's current vector diagrams
- Result: Although the busbar currents are relatively balanced, the feeders are not.



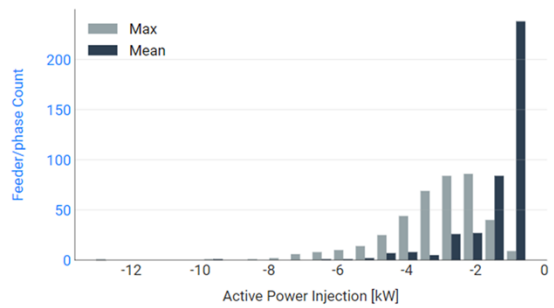
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Some Outcomes – PV Injection Comparison

- The PV injection data collected by the monitors were compared with the Powerco's register of distributed generators.
- Result: There were many mismatches. Many feeders were found to have more power injection than the generators' ratings in the Powerco's register. It was suspected to be the monitors' software algorithm issue.

Feeder/phase Active Power Injection



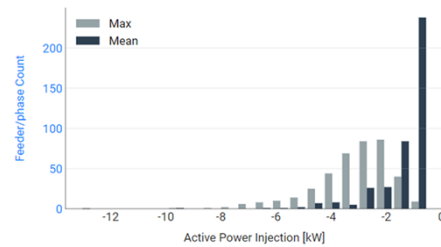
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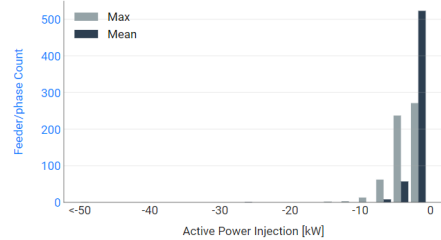
Some Outcomes – PV Injection Comparison Cont.

- Eneida is constantly upgrading their monitors' software.
- Result: After a recent upgrade, the PV injection data is now more realistic.

Before the upgrade:



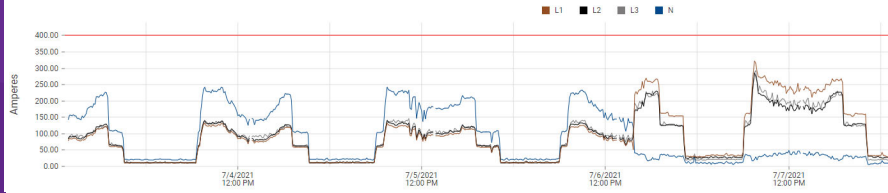
After the upgrade:



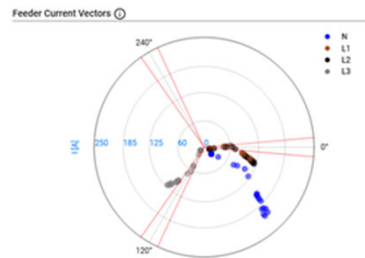
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Some Outcomes – Abnormal Neutral Current



- A feeder was found to have an abnormally high neutral current.
- It was initially suspected to have a 3rd harmonic issue.
- Further investigation: Current vector diagram shows L1 and L2 match very closely in terms of phase angle and magnitude.
- Result: 2 Rogowski coils were somehow installed on the same phase. The issue was fixed after reinstalling.



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Some Outcomes – Overvoltage

- A transformer was found to have an overvoltage issue after it was replaced.
- Result: This transformer required to be tapped up. The voltage is normal now after tapping up.

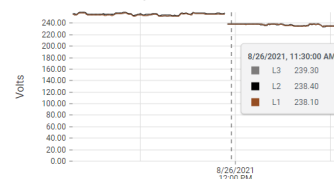
Before replacing:



After replacing:



After tapping up:

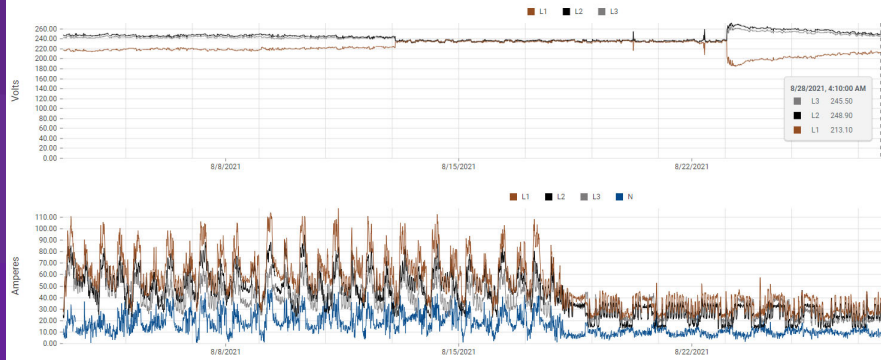


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Some Outcomes – Undervoltage

- A transformer was found to have an undervoltage issue on one of its phases (and also overvoltage issues on the other two phases).
- Result: The findings were reported, and further investigation will be conducted.

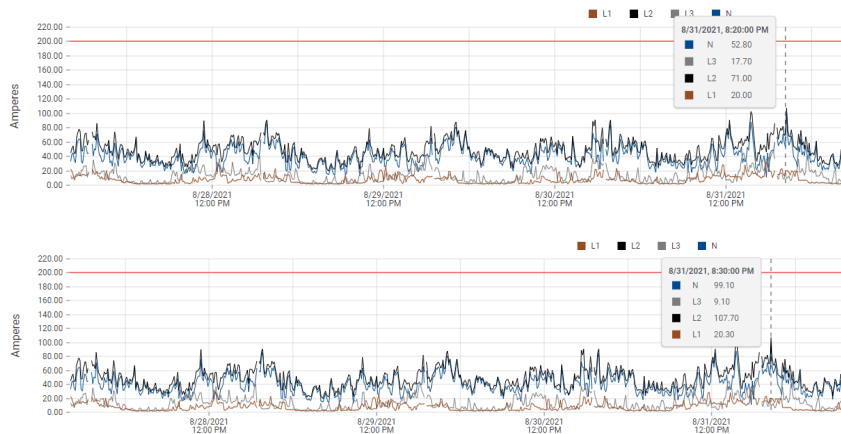


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Some Outcomes – Current Imbalance

- Some transformer were found to have current imbalance on some feeders.
- Result: The findings were reported, and further investigation will be conducted. The data provides a basis for accurate forward planning.



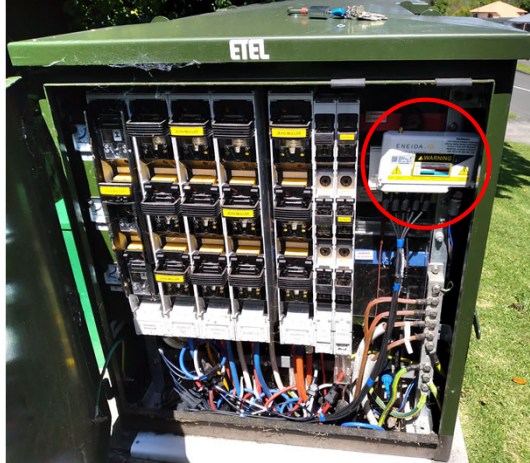
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Summary – Features of the Eneida Monitor

- Easy installation
- A cloud-based storage system with Web access and Mobile access
- Congestion Visibility
- Current Vector
- PV Injection
- Abnormal Neutral Current
- Voltage issues
- Current Imbalance



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Thank you

Any questions?

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