

Transformer Smart Meter: Enhancing & Reinforcing LV Network Visibility

Leon Liang

Graduate Network Innovation and Performance Project Engineer



• WEL & WEL Smart Meter Fleet

Transformer Smart Meter (DTX SM)

Applications

WEL Network



An electricity distribution company, serving the northern and central Waikato Region of New Zealand.

WEL Network

- Own ~ 6,000 DTXs
- Feed ~ 100,000 ICPs



Industry Challenges



Overloading

Line Down

ΕV

Solar Generation

Customer Compliance



Enabling our communities to thrive

61 Access Points (AP) lano

Customer/

ICP meter

- ~ 70% ICPs have WEL Smart Meter • (Mainly CAT 1)
- ~ 4700 transformers have some ٠ smart meter visibility
- Use mesh to communicate •
- •
- 100 Relays •





Primary

Secondary

AP1

 $(((\uparrow)))$

AP₂

WEL Smart Meter Fleet

Smart Meter Data

• UIQ: Half hourly energy volume data – collected every 12 hours



- SIQ: 5-minute instantaneous data every 15 minutes
 - Voltage
 - Current
 - Active power
 - Reactive power
- Alarm: 3 alarm events types being collected
 - Outage detection system (ODS)
 - UIQ events (collected every 4 hours)
 - SIQ events (sent from the meter as they happen)



Enhancing & Reinforcing visibility & mesh reliability



- New meter installed at an ICP:
 - Increase meter density
 - Provide ICP level data insight
- Antenna retrofit on existing meter:
 - Boost the signal to resolve meter low/no comms issue
- New Access Point and Relay installation:
 - Provide another route for meters AP
 - Boost the signal in the area with higher gain antenna Relay
- Transformer Smart meter

Transformer Smart Meter (DTX SM)

- Since 2022, WEL has installed 95 DTX SM, a continuing project underway to install 45 DTX SM every year.
- What does a transformer smart meter do?
 - Data insights of a transformer
 - Act as a relay
 - Increase meter density
 - Fault Detection
 - Phase identification





Transformer Smart Meter – Selection

- The DTX SM is targeted for the transformer that:
 - Under high fault count feeder
 - Low smart meter penetration rate
 - High distribution generation penetration
 - Supplies Civil Defence Customers
- Main tools:
 - Geographic Information System (GIS)
 - Advanced Distribution Management System (ADMS/SCADA)
 - Meter Headend System
 - Google Earth





Pole Top Transformer Smart Meter Fused IPC Networks Meter with test block Enclosure on a pole in an enclosure 1,5° - 16° 6° -A/Cu AM K223 NZ MICHA 30kVA 21921-473 CTs Antenna Enabling our communities to thrive

Ground Mount Transformer Smart Meter





Transformer Smart Meter – Site Visit

Things need to be confirmed in the field:

- Pole Top
 - Other assets on the pole
 - Surrounding environment & terrain
 - Nearby mesh equipment
 - Main fuses
- Ground Mount
 - Space restrictions
 - 3 phase voltage supply
 - Number of main incomer cables per phase
 - Antenna location





Enabling our communities to thrive

Application – Overloading

T1527 Overloading issue:

- 100 kVA, feeds 53 customers ٠
- 78% SM penetration rate ٠
- Often to be overloaded during ٠ last winter. Maximum 157% overloaded in June 2024





Application – Phase ID



05:15

09:30

01:00

T712: 2024-09-04 Group 1 - 9 meters



Meter Number	Voltages (V)			
Name	Trend	Average	Minimum	Maximum
meter.10005773[_E1.Voltage	man	243.2	239.4	246.3
meter.10005773[_E2.Voltage	wayne	243.04	238.9	246.4
meter.10005773[_E3.Voltage	wayn	243.88	240.3	247.2
meter.10024458[_E1.Voltage	wayn	236.92	233.6	239.9
meter.10024458[_E2.Voltage		No Data	No Data	No Data
meter. 10024458[_E3.Voltage		No Data	No Data	No Data
meter.10075582 _E1.Voltage	when	236.97	234.4	240.1
meter.10075582[_E2.Voltage	www.	238.01	234.7	241.37
meter.10075582[_E3.Voltage	water	237.76	234.2	241.3
TOU 0000005340WEEEOLE4.W		No Data	No Date	No Deta
TOU.0000025248WE6FCL_E2.V		No Data	No Data	No Data
TOU.0000025248WE6FCL_E3.V		No Data	No Data	No Data
TOU.0087020028WE15CLE1.V		No Data	No Data	No Data
TOU.0087020028WE15C[_E2.V		No Data	No Data	No Data
TOU.0087020028WE15C[_E3.V		No Data	No Data	No Data



20:40

Time

12:20

08:15

16:30

Application – Others



• Reinforce the mesh: Meter on the pole can act as a relay point

• Customer Compliance

• Power export monitoring

• Fault detection

• And so on.....









