How Powerco's Digital transformation supports customers electrification

Bringing network management into the digital age; with a customer lens

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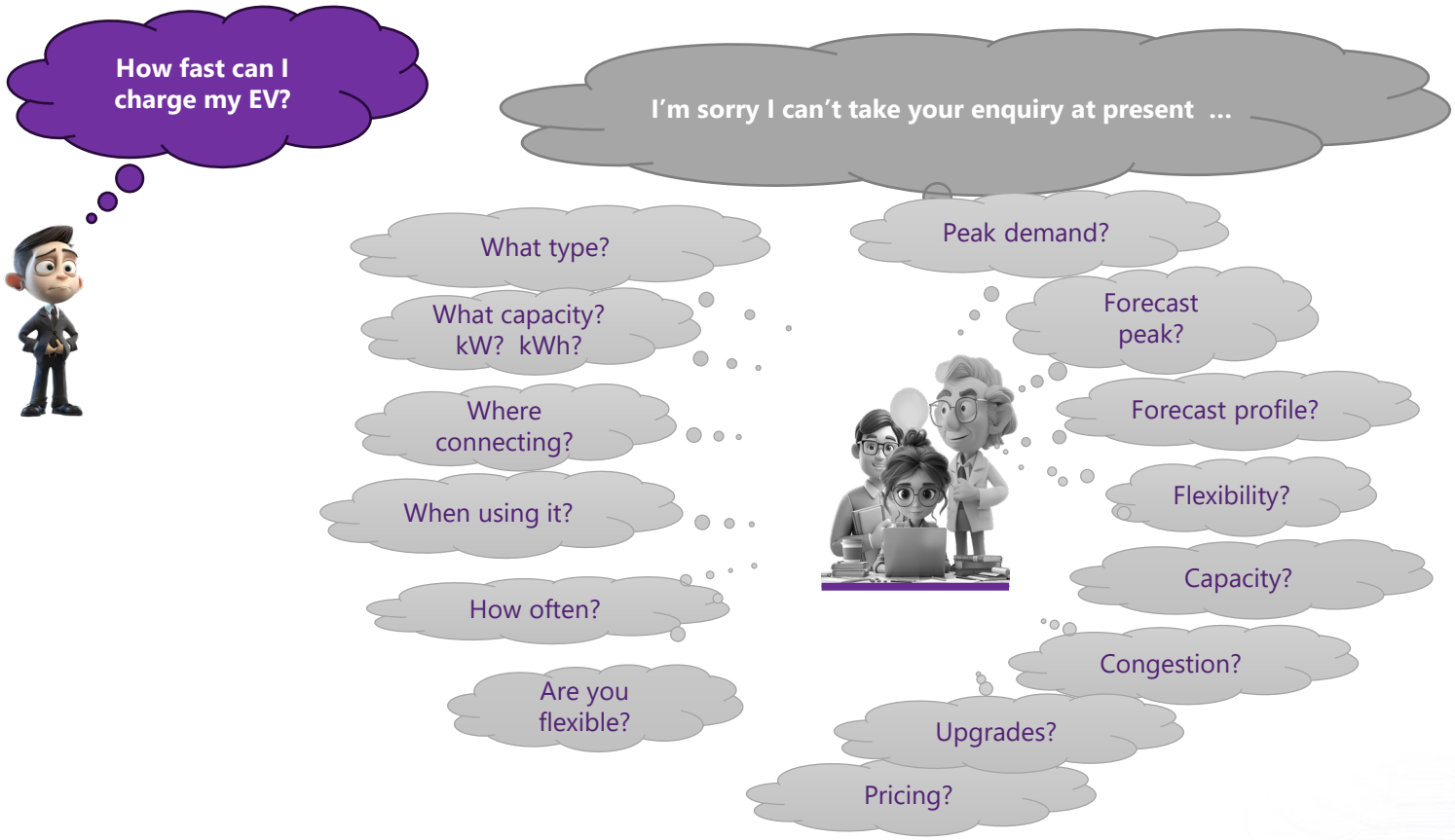
22nd July 2026

I want to know my options to connect and charge a new EV...

“Ask a simple question, …..”



Questions for the Customer

Questions for the Network

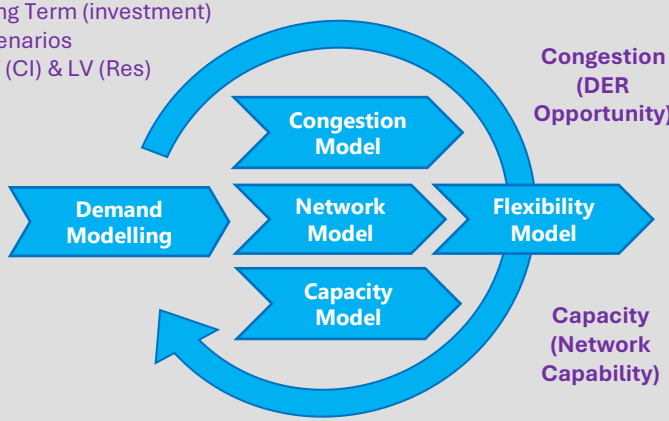
“As a customer I want to know my options to connect and use my CER”

MODELLING & FORECASTING

(the “engine room”)

Dimensions:

- 2 way & flex/price
- Time variant (flex)
- Long Term (investment)
- Scenarios
- HV (CI) & LV (Res)



Congestion (DER Opportunity)

Capacity (Network Capability)

Integrated modelling suite

- Auto approval
- Flexible Connections
- Forecast Capacity
- Forecast Congestion
- Forecast Price
- Flexibility / DER
- Forecast Reliability
- Forecast Investment
- Network Model
- Demand Scenarios

Investment Planning | **LV Management** | **Network Operations**

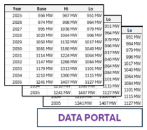
Demand (Load & DG) Forecast & Flex | **Network Model**

DATA & DIGITAL

Network capability & opportunity

Visualisation / Navigation

Info Services / Apps



Information (Data)

CONNECTED COMMUNITIES

Informed & Engaged Customers

Responsive to Customers decisions

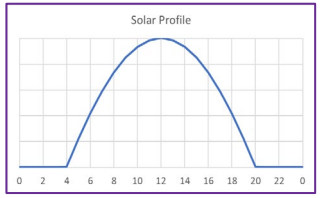
Uncertainty is the new certainty

"Kiwis are predicted to use more electricity than ever before"

... but how much?

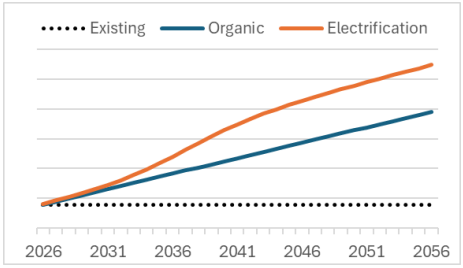
... and when?

The murky crystal ball

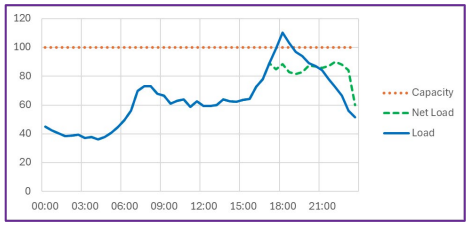


DG & BESS

- 2 way flows (& limits)
- Intermittency
- Wholesale price

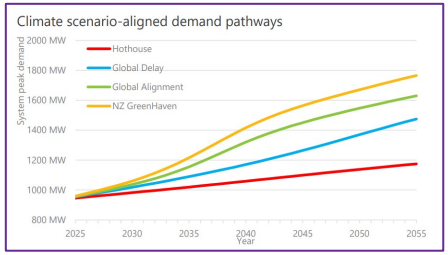


- Organic (growth ?)
- Electrification

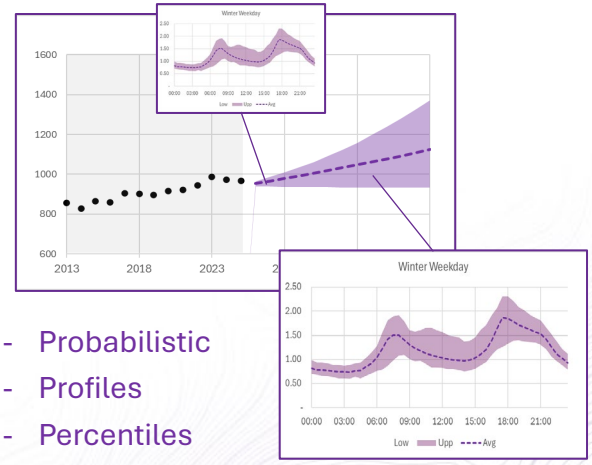


DER / DSR

- Flexibility
- Price Elasticity



- Scenarios



- Probabilistic
- Profiles
- Percentiles

CUSTOMER DEMAND

DEMAND FORECASTING

The Scale Factor …

"Size matters"

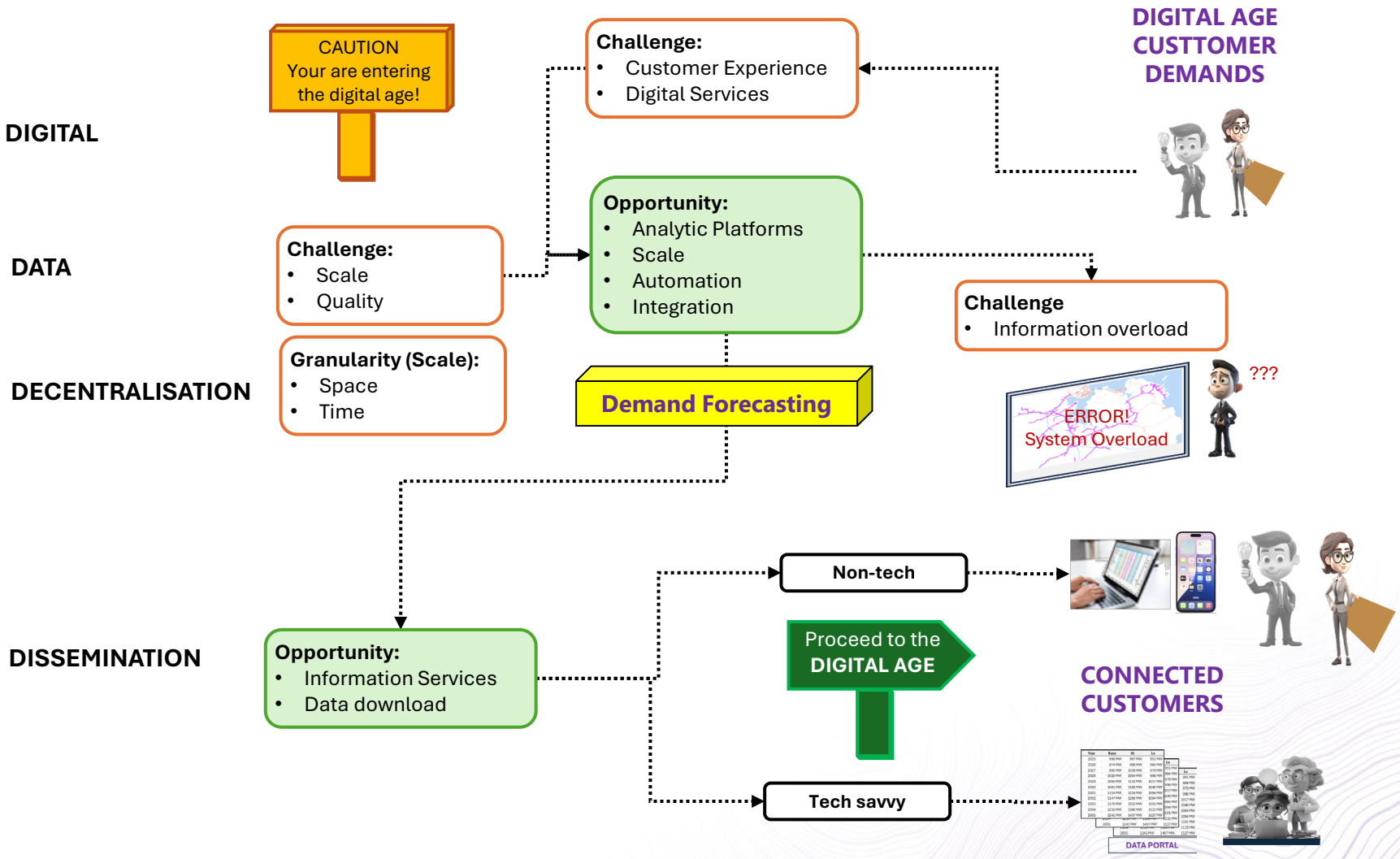
Demand Forecasting:-

- Spatial Granularity: 700 Feeders ➔ 350,000 ICPs
- Temporal Granularity: MD ➔ Profiles
- Electrification: DG & Load (2 way)
- Flexibility: Gross & Net demand
- Uncertainty: Scenarios, variance, percentiles

Dimension	Past	Future	Exp Factor
Network (spatial) granularity	700	400,000	x 570
Temporal granularity	1	17,500	x 18,000
Scenarios / Statistical variants	1	10	x 10
Forecast Horizon	10	30	x 3
Import/Export / Flex (Options)	1	10	x 10
Forecast Data Points	7,000	21,000,000,000,000	x 3,000,000,000
Forecast Data Volume	70 MB	210 PB	x 3,000,000
Complexity (Forecast processing)	1	10,000	x 10,000
Frequency (Forecast refresh)	1	100	x 100
Digital Expansion Factor (DEF):		**3.0 E+15**	

- Scale
- Automation
  - integration
  - data quality
  - self verification
- Digital Transformation

The digital revolution meets demand forecasting




I'd hope the power company has plans for congestion...
EXIT 430
Khyber Pass Rd
EAST
Symonds St
Wellesley St
Port
WEST
Waitakere
Helensville
NORTH
Nth Shore
Whangarei
500 m
EXIT 430

Our challenge…

Network Visibility **or lack thereof,**
has been getting attention lately as a key barrier to electrification

Hosting capacity/congestion maps simply give more information for customers to make decisions

"Digital twins" provide a representative model of your network to test "what-ifs"

If your people operate a network, connect customers etc - *you're already doing this*

Working on tools & data help make this scalable and automatable (HV is already 278,000 elements…)

’26 Expanding twin

Model extended into **LV Analytics (Gridsight)**, and **LiDAR-based 3D model** (**Neara**) – building towards a **fully-realised** electrical/physical digital twin

’25 GXP – ICP

Model performance **optimised**, allowing for extension into **Low Voltage. Gas Pipeline** network developed

’24 Planning expansion

Expanded model – now the **Common Network Model** by incorporating a **loading model (smart meter data)**, **asset rating libraries & demand forecasts,** supporting Network Planning

’22-23 Initial build

Established **GIS-based HV connectivity model, built daily** for **ADMS**

Ends up a bit like this…

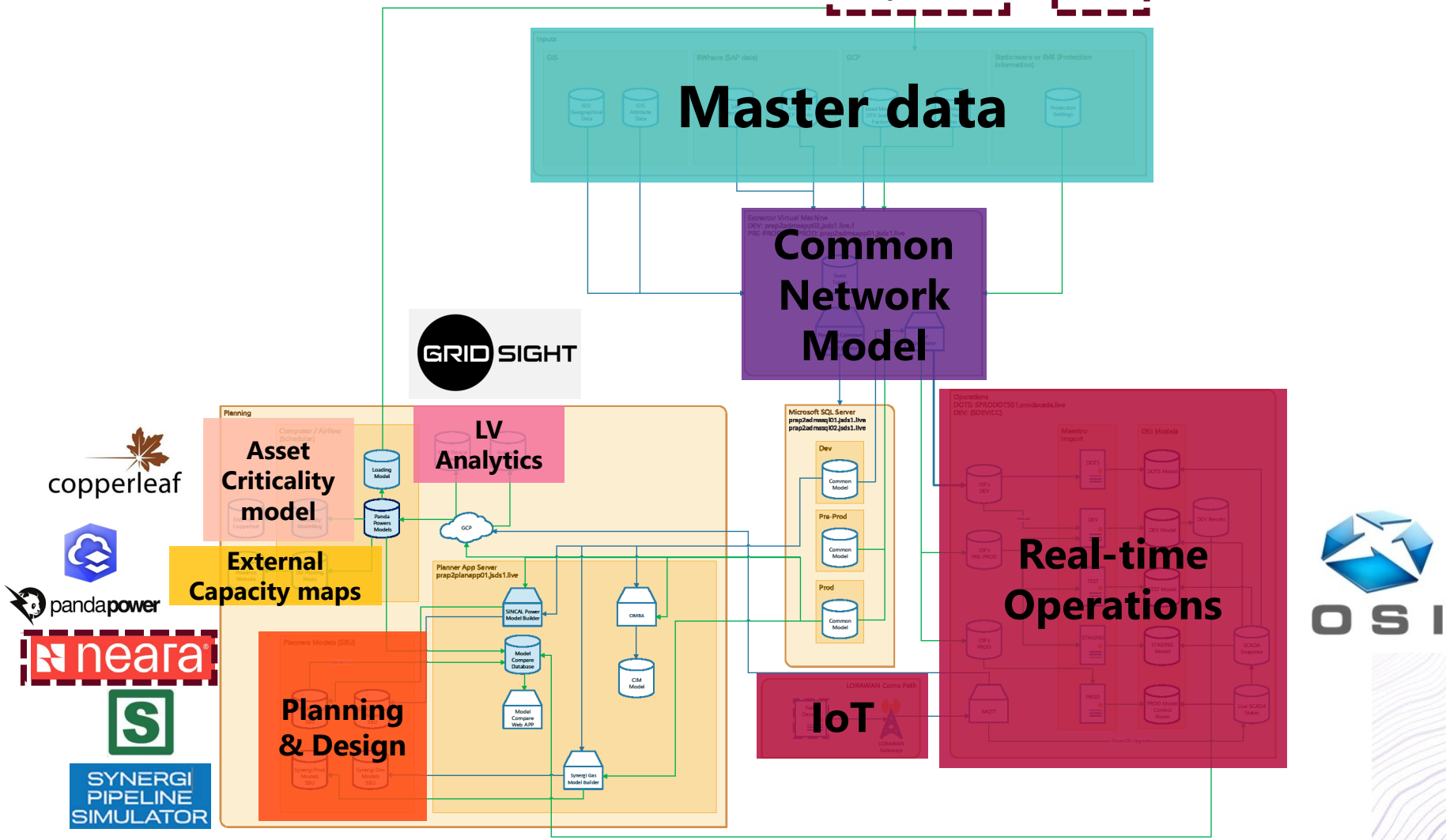
WIP

GIS

EAM

Bernie's Crystal Ball ™

Protection



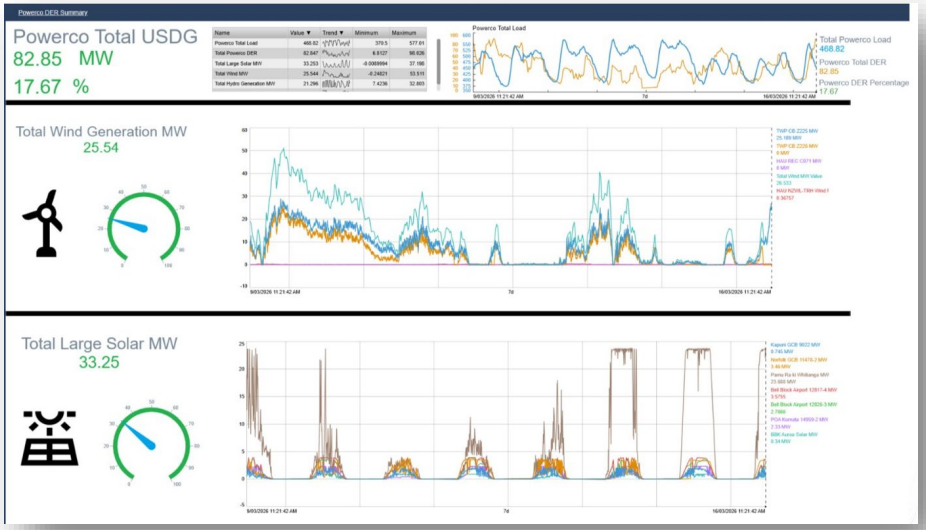
Some advice…

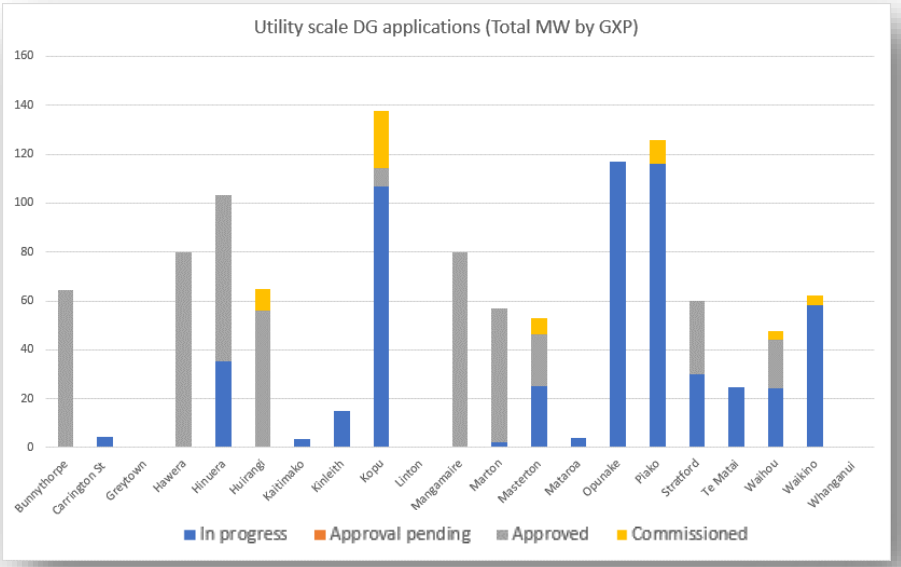
- Network capability (capacity/congestion) is something **your teams already do** (manual, outsourced or not)
- **Your data will be bad** - It's better to start with something a bit broken worked through to the end, then set up processes for fixing. Ops are very good at finding data errors
- Without a **unifying grid model**, engineering and ops teams will disagree on what the network is capable and future system integration costs & time will skyrocket
- Be good friends with your **asset information & IT** teams – you will need their help in supporting data improvement
- **Capacity tools** (internally built or via external tools) flow on naturally once your grid model is sorted - Vendors and consultants will pick you apart if you don't have people with a core understanding of your asset data


I want to export as much as possible...

Our challenge…

We have a strong pipeline of renewable generation
– but some areas are running out of capacity





Right now:
83MW connected

The Pipeline:
53 Applications -
- **500MW** Approved
- **600MW** in progress

Compare ~900MW peak demand

Operationalising Large-Scale DER – What's Working Well from Network Operations Centre

- **Commissioning outside the live control room** — complex DER commissioning is being worked through before formal handover to Operations.
- **Applying an Operational Lens early** — from high level review through to Concept Design review works well when implemented. Removes unrealistic expectations.
- **Operational protocols from the get-go** — expectations are being agreed early between customers, project teams, Network Access, and Operations.
- **Automation protecting the network and customers** — curtailment, runback, and support pathways are reducing manual load and improving response to power-quality or network limit breaches.
- **Real-time DER visibility** — DER Export real time data views are improving situational awareness for Network Operations.

VA Operating Envelope for DER Integration

File Tools View LYS_Operational_Data - Read-Only - Compatibility Mode • Saved to S: Drive

Multiple pages of notes.

1. **11kV CB C875 – Holdsworth Feeder – USDG - 3.8MW Light Years Solar farm (PV) -LYS.**

(USDG = Utility Scale Distributed Generation)

2. **Curtailment Table: Faults.**

(For planned works, refer item 8)

Curtailment Table.		
Activity	**Comments**	**MW Curtailment**
During any switching *(Opening/Closing devices)*	PV circuit.	0 MW
NOR C875 offloads *(After completion of Network switching)*		
Device OPEN	***Device CLOSED***	**MW Curtailment**
Sub CB C875	Sect 11455 or Sect 11517	0
ABS S319		
Sub CB C875	ABS S373	<2.5
Recloser 11090	N/A - nil impact on PV connection	3.8
NOR C875 Supporting load *(After completion of Network switching)*		
Full or partial Load supported from:	***Device CLOSED***	**MW Curtailment**
NOR C881 to NOR C875	ABS S373	3.8
CLV C834 to NOR C875	Sect 11455	
AKU 2 to NOR C875	Sectionaliser 11517	
Fault work: NOC authorised to curtail USDG to 0MW where required for duration of faults.		
Local Service outages	Transformer T3442	0 MW

3. **Operational:**

NOC authorised to de-energise the site at any time.
(To ensure safety to persons, assets & maintain security of supply)

- **Switching reconfigurations:**
  - 0MW during switching activities from the DER site back to CB. (refer planned works table in section 8)
  - Planned works, ideally should be done outside morning & evening peak periods where feasible. (i.e. 0700-0930 & 1700-1900hrs).
- **Re-livening Protocol:** Prior re-livening, NOC must contact solar farm & confirm safe to re-liven.
- **Planned works:** refer Access Planning section below.
- **LOS events to LYS:** 11kV Sw/gear CB 11478/2 auto-opens. *(SCADA Macro)*
- **Feeder reconfigurations:** Refer curtailment table below.
- **Anti-islanding:** Enabled *(within PCO & LYS protection systems).*
- **A/R events** *(Network/Grid)*: Generation ceases - resumes once network voltage stable *(approx. 2Mins)*
- **LYS control scheme stability:** If generation control (LYS) fails to respond stably to voltage changes on the Powerco network CB 11478/2 may trip. *(i.e. Tapchanger operations or significant load reductions)*
- **Power quality:** If LYS creates power quality issues, de-energise LYS & advise PCO operational engineering team. They will assess & confirm to NOC when safe to re-liven LYS.
- **Power Quality Meter (PQM):** Sw/gear 11478 fitted with PQM & alarm/trip capability. PQM can initiate trip to CB 11478/2 on detection of LYS power quality issues.
  PQM initiated trip events: One or more alarms will be presented to View-point:
  - GCB 11478-2 OV TRIP
  - GCB 11478-2 U Freq TRIP
  - GCB 11478-2 O Freq TRIP
- **PQM Alarm/Trip Protocol:** Each PQM alarm/Trip initiates emails to Powerco's Operational Engineering Team to assess & confirm to NOC when safe to re-liven LYS.
- **HLT functionality on CB 11478/2:** refer Network Access & Planning section, item 8.
- **Generation Inter Trip:**
  - NOR C875 trip to lock out on fault – SCADA macro opens CB 11478/2 for safety.
  - Must be Disabled For: *(to avoid nuisance trips to farm/customer)*
    - ALL maintenance on NOR C875.
    - Anytime CB C875 is to be Open/offloaded, i.e. Fdr is to be back fed.

Network & Access Planning related activities.

4. **Outage Planning.**
   - **Customer Advisements:** Planned works require customer to be notified via email.
   - **Permitting & Consent requirements:** refer table below.
   - **Feeder reconfigurations:** Refer curtailment table above.
   - **ICP data:** Site has 2 separate ICP's. Notable Customer notification required w either are going off.
     - local service supply is External to SF, supplied from: **T3442**.
     - Main line generation connection via Sw/gear 11478.

5. **Contact details.**

(LYS) - Light Years Solar Farm. *331 Norfolk Road Masterton*			
24/7 operational contacts	A	[redacted]	[redacted]
	B	[redacted]	TBC
General business contacts		Main Office	TBC
		Email (outage notifications etc.)	[redacted]

6. **Demarcation Details**

Network Demarcation point			
No.	**Asset Type**	**Asset ID**	**Notes**
1	8DJH Switchgear	11478/1	Cable termination connection to 11478/1

7. **HLT Functionality on CB 11478/2.**
   - HLT requirements as per HLT State column in table above.
   - Provides instantaneous tripping at 80Amps in conjunction with a voltage disturbance (reason: Invertor controls cannot provide a high fault current to operate above (generated load)
   - CAC: When HLT enabled & generating; provides stability to generation (note: any upstream network/grid disturbances will cause HLT to open Sw/gear 11478-CB).

Continues over page

8. **Planned Works Table.**

Planned Works Permit & Consent Requirements Table			
Activity	**Comments**	**HLT state**	**MW Curtailment**
Access Permit	Where USDG site is within permit area	Disabled	Isolated
Live Line Works	Working upline or Down line of Recloser 11090	Enabled	0
CAC Electricity	No switching or outage areas involved	Enabled	3.8
CAC Treeworks	Live network works only		
Work Authority	i.e. LFI install or Pole reinforcement		
NOR C875 offloads *(After completion of Network switching)*			
Device OPEN	***Device CLOSED***	**HLT state**	**MW Curtailment**
Sub CB C875	Sect 11455 Sect 11517	N/A	0
	ABS S373		<2.5
ABS S319	Sect 11455 or Sect 11517		0
Recloser 11090			3.8
NOR C875 Supporting load *(After completion of Network switching)*			
Full or partial Load supported from:	***Device CLOSED***	**HLT state**	**MW Curtailment**
NOR C881	ABS S373	N/A	3.8
CLV C834	Sect 11455		
AKU 2	Sect 11517		
Local Service outages	Transformer T3442		0 MW

END

End of document

Screens 1-3 of 3

Key management is an essential tool contributing to personnel & asset safety.

Powerco DER interconnection

Powerco's had DER for 25 plus years.

Outcomes

Powerco

DER growth: ... dynamic

Informed & timely operational decisions

Customer expect... are evolving

Communications & ... maintain security of supply

Currently achieving a form of DERMS operability

HMI: ... data

Operability: Open/Close/.../Curtailment/Dispatch

DER management: Basic

Customer

Data needs: Minimal

Efficient planning & real time communications to minimise curtailments

Maximised generation & revenue across abnormal network configuration periods

Customer needs

Notification

Timely network operations

Communication

Generate baby - Generate!

Future

Current interconnectivity requirements should provide easier integration to DERMS

Manage congestion whilst maintaining security of supply & maximising customer returns

Commissioning

Commissioning DER typically consists of multiples of teams, processes, paperwork & timelines

Why it matters? / Outcome / How

Task hierarchy & alignment

All actions in logical & correct sequence

Contributes to reliability & security of supply

Clarity & ONE point of control

Single commissioning document

Commission plan

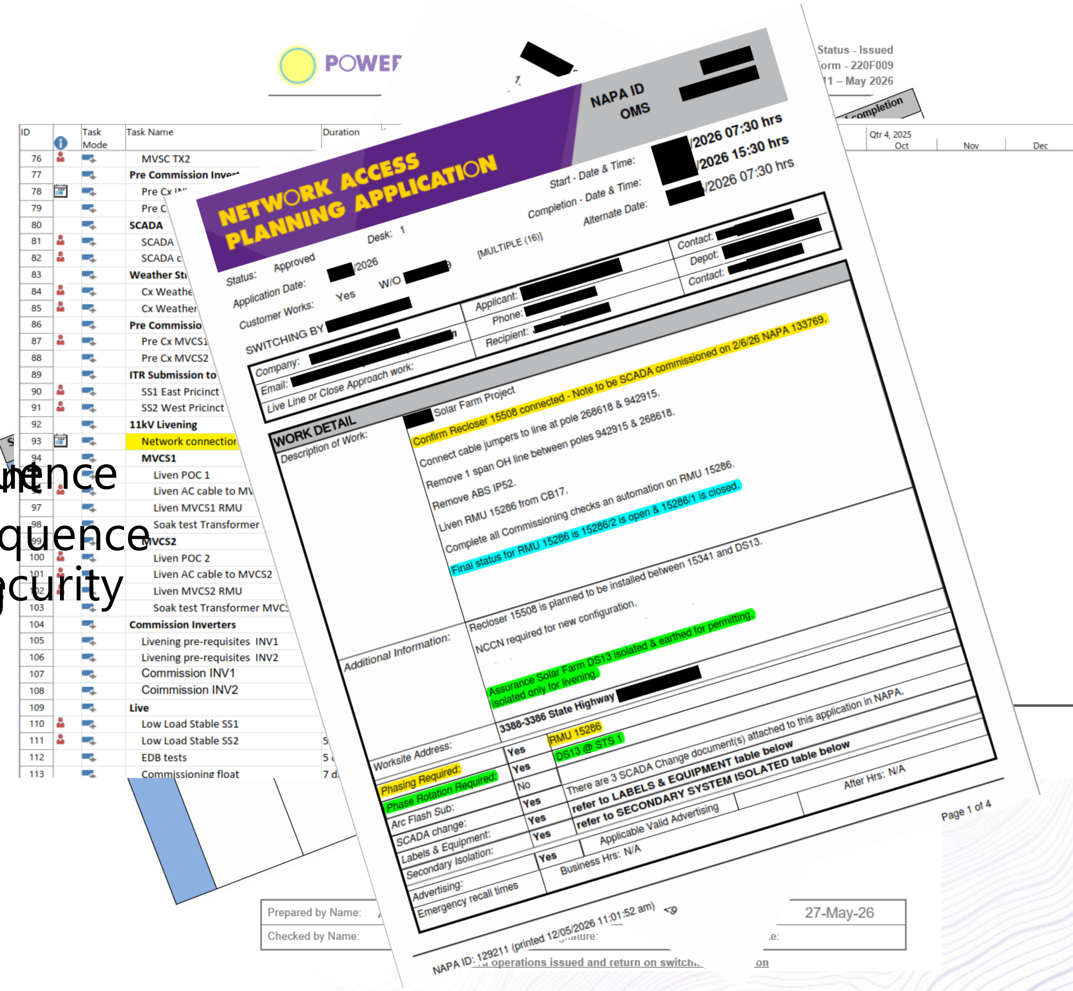
Operational document

- Single document for:
- Who, What, When & Where
- Operational switching provides a sequence

Maintain safety

for all commissioning tasking

One source of truth



How We Work

A dedicated commissioning team, independent of the control room

Our commissioning team consists of:

- Operations Controller.
- Commissioning Engineer (overall coordination).
- Power Quality Engineer (performance & verification).
- DER assigned Project manager.
- Customer's technical representative.

Agile approach to commissioning

- Modified (outage) planning processes to account for:
- Weather & irradiance issues.
- Testing irregularities & technical discoveries requiring rework.
- Teams' availability.

Benefits

✅ Consistent decision-making.
✅ Efficient issue resolution.
✅ Efficient use of time & testing opportunities.
✅ Reduced commissioning delays.
✅ Strong customer relationships.
✅ Safety focused.

Delivering Customer focused outcomes

An informed interface with:

- DER owners
- Network operations
- Engineering
- Contractors & service providers
- Commercial & Legal

Collaboration: Tools & Support

- Use of Microsoft Teams commissioning forums.
- Access to real-time power quality data & operational control of network.
- Provide overall commissioning leadership, process, documentation & data sharing.
- Immediate response & resolution to any testing, faults or power quality issues.

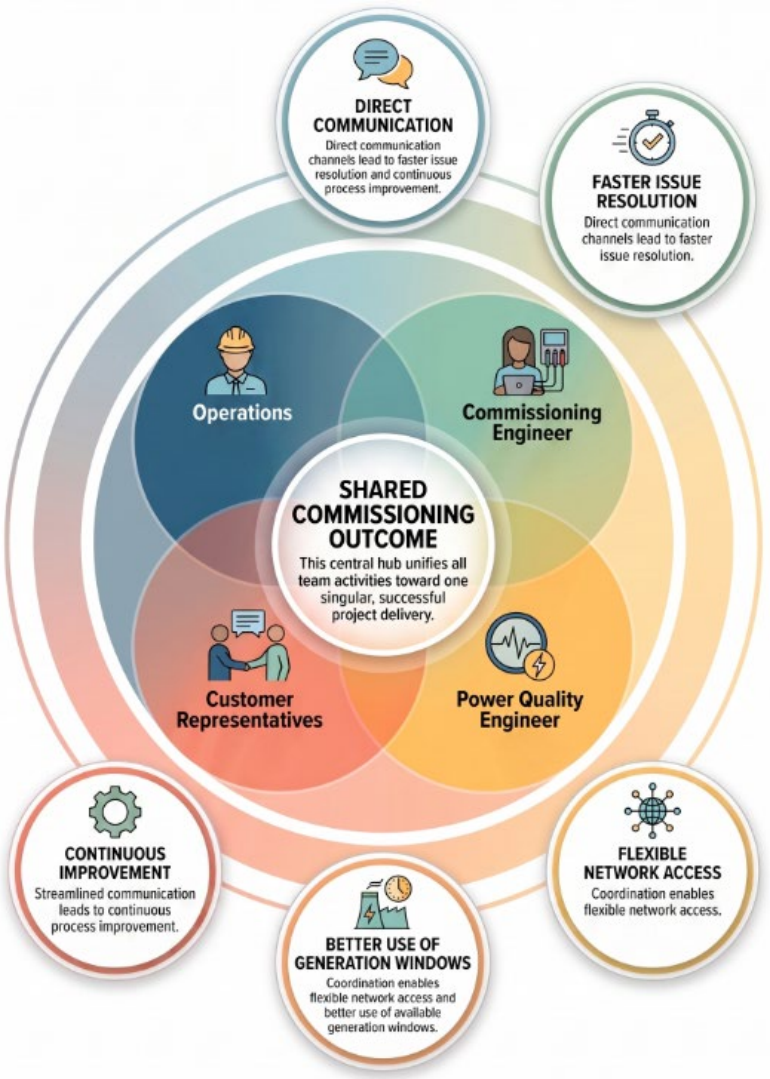
Continuous Improvement

- Validation of systems & network behavior's & settings.
- Ongoing process & documentation reviews.
- Improved efficiencies for future DER connections.

Benefits

✅ Efficient communication & transparency.
✅ Improved power quality & compliance outcomes.
✅ Continuous focus on safety to personnel, assets & security of supply.
✅ Trusted commissioning partnership

The Unified Commissioning Strategy
One Team, One Plan, One Outcome



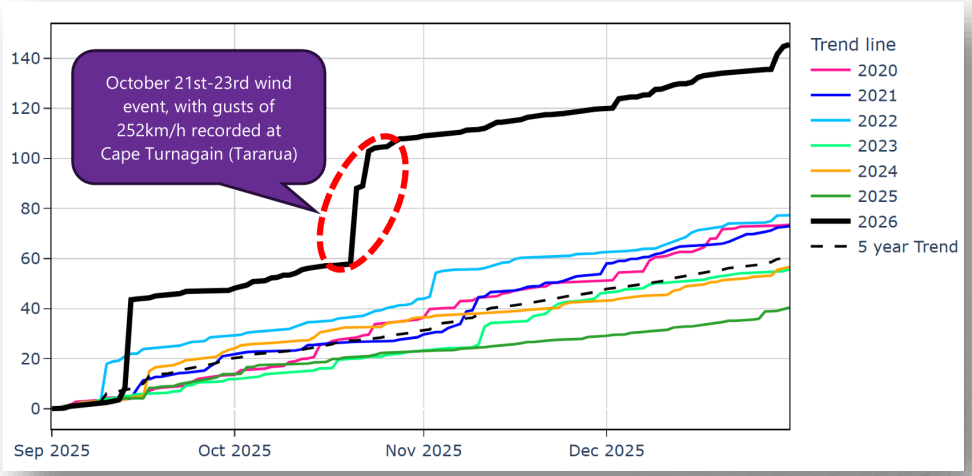
Keeping the same small team involved builds trust, context and pace — especially when conditions change quickly.


I’d hope the power company plans for climate change…

Our challenge…

Climate response is a rapidly developing area as nations move from prevention to adaptation

2022	2022-05-20	May Storm
	2022-06-10	Wairarapa Windy Weather
2023	2023-01-10	Cyclone Hale
	2023-02-13	Cyclone Gabrielle
2025	17.04.2025	Cyclone Tam
	2025	- September Storm
	2025-05-01	Wairarapa Coast line Severe Weat…
	2025.10.21	Weather event - Western network
2026 (so far…)	2026-01-21	Coromandel Tauranga Tropic…
	2026-02-16	Western AOR Weather Event
	2026-03-27	March Tropical Low
	2026-04-12	*Cyclone Vaianu*
	2026-06-26	- Wild Weather Taranaki

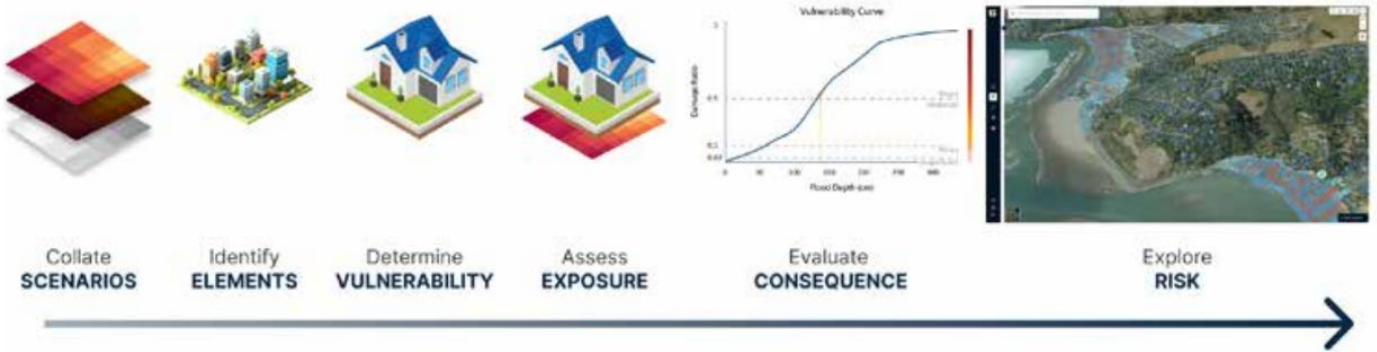


A few things we're working on…

2024 – Carried out exposure/vulnerability for key asset classes against flooding, slips, sea-level rise, vegetation
2025 – Continue developing Community Hubs programme, focussing on community buildings
2026 – Established first marae site with islanding SAPS with part funded EECA Community solar feeding in

What now:

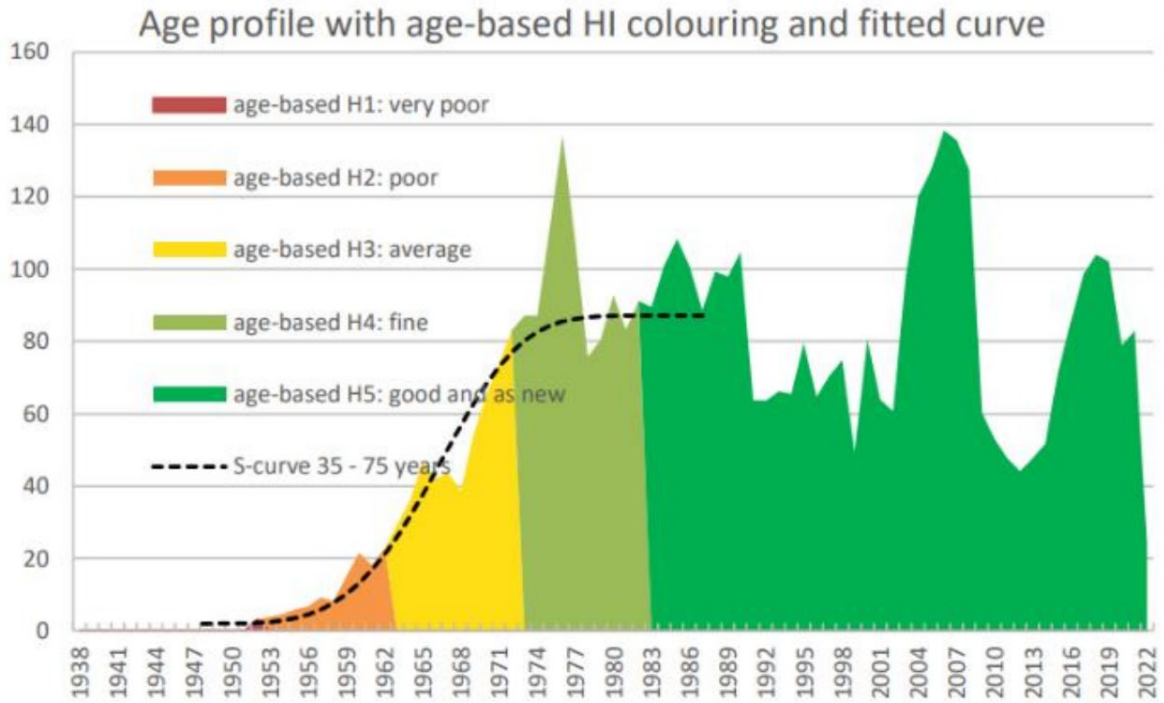
- Exploring greater use of smart meter data to support restoration efforts
- Looking to evolve resilience focus towards customer/community angle, expanding on Lifelines approach
- Surveying of key customer groups, expanding on traditional VoLL into factors that influence individual resilience e.g. solar + battery, community services & other critical infrastructure
- Potentially exploring trial with **Urban Intelligence** (used by a number of EDBs/Councils) – common NZ EDB hazard functions, **functional isolation** concepts & infrastructure interdependencies



“I’d hope the power company looks after their network…”

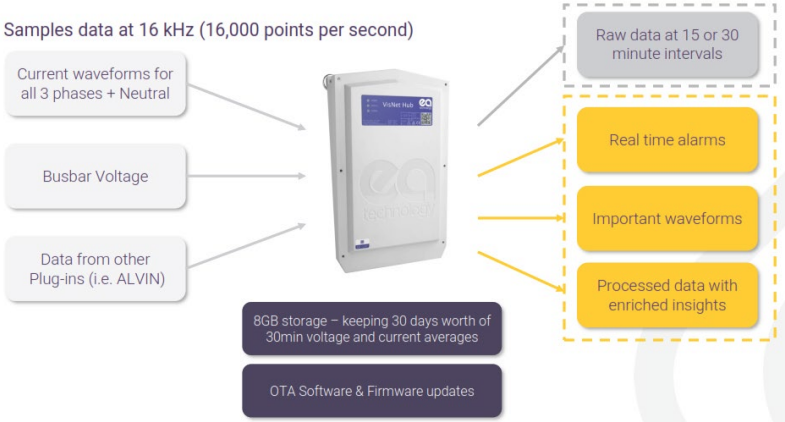
Our challenge…

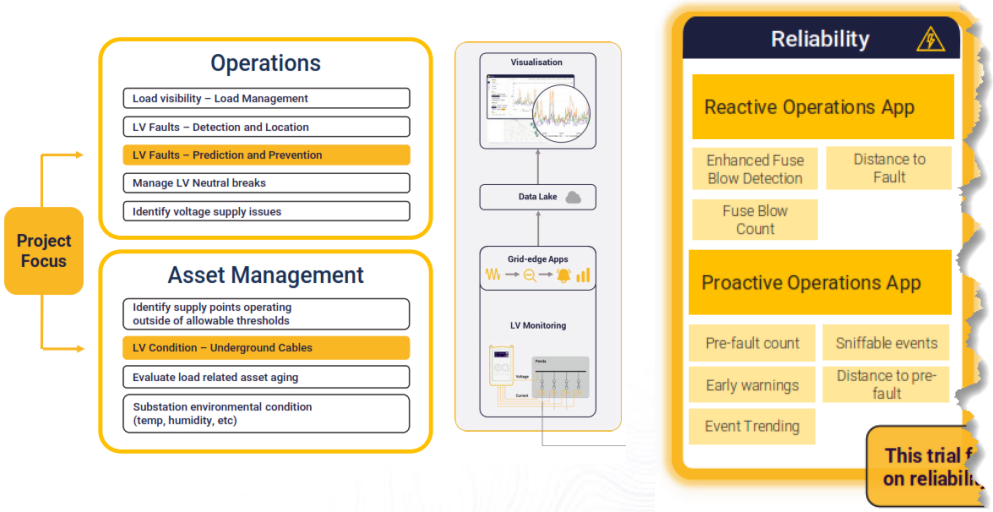
Urban Low Voltage cable networks are where 90% of customers connect – but large portions may be coming up for renewal



NZ Lens cable health monitoring INTSA

- There is an opportunity to improve our understanding of LV network health to optimize replacement work with other utilities.
- Currently working with Orion & Unison to trial EA Technology's low-voltage monitoring devices (VisNet® Hub) & analytics platforms
- Joins a suite of approaches (including smart meter data, transformer monitors) to provide visibility on LV network health, these types of monitors utilizing high-frequency (16kHz) waveform measurement paired with compute at grid-edge
- This trial will be facilitated by EA technology, hoping to survey a representative sample (400+ LV feeders) to provide further understanding in to NZ cable health





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Thanks for listening!
Questions?

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