Flexibility

27th June 2023
Electrical Engineers Conference, Flexibility Workshop

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solarZero

- Largest VPP in Asia Pacific and the 3rd largest in the world
- First in the world to provide reserves via distributed batteries
- Delivering non-network solutions in Upper Clutha and Coromandel
- Current Scale - 11,000 systems, 40MW, 60MWh storage
- Target Scale: 100,000 systems, 400+MW peak, 1GWh of storage, 35MW hot water
- Owned by BlackRock, partnered with Panasonic

solarZero is much more than the technology (solar and battery). It's about how our communities, technology, finance and smart communication, control and data systems are brought together to **create a better power system**

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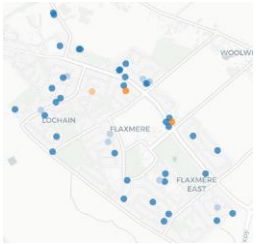
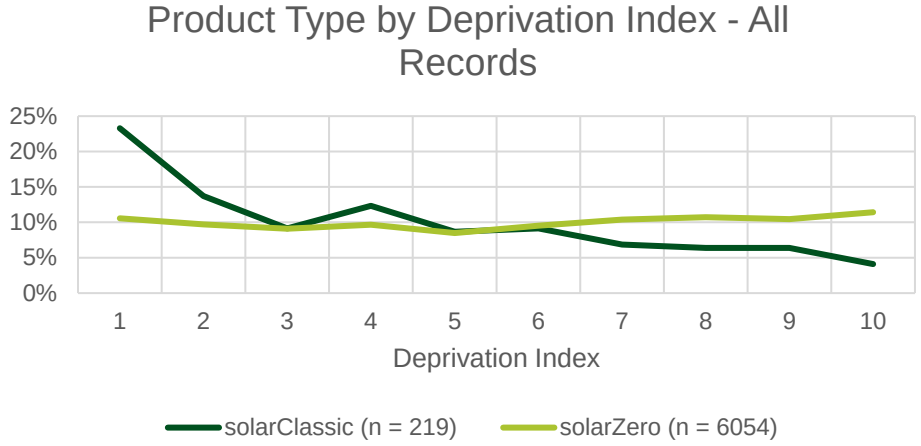
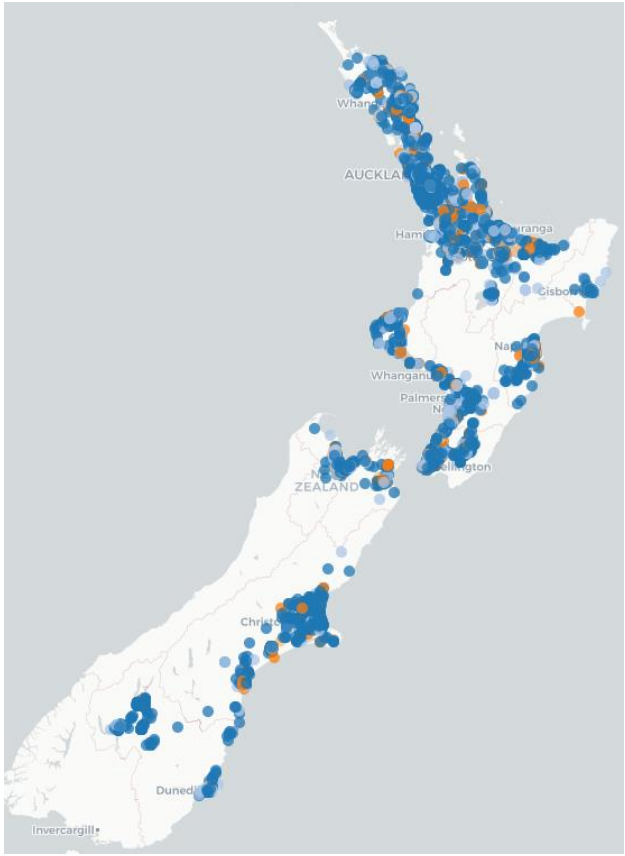
solarZero systems nationally

South Auckland

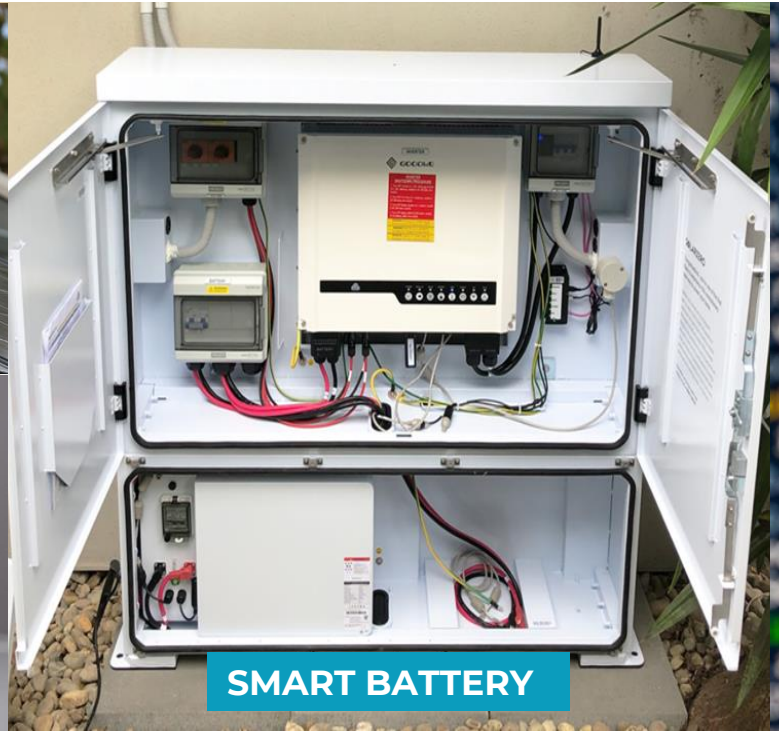


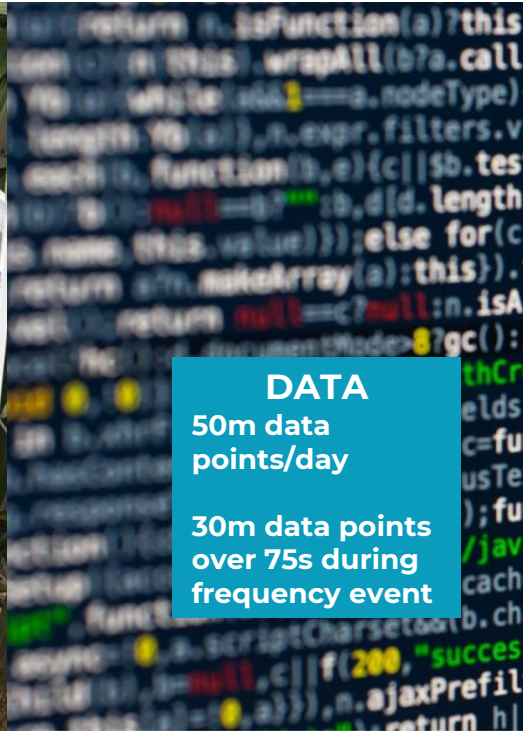
Flaxmere/
Hastings





The platform





+ Not just supporting households, but also the power system too

Agenda

- The Big Idea
- The prize
- Community
- Power quality and standards
- Transparency
- Innovation and incentives

The BIG IDEA

What if we could make demand elastic?

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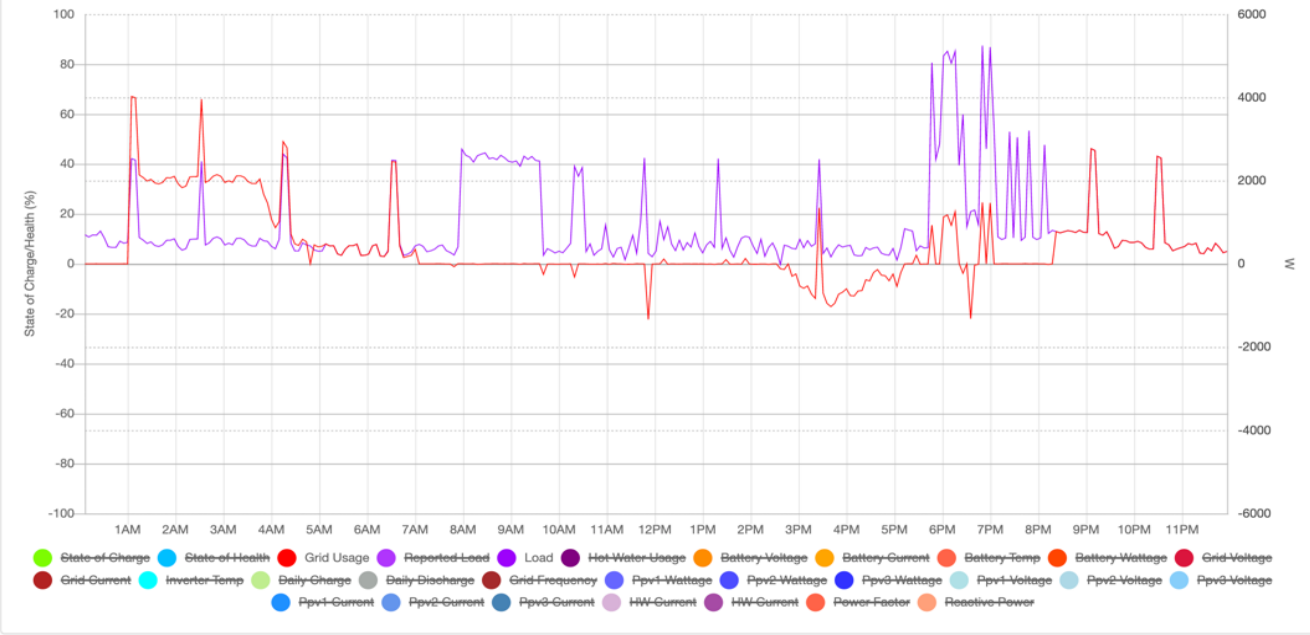
Elasticity: solarZero's effect on our customer's energy profile

Meet customer load

Discharge into the grid if required



Flexibility: The Prize – will we collectively take the prize?

It's really big – billions of dollars

Two huge drivers at the same time:
- Electrification of the economy
- New technology mostly behind the meter

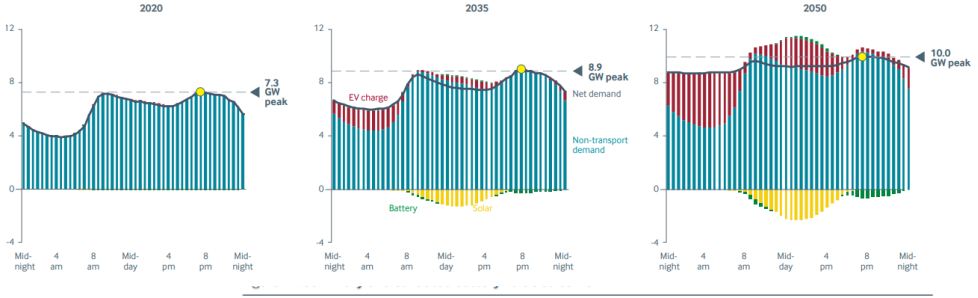
Either an orderly and efficient transition or…

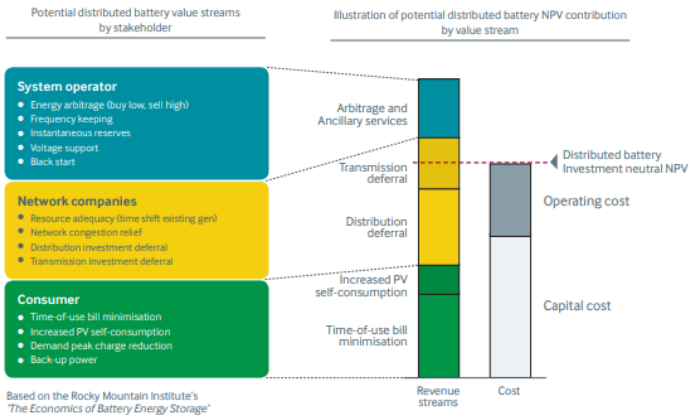
It will happen anyway and eventually – lots of smart devices:
- Doing clever things
- Or NOT doing clever things

How does the industry want to embrace and work with the new technology?

Figure 19: **Peakiest day profile**

(GW, Accelerated Electrification)





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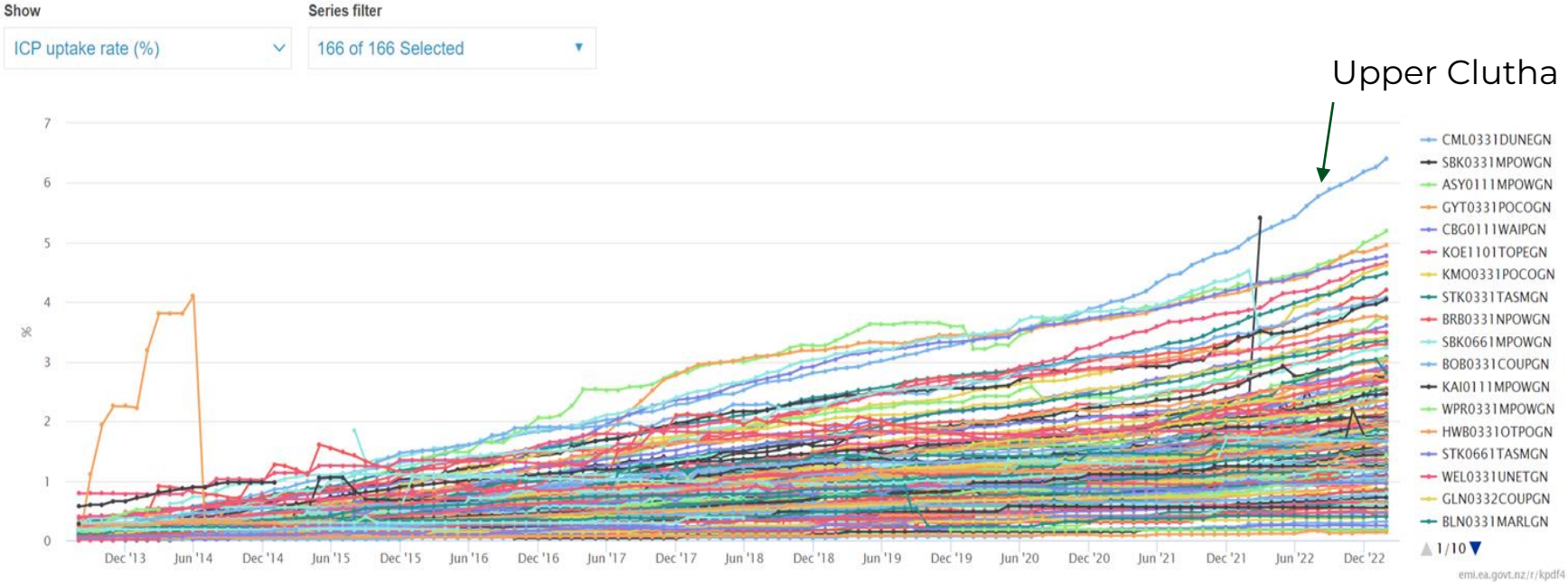
Community understanding and incentives

- The community does not understand what a lines company is, who they are what they do, unless something has gone very wrong

- Incentives are really important – lines pricing

- We need to work collectively on non-network solutions – the learning curve is huge

Influencing community uptake



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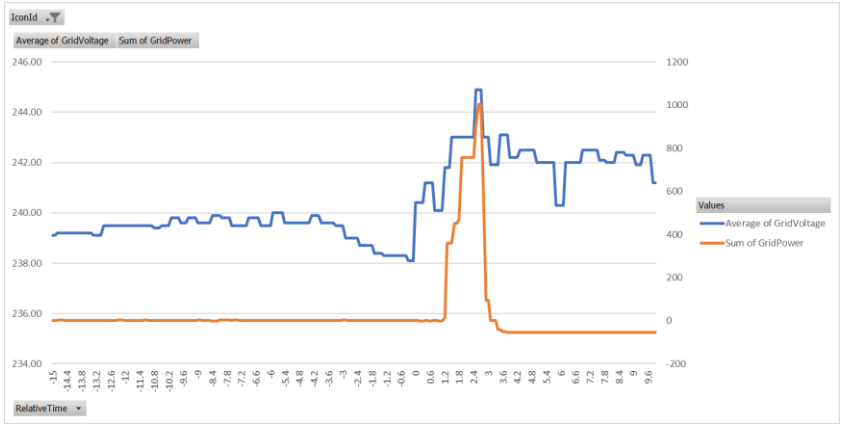
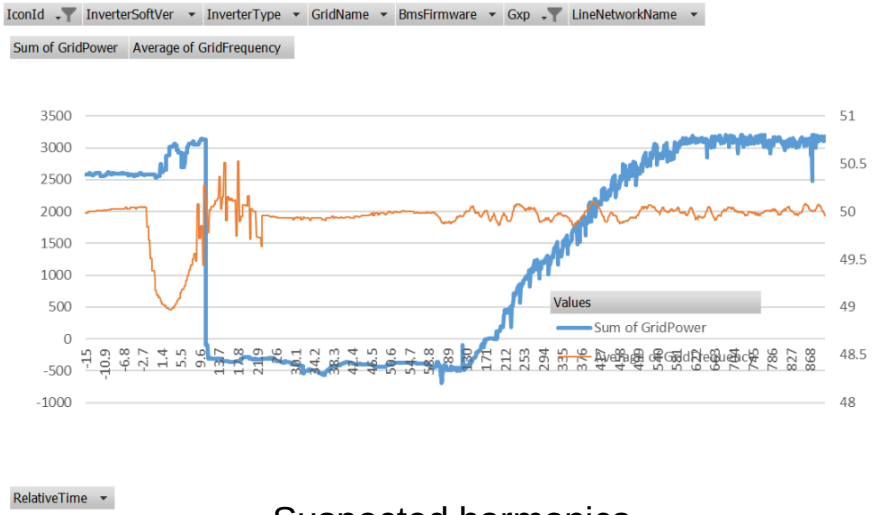
Power quality becomes really important

Power quality needs to be good to enable our systems to stay connected and respond when required



High voltage



Suspected harmonics

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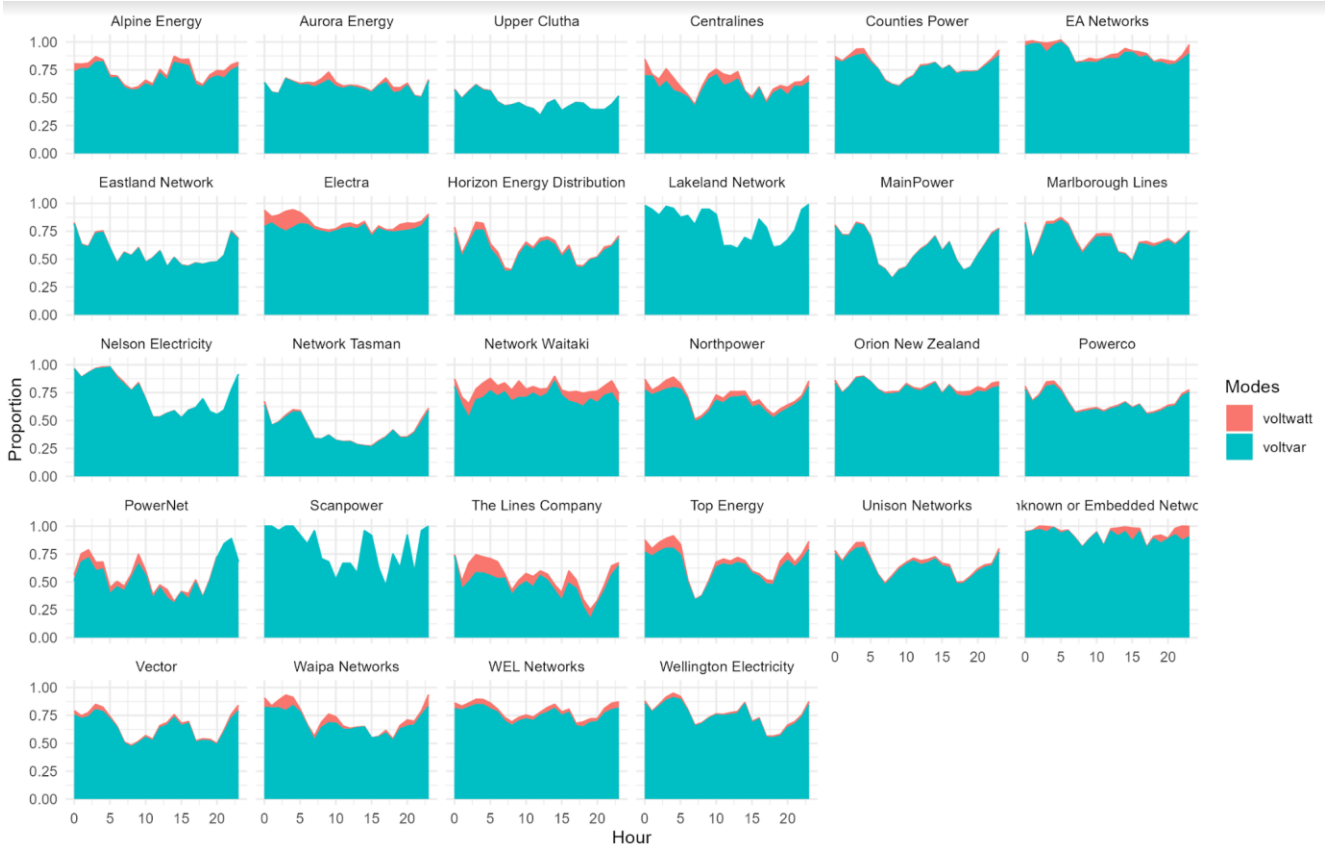
4777.2:2020 is problematic, needs to be changed



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Transparency and accuracy

Non-network- Do nothing Network - Upgrade cable	4M	Upgrade cable.	Network - Create interconnection Network - Upgrade 33kV conductor Network - Upgrade 11kV conductor Non-Network - Distributed Generation Non-Network - Battery Technology Do nothing	6.8M	Creating an interconnection between the two substations resolves both constraints at the same time. It will require obtaining permission to install lines or cables across private land. Upgrading the existing 33kV connections is the most expensive option but has some renewal benefits. Upgrading the 11kV reduces the risk but to completely resolve the constraint would require 33kV upgrades. Distributed generation and battery technology are currently too expensive in comparison with the other options.
Predicted voltage constraint on Mangatahi Feeder. Project to be confirmed following detailed verification survey.	Non-Network - Do nothing Network - Reconductor Network - Voltage regulator	300k			
Onekawa 33kV network is reaching its limits and will require sub transmission circuit reinforcement including substation assets.	Network – Multiple 33kV circuits from existing GXP Network – New 110kV injection point in Napier	15M			

Options	Cost ($)	Solution
Network - Upgrade cable Network - Deploy 11kV fast transfer scheme Non-network - Dynamic feeder rating Non-network - Battery technology Do nothing	3M	Upgrading the cable will completely resolve the constraint for the lowest cost. Dynamic rating or a fast transfer scheme would only be useable under certain load conditions. Dynamic ratings would also require the installation and maintenance of monitoring equipment and the transfer scheme would require the installation and maintenance of automated switchgear.

5. **Implement demand side management and non-wires alternatives:** This area has a large residential component and implementation of non-wires alternatives will be considered and subject to technology development, customer adoption and regulatory settings.

PREFERRED SOLUTION

Option 3 is preferred. The cost is less than both Options 2 and 4, and it relieves the developing constraints at all three zone substations. The cost of a new zone substation plus an 11 kV cable network is much greater than upgrading an existing zone substation.

Innovation and incentives

- Learning is really hard and time consuming - for everyone!
- Innovation incentives are needed to kick start progress, get everyone up the learning curve faster
- Question is: What form of incentives?

We can do better, faster

- Elasticity is possible!
- The prize is large
- Lines charging regimes/incentives
- Accelerate the whole industry by rewarding innovation
- Power quality – ensuring systems *can* respond effectively

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