Regulatory Distributed Energy Integration Program (DEIP) Dive Workshop

6 JUNE 2019, ADELAIDE

Co-Hosts:

AEMC

Australian Government
Australian Renewable Energy Agency

ARENA

WHY COME TOGETHER?

The increased use of distributed energy resources (DER) offers opportunities for a more agile, lower cost electricity system. In a high DER future, distribution networks have an important role in maximising the benefits that DER can provide to all users of the electricity system.

Guided by this, ARENA and AEMC brought together over 60 stakeholders from market bodies, industry organisations, consumer advocacy groups, and state and territory governments to work collaboratively on the issue of how distribution network service providers (DNSPs) and regulatory frameworks can best facilitate customers' use of DER while keeping the total cost of the electricity system to the minimum.

The DEIP Dive workshop was used as a platform to ask the 'big picture' questions and agree on what the key issues are, the short-term actions and the longer term changes needed. The outcomes will inform AEMC's work, ARENA's funding initiatives, and unite the future activities to be coordinated by DEIP members and industry more broadly.

This summary presents the key takeaways and discussion points from the workshop. While ARENA and AEMC work to ensure that knowledge is shared effectively from its projects and work, due to the sensitive nature of some information presented, *Chatham House Rule* was applied to this workshop. We have endeavoured to seek approval, and indicate a reference point, to as much knowledge as possible. At the back of this summary note, you will find a number of presentations from the day.

WHAT WERE THE KEY TAKEAWAYS?

- Successful regulatory reform will better incentivise network businesses to operate in a way that delivers the lowest total system cost, while maintaining reliability and security and meeting customers' expectation at the same time. The challenge at the distribution level is how to balance the value to the electricity system that is lost through export constraints with the costs of network investment in order to best reduce constraints.
- There are information gaps in the electricity system, particularly around DNSPs' visibility and their understanding of hosting capacity in their low voltage (LV) networks. This hampers DNSPs' efforts in identifying the most efficient solution to technical issues brought about by high DER penetration, and is also a barrier to DNSPs facilitating the increasing uptake of DER by customers. Technical standards, technology, tariffs and connection arrangements are levers that can help achieve a more efficient utilisation of network capacity.
- How customers use the electricity system in the future will impact on the design of future tariffs. There was discussion around creating a new 'customer compact' for users' access to the distribution network, the potential for the need to develop a bidirectional charging regime and possibility for machine-to-machine tariffs that could streamline customers' decision making from the complexities.
- Data was identified as an enabling component to many of the opportunities that could maximise DER's benefits to the electricity system. Discussions included the need to protect customer privacy, enable appropriate access where valuable, combine multiple data sets, mitigate risks of critical infrastructure, and effectively manage data storage.
- A number of trials and sandboxes were identified that could be used to better understand and test potential reform and improvements in the system. For example, looking at the behavioural impacts of pricing models and exploring how to best navigate equity issues moving forward.

DELIVERING OPTIMAL INVESTMENT IN THE DISTRIBUTION NETWORK

Session one explored the key question *'How can the regulatory framework deliver an optimal amount of distribution network investment and non-network enabling expenditure, at the right time, to maximise net benefits for customers?'* The session was introduced by Craig Chambers from ARENA, and Charles Popple, Richard Owens and John Mackay from AEMC.

SA Power Networks and Endeavour Energy shared their perspectives and experiences on DER uptake in their respective network areas, and discussed the mechanisms their organisations are currently using to manage increasing DER penetration. The session was followed by a breakout activity that saw attendees separate into groups and discuss various future scenarios.

Key Takeaways

- Networks have a finite capacity, and DNSPs currently have limited visibility of the lowest levels of their network, particularly where additional DER is being connected and how this is impacting on the operational capacity of their networks. There is a growing need for information, and new technologies such as smart inverters, smart meters and control devices could provide a ready source of data; however, this raises new issues of access, universality, privacy and storage.
- The uptake and use of DER is driven by customers, and regulatory frameworks should support DNSPs to become platforms that maximises the benefits that DER can provide to all customers along the value chain.

Panel discussion points

- Customers' perspectives on network services are changing and the industry may need to reconsider business models to adapt. The telecommunications industry and their pricing structures could provide some useful insights.
- The implementation of full functionality required under AS4777 is important in decreasing inverter curtailment and will ultimately work in the customers' best interests. Compliance to standards will become increasingly important.
- Potential options for addressing the challenges of optimising network hosting capacity include:
  - Building additional network capacity;
  - Procure demand-side services and infrastructure;
  - Continue with current practices of imposing static export limits in areas with technical issues (e.g. voltage constraints);
  - Dynamic export constraints, which may be the most efficient solution, as it is important to acknowledge that network congestion vary both in time and location, and therefore some DER exports may only need to be constrained on the rare occasions it threatens security.

EFFICIENT ALLOCATION OF DISTRIBUTION NETWORK CAPACITY

Session two explored the key question *'How should distribution network capacity be efficiently allocated when there are competing users, and how should it be paid for?'* The session was introduced by Ed Chan from AEMC and Richard Owens facilitated a group discussion before attendees reconvened in their groups to continue discussing the proposed future scenarios.

Key Takeaways

- In the past, many of the challenges surrounding network capacity were one dimensional (i.e. how to ensure the network can meet maximum demand within the bounds of customers' value of reliability), but with recent technological improvements and customer investments in DER they have now become a multifaceted socio-techno-economic challenges.
- Tariff reform remains a contest of views, with some stakeholders advocating for a staged approach, while others argue that incrementalism won't achieve the necessary change fast enough.
- Many views exist on how to best value customer exports and apply export limits, which creates a debate around equitably allocating access to the network.
- DNSPs have different methods of allocating network capacity, with the static limit based on a 'first come, first served' principle currently being the most common. In future, technical standards, tariffs, access and connection arrangements could be used as levers to influence the future allocation of network capacity. It is important to note that these arrangements need to be considered together, as not one measure is capable of addressing the issue on its own.

Panel discussion points

- Improvements to inverter settings could be an 'easy win' solution to increasing DER hosting capacity, and can complement other measures.
- There is a need to reform access and pricing arrangements to ensure efficient and equitable grid investment and operation in a high DER environment. This may require a redesign of the 'social compact' around electricity and the rights, responsibilities and expectations of people connecting to the grid both as producers and customers of energy. Batteries may be a good place to start due to the lack of legacy issues such as grandfathering.
- At some point in the future we will no longer be designing tariffs for customers, but rather for smart technology, and this will change the incentive structures.
- Cross-subsidies are a growing issue, especially in relation to the under-recovery of revenue from solar PV owners.
    - Prior analyses on the equity implications of rooftop solar and the impacts of cross-subsidies have been undertaken by a number of customer-focused organisations, some of which are considering potential reform to the current charging frameworks. This may include a rule change request to remove the current prohibition on DNSPs to apply a use-of-system charge on energy exporters.

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1.WELCOME, GOALS & SCOPE

Craig Chambers, , Senior Consultant, ARENA

Charles Popple, Commissioner, AEMC

DEIP's purpose

Craig Chambers, ARENA

"To collaborate to maximise the value of customers' DER to the Australian energy system for the benefit of all energy users."

Secretariat

Steering Group

Energy Security Board **COAG Energy Council**

DEIP at a glance

Information exchange and collaboration

Past DEIP Dives

Identify knowledge gaps

Today's DEIP Dive

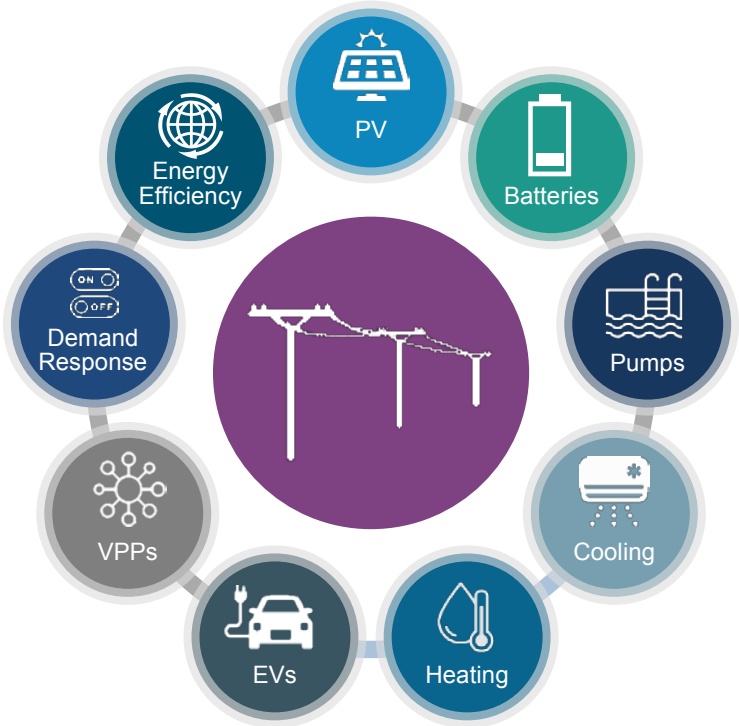
Define priorities

Today will inform into ARENA's funding considerations.

Today's goal

Charles Popple, AEMC Commissioner

"Formulate a vision for how network regulation can support the efficient integration of DER"



- Impact of high DER on DNSPs' operation and regulation
- Role of DNSPs is the focus, as they can be a key enabler for maximising the value of DER
- Complements current work by DEIP members and others
- Today will feed into AEMC's 2019 Electricity Network Economic Frameworks Review.

SCENE SETTING

Richard Owens, Executive General Manager, AEMC

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What are we taking as read?

DER

- Is behind the meter – PV, EVs, demand response and batteries
- There will be high DER penetration in the future
- Varying by location, pace, and type
- Issue is not whether to encourage higher DER, it's how we integrate it in a way that maximises the benefits for all consumers

What does success look like?

- Judged from perspective of all consumers
- Lowest total system cost while maintaining reliability and security
- How regulation of DNSPs can drive lowest total system cost.

What are we taking as read?

Regulation

- Range of regulatory options available
- On a spectrum from 'light touch' to 'heavy-handed'
- Typically light touch is preferred
- Regulation of any monopoly infrastructure is a special case
- Incentive regulation is used in Australia.

DNSPs' role

- Will still transport electricity
- Will still operate networks safely and reliably
- What may change is aspects of:
  - how they operate
  - how they are regulated.

What we will explore

Two key questions about a future with high DER:

How can the **regulatory framework** deliver an **optimal** amount of distribution **network** investment and **non-network** enabling expenditure, at the **right time**, to **maximize net benefits to consumers**?

How should distribution **network capacity** be **allocated** when there are **competing users**, and how should it be **paid for**?

Question 1 – Optimal investment (previously 'capacity')

How can the **regulatory framework** deliver an **optimal** amount of distribution **network** investment and **non-network** enabling expenditure, at the **right time**, to **maximize net benefits to consumers**?

- This topic is about regulating monopoly infrastructure to achieve the optimal amount of:
  - network capacity (i.e. investment)
  - network monitoring & data
  - other options (e.g. phase balancing, tap changes, demand management?)

  at any point in time

Question 1 – Optimal investment

- Topics include:
  - what are DNSPs current security, quality and reliability obligations, how is DER impacting those obligations, and what strategies are DNSPs adopting to address those impacts?
  - How much do DNSPs currently know about their LV networks, their DER hosting capacity and extent of constraints and other issues. How much more will they need to know in a high-DER future? What are the options to fill those information gaps?
  - How should DNSPs determine what to invest in, and when to make investments to best take advantage of DER?

Question 2 - Allocation

How should distribution network **capacity** be **allocated** when there are **competing users**, and how should it be **paid** for?

- About allocating a scare resource
- About charging for its use
- Conceptually follows Question 1
  - once optimal investment determined & achieved at any point in time
  - apply an approach to allocating that capacity (a scarce resource) and paying for it.
- In reality the two questions are linked, eg how you charge for capacity will affect how much capacity consumers demand
- Topics to include – technical standards, tariffs, access and connection arrangements.

Overview of today's approach

- Aim of the day is to get people thinking about these bigger picture questions and agree on what the key issues are, so as to inform future work by the AEMC, other DEIP participants and ARENA funding
- Aim is not to agree on answers to all of these questions
- Three scenarios we will use through the day:
    a. Passive PV, active consumers
    b. Stored and aggregated
    c. Urban charging EVs.

Run of the day

Jackie Biro, Director, AEMC

Morning session – optimal investment (Q 1)

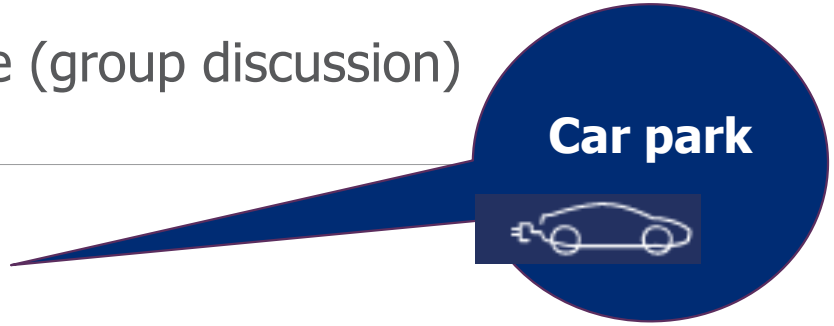
a. Current mechanisms
   - Overview presentation
   - DNSP and Q&As (Morning tea)

b. What needs to change in the future (group discussion)

Afternoon session – allocation aspects of network capacity (Q 2)

a. Current mechanisms:
   - Overview
   - Panel and Q&As

b. What needs to change in the future (group discussion)



Report back and next steps

2. OPTIMAL INVESTMENT

CURRENT MECHANISMS - OVERVIEW

John Mackay, Senior Specialist Consultant, AEMC

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The question we are considering in this session

- In a high DER world, how do we get the right amount of investment in network capacity, at the right time, to deliver the lowest possible electricity prices while maintaining security and reliability?
  - Export constraints reduce the amount of energy for sale, impacting energy costs. Investing to address those constraints impacts network charges. How do we get the balance right?
- Aspects of network capacity investment we are considering today:
  - incentives & revenue determinations
  - information transparency
  - degree of urgency
  - who pays?

How can **regulation** facilitate an **optimal** amount of **expenditure** at the **right time**, to **maximize net benefits to consumers**?

How is it done now?

Funding

- Revenue determination process
  - efficient costs of meeting expenditure objectives –principally quality, reliability or security of supply (6.5.7)
  - RIT-D provides for cost/benefit assessment
  - Once allocated, revenue is not tied to projects or constraint outcomes

Incentives

- Financial incentives through the CESS and EBSS
- Service target performance incentives for reliability
- DMIS for network support
- No explicit incentives around export constraints
- Obligation to connect, but no export obligation

Are current arrangements suitable for a high DER future?

- This is what we are here to discuss …
- Some things to consider:
  - What would be the consequence for DNSPs right now if they just did nothing? What would be the consequences for consumers?
  - What is the right investment trade off? What's the test?
  - How do we get there? What's missing in the current framework?
  - What information would be needed to apply the test? Is it available?
  - Are current reliability and quality obligations appropriate in a high-DER world? Are new operating methods needed to meet those obligations?
  - What benefits could DER provide to networks (or other network users)? Do batteries change everything?
  - How could helpful DER investments and behaviour be encouraged, and unhelpful DER investments and behaviour dissuaded?
  - How is constraint related investment dealt with in the current framework? - Endeavour Energy, SAPN

CURRENT MECHANISMS – DNSPS' PERSPECTIVES

Endeavour Energy: Ty Christopher

SA Power Networks: Mark Vincent

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WHAT MIGHT NEED TO CHANGE IN THE FUTURE - TABLE DISCUSSION

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Optimal investment questions - what might need to change in the future

Reflect back on the core question: How can the regulatory framework deliver an optimal amount of distribution network investment and non-network enabling expenditure, at the right time, to maximize net benefits to consumers?

1. Goals

- How might DNSPs' network operation and investment decisions need to change in a high-DER future?
- What does optimal expenditure, at the right time, look like in a high-DER future?

2. Regulatory mechanisms to achieve the goals

- List the aspects of the current regulatory framework that you would retain and those you would reform.
- Looking at this list, then rank the top 3 mechanisms and outline why each would achieve better investment decisions.

3. Fill gaps - list the current data, knowledge and skill gaps, and outline a study/trial that could fill each gap.

3. ALLOCATION

CURRENT MECHANISMS - OVERVIEW

Ed Chan, Director, AEMC

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The question we are considering in this session

- Distribution network capacity is likely to remain scarce in the future
  - It is unlikely to be in the interest of consumers to 'build out' the distribution network to accommodate all import and export requirements
- Aspects of network capacity allocation we are considering today:
  - Access and connection arrangements
  - Tariffs and charging mechanisms
  - Other optimisation platform such as DSO

How should distribution network **capacity** be **allocated** when there are **competing users,** and how should it be **paid** for?"

How is it done now?

Access and connection

- Open access, connection agreements and service installation rules
- Framework designed around meeting reliability standards for consumers, not producers
- DNSPs must connect DER but have no obligation to enable export
- For producers, it is a 'first come, first serve' and 'one size fits all' approach
- DNSPs have limited visibility of LV network constraints so limited practical ability to implement more dynamic approaches

Tariff and charging mechanisms

- Consumption charging only
- Limited set of 'network services', based around meeting the needs of consumption

Are current arrangements suitable for a high DER future?

- This is what we are here to discuss …
- Some food for thought:
  - Geography and time-of-day is likely to matter more in the future
  - What role should connection requirements and technical standards (e.g inverters) play?
  - If networks become a platform for a range of services, how should they charge for those services? Who should they charge?
  - How should scare capacity be rationed, eg constraints that apply equally to all consumers, pricing signals, different access products with different levels of "firmness", other tools?
  - What role do DSO platforms play in a high DER future?
  - How important is it for the access framework between distribution and transmission network to be aligned?
  - What additional data would we need to facilitate alternate approaches?
  - We could just do nothing…what would be the benefits and risks?

CURRENT MECHANISMS – PANEL

Ann Whitfield, HoustonKemp
Melanie Koerner, CutlerMerz
Mark Byrne, Total Environmental Centre
Darren Gladman, Clean Energy Council
Anthony Seipolt, AER

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WHAT MIGHT NEED TO CHANGE IN THE FUTURE - TABLE DISCUSSION

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Allocation questions - what might need to change in the future?

Reflect back on the core question: How should distribution network capacity be allocated when there are competing users, and how should it be paid for?

1. **Goal** – what does efficient allocation of capacity look like, and who should pay for the services DNSPs provide?

2. **Regulatory mechanisms -**
   - List the aspects of the current regulatory mechanisms that you would retain and those would you reform.
   - Looking at these, rank the top 3 mechanisms & outline why.

3. **Fill gaps** - list the current data, knowledge and skill gaps, and outline a study/trial that could fill each gap.

- Access and connections
- Tariffs and charging
- Technical standards
- DSO platforms

4. REPORT BACK & NEXT STEPS

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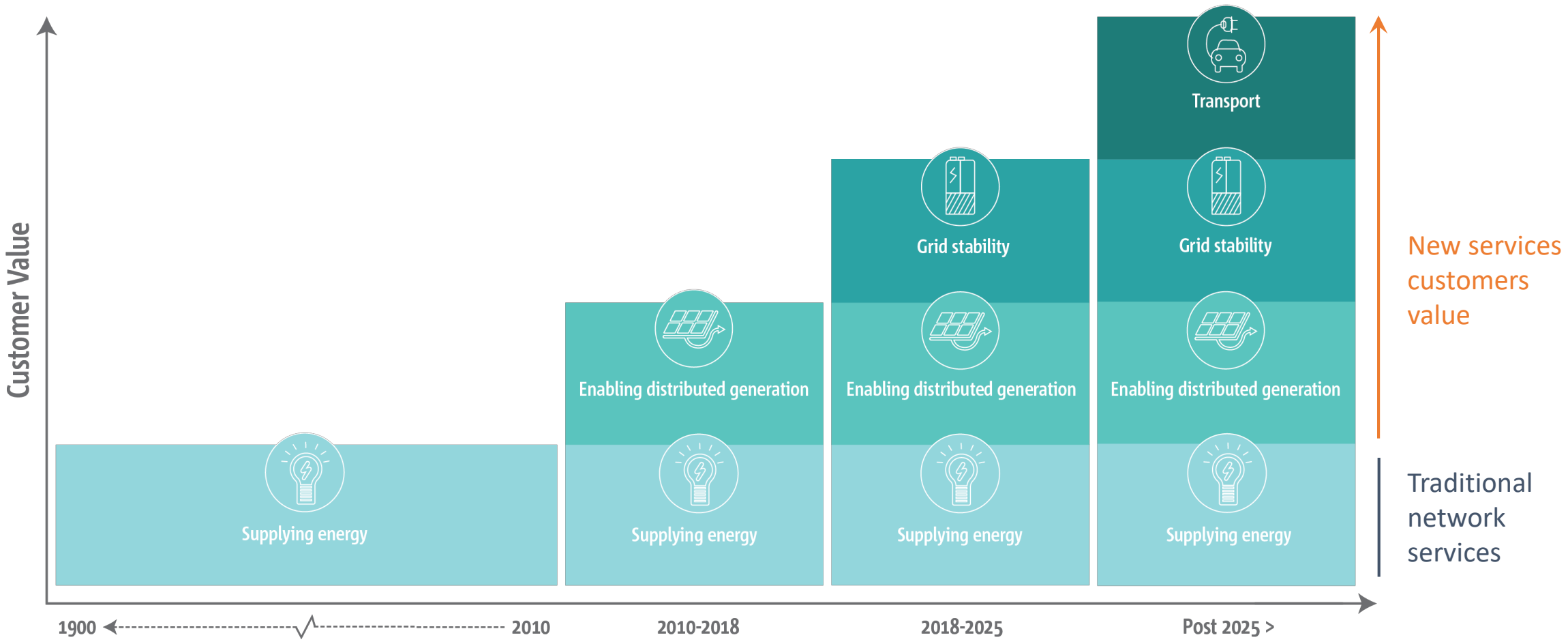
SA Power Networks

Maximising customer value from the network in a high-DER future

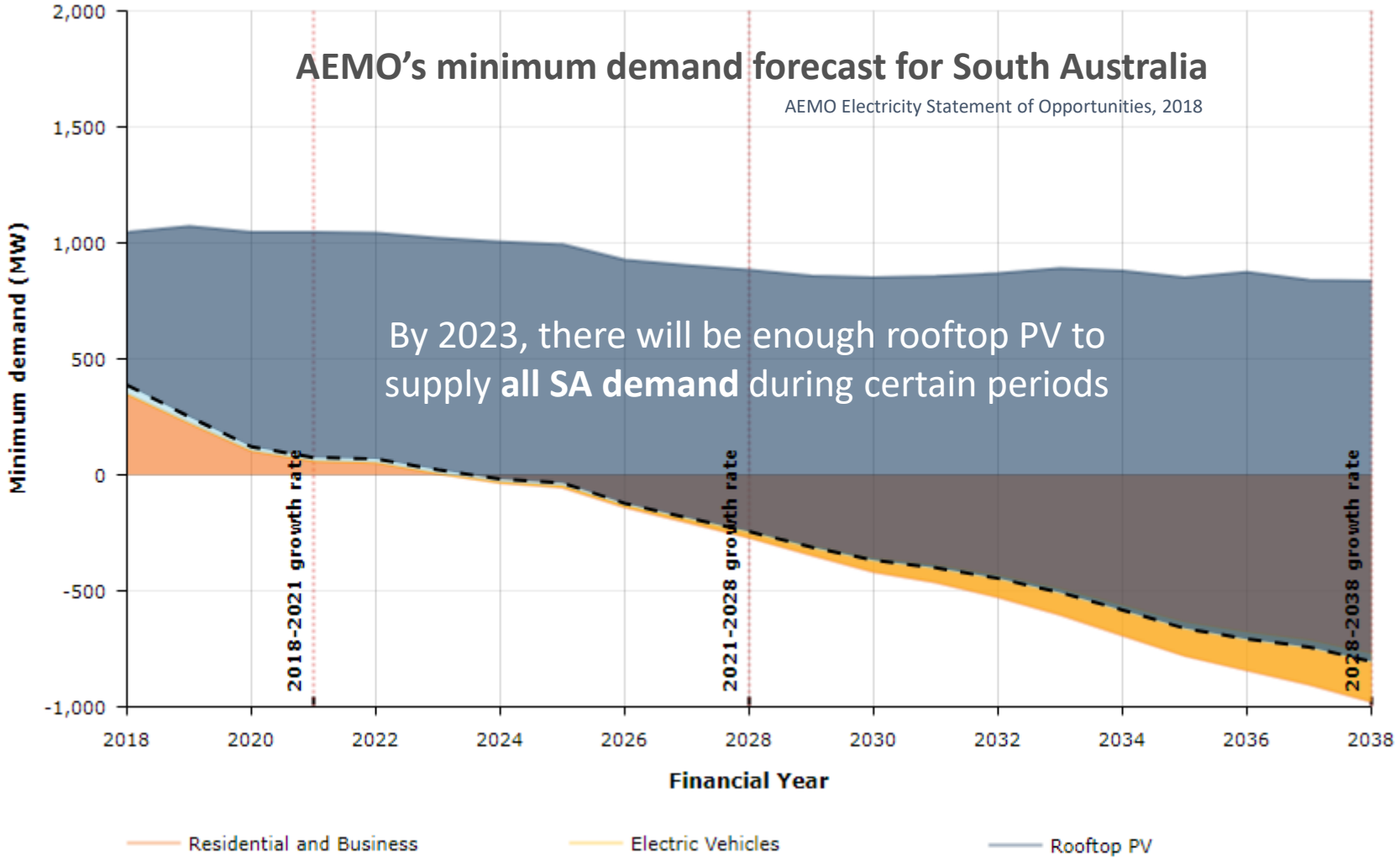
AEMC / ARENA Regulatory DEIP dive, 6th June 2019

The future of the distribution network

- Providing additional value for customers
- More relevant than ever



Distributed resources: integral to the energy mix



Rooftop PV

The **largest generator** in the State

Distribution network now **key source of supply** as well as meeting demand

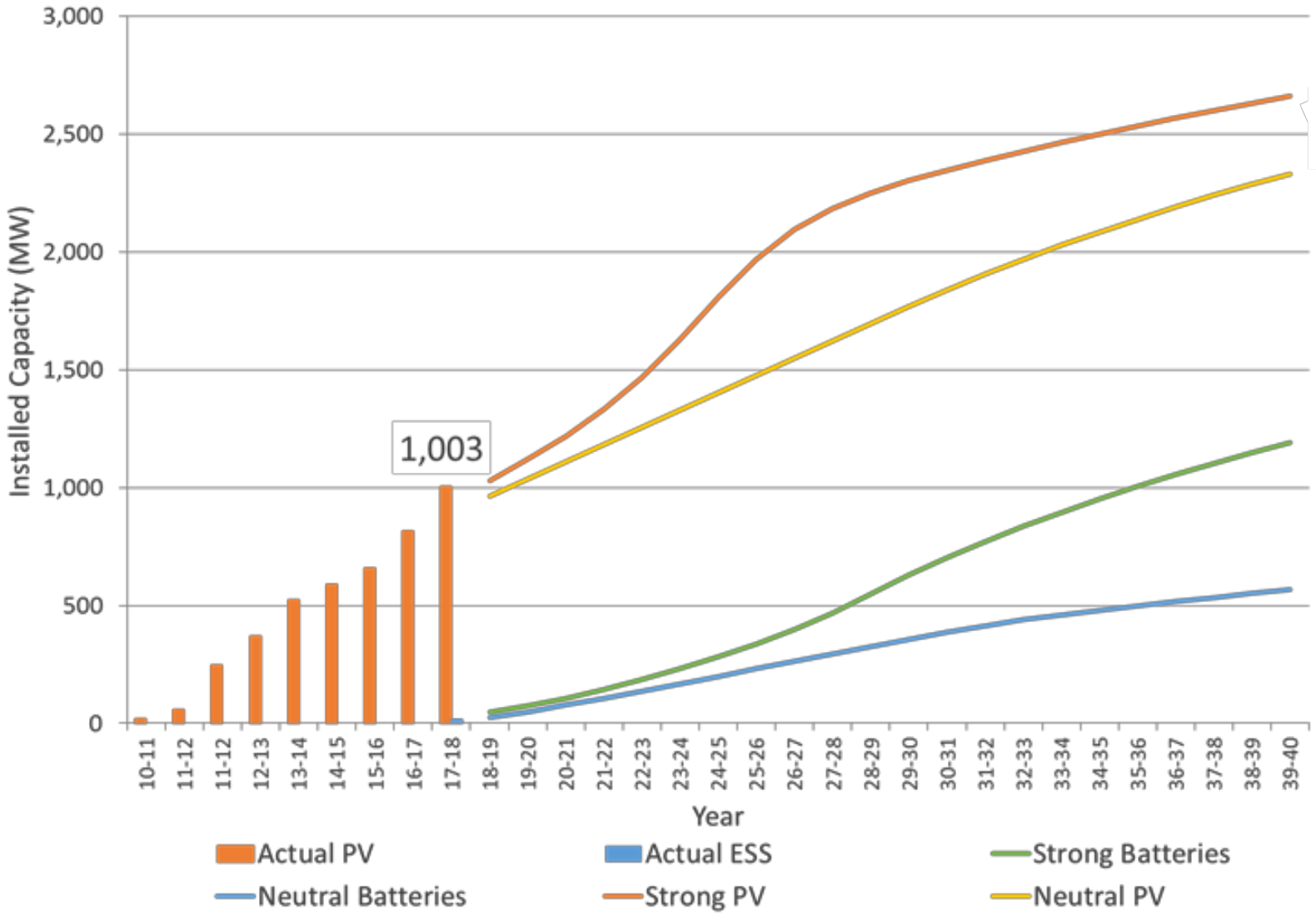
More on the way…

Virtual power plants and **electric vehicles** will expand network use:

- **Demand & supply**
- **Firming & flexibility**
- **Transport**

Transition must be **carefully managed** to capture opportunities and minimise risks

Forecasts - rooftop PV and batteries



20,000 new small-scale PV systems in 2018

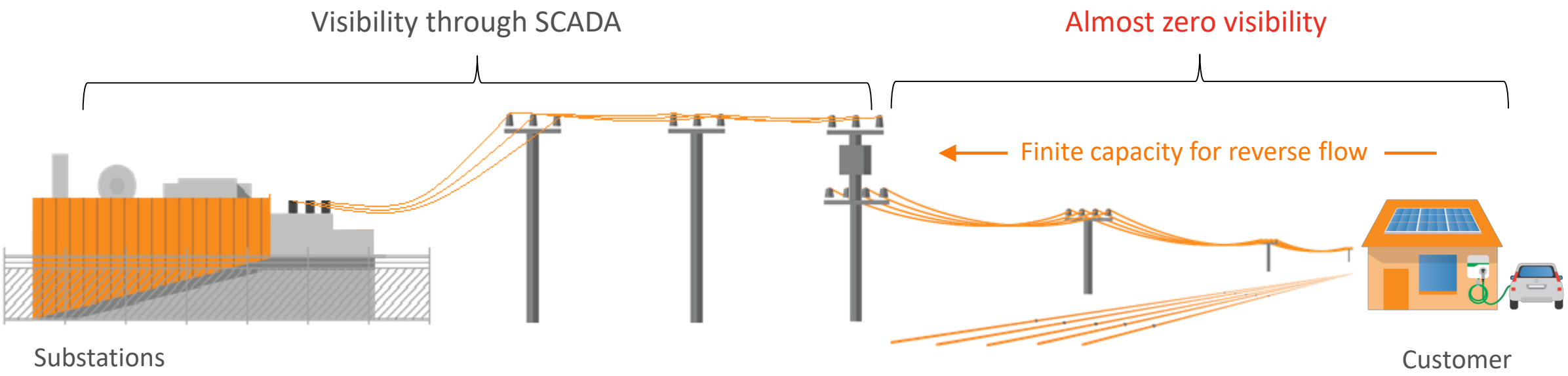
284 MW of new solar in the past 12 months

Up to 90,000 batteries in coming years under SA Government schemes

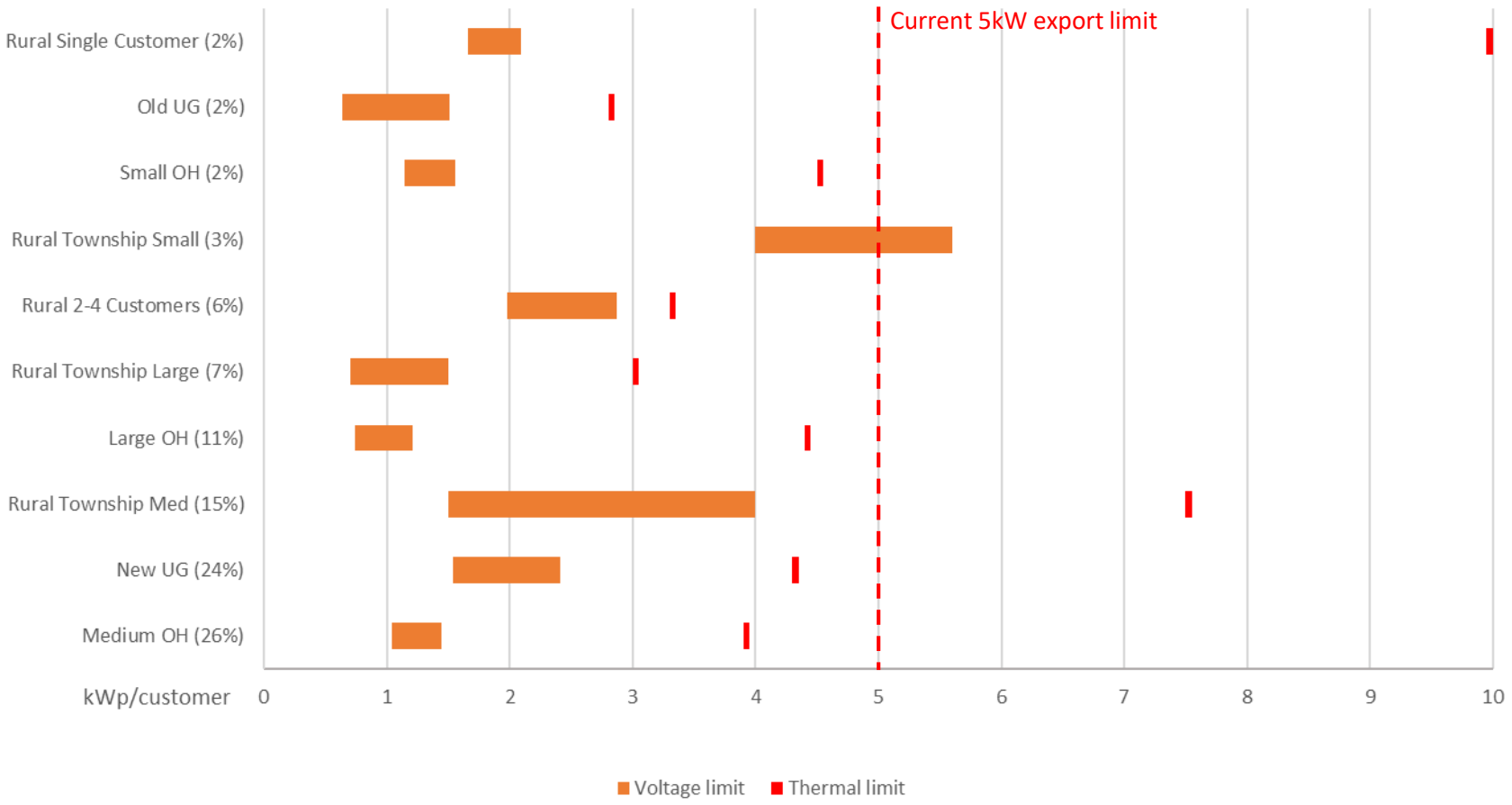
Source: SAPN and AEMO ISP 2018

Challenges in integrating DER

- Our network has a finite **hosting capacity** to transport energy exported from the premises
- We have **estimated the hosting capacity of our LV network** using a statistical modelling tool developed for Ofgem in the UK (EA Technology)
- A key challenge is we have **almost no visibility** of our LV network today

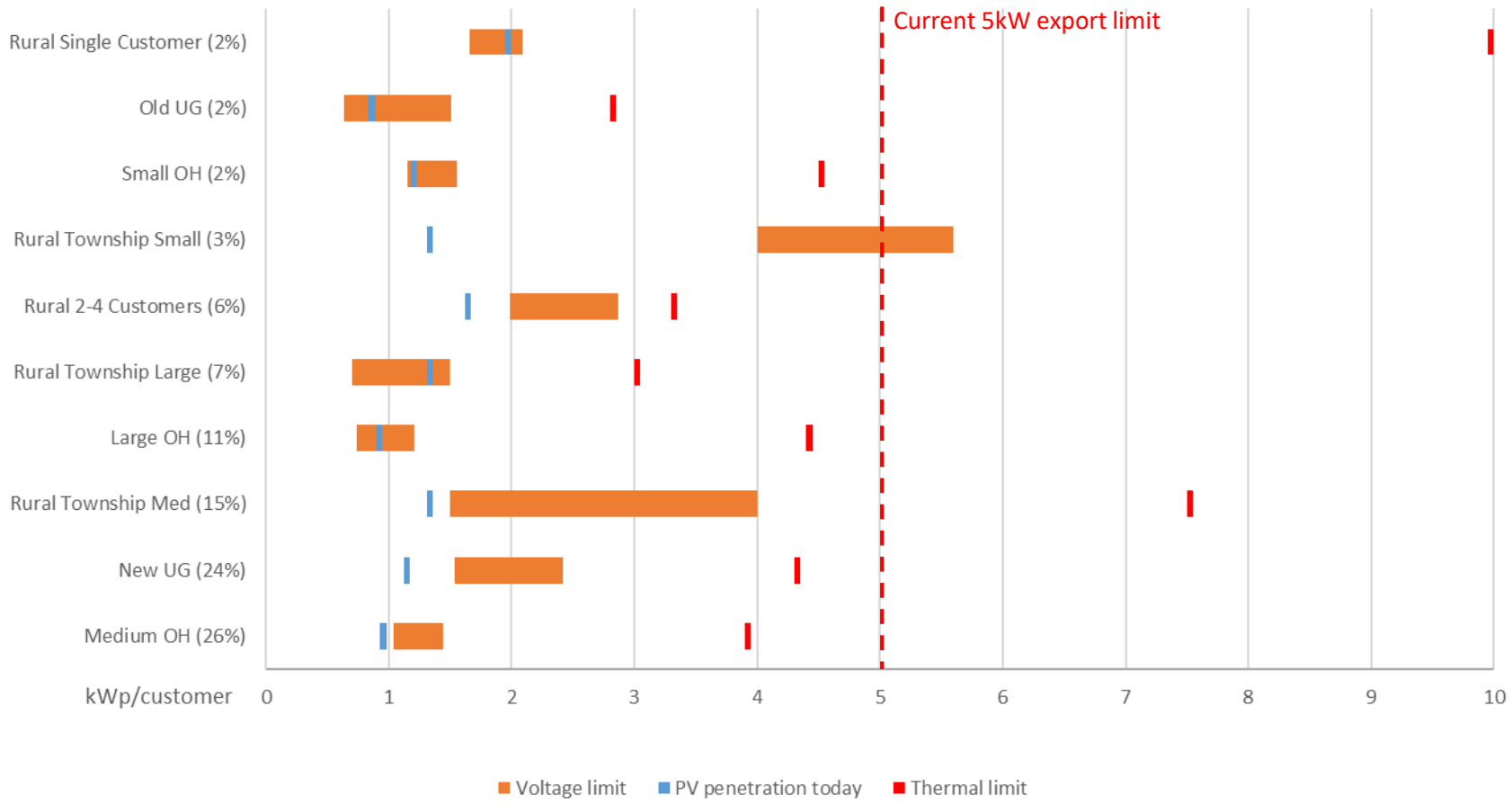


Hosting capacity analysis



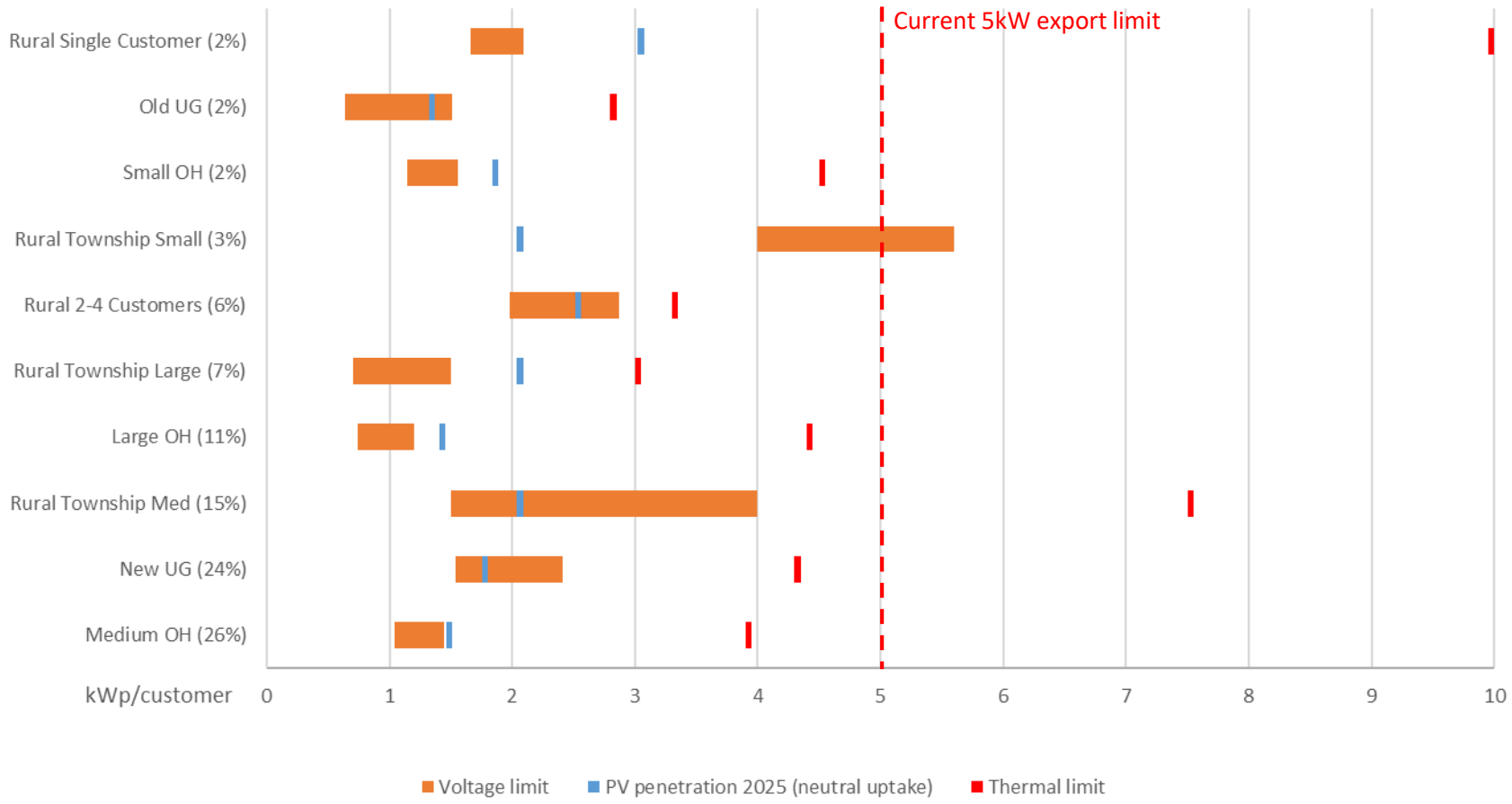
Hosting capacity analysis

- Average PV penetration per network type today

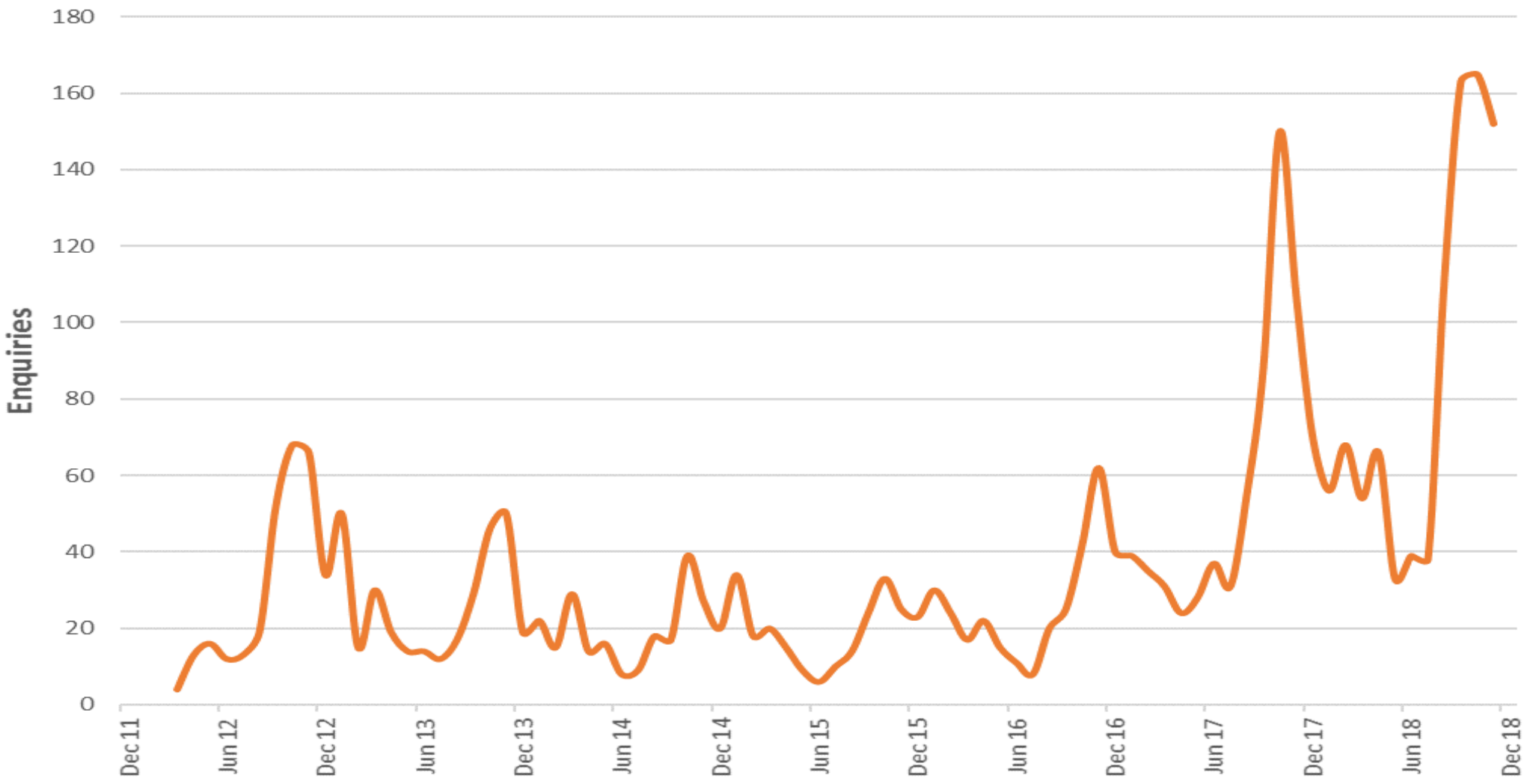


Hosting capacity analysis

- Forecast average PV penetration per network type 2025 (neutral uptake)

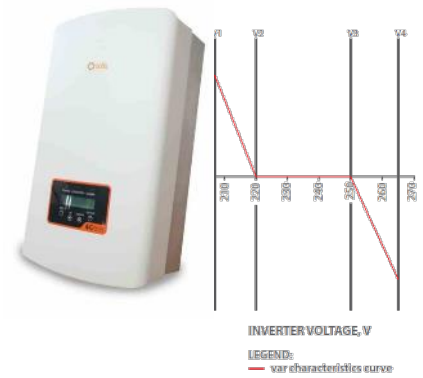


Customer enquiries – high voltage

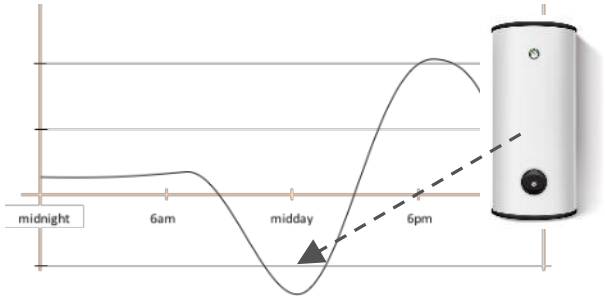


Integrating DER – static strategies

We are actively pursuing strategies to **increase DER hosting capacity**



Smart inverter settings
AS4777.2 Volt/VAR response modes



Shifting controlled load into the solar trough

Tariffs and price signals
Incentives for customers

Improved voltage control and network nominal voltage

What can we do when we reach hosting capacity?

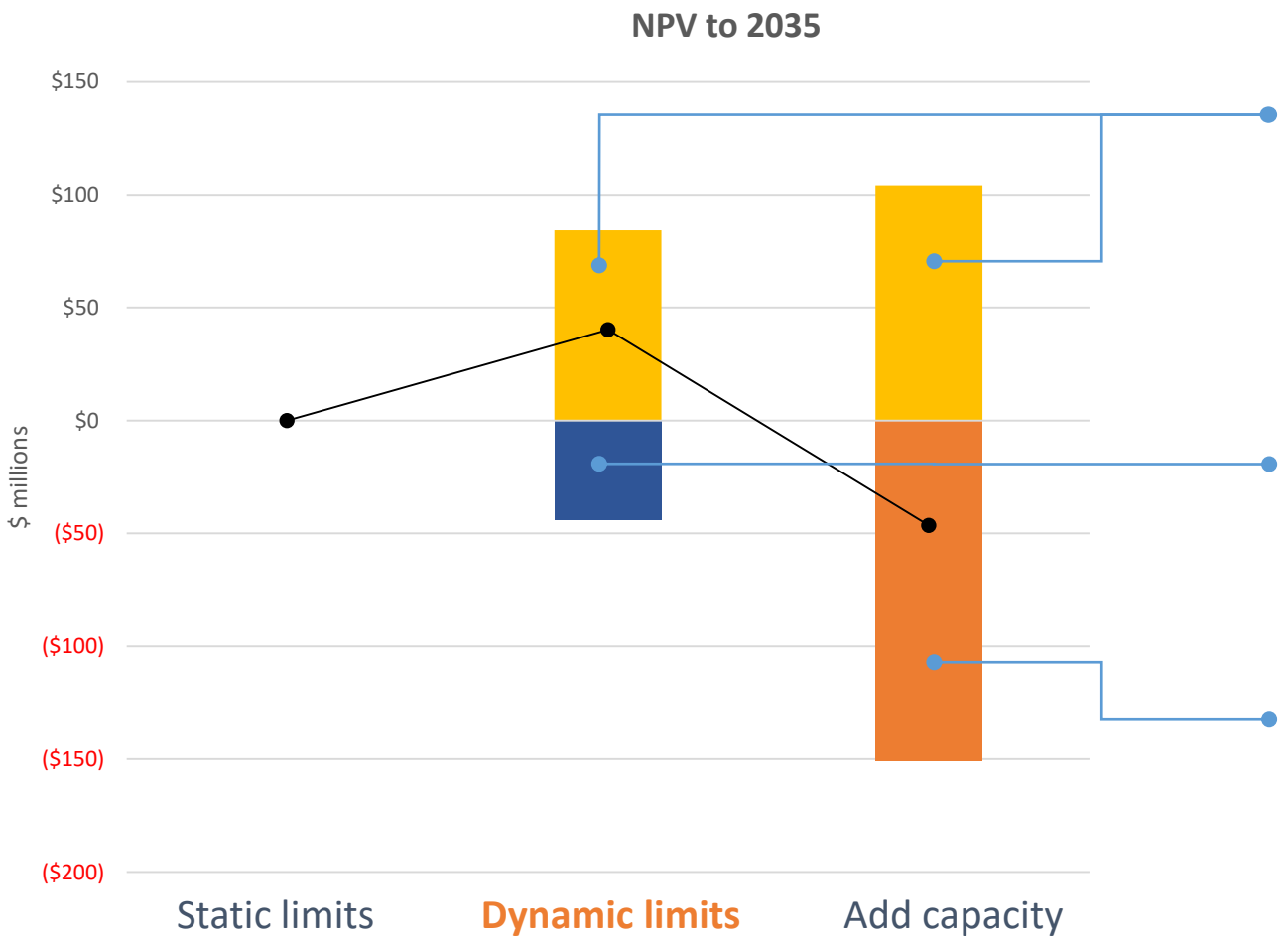
1. **Invest in increasing network capacity to support DER**
   Upgrade the network *or procure demand-side services to support DER growth*

2. **Cap DER at hosting capacity**
   Once ***local*** *hosting capacity reached, limit new systems to zero export*

3. **Dynamic DER management (flexible exports)**
   Manage DER output only on ***rare occasions*** *to remain within network capacity*

Modelling the strategies

To determine the **best long-term option for all customers**



Estimated economic value of exported energy
- Volume (MWh)
- Value ($/MWh)

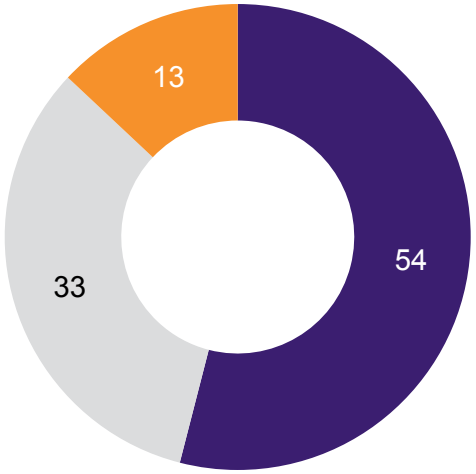
Cost of enabling technologies
- Capex and opex

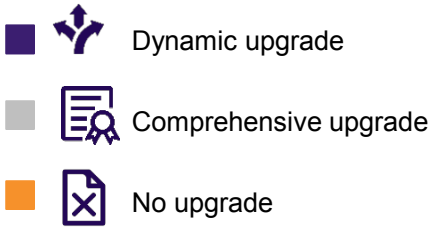
Cost of increasing network capacity

What do our customers think?

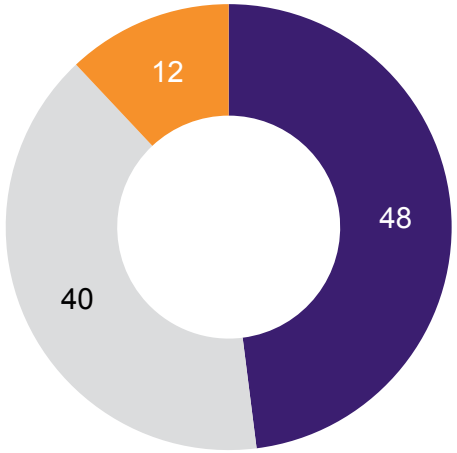
"Dynamic" upgrade ranked as both the **most preferred**, and as **most in the long-term interests of customers** across all customer segments, including solar, non solar and vulnerable customers

Most preferred option
(% selecting each as their top option)





Most in customers long-term interests
(% selecting each as their top option)



Full Newgate Research report available on talkingpower.com.au

Flexible exports

- 2017 **reduced standard export limits** from 10kW to 5kW – likely to reduce further in future

- 2020-25 Regulatory Proposal proposes expenditure to implement **flexible exports**

- Planning for new **flexible export connection option** to be available by 2021

  A **new option** for customers that enables their system to respond to dynamic export limits based on the real time capacity of the network

- Currently undertaking ARENA-funded $2.1m **proof-of-concept** trial with the Tesla / South Australian Government VPP

Key challenges

Although international standards are emerging, **we are at the forefront**

Vendors unlikely to adopt unless national direction and standards agreed

Require clear direction and agreement from policy makers and rule enforcers on DER integration strategies

The longer we wait, the more non-smart DER is connected (220,000 per year nationally)

We must work as an industry to agree on common approaches and standards for DER integration

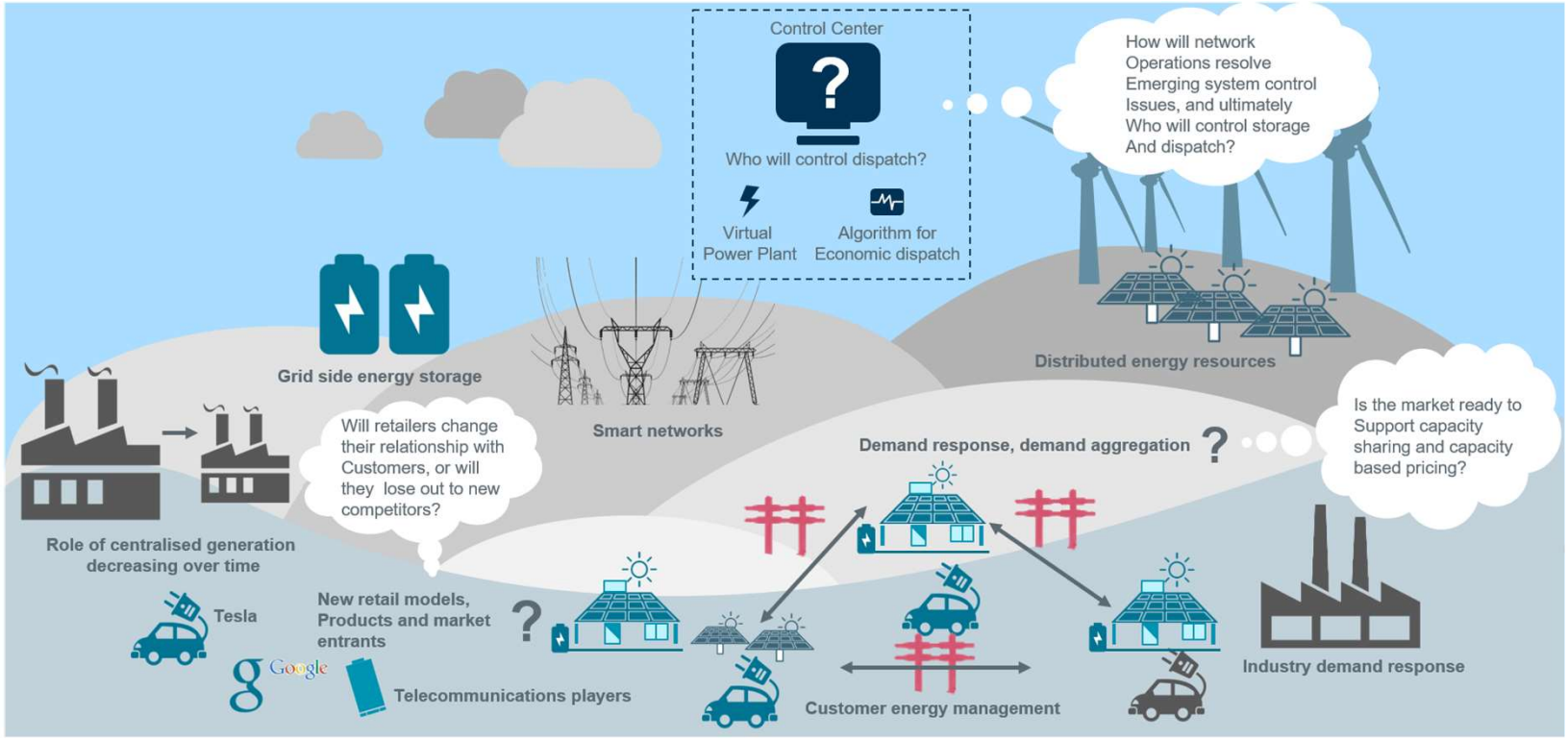
sapowernetworks.com.au

Regulatory DEIP Dive
Endeavour Energy

Ty Christopher

Endeavour Energy

A new energy eco-system is emerging, with the increase in digitalisation and two-way flows enabling end-consumers to have greater control and power



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There are four main areas transforming the energy market

Energy Market Transformation

COMPETITIVE LANDSCAPE

- Break down of industry boundaries between electricity, technology, telecommunications and mobility
- Stagnant or declining demand for electricity
- Distributed generation and disconnection from grid enables small start-ups to capture emerging opportunities, with focus on skills and innovation

TECHNOLOGICAL ADVANCEMENT

- Maturity of technologies (e.g. solar PV, electric vehicles, battery storage, energy efficiency) becoming more cost-competitive in an increasing number of markets
- New technologies such as intelligent grids and smart meters giving enhanced demand-side management opportunities

CUSTOMER DEMANDS

- Increasingly mobile, interconnected customers
- Increasing demand for additional services that go beyond the commodity
- Convenience and digital engagement becoming more important
- New technologies will drive new consumer demands and consumption behaviours

REGULATORY FOCUS

- Global trend towards tighter regulation around CO_2 emissions and energy efficiency
- Balancing supply security and affordability with environmental impact
- Broad energy reforms possible as new technologies and markets continue to evolve with expanding market base

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Distributed Energy Focus Areas

Customer Choice	• Customers are expecting more from the energy supply environment • Customers are and will continue to make their own choices and drive change as a result
Power System Security	• Multi-directional power flows create new technical challenges • Stand Alone Power systems are now a viable (and superior) alternative to grid connection in remote areas
Carbon Abatement	• Secure a stable carbon policy is needed • Uncertainty is driving customers to make their own decisions and choices
Intelligent Networks & Markets	• Information visibility needs to be a priority in order to facilitate the new energy market • A new customer relationship needs to be forged between NSP's and their connected customers
Incentives & Network Regulation	• Technology and customer behaviour is running ahead of regulation • Insufficient or misaligned economic signals within existing schemes

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Changing customer expectations

Industrial

We are receiving applications from customers to apply new business models for DER integration.

These models seek to apply commercial and physical solutions which operate behind the meter and in front of the meter.

Current rules around NMI's etc were not written with such arrangements in mind.

Residential

Economics would appear to be providing a reliable moderating influence.

Increasing solar uptake is increasing the level of cross subsidy between solar generators and electricity consumers

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System operation and security

Industrial

Generally larger scale solar generation is well supported by adjacent load, minimising technical issues such as voltage control.

Development of the DER register may prove challenging but is on the right track

Residential

Micro solar output capacity of 5kW single phase or 30 kW three phase per premise are within system capability and present a low risk to connection.

As DER penetration increases, voltage constraints will continue to emerge.

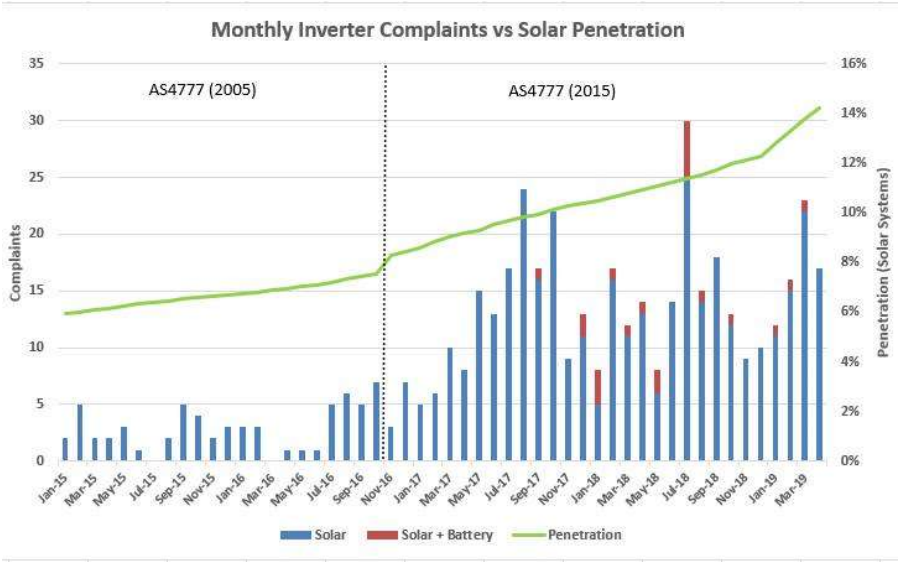
New technology (low voltage Stat Coms) is available to increase hosting capacity at LV

Proactive resetting of distribution transformer taps to facilitate voltage management is occurring

Presently, the vast majority of customers connecting solar or solar + battery systems to Endeavour Energy's network are not constrained in exporting up to their prescribed installation limit.

There has been an increasing trend in voltage based export complaints.

SAP's are a reality. In remote areas they can offer a superior economic and social solution to grid connection.



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System operation and security – example 1

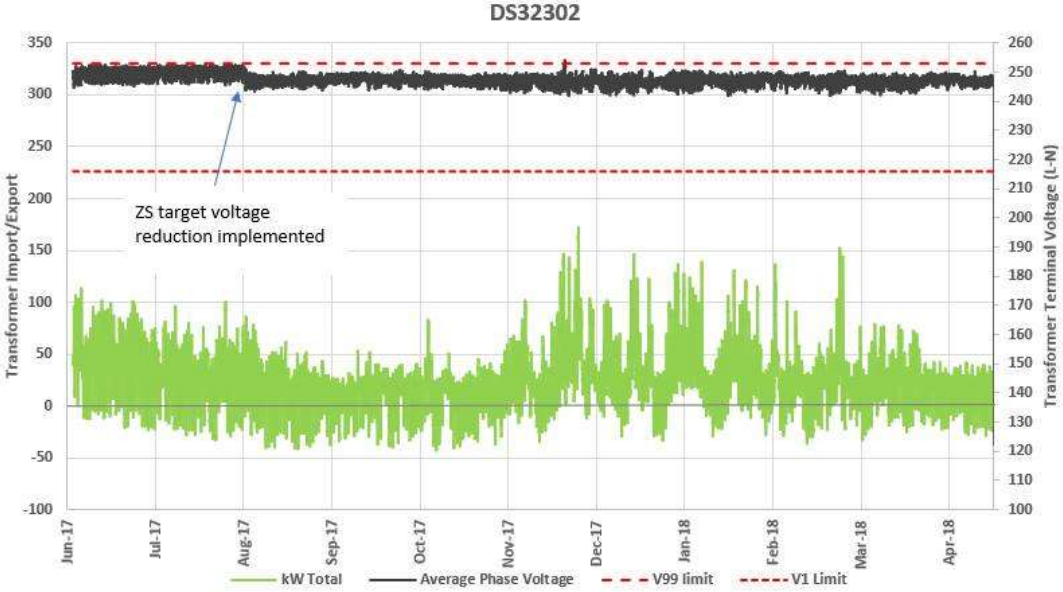
Kellyville

Distribution Substation with close to 100% solar penetration.

System sizes 3-5kW.

Voltage reduction undertaken at zone substation. Likely headroom to re-tap distribution transformer as well.

Routinely has reverse power flows but strong urban network can accommodate this.



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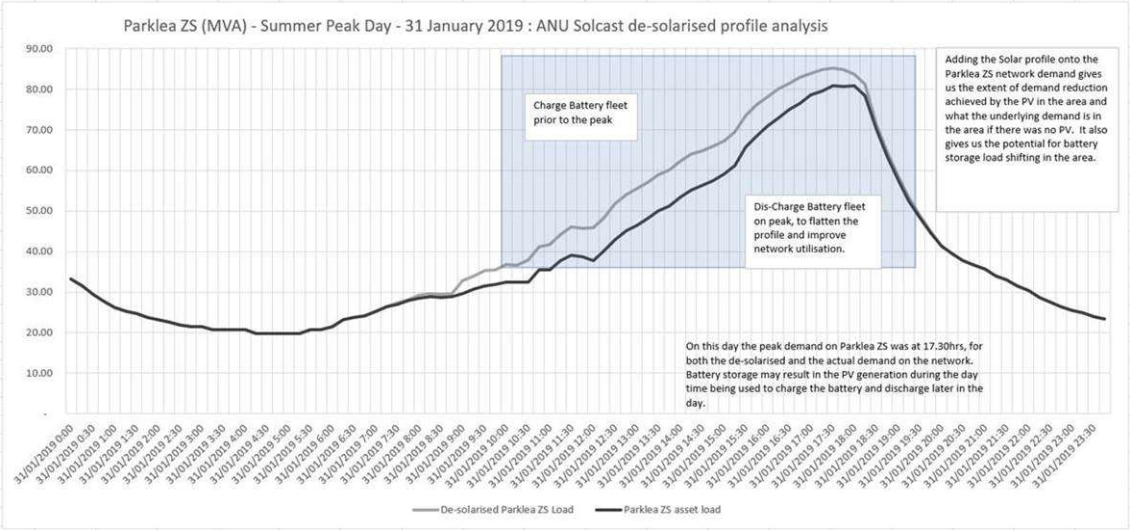
System operation and security – examples 2&3

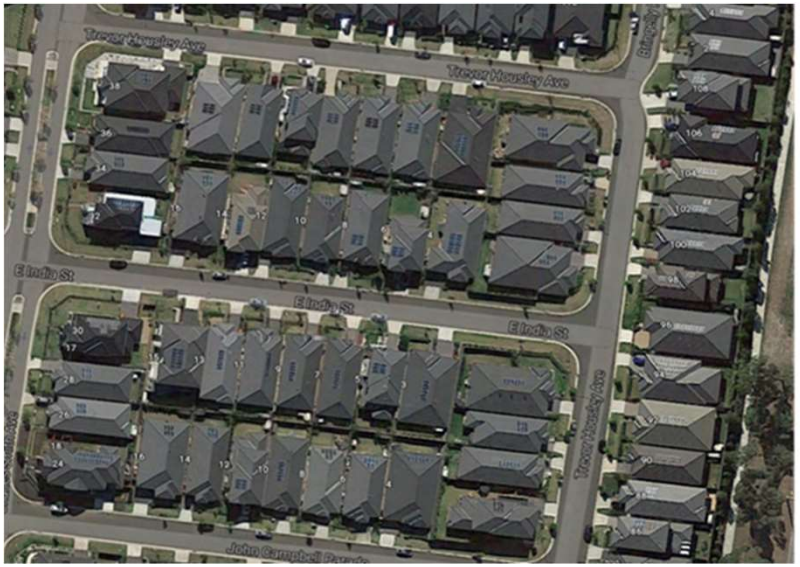
Parklea

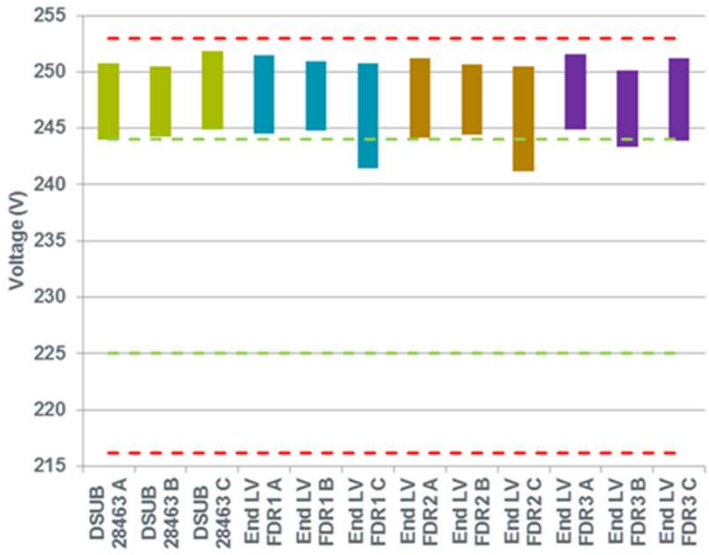
Analysis shows contribution to peak demand reduction from solar + batteries on peak summer day.



Bungarribee

100% solar penetration, average size 2kW
Reverse power flows on 11kV feeder level at some times.
Strong underground LV network is coping.





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System operation and security – example 4

Kentlyn

Solar DER at urban fringe.

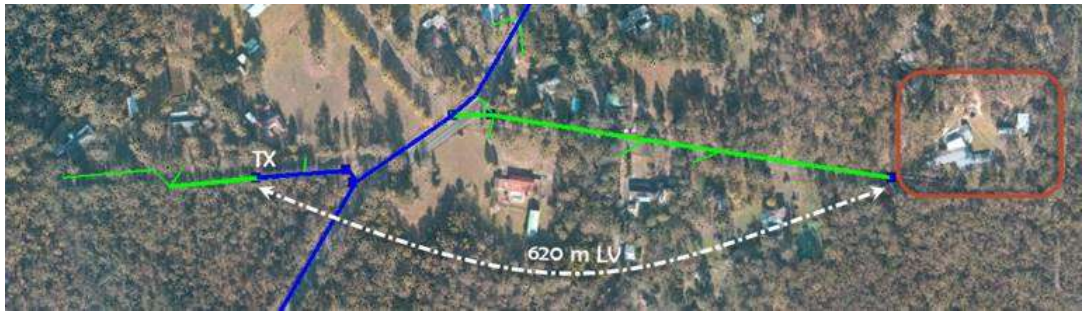
Customer has ~16kW 3-phase solar (compliant installation).

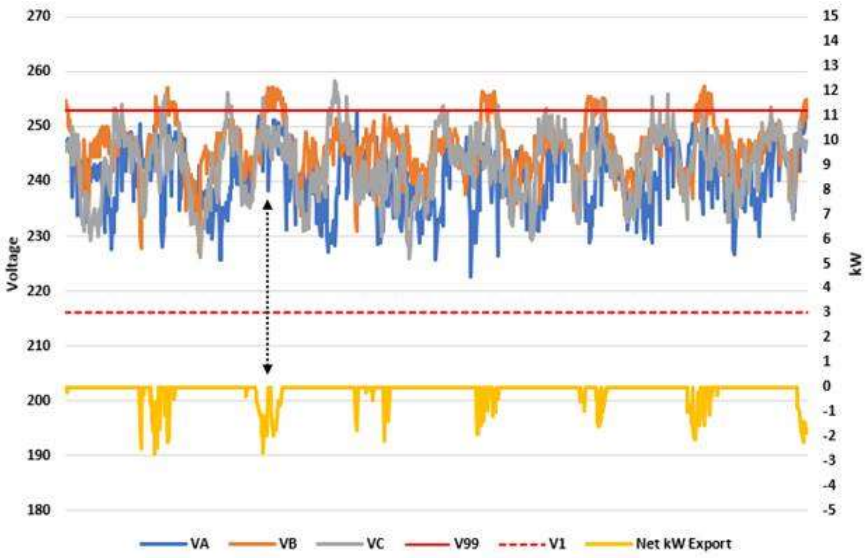
Other solar customers on the same LV feeder (~40kW total solar)

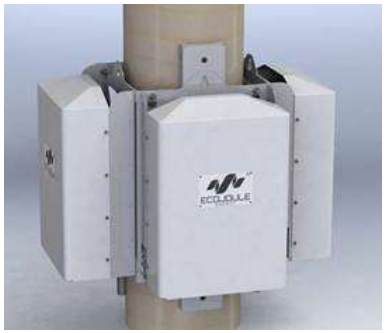
Customer complaint is loss of generation (volt-watt curtailment and trips).

Data shows minimal opportunity to export before curtailment, at best ~3kW can be exported.

LV Stat Com the recommended solution







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Intelligent Networks and Markets

Acquiring smart meter data from energy retailers and metering coordinators will allow NSP's to monitor edge of grid safety, reliability and security.

The OPEn energy network project demonstrates the need for greater information visibility and coordination.

Due to a lack of visibility of the LV network (via measurement/monitoring), Endeavour Energy's primary knowledge of LV export constraints are through responding to customer complaints.

Customers expect a closer relationship between them and their NSP. Customers want to know about their electricity supply situation in real time.

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Incentives & Network Regulation

Endeavour Energy is currently experiencing a period of significant customer growth, current forecasts are that we will add about 10% to our customer numbers of the next 5 years in greenfield customers.

We expect near to 100% penetration of PV in these new areas to meet the relevant housing code, as evidenced in the previous examples.

When engaging with the AER and stakeholders during our most recent determination process for the period that commences next month there was a great focus on the ADMD used in our planning assumptions for sizing the network. This is of course an appropriate discussion.

However, what this measure does not consider is the expectation of DER generation within those areas and what the “load” from these generation sources may be.

It is entirely conceivable that by reducing the ADMD assumptions we may be creating the environment where localised generation constraints may arise in the future.

As the current range of benchmarking measures and other regulatory assessment tools are focused on consumption load, the allowed network investment will be sized accordingly.

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Incentives & Network Regulation

As customers change how they use the network our perception of the services that the network provides also needs to change to keep pace.

The simplest concept that takes a future proofing view is that the network of the future is an open source network.

An open source network is ambivalent to whether you use network capacity to ‘buy’ or ’sell’ electricity; it only matters that network capacity is used. It is also agnostic to the technology or devices themselves.

If we price the correct network cost drivers – say demand and demand at peak – how relevant is it that a customer uses the network for air-conditioning, selling PV energy, or charging an EV?

Telecommunications networks have faced similar economic challenges and approach the issue very differently, but they also have different rules.

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