# Network Innovation Advisory Committee

24 July 2019

Ausgrid

# Agenda

| # | SESSION | | FACILITATOR | TIMING |
|---|---|---|---|---|
| | Arrival / Coffee / Greetings | | | 9:15 – 9.30 |
| 1 | Introductions and Expectations | | Junayd Hollis + all participants | 9.30 – 10.00 |
| 2 | Committee purpose, Terms of Reference and Guiding Principles | | John Skinner | 10:00 - 10:20 |
| 3 | Overview of the Network Innovation Program | | Junayd Hollis + Alex Moran | 10:20 – 11:00 |
| | BREAK | | | 11:00 – 11:15 |
| 4 | Key project deep-dives / highlights<br>1. Community Batteries<br>2. Stand Alone Power Systems<br>3. Network Insights<br>4. Advanced Voltage Regulation | Members will choose 2 items to discuss | Junayd Hollis<br>Alex Moran<br>Felix Keck | 11:15 – 12:15 min |
| 5 | Wrap up and next steps | | | 12:15 – 12:30 |
| | LUNCH | | | 12:30 – 1:00 |

# Introductions and Expectations

What are your expectations?

What are your priorities?

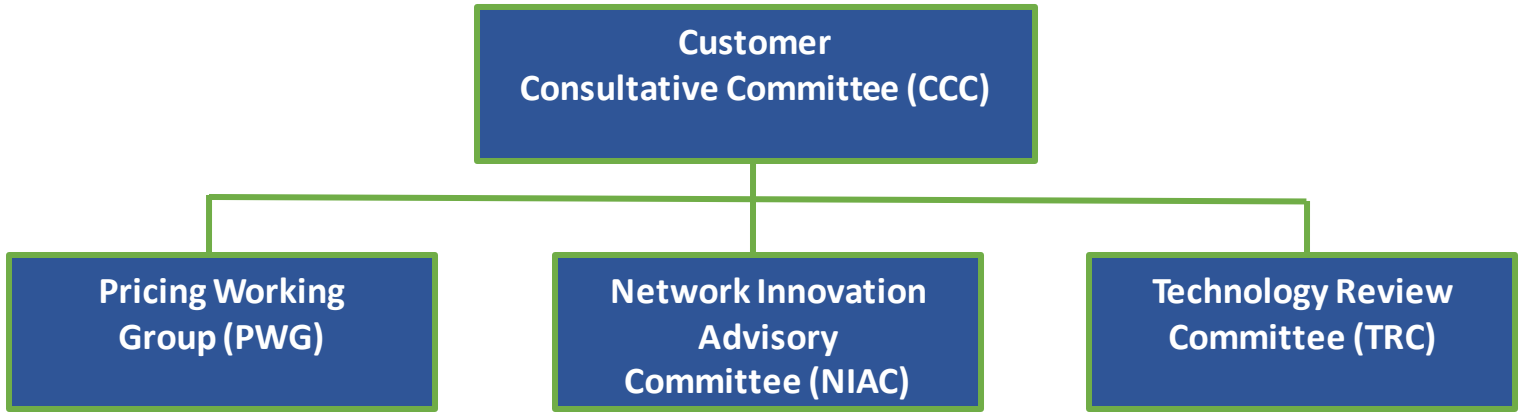
What does success look like?

# Ausgrid engagement principles and customer committees

**Ausgrid's objective is to continue building trust with customers. The following principles aim to support this goal.**

**Be collaborative:** Proactively engage and collaborate with stakeholders
**Be quantitative:** Provide data from the perspective of the consumer
**Be accountable:** Agree a timeframe and deliver
**Be transparent:** Ask for regular feedback, understand what is required
**Be adaptable:** Be prepared to change based on feedback

Through our customer committees we aim to embed customer views in our business decisions and collaborate on the future direction of our network

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# Terms of Reference

## NIAC Collaboration goal

Our aim is for the NIAC to be a forum where Ausgrid can *collaborate* with customers about the future direction of the network

**Public participation goal**

Through our customer committees we aim to embed customer views in our business decisions and collaborate on the future direction of our network.

**Promise to the public**

We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.

## Draft Terms of Reference

We are seeking views on a new draft Terms of Reference covering all our customer committees

**Ausgrid Customer Charter supporting the CCC**

Due for review in 2019

**Draft NIAC ToR**

Developed with consumer advocates in December 2018 and submitted with Revised Proposal

**Draft Terms of Reference for our customer committees**

Our draft Terms of Reference (attached) will cover the CCC, NIAC, PWG and TRC

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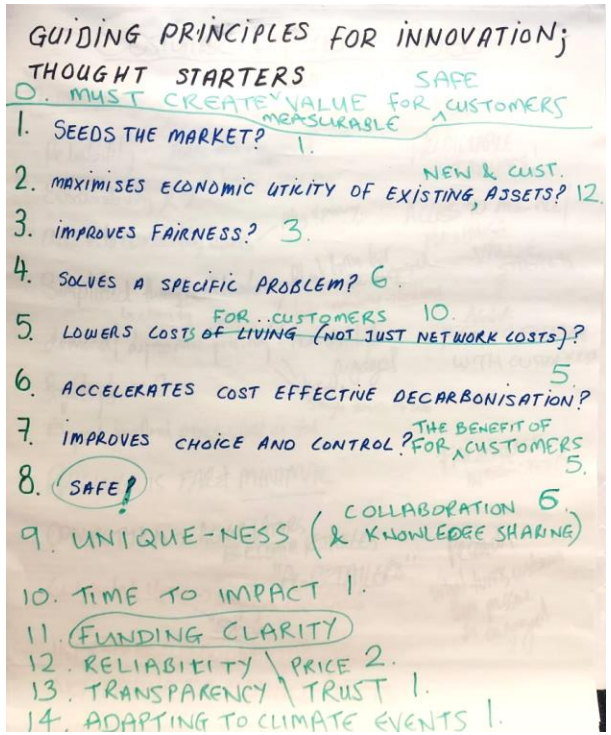
# Guiding principles for innovation

All innovation projects must be in the long-term interests of consumers with respect to price, quality, safety, reliability and security of supply. At our Network of the Future forum in November 2018, we developed the following principles that will be used to assess all innovation projects we undertake:

## Output from network of the future forum




## Guiding principles for innovation

1. Maximise economic utility of new and existing assets
2. Lower costs for customers
3. Solves a specific problem
4. Unique-ness of problem and collaborative opportunities
5. Accelerates cost effective decarbonisation
6. Improve fairness
7. Reliability and price

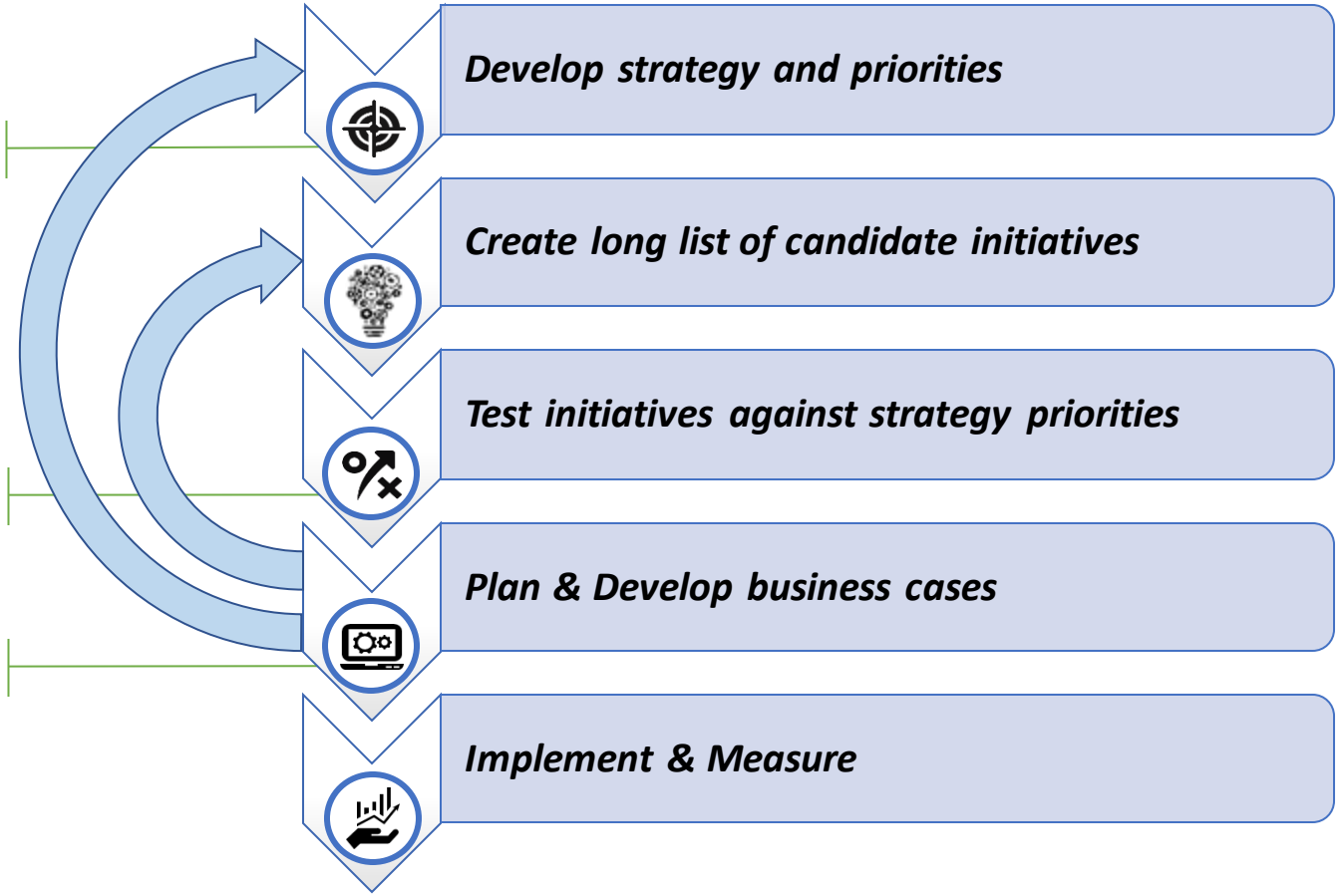
# Governance & Collaboration Model

Investment Governance Framework | Innovation Framework | Collaboration Framework/Opportunities

Asset Strategy

Program Approval

Project Approval




NIAC can raise strategic issues and industry trends of interest to the committee

NIAC can provide feedback and suggestions on initiatives and projects for consideration within the Network Innovation Program

NIAC advises on program priorities, direction and governance

NIAC advises on project specific objectives, priorities and analysis, as well as provide feedback on implementation plans

NIAC can discuss Project Implementation Reviews and provide feedback on outcomes and next steps

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# Recap – AER Determination Network Innovation Program

- The AER has approved Ausgrid's Innovation Program funding subject to establishment of NIAC and exclusion from CESS.
- Further refinement and review will occur before detailed business case, design and implementation stages.
  - Learnings from prior stages, peer DNSPs and wider industry will be incorporated
  - Feedback from this forum will guide priorities and scope
- Some items carry over from current works underway now. Others are new initiatives yet to undertake detailed design

| ID | Project | Benefit Cost Ratio | Initial Estimate | Benefits | | |
|---|---|---|---|---|---|---|
| | | | | Capex | Opex | Customer Benefits |
| A. | Advanced Voltage Regulation | 1.75 | $3.0 | ✓ | | Enabling renewables and the zero carbon economy |
| B. | Network Insight Program | 3.10 | $10.5 | ✓ | ✓ | Enabling renewables and the zero carbon economy<br>Improved Service Delivery |
| C. | Fringe of Grid Optimisation | 3.02 | $4.7 | ✓ | ✓ | Safety and reliability for remote communities |
| D. | HV Microgrid Trial | 1.37 | $17.2 | ✓ | ✓ | Safety and reliability for remote communities |
| E. | Advanced EV Charging Platform Trial | 1.38 | $1.2 | ✓ | | Enabling renewables and the zero carbon economy |
| F. | Grid Battery Trials | 1.01 | $2.0 | ✓ | | Enabling renewables and the zero carbon economy |
| G. | Portable All-in-One Off-Grid Supply Units | 1.26 | $1.0 | | | Improved Service Delivery |
| H. | Self Healing Networks | 1.19 | $0.6 | | | Improved Service Delivery |
| I. | Dynamic Load Control | 1.05 | $0.6 | ✓ | | Enabling renewables and the zero carbon economy |
| J. | Asset Condition Monitoring | 1.72 | $0.6 | ✓ | | Improved Service Delivery |
| K. | Line Fault Indicators | 1.11 | $0.6 | | ✓ | Improved Service Delivery |

*Source: Ausgrid revised proposal*

# Governance & Collaboration Model

Investment Governance Framework | Innovation Framework | Collaboration Framework/Opportunities

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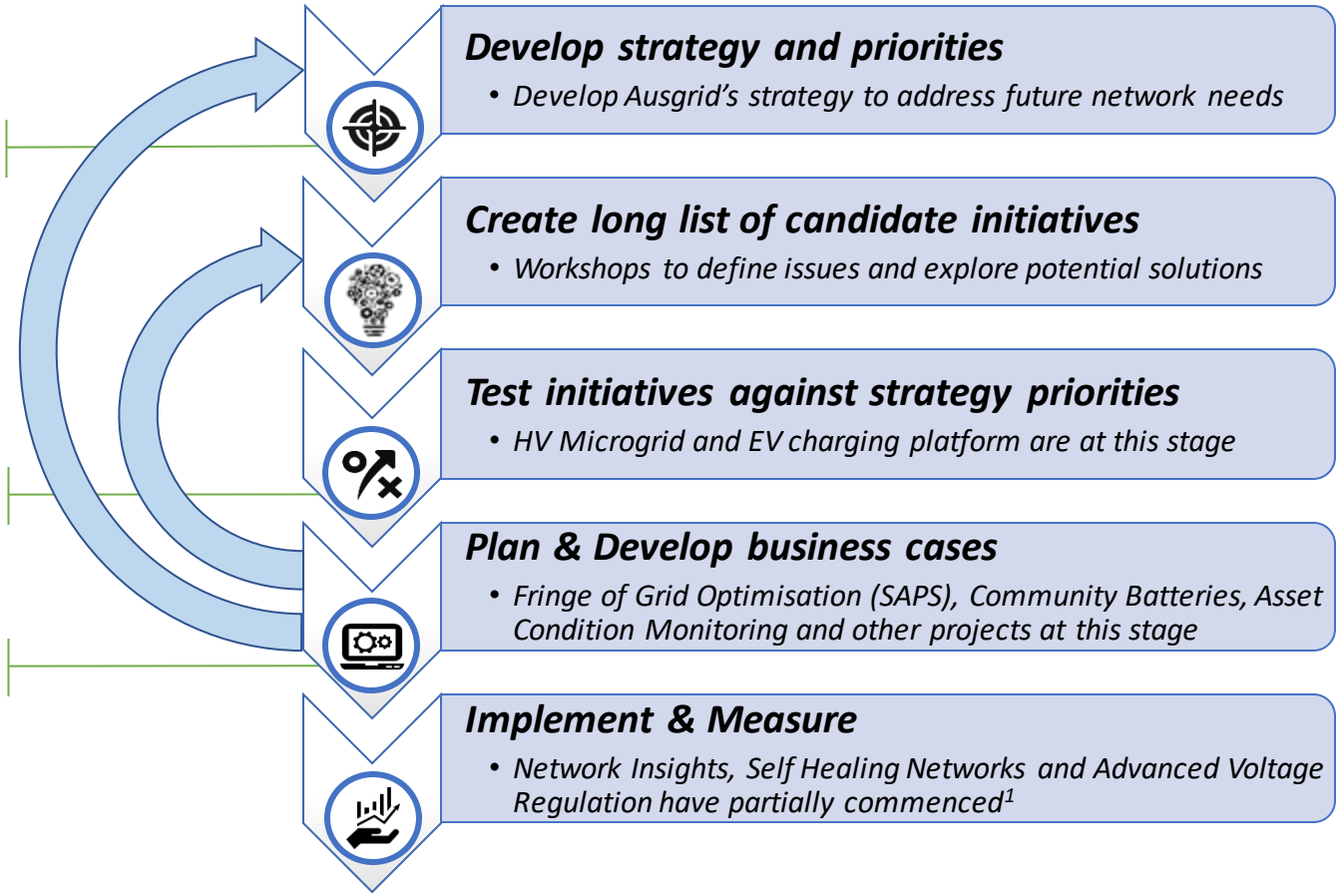

***Develop strategy and priorities***

- *Develop Ausgrid's strategy to address future network needs*

**NIAC can raise strategic issues and industry trends of interest to the committee**

***Create long list of candidate initiatives***

- *Workshops to define issues and explore potential solutions*

**NIAC can provide feedback and suggestions on initiatives and projects for consideration within the Network Innovation Program**

***Test initiatives against strategy priorities***

- *HV Microgrid and EV charging platform are at this stage*

**NIAC advises on program priorities, direction and governance**

***Plan & Develop business cases***

- *Fringe of Grid Optimisation (SAPS), Community Batteries, Asset Condition Monitoring and other projects at this stage*

**NIAC advises on project specific objectives, priorities and analysis, as well as provide feedback on implementation plans**

***Implement & Measure***

- *Network Insights, Self Healing Networks and Advanced Voltage Regulation have partially commenced[1]*

**NIAC can discuss Project Implementation Reviews and provide feedback on outcomes and next steps**

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*1. Consists of regulatory control period 2014-19 in-flight projects*

# Network Innovation Program related activities currently underway

| Project | Description | Commenced | Status | On Agenda? | Possible FY20 expenditure |
|---|---|---|---|---|---|
| Self Healing Network trial | A trial of a self-healing network at Castle Cove to automatically restore customers in the event of a network fault. | Jun 2018 | Installation phase – target commissioning date now Aug 2019. | No | $100,000 |
| Advanced Voltage Regulation (Phase 1 & 2) | Phase 1: Desktop evaluation of low voltage regulation technology and integration testing in Ausgrid laboratory.<br>Phase 2: Pilot deployment in field. | Oct 2018 | Phase 1 investigation complete. Final report and recommendations due July 2019. | Yes | $750,000 |
| Distribution Monitoring & Control - High Priority | Refurbishment and capability upgrade of high priority sites | Nov 2018 | In progress – forecast completion end FY20 | Yes | Up to $1,500,000 |
| Evolve Project | Development of published near real-time operating envelopes to maximise the equitable utilisation of DER. | Feb 2019 | Consortium project commenced – Ausgrid full participation commencing late 2020. | Yes | <$50,000 |
| Community Battery | Pilot program of community use batteries to assist customers obtain better value from household solar investment. | May 2019 | Feasibility study underway with final report due July 2019. | Yes | Up to $2,000,000 |

# Break discussion

Are there other focus areas for the Network Innovation Program that you would like to see?

Which projects would you like to explore in more detail?

# Project Deep-Dives

- *Community Battery Pilot*
- *Stand-alone Power Systems Program*
- *Network Insights Program*
- *Advanced Voltage Regulation Trials*

***Why these projects?***

*We have selected those projects which have the most advanced proposals or which we expect might be the largest projects in FY20*

**Objectives of the deep-dives**

1. Share Ausgrid's project objectives
2. Capture NIAC member views and suggestions
3. Collaboratively develop roadmap to incorporate NIAC guidance into project development

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# Key Initiative Deep Dive – Community Batteries

*Estimate: $5.5m[1]*

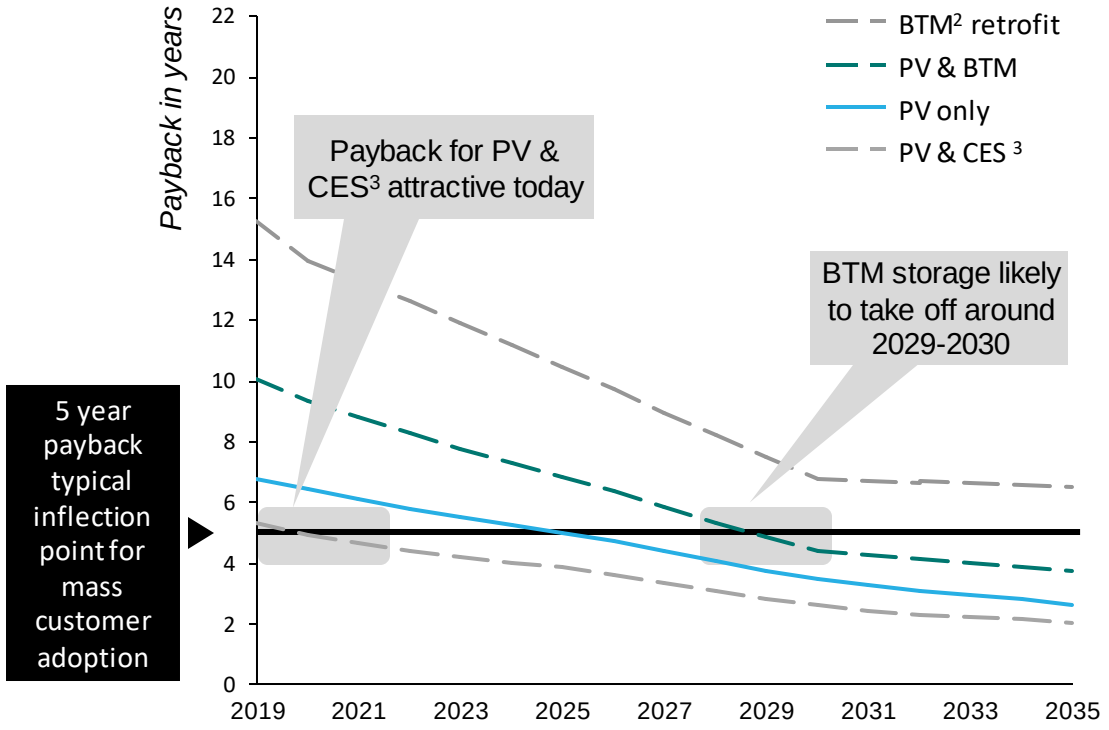
| | Project Prioritisation Principles | Rating (1 – 5) | Weight | Score |
|---|---|---|---|---|
| 1 | Maximise economic utility of new and existing assets | 5 | 25% | 1.3 |
| 2 | Lower costs for customers | 4 | 20% | 0.8 |
| 3 | Solves a specific problem | 5 | 15% | 0.8 |
| 4 | Uniqueness of problem and collaborative opportunities | 5 | 15% | 0.8 |
| 5 | Accelerate cost effective decarbonisation | 4 | 10% | 0.4 |
| 6 | Improve fairness | 4 | 10% | 0.4 |
| 7 | Reliability and price | 4 | 5% | 0.2 |
| **Project prioritisation score** | | | **100%** | **4.6** |



Community batteries are able to provide value and benefits to a **range of stakeholders**. The magnitude of the respective benefits lies in the design and operation of the battery scheme.

Understanding the drivers for the **various value streams** of a community battery is key to structuring its design to co-optimise these values and maximise the benefits to customers – both **participating** and **non-participating**.

## Why build a Community Battery?




- When our customers choose BTM storage it is primarily to do two things: enable them to consume their excess solar energy, and to protect them against "skyrocketing" grid prices.
- When a customer with PV decides to invest in a BTM battery they:
  - Pay more for their energy supply
  - Use more renewable energy, reduce their exposure to energy price change
- Community batteries / CES would be an economic addition to solar today.

*1. Subject to scope and external funding options; 2. Behind The Meter; 3.* Community Energy Storage

Note: analysis based on representative residential 30-minutes interval sample NMI from Sydney with 5,181 kWh annual consumption. Calculation assumes 5 $kW_{Installed}$ PV capacity, with 5 kWh battery capacity at C-rate=1. Source: Baringa Partners, Energeia, SolarChoice.com, BNEF, EnergyAustralia, team analysis

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# Community batteries

REFER TO ATTACHED KMPG SLIDES

# Key Initiative Deep Dive – Stand Alone Power Systems (SAPS) *Estimate: $4.7m[1]*

## Our objectives

- *A clear and **efficient regulatory framework** which supports cost-effective deployment of SAPS to lower overall network charges;*
- ***A robust methodology** for determining the efficiency of SAPS vs traditional network solution; and*
- ***A successful pilot program** of SAPS sites delivering positive customer experiences and BAU capability to deploy SAPS in areas of the network where efficient to do so.*

| Project Prioritisation Principles | | Rating (1 – 5) | Weight | Score |
|---|---|---|---|---|
| 1 | Maximise economic utility of new and existing assets | 3 | 25% | 0.8 |
| 2 | Lower costs for customers | 5 | 20% | 1.0 |
| 3 | Solves a specific problem | 3 | 15% | 0.5 |
| 4 | Unique-ness of problem and collaborative opportunities | 3 | 15% | 0.5 |
| 5 | Accelerate cost effective decarbonisation | 2 | 10% | 0.2 |
| 6 | Improve fairness | 4 | 10% | 0.4 |
| 7 | Reliability and price | 4 | 5% | 0.2 |
| **Project prioritisation score** | | | **100%** | **3.5** |



*Customer benefits include **lower prices** & safety and **bushfire risk reductions***

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*1. Network Innovation Program funding only*

# AEMC Review of SAPS

## Saving for everyone

Stand-alone power systems provided by a network business would be considered part of the network. This means the costs of the system would be included in the network's revenue determination and regulated by the Australian Energy Regulator.

The cost savings made by network businesses would be shared across all customers through the revenue determination process.

**Distribution network businesses would:**

publish information each year that identifies opportunities for stand-alone power systems. This information would include the total number of their customers who transitioned to stand-alone power systems.

develop and publish a customer engagement strategy for transitioning customers to stand-alone power systems.

carry out a formal consultation process including timely notification, as well as information about the quality of supply and performance.

source stand-alone power systems from competitive providers. To support competition, a ring-fenced affiliate of the network business would be able to provide a system, but not the network business itself.

**Customers would:**

continue to have access to retail competition, and can choose to stay with their current retailer on the same deals, including feed-in tariffs.

**Retailers would:**

pay an administered settlement price to AEMO as a proxy for the wholesale spot price, enabling them to continue to manage their risks and offer stable prices to their customers.

## Protecting consumers

Consumer protections and reliability standards would be extended to customers with stand-alone power systems provided by network businesses. Trials have shown that reliability can improve significantly with stand-alone systems provided by network businesses, particularly where this avoids very long lines through bushland.


*"This is as close to a 'no brainer' as we can get," – Andrew Dillon AEMC*

## *Regulatory steps:*

| WHO | KEY ACTIONS |
|---|---|
| COAG Energy Council | Endorse recommendations and agree package of law changes<br>Ask AEMC to develop detailed rules |
| Senior Committee of Officials (advising Energy Ministers) | Draft and agree electricity law and energy retail law based on proposed law change descriptions, and submit final amendments to SA Parliament |
| AEMC | Develop detailed changes to the rules |
| State governments and state regulators | Review and amend jurisdictional frameworks |
| AEMO | Update settlement systems |
| AER | Review guidelines |

## Priority two report

We are continuing to consult on developing a national framework for regulating stand-alone power systems offered by local councils, community groups, developers or other third parties. A draft report is due in June 2019.

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# How should we structure a SAPS trial within the evolving regulatory landscape?

## Today

**Curracabuni National Park Facility: Our first SAPS solution**

*In 2015 Ausgrid provided a subsidy to enable a willing customer to fully disconnect from the NEM and save significant network investment*

## Tomorrow

How can we prepare for the changes in regulation foreshadowed by the AEMC?

- "Western Power" – style arrangement (maintain existing infrastructure)
- AEMC Regulatory sandbox
- NSW Government NER derogation

NSW GOVERNMENT

?

AEMC

westernpower

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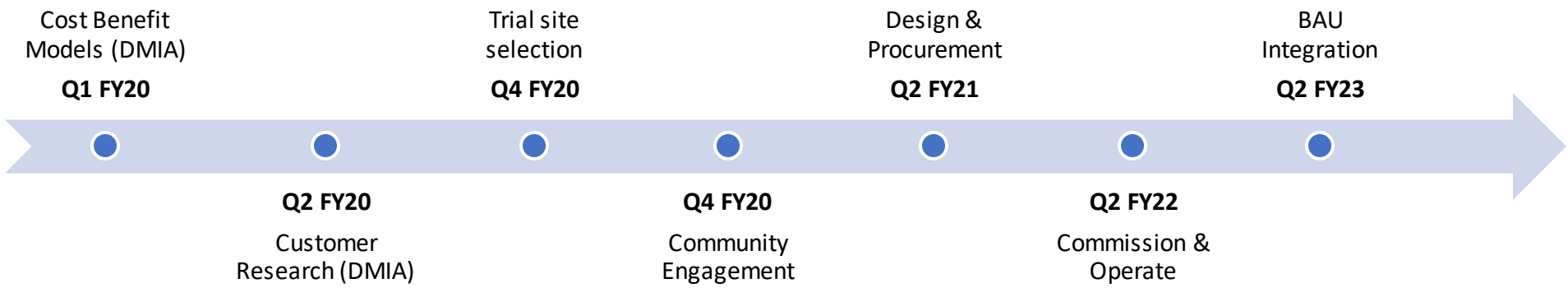
# SAPS Roadmap and key questions for the NIAC




## Key Questions

- What would an efficient SAPS tariff look like?
- How do we best engage with the range of potential SAPS customers under each deployment scenario?

## Where will we trial these?

- SWER network (safety, bushfire risk, economics)
- No road access sites (reliability, economics)
- Water crossings (safety, reliability, economics)
- Low load infrastructure sites (pipelines & telecoms)
- Remote rural areas (safety, bushfire risk, reliability, economics)

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# Key Initiative Deep Dive – Network Insights Program

*Estimate: $10.5m*

| Project Prioritisation Principles | | Rating (1 – 5) | Weight | Score |
|---|---|---|---|---|
| 1 | Maximise economic utility of new and existing assets | 5 | 25% | 1.3 |
| 2 | Lower costs for customers | 4 | 20% | 0.8 |
| 3 | Solves a specific problem | 3 | 15% | 0.5 |
| 4 | Unique-ness of problem and collaborative opportunities | 3 | 15% | 0.5 |
| 5 | Accelerate cost effective decarbonisation | 4 | 10% | 0.4 |
| 6 | Improve fairness | 2 | 10% | 0.2 |
| 7 | Reliability and price | 5 | 5% | 0.3 |
| **Project prioritisation score** | | | **100%** | **3.8** |

For Discussion

*Customer benefits include **lower prices,** increased **hosting capacity** and improved **reliability***

- Substation monitoring & control
- Distributed monitoring
- Data analytics & Operational Integration
- LV network visibility

*Real-time network status*

*Operating envelopes*

*Improved planning & forecasting*

*Remote Control*

*Neutral Integrity*

*Power quality & operating envelopes*

*Connectivity validation*

## Objectives

- Increasing utilisation of the 11kV network from ability to dynamically reconfigure the network to alleviate constraints
- Increased hosting capacity from visibility of network performance allowing for less conservative restrictions on DER and better management of network issues
- Improved investment prioritisation & efficiency and lower network risk by better understanding network performance
- Faster response to customer supply outages

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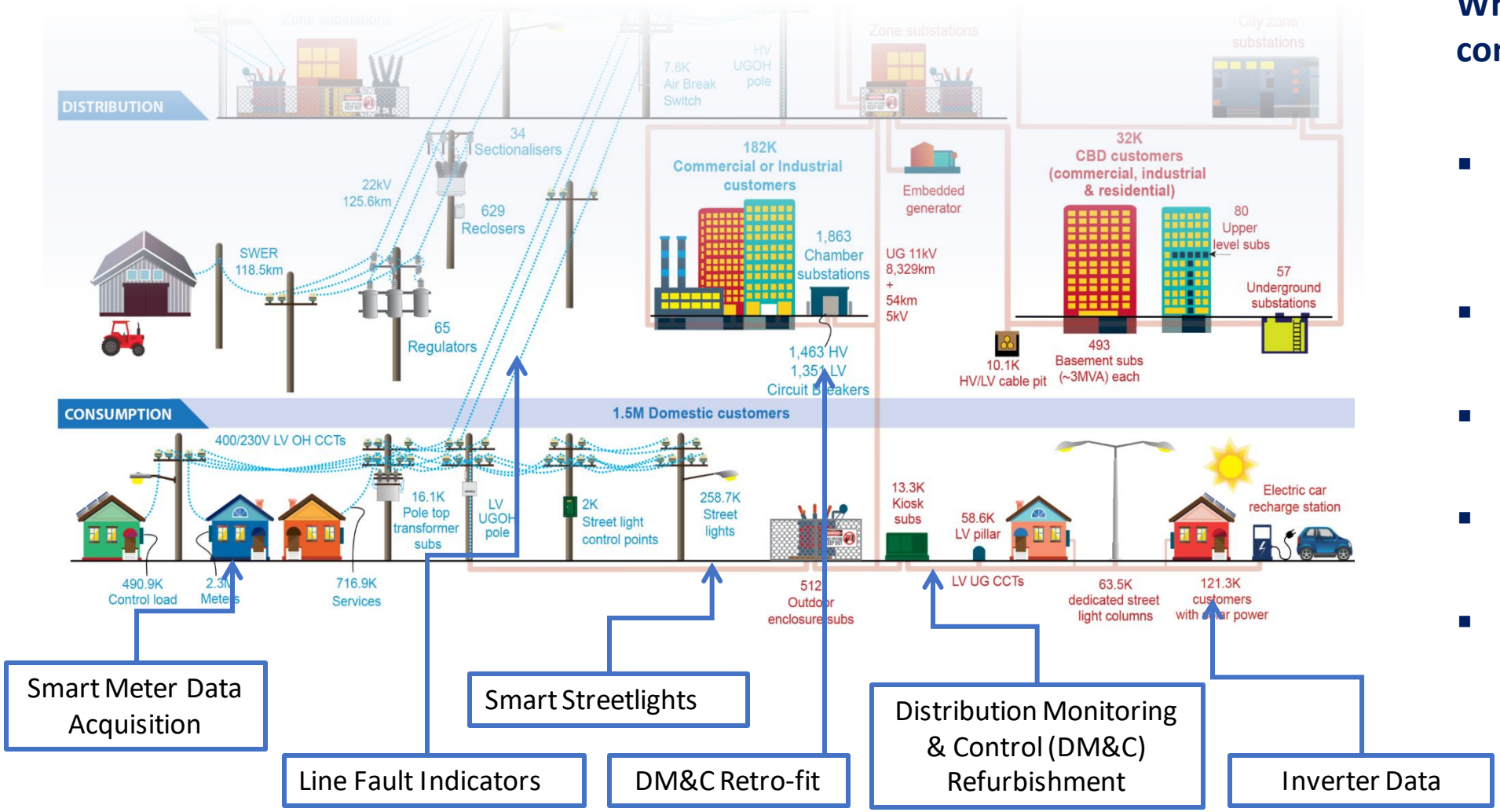
# Key Initiative Deep Dive – Network Insights Program




## What do we need to consider?

- Required density and distribution of data points to model performance
- Quality (accuracy) of data required
- Life-cycle costs of data acquisition
- Privacy, security & commercial risks
- Do we build or buy data source?

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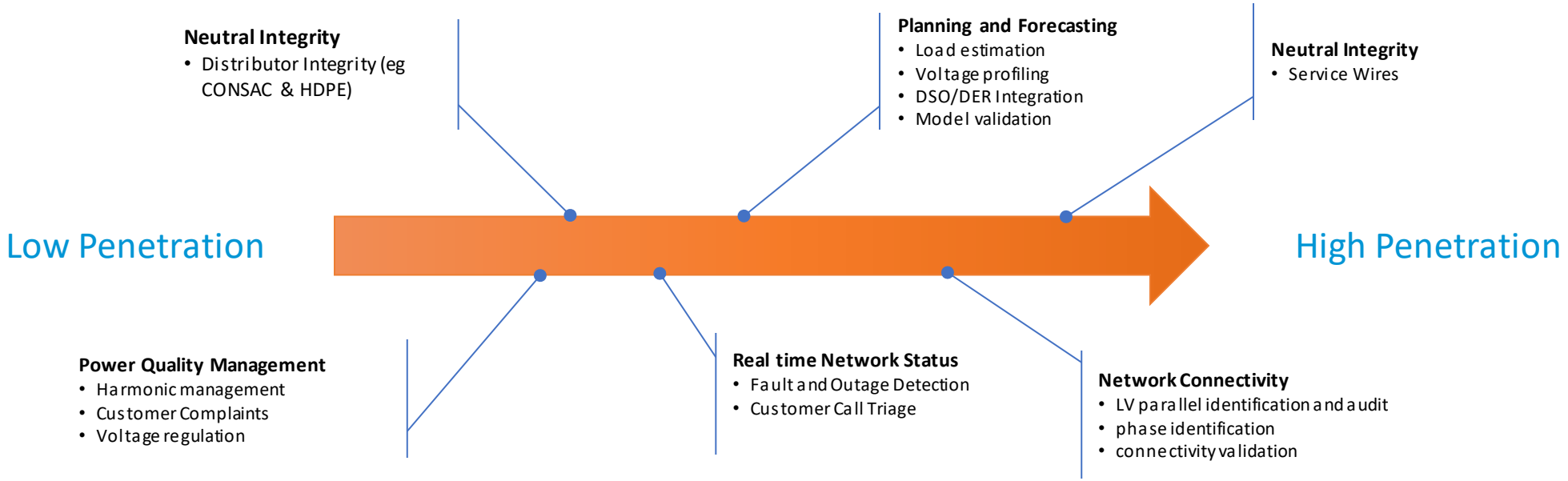
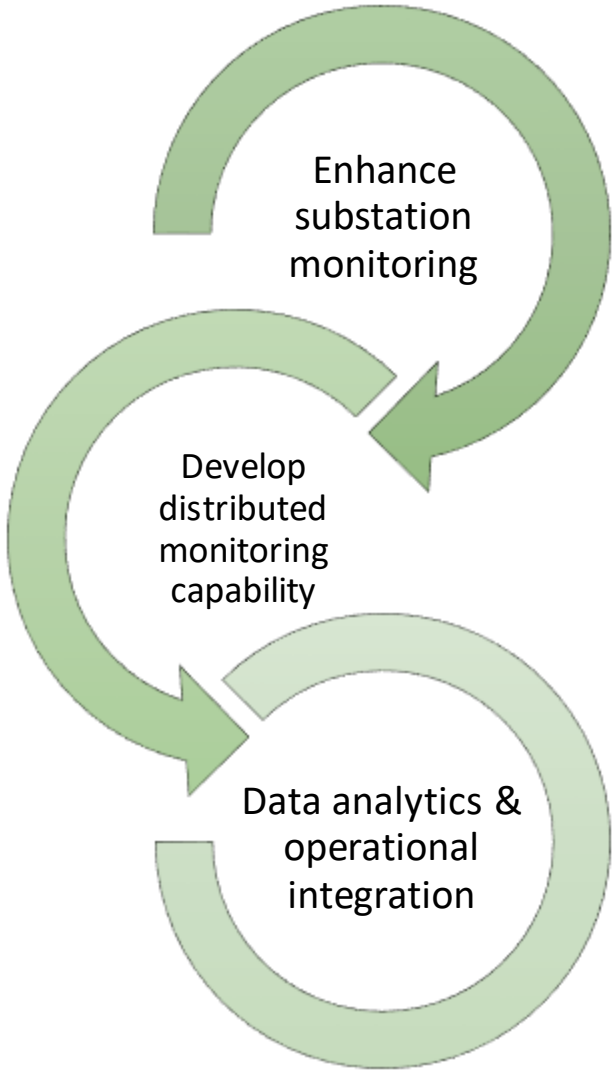
# Smart Meter Data to support Management of the Network




## General data requirements (indicative)

| Periodic Data | Real time Data | Alerts and Alarms |
|---|---|---|
| Average Voltage (eg 5 or 10 min interval)<br>Average Current (eg 5 or 10 min interval)<br>Instantaneous time-synced voltage samples<br>Instantaneous time-synced phase angle samples<br>Average Harmonics (eg 5 or 10 min interval) | Instantaneous Voltage on request<br>Instantaneous Current on request<br>Meter Status | Source Impedance / Neutral Integrity alarm/alert<br>Power Quality (eg sag/swell) alerts<br>Fault alarms<br>Last Gasp alert |

# Roadmap for network monitoring & control strategy




- Smart meter data trials
- Consumer equipment data (eg inverters, chargers, HEMS)
- Distributed network device trials

- Installation of smart monitoring and control devices at critical network locations

- Develop data analytics capability
- Integrate into ADMS and other operational systems

**Key Questions**

- What regulatory changes would the NIAC support to improve access to contestable smart meter data?
- How should information on network state and performance be communicated to the market to support a future 'DSO'?
- Should the path to a future 'DSO' be prioritised & staged according to the greatest areas of constraint?

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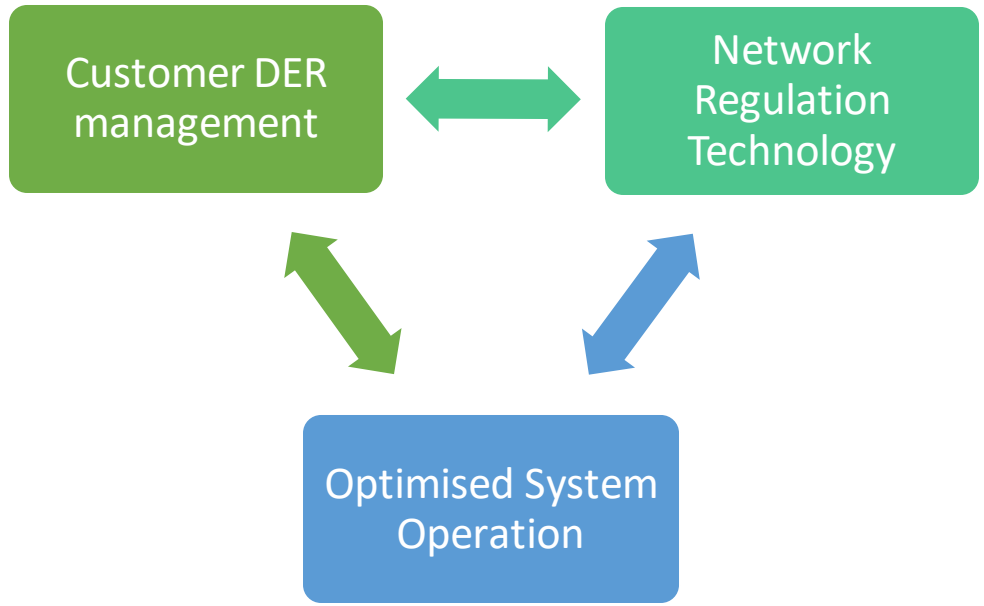
# Key Initiative Deep Dive – Advanced Voltage Regulation

*Estimate: $3.0m*

| Project Prioritisation Principles | | Rating (1 – 5) | Weight | Score |
|---|---|---|---|---|
| 1 | Maximise economic utility of new and existing assets | 4 | 25% | 1.0 |
| 2 | Lower costs for customers | 3 | 20% | 0.6 |
| 3 | Solves a specific problem | 5 | 15% | 0.8 |
| 4 | Unique-ness of problem and collaborative opportunities | 3 | 15% | 0.5 |
| 5 | Accelerate cost effective decarbonisation | 4 | 10% | 0.4 |
| 6 | Improve fairness | 3 | 10% | 0.3 |
| 7 | Reliability and price | 2 | 5% | 0.1 |
| **Project prioritisation score** | | | **100%** | **3.6** |



*Customer benefits include **lower prices** and increased **hosting capacity***




**Why is it important:**

- Optimise balance of network investment vs DER hosting capacity to achieve most efficient electricity market overall
- Increasing levels of PV penetration and the trend of larger solar systems will drive this cost up, and will result in increasing curtailment of customer generation via traditional set point and volt-var / volt-watt inverter requirements, particularly with the latest iteration of AS4777.

# Managing voltages – the current state

## Transmission

- Generator controls
- Synchronous Condensers
- Static Compensators
- Remotely operable switches

## Zone substation

- On-load tap changers
- Shunt capacitors
- Shunt reactors
- Static Compensators
- Remotely operable switches

## 11kV distribution

- Series regulators
- Line capacitors
- Remotely operable switches
- Static Compensators

## Dist. Substation

- Off-load tap changers
- On-load tap changers
- Static Compensators

## Low Voltage

- DER inverter static limits
- DER inverter dynamic limits
- Static Compensators
- Dynamic operating limits

*Existing real-time control methods*

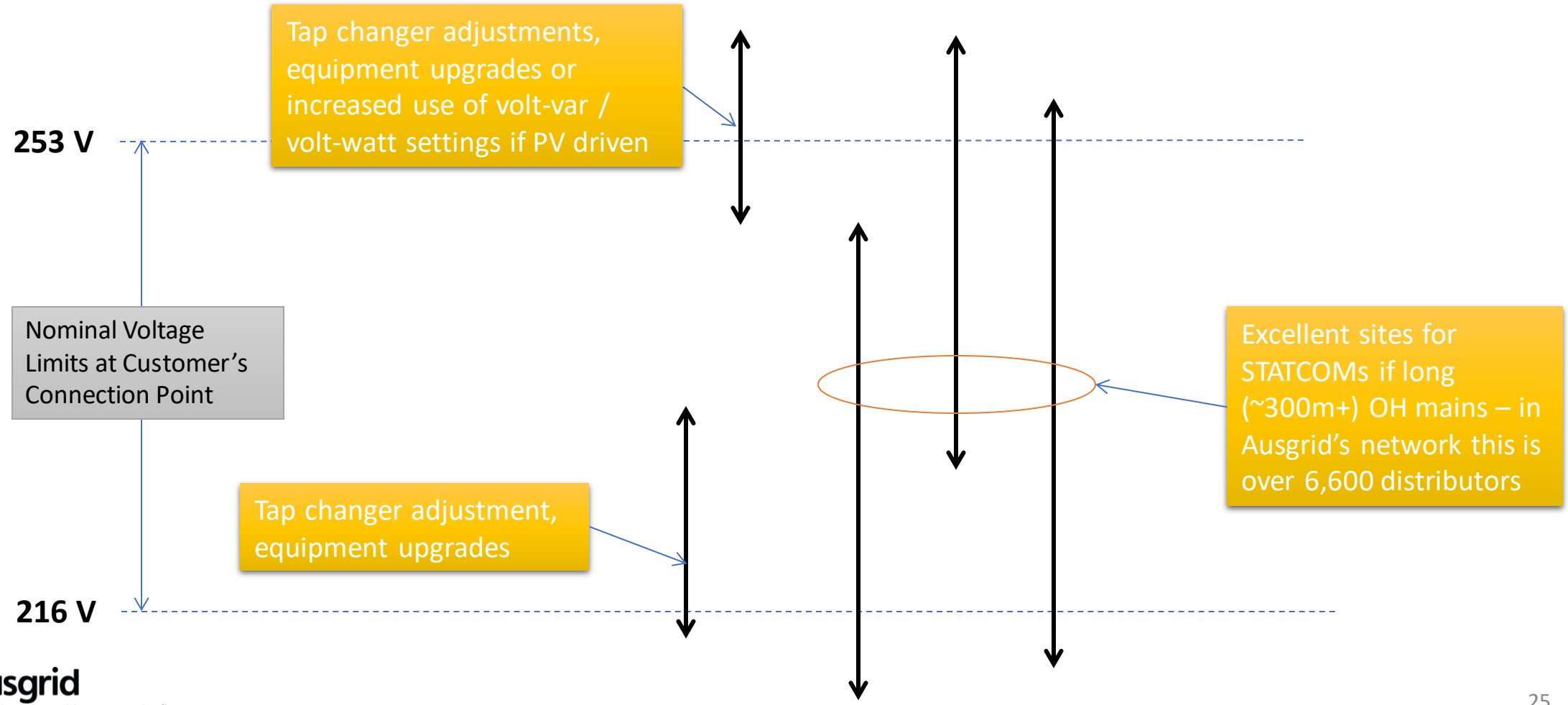
*Limited (static) control methods*

*No active control*

Mature control method
Emerging control method

# Different voltage problems, different solutions

Examples of measured voltage variation/range at Customers' Connection Points

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# Advanced Voltage Regulation Roadmap & Key Questions

**Phase 1**

- Desktop Analysis of low voltage regulation options and restricted trial of LV STATCOM technology

**Phase 2**

- Pilot installation in field and evaluation of Low Voltage STATCOM

**Phase 3**

- Integration of LV STATCOM deployment as BAU if successful
- Evaluation of HV STATCOM and on-load tap changing transformers

**Key Questions**

- How do we define equity and fairness in dispatch of DER?
- How should we evaluate the cost-benefit of network investment to avoid curtailment of DER?
- How do we approach enforcement of standards e.g inverter volt-var settings?

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# Evolve Project – towards the 'Distribution System Operator'

Ausgrid's first no regrets DSO project is "evolve"

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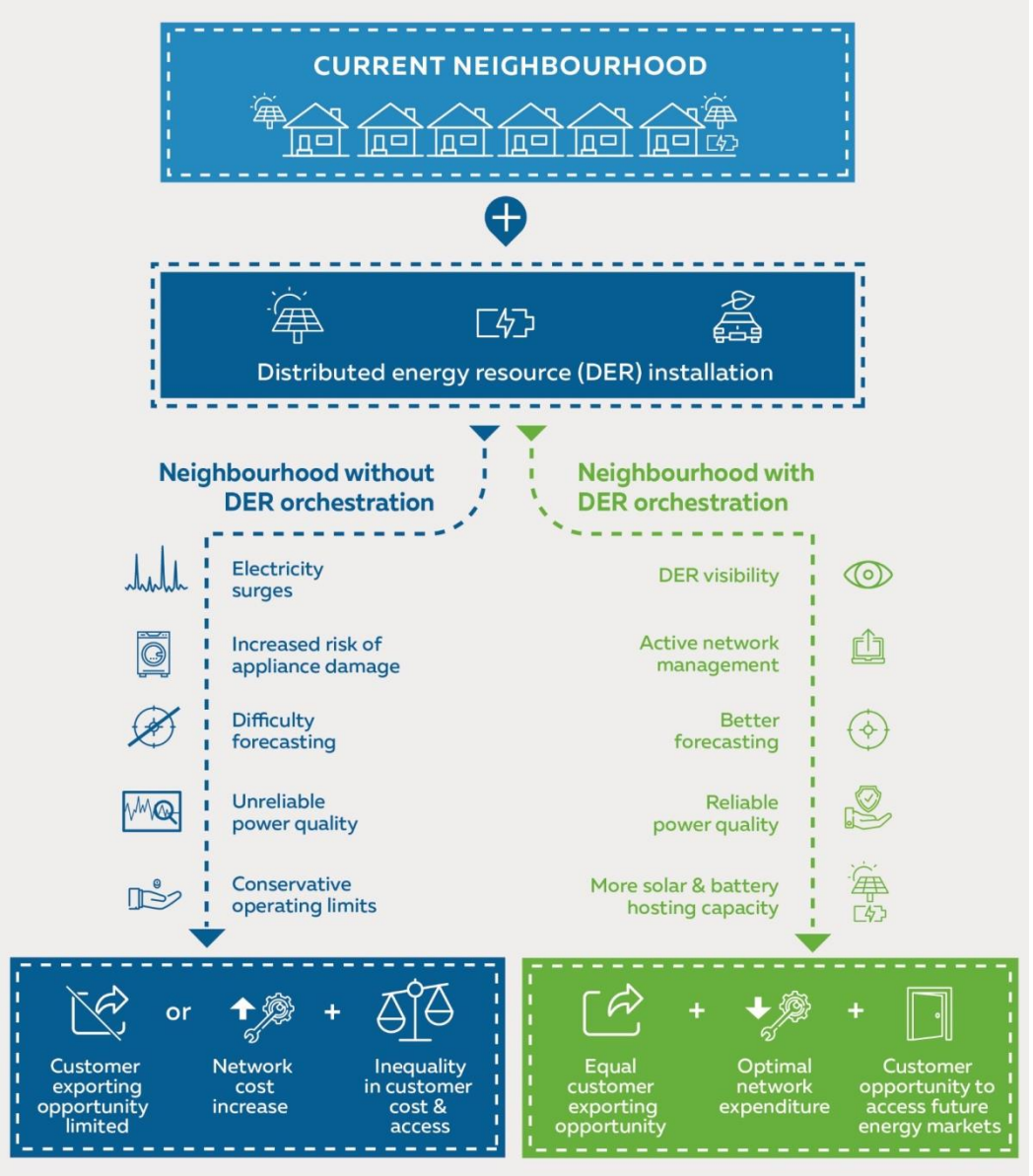
**Key Questions**

- What is equitable orchestration of DER?
- When is orchestration of DER required in the broader market – should it be prioritised & staged according to the greatest areas of constraint?

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# The End