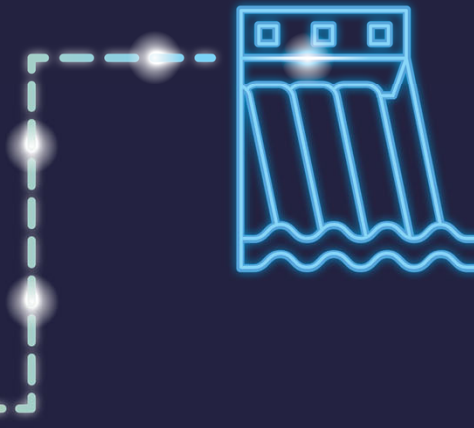
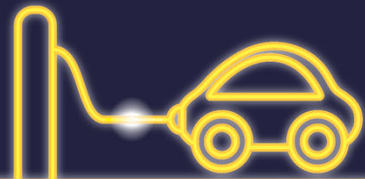




# Network Transformation Roadmap (NTR)

Richard Le Gros

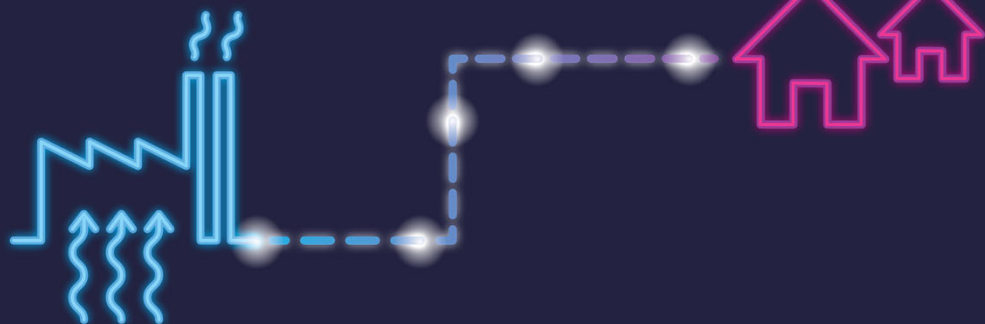
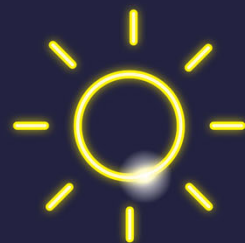


24 June 2019 – EEA Asset Management Forum



**Now, and in the future, this role is changing.**

# Why **the** NTR?



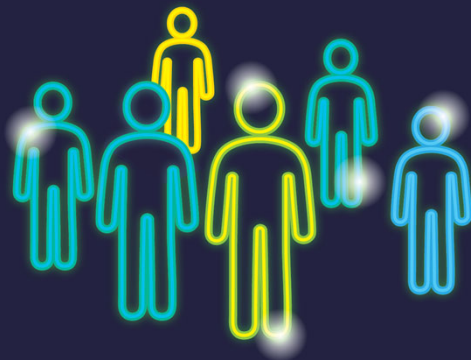
## Why the NTR?

- The electricity industry is undergoing a period of change that it has not experienced since its formation around 100 years ago
- This change is centered around changes in the way consumers use – and in some cases produce – electricity. Think solar panels, electric vehicles, batteries, etc.
- From an electricity network perspective, the change is characterized by much uncertainty around its scope, scale and timing.

## Why the NTR?

- Despite uncertainty, local electricity distribution businesses (EDBs) have to make decisions about investments in expensive network equipment with asset lives of 60-80 years plus.
- Risk that some assets may become redundant before they have been paid for, due to change in electricity usage.
- The question arises: What is the best decision I can make right now, with the information available to me?
- This is the question the NTR attempts to answer.

# Who is **the** NTR for?



## Who is the NTR for?

- The NTR was designed and developed for use by New Zealand EDBs.
- It may also be helpful to other parts of the electricity sector by foreshadowing future roles for the electricity distribution network.

# How did we develop the NTR?



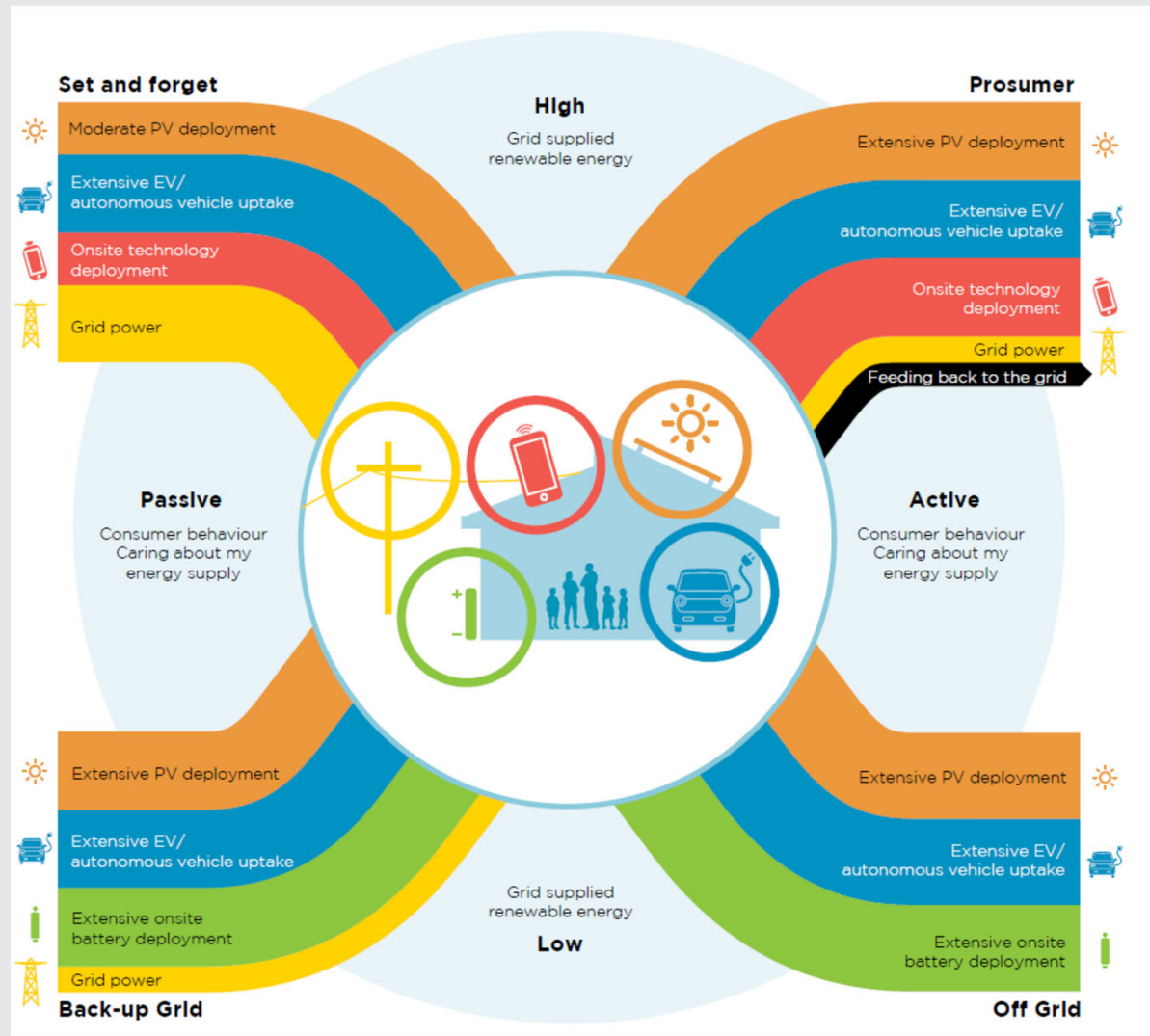


## How did we develop the NTR?

- Briefly...
- A review of similar projects in other jurisdictions was undertaken, primarily Australia and the United Kingdom.
- The Energy Networks Australia Network Transformation Roadmap project was selected as a model for our work.
- The future energy use scenarios that underpin the Australian project were reviewed in detail and then revised to reflect New Zealand conditions.

# Scenarios

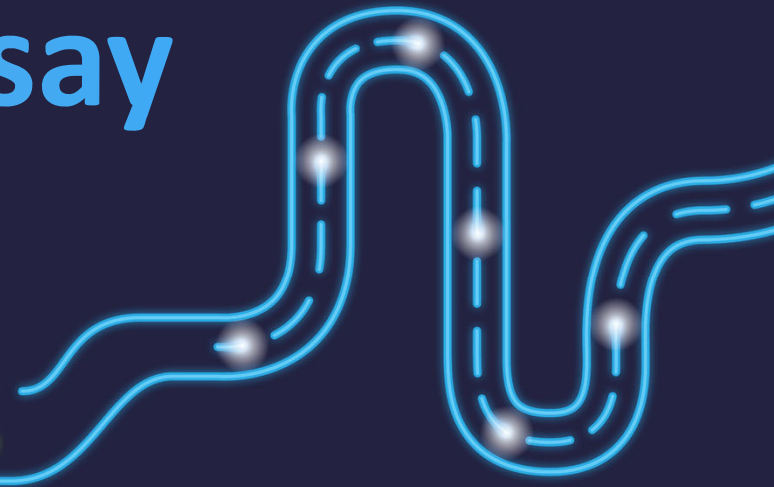
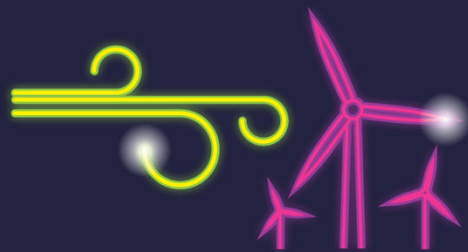
NETWORK TRANSFORMATION ROADMAP SCENARIOS  
[WWW.ENA.ORG.NZ/DMSDOCUMENT/403](http://WWW.ENA.ORG.NZ/DMSDOCUMENT/403)



## How did we develop the NTR?

- These four ‘adapted’ scenarios were then considered by NZ EDB experts and other industry stakeholders.
- They were asked, for each adapted scenario – if this future scenario came true, what would you need to do to be able to continue to operate your electricity network in the way you do today?
- Where the answers (or actions) were common across multiple of the adapted scenarios, these were taken forward to the NTR.

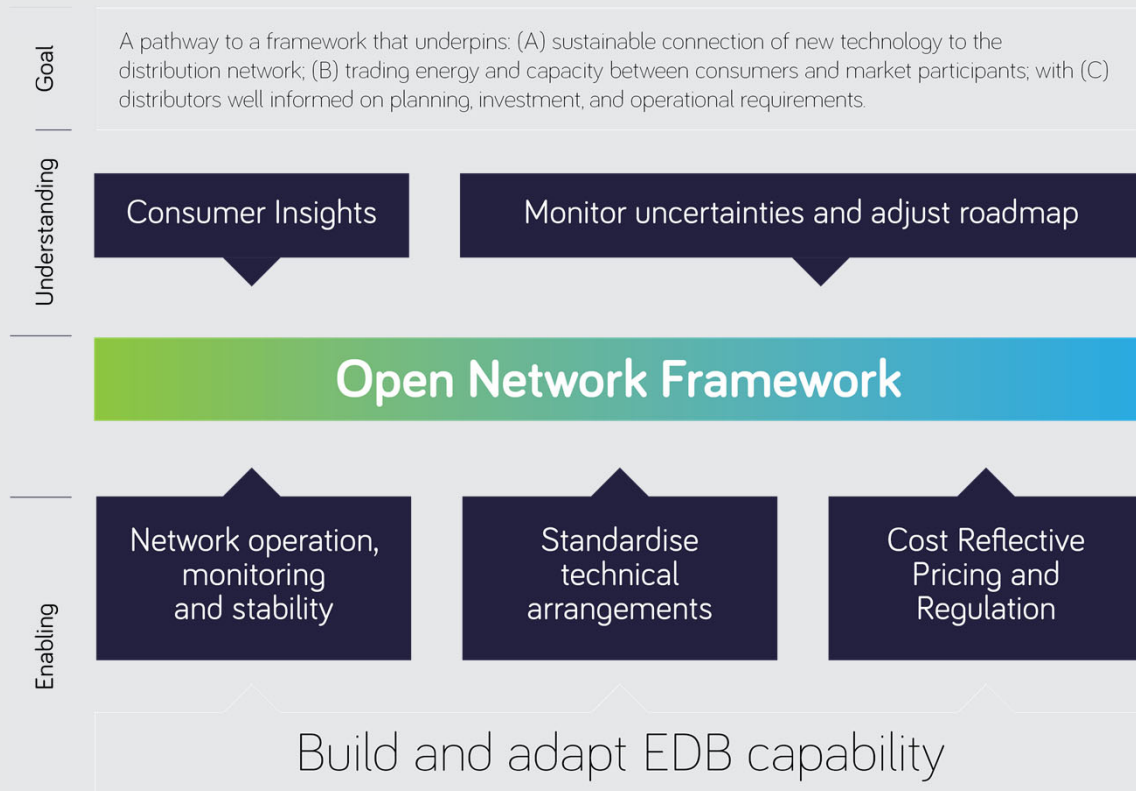
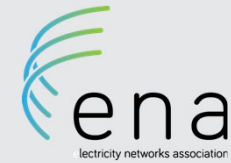
# What does the NTR say we should do?



## What does the NTR say we should do?

- The NTR report contains actions, grouped logically into ‘programmes’, that it recommends NZ EDBs consider undertaking.
- The NTR recognizes that there is a wide variety amongst EDBs, and therefore not every programme/action is relevant or necessary for every EDB. Individual EDBs need to use their own judgement.
- Some NTR programme/actions might be better achieved via some industry-level collaborative projects, rather than by individual EDBs.

# Summary of Roadmap Programmes



# What does the NTR say we should do?

## 1. Consumer Insights

- The actions in this programme are all intended to increase EDB visibility of the electricity usage/production happening at the ends of their networks – largely by residential consumers.
- The presence of significant smart metering in NZ (while not evenly distributed across all EDBs) means this information should be relatively easily obtained.

# What does the NTR say we should do?

## 2. Monitor Uncertainties

- Key inputs to the adapted scenarios to be reviewed regularly.
- If our understanding or assumptions around these inputs changes, the scenarios, and/or the NTR itself, should be updated to reflect these.



# What does the NTR say we should do?

## 3. Open Network Framework

- Sits at the centre of the NTR
  - contains actions which are enabled by the other programmes
  - The most transformative aspect of the NTR.
- Local networks should be used in more open and sophisticated ways, by both EDBs and others (including consumers)
  - allows for more innovative and flexible use and production of electricity, and the markets to support this.

# What does the NTR say we should do?

## 4. Cost Reflective Pricing and Regulation

- The NTR recognizes that appropriate pricing for the use of local electricity networks is critical to achieving many of the NTR outputs.
- Pricing reform has been underway for some time and pre-dates the NTR project – the NTR does not attempt to duplicate this.

# What does the NTR say we should do?

## 5. Standardise Technical Arrangements

- Recommends a series of actions to provide consistent standards and codes for the connection of new types of technologies to the local electricity network.
- Enable consistent functionality within new technologies that the EDBs and others can access (via the Open Network Framework programme and actions) to enable the safe operation of the local network.

# What does the NTR say we should do?

## 6. Network operation, monitoring and stability

- Focuses on actions to enhance EDB visibility and operation of their networks (as opposed to consumers described in programme 1).
- Proposes certain network information be made available to other network users in a useful, standard and consistent way.
  - To help enable outcomes sought under the Open Network Framework.

# What does the NTR say we should do?

## 7. Build and adapt EDB capability

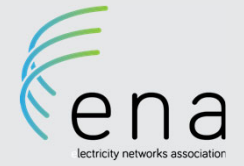
- Concerns the capability that exists with the EDB businesses to understand and operate their networks.
- Suggests the types of modelling, analytical and human resource capabilities networks will need to operate in the future – differing from past and current requirements.

## Summary

- The NTR is a tool to aid EDBs in their strategic planning.
- It suggests sensible, least-regrets actions that EDBs can take over the next ten years, for an uncertain future out to 2050.
- It does not attempt to cost these actions, although the expectation is that these are likely the minimum cost way EDBs could continue to provide their core service.
- Some actions in the NTR lend themselves to industry-level collaborative projects, and ENA is considering how these could be supported.

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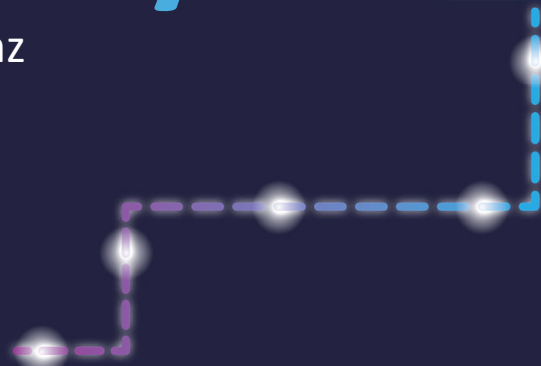
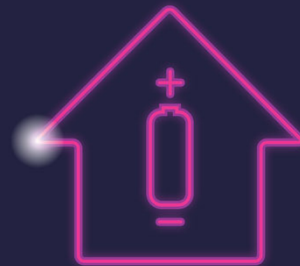
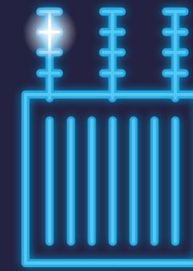
# Questions





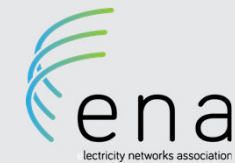
# Thank you

[electricity.org.nz](http://electricity.org.nz)





# Detailed NTR actions



**Objective:** Understand consumer motivations and behaviours to determine: (1) the impact on DER deployment and consumption patterns; and (2) new load requirements.

Actions	2 years	2–5 years	5–10 years
1. Access to smart meter data	Addressing barriers to access half-hourly consumption data	Provision of half-hourly consumption data to understand emerging behaviours	Access to sub half-hourly consumption data to develop deeper understanding, access to power quality data where such meters installed
2. Understand DER deployment	Develop requirements to access data for all DER types	Data for all DER types being gathered and analysed	Scenario modelling across the entire network is commonplace to consider DER deployment possibilities

**Note:** there is synergy between ‘Consumer Insights’ and ‘Network Monitoring, Operation, and Stability’ Programmes

3a. Understand new loads	EDBs connecting new load types or converted loads	EDBs are able to plan their network to be able to connect future new loads	EDBs actively delivering new network services to new loads
3b. Understand new DG	Develop and trial consistent DG connection approach and connection and operation standard for small and large scale DG.  Designed to collate information on new small and large scale DG	Implemented and practicing DG connection approach and connection and operation standards for small and large scale DG.  Potential DG connections are understood.	Consistency in DG connection between all EDBs.  Potential DG connections are well understood, analysed and managed consistently across all EDBs

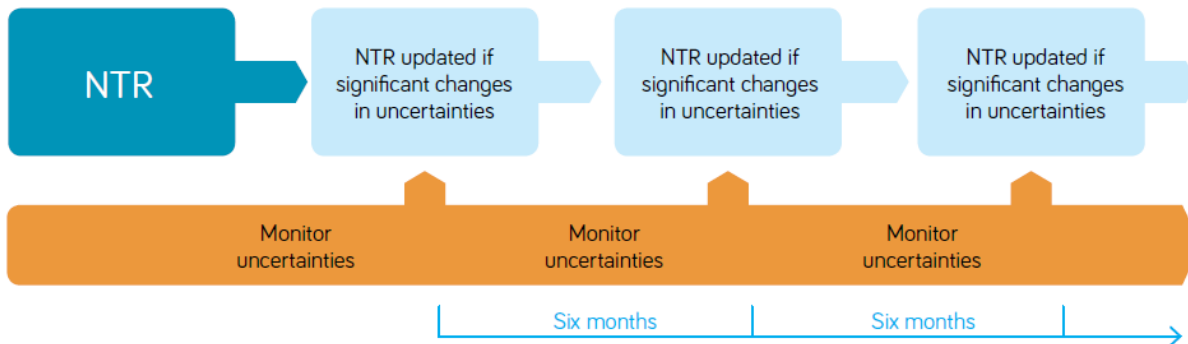
# Detailed NTR actions

**Objective:** Stay abreast of technology developments and update the EDB industry.  
Update this roadmap to remain relevant.

## Actions

### 1. Monitor uncertainties

Monitor uncertainties, megashifts and consumer behaviours and periodically (every six months) feed into roadmap programmes where necessary (where there are significant changes in uncertainties that will affect one or more roadmap programmes).



# Detailed NTR actions



**Objective:** Access to the electricity distribution network by existing and new consumers and traders to connect and operate any equipment they desire (specifically DERs and new loads) with appropriate consideration of: (1) cost of access; (2) network operation and system security; (3) standard equipment; and (4) standard access arrangements.

Actions	2 years	2-5 years	5-10 years
1. Enable distribution Network Trading	Consulting on access requirements to the distribution network for delivery of energy from alternative source and trading of energy and capacity. This will involve engaging with regulators and their consultations	Distribution network starts to open up as a stable, effective platform for delivery of energy and trading of alternative energy from producer to consumer	Full and equal access to the distribution network as a vital platform for delivery of energy and trading of alternative energy from producer to consumer
2. Third parties provide DERs and DR for network support	Trialling DERs in certain constrained areas for network support	Process and systems in place to consider DERs and DR for network support	DER and DR use fundamentally changes network operation and support
3. Demand response framework	Challenges of multiple users of demand response understood, transition plan under development	Trialling multiple users of demand response; incorporating home and business automation; developing experience into standards/codes	Starting full scale use of third party supplied demand response including coordination with other DR users

# Detailed NTR actions



**Objective:** Provide consistent method of connection of any equipment (DERs or appliances) across all EDB areas. Ensure equipment complies with approved standards to minimise its impact on the electrical power system.

Actions	2 years	2-5 years	5-10 years
1. DER Connection Standards	Developing and implementing new connection standards and frameworks/codes derived from this roadmap for DERs	All EDBs regularly use 'the' connection standards and codes for DERs	Connection standards and codes for DERs evolved by EDBs, with consistency maintained between all EDBs
2. Appliance and DER equipment standards	Distribution industry group set up to assess and contribute to international equipment standards to ensure they are appropriate to NZ	Standards appropriate to NZ, with test houses to approve equipment as compliant before being allowed on the network. Consistency across all EDBs	All equipment connecting to the network is compliant to the approved standards with enforcement for breaches
3. Network engineering	Investigate how best to achieve consistent network engineering	Trialling consistent network engineering across EDBs	Practising consistent network engineering across all EDBs
4. Cyber security and autonomous DERs	Research appropriate cyber security standards and standards for autonomous DERs	Research and trial implementation of new cyber security standards and contribute to autonomous DER standards	Implementation of new cyber security standards and standards to ensure stability of autonomous DERs

# Detailed NTR actions



**Objective:** Ensure the stability of the open network through deeper monitoring of the network and improved planning techniques.

Actions	2 years	2-5 years	5-10 years
1&2. LV network monitoring & visibility	<p>Actively rolling out LV monitoring systems with data management systems</p> <p>Provision of available AMI operational data to assist network management</p>	<p>Improve quality of LV monitored data and AMI data. New indices (data types) added. E.g. move from just voltage levels to energy and power flows, and eventually other voltage quality metrics and harmonics</p>	<p>Extensive knowledge of LV network and analysis tools</p> <p>AMI capability able to meet operational requirements for network management, provided in real-time</p>
3&4. Network stability	<p>Researching the implications of numerous autonomous DERs and methods of control to ensure stability and avoid new load peaks</p>	<p>Trialling control systems for numerous autonomous DERs to ensure stability and avoid new load peaks</p>	<p>Implementing control systems for autonomous DERs</p>
5. Provision of network information	<p>Investigating and trialling provision of network information to operator(s)</p>	<p>Provision of available network information to operator(s)</p>	<p>Provision of extensive network information to operator(s)</p>

# Detailed NTR actions



**Objective:** Understand networks in greater depth, their ability to host DERs, congestion, and contracting for network support. Ensure working understanding of regulations and obligations of those.

Actions	2 years	2–5 years	5–10 years
1. Network understanding	Starting to understand LV network capabilities, performance and constraints	Most EDBs are starting to collect extensive data about their LV networks and their operation	All EDBs have comprehensive LV network condition, performance, and utilisation data with models of the combined LV and MV networks
2. Develop contracting for network support capabilities to support Action 2 of the Open Network Framework	Trial framing of EDBs requirements for network support and introduce contestable procurement to discover a range of solutions	Develop the necessary processes and systems for contestable procurement of network support from trial experience	Consistent practice of open procurement for network support, practiced consistently across all EDBs
3. Asset Management practice	EDB industry exploring improved asset management practices and consistent frameworks	Improving asset management practice across most EDBs, with regular information sharing	Mature asset management and systems engineering practiced consistently across all EDBs
4. Off grid power supplies	Trial remote area power supplies	Implement remote area power supplies in areas where it is less costly than traditional networks	Consistent best practice agreed between EDBs and other industry participants, and practiced extensively