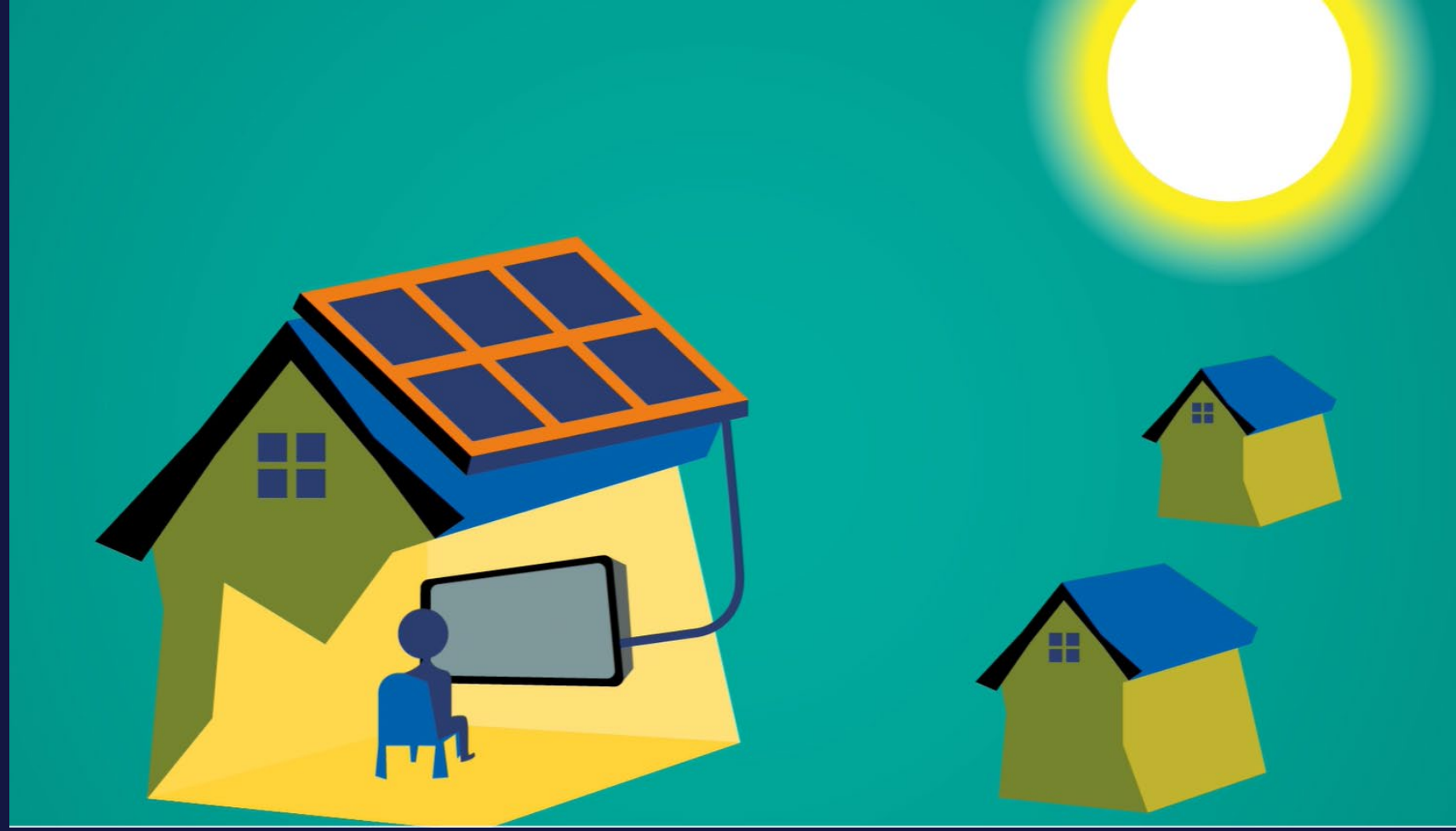
# Future Networks Forum



11 November 2021

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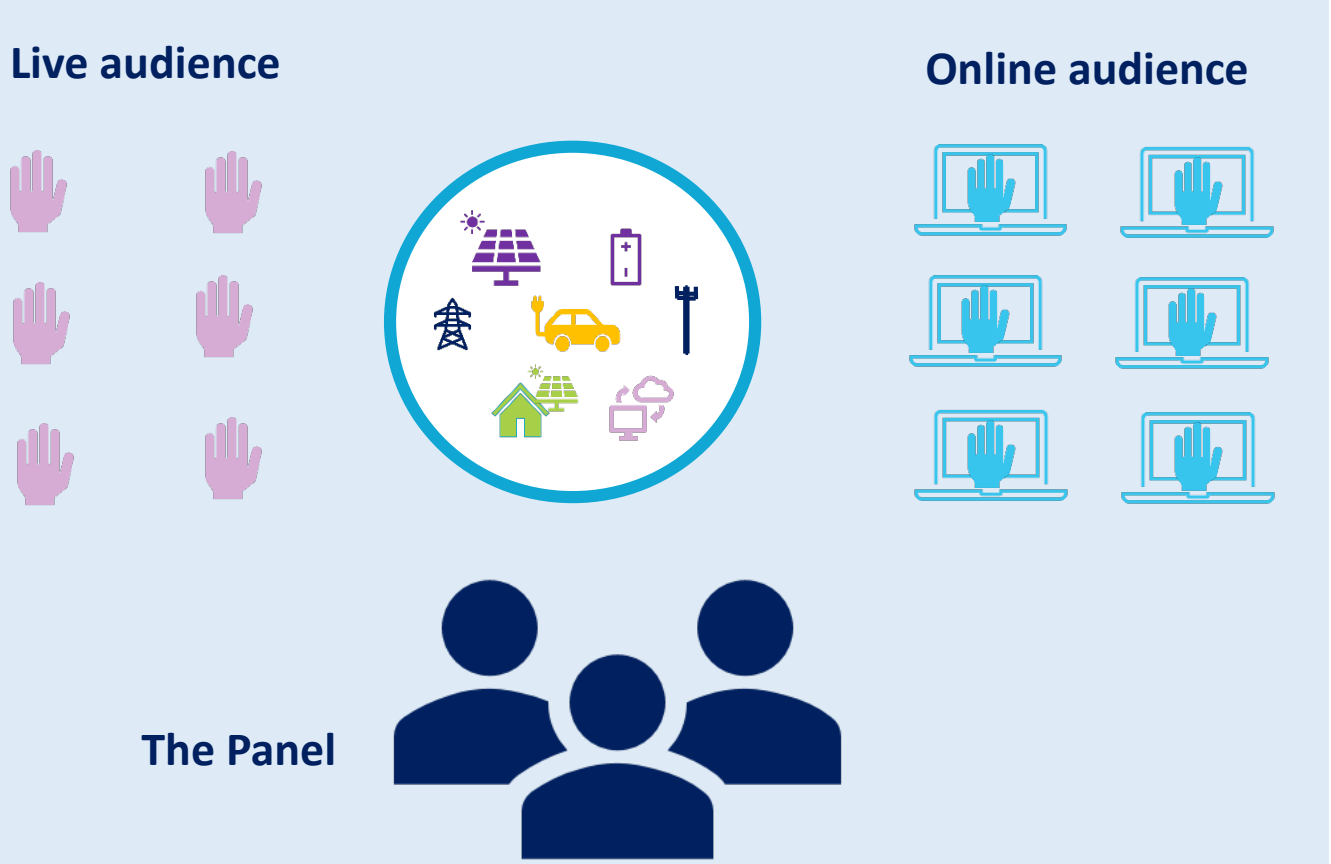
On behalf of Power and Water Corporation, we acknowledge the Larrakia people as the Traditional Owners of the Darwin region and the land on which this forum is hosted and warmly welcome any Aboriginal people here with us today.

We also acknowledge the Traditional Custodians of the lands where all other participants are located today, and pay our respects to their Elders, past, present and emerging.

# Welcome to the Future Networks Forum

**Today**

| | |
|---|---|
| Welcome | 2:00pm |
| Introduction to our Panel | 2:15pm |
| Hearing from the Panel | 2:20pm |
| | 2:40pm |
| **You can ask that – the Panel** | **3:00pm** |
| | 4:15pm |
| Future Network Readiness Plan | 4:30pm |
| Consultation and next steps | 4:50pm |



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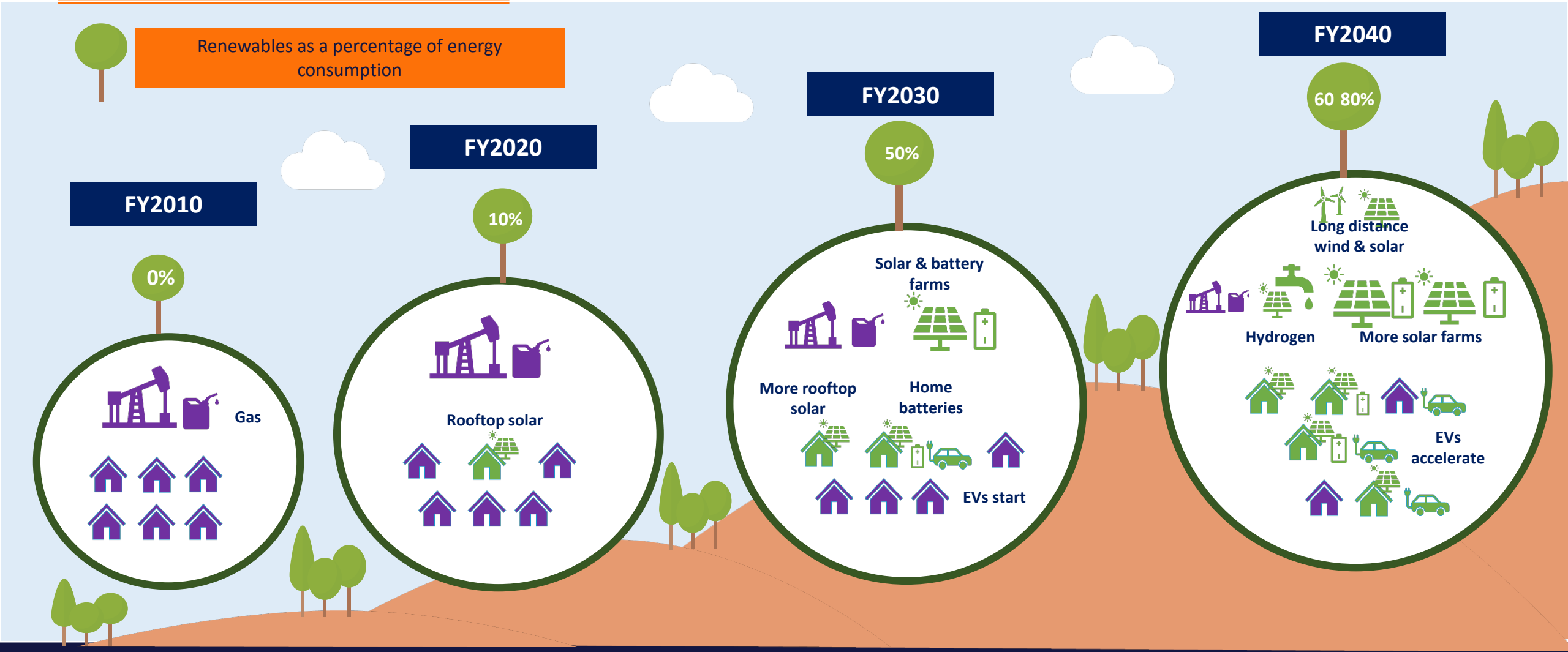
# Accelerating to a renewable energy system



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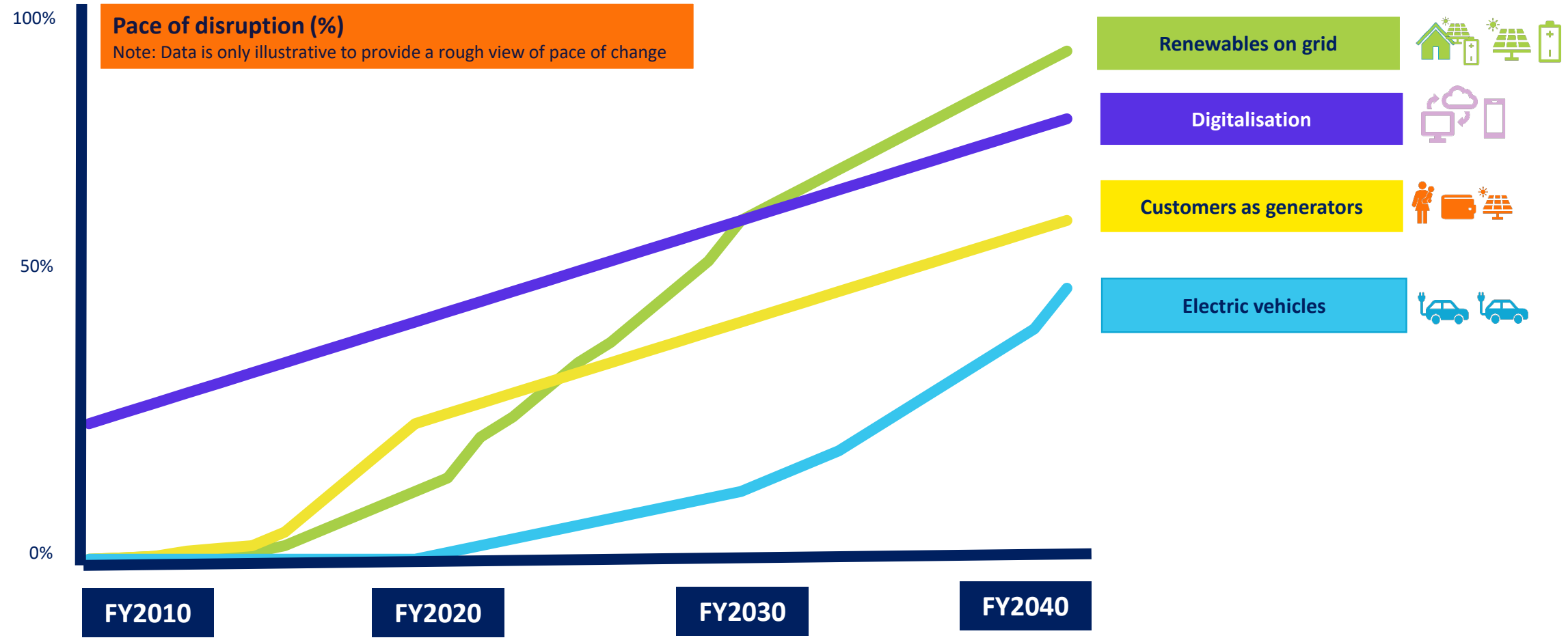
# Pace of change impacting the electricity system



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# Evolving customer expectations

| | 2000 | 2020 | 2040 |
|---|---|---|---|
| **Changing customer base** |  |  |  |
| **Connecting** | | | |
|  | Connect me to power | Connect my solar | Connect my micro grid |
| **Powering lifestyle** | | | |
|  | Power my fridge and AC | Charge my mobile and wifi | Charge my EV |
| **Power interrupted** | | | |
|  | Call centre, tell me | Info online please | Ping my mobile |
| **Disconnected** | | | |
|  | I'm doing it tough | Reduce prices please | Give me a deal or I'm off-grid |



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# A customer's view - Video

**Do you think the NT as a whole should increase the supply of electricity it gets from solar over the next 20 years?**

Watch the video:
https://www.youtube.com/watch?v=9OCrpHQXn1o



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# Where this fits into 2024-29 proposal

Current Regulatory Control Period | 2024-2029 Regulatory Proposal | 2029-2034 Regulatory Proposal

**Immediate (1-2 years)** | **Short-term (2024-2029)** | **Long-term (2030-2040)**



**ENABLE** | **TRANSITION** | **ACCELERATE**



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# Introducing the Panel

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# The Panel

**Jim McKay**

Northern Territory Government — Department of Industry, Tourism and Trade

**Jo Cruickshank**

Northern Territory Government — Department of Infrastructure, Planning and Logistics

**Paul Graham & Tim Edwards**

CSIRO

CutlerMerz
www.cutlermerz.com

**Lyndon Frearson**

Ekistica

**Stephen Vlahovic**

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# Hearing from the Panel

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Department of INDUSTRY, TOURISM AND TRADE

# Darwin-Katherine Electricity System Plan

Jim McKay – Office of Sustainable Energy

NORTHERN TERRITORY GOVERNMENT

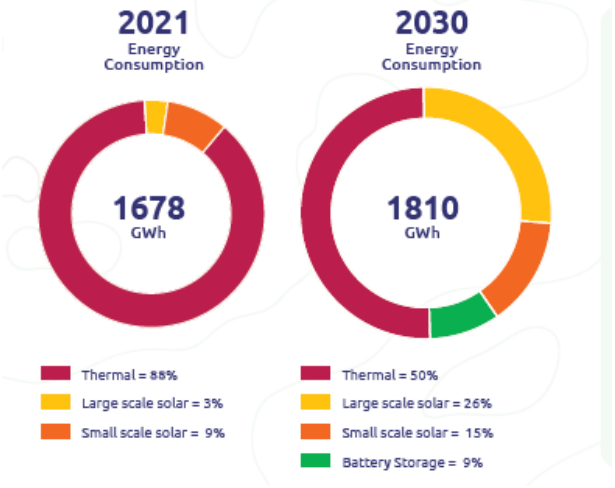
# Helicopter view

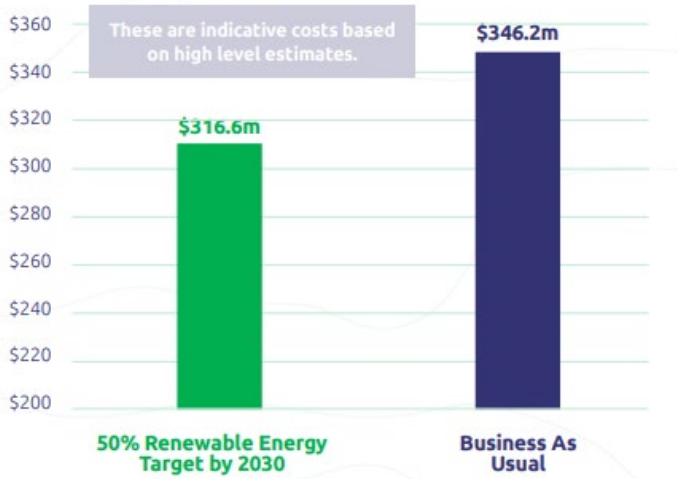
## The goal

**50%**
of electricity is renewable

Low cost | Secure | Future-proof

## The outcomes




## The focus areas

**320 MW** NEW
Focus Area 1
**Solar and Renewable Energy Hub**
- Small scale solar (80MW)
- Committed Large scale solar (60MW)
- Large scale solar in Renewable Energy Hub (180MW)

**110 MW** NEW
Focus Area 2
**Storage Batteries**
- Home & Community Storage(10MW/40MWh)
- Large scale Storage(100MW/560Mwh)

**200 MW** RETIRE
**80 MW** NEW
Focus Area 3
**Thermal Generation**
- Retire ageing thermal generation (200MW)
- Install smaller and faster machines (80MW)

**105 MW** NEW
Focus Area 4
**High-spec Security Batteries**
- Install 3 new 'high spec' batteries (105MW)

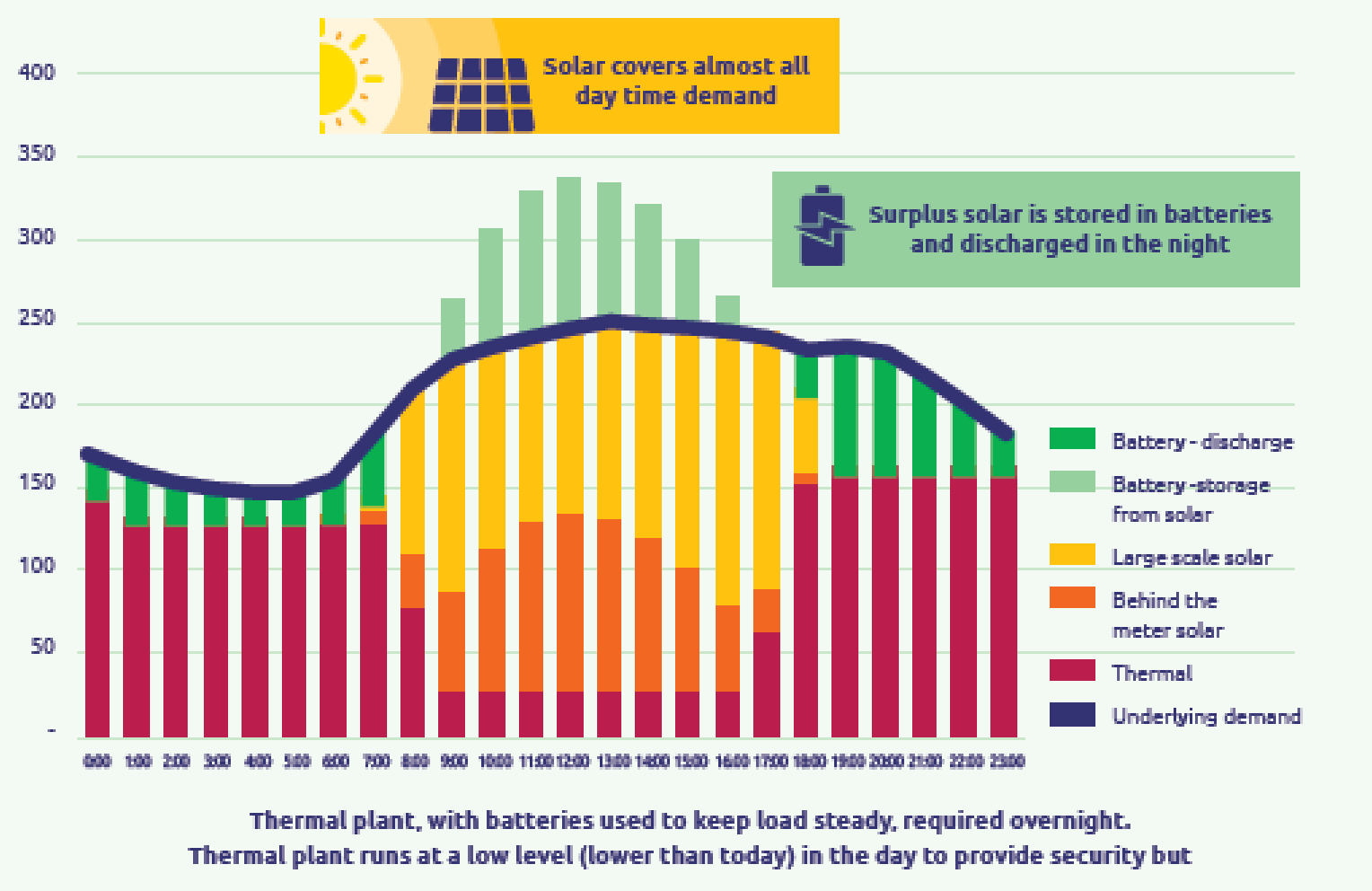
NEW
Focus Area 5
**Virtual Power Plants**
- Operate and expand a Virtual Power Plant

NEW
Focus Area 6
**Demand Management Initiatives**
- Encourage customers to shift energy use from evening to the day



NORTHERN TERRITORY GOVERNMENT

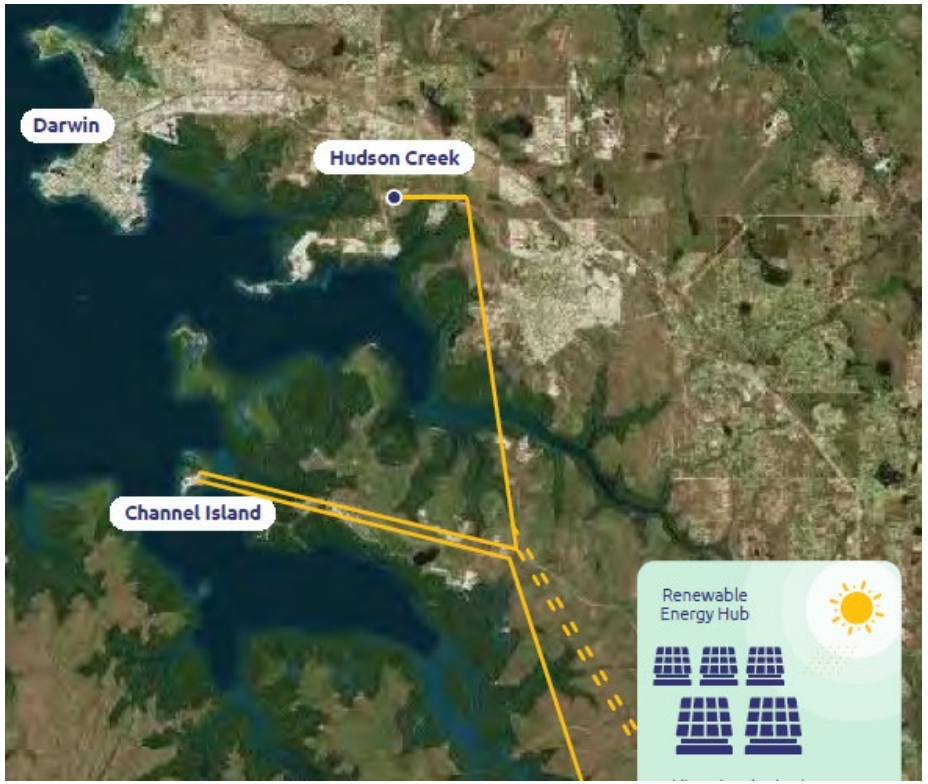
# A customer's energy in 2030



# Power and Water's network

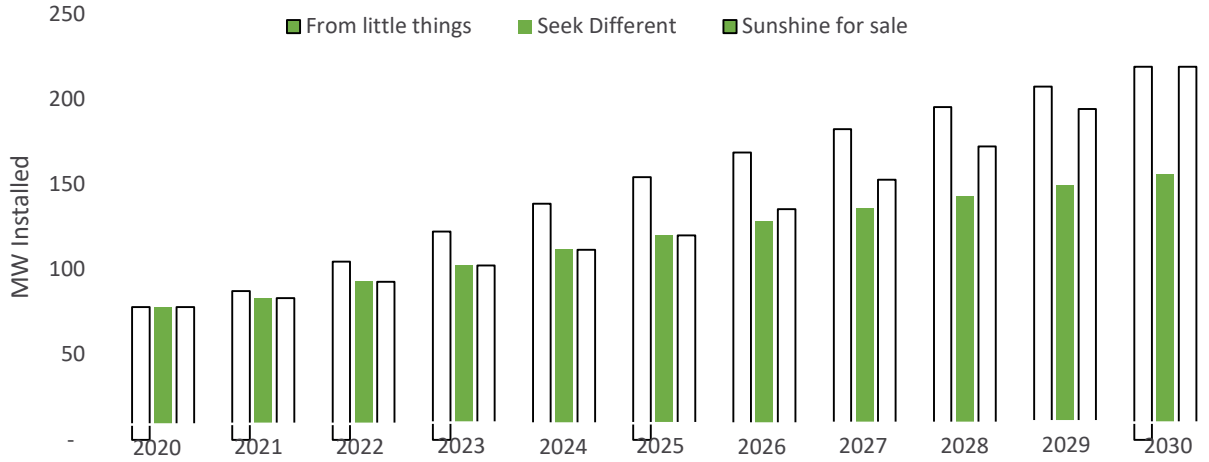
Watch a Typical Day in Darwin 2030 video:
https://www.youtube.com/watch?v=WrWyN0qJQXs

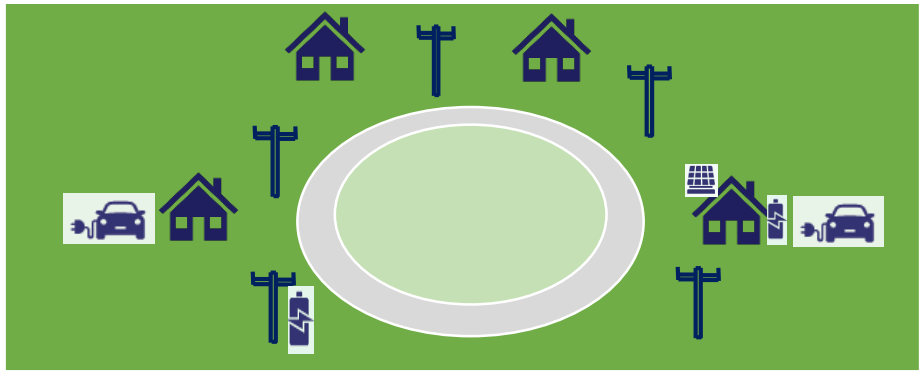
## Unlocking large scale solar and batteries




The Renewable Energy Hub is the most efficient mechanism to transport large scale renewables from Power and Water's transmission network

## Unlocking small scale renewables



**How to coordinate DER?**

- Virtual Power Plants
- Demand Management
- Community Batteries
- Incentives for home batteries



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# Future Network Pathways

## Overview

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www.cutlermerz.com

## External drivers of change

- Increasing customer investment in BTM solar and batteries
- Increasing customer adoption of EVs
- Falling costs of large scale solar and battery technology
- Global, national and local renewable and climate ambitions

## Opportunities

- BTM resources can be utilised to provide grid support services without the need for capital investment
- EVs can be enabled via V2G technology to provide grid support services without the need for capital investment
- Improved energy security and reliability a possible side effect of new transmission infrastructure connecting dispersed solar resources
- Growth of renewable energy industries in the Northern Territory

## Risks

- Greater incidence of low demand events
- Uncertain costs of managing BTM devices
- System more vulnerable to weather events; loss of system strength and inertia
- Existing policy and regulatory framework may struggle to evolve to meet the changing requirements

Note: BTM = Behind-the-meter, EV = Electric vehicles, NT = Northern Territory, V2G = Vehicle-to-Grid

## Transmission and generation will need efficient planning and coordination

- More generation is needed to achieve the 50% RET by 2030, particularly large-scale generation
- Efficient planning will be required to coordinate generation connections to the network and minimise costs on the network (and therefore consumers)

## Capability is needed to unlock the services that BTM renewable resources can provide

- Small-scale adoption of solar PV and batteries is increasingly prevalent in the network
- These devices have the capability to provide grid support services and reduce the need for large-scale expenditure
- Capability will need to be developed to unlock these services and utilise BTM renewables to ease the burden on the centralised system

## The impact of EVs can be significant on the network, but it is an opportunity to provide services

- If left unmanaged, EV charging can have a significant impact on the network
- Capability will need to be developed to provide managed charging to minimise network impacts
- With the right technology and capability, EVs can also act as a battery which can also provide grid support services
- Capability will need to be developed to utilise EVs as a battery

Department of Infrastructure, Planning and Logistics

# NT EV Strategy and Implementation Plan

Jo Cruickshank
Transport and Civil Services

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# What are the benefits of EVs?

**Lower Operational Costs**
Running costs of EVs are around 60 per cent to 90 per cent cheaper than fuel costs for a conventional vehicle and with fewer moving parts, maintenance and servicing costs are lower[2].

**Reducing greenhouse gas emissions**
Transport is responsible for 19 per cent of Australia's total greenhouse gas emissions and eight per cent of the Northern Territory's emissions[3].

**Supporting the Northern Territory's 50% by 2030 renewable energy target and managing electricity demand**
Managing electricity demand by charging vehicles at peak solar energy production during the day and lower energy demand periods during the middle of the day and at night.

**Improved fuel security**
Reduced reliance on imported liquid fuels.

**Improving urban amenity**
Reduced road traffic noise and improved air quality.

**Potential economic benefits**
New jobs in mining and manufacture related to EV supply chains and in the renewable energy sector.

> *The main benefit [of EVs] to the NT is the fuel is local, made locally and locally owned instead of foreign imported oil.*
>
> ***Feedback to the 2019 NT EV Discussion Paper.***



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# NT EV Implementation Plan

- reduced registration and stamp duty fees from-mid 2022
- increasing the number of EVs in the NT Government fleet
- Installing chargers in NTG buildings
- Grants for home, workplace and public EV chargers
- Planning scheme amendments
- Planning for power supply implications
- Providing consumer information




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# Implications for electricity systems

- Increased demand
- Encouraging daytime charging
- V2G
- Dynamic charging
- Charger installation

# A customer's view - Video

**What do you think about using new technology like electric vehicles?**

Watch the video:
https://www.youtube.com/watch?v=vNIsBioNzM8



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# You can’t ask that!
## Questions for the panel

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# The CEO of ECA on the future of energy - Video

**What will the energy future look like?**

Watch the video:
https://www.youtube.com/watch?v=2Pn8mRpqNBM



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# Future Network Readiness Plan

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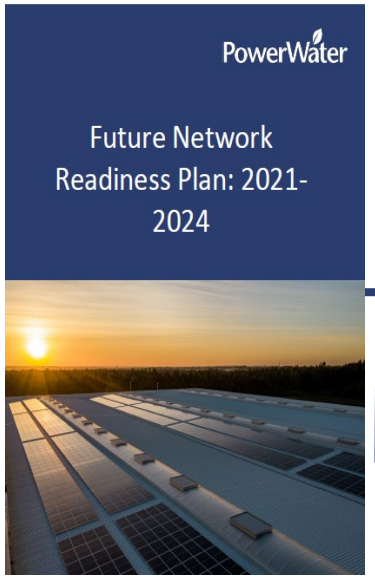
# What is the Future Readiness Plan?

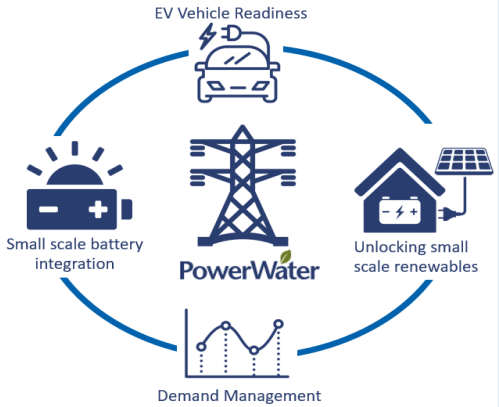



## Informed by

- ***Consumer-led investment in self generation***
- ***Changing industry expectations***
- ***Changing policy and political landscape- including Darwin-Katherine Electricity System Plan***

## Identifies

### Network Focus Areas




### Network Capability Requirements

- Dynamic Operation
- Dynamic Operating Envelopes
- Low Voltage Visibility
- Demand Management
- Digital Capabilities

### Readiness Initiatives

**Initiatives 1 & 2:** Small-Scale Network Visibility & Dynamic Operating Envelope Pilot

**Initiatives 3:** Community Feasibility Study

**Initiatives 4:** EV Charging Impact Research



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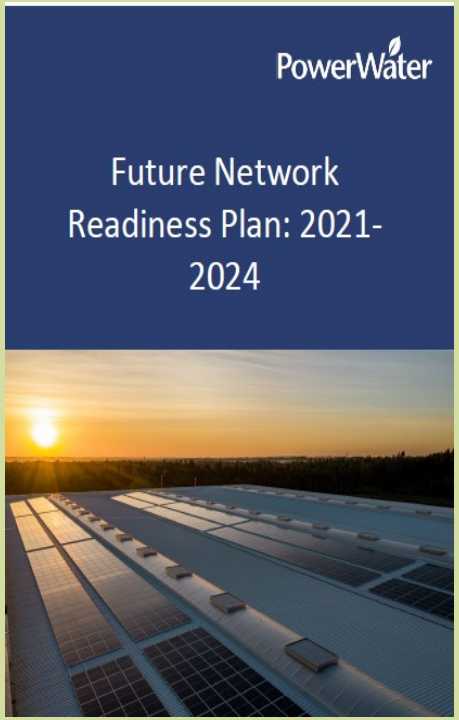
# What is it aimed at?

**Immediate (1-2 years)** | **Short-term (2024-2029)** | **Long-term (2030-2040)**





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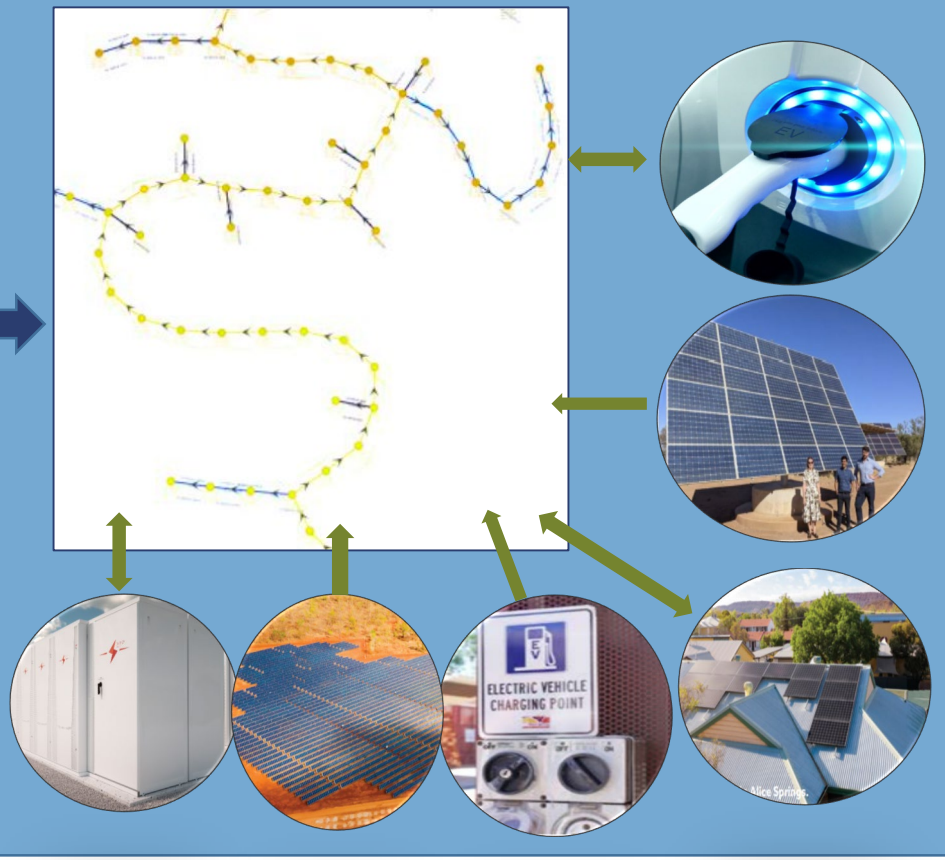
# Initiatives 1 & 2: Small-Scale Network Visibility & Dynamic Operating Envelopes


## Provides visibility of two-way electricity flows on the network & dynamic operating capability




## Measured node density scenarios

Estimated nodes  Measured nodes

**Limited Coverage**

- Uncertainty quantified
- Estimations replace worst-case assumptions.

75% nodes on feeder estimated | 25%

## Estimated State vs Measured State

As the number and quality of measurements on a feeder increase, the differences between estimated and measured (actual) values of voltage, current and power reduce.

Estimated State  Measured State

**Limited Coverage**

## Evolving PV export-status mix

State Estimation technology can be used to dynamically control and maximise export. This will minimise network impacts and enhance customer, market and environment outcomes.



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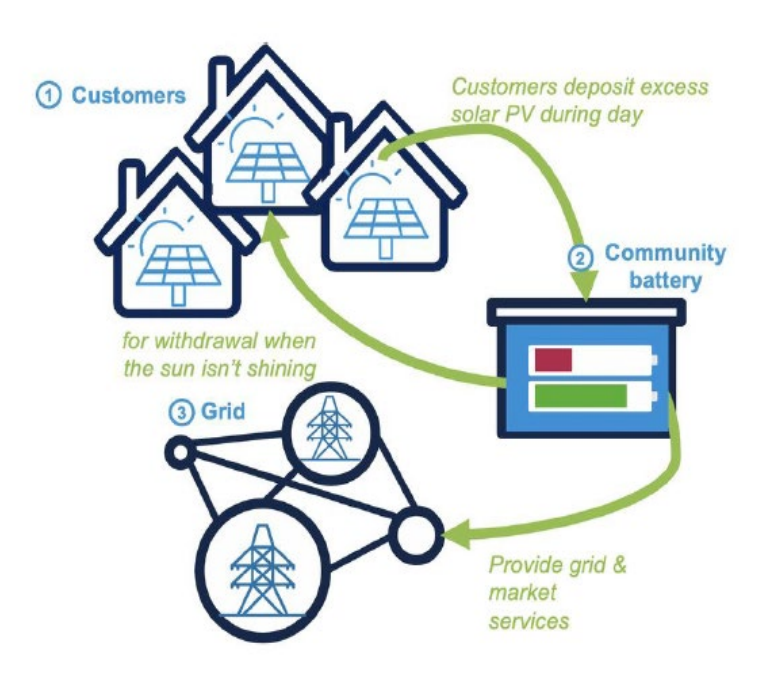
# Initiatives 3: Community Battery Feasibility Study

## Understand Value Proposition for Community Batteries




## The 'Value Stack' for Grid-Scale Batteries

***Network***
Alternative to network upgrades to address constraints

***Customer***
Local customer energy storage service

***Market***
Wholesale and essential system service markets



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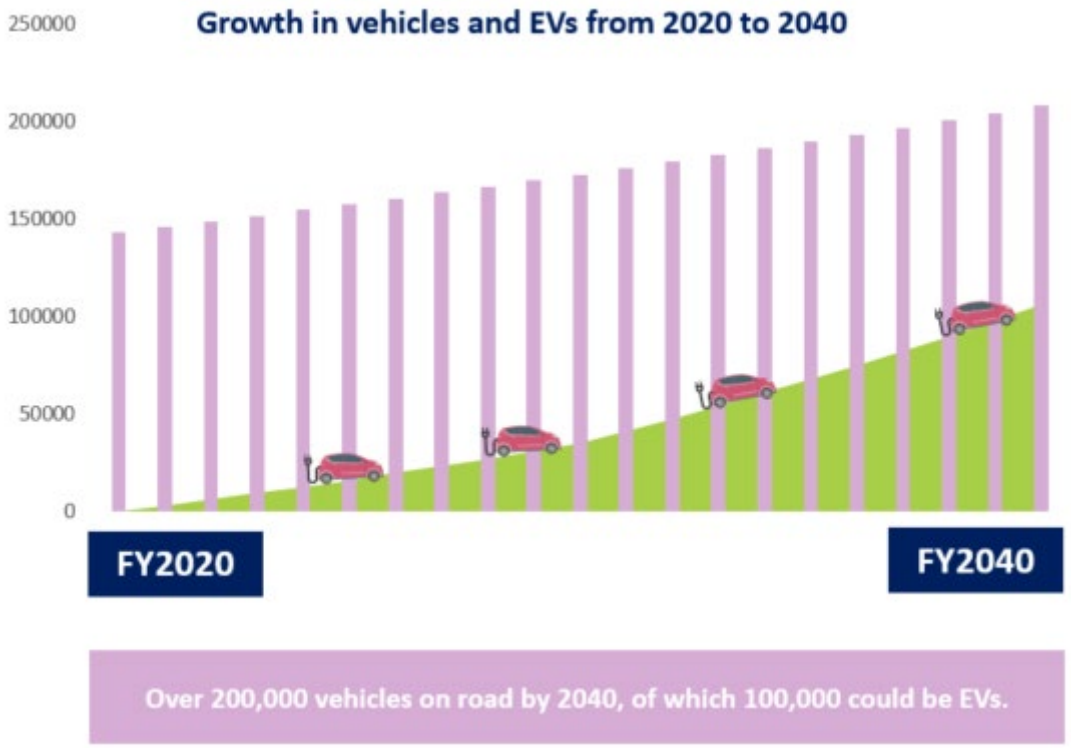
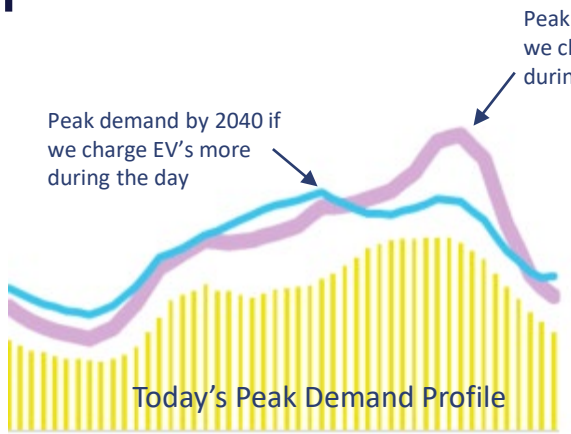
# Initiatives 4: EV Charging Impact Research







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# Consultation and next steps

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# Consultation

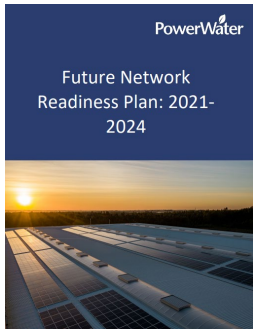
## Consultation Approach

People's Panel

Customer Advisory Committee

Knowledge
Insights
Feedback

Future Network & Retail Forum




## Development of Expenditure Plans

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Expenditure Plans




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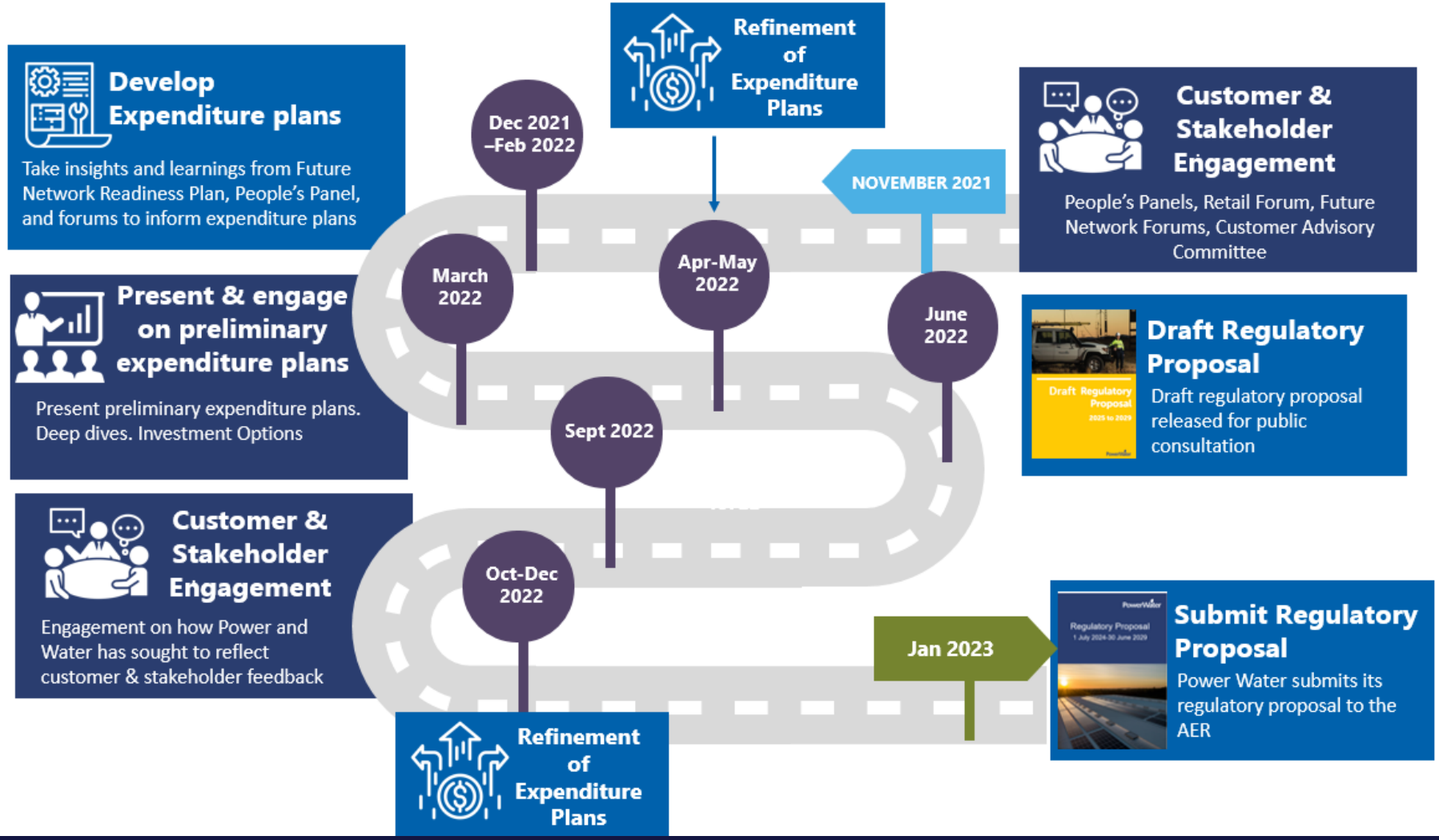
# Next Steps



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