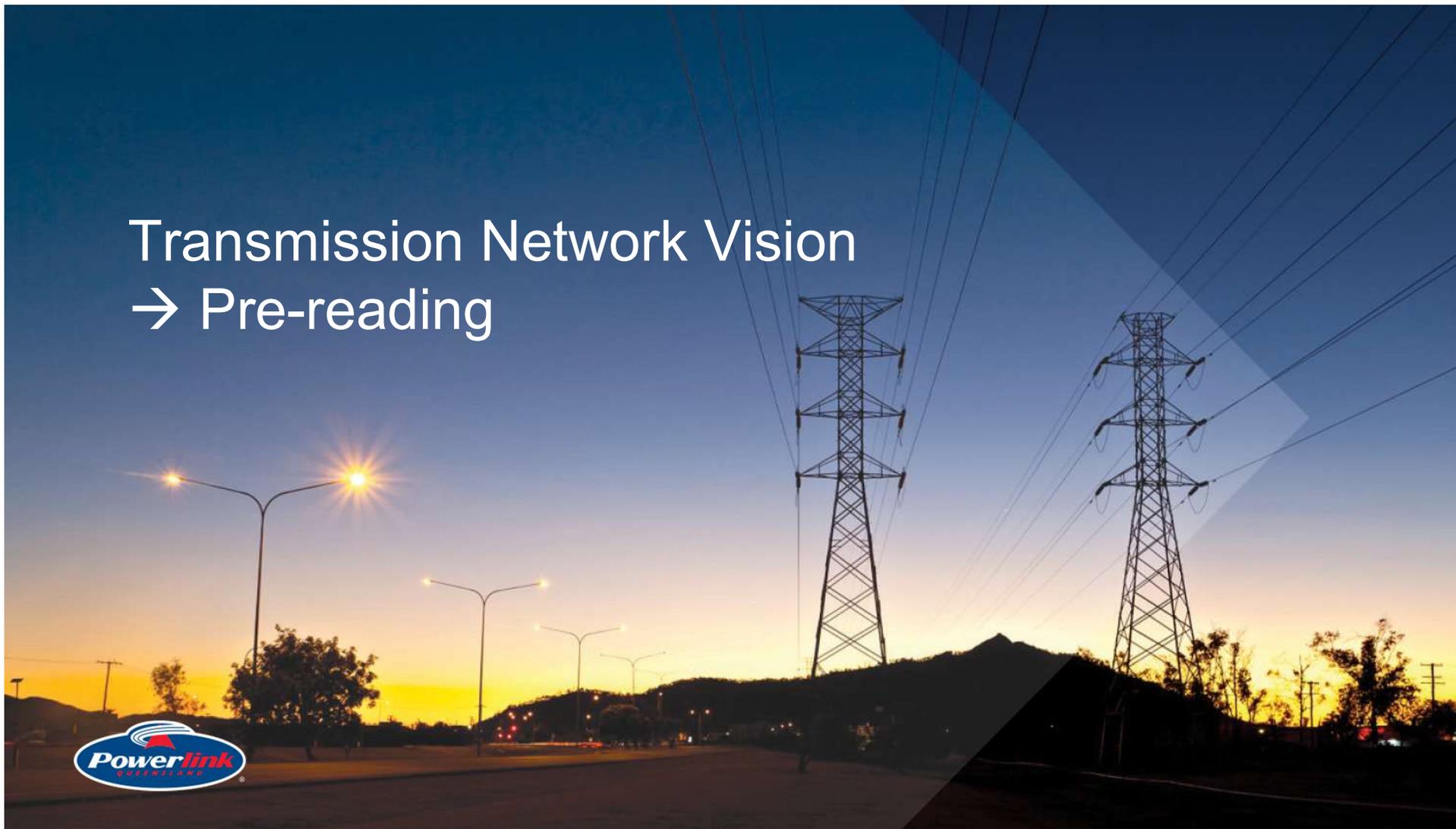


# Transmission Network Vision → Pre-reading



# Need and purpose of the Network Vision



## Why a Network Vision

The energy system is experiencing the most profound change in a century:

- Increasing customer concerns creates interest in and adoption of solar PV and batteries
- Renewable generation is displacing traditional generators
- This is enabled by technology advances and cost reductions (e.g. renewables, electric vehicles, Internet of Things facilitating load aggregation and Virtual Power Plants, hydrogen economy)
- Numerous reviews into the industry (eg. Finkel Review, AEMO Integrated System Plan (ISP), CSIRO and Energy Network Australia's Electricity Network Transformation Roadmap (ENTR), and the Queensland Government's Powering Queensland Plan).

## What is the Network Vision

The Network Vision helps to navigate the current uncertainty in the industry. It is:

- Summarising the industry shaping trends and disruptions
- Organising the future into scenarios that provide the canvas of potential futures
- Creating an understanding of the signposts of key trends that result in unique implications
- Clarifying the role of transmission in the future and services that will be valued by customers.

## Recap – What we did at the last Customer Panel meeting



1. How are your customers' needs changing? Why is that?

2. How might the energy sector evolve to meet these changing expectations?



## Recap – What you told us at the last Customer Panel meeting



### Question 1 – How are your customers' needs changing? Why is that?

#### Political:

- Paris Agreement – this may impact import/export tariffs
- Setting of emission targets – not spread evenly across industries i.e. transport don't pull their weight whereas agriculture sector gets “flogged”
- Fuels uncertainty in the business community e.g. agriculture industry is deferring implementing energy technology as there is no certainty around tariffs
  - o More businesses will struggle and close as a result
- People are now more risk averse
- Seems to be continued conflict in policy
- Protectionist trends
  - o Affects trade balance and competitiveness - national and international level
- Declining tax base at all levels

#### Social:

- Ageing population and how to manage – impacts political environment. Will see kneejerk reactions which will put more people in financial stress, impacts on transport, medical services, housing etc.
- Megatrends will impact all aspects
- Society overall less socialist and more ‘want it all now’ attitude
- Managing population growth will pose challenges
  - o Immigration – changing community expectations
- Different drivers due to different customers – knock-on effect
- Expectation on consultation
  - o Level of (mis-)information
  - o Reviews and reforms are “coming out of ears” resulting in fatigue and inability to keep up
  - o Motivation to become more self sufficient

#### Environment:

- Climate change / high impact weather events
  - o Drought / water scarcity could become a limiting factor on populations
  - o Fire
  - o Flood
- Loss of farmland
- Denser cities – urbanisation
- Links to social and economic challenges

## Recap – What you told us at the last Customer Panel meeting



### Question 1 - How are your customers' needs changing? Why is that? (*continued*)

#### Legal:

- Above impacts will result in more intervention
- Social outrage is on the rise. Will see heightened activism – results in more regulatory change and impacts how businesses will operate. Targets for renewables. Driven by social media and enables people to become more proactive.
- Technology impacts
- Enforcing IP is becoming increasingly difficult
- Power of choice
- Feed in tariff drops off in 2028
- Regulation is backward looking and catching up
- Trending towards more network competition which will offer more diversity of offerings at the cost of less coordination

#### Economic

- Markets are being inhibited
- Customers are struggling to manage bills in the short-term let alone consider the long-term
- Investment paralysis
- Shift to globalisation
  - o Global competition
    - Labour
    - Expiring gas contracts
    - Demand → Boyne retirement
    - Bulk commodities

#### Technology:

- Development vast and unknown real impacts (cost reductions and rate of change)
- Breaking down social fabric i.e. crowd funding, don't need big business to get projects up
- Digital divide between the population – old vs young, increased inequality
- Consumer behaviour is changing – no longer responding to incentives
- Enablers for competition – providing optionality

## Recap – What you told us at the last Customer Panel meeting



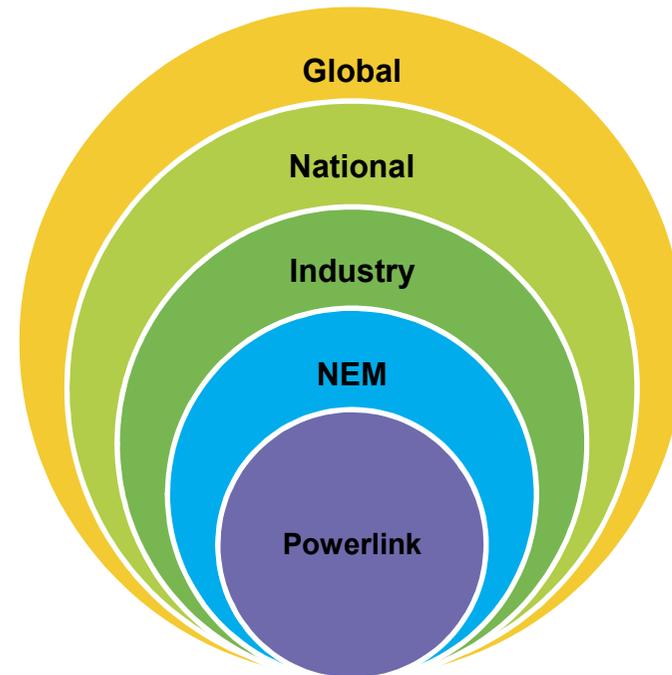
### Question 2 - How might the energy sector evolve to meet these changing expectations?

- Energy Sector needs to be more responsive
  - o Data driven:
    - Make better investment decisions / tailor solutions to customers and energy optimisation
    - Two-way flow of information
  - o Fit for purpose solutions that allows customer needs to be in control and provides them with more choice
- Different platforms and business models
  - o More than just shifting electrons, but provides a mechanism to support vulnerable customers
  - o Customers don't understand Powerlink's timeframe & vice versa
    - Need to simplify the narrative
- Understand the customer better
  - o Their behaviour – rational and irrational
  - o Enabling control (taking future energy supply into own hands)
    - Different funding streams and technical support
    - Farmers building own network → becoming less engaged in the conversation
- Energy sector needs to be more proactive in regulatory change – more collaboration needed with customers to drive this
  - o Shorter regulatory periods
  - o Greater flexibility to cater for uncertainty
  - o If not, could see forced planning
- Less utilisation of network could result in RAB write downs
- Greater collaboration is required with customers
  - o Partnerships to foster innovation; risk and opportunity sharing
  - o Be prepared to fail – business models
  - o Value doesn't just relate to dollars
- Different services – range, speed of adoption of new technology which may be incremental or transformational for various sectors
- Holistic approach to overcome uncertainty & boost investment certainty
- Technology developments
  - o Evolution of alternate energy sources
    - Hydrogen (transport, agriculture, commercial and freight)
  - o Peer to peer trading
  - o Impact of storage on the NEM
- Undergrounding of powerlines / use of HVDC to remove impact of natural hazards, e.g. bushfires & increased cost of supply

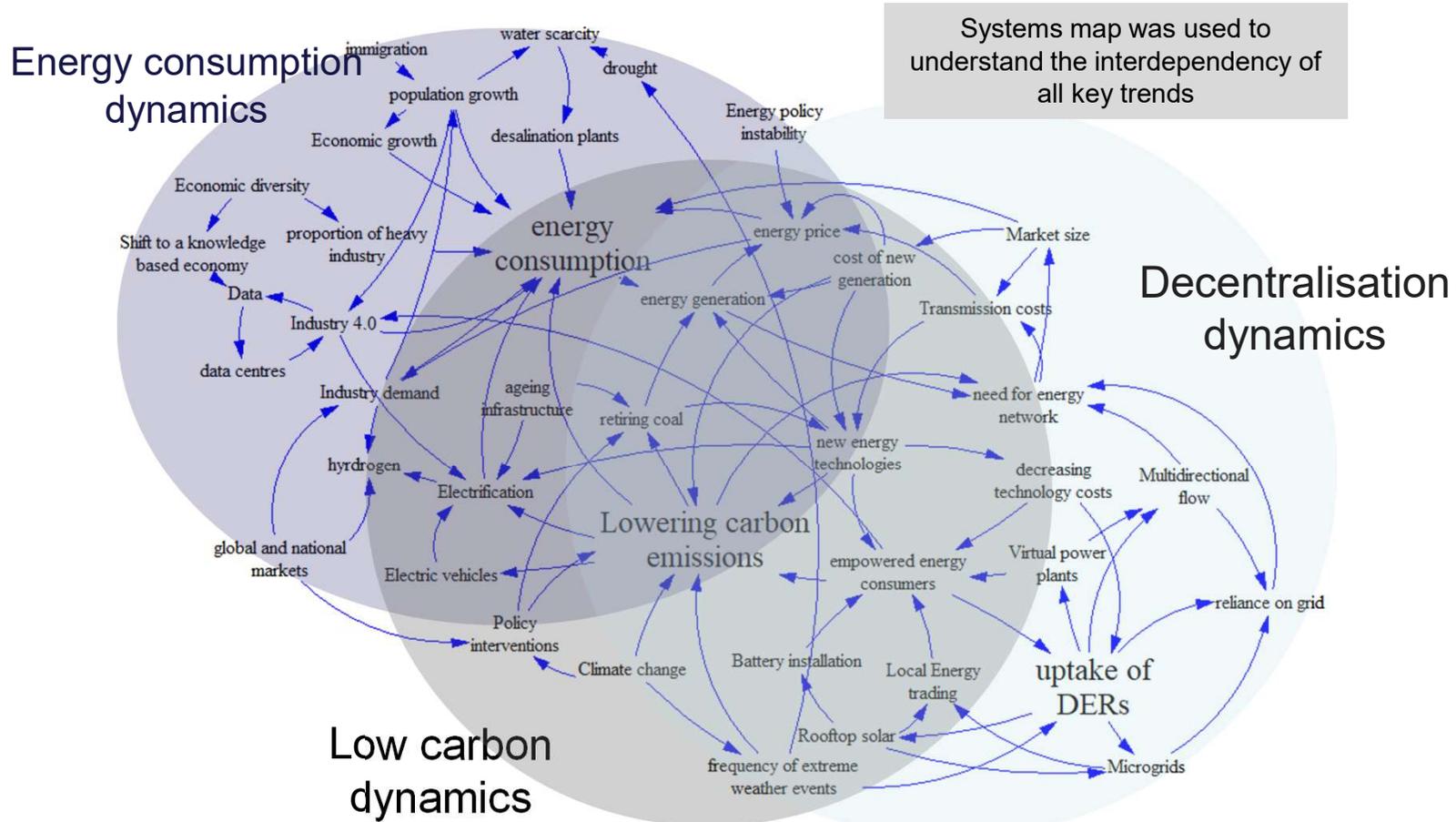
- The project team has identified over 40 trends through stakeholder interviews, reviewing existing scenarios and research that will shape the future of the National Electricity Market.



- Trends have been grouped into four main categories of uncertainties:
  - 1. Decentralisation**
  - 2. Lower carbon future**
  - 3. Energy consumption**
  - 4. Electrification**



# Uncertainties, trends and scenarios – Systems map



## Selected key drivers of the four uncertainties



1

### Decentralisation

- Consumer preferences and choices
- Decreasing cost distributed renewables and storage
- Lack of policy framework and system architecture
- Cost and risk of network investments
- Emerging Internet of Things to manage distributed system

2

### Lower carbon future

- Consumer and business desire for emissions reduction
- Decreasing costs and risks of large-scale low carbon and storage technologies
- International, national (currently a vacuum) and state greenhouse gas policies
- Uptake of Distributed Energy Resources (DER)

4

### Electrification

- Electric Vehicles
- Electrification of industry 4.0
- Switching of gas and diesel consumption to electricity

3

### Energy consumption

- Structure and growth of economic activity and population
- Lower future energy prices
- New commercial and industrial loads e.g. data centres
- Emerging hydrogen (or other energy carrier) export industry

## Scenarios summary – key characteristics



Scenario	Carbon Emissions	Location	Energy Consumption	Key Characteristics
Rise of the Prosumer	Low Carbon	Decentralised	High	<ul style="list-style-type: none"> <li>Continued falling costs of solar photovoltaic panels and other on-site generation technologies, sustained high retail prices, and innovative product packaging from energy services companies leads to the widespread adoption of on-site generation.</li> <li>Residential consumers in particular are empowered by their choice to become more actively engaged in their electricity supply and call themselves 'prosumers'.</li> <li>Electric vehicle (EV) adoption is also popular.</li> <li>The use of on-site generation is also strong in commercial and industrial customer sectors.</li> <li>By 2050, on-site generation supplies almost half of all consumption</li> </ul>
Community Renewables	Low Carbon	Decentralised	Low	<ul style="list-style-type: none"> <li>Higher decarbonisation target is achieved through a more decentralised energy landscape.</li> <li>Smart technology is used extensively to manage peak electricity demand. Appliance efficiency improves as well as a greater use of demand side actions.</li> <li>EVs are the most popular personal mode of transport. Hydrogen becomes the fuel of choice in the transport sector by 2050 to aid the decarbonisation target.</li> <li>Onshore wind and solar, co-located with storage, dominate electricity supply. Flexibility is provided by small scale storage, small gas-fired plant, some interconnection, and hydrogen production by electrolysis.</li> </ul>

Source: National Grid, *Future Energy Scenarios*, July 2018  
 EA Technology Report NTR: *Grid Design, Operation, Platform & Telecoms for Electricity Network Transformation Roadmap*

## Scenarios summary – key characteristics



Scenario	Carbon Emissions	Location	Energy Consumption	Key Characteristics
Renewables Thrive	Low Carbon	Centralised	High	<ul style="list-style-type: none"> <li>Confidence in the improving costs of renewable technologies, achieved by combined efforts from government and industry around the world, results in the introduction of a linearly phased 100% renewable target by 2050 for centralised electricity generation.</li> <li>To shift demand and meet renewable supply gaps, storage technology is enabled to achieve the target at utility, network and consumer sites.</li> </ul>
Set and Forget	High Carbon	Centralised	High	<ul style="list-style-type: none"> <li>Customer-centric model where customers consume, trade, generate and store electricity.</li> <li>Generation from traditional carbon sources still in generation mix.</li> <li>Heightened awareness about the issue of peak demand, and new business opportunities lead residential, commercial and industrial customers to adopt peak demand management.</li> <li>Demand management systems are designed to be on a 'set and forget' basis after customers have decided which level of demand management suits them.</li> <li>Measures include building large-appliance control (air-conditioning, pumps), on-site storage, specialised industrial demand reduction markets, and EV charge management, as well as advanced metering and communication to enable these services.</li> </ul>

Source: EA Technology Report NTR: Grid Design, Operation, Platform & Telecoms for Electricity Network Transformation Roadmap

# Scenario summary



	Degree of customer participation	Importance of TNSP/DNSP role	Degree of technical differences for TNSP/DNSP	Degree of regulatory changes for TNSP/DNSP	Volume / \$ of TNSP / DNSP solutions	Level of system balancing challenge
<b>Set and Forget</b>						
<b>Rise of the Prosumer</b>						
<b>Community Renewables</b>						
<b>Renewables Thrive</b>						

Source: EA Technology Report NTR: Grid Design, Operation, Platform & Telecoms for Electricity Network Transformation Roadmap

## Questions for discussion at the Customer Panel meeting



We are seeking your feedback:

1. What are the key opportunities you see arising for a transmission company under each scenario?
2. Which scenario do you think delivers the best outcomes for customers?