Network innovation Down Under

Andrew Dillon, CEO, Energy Networks Australia

UK Low Carbon Networks & Innovation Conference

16 October 2018

Energy Networks Australia

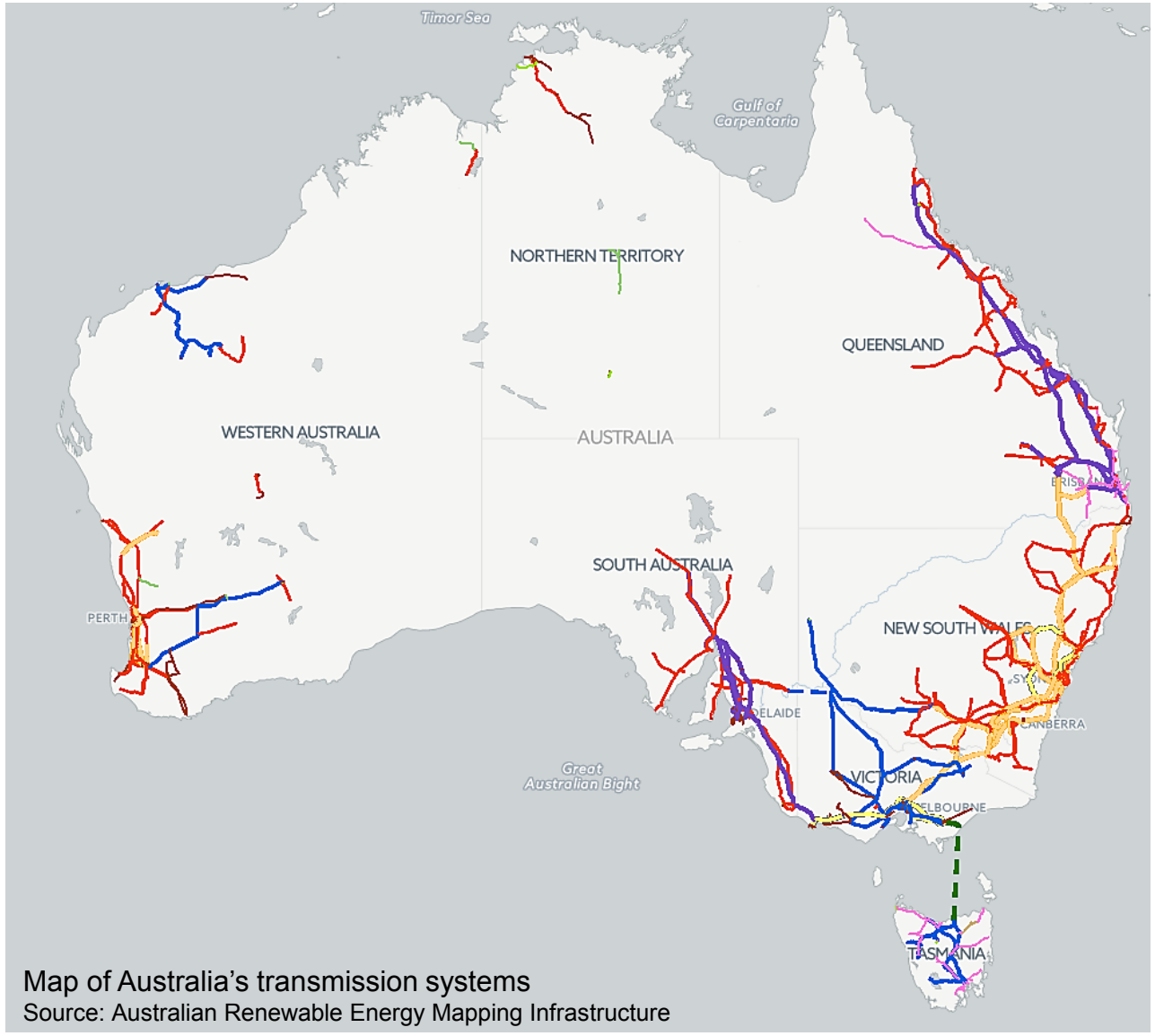
Energy Networks Australia

» 25 electricity and gas networks

» a mix of public and private ownership

Energy Networks Australia

About Australia's energy system



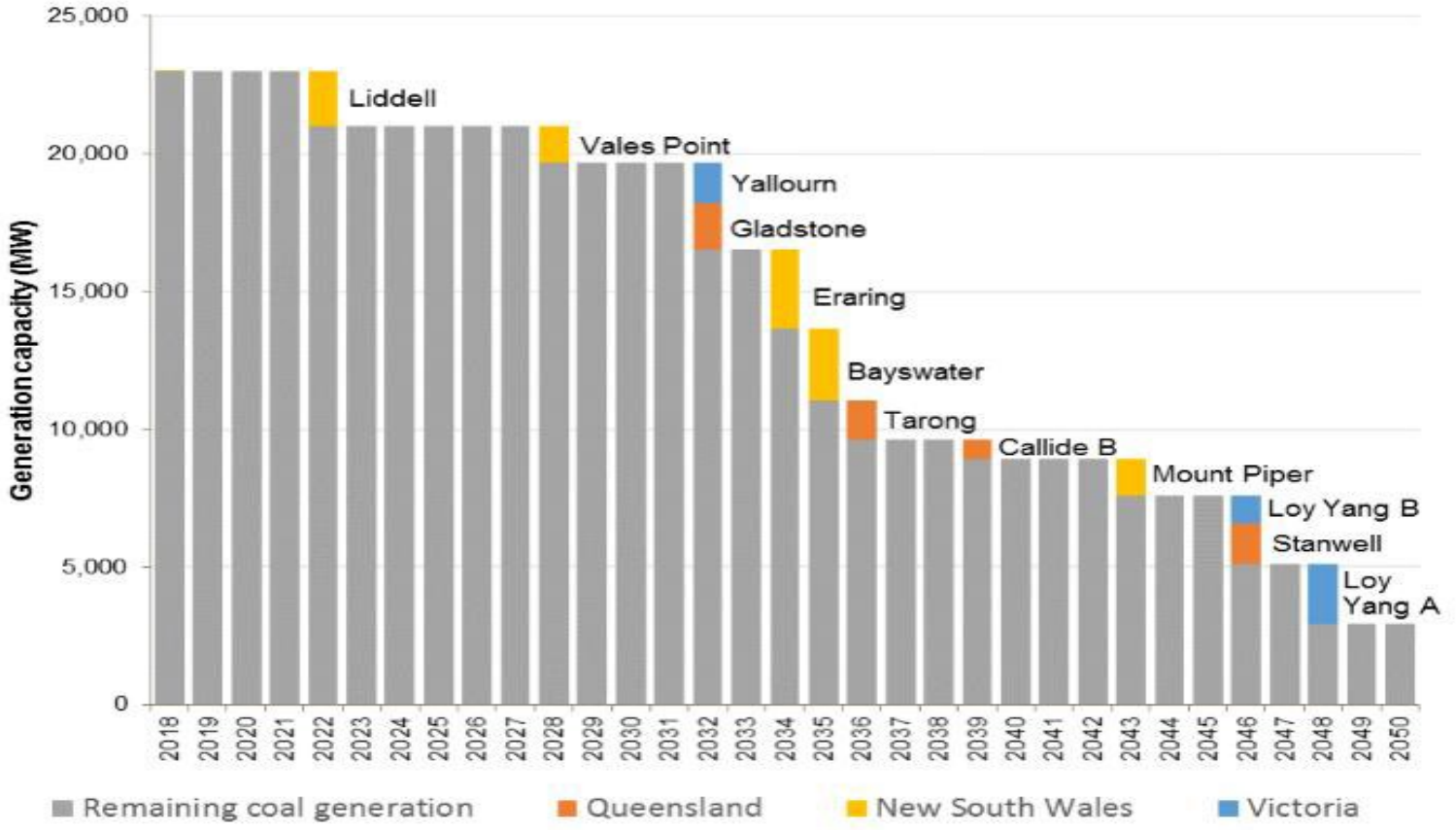
Map of Australia's transmission systems
Source: Australian Renewable Energy Mapping Infrastructure

- ~11 million electricity & 5 million gas connections
- Electricity network extends about 918,000 km and could circle the equator 23 times.
- Gas is carried along about 130,000 km of gas pipes.
- The east-coast NEM is the largest interconnected system in the world but with low customer density.

Energy Networks Australia

Current wholesale energy mix

» Australia relies predominantly on coal (74 per cent) for electricity generation, followed by gas (14 per cent) and hydro (7 per cent).



NEM coal generation fleet if plant retires as announced or at 50th year from full operation

Energy Networks Australia

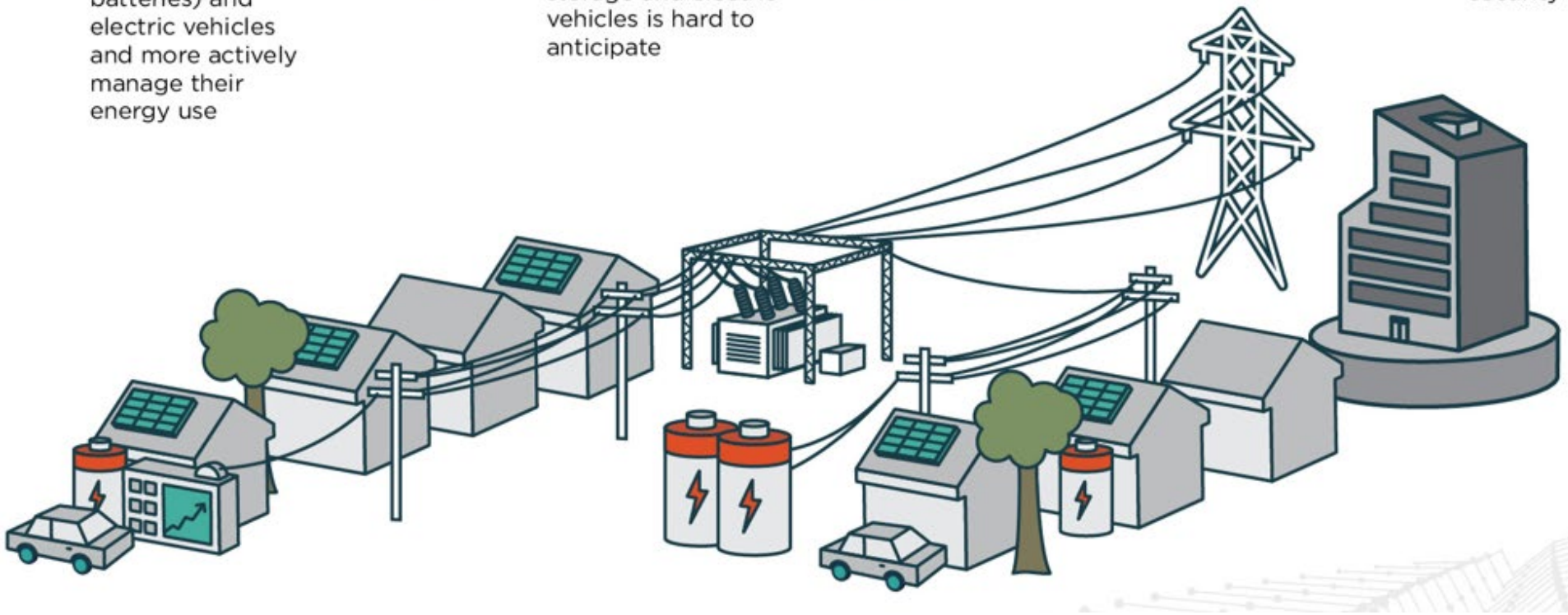
Changes in the current landscape

Customers embrace new technologies such as rooftop solar, storage (e.g. batteries) and electric vehicles and more actively manage their energy use

Solar and storage use grows at a rapid rate. Behaviour of solar, storage and electric vehicles is hard to anticipate

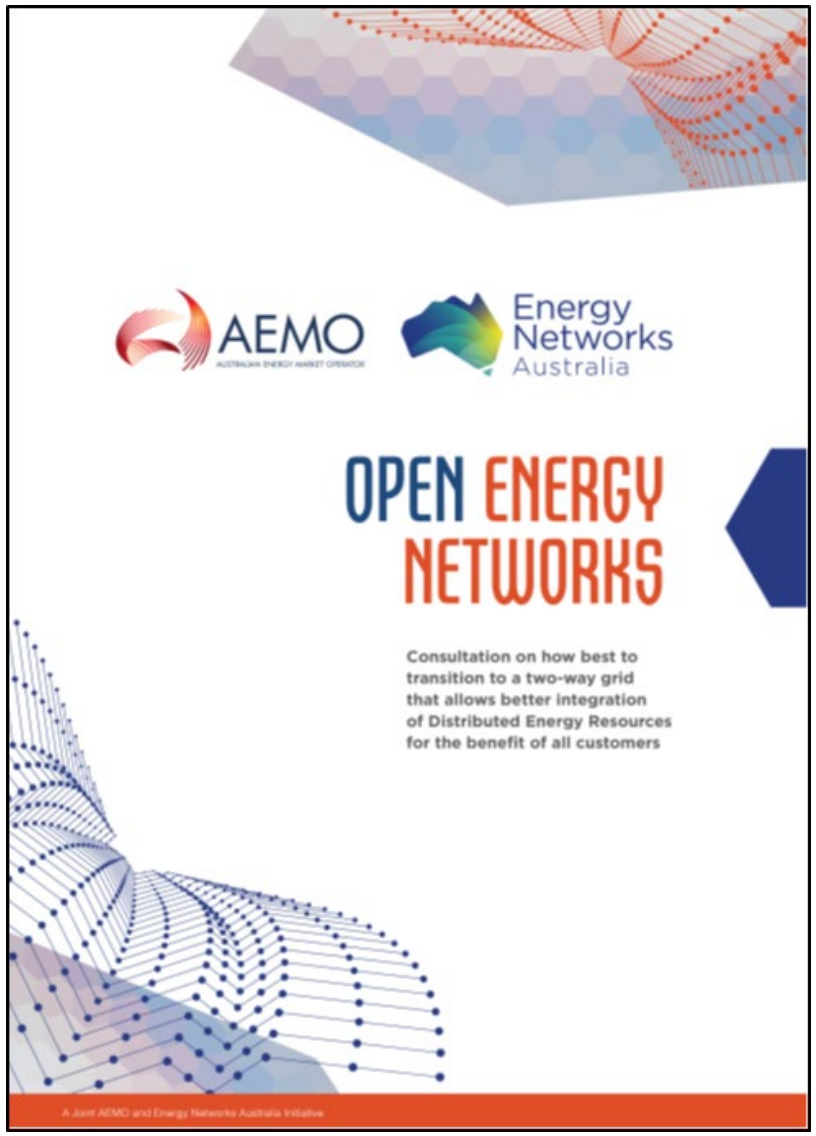
Power flow is now in two directions

Local network challenges can exceed network limits and cause risks to system security



Energy Networks Australia

Open Energy Networks



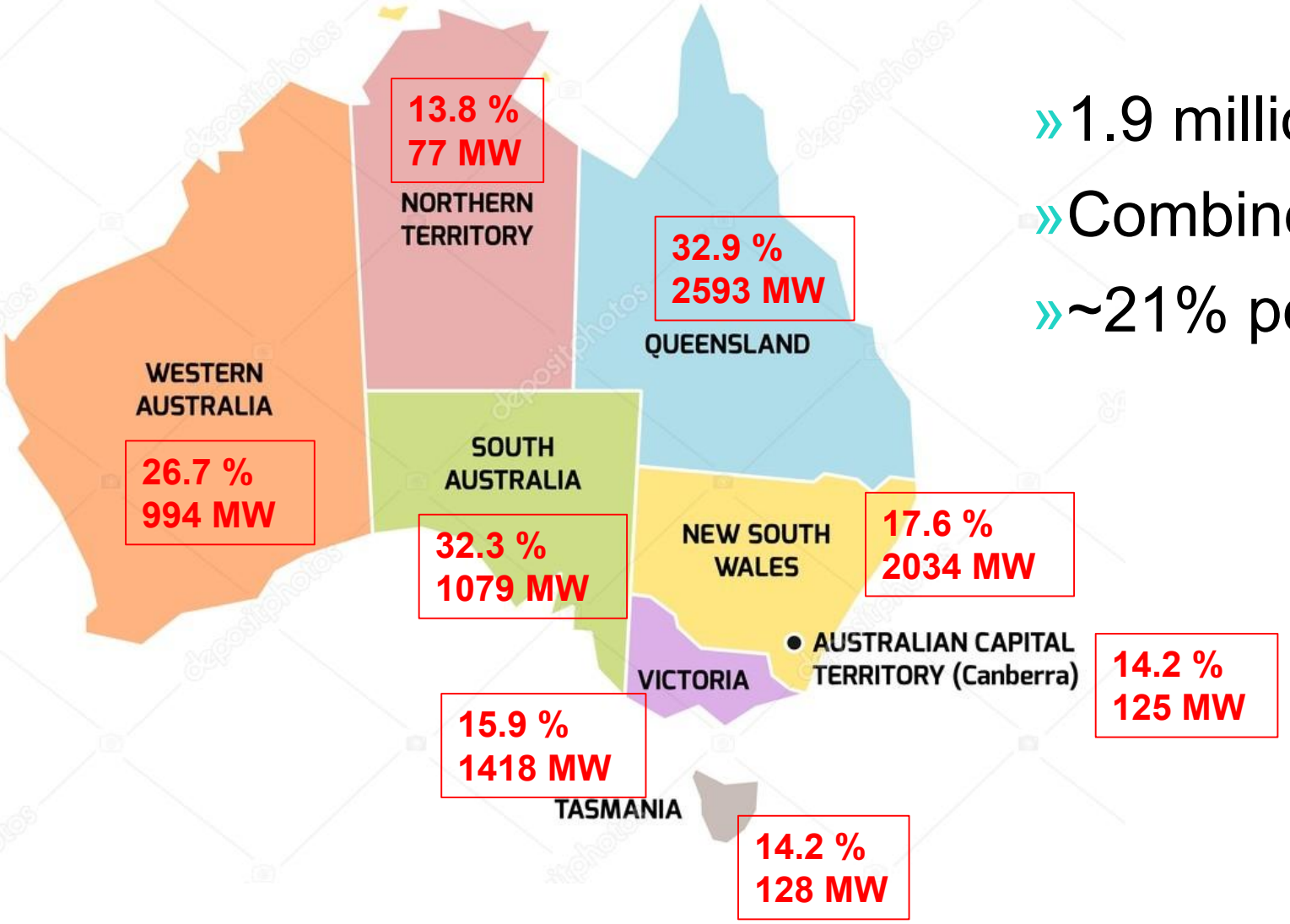
- The 2017 Electricity Network Transformation Roadmap identified that distributed energy resources (DER) must be optimised and coordinated across the system to deliver significant value for all stakeholders.

- Open Energy Networks is the result – a joint project with Australian Energy Market Operator (AEMO) to identify:
  - system requirements for DER optimisation
  - what market participants want
  - how we can reduce barriers to entry
  - how we best facilitate innovation & competition
  - to deliver value to all customers.

- Knowledge sharing with the UK's 'Open Networks' project

Energy Networks Australia

Solar PV penetration in Australia

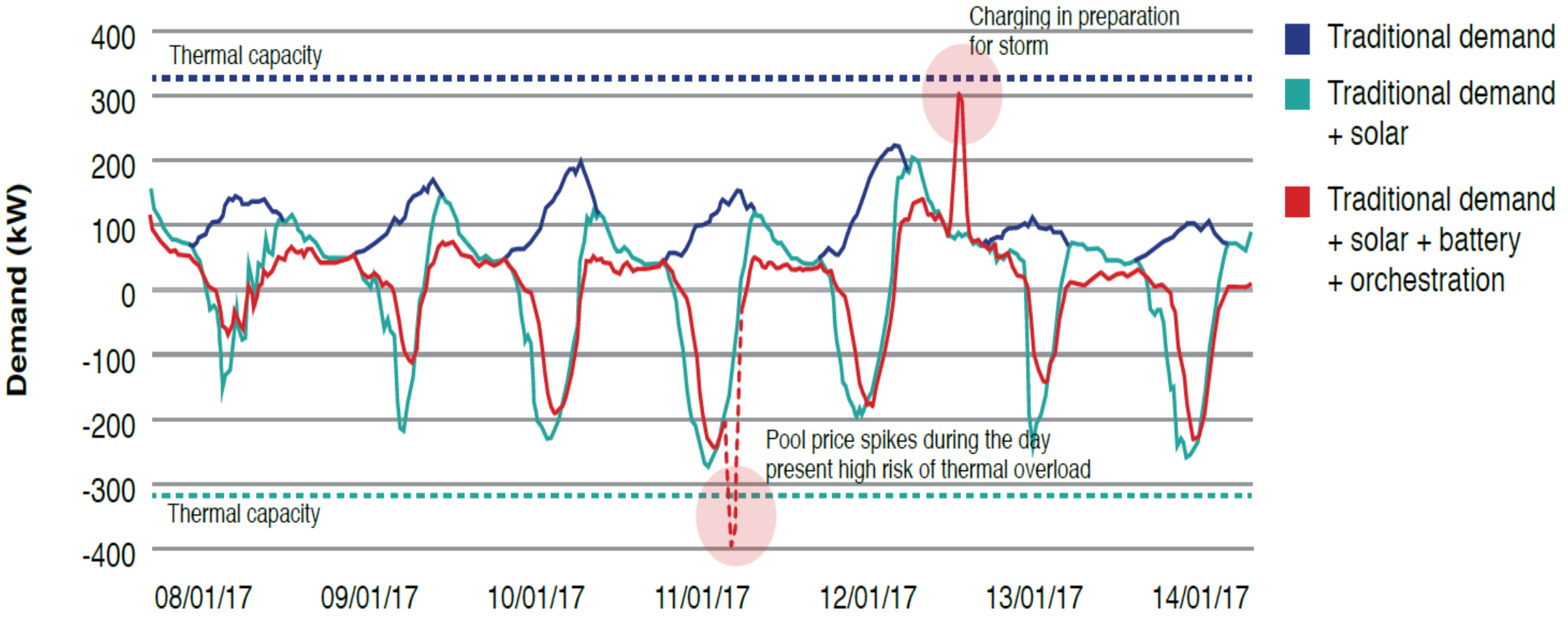


- 1.9 million PV customers
- Combined capacity 8.5 GW
- ~21% penetration rate

[7] Installed PV systems (%), total PV capacity (MW) by state/territory

Energy Networks Australia

VPP impacts on network flows: SAPN Salisbury battery trial



Energy Networks Australia

Integrated System Plan

- AEMO estimates the Integrated System Plan's transmission network investment would conservatively deliver savings of around $1.2 billion.
- New interconnectors will more than pay for themselves through better use of generation and storage NEM-wide.
- AEMO projects that without further network development, consumers would pay more for energy.
- A more connected grid will also help manage the risk of bushfires, droughts and heatwaves = greater system resilience.

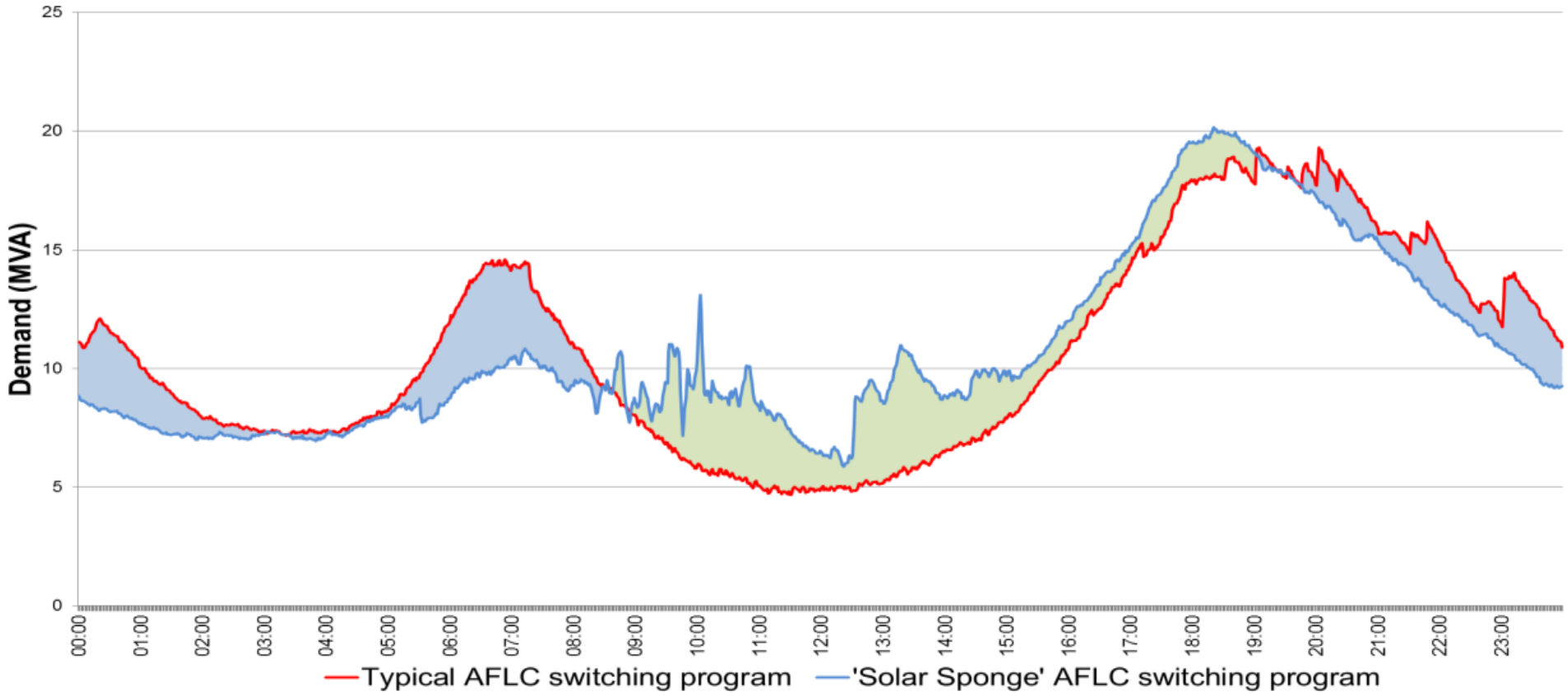
Energy Networks Australia

Australian innovation

Energy Networks Australia

The solar sponge in Queensland

» Energex can now use existing hot water load control as a low cost option to manage PV



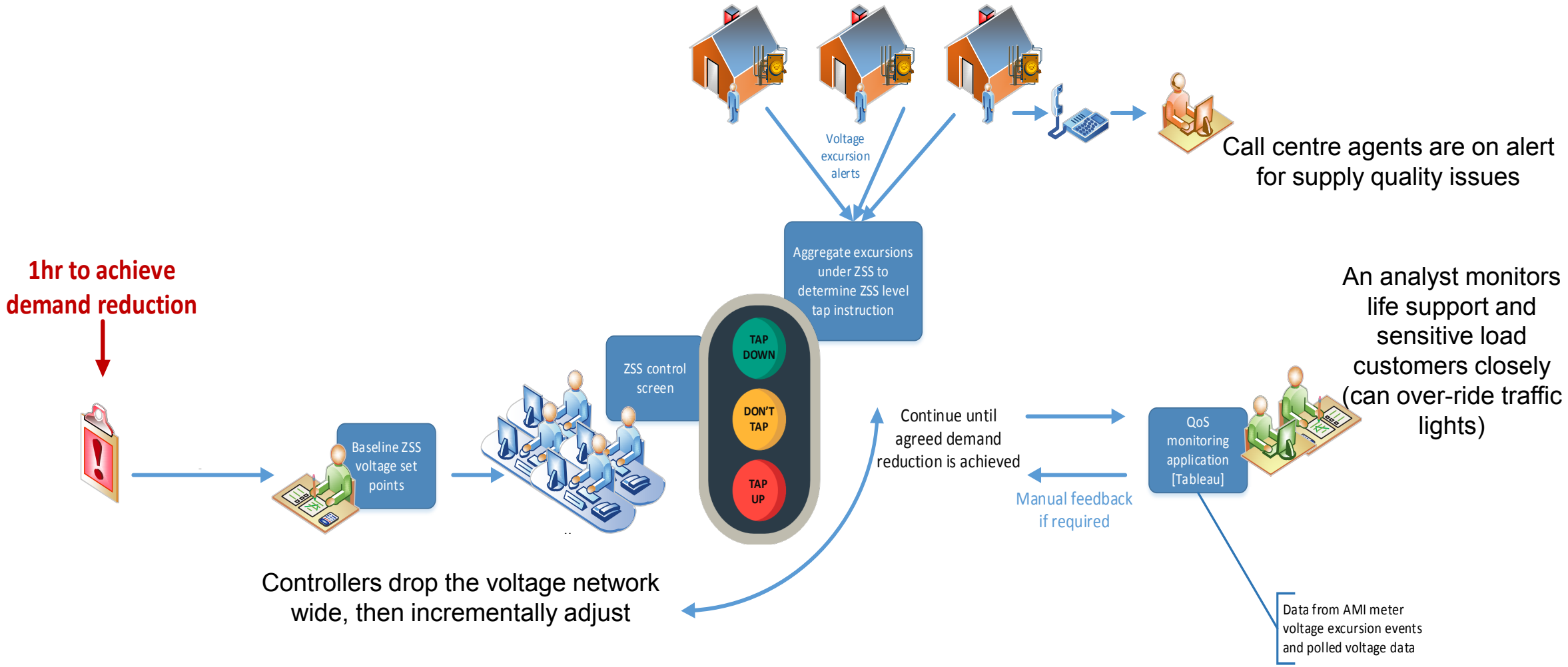
Energy Networks Australia

Networks helping manage summer peaks

- The market operator AEMO sought bids to deliver DR to manage 2017/18 summer peaks
- CitiPower & Powercor agreed to provide 60MW-110MW of DR
- Works to improve the quality of supply across the network
  - **53** voltage regulating relays to remote control rural zone subs
  - **352** distribution transformer tap adjustments to address low voltage across the network
  - **372** low voltage multi-meter tests to indicate voltage at sites without smart meters
- Two key pieces of analysis critical to the success of the program
  - Determine the acceptable low point for customer voltage
  - Determine the voltage to power drop ratio

Energy Networks Australia

Responding with a reduction in power



Energy Networks Australia

Success - RERT activation result

» Citipower/Powercor delivered 52MW demand response via RERT activation on 19 Jan 2018

	Controllable Zone Substations	Minimum Temperature	Controllable Network Load	Demand Reduction
Maximum Achievable	83	36°C	3000MW	110MW
Contracted Minimum	83	36°C	3000MW	48MW^
Actual **(19 Jan 2018)**	**64***	**43°C - 20°C** (cool change mid event)	**1900MW**	**52MW**

» Reduction was delivered as requested, despite numerous challenges
» 17 zone subs were excluded due to:
  » Fires (non-network)
  » Unrelated faults
  » Switching (network-abnormal)
  » Australian Open
  » Dramatic weather changes

^ *Must maintain 80% of 60MW for duration of event, where temperature is minimum 36°C and controllable load is minimum 3000MW*

Energy Networks Australia

Hydrogen Park South Australia

SA backs second renewables-to-gas hydrogen plant, in Tonsley

reneweconomy.com.au/sa-backs-second-renewables-gas-hydrogen-plant-tonsley-53911/

By Sophie Vorrath

Australian Gas Infrastructure Group

L6, 400 King William Street
Adelaide, SA 5000 Australia

PO Box 6468, Halifax Street,
SA 5000 Australia

+61 8 8227 1500

21 February 2018

MEDIA RELEASE

Australian-first, $11.4 million hydrogen demonstration plant to be built in Adelaide

An Australian-first, $11.4 million demonstration plant that will produce hydrogen from renewa
energy will be built in Adelaide.

ased Australian Gas Infrastructure Group (AGIG) – the country's largest gas distribu
will construct and operate the state-of-the-art plant at Tonsley Innovation District,

lian Government through its $150 millio

Energy Networks Australia

21 February 2018

MEDIA RELEASE

Hydrogen technology trials greenlighted with $4.9m funding

Energy Networks Australia welcomes the announcement of $4.9m funding support for Australian Gas Infrastructure Group as a key milestone in efforts to decarbonise Australia's gas networks.

The Hydrogen Park project will demonstrate the potential to produce hydrogen from renewable energy and inject it into gas networks. It will then be used to power the Tonsley Innovation District in Adelaide

"South Australia leads the way when it comes to renewable generation," said Andrew Dillon, CEO of Energy Networks Australia.

"Using hydrogen to store excess renewable energy in the gas network is breakt
technology. The stored energy could then be used for heating or cookin
alternatively used for power generation when required.

"Our gas networks are potentially a huge battery storag
infrastructure already in place."

Hydrogen will be produced using a
renewable energy generated
Australian Government

gtm:

A Wood Mackenzie Business

OTHER ENERGY (/ARTICLES/CATEGORY/OTHER-ENERGY)

Australia Seeks Hydrogen to Soak Up Excess Renewable Energy Production

Australian Gas Infrastructure Group pursues power-to-gas as a complement to renewables. Could Australia eventually become a hydrogen exporter?

JASON DEIGN | MARCH 05, 2018

https://www.greentechmedia.com/articles/read/australia-looks-to-hydrogen-to-soak-up-excess-renewable-energy-production#gs.zACuOvc

Australia's First Hydrogen Demonstration Park with Siemens Technology to be Buil in Adelaide

February 21, 2018

a's Tonsley Innovation District is set to become a hub
tivity in Australia after Australian Gas Infrastructure
the country's largest gas distribution business,
ced the construction of the country's first hydrogen
production and distribution facility. This will be enabled by a 1.25
mega watt Siemens PEM electrolyser that will produce hydrogen
using electricity from the grid and potentially on-site solar.

1/5

South Australia announces plans to build hydrogen plant

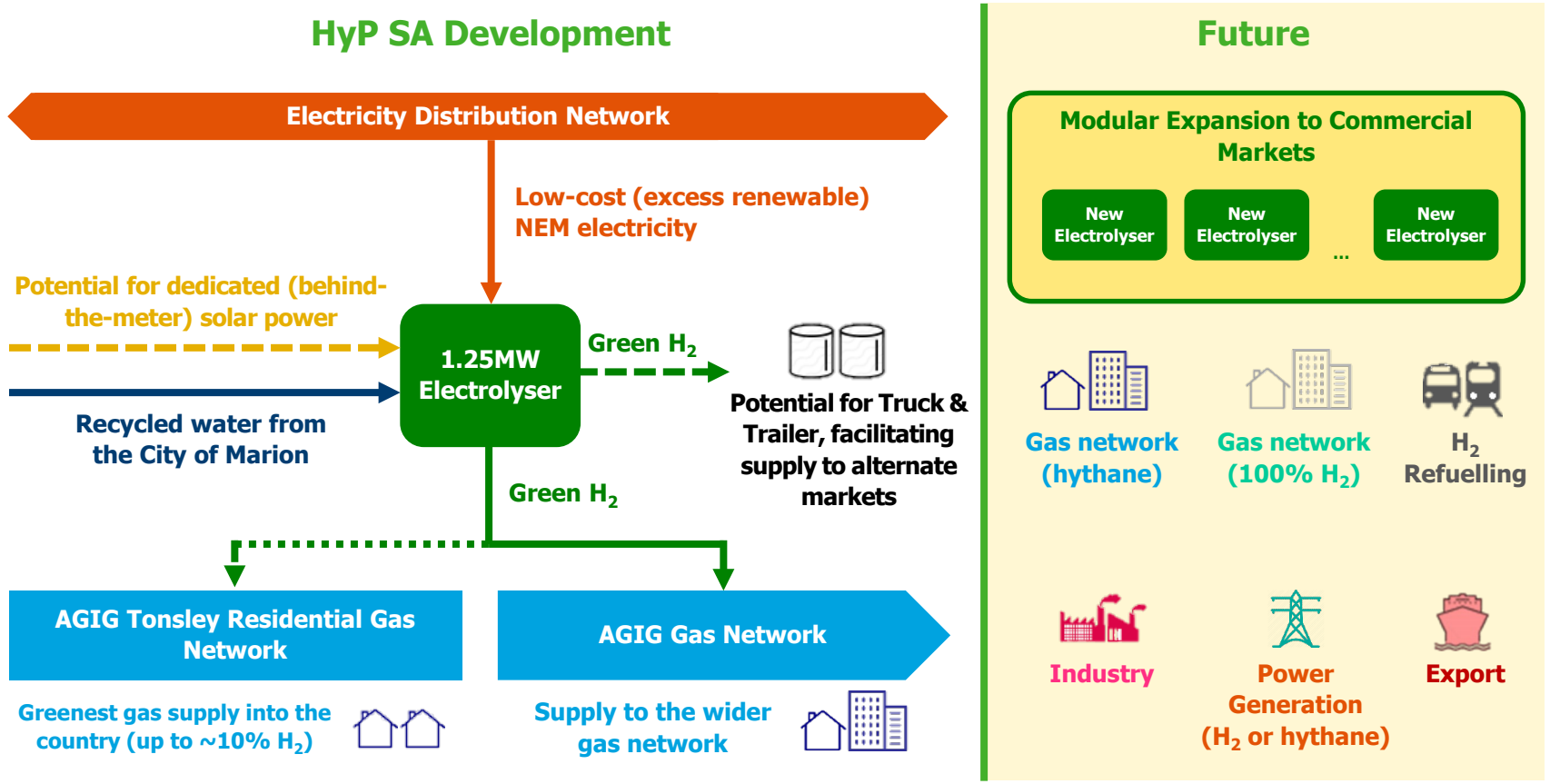
February 13, 2018

A 15MW hydrogen electrolyser power plant is set to be constructed near Port Lincoln.

Hydrogen infrastructure company Hydrogen Utility (H2U), with German-based electrolysis and ammonia specialist thyssenkrupp, will deliver the $117.5 million project, with the assistance of a $4.7 million grant and $7.5 million loan from the South Australian Government's Renewable Technology Fund.

Energy Networks Australia

HyP SA | Core Infrastructure Underpinning Future Growth



Potential for HyCoE - Centre of Excellence

Energy Networks Australia

Future Fuels CRC

- Enabling the decarbonisation of Australia's energy networks.
- A cooperative research centre is an industry-led collaboration between industry, researchers and the community.
- A proven model for linking researchers with industry to focus on R&D towards use and commercialisation.
- Energy Network Australia is supporting the Future Fuels CRC as an enabler to Gas Vision 2050.
- $92 million over a 7 year period.
- First projects starting early 2019.

FUTURE FUELS CRC

Three programs

1. Future fuel technologies, systems and markets
2. Social acceptance, public safety and security of supply
3. Networks lifecycle management

Energy Networks Australia

The Tesla big battery

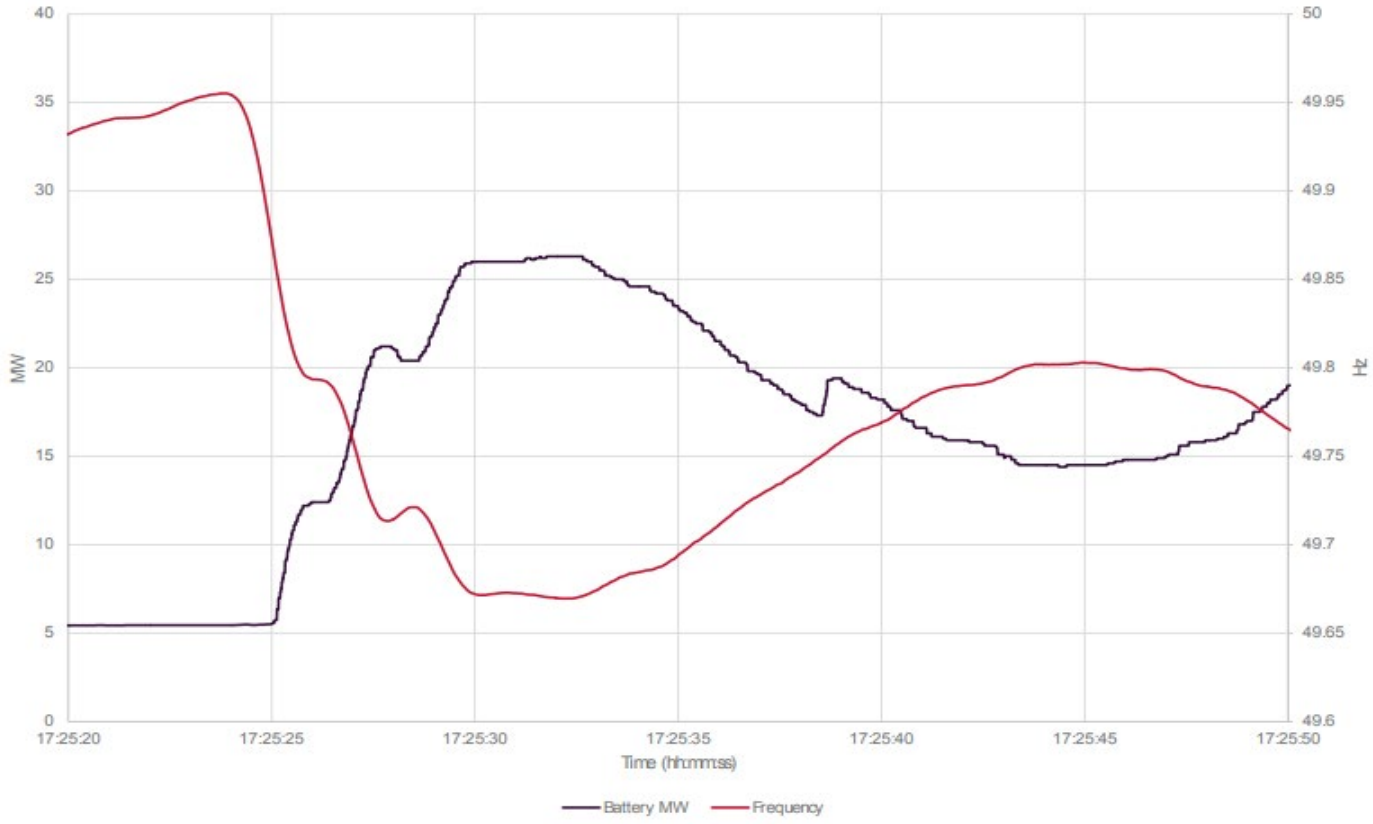
- Hornsdale Power Reserve, the world's largest lithium-ion battery was turned on in December 2017
  - 220km north of Adelaide
  - ~$A90M cost
  - Charging at 80 MW
  - Discharing at 100 MW
  - Storage of 129 MWh
    - 70MW of capacity contracted to SA Govt
    - 30MW + 90MWh storage merchant plant

Energy Networks Australia

AEMO gives the Hornsdale battery a glowing report

- The **speed, precision and agility** of the battery is unprecedented
  - major system disturbances
  - day-to-day frequency variations.
- Far more “rapid and precise, compared to a conventional synchronous (usually gas) generation unit”.
- The cost of Frequency Control Ancillary Services (FCAS) to the SA market fell by 57% in the first quarter after the battery was switched on.
- The battery made $14 million in revenue in first half of 2018.
- More big batteries coming in Aust

Figure 3 Hornsdale Power Reserve response to trip of generation in New South Wales, 18 December 2017



Energy Networks Australia

Questions?

Energy Networks Australia