

# Innovation projects: Power to Gas in NSW



# Changing energy landscape

**smh** The Sydney Morning Herald  
23 Jun. at 3:40pm • 🌐

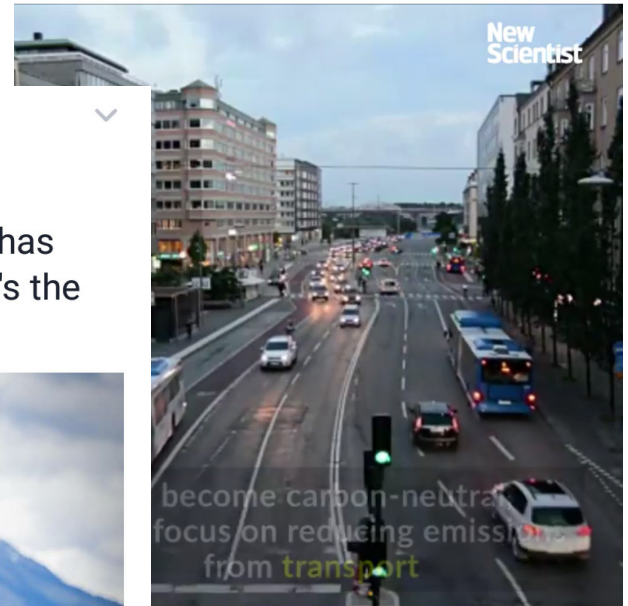
NSW homes and businesses will be paid to use less power on hot days as part of a joint pilot program between the state and federal governments designed to stabilise the electricity grid.



**You could be paid cash to turn off power-guzzling appliances**  
smh.com.au

**New Scientist**  
23 Jun. at 1:45am • 🌐

Sweden is aiming to be carbon neutral by 2045  
<http://ow.ly/8O6P30cOIKQ>



**TED**  
9 hrs • 🌐

Richard Browning of **Gravity Industries** has been called the "real life Iron Man." Here's the story behind his incredible flight suit:

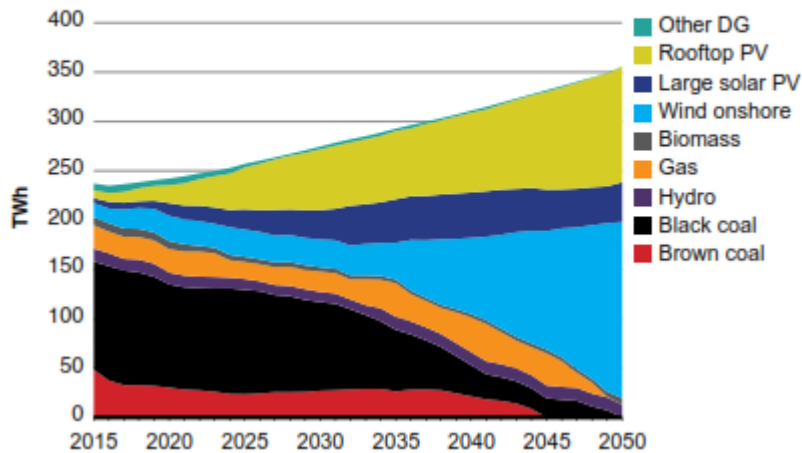


**How I built a jet pack**  
Richard Browning has built an Iron Man-like suit, bringing...  
ted.com

# CSIRO zero emission electricity by 2050

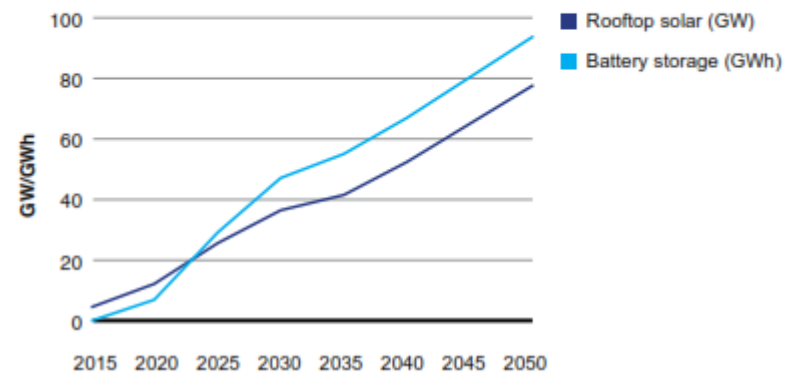
## Electricity generation mix

Projection of Australia's changing electricity generation mix to 2050



## Rooftop solar and battery storage adoption

Projected uptake of solar PV and battery storage to 2050



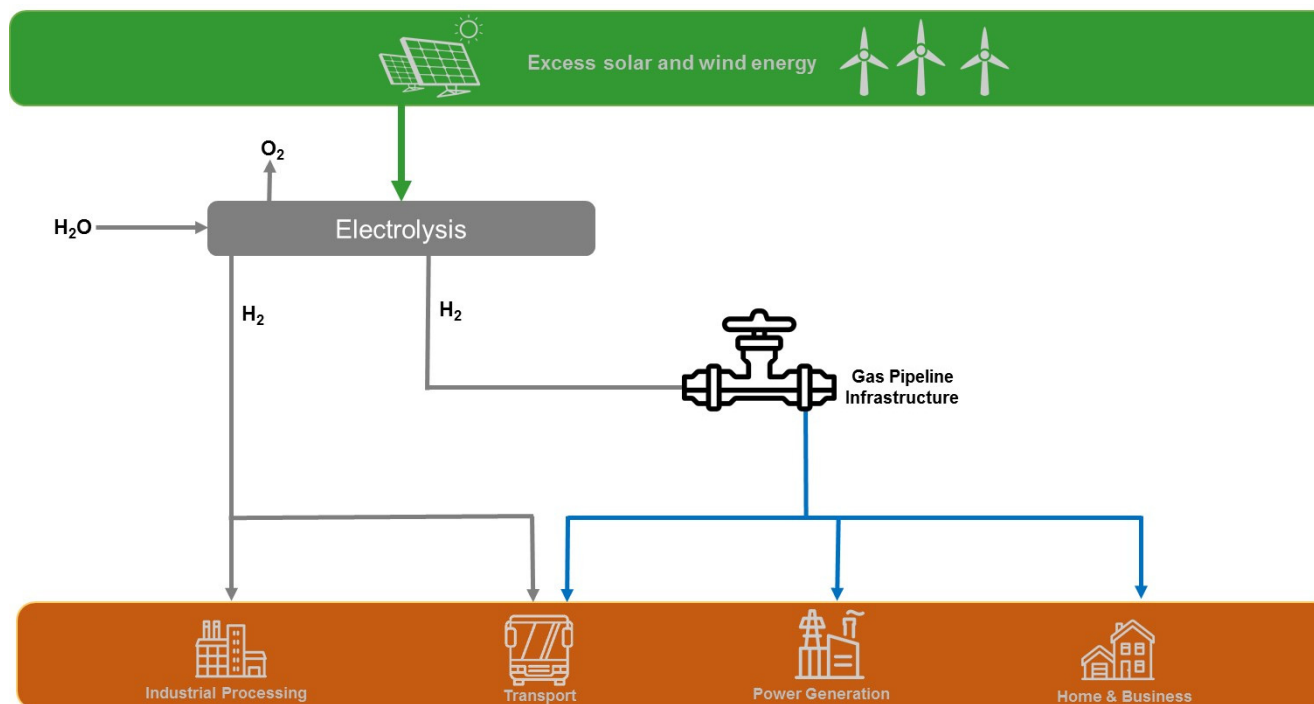
Source: Energy Networks Australia and CSIRO, Electricity Network Transformation Roadmap December 2016

- CSIRO expect 87GWh of battery storage – equivalent to 13.6M Powerwall batteries.
- Jemena's Gas Network in NSW has a storage capacity 80GWh – equivalent to **12.5M Powerwall batteries.**



# What is Power to Gas?

- Power-to-Gas is the conversion of electrical power into a gaseous energy carrier such as hydrogen or methane.
- Represents a solution to the problem of surplus energy reserves as Australia significantly increases energy generation from renewable sources.

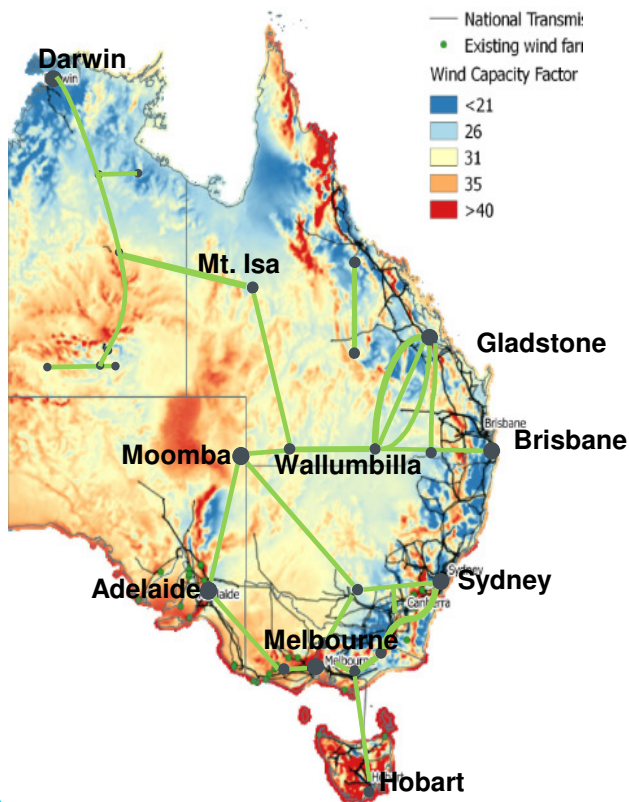


# German installation

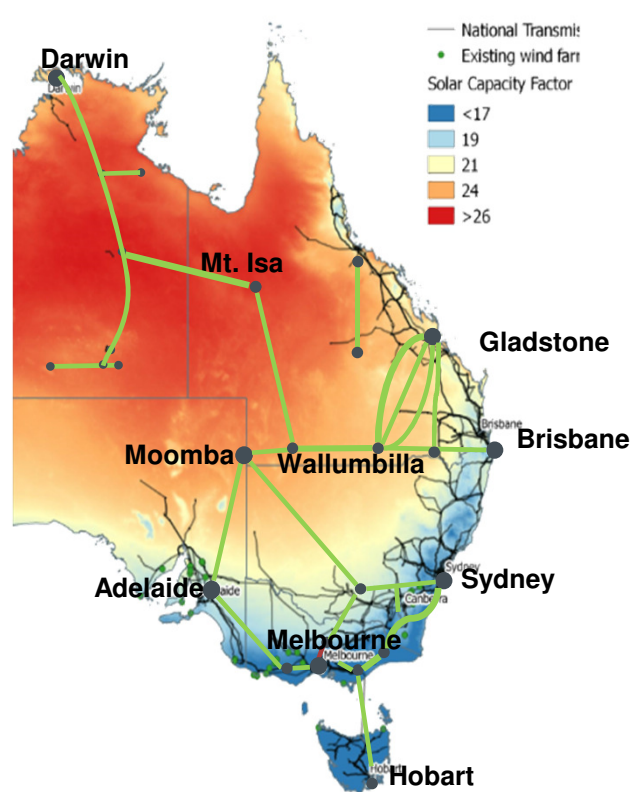


# Geographic synergy for P2G, renewable electricity generation and existing gas infrastructure

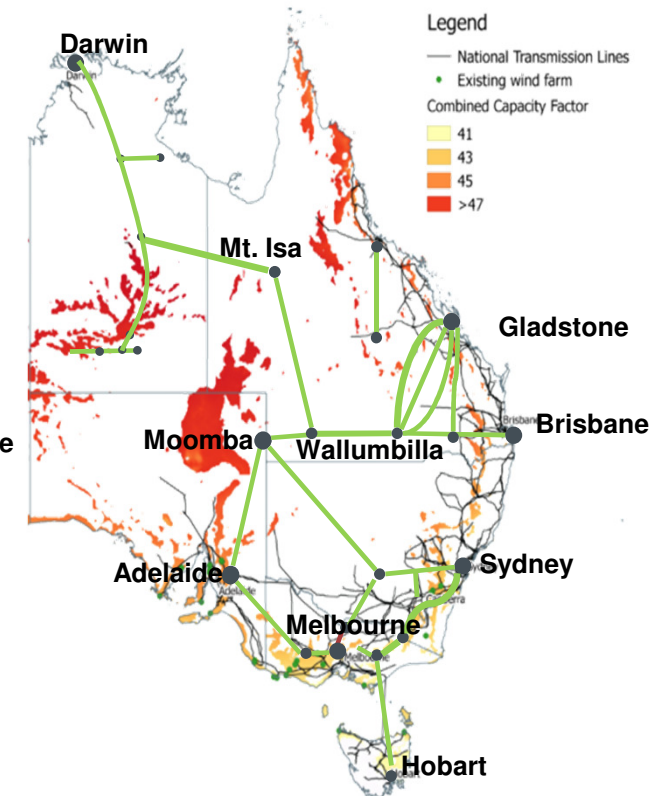
## Wind energy



## Solar energy

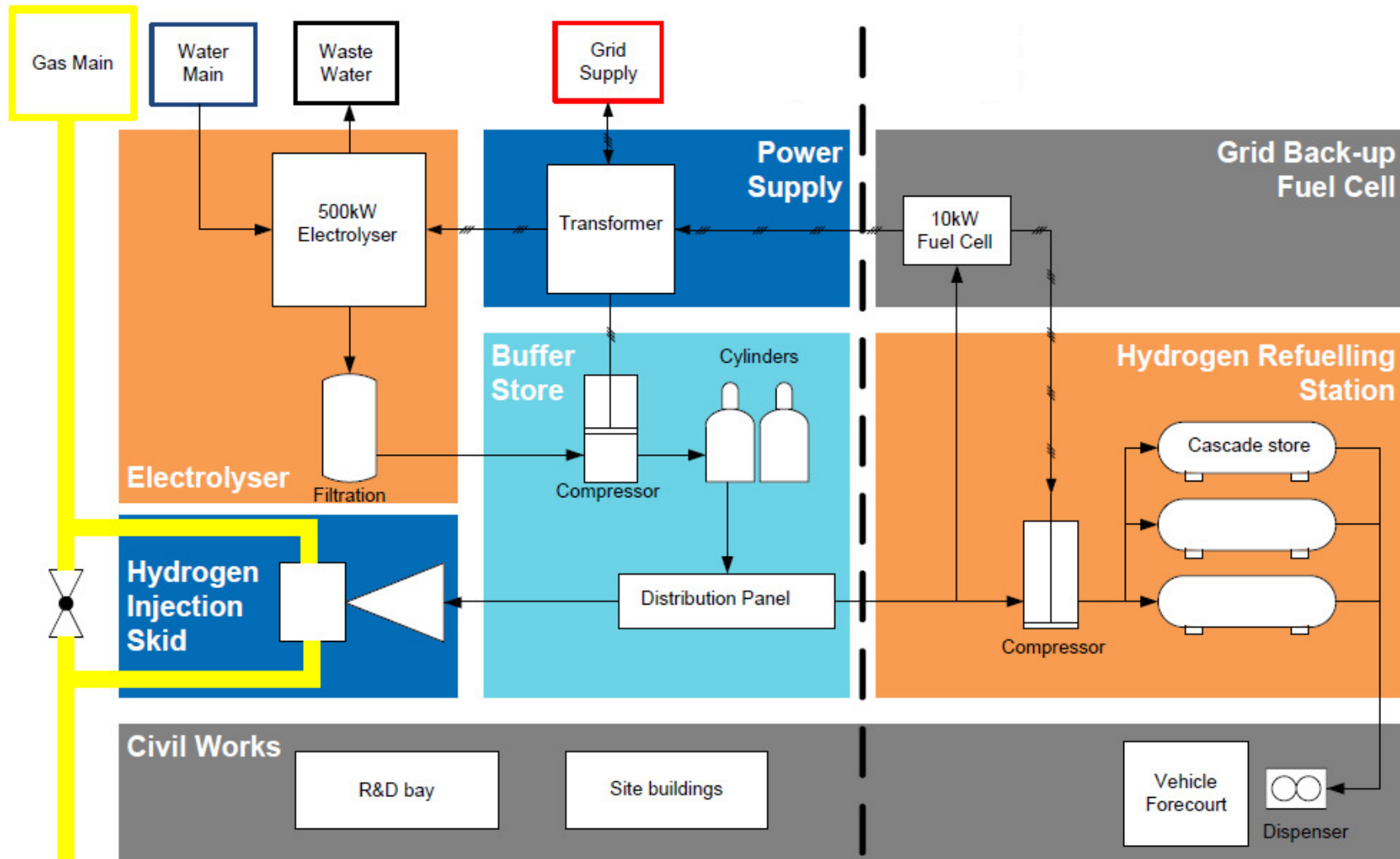


## Co-located renewables



Source: AECOM Co-location Investigation for ARENA - study into the potential for co-locating wind and solar farms in Australia, 15 Mar 2016  
AECOM (using DNV GL wind resource data)

# Jemena's pilot project proposal



# Hydrogen refuelling station concept

In addition to the core P2G infrastructure, Jemena has identified hydrogen vehicle re-fuelling plants as a complementary technology for inclusion in the scope of this project.



Hydrogen's key advantage over plug-in electric vehicles is that a car can take on a full tank of hydrogen in a few minutes – roughly the same amount of time it takes to top up a tank of petrol – while electric cars usually require several hours to take a charge.



The challenge today is that hydrogen technology is expensive and infrastructure is extremely limited – particularly compared with the power grid. Both of those factors are likely to change in coming years.





## Jemena



## Australian Energy and Renewables Industry



## NSW Government

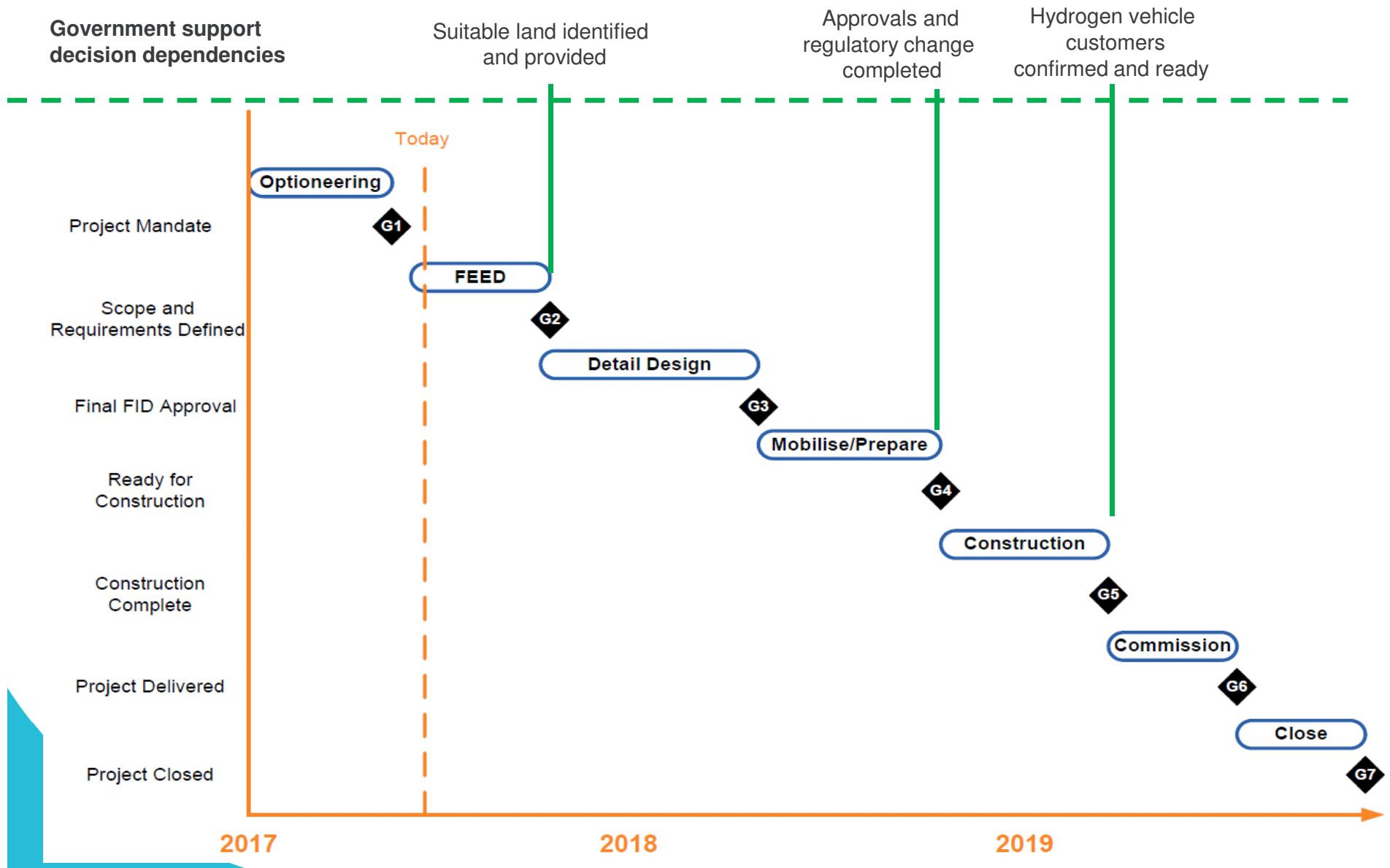


## Customers



Sustained utilisation of existing assets in the medium to long term	Address knowledge gaps and barriers for integrating renewables into energy grids	Lower volatility in energy prices	Reduced cost pressure and volatility of peak demand supply
Offset unaccounted for gas by increasing gas supply	Reduce transaction costs associated with renewable energy	Reduced impacts of climate change	Reduced energy losses and improved reliability of gas pipeline infrastructure
Improve customer retention and growth efforts for the Jemena Gas Network	Improved knowledge and capability in the renewables market	Reduced carbon emissions and alignment with NSW strategies and carbon emission targets	Reduced energy costs associated with gas appliances
Development as an industry leader in renewable energy		Improved community perception through focus on clean energy	Improved access to clean energy transport options
New product development		Demonstration of facilitating market development and innovation	Improved efficiency and reduced operating cost for business
			Reduced investment required for clean energy

# Project Timescale



# Project Stakeholders

Stakeholder	Input	Benefit
<b>Jemena</b>	Project sponsor and gas network owner in NSW, address technical, and economic barriers	Key learning and potential product development
<b>ARENA</b>	Invitation to make full application for funding	Knowledge sharing of lessons learned
<b>NSW Government</b>	Concierge and demonstration support, address regulatory barriers and customer impacts	Facilitate increased renewable energy and energy security, develop expertise in P2G, promote hydrogen vehicles market, publicity
<b>Renewable energy industry</b>	Address barrier for integration of renewables into gas pipelines	Facilitate higher penetration of renewables and storage
<b>NSW electricity and gas customers</b>	Beneficiary	New product opportunities, increased security of supply and reduced carbon intensity
<b>Research partners</b>	Active involvement in Energy Pipelines CRC, initial discussion with UTS	PhD opportunities, academic advancement. Australian CoE for P2G technologies
<b>Automotive OEMs</b>	Vehicle support (initial discussion commenced with Toyota)	Increased market exposure for hydrogen vehicles in NSW
<b>H2 industry partners</b>	Varied and collaborative	Potential contracts, R&D opportunities



Questions?