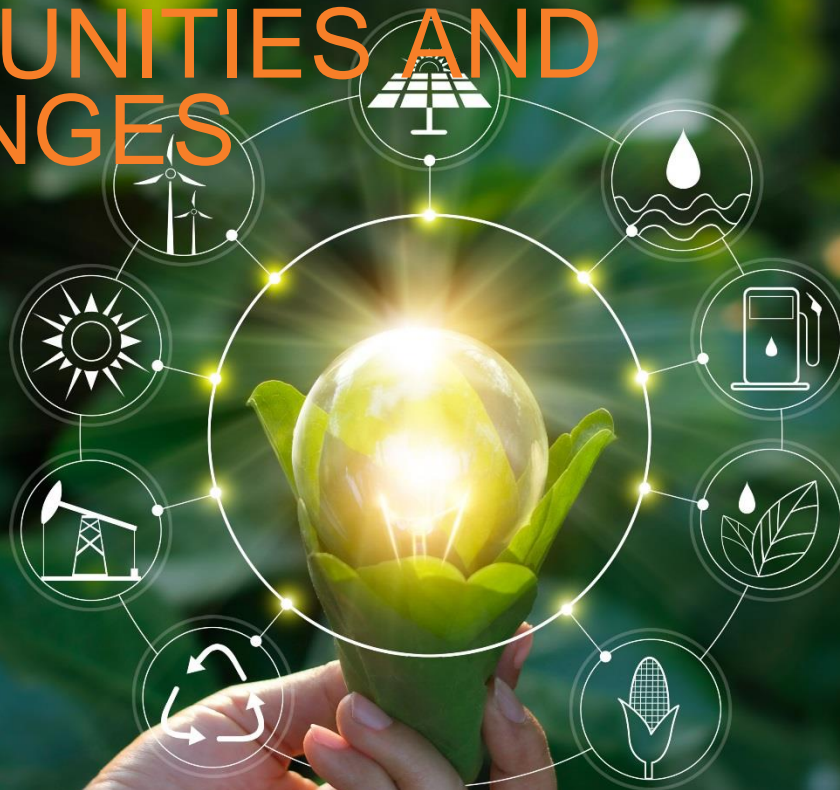


# RENEWABLE ENERGY IN AUSTRALIA – OPPORTUNITIES AND CHALLENGES

Jane Hider  
21 June 2018



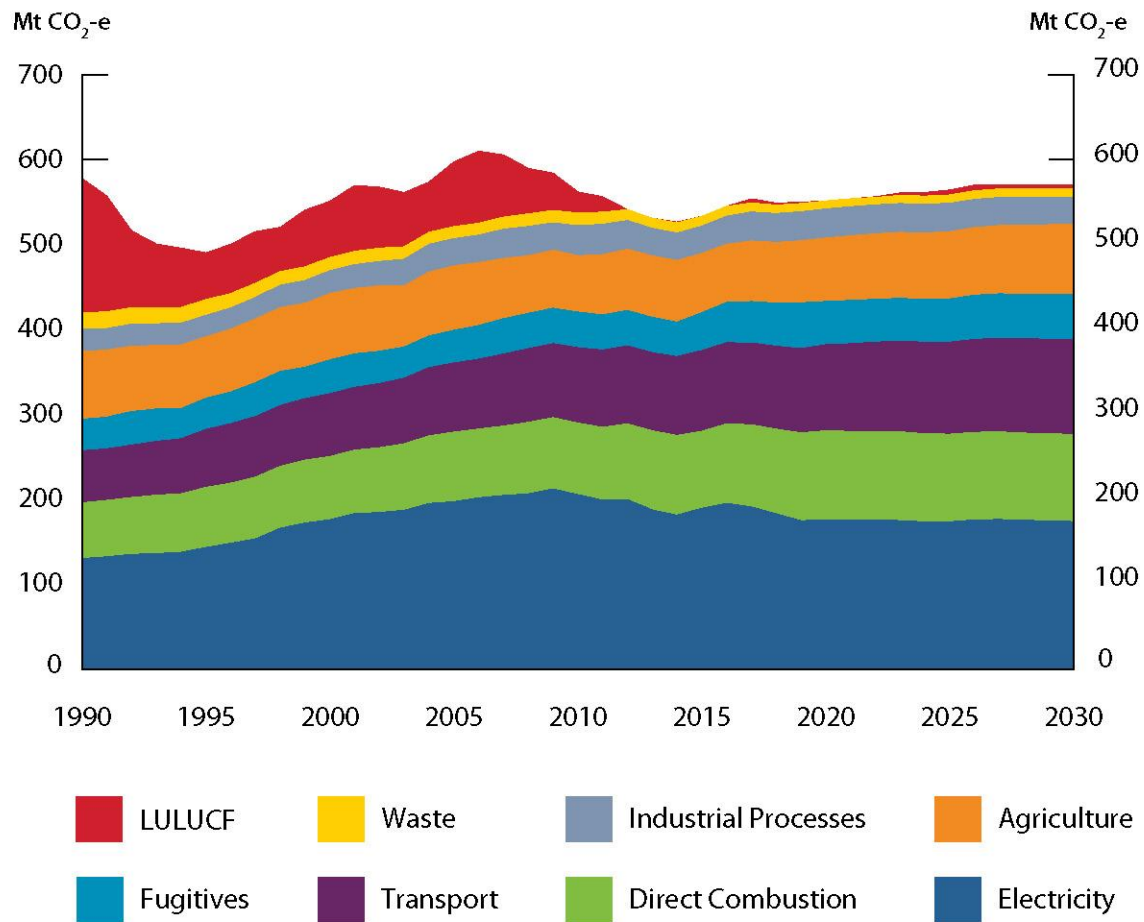
# OVERVIEW

- 1 **Setting the scene**
- 2 **Current Renewables market in Australia**
- 3 **What types of renewable projects are we seeing?**
- 4 **Challenges for Market Participants**
- 5 **Key Trends and Opportunities in the market**
- 6 **Where are the Opportunities**



# SETTING THE SCENE – EMISSIONS GENERATION

Figure 3 Australia's emissions, 1990 to 2030





# SETTING THE SCENE

## Regulation of Electricity - Australian National Electricity Market (NEM)

The NEM is a wholesale market through which generators (bid to) sell electricity in eastern and southern Australia. 40,000 km transmission lines (including the world's longest interconnected power system (between Port Douglas in Queensland and Port Lincoln in South Australia), 9 million customers and 50,000 MW trading capacity.

It was established in December 1998 under statute. **Western Australia and Northern Territory are not in the NEM.** Victoria is half in half out. All states have small tweaks.

The main customers are **energy retailers**, who bundle electricity with network services for sale to residential, commercial and industrial energy users. Most generators and retailers are now privately owned.

Energy retailers have structural and geographic monopolies and so are subject to economic regulation. In theory, they are incentivized to have efficient costs and meet reliability service standards. They are rewarded for over performance and penalized for under performance

# ELECTRICITY REGULATION CONT....

**Q: What is regulated? A: pretty much everything:**

- Generating electricity
  - Supply within a network
  - Operating a network comprising:
    - Transmission
    - Distribution
  - Selling \ retailing.
- 
- The Australian Energy Regulator regulates. The governing rules are created by the Australian Energy Market Commission.
  - The Australian Energy Market Operator operates the NEM, the short term hedging market and coordinates the interconnected electricity systems of Victoria, New South Wales, South Australia, Queensland and Australian Capital Territory.
  - There are also state based regulators and legislation.

# ELECTRICITY REGULATION

- Every 5 years there is an **electricity distribution price review** (proposal to AER forecasting next 5 years costs) (eg Powercor, Transgrid, Actew AGL etc).
- AER evaluates and caps the amount of revenue a regulated business can recover from customers through tariffs.
- To make this determination the AER reviews capital expenditure \ operating expenditure.

## CLIMATE CHANGE COMMITMENT

- Australia is a signatory to the Paris Agreement, and has committed to reduce carbon emissions to 26-28 % below 2005 levels by 2030.

# MARKET GOVERNANCE

## How the energy markets are governed

### COUNCIL OF AUSTRALIAN GOVERNMENTS (COAG)

COAG is the peak intergovernmental forum in Australia with a role to initiate, develop and monitor the implementation of policy reforms that are of national significance and which require cooperative action by federal, state and territory governments.

#### COAG ENERGY COUNCIL

The COAG Energy Council is made up of federal, state and territory energy ministers. It provides national leadership on energy policy development.

#### NATIONAL ELECTRICITY, GAS AND ENERGY RETAIL LAW AND REGULATIONS



#### ENERGY SECURITY BOARD (ESB)

Comprised of an Independent Chair, Independent Deputy Chair and the most senior leaders of the AEMC, AER and AEMO. Responsible for the implementation of recommendations from the *Independent Review into the Future Security of the National Electricity Market* (Finkel Review)

#### MARKET BODIES

##### AUSTRALIAN ENERGY MARKET OPERATOR (AEMO)

Gas and electricity systems and market operator

##### AUSTRALIAN ENERGY MARKET COMMISSION (AEMC)

Rule maker, market developer and adviser to governments

##### AUSTRALIAN ENERGY REGULATOR (AER)

Economic regulation and rules compliance

#### MARKET PARTICIPANTS



Generators



Network and pipeline operators



Energy service providers



Retailers



Major energy users and business consumers



Households and individual consumers

# POLICY CHALLENGES

- Australia faces similar challenges to other developed countries:
  - service reliability is difficult to forecast when:
    - electricity use is decreasing;
    - customers are going off grid, or increasing reliance on renewable energy.
  - Capex spend on infrastructure is difficult to predict when:
    - the infrastructure needs to adapt to changes (eg batteries, smart meters, new types of solar) but
    - parts may become obsolete

**BUT .....**



# POLICY CHALLENGES

- In Australia, the problem is exacerbated by:
  - Cheap coal and plentiful and cheap natural gas.
  - Aging coal infrastructure which is coming offline.
  - Geography means massive distance required for transmission and distribution electricity infrastructure.
  - different States imposing their own (conflicting) policy and legislative regimes for electricity and RE delivery.
  - Powerful electricity retailers and fossil fuel generators.
  - Regular power outages in peak periods (causes vary).
  - States compete for investment and projects.
  - Policy uncertainty has impacted on investment.
  - Lack of network wide planning.

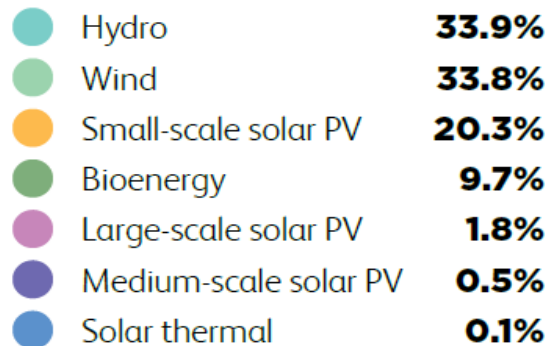
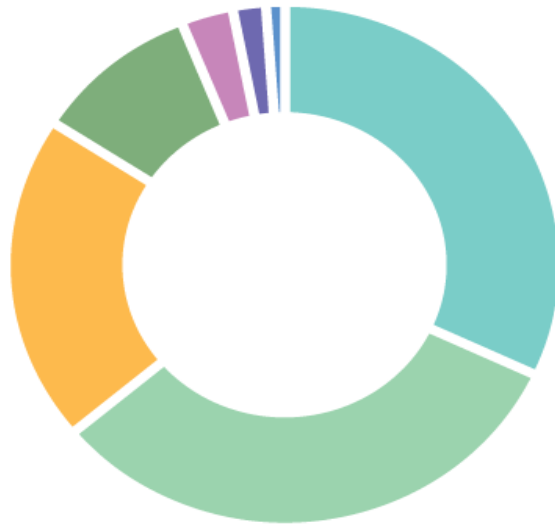
# RENEWABLES POLICY IN AUSTRALIA

- The result has been 15 years of policy uncertainty and political infighting.
- There is NO emissions trading scheme in Australia (the cap and trade scheme introduced in 2011 but was repealed in 2014).
- **Today**, renewable energy policy comprises three components:
  - **REPORTING** – on greenhouse gas emissions, energy production and consumption
  - **EMISSIONS REDUCTION FUND** – enables registration of projects and issue of Australian carbon credit units
  - **RENEWABLE ENERGY TARGETS** – large scale target, and small scale target.

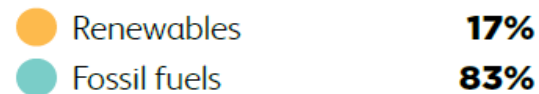
# PROGRESS....

## AUSTRALIAN CLEAN ENERGY 2017

**RENEWABLE GENERATION  
BY TECHNOLOGY TYPE**



**ANNUAL ELECTRICITY  
GENERATION IN 2017**



# RENEWABLE ENERGY TARGET

- **Renewable Energy Target (RET):**
  - In place since 2001 – original target 2% generation from RE
  - Then increased to 20% (41 000 GWh)
  - **Currently 33 000 GWh by 2020** (NB Paris Agreement promises cut of 27% below 2005 levels by 2030). The CER says this target will be met.
- **RET comprises:**
  - Large Scale RET – financial incentive to establish and expand RE generation
  - Small Scale RET – financial incentive to install small scale RE (via feed in tariffs – now largely wound down)
- **Large scale RET:**
  - RE stations which are accredited can create large scale generation certificates which can be sold or traded to off set investment cost
  - ‘liable entities’ (ie retailers) must buy and surrender certificates to the CER on annual basis.
- ARENA \ CEFC provide funding.

# FUTURE POLICY – FINKEL REPORT

- Dr Alan Finkel (Chief Scientist) released a report into the future of renewables in June 2017.
- Objectives:
  - Increased security
  - Future reliability
  - Reward consumers
  - Lower emissions
- Recommendations:
  - a **Clean Energy Target**.
  - Development of Renewable Energy Zones
  - Development of list of potential priority projects in each key region
  - Support for battery storage
  - Support for distributed generation
- The CET will not be adopted.

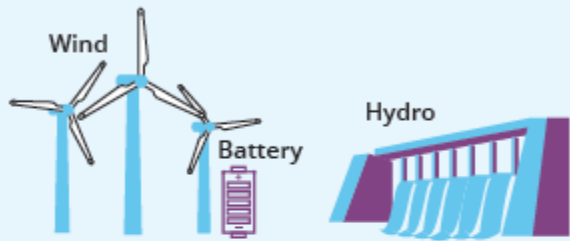


# FUTURE POLICY – OTHER

## The National Energy Guarantee

- Australian Government has proposed to implement the NEG by early 2019.
- Objective is to integrate climate\emissions policy and energy policy for the first time.
- The States have agreed to NEG on in principle basis.
- **Two components:**
  - Emissions Guarantee - Retailers must keep emissions below specified level
  - Reliability Guarantee - Retailers must contract with, invest or demand response to meet minimum level of dispatchable electricity where there is an identified gap.

# Retailers choose the energy mix which is right for their region

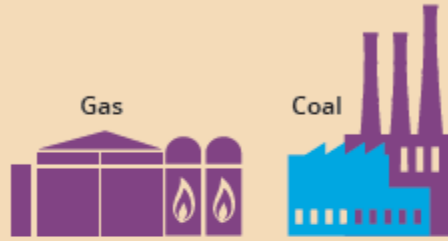


**Retailer A**

Dispatchable	✓
Emissions	✓



**Meets energy guarantee**

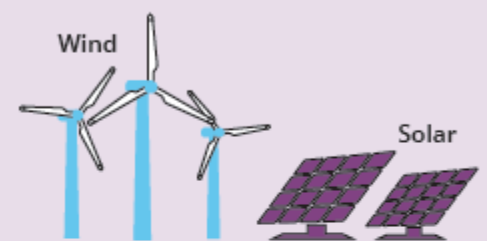


**Retailer B**

Dispatchable	✓✓
Emissions	✗



**Meets energy guarantee**



**Retailer C**

Dispatchable	✗
Emissions	✓✓



**Meets energy guarantee**

<b>Emissions</b>	✓	Retailers can adjust their portfolios by contracting with each other	<b>Dispatchable</b>	✓
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# OTHER POLICY DEVELOPMENTS

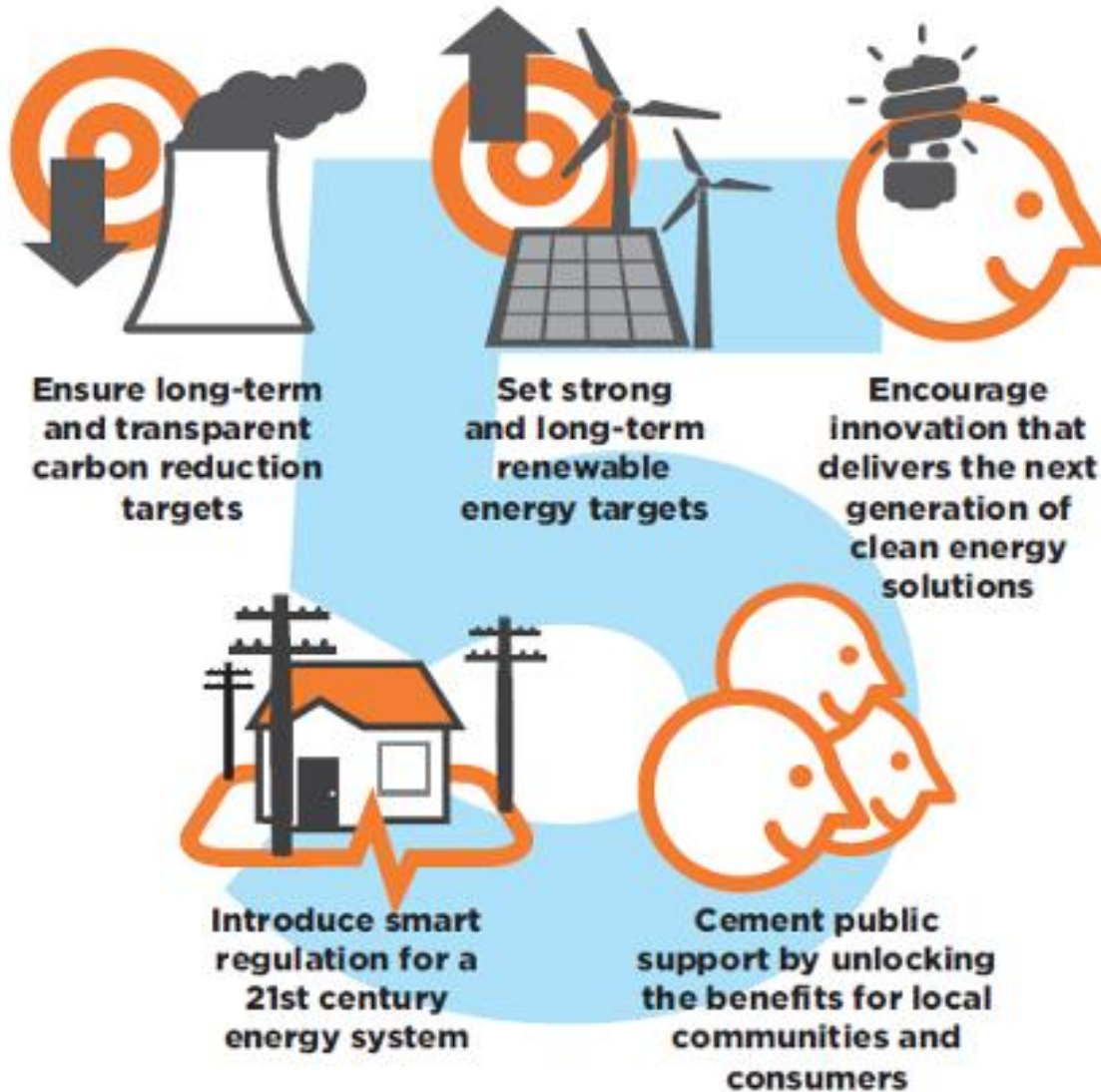
A number of states are 'going it alone'.

Individual states are driving targets by providing investment, political and other support for individual initiatives, eg:

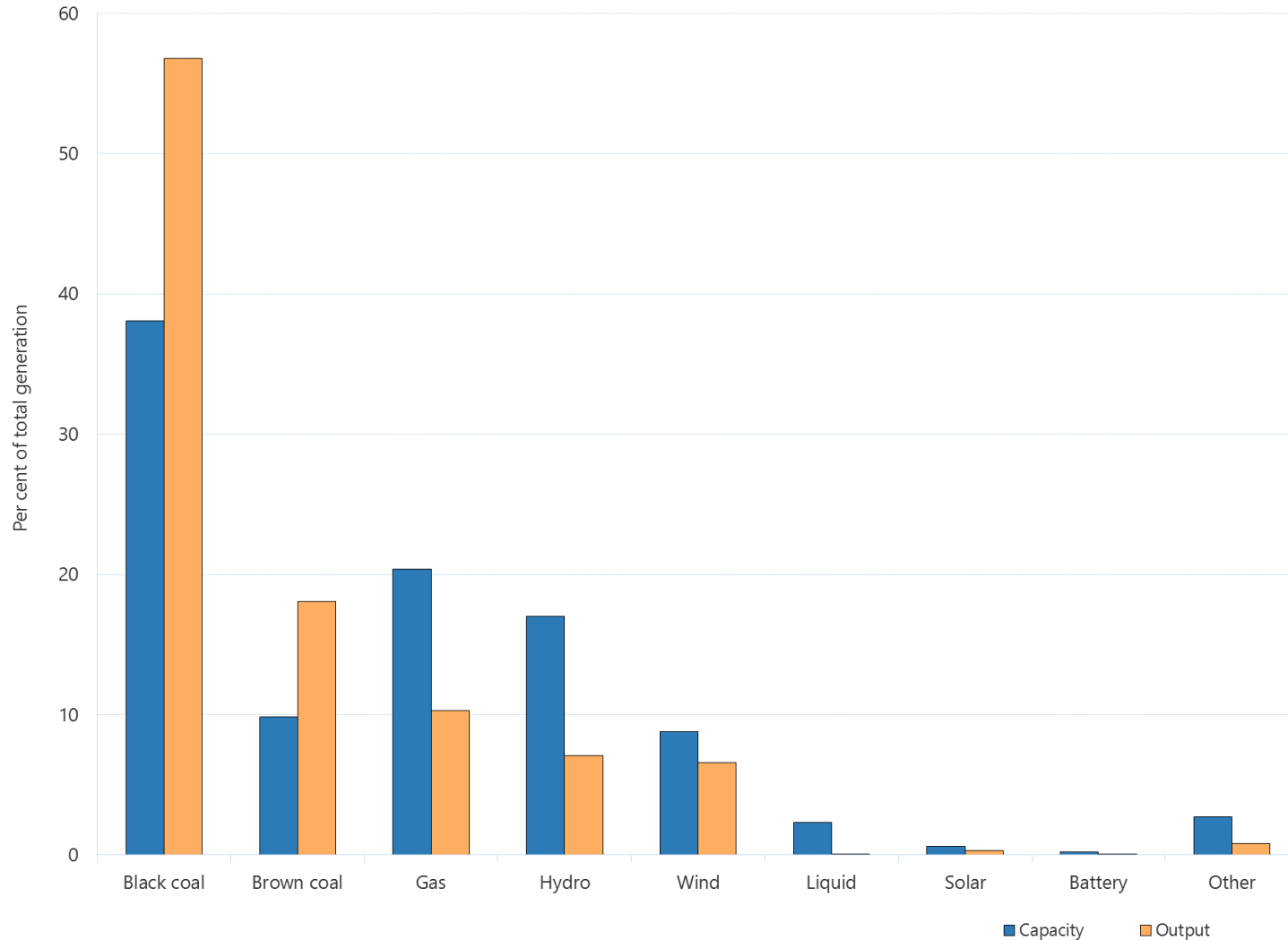
- 30 MW **Battery** at Ballarat Terminal Station (in Vic)
- 225 MW Cultana seawater **pumped hydro** (in SA) (feasibility)
- **Reverse auctions** (in Victoria, ACT and Qld)

The States also have their own targets eg: Victoria (second largest market in Australia) – 25% by 2020 and 40% by 2025

# CLEAN ENERGY COUNCIL'S MODEL



# AS AT APRIL 2018 - THERE IS SOME WAY TO GO



Source: AER; AEMO, Last updated: 6 Apr 2018 - 12:08 pm



# CURRENT MARKET FOR RENEWABLES

## QUICK COMPARISON WITH ITALY \ EU

Renewable Energy Generation in 2016  
Percentage of total generation based on GwH

	Solar	Wind	Biomass	Hydro
<b>Australia</b>	<b>3.17%</b> (2017 - 3.84%)	<b>5.32%</b> (2017 - 5.72%)	<b>1.49%</b> (2017 - 1.65%)	<b>7.32%</b> (2017 - 5.74%)
<b>Italy</b>	<b>7.63%</b>	<b>6.10%</b>	<b>8.97%</b>	<b>15.08%</b>
<b>EU- 28</b>	<b>2.80%</b>	<b>9.03%</b>	<b>1.57%</b>	<b>11.48%</b>

Source: Australia - Clean Energy Council Renewable Energy Database, NEM Watch, *Australian Energy Statistics 2016*, REC Registry SunWiz, AEMO, AEMC.

Italy and EU: Calculations based on data from EUROSTAT (nrg\_105a and ten00087) and Agora Energiewende Report, *EU power sector report 2017*.

Note: some figures have been rounded.

# KEY TRENDS

A snapshot:

- Utility scale wind and solar is continuing (particularly solar)
- State government initiated (reverse auctions)
- Corporate PPAs
- Large battery storage
- Community solar
- Renewable Funds
- Innovation at the edge \ off the grid

# CHALLENGES FOR MARKET PARTICIPANTS

- **Policy uncertainty** / highly politicised environment.  
Not conducive to investment.
- **Confusing regulatory environment** \ barriers to entry.
- **Price decreases** (although this is also an opportunity)
- **Under-resourced regulators**
  - For example grid connections are taking months
- **Retailer market power:**
  - Three largest control 70% of NEM
  - They need to be involved in Corporate PPAs, this causes delay

# TRENDS AND OPPORTUNITIES

- **Corporate Control of off site generation**
  - Corporate PPAs (more on these below).
  - Aggregated purchasing
  - Corporates setting up their own energy businesses (Mirvac).
  - Community solar
  - Corporates owning their own generation. In June 2018, University of Queensland announced it had bought the 64MW Warwick Solar Farm. UQ will be the first to offset 100% of its electricity usage through its own renewable energy asset.

# TRENDS AND OPPORTUNITIES

- **Consumer control of on site generation**
  - Most FIT schemes have wound down BUT on site solar has very high penetration.
  - Distributed energy and behind the meter is booming.
  - Embedded networks are multiplying (due to exponential growth in multi storey residential).
  - Batteries in houses.
  - Demand management offerings
    - Home owners adopting energy efficiency and local generation
    - Some state governments offering a Demand Management Incentive Scheme, customers will be encouraged by retailers to adopt a demand-side solution.



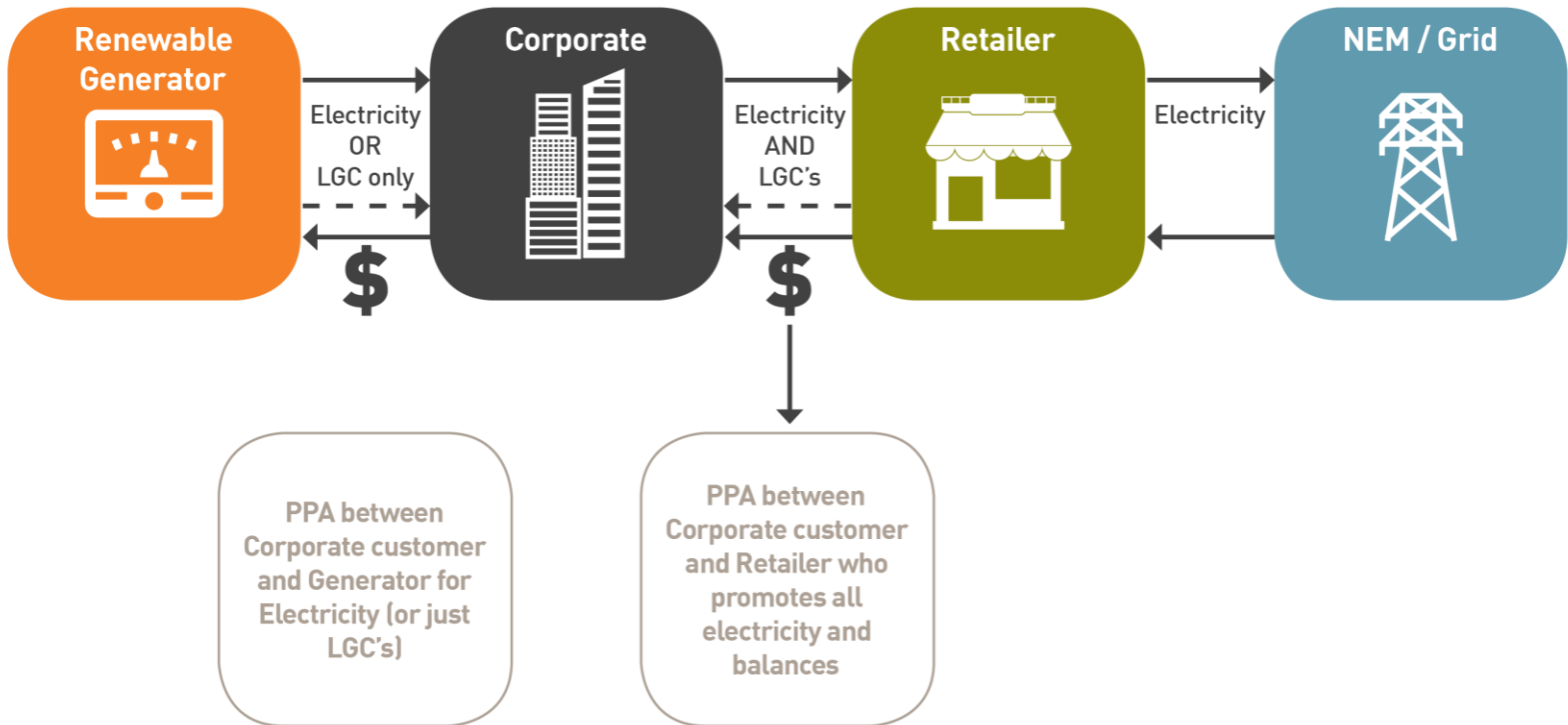
# TRENDS AND OPPORTUNITIES

- **Sustainable Building (materials, design, equipment)**
  - Low profile area, but CEFC actively seeks to fund these kinds of projects.
- **New forms of renewable:**
  - Waste to energy – still not taken off in Australia but there are a number of projects in planning. Australia's recycling crisis will drive this to some extent.
  - Pumped Hydro – Snowy Hydro scheme, in disused mine shafts in Victoria and in Tasmania.
- **'Mixed use' projects**

Eg Neoen's proposal to develop worlds first protected crop farm powered by RE at Bulgana Green Power Hub. 30 acres of glasshouses will be powered by wind and batteries.
- **Aggregated Purchasing of Renewables:**
  - In the corporate PPA space (see below)
  - In community solar and other to achieve scale.

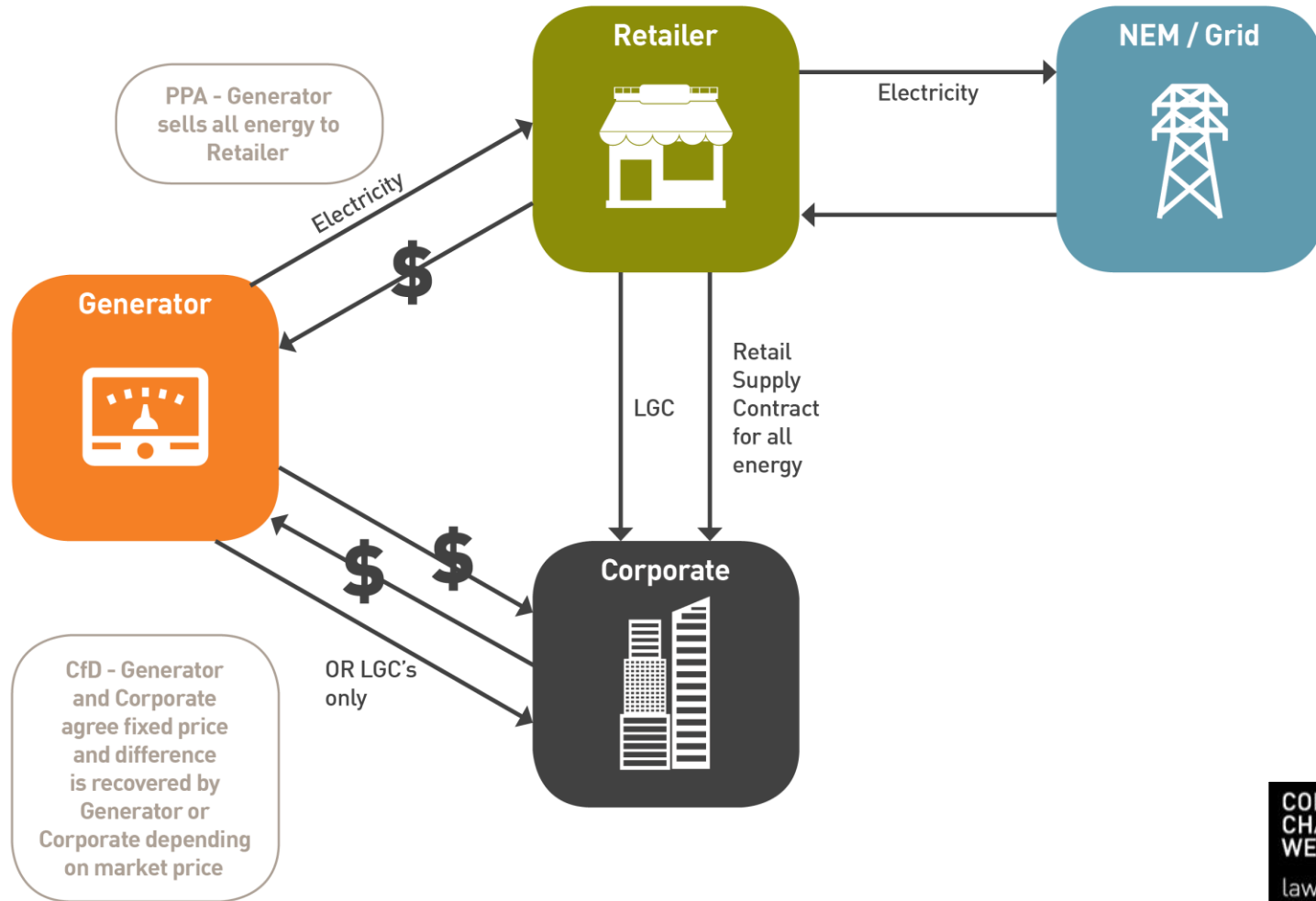
# CORPORATE PPAs

## Model 1 - SLEEVED (Bundled or Unbundled)



# CORPORATE PPAs

## Model 2 - SYNTHETIC (Bundled or Unbundled)



# CORPORATE PPAs

- Market still embryonic. But, in 2017, Corporate PPAs were reported by Telstra, Sunshine Coast Council, University of Melbourne and CUB.
- At the moment, being driven by education, health and some large corporates.
- The growing pool of renewable energy project development since 2015 has helped grow these.
- Key driver is a spike in energy costs for corporates, provides a long term hedge, energy cost certainty and (usually) lower prices long term.
- Unless the arrangement is an LGC only one, *retailer must be involved to balance the load.*

## Some challenges:

- Role of the retailer (especially in a 'sleeving' PPA)
- Tenor
- Change in law risk
- Explaining risk within the organisation \ complexity of deal \ not core business

# AGGREGATED PURCHASING

- We are seeing increasing activity in corporates \ communities \ small businesses grouping together to purchase renewable energy via a PPA.
- There are many models.
- This approach enables larger projects to get off the ground. In Australia (unlike say the US), we do not have a lot of corporates with huge energy loads who may be in this market.
- Although there are limited statistics available, anecdotally there are many projects with planning approval which cannot get funding.

# A CASE STUDY

- Melbourne Renewable Energy Project (MREP)
  - Crowlands Wind Farm (80 MW) to be built by Pac Hydro
  - Separate retail entity (owned by Pac Hydro)
  - Melbourne City Council plus 12 others enter into
    - Retail supply agreement plus LGC OR
    - LGC only agreement
- Corporate members have their own coordination agreement
- ‘Cross group’ energy use risk shared



# MREP

- Challenges:
  - Market depth (the first round of bidding was suspended as market responses not satisfactory)
  - Different purchasing preferences of aggregated groups increases complexity
  - Each participant can nominate a site for the electricity generated, these can be scaled up or down over the 10 year term.
  - Complex forecasting arrangements, enabling adjustment but overall capacity is 'smoothed' over all participants.
  - MOU arrangements meant parties could pull out if they wanted to.
  - Market conditions changed during process (for example some power stations closes)

# ENERGY STORAGE

Includes Hydrogen, Pumped Hydro, and Batteries

## Queensland - Current Projects:

- Ergon Energy is conducting a number of battery storage trials through different projects including:
  - a solar and battery storage pilot program where testing occurs in 33 homes across Townsville, Cannonvale and Toowoomba;
  - battery storage experiments looking at the impact on customers and the network when battery energy storage systems are used with different electricity tariffs; and
  - grid-scale battery trials.
- Energex has also undertaken a range of projects to increase penetration of solar PV in Queensland and optimise network utilisation in line with changing customer energy use.

## Victoria – Current Projects

Two large-scale, grid-connected batteries to be installed in regional Victoria to deliver 55 MW of power and provide approximately 80 MWh of energy storage capacity (Warrenheip and Gannawarra). Private consortia Edify Energy and Spotless Sustainability Services will carry out the projects, with \$25 million from the Victorian Government and matched funding from ARENA.



# ENERGY STORAGE

- **Strong trend for private and government (state and federal) investment in storage. 2015 – 500 batteries installed, 2016 – 6,750 batteries (52MWh).**
- 100MWh lithium-ion battery in SA developed by Tesla and Neoen is the most high profile project.
- **Current Policy Settings – Qld:**
  - In late 2018, the Queensland Government will provide interest-free loans and grants to:
    - add an eligible battery system to an existing solar system, or
    - install a new combined solar and battery system.
  - Small business can also apply for the grant, but will not be eligible for an interest-free loan.
  - In addition, the Queensland Government is establishing a home battery database and system owners are being offered \$50 to register their batteries on the database.

# ENERGY STORAGE

- **Current Policy Settings – Victoria**

The Renewable Energy Action Plan says the Victorian Government will encourage investment in the energy sector, including supporting commercial investments in battery storage and building large-scale battery storage facilities.

## Federal Government

- Has repurchased Snowy Hydro from NSW and Victoria (in early 2018)
- Is investing in pumped hydro feasibility studies in Tasmania.
- Other funding:
  - While CEFC has yet to fund stand-alone battery storage projects, it has invested in large-scale renewable energy projects which contain battery storage component. For example, CEFC has provided debt finance of:
    - \$150 million to stage one of the Lincoln Gap wind farm in South Australia's Port Augusta region, which consists of a 10MW/10MWh battery energy storage system; and
    - \$94 million to Australia's first fully integrated wind, solar power and battery project, Kennedy Energy Park in Queensland.

# ENERGY STORAGE

## Issues, Challenges and Opportunities

- Issues for utility scale are different for small scale.
- Safety questions have been raised, although these are probably overstated and it is likely an Australian Standard will be developed.
- There is still concern about large scale battery storage in populous areas.
- regulatory barriers arise (for grid connection) – there could be short cuts developed for batteries connecting to an already connected solar facility. At the moment it appears connection being assessed by AEMO on case by case basis.
- Energy storage is now treated as generation for purposes of rules.
- Another regulatory challenge was the way in which spot prices were determined. Currently at 30 minute intervals, from 2021 will be at 5 minute intervals. This change benefits demand response technologies entering the market.
- Costs are plunging. Battery storage as an adjunct to solar can enable quicker project delivery (as finance might be easier to obtain).



# QUESTIONS?

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