



# Microgrids in Australia

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# Who is CSIRO?

- Commonwealth Scientific and Industrial Research Organisation
- Australia's national science agency
- Established in 1926
- Over 5000 staff
- Annual budget ~A\$1.2B
- 184 companies based on CSIRO IP
- 3500 patents granted or pending
- Currently working on projects in 68 countries
- Our Mission:
  - We deliver great science and innovative solutions for industry, society and the environment



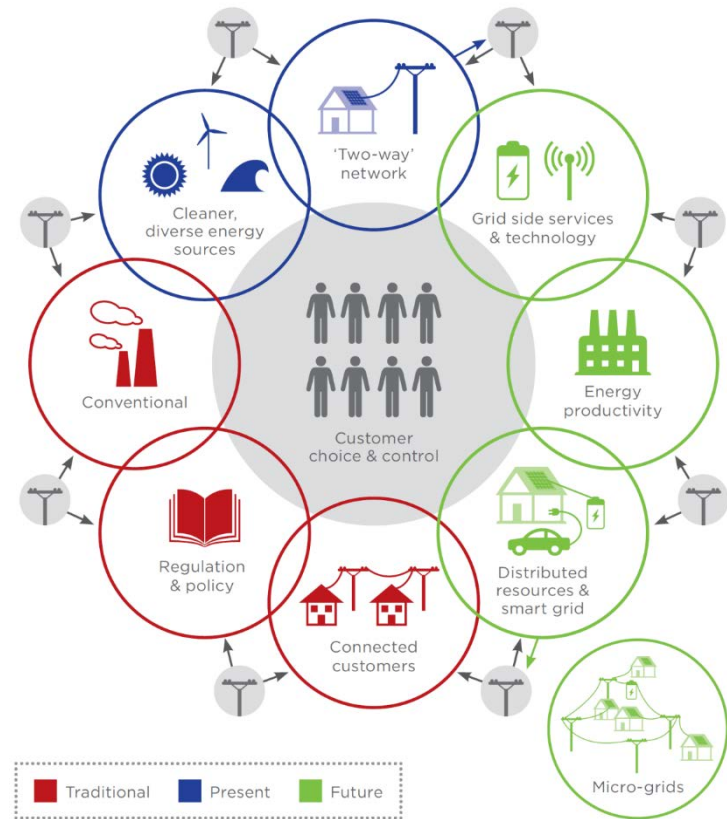
# Two big drivers of change

Actions to mitigate climate change



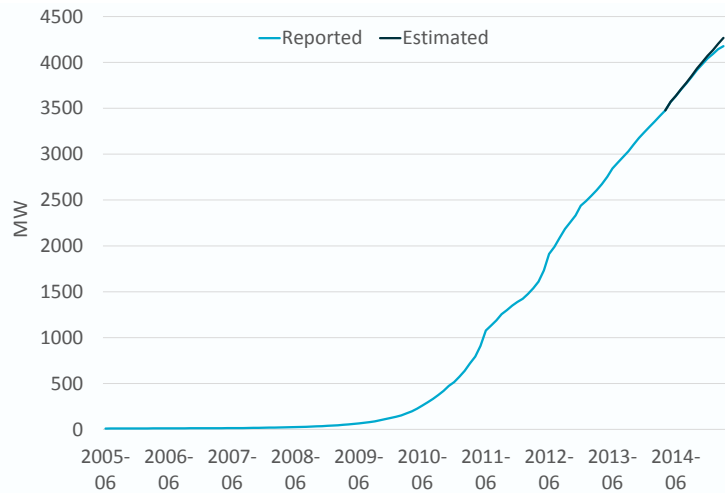
Bipartisan  
commitment to Paris  
climate targets

Distributed energy (solar, batteries,  
electric vehicles)

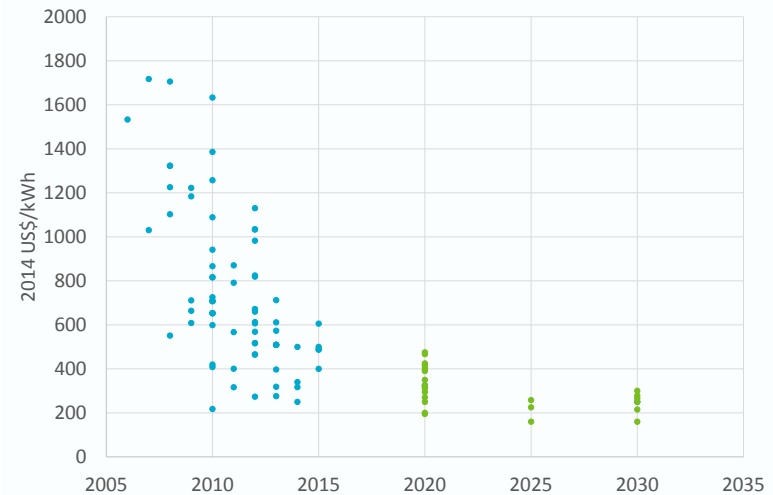


# Drivers of the customer-led disruption of electricity

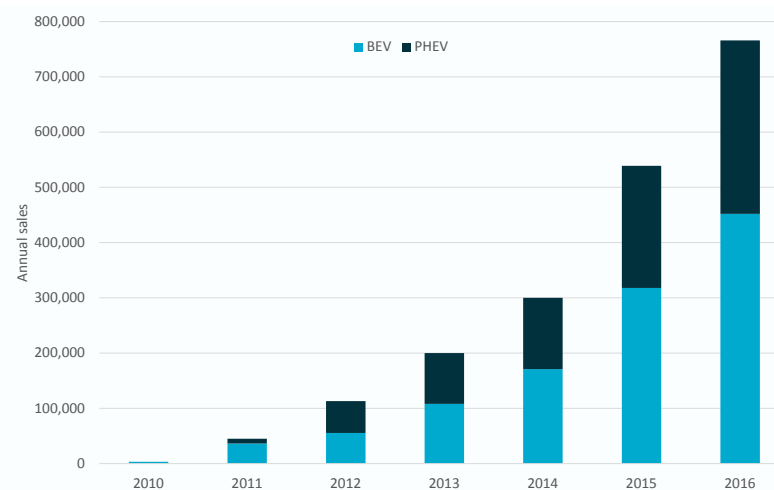
## Roof-top solar adoption



## Battery cost trends



## Global electric vehicle sales



# Both increase electricity prices

## Actions to mitigate climate change

When the full costs of integration are included, all low emission technologies lead to higher generation prices

It is also unclear that you could build anything else regardless of climate policy

## Distributed energy (solar, batteries, electric vehicles)

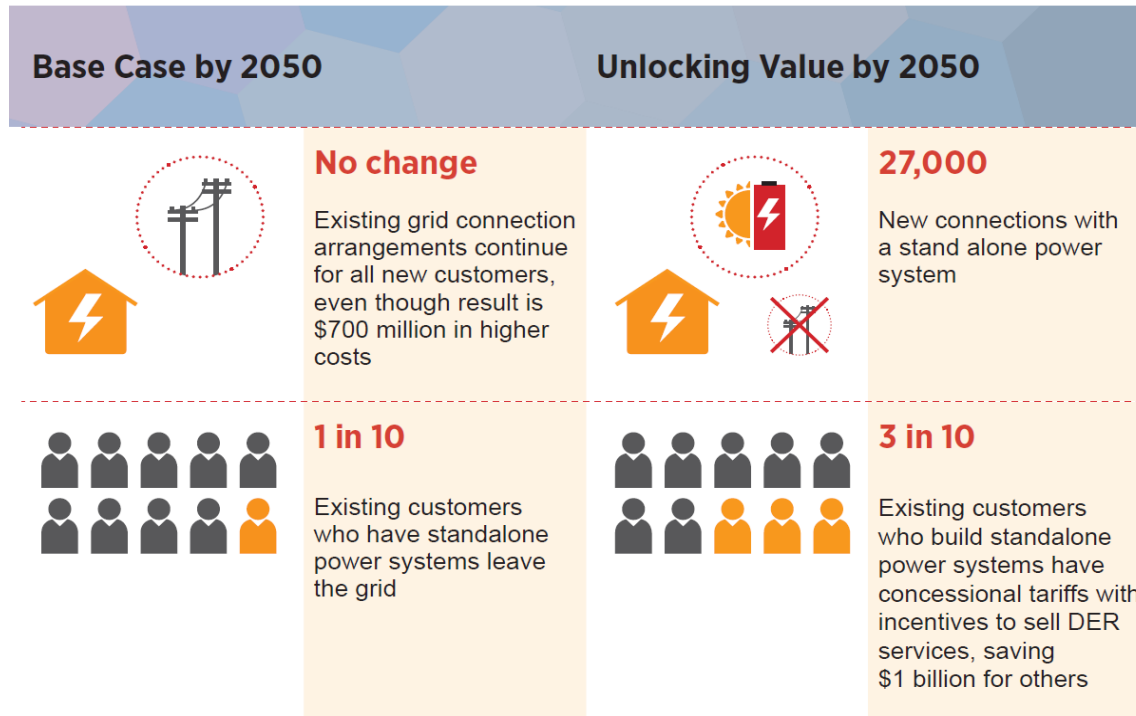
↑ Customer solar + flat consumption outlook = ↓ kWh supplied by networks

Only option to recover the fixed costs of networks is to ↑ prices

# Roadmap findings on microgrids

- **Connected, urbanised networks:**

- Without better incentives, up to 10% of customers are likely to leave the grid by 2050, increasing average bills to other customers by \$132 per year.
- Innovative network incentives, like a standalone power system tariff, would encourage over 1 million customers to choose to stay on grid to sell their own distributed energy resources, resulting in lower costs for themselves and other grid customers.
  - This could save those other customers around \$1 billion between 2030 and 2050.



# Roadmap findings on microgrids

- **Standalone power system tariff:**
  - Customer agrees to island itself during peak periods and is therefore not impacting on the required size of the network and receives a significantly discounted network price
  - The customer may import and export at all other times (noting that spilling solar energy during summer months is inherent in most SAPS designs)
  - Agents can potentially enlist the customer in providing grid services at non-peak times
- **New connections standalone power systems**
  - Cost competitive for any connections further than 1km from existing grid
  - Almost \$700 million could be saved by avoiding these connections, usually farms
  - This can also result in other benefits such as reduced bushfire risk.
  - While this makes sense in theory, current regulations also make the transition from conventional grid supply arrangements very difficult to enact
- **Islanded microgrids:**
  - Not cost effective due to cross-subsidisation in network prices. There is one price for entire network zone regardless of customer density
  - Only the network can see that this arrangement is not cost effective.
  - The customer sees that microgrids can't compete with grid connected prices
  - Solution: allow networks to choose which areas become microgrids if a competitive solution does not emerge

# Examples of Australian microgrid projects

- **Kalbarri Microgrid Project – Horizon Power**
  - Kalbarri - coastal town (>500km north of Perth) currently supplied by a 140km long rural feeder from Geraldton – feeder's length and remoteness can lead to extended outages
  - Solar, wind, existing 33kV rural feeder line, minimum of 2MWh battery storage
- **Alkimos Beach Project - Synergy**
  - Large-scale battery storage trial for households with solar panels at Alkimos Beach in Perth's northern suburbs
  - 1.1MW battery in a shipping container connected to a line that feeds the subdivision
  - Allows households to store excess solar generation during the day and withdraw at night
  - Synergy's business model affected by rapid uptake of solar panels
- **Standalone Power System (SPS) – Horizon Power and Western Power**
  - Hybrid diesel/solar/battery power source
  - No connection to utility-owned distribution system
  - Usually a single customer, but not always
  - Avoids expensive reinvestment at the fringes of the network
    - When a network asset is due to be replaced/upgraded
    - When the network asset is damaged
  - Solar: 8–12kW; Batteries: 16-33 units of 1.2kWh lithium ion batteries; Diesel:15-20kVA





# Thank You!

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