

ITLS

INSTITUTE OF TRANSPORT AND LOGISTICS STUDIES

ZEB Forum

Zero Emission Buses Forum

December 2021



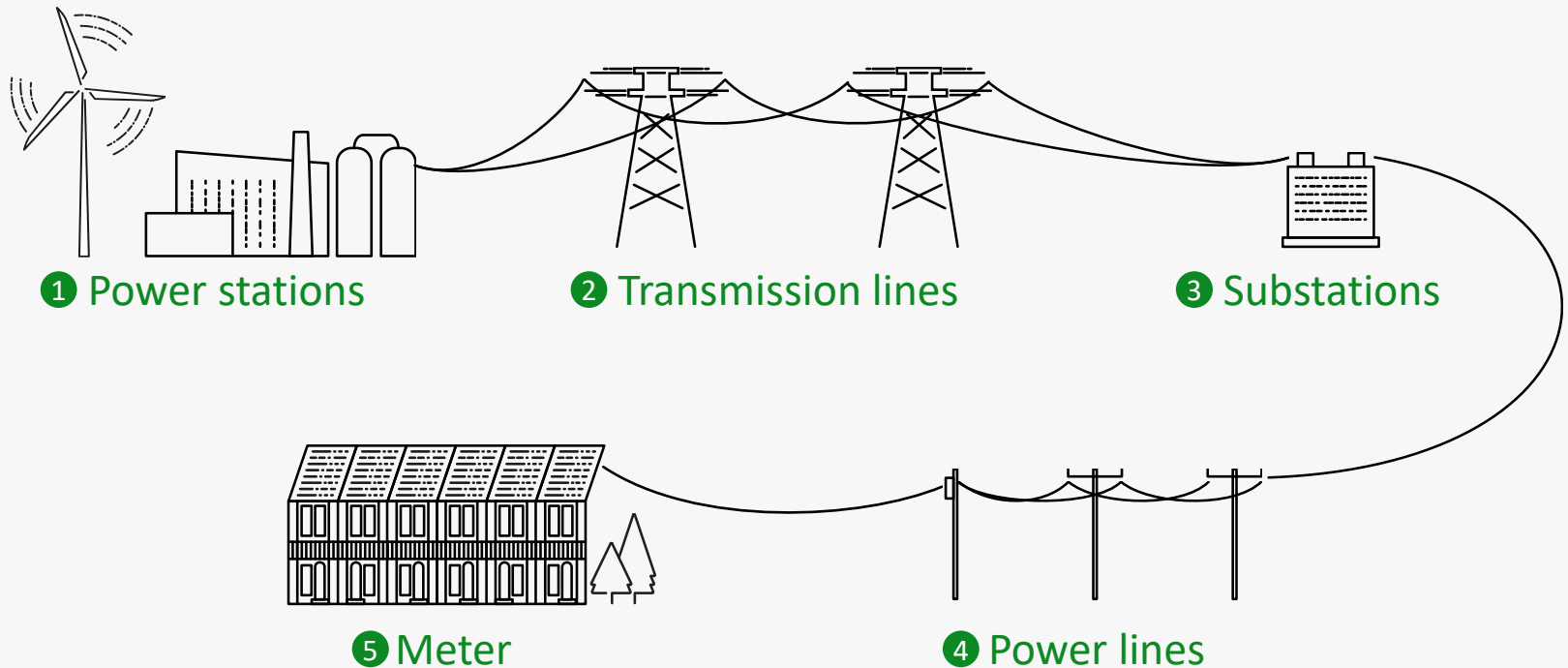
EnergyAustralia

LIGHT THE WAY

What does an Energy Retailer have to do with Zero Emissions Buses?

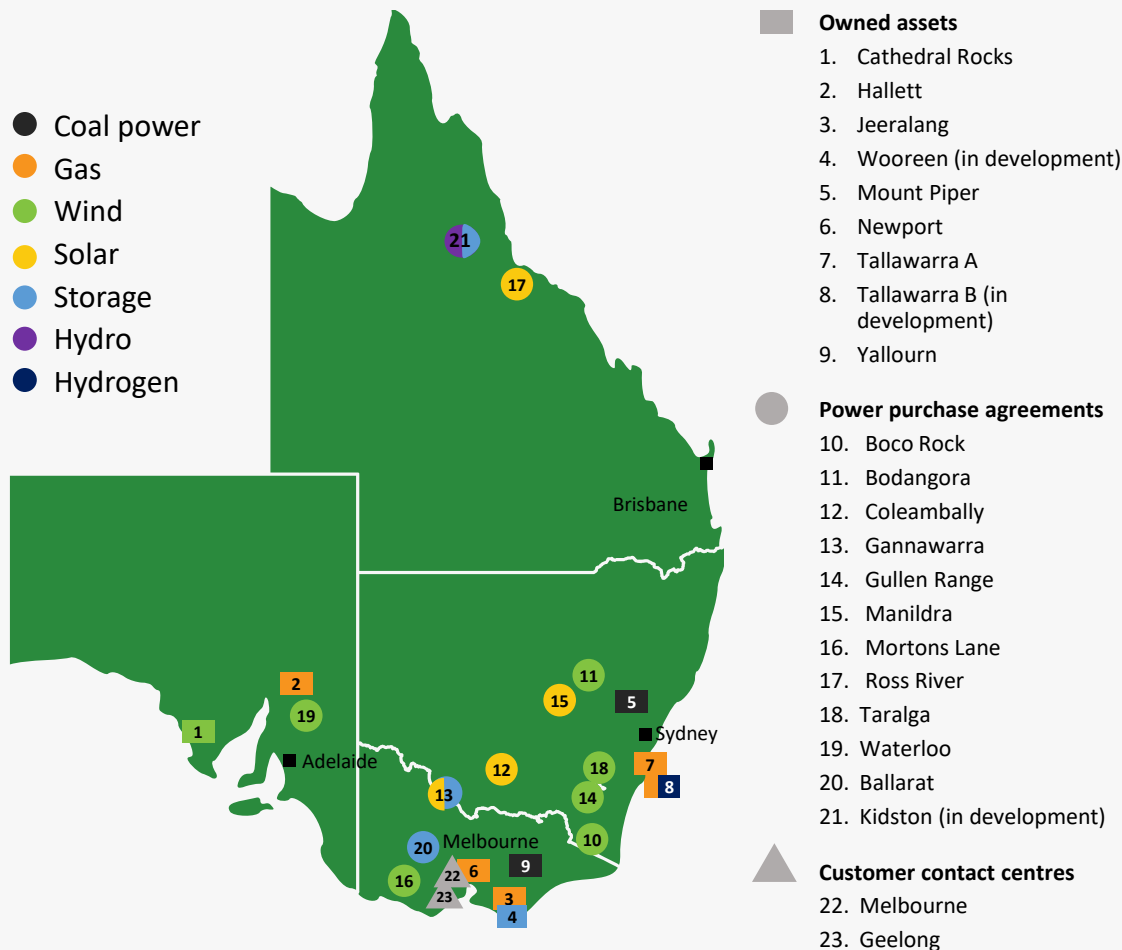
What is a GenTailer?

EnergyAustralia generates electricity and gas for its customers and is also a retailer. This means we buy power for our customers, take care of their account and make sure they have access to products which help them control their gas and electricity consumption.



The Generation Power Mix

Generation assets 5000 MW capacity (1,000MW renewables)



- **Pumped hydro:** 250 MW Kidston pumped-hydro storage facility in Queensland.
- **Tallawarra B:** Australia's first net zero emissions hydrogen and gas-capable power plant.
- **Ballarat and Gannawarra:** Victoria's first two battery storage facilities (55 MW / 80 MWh).
- **Demand response:** capacity up to 172 MW - more than 360,000 household customers.
- **Wooreen battery:** EnergyAustralia has committed to build Australia's first four-hour utility-scale battery of 350 MW capacity by 2026 in Victoria.

Our purpose

To lead and accelerate the
clean energy
transformation for all

What do you mean electric vehicles?

| ROAD | RAIL | SEA | AIR |
|--|--|--|--|
| <ol style="list-style-type: none"> 1. 2/3 wheelers 2. Passenger – private 3. Passenger - fleet 4. LDV (delivery) 5. Trucks - rigid 6. Trucks - heavy 7. Buses – Public 8. Buses - Charter 9. Buses – School | <ol style="list-style-type: none"> 1. Trams 2. Trains – passenger 3. Trains - freight | <ol style="list-style-type: none"> 1. Pleasure boating (fishing, sailing, etc) 2. Ferries 3. Shipping | <ol style="list-style-type: none"> 1. Drones 2. eVTOLs 3. Planes – light 4. Planes – long haul 5. Planes – commercial |

The Electrification Lifecycle

The electrification of transport will see the collision of the automotive, petroleum and electricity industries. This process develops in three broad phases:

DECISION-ING

The provision of tools and advice to support fleet electrification decisions.

- Fleet demand modelling
- Engineering site audits
- Grid integration
- Civil Engineering Design
- Electrical Engineering Design

DEPOT ELECTRIFICATION

The capability to execute on public and depot charging infrastructure (EVSE).

- Design approvals
- Project Management
- Construction planning
- Site safety
- Procurement
- Training

OPERATIONS

CURRENT

- Supply agreements
- Fault detection & repair
- EVSE optimisation
- Warranty
- VPP
- PPAs (renewables)
- Embedded Networks
- Dashboard

FUTURE

- VPP
- V2G
- Market participation
- FCAS

CASE STUDY

Case Study – what did we do?

DEPOT - We worked with a Melbourne bus operator at one of their depots.

DATA - We pulled per second data on 20 buses for 20 days.

ANALYSIS - We analysed this data for route shape, timing and travel dynamics.

SIMULATION - We simulated out to 365 days, including temperature profiling – calculating total and maximum demand.

ENGINEERING - We ran a full engineering assessment on site – EVSE review, EPC and site-specific work.

GRID - We negotiated a hard quote from Jemena (DNSP) for transformer installation.

COSTS - We completed a deep dive on purchase, fuel and maintenance costs.

TCO - We completed a TCO (total cost of ownership) comparison of diesel v electric buses over 18 years.

Electric Buses are cleaner, greener and, in many cases, demonstrably cheaper

Case Study – what did we learn?



Operating a bus fleet is not as simple as it sounds.

Dead running, AC loads, driver behaviour, rail replacement.

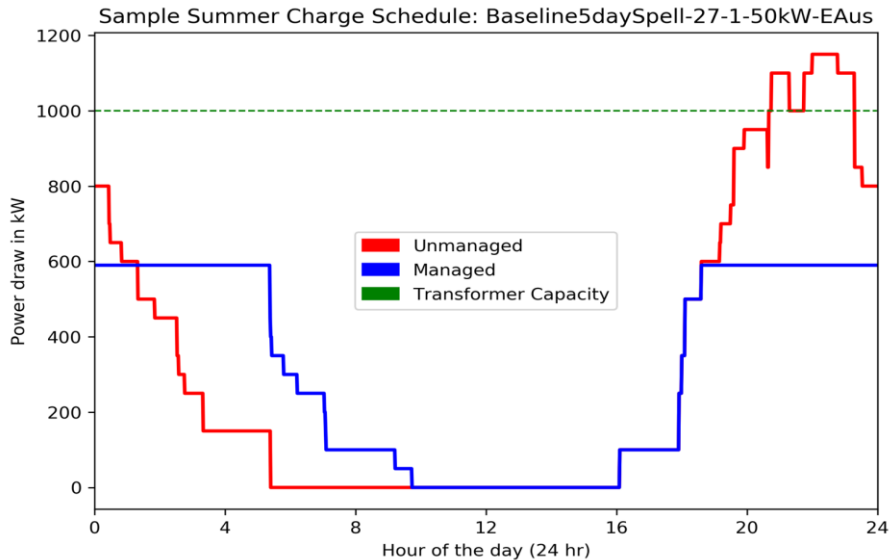
There's a material difference between managed and unmanaged fleet charging.

Depot real estate is very, very tight.

TCO is at parity, or better – right now.

We can solve the challenges of electrification – but not all bus operator challenges

Case Study – Managed v Unmanaged Charging



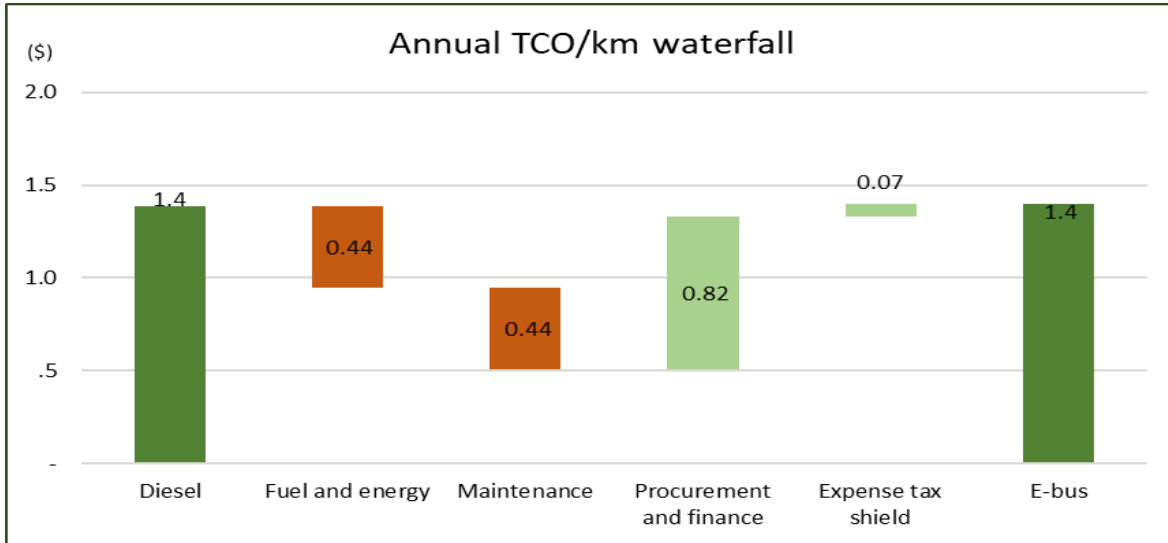
| Full Year Simulation | | Managed | Unmanaged |
|----------------------|-------|------------|------------|
| Peak | MWh | 966 | 1,286 |
| Off-Peak | MWh | 1,689 | 1,379 |
| Total | | 2,655 | 2,665 |
| Demand | kWh | 730 | 1,100 |
| Demand (0.9 PF) | kVA | 811 | 1,222 |
| Energy Cost | \$ pa | \$ 291,287 | \$ 352,927 |
| Unmanaged premium | | | \$ 61,640 |
| Unmanaged premium % | | | 21% |

There are two important variables that a managed charging service optimises for:

- Maximum demand charges.
- Peak v Off Peak consumption charges.

Lower demand charges also means lower CAPEX outlay (transformers, cabling etc).

Case Study – TCO Comparison Waterfall



TCO price parity exists now for electric buses.

In addition, we expect TCO to improve for electric buses in the future due to:

1. Battery prices continuing to decline through to 2030.
2. Retail prices of electric buses declining due to increasing demand; and
3. Government mandated plans to transition to electric.

Figure 259: Lithium-ion battery-pack price outlook

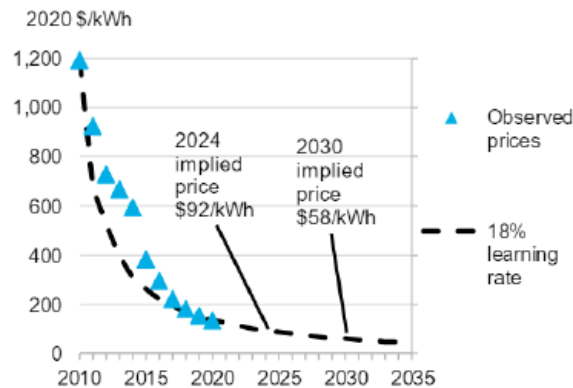
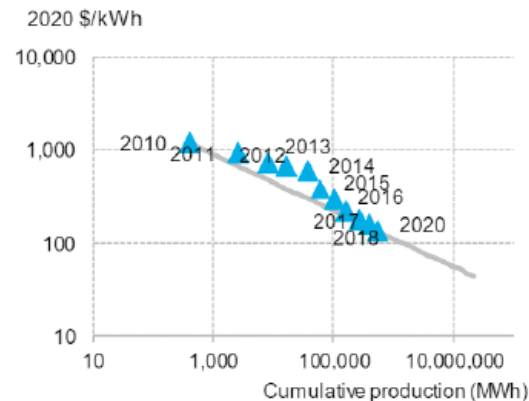


Figure 260: Log-log battery pack price outlook

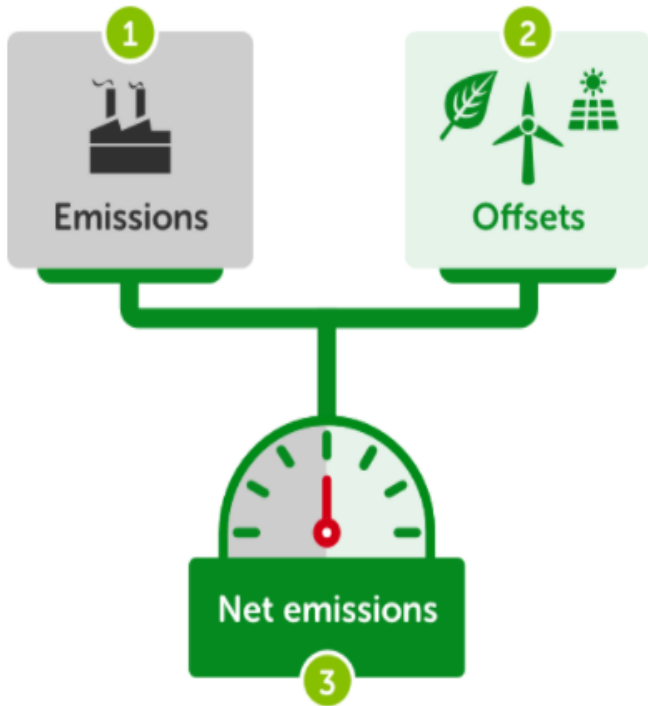


Source: BNEF. Note: The data in this chart has been adjusted to be in real 2020 dollars.

An Electrification Solution

How Green can you Go?

Offset - Large Business Carbon Neutral Electricity



- 1 If you're using energy generated from fossil fuels, this releases carbon into the atmosphere.
- 2 To reduce the environmental impact of your carbon emissions, we purchase certificates from carbon reduction projects which remove or cancel the equivalent amount of greenhouse gases released i.e. 'offset' emissions.
- 3 The resulting 'net' level of those emissions is zero.

Power sourced directly from the grid is currently about 24% renewable* or 'green' – how do we get to 100%?

*source: 2021 Australian Energy Statistics (Electricity, 4 June 2021, The Hon Angus Taylor MP, Minister for Energy and Emissions Reduction - <https://www.minister.industry.gov.au/ministers/taylor/media-releases/2021-australian-energy-statistics-electricity>

An Electrification Solution – CHaaS

Providing a Charging as a Service (CHaaS) retail contract over the term of the transit contract that includes:

- Advice on electrification;
- EPC (financed or self-financed);
- Optimising energy charges down (peak / off peak, maximum demand suppression);
- Fault detection and repair / warranty management of EVSE assets;
- Add-on services: BESS, Solar, VPP, V2G, Market Participation, FCAS;
- Green-ification of supply: the road to full renewable (from 24% to 100%); and
- EVSE and ZEB SoC (State of Charge) dashboard to support operations.

Thank You



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