PRESENTATION ON ELECTRIC VEHICLES TO:

NATIONAL CONSUMER ROUNDTABLE ON ENERGY

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ELECTRIC VEHICLE COUNCIL

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Agenda

The impact of market projections on electricity demand

Potential ways of handling this added demand

Tariffs appropriate to different charging types

The advent of bidirectional charging

The impact of housing type and tenure

The big picture
EVs and the energy transition

- 14 million cars, 6 million other road vehicles
  - Consuming ~32 billion litres of petrol and diesel each year.

- Road transport contributes about 15% of Australia's CO_2 emissions.

- Transition this fuel load to electric, it would look like ~95TWh/annum, off a base today of ~240TWh.
  - ~20% increase in electrical energy requirements from the cars, ***plus***
  - ~20% increase in electrical energy requirements from the other vehicles

- Hydrogen? Yes, for some of the bigger vehicles, but electricity will be used to source the hydrogen.

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How long will it take?

The car makers are announcing end dates for the production of internal combustion engines.

The speed of the transition locally will be a function of government policy…..

2030

- Assume 50% of new car sales are EV, and transition of trucks and buses is getting started.
- This will add about 3% to overall electrical energy use.
- Norway hit this sales volume mark last year, with negligible overall grid impacts.

2040

- Assume trucks and buses follow 5 years behind cars, and 90% of new car sales are EV by 2040.
- This will add about 20% to overall electrical energy use.

EV charging and probable network impacts

Low power AC (2 – 11 kW)

Majority of total energy (> 90%)

Low peak demand

Millions of locations - every home

Risk of temporal concentration.

The challenge:

Peak demand management.

Solution:

Many, many ways to address it.

Consumer buy-in will be key.

High power DC (50 – 350 kW)

Minority of total energy (< 10%)

Less locations, like petrol stations

Temporally distributed.

Localised high peak demand

The challenge:

Tariff design.

Solution:

Tariff reform, policy direction, subsidy.

Probably a mixture.

Managing the pricing – in public

Tariff structures vary widely by DNSP.

For the purposes of this presentation:

Demand and capacity charges means, ‘a portion of the bill based on peak demand’

Energy-only tariff means, ‘a tariff structure without demand or capacity charges’

Most jurisdictions provide the ability to choose ***energy only tariffs*** for small to medium consumers

Managing the pricing – in public

Victoria*	NSW	Queensland	WA	ACT
Powercor	Ausgrid	Ergon	Western Power	Evoenergy
United	Essential	Energex	Horizon	
Citipower	Endeavour			
Ausnet		**NT**	**Tasmania**	**South Australia**
Jemena		Power and Water	Tasnetworks	SAPN

	New connections below 160MWh/annum can opt out of demand charges
	New connections below 100MWh/annum can opt out of demand charges
	New connections below 120KVA can opt out of demand charges
	New connections are assigned to demand or capacity based billing

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Managing the pricing – in public

High utilisation sites:

160MWh/annum is about 670 charging sessions per month. At this level, demand and capacity charges don't typically pose a commercial problem for public EV charging operators.

Low utilisation sites:

For a site delivering 50 charging sessions per month, capacity charges can add $3-$4 to the cost of each delivered kWh…. the equivalent of adding ~$10 per litre to the price of petrol.

The EVC is working with many people on this issue. Our members include both the charging station operators and the DNSPs.

Managing the load - domestic

Typical starting point for analysis is, ‘what if everyone plugs in at the same time?’

14 million cars x 7kW charging = 98GW (~3 times current NEM peak demand)

This leads very quickly to:

- “The sky is falling!”
- “We must rush to regulate this new technology!”
- “We should create and enforce unique Australian standards in this space!”

The reality is not so dire….

Managing the load - domestic

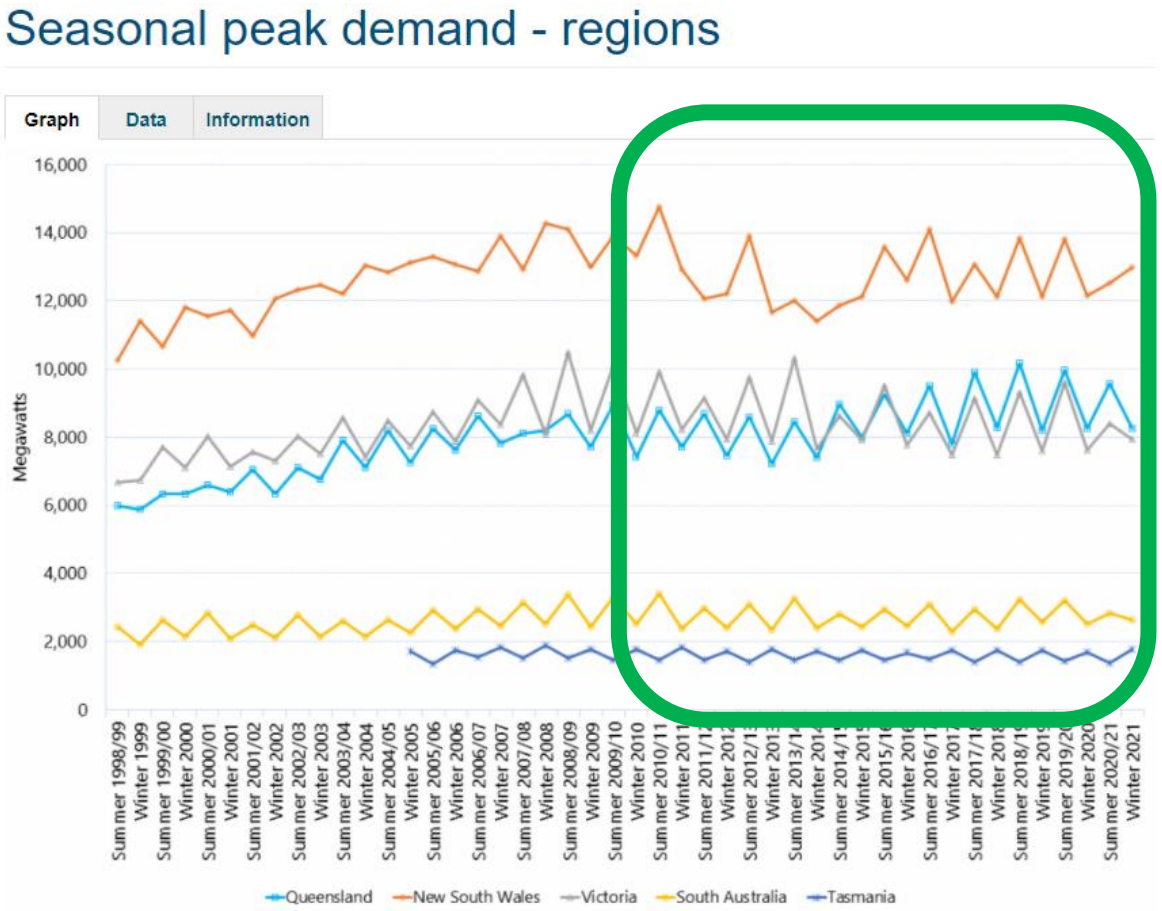
Looking at overall seasonal peak demand.

Peak demand has not kept up with population growth.

900,000 split system AC units per year.

Load is highly temporally concentrated.

Not much impact over the last 10 years



https://www.aer.gov.au/wholesale-markets/wholesale-statistics/seasonal-peak-demand-regions

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Managing the load - domestic

Potential solutions:	Challenges:	The smart move today?
Controlled loads	Consumer acceptance	Run trials
ToU tariffs (and Solar FiT)	Cost to deploy	Gather actual usage data
Consumer-in-the-loop DR	Cost to operate	Test approaches
Orchestration of chargers	Interference between methods	**Hold off new regulation until we've learned more.**
Orchestration of cars	Technical aspects	

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If we need to build out the network, what will it cost?

+10% in the RAB:

$20B transmission, $80B distribution

10% increase is $10B over 20 years.
Assume the petrol stations stay open

~$500m network build cost per year

~$20 cost per person per year.

Fuel use:

~$50B per annum in petrol and diesel

Replace with 95TWh of electricity.
Price it at an average of 20c/kWh

~$19B per annum cost in electricity.

~$1240 saving per person per year

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Bi-directional charging

Typical starting point for analysis is the polar opposite to the ‘sky is falling’ proposition:

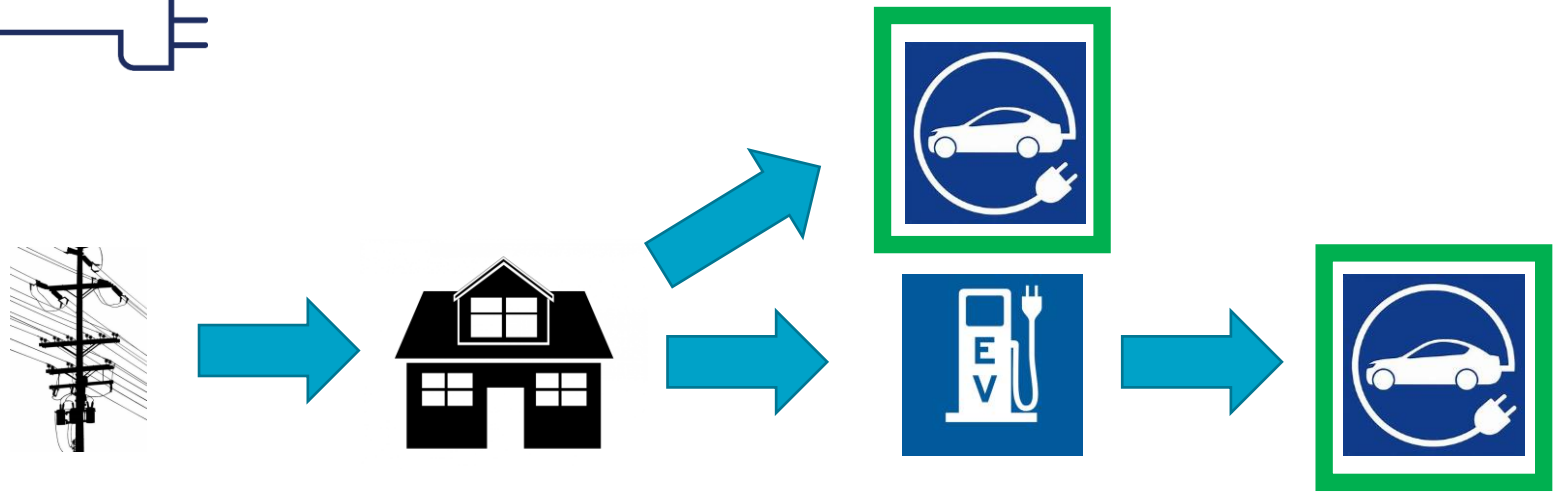
14 million cars x 50kWh available in the batteries = 700 GWh

Enough to feed the whole NEM at peak load for 16 hours.
About double the storage capacity of snowy 2.0

On the face of it, extremely useful... But needs a little bit of unpacking on the ‘how’.

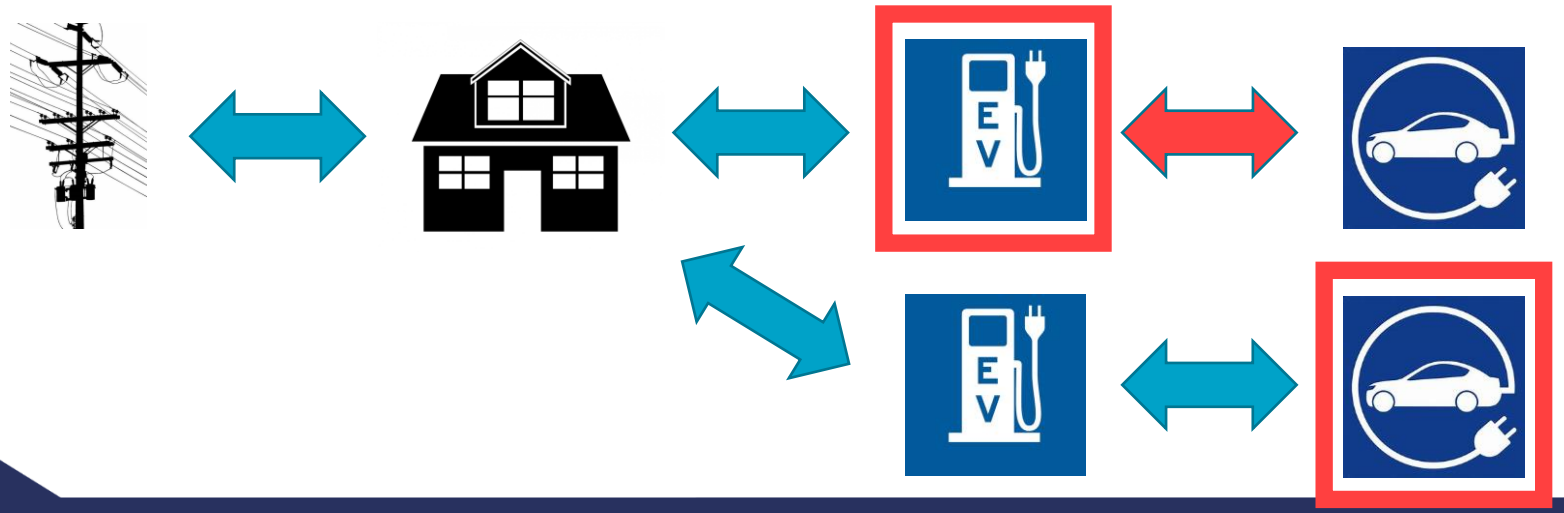
Exporting energy to the grid is more complex to achieve than scheduling charging.

Single vs bi-directional charging



Existing 10A power outlet to the car
120km top up overnight

$1000-$1500 wallbox (32A, 7kW) to the car
Full recharge overnight



V2G charger on the wall
~$10k today, maybe $3-$4k in future
Some standards compliance issues (AS4777)

Grid synchronized AC output from vehicle
Adds a little to vehicle cost
Uses a low cost wallbox (per above section)
Significant standards issues

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Deploying at-home charging by building type

	Standalone home Parking in driveway or garage (~70%)	Terrace house or similar Parking on-street (~10%)	Apartment Parking in the building (~20%)
Owner	Easy. $2k to install a 7-11kW charger $0 to use existing powerpoint.	Hard and varies by jurisdiction. Kerbside charging just starting to be explored in Australia, ~$5k-$6k. Risk of extension leads across footpaths.	Hard. Significant work going into the NCC to make this easier in future Risk of a specific segment of consumers being disadvantaged
Renter	Easy if ~120km/day is enough. $0 to use existing powerpoint. Landlords' permission needed if faster charging is required.	Very hard. Split incentive problem.	Very hard. Split incentive problem.

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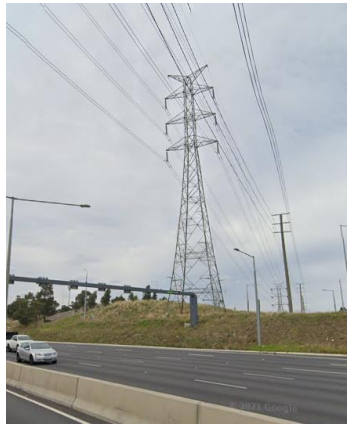
What does victory look like from the electrical perspective?

+40% *overall* generation



Minimise network increase

Charging available at home and on the move

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