Potential barriers to uptake of clean energy passenger vehicles, and possible solutions

Presentation to LEANZ

4 August 2022

Contents

1
Key policy question for New Zealand

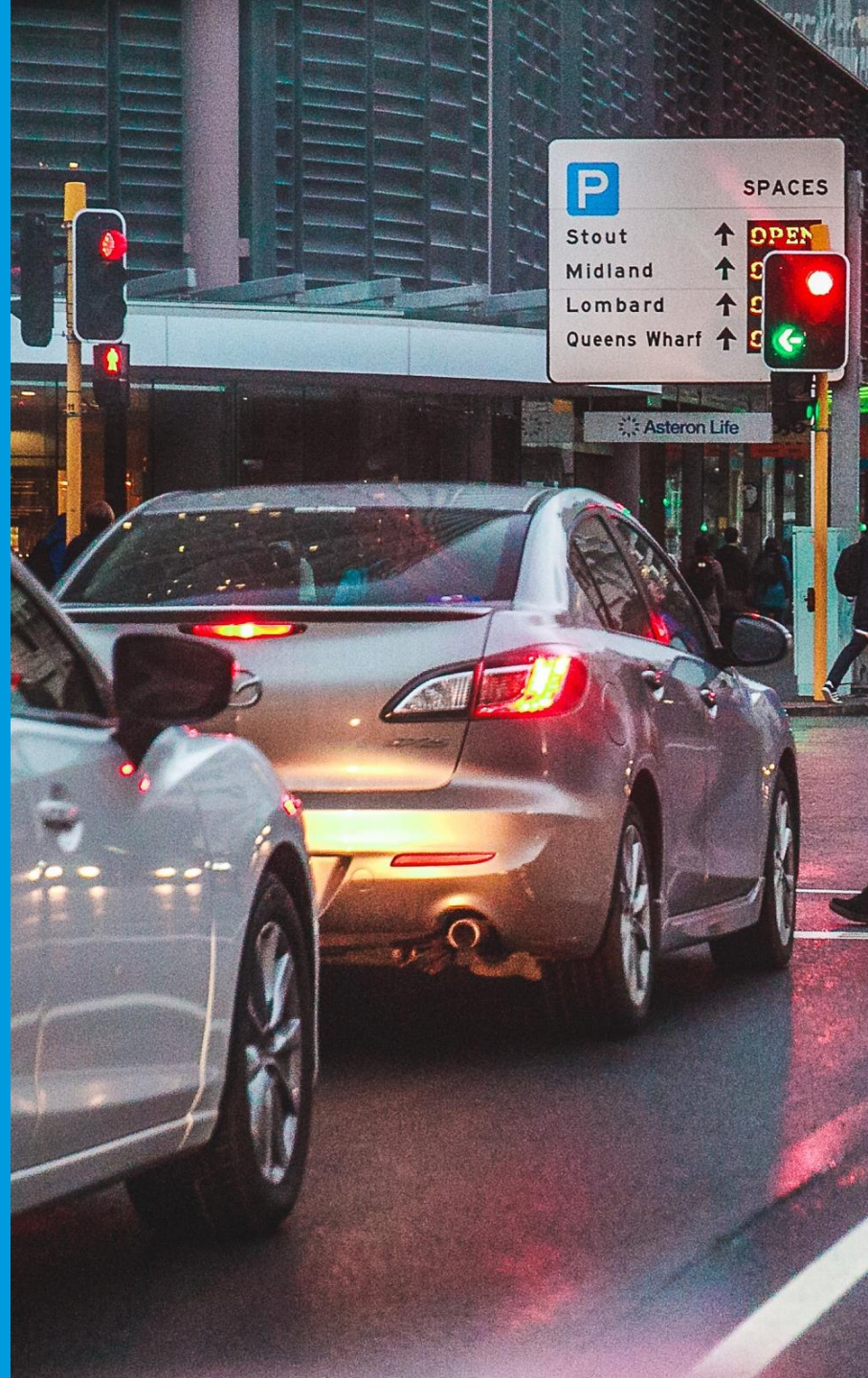
1.1 The Question

"How will New Zealand get the clean passenger vehicle fuelling system it needs quickly and efficiently?"

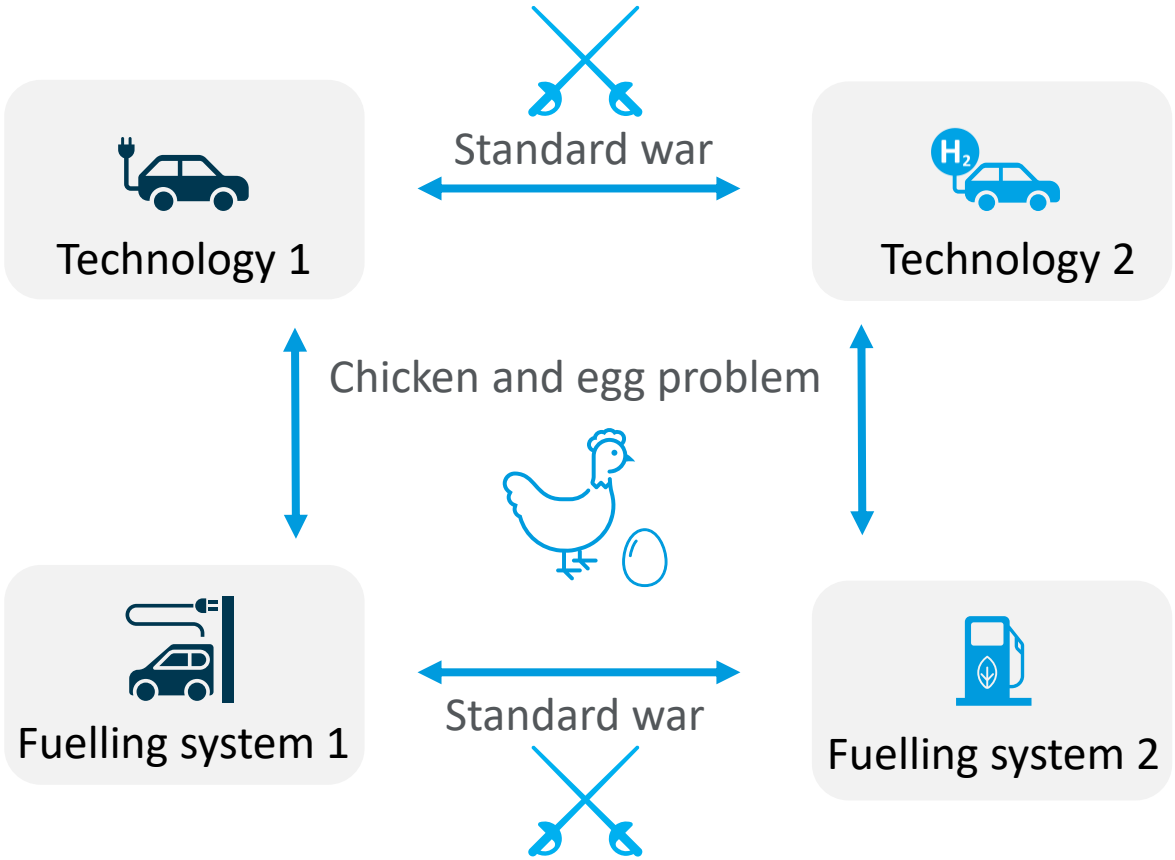
If market failures exist and are significant, government intervention may be justified

But the scale and type of intervention should match the scale of the market failures

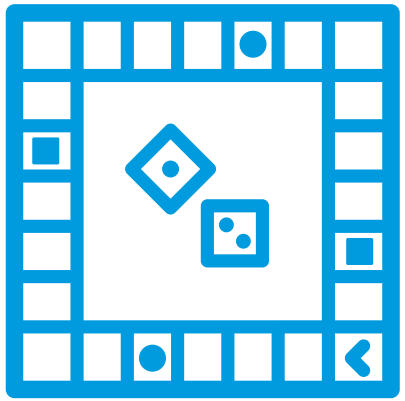
2
What are the potential market failures?



2.0 Market Failures



Monopoly?



2.1 Standard wars

A standard war may occur when network effects are present; adoption confers a benefit on others

This is a classic **coordination problem**

How do we end up in one of the right quadrants?

- Company 1 manufactures tech 1
- Company 2 manufactures tech 2

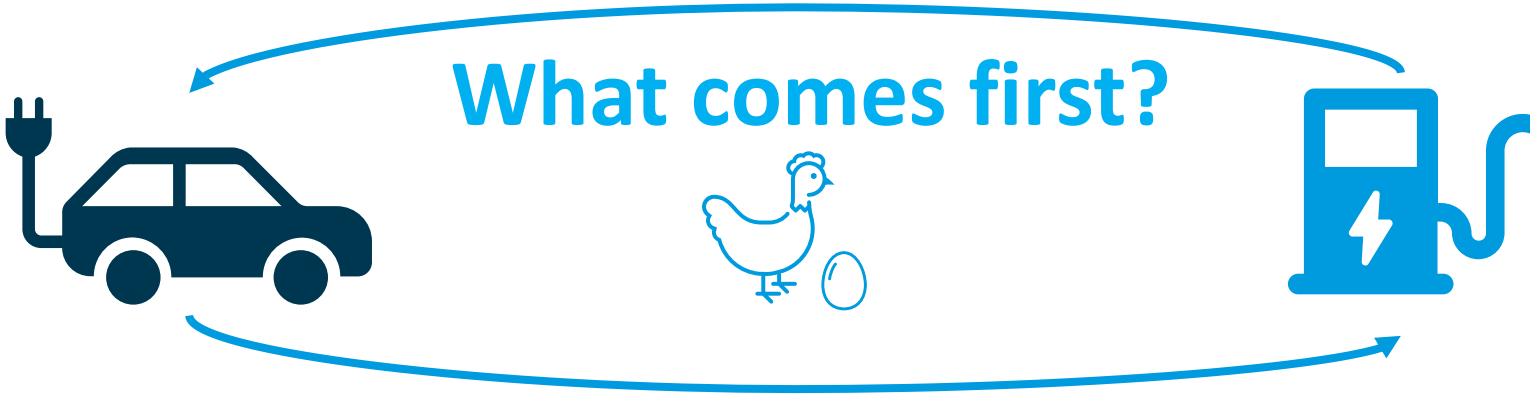
		Company 1	
		Persist with tech 1	Cooperate with tech 2
Company 2	Cooperate on tech 1	3,1	0,0
	Persist with tech 2	0,0	1,3

- Markets may move to slowly between standards
- Markets may move too quickly to an inferior standard
- Avoidable costs in the battle for the “winning” tech

2.2 Chicken and egg problem

Refuelling infrastructure will not emerge without certainty that there is demand from vehicle uptake

Vehicle uptake will not emerge without refuelling infrastructure



2.3 Monopoly

A proprietary standard could allow one company to develop a monopoly position

Scale economies could result in a natural monopoly

Under provision

Higher prices

Innovation stifled

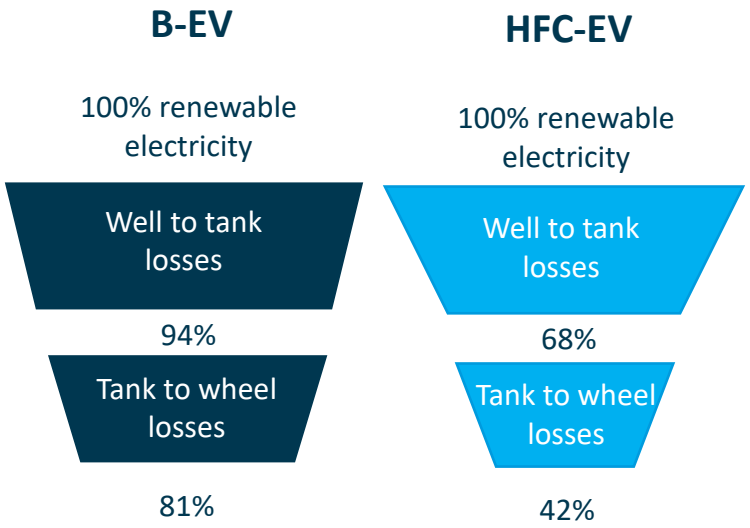
3
Analysis of the market failures

3.0 Is there real uncertainty about which technology will win?

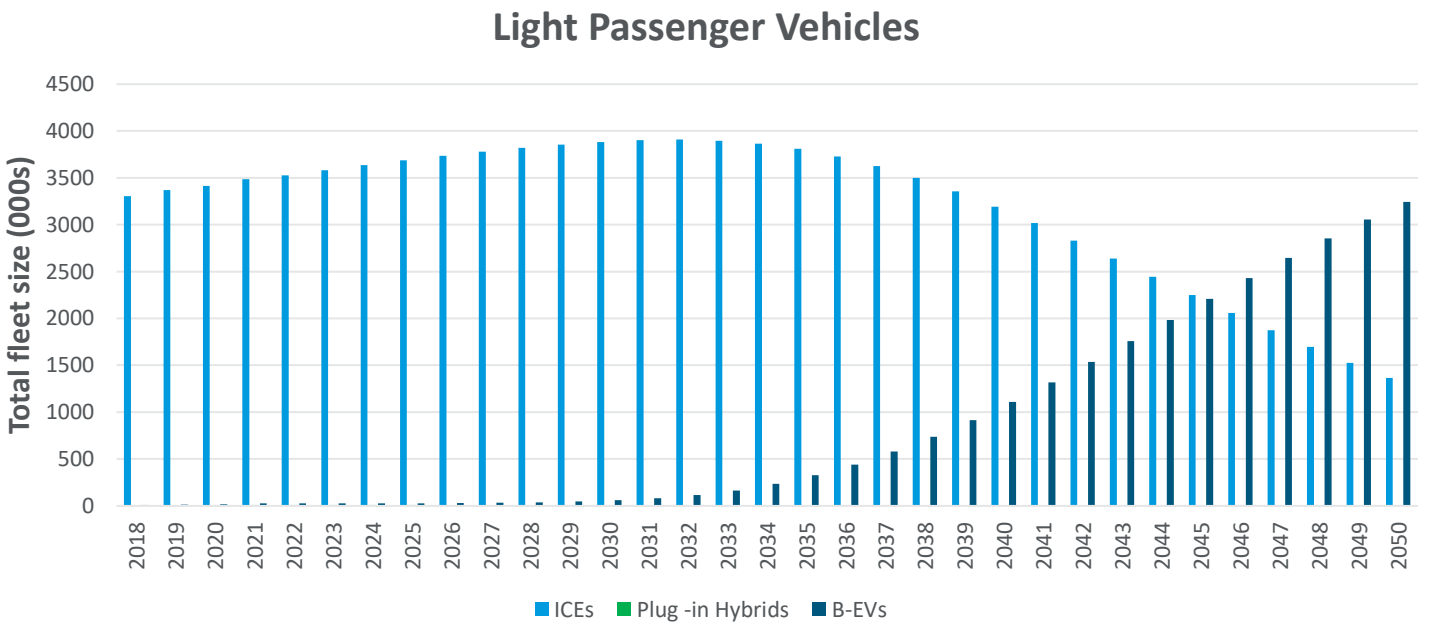
BEV are clear favourites for light weight vehicles

HFC-EV light passenger vehicles are half as efficient as B-EV light passenger vehicles (see LH figure)

B-EVs and PHEVs will reach cost parity soon, and using Bass Diffusion model B-EVs make up a larger share of the fleet from the mid-2040s (RH figure based on Castalia modelling for Z Energy and another NZ fuel company)



https://cleantechnica.com/2021/02/01/chart-why-battery-electric-vehicles-beat-hydrogen-electric-vehicles-without-breaking-a-sweat/

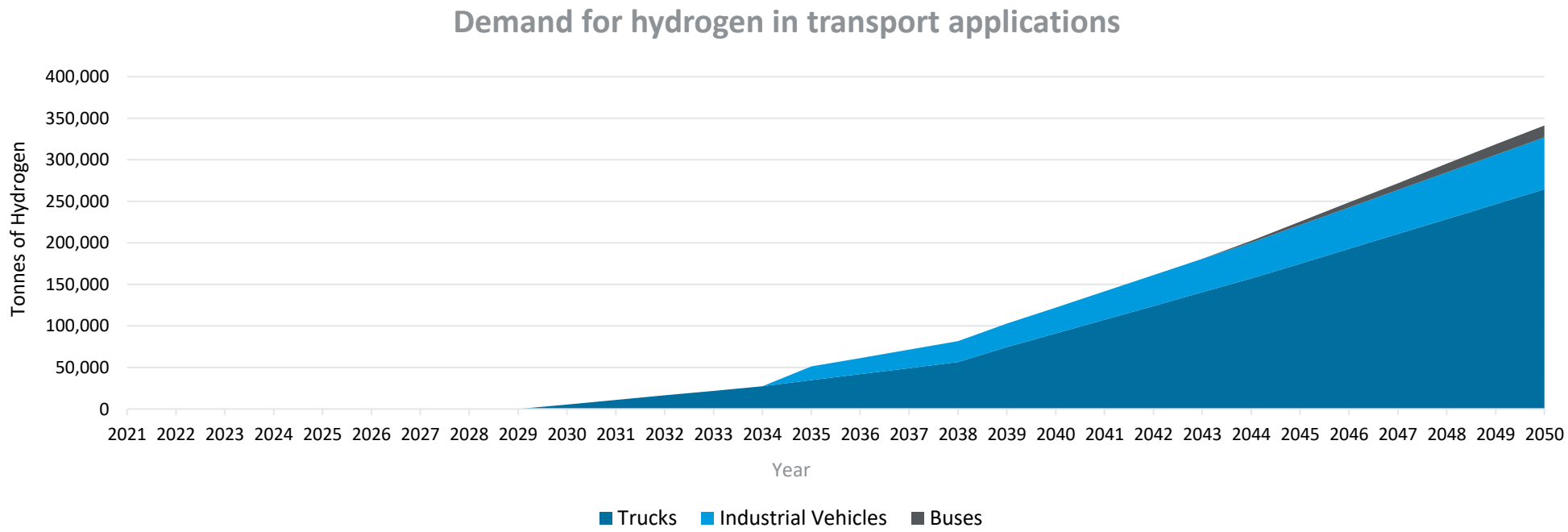


3.1 Is there real uncertainty about which technology will win?

HFC-EV technology will likely be used only for heavy vehicles

Hydrogen use is more likely in heavy-duty vehicles like trucks, some buses and in specialty industrial vehicles; HFC-EVs have a high gravimetric energy density, fast refueling time, and a long driving range compared with alternatives

The below figure shows Castalia's MBIE model uptake rate for different hydrogen transport applications. The modelling reflects typical commercial use—that is, relatively high utilization of the capital plant (vehicle)



3.2 Could a standards war exist?

A standards war may exist between B-EV manufacturers

The outlet of the charging station must match the inlet of the car

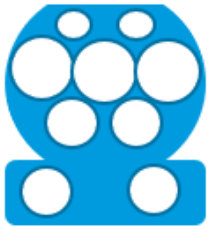
All rapid charging units have tethered cables and there are multiple connector types:

- European EV models (Audi, BMW, Renault, Mercedes, VW and Volvo) tend to have the CCS rapid standard
- Asian manufacturers (Nissan and Mitsubishi) prefer a CHAdeMO
- Tesla models are designed for use with Supercharger units, but a Tesla supplied accessory can be used to charge from a CHAdeMO or CCS Type 2 connector

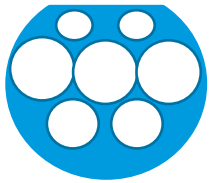
Alternative charging units

CHAdeMO

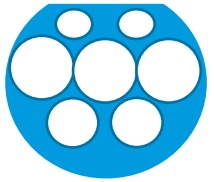
CCS



Type 2 AC



Tesla type 2 DC

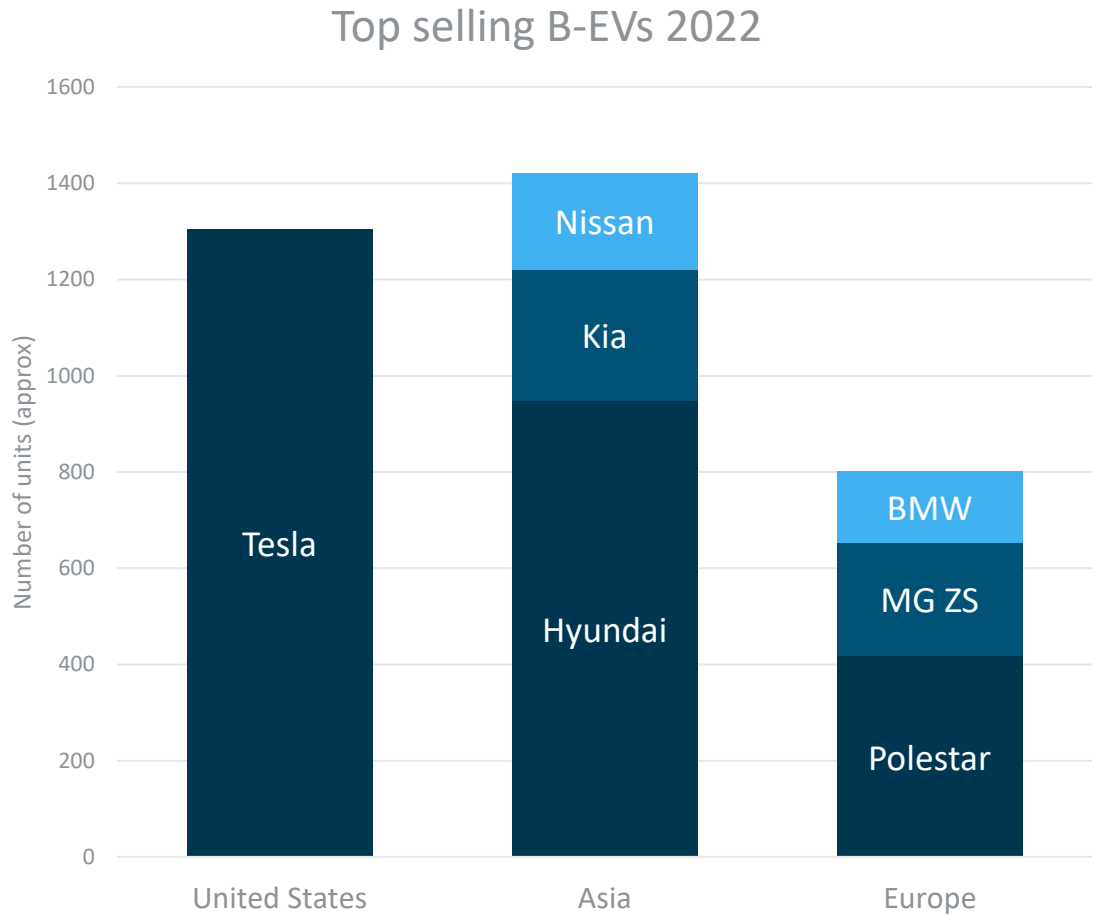


3.3 International standards will prevail

New Zealand will likely follow standards set by Asian and US leading car manufacturers

New Zealand import all vehicles

New Zealand is a very small share of the global market



Data from: Motor Industry Association

3.4 Charging stations can accommodate multiple standards

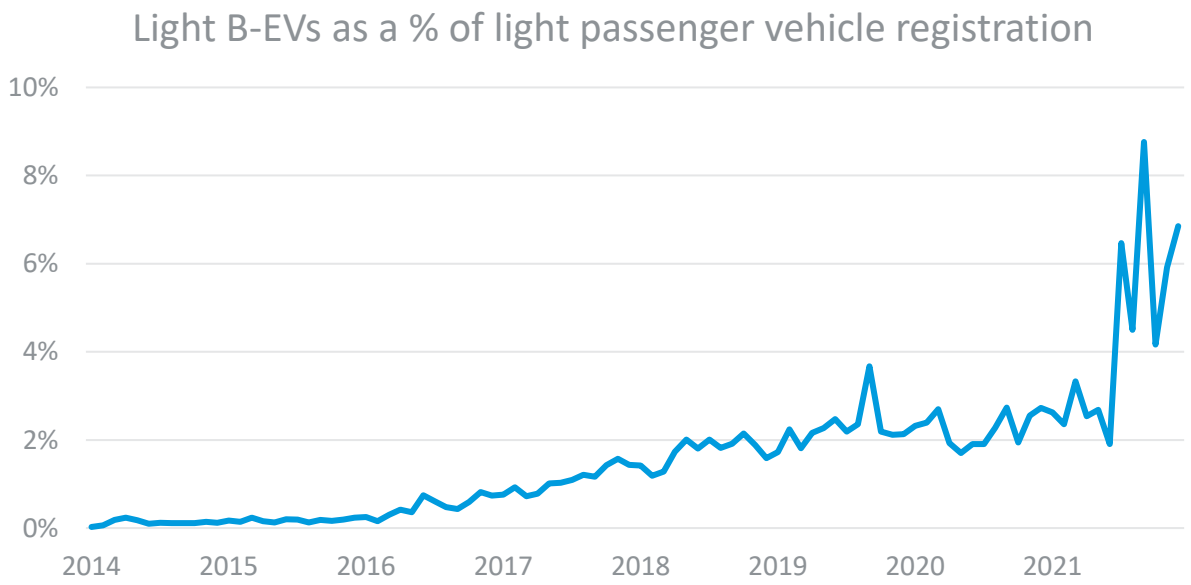
History shows us that it is common for multiple standards to coexist

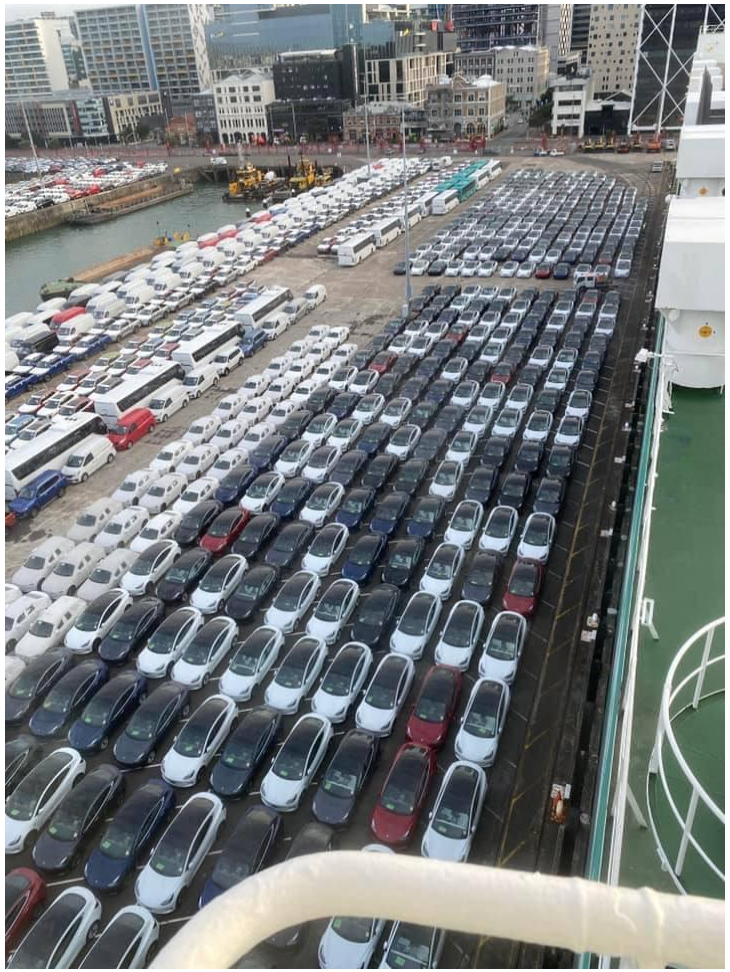
- Apple and Android
- Diesel and petrol
- Microsoft and IOS
- Facebook and twitter

Re-fuelling stations can accommodate multiple standards

Car manufacturers may adopt standards for cars sold in a region

3.5 Are potential BEV buyers waiting for charging infrastructure provision?





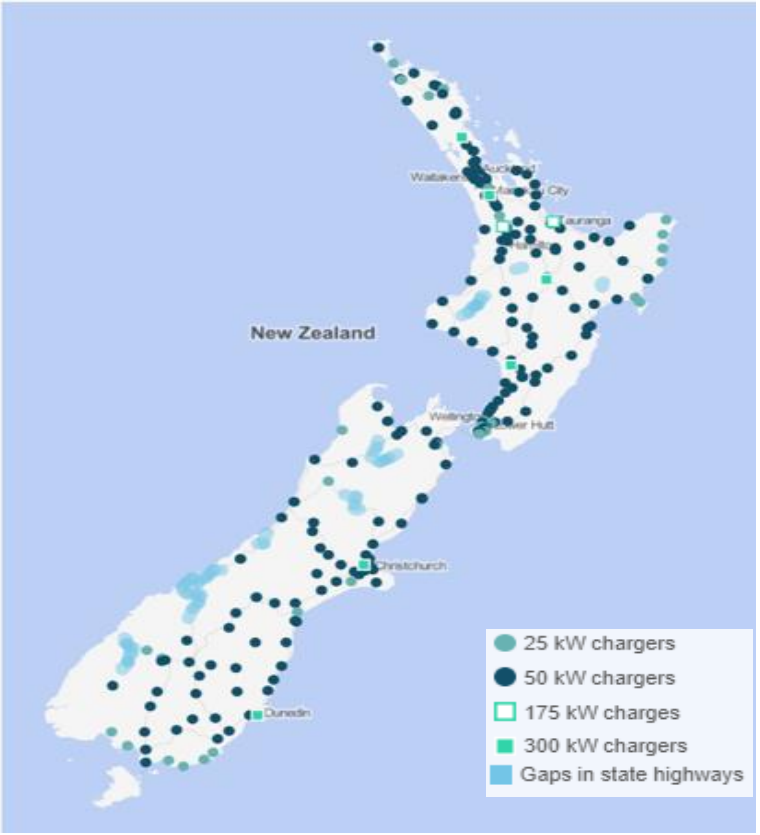
3.6 Is there under-provision of charging stations? No

Overnight home charging is available

Public and private investment in fast and ultra fast chargers is significant

- New Zealand has 867 public B-EV chargers installed and 446 in progress
- 316 re-fuelling stations are fast or ultra fast chargers available in 278 locations
- The Low Emission Transport Fund (LETF) has committed co-funding to over 1,200 private and public electric vehicle (EV) chargers in New Zealand
- Mercury and Hikotron target 500 smart chargers by 2026
- ChargeNet plans 400 new rapid and hyper rapid charging points
- Future hyper-rapid sites include Auckland, Bulls, Christchurch, Dunedin, Kaiwaka, Rotorua, Tauranga, Queenstown, Waikato, and Wellington

New Zealand fast charging infrastructure

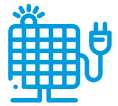


Source: Energy Efficiency & Conservation Authority https://www.eeca.govt.nz/insights/data-tools/new-zealand-public-ev-charger-map/

3.8 Is there a monopoly in charging infrastructure? No

Supply of charging infrastructure will respond to demand (already happening)

Low cost of entry and exit



Numerous grid connection points

3.7 Location-specific market failures may exist

Range anxiety: charging stations may not be commercially feasible on low trafficked long-distance routes

Apartment building carparks: it is cheaper to install chargers for all carparks at one time, rather than individually, but some apartment owners may not agree to co-fund the installation, or may hold-out letting others co-fund

Commercial property where there is low competition for tenants: commercial property owners do not face strong incentives to provide charging infrastructure for tenants

Street parking (that is, council-owned land): technology in development and there is low private incentive for provision

4
Possible interventions

4.0 Government failure?

Government intervention does not mean problem solved

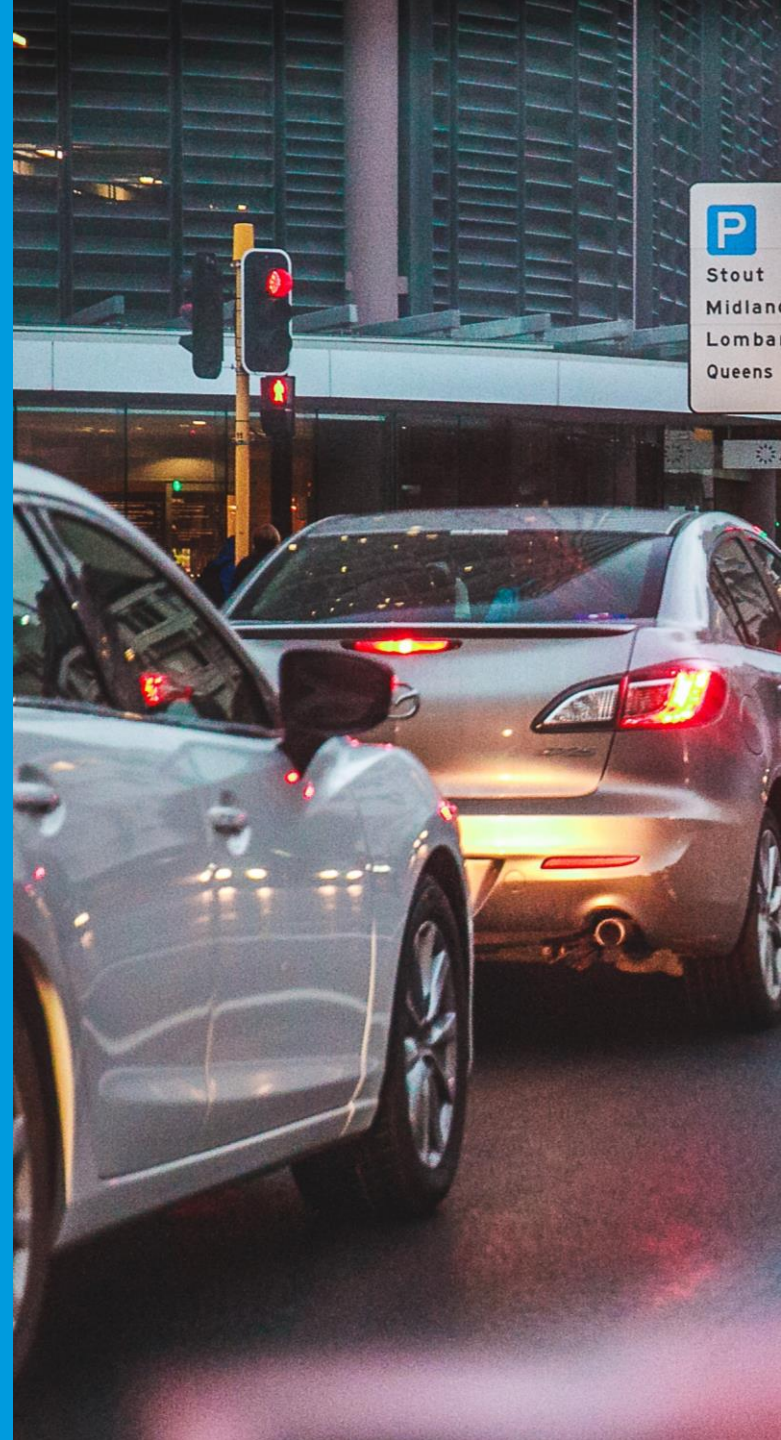
Government intervention could actually make the situation worse

Well designed policies that appropriately address the market failures that do exist

4.1 Residual issues – targeted policies appropriate for the scale of market failures

Residual issues	Possible interventions
Apartment buildings	Introduce provisions in Unit Titles Act for decision-making by unit-owners around the majority needed to approve expenditure on charging installation (for example, if 50 percent of unit-holders vote in favour, then the Body Corporate can raise a special levy to fund the works)
Range anxiety	Targeted public funding – LETF (EECA) round four focused on filling gaps in the public charging network - 10 new co-funded chargers will mean there will be public EV chargers every 75km on 99% of New Zealand's highways
Council-owned on-street parking	Public provision of the charging infrastructure, or a competitive procurement of a concession contract to a private party to build and operate charging infrastructure (once technology exists for easier on-street charging)
Where commercial property competition is low	Targeted public funding, for example through LETF (EECA)

Questions/discussion



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