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Electric vehicles: future cost and uptake

Bronwyn Lauten

Ministry of Transport TE MANATŪ WAKA
NZ TRANSPORT AGENCY WAKA KOTAHI
MARITIME NEW ZEALAND
CAA CIVIL AVIATION AUTHORITY OF NEW ZEALAND

Future price and supply of new EVs

We commissioned Emission Impossible to

- synthesise existing research on projections for new electric vehicle production, supply and price for the period 2015-2030
- This included quantifying:
  - expected level of electric vehicle production in New Zealand's key supply markets
  - potential supply of new electric vehicles into New Zealand
  - expected change in the price of new electric vehicles available to the New Zealand market.

Electric vehicle production and supply

Mainstream estimates of new electric vehicle production (as a percentage of total production) for light duty vehicles

Technology	Market share in 2020			Market share in 2030		
	Low	Medium	High	Low	Medium	High
Plug-in hybrid and battery electric combined	2%	4%	10%	20%	30%	50%

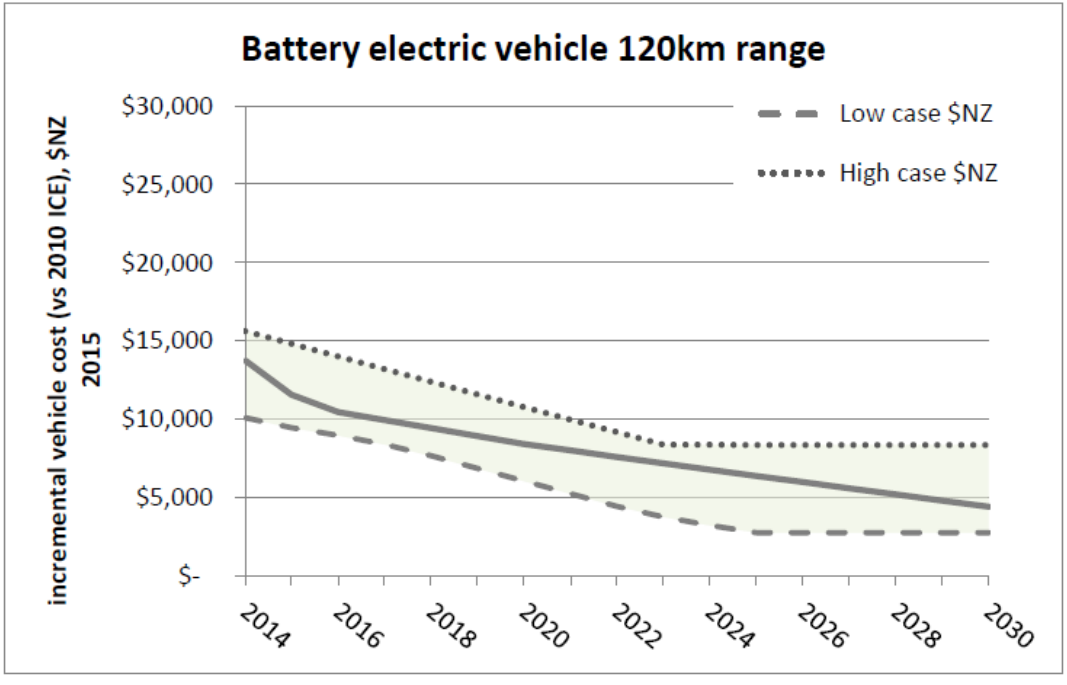
- Not unexpectedly, the report concludes that the future market share of electric vehicles is highly uncertain.
- By 2020, electric vehicles could make up 2-10% of production, and 20-50% by 2030.

Electric vehicle costs

- The results suggest that a typical electric vehicle costs around $11,500 more to manufacture in 2015 than an equivalent internal combustion engine vehicle. This difference is expected to drop to around $4,500 by 2030.

- It is not possible to project price with any confidence because reductions in manufacturing costs may not necessarily translate directly into vehicle price.

Figure 18: High, medium and low projections of the incremental[42] manufacturing cost for a battery electric vehicle with a 120km range



[42] Incremental cost of a battery electric vehicle compared with an internal combustion engine vehicle constructed in accordance with 2010 fuel efficiency requirements.

Electric vehicle costs

Table 10: Summary of cost projections showing the incremental cost of an electric vehicle compared with an internal combustion engine vehicle constructed in accordance with 2010 fuel efficiency requirements

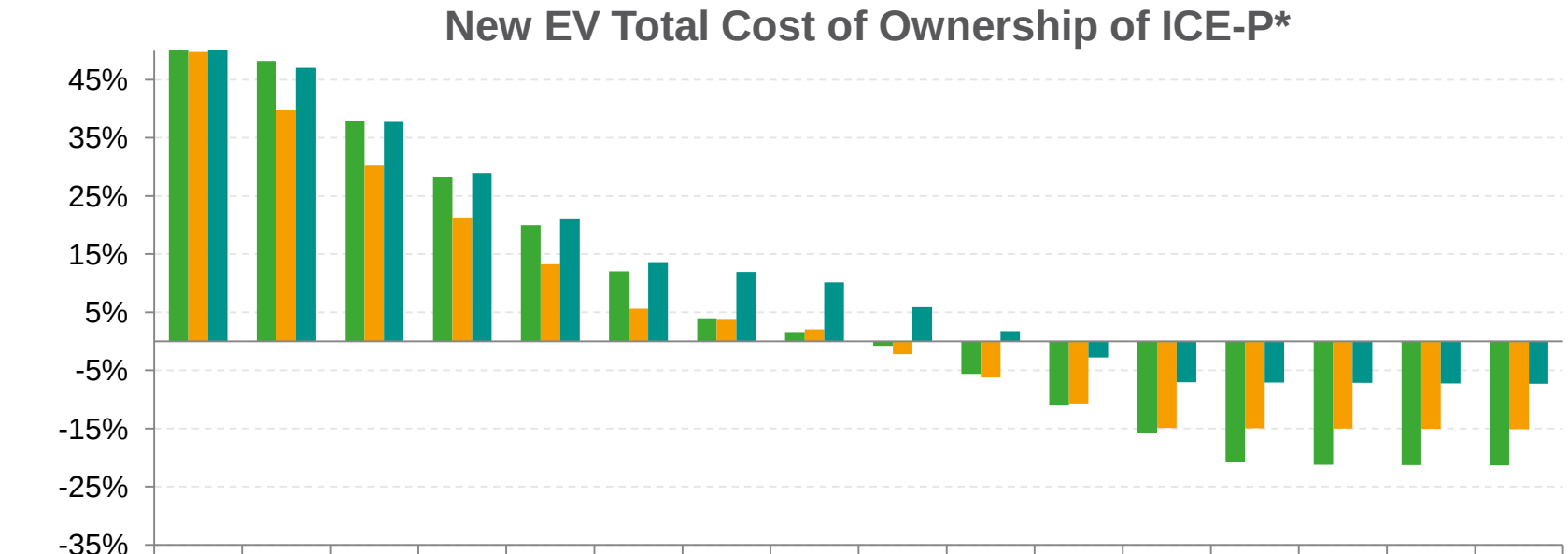
		2015	2020	2025	2030
		NZ$ 2015			
BEV - 120km range	low	9,461	6,060	2,782	2,782
	medium	11,569	8,425	6,393	4,422
	high	14,821	10,790	8,363	8,363
BEV - 160km range	low	11,186	7,139	3,232	3,232
	medium	13,707	9,966	7,548	5,192
	high	17,595	12,793	9,904	9,904
BEV 240km range	low	14,631	9,292	4,130	4,130
	medium	17,975	13,042	9,855	6,730
	high	23,131	16,792	12,980	12,980
PHEV 50km range	low	10,707	7,922	5,292	5,292
	medium	12,175	9,568	7,805	6,433
	high	14,438	11,214	9,176	9,176

Developing a model for future uptake of EVs

We commissioned Infometrics and Covec to construct a model of demand that covers petrol powered internal combustion engine vehicles (ICEV) and electric vehicles (EVs), including plug-in hybrids.

- The literature review confirmed the reasonableness of the following assumptions:
  - *there will be some initial level of demand for EVs that is relatively price inelastic. These early adopters represent a very small percentage of all car owners.*
  - *in the long-run, total operating costs (TOC) of EVs relative to ICEVs will determine levels of uptake, but that TOC includes factors such as range (and thus the frequency of recharging), the convenience of recharging plus a number of other factors that currently operate as barriers, that include perceived risks of EVs reflecting the newness of the technology.*

Driver of uptake



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
BEV	59.3%	48.3%	37.9%	28.4%	20.0%	12.0%	4.0%	1.6%	-0.8%	-5.6%	-11.1	-15.8	-20.8	-21.2	-21.3	-21.3
PHEV-P	49.8%	39.7%	30.2%	21.3%	13.3%	5.6%	3.9%	2.1%	-2.2%	-6.2%	-10.7	-14.9	-14.9	-15.0	-15.1	-15.1
PHEV-D	56.9%	47.1%	37.7%	29.0%	21.1%	13.6%	11.9%	10.1%	5.9%	1.8%	-2.8%	-7.0%	-7.1%	-7.2%	-7.2%	-7.3%

- Assuming purchase BEV/ICE-P price parity in 2024 and a 4-year ownership period, the model suggests that electric vehicles reach TCO parity with ICE-P vehicles in 2022/23.

BEV = battery electric vehicle; PHEV-P = petrol plug-in hybrid electric vehicle; PHEV-D = diesel plug-in hybrid electric vehicle

Not Ministry of Transport or Government policy. Indicative scenario only – assumes BEV price parity with ICE-P in 2024, a replacement age for new vehicles of 4 years, and expiry of the RUC exemption in 2020.

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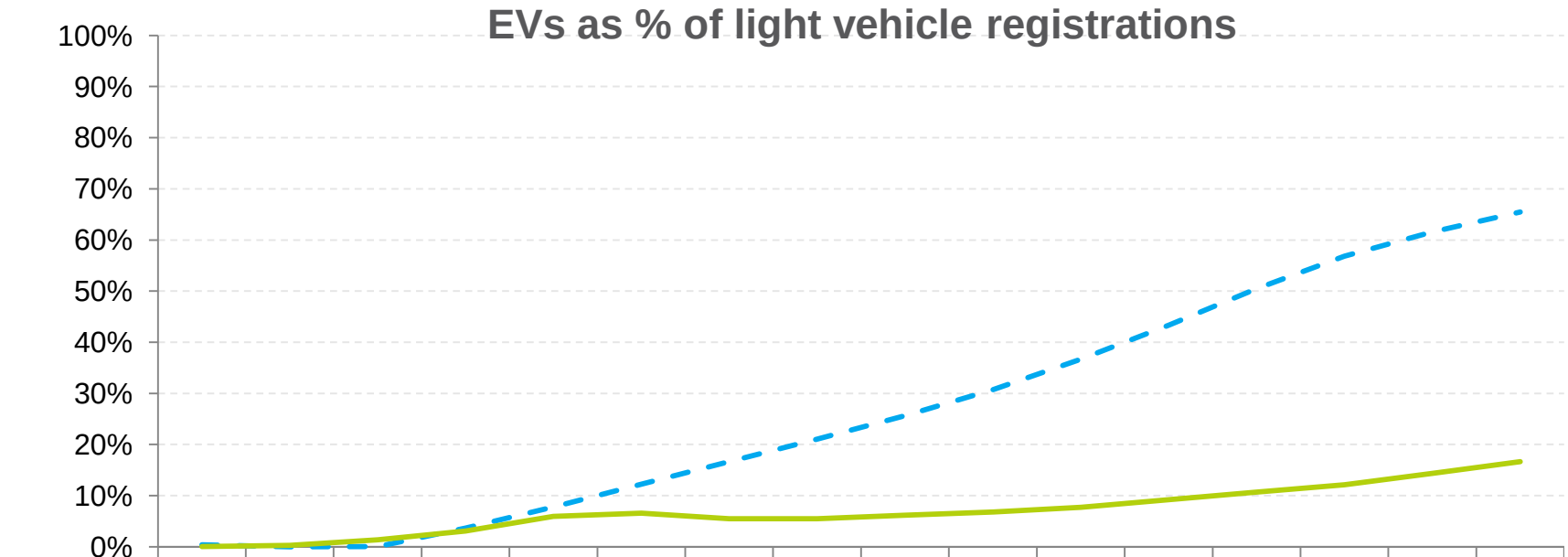
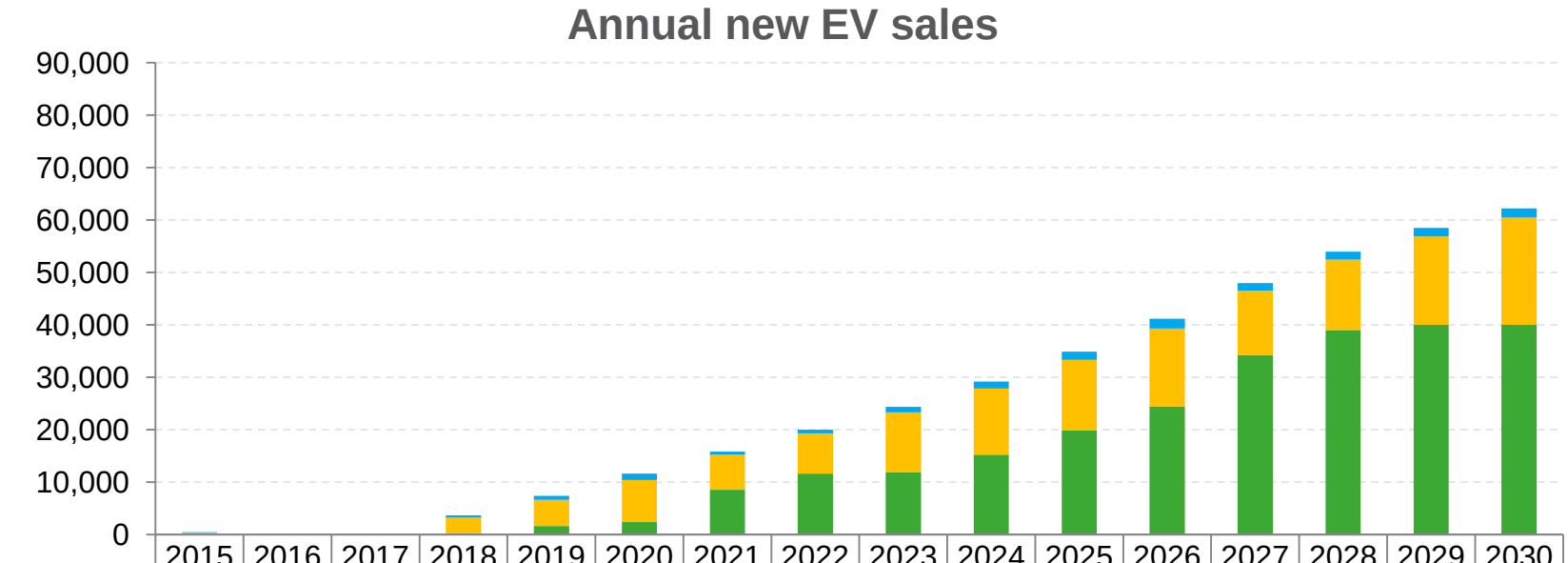
Potential future electric vehicle uptake



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
New	0.4%	0.0%	0.0%	3.7%	7.7%	12.2%	16.6%	21.0%	25.6%	30.7%	36.7%	43.3%	50.5%	56.8%	61.6%	65.5%
Used	0.1%	0.2%	1.3%	3.1%	5.9%	6.6%	5.5%	5.5%	6.1%	6.8%	7.7%	9.2%	10.7%	12.1%	14.4%	16.6%

- The same scenario suggests that new electric vehicles could account for 12.2% of light registrations by 2020, and 36.7% by 2025.

Potential future electric vehicle uptake

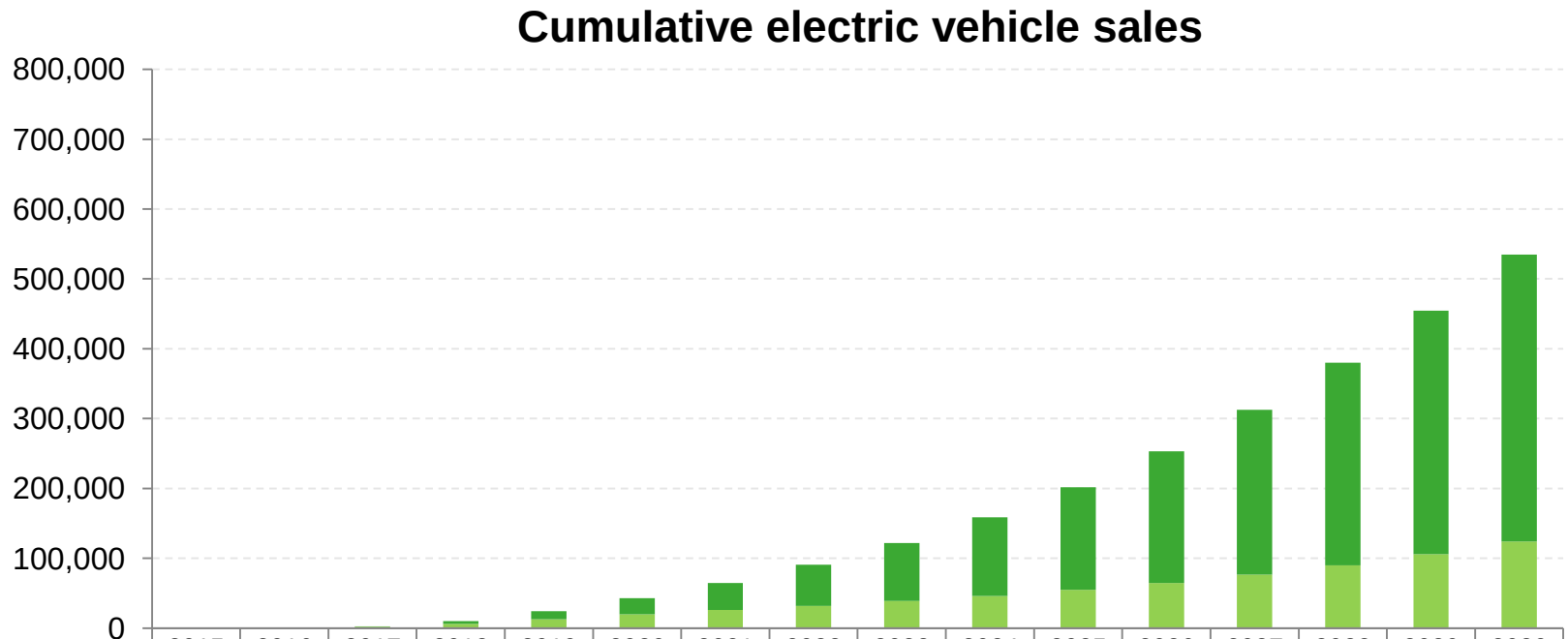


	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
PHEV-D	61	0	0	437	758	1232	570	710	1067	1321	1546	1825	1431	1540	1671	1782
PHEV-P	285	0	9	3021	5000	8000	6712	7686	11390	12615	13428	14891	12290	13405	16819	20435
BEV	99	0	0	204	1596	2364	8498	11573	11876	15227	19863	24412	34211	39014	40000	40000

- PHEV-P dominate new sales early on, but as the cost of batteries comes down, BEVs become more competitive.

BEV = battery electric vehicle; PHEV-P = petrol plug-in hybrid electric vehicle; PHEV-D = diesel plug-in hybrid electric vehicle

Potential future electric vehicle uptake



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
New EV sales	444	444	453	4116	11470	23067	38846	58815	83148	112310	147146	188274	236206	290166	348656	410874
Used EV imports	83	408	2158	5833	12633	19883	25883	31883	38633	46133	54633	64758	76508	89820	105633	123945

- The model suggests that used electric vehicles will make up the majority of NZ's electric fleet until 2020, when new electric vehicle sales begin to pick up pace.

Thank you