

Transformation of the Automobile Industry

Horse vs. Automobile

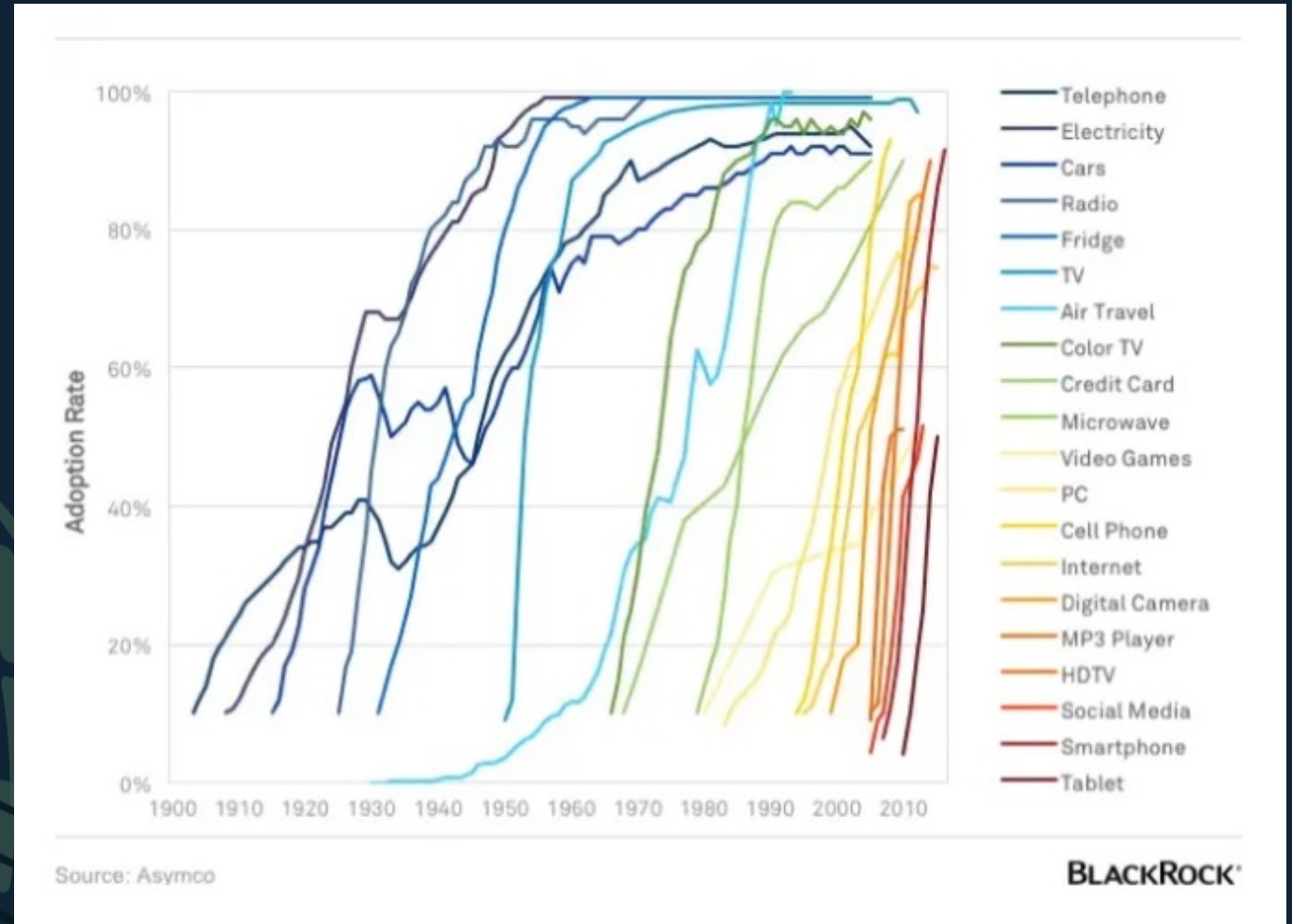
BEFORE you discard your horse and buy an auto it is well to think of the cost.
Figure how much you spend for harness and then think of what new tires amount to.
Figure up what it takes to feed Dobbin in a year and then think of gasoline, repairs and storage charges.
Dobbin is worth what you paid for him two years ago, where's the man with an auto that can say the same?
Come in and get a new harness instead of a new car and remember that Dobbin will take you through snow and mud as well as on good roads and that his carburetor is never out of order.

Ed. Klein
732 Massachusetts Street



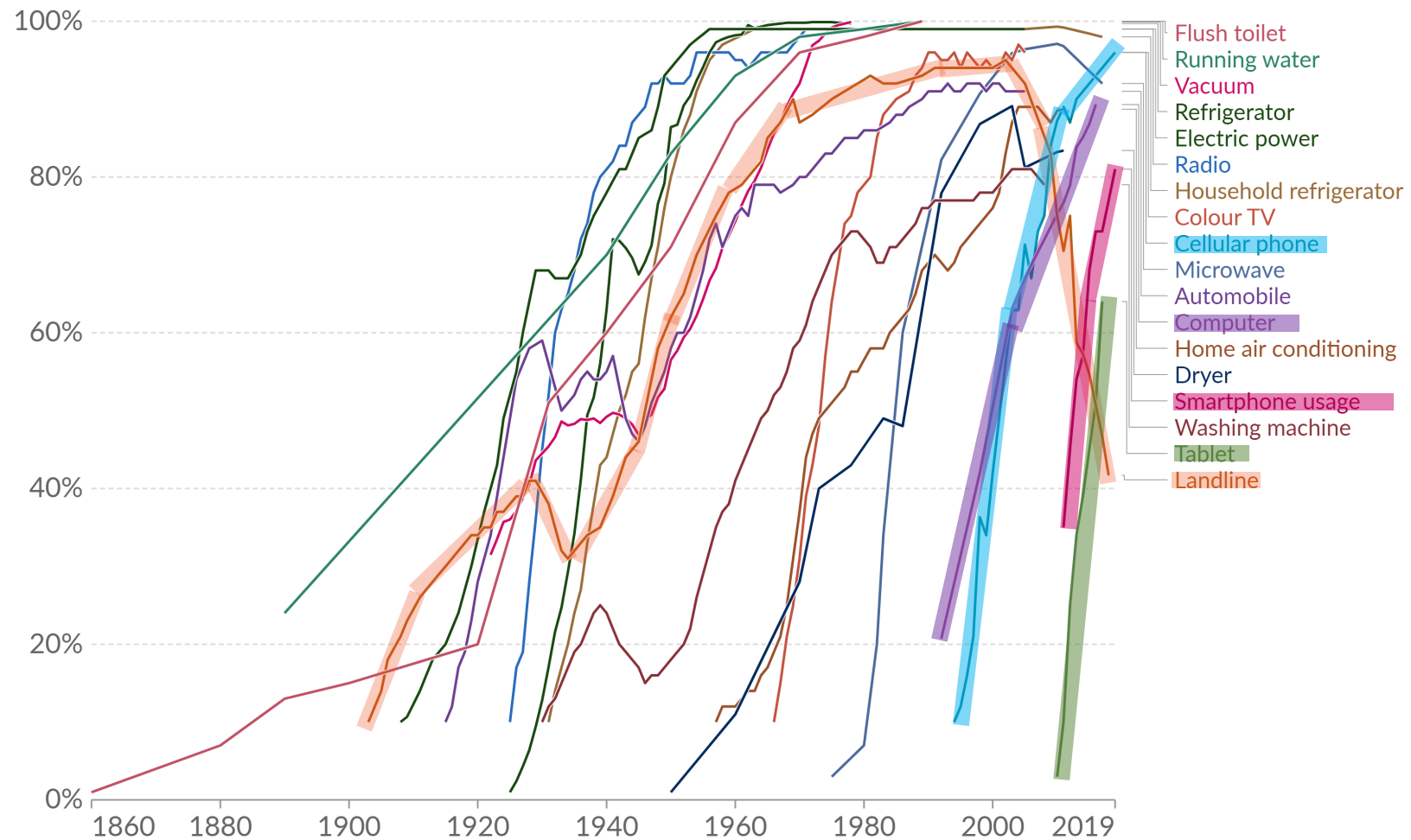
Adoption S-Curve

- Adoption occurs slowly at first, and then rapidly
- Tipping point 2-5%



Share of United States households using specific technologies

Our World
in Data



Source: Horace Dediu; Comin and Hobijn (2004); other sources collated by Our World in Data [OurWorldInData.org/technological-change](https://ourworldindata.org/technological-change) • CC BY

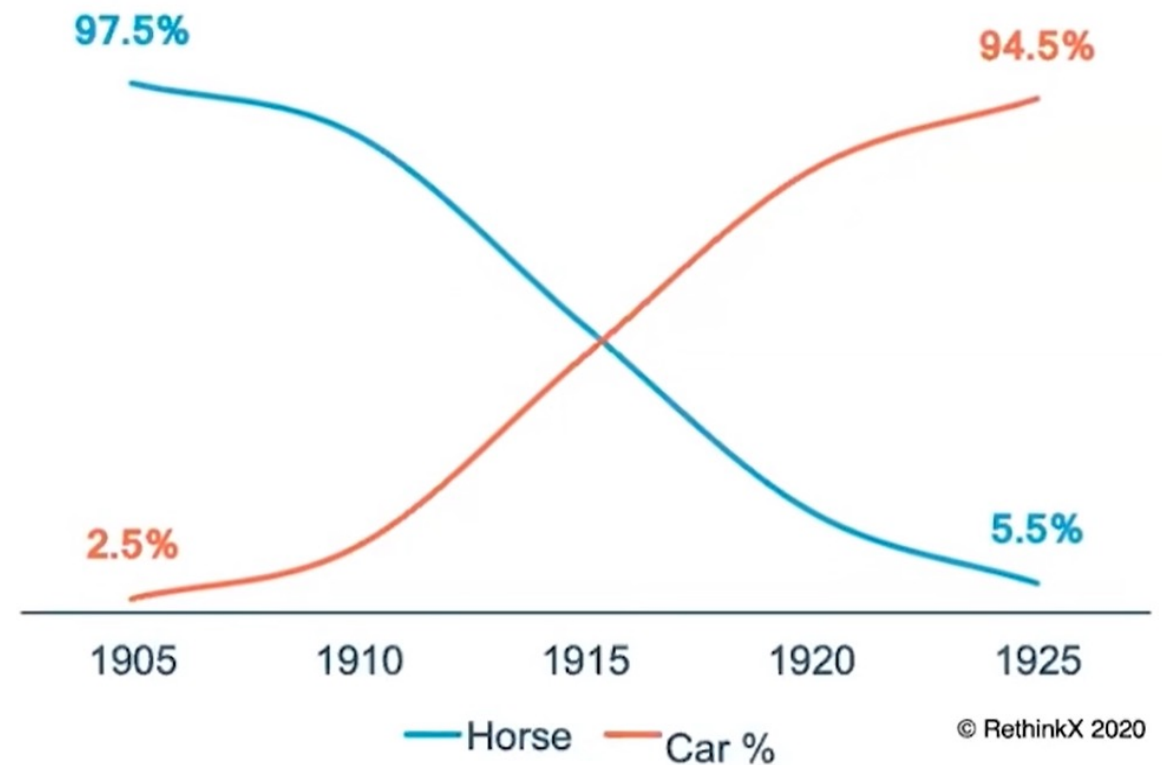
Source: <https://ourworldindata.org/technological-change>

- Adoption occurs slowly at first, and then rapidly
- Tipping point 2-5%
- Cars displaced horses in 10 years (11% of passenger miles to 81%)

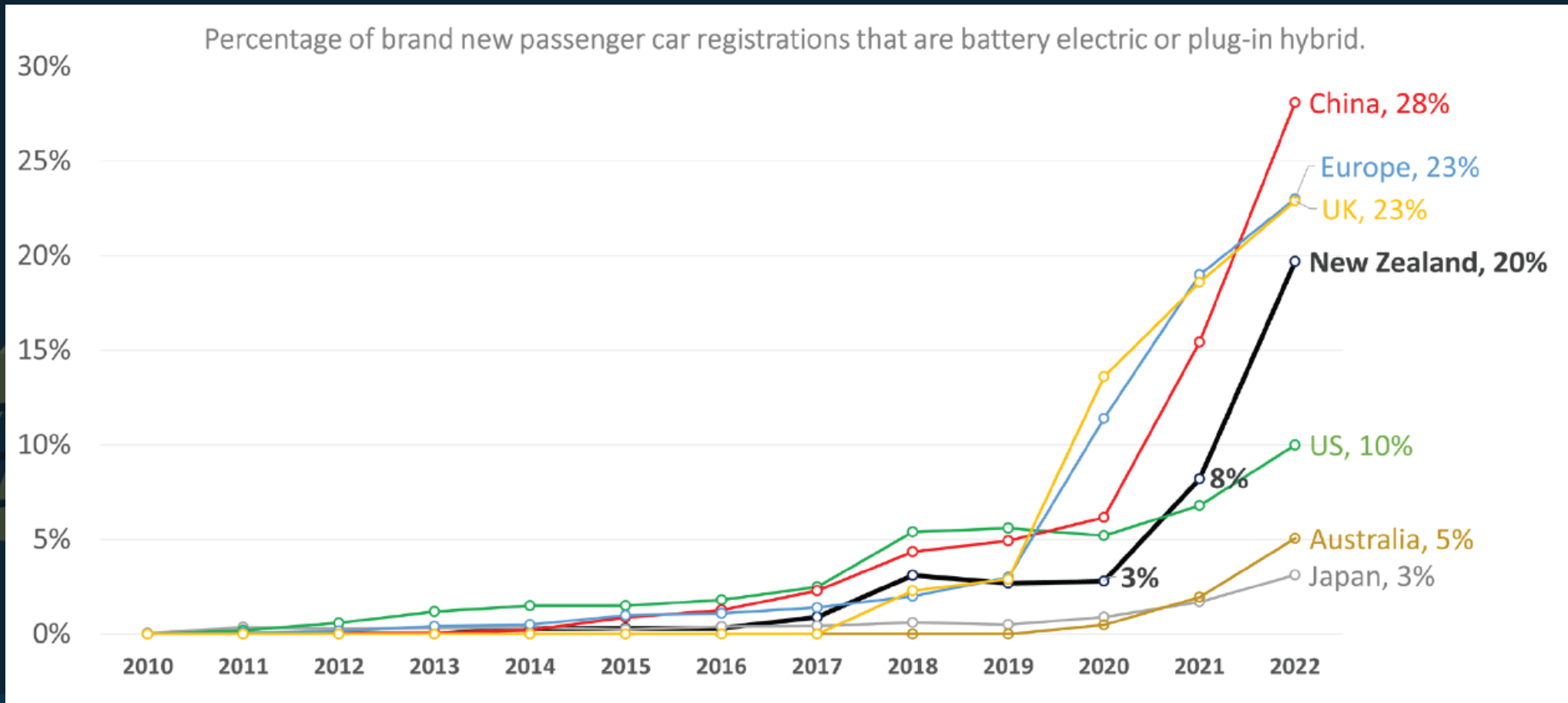
Year	Registered Cars (USA)	Registered Trucks (USA)	Increase
1907	140,300	~5,000,000	33x
1917	2,900	~400,000	134x

<https://www.scientificamerican.com/article/the-motor-vehicle-1917-slide-show/>

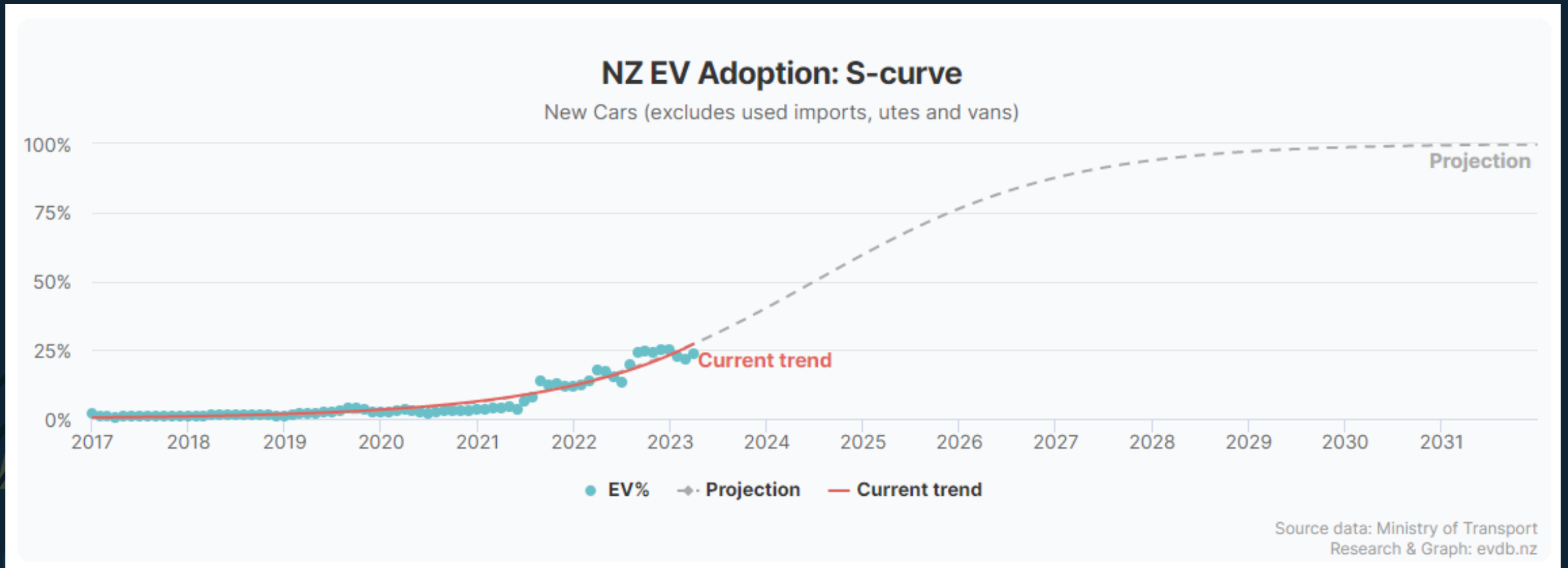
Market Share, Car vs Horse



EV Market Share by Market



New Zealand New Vehicle Market Projection

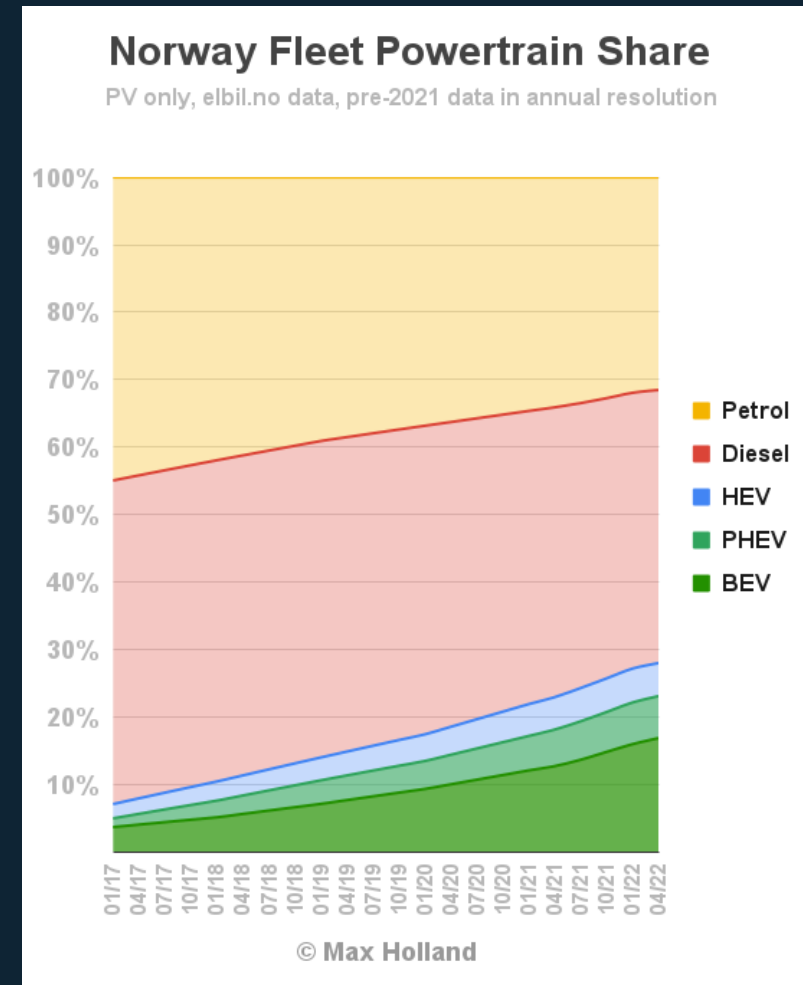
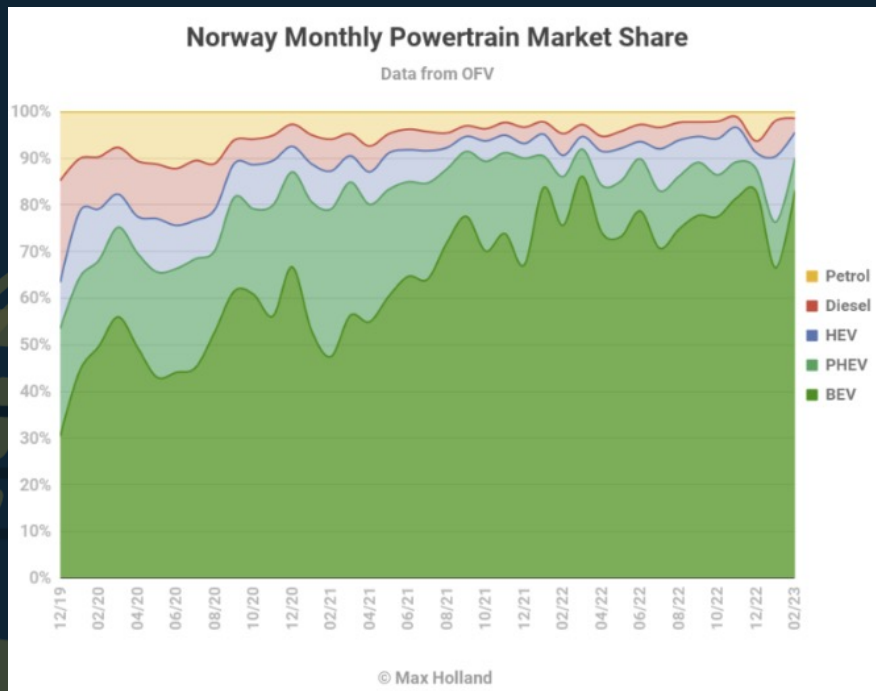


Source: <https://evdb.nz/ev-new-cars>

15-20 July - 2023

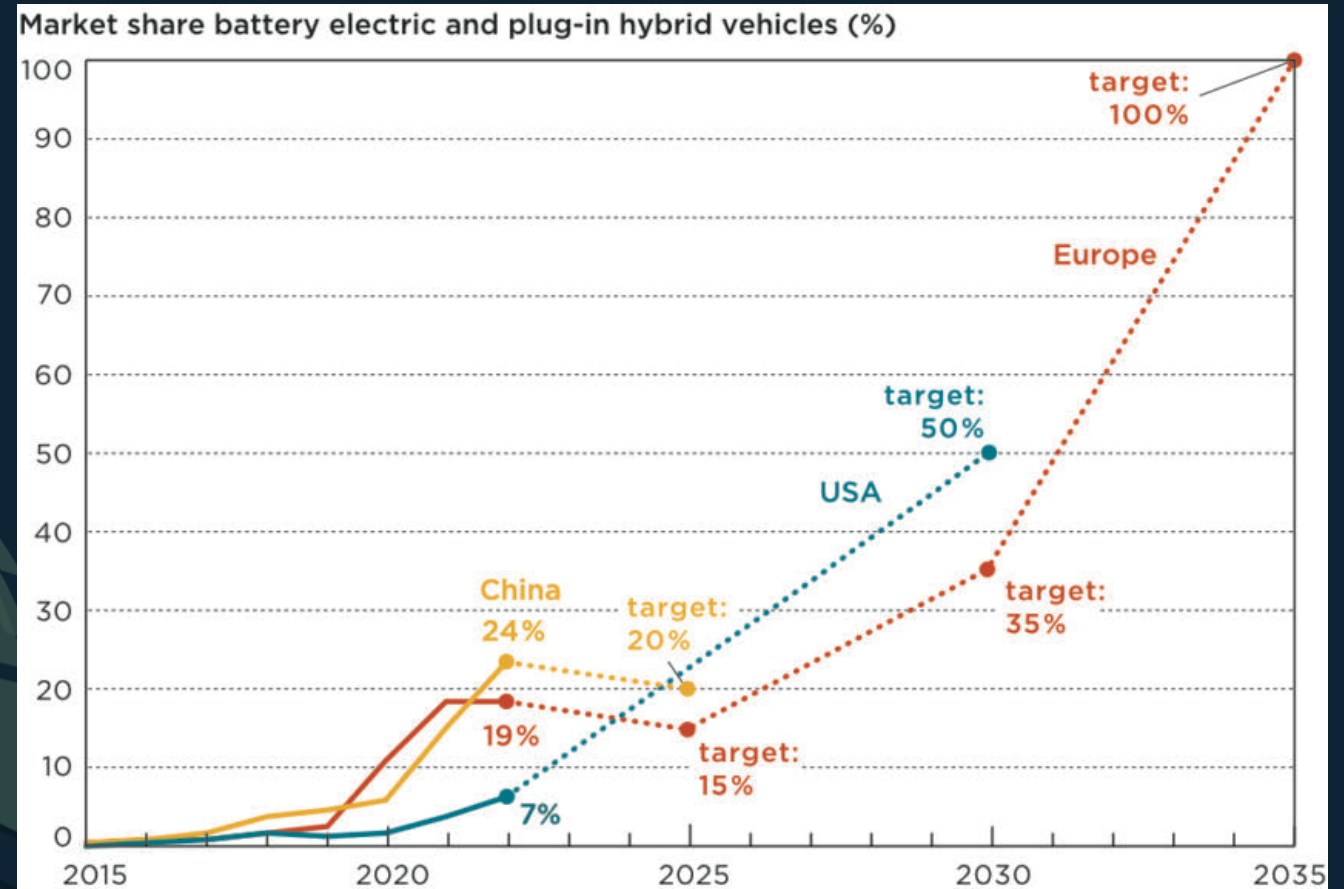
www.incose.org/symp2023 #INCOSEIS

Norway New Vehicle Market



EV Market Share v Targets

- Market share exceeds targets
- Adoption occurring more rapidly than predicted (by policy makers)
- Europe 2019 (3%) → 2021 (19%)
- 2022: Norway (65%), The Netherlands (20%), Sweden (19%), Germany (14%)



EVs are more than just a car

The System of Interest (SOI) is much bigger than the car, and includes:

- **Energy source** – ideally renewables (esp. home solar systems)
- **Energy storage** – grid, home, EV (e.g. Tesla PowerWall)
- **Energy distribution** – charging networks
- **Roadside assistance / servicing**
- **Communication Networks / apps**

