

Alternative propulsion vehicles - EVs

Grant Thornton

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Agenda

- What is AFV and EV
- EVs are already happening, but what are the drivers for growth
- EV production and impact on the market
- Changing ways we produce EVs
- Changing ways we sell EVs
- The end of life issues for EVs
- Batteries power and EVs what next?

What is alternative propulsion?

We have classified alternative propulsion as any vehicle which come in the following category (according to the SMMT)

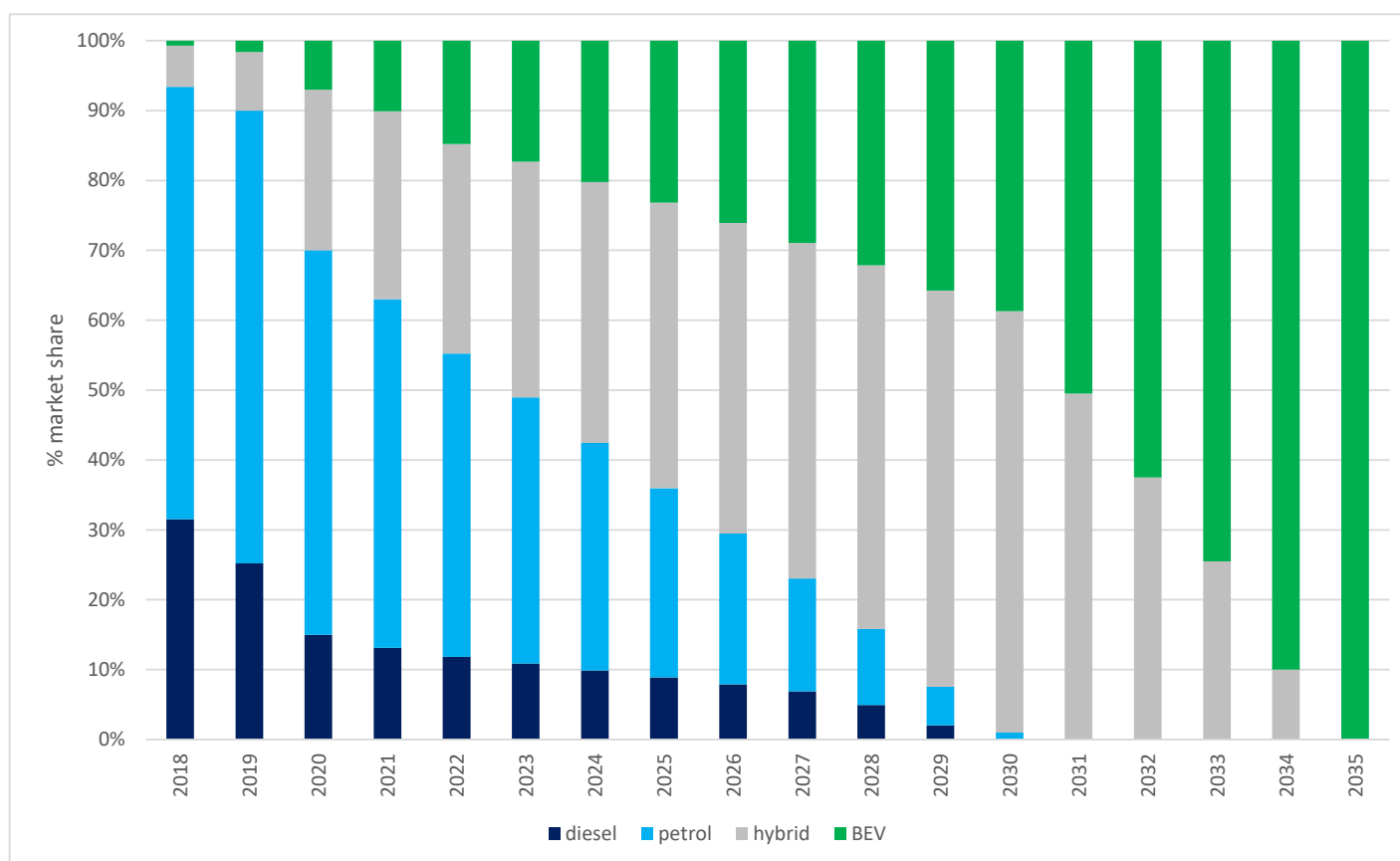
Mild Hybrid Electric vehicle Petrol	Mild Hybrid Electric vehicle Diesel	Plugin Hybrid Electric vehicle	Hybrid Electric vehicle	Battery Electric vehicle	Hydrogen vehicle
					
Ford Puma HEV Petrol	Ford Puma HEV Diesel	Mitsubishi Outlander PHEV	Toyota Prius	Tesla 3	Riversimple Rasa
Total market share 2020 (full year)					
7.3%	3.7%	4.1%	6.8%	6.6%	N/A

AFV total market share Full Year 2020 – 28.5%

AFV total market share Full Year 2015 – 2.8%

The take up of alternative propulsion vehicles is already happening

UK new vehicle registrations market share by fuel type 2018 to 2035
by 2035 new units registered c 2.3m



Emissions regulation and legislation is driving the alternative propulsion market

Europe

- WLTP 2018: 120.4g CO₂/km
- RDE 2019
- CAFE2020
- EU target 2030: 59g CO₂/km

China

- VI emissions standards 2020: 119g CO₂/km
- 2030 to European levels

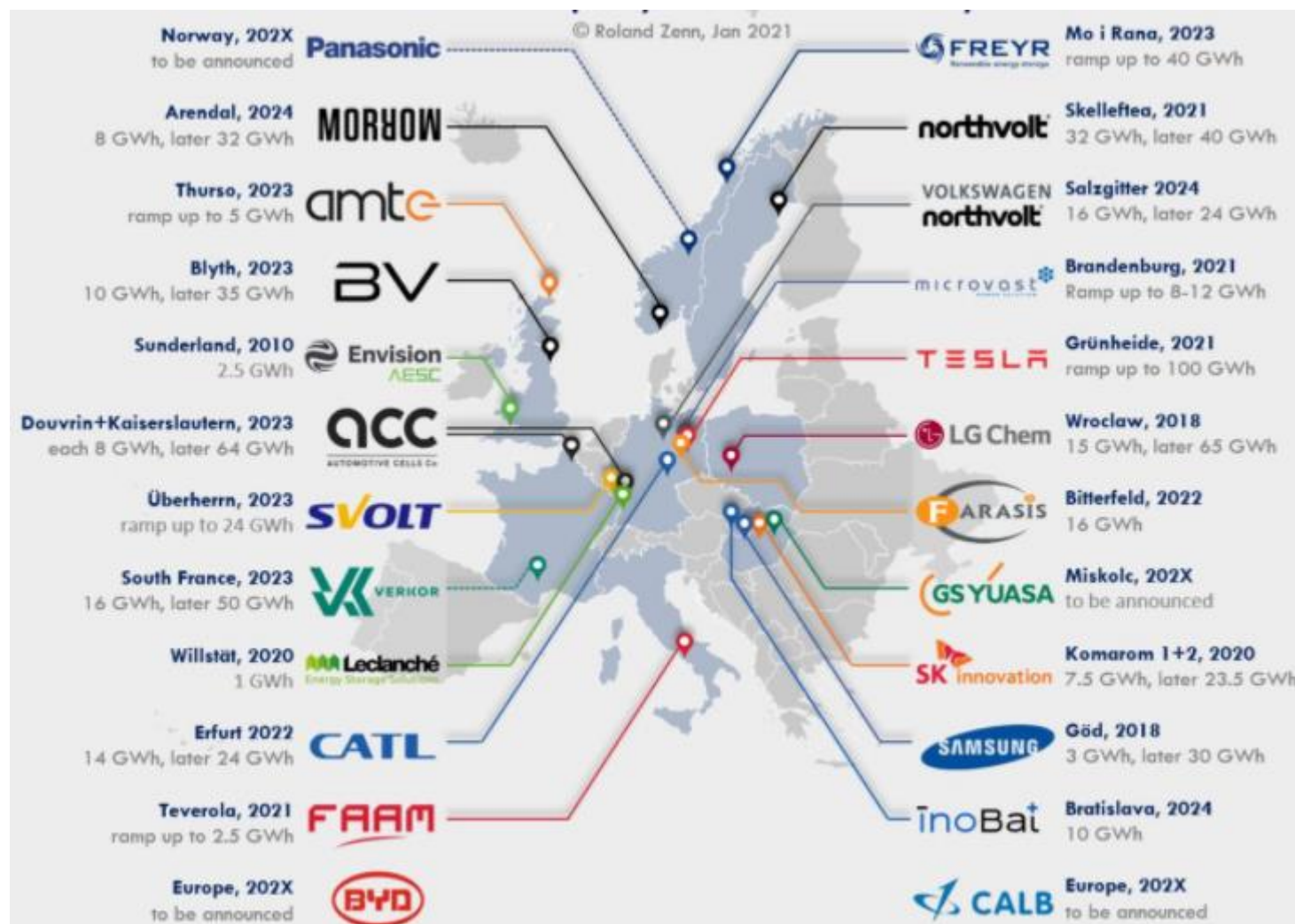
UK Government

- 2030 ban the sale of pure diesel and petrol vehicles
- 2035 zero tail pipe emissions

Source: Grant Thornton

Where is the geographic centre of gravity for Europe?

600GWh Annual Production Capacity for Lithium Ion Battery Cells Announced



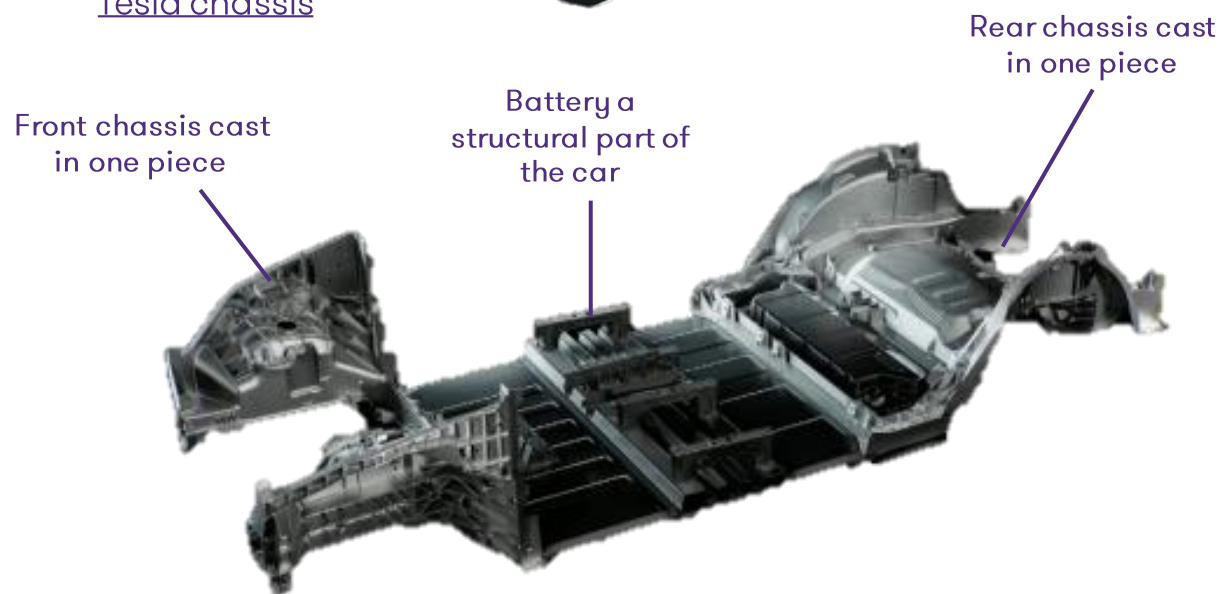
Source: Roland Zenn

The way vehicles are built is changing with new technology

Tesla battery



Tesla chassis



A change in processes and construction of the vehicle:

- Light weight materials
- Castings and stamping
- Move from internal ICE to EV

70% of an ICE vehicle remains whether electric or ICE

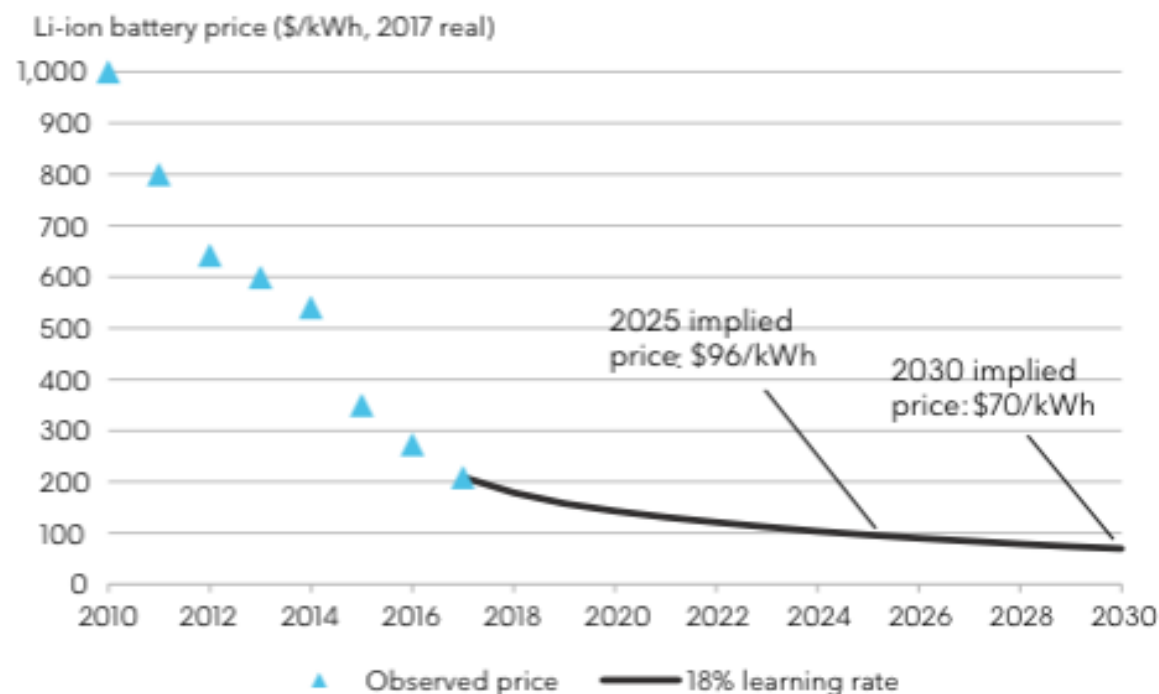
50% of the value of the ICE remains whether electric or ICE

Source: Tesla

10% mass reduction | 14% range increase opportunity | 370 fewer parts

The way we sell and service EVs is changing

Lithium-ion battery prices, historical and forecast



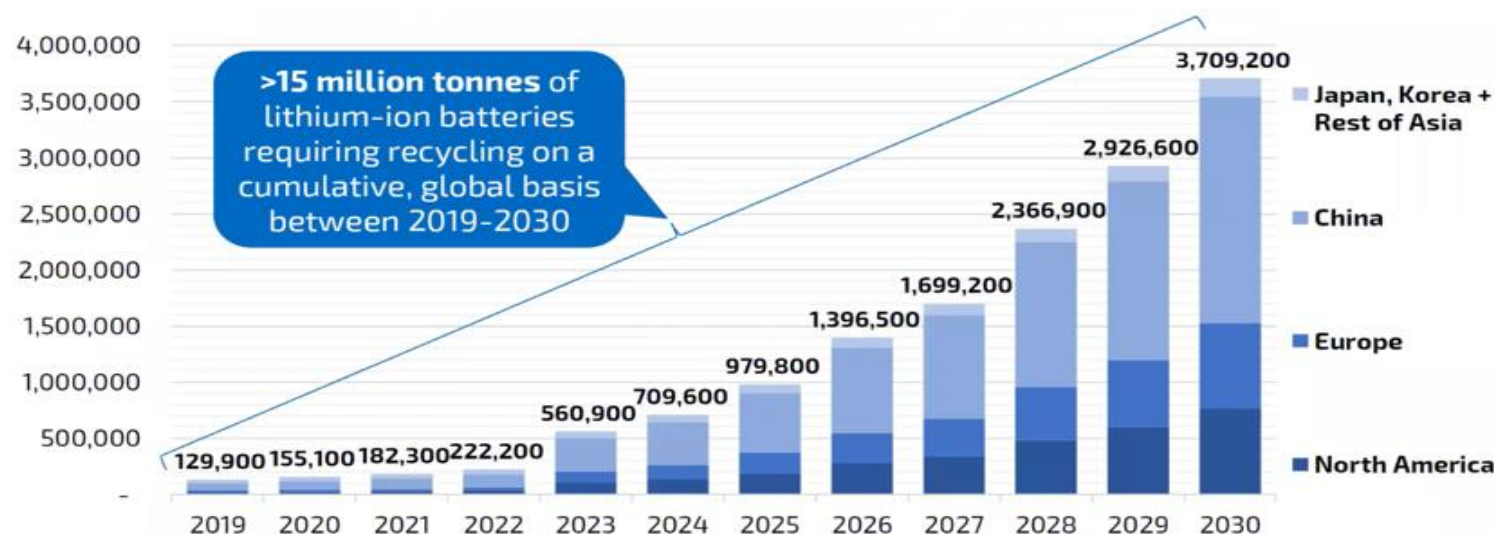
Source: Bloomberg

Expectations

- Total life cost both price and Co2 emissions
- Cost of battery ↓ Prices of EVs ↓
- Agency model – VW ID direct selling ↑
- Leasing periods - 2 to 3 periods ↑
- Warranty periods 8 years? ↑
- Cost of aftermarket services - \$19,500 for a 400k miles - Tesloop ↓

The way EV end their life – the future areas of growth – Recycling

Total Lithium-Ion Batteries Available for Recycling by Region (tonnes/year)



Source: li-cycle

Average percentage cost of the battery in a EV (2019) 33%

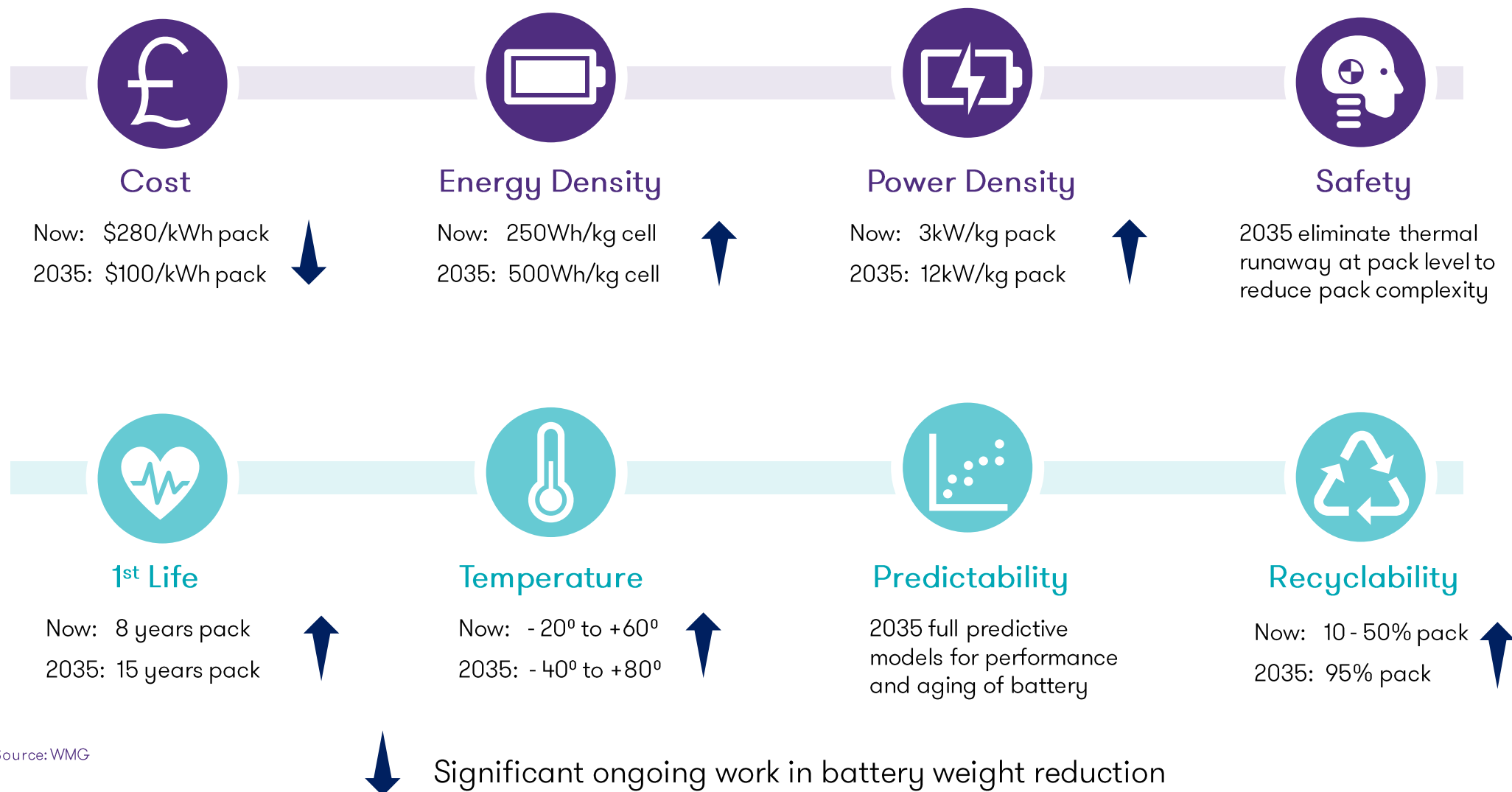


Average percentage cost of the battery in a EV (2025) 20%

60% of the battery cost is raw materials - 40% is manufacturing profit and overheads

Ore Type	Nickel	Lithium	Cobalt
Typical amount of element extracted from ore (%)	1.2%	0.7%	0.2%
Typical amount of element extracted from recycled cells (%)	20%	2.7%	2%

Where do batteries and EVs go next?



Source: WMG

Questions?



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