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The Electric Vehicle Transition:

Long-Term Outcomes and Short-Term Uncertainties

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The long-term scenario presented by the International Energy Agency (IEA) of a largely electrified road transport sector seems increasingly plausible, especially in the light duty vehicle and passenger segments.[1] However, while the destination seems clear, the pathway the sector will take is less so. For automakers navigating the transition, uncertainties exist across the value chain, from the design and manufacturing process of vehicles to the supply of raw materials to consumer demand.

Underpinned by a combination of environmental legislation, state-backed industrial initiatives, and consumer incentives, global sales of electrified vehicles (EV), including both battery electric vehicles (BEV) and plug-in hybrid electric vehicles (PHEV), reached 14.1 million by 2023, accounting for 15.8% of new vehicle sales (of which BEV 11.1%).[2] China remains the largest market for both BEVs and PHEVs, commanding 60% of global share, but growth is slowing on the higher base. In Europe (EU+UK+EFTA), the second largest market, market penetration of all-electric vehicles (BEVs) reached 15.7% in 2023. In the United States, the third major market, BEV sales reached almost 1.2 million last year, an increase of 46%, taking market penetration to 7.6%.[3,4]

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Dynamics within the industry are changing as new entrants such as Tesla and BYD, which together accounted for around 37% of global BEV sales in 2023[5], set the standards with advanced technology and know-how. The EV transition represents a major challenge to all legacy OEMs, which must construct new dedicated platforms and develop digitalised electronic architecture, software strategies and a degree of autonomous driving capability. In contrast to Tesla and BYD, this must be done whilst managing the decline in internal combustion engine (ICE) vehicle sales and production. Given high battery costs, and lack of initial scale, margin dilution from rising EV sales must be managed adroitly.

Rising competition, price sensitive customers and the need for BEV premiums to achieve profit parity all emerge as obstacles. The cadence of ebb and flow between technologies also appears to be more variable than envisaged. Whilst we see BEVs eventually replacing ICE vehicles globally, at current penetration growth rates, BEV adoption may be delayed in Europe and the U.S. until lower cost models become available. Near term, we could see hybrid vehicles operating as the bridge technology for longer than previously anticipated.

Technology and Manufacturing

Delivering BEVs to market involves striking a balance between flexibility and scalability. OEMs have taken different paths to achieve this, generally choosing between building dedicated BEV platforms and adapting existing ICE platforms to produce BEVs. While dedicated platforms often produce better vehicles, utilising space more efficiently, distributing weight across the wheelbase more evenly and in some cases being easier to manufacture with fewer moving parts, doing so also locks in manufacturing capacity dedicated exclusively to producing BEVs, thus reducing flexibility to modulate between vehicle types. Despite the engineering and manufacturing benefits of a dedicated platform for BEVs, a production process based on a hybrid ICE/BEV platform can more easily respond to shifts in market demand and has a lower fixed cost of entry.[6] Additionally, given that PHEVs still require an internal combustion engine, maintaining production capacity for dual-use platforms to produce these vehicles will be crucial in future. Understanding the difference between these approaches is crucial in examining an OEM's strategy.

Another technical consideration for OEMs is batteries. Automakers must navigate between customer requirements for robust range and charging speeds, and the costs of cells. These decisions extend to the fundamental battery chemistry, with the cost savings of Lithium-Iron-Phosphate batteries competing against the greater energy density offered by Nickel-Cobalt-Manganese or Nickel-Cobalt-Aluminium chemistries.[7] While consumer reluctance surrounding EVs continues to fall, concerns surrounding charging stations and range have overtaken upfront purchase costs as key determining factors in purchase decisions in some analyses.[8] Batteries are decisive across all three of those considerations, indicating that battery performance and costs can become a key differentiator. In addition, close attention must also be paid to future chemistries, such as sodium-ion or solid-state electrolyte batteries. While these have yet to be demonstrated to be commercially viable, they can still potentially represent step changes in performance for consumer EVs.

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Material Inputs and Supply Chains

While the chemistry, technical specifications and performance of batteries are crucial, there is a more basic question. OEMs need to ensure that they can acquire batteries at a reasonable cost and without exposure to unnecessary risks. Batteries still make up a significant proportion of an EV's total cost,[9] and OEMs are exposed to volatility and price fluctuations. While lithium prices have cooled from their highs in 2022,[10] they remain volatile in the face of increasingly tight demand out towards 2030.

As raw material prices cool and pack costs continue to decline,[11] it is possible that the uncertainty surrounding reliable supplies of critical minerals will subside, at least with respect to price. However, there are also clear areas of concentration within the supply chain that may be vulnerable to geopolitical risks or other exogenous shocks. In the case of lithium, both extraction and refining are highly concentrated, with over 75% of extraction occurring in Australia and Chile, and over 50% of refining occurring in China.[12] With increasing trade barriers globally, some governments have signalled intentions to diversify and fortify supply chains, such as through the U.S. Inflation Reduction Act's (IRA) "onshoring and friend-shoring" requirements for EV subsidies,[13] as well as the EU's recent passage of the Critical Raw Materials Act which aims to diversify away from China and increase domestic critical raw material extraction and refining.[14]

The IRA includes a range of tax incentives that support direct investment into domestic supply chains that will benefit both consumers and manufacturers. Consumers can receive up to a $7,500 tax credit, consisting of two distinct tax credits of $3,750 each. These tax credits are based on sourcing requirements for critical minerals, stipulating that 40% of an EV battery's critical minerals must be sourced from the U.S. or free trade partners, and 50% of the battery's components must be manufactured or assembled in North America. Note that these initial values are only for 2023 and incremental restrictions as well as increased requirements will increase annually. It is important for U.S. OEMs to make the necessary investments to ensure compliance with the IRA requirements, so consumers benefit from the full $7,500 tax credit. As noted, OEMs must make a cost competitive EV to support profitability, but that vehicle must also be attractive on a total cost of ownership basis for consumers to support adoption; the $7,500 tax credit is additive to that equation.

It is also important to note that much EV battery technology is owned by Chinese and Korean companies, such as Contemporary Amperex Technology Co (CATL), LG Chem and SK On. U.S. OEMs have partnered with these companies to address their battery needs, but monitoring risks associated with these partnerships is key going forward given ongoing geopolitical issues. As a result, partnerships with Korean battery manufacturers may prove more stable over time.

CAPEX and Investment

Automotive manufacturing has always been capital intensive, demanding substantial continuous investment to maintain and build plants, ensure adaptability to the latest technology, refresh existing vehicle range or bring new models to market, and comply with hefty regulatory requirements. The sums involved are material and include not only capital expenditure but also research and development, increasingly used to promote digitalisation and electrification. Automotive OEMs, such as Mercedes, Volkswagen and General Motors, spent 13% to 14.5% of sales in 2023 on capex and R&D. The largest spender, in absolute numbers, is Volkswagen, allocating €36.1 billion, or a substantial 13.5% of sales, in FY23 and including plans for 2025-2029 investment levels totalling €170.0 billion.

Legacy U.S. OEMs planned on investing significant capital into R&D and capital expenditures to support their EV ambitions. In 2023, General Motors's

investment ratio, including R&D, reached 13.1% of sales, distinguishing itself as an EV front runner relative to Ford (9.9%). However, the recent moderation of EV sales growth has caused some revisions to original plans. General Motors expected to spend $35 billion in 2022-2025 solely on capital expenditure; however, 2024 capital expenditures have been cut by approximately $1 billion from prior estimates to approximately $11 billion due to efficiencies on spending and some product launch deferrals. Of this spend, General Motors targets some 70% on EV-related projects. On the other hand, Ford has been more aggressive on spending revisions. Ford expected to spend $50 billion on EV investments over the 2022-2026 timeframe, but recently revised 2024 capital expenditures lower by around $2 billion to $8.5 billion with only 40% targeted on EV activities. General Motors is primarily focused on ICE and EV related investments, while Ford includes those technologies along with hybrids, which addresses a growing market segment. Importantly, both General Motors and Ford maintain the ability to flex their facilities between the different propulsion technologies to support customer demand.

Investments to sales ratios have been relatively stable, declining modestly during the pandemic, before recovering. Near term, we expect investment levels to rise further where adoption has been quickest, namely China and Western Europe, as new, enhanced all-electric platforms near completion and infrastructure investment ramps up. Volkswagen, an early investor forecasts a peak in investment levels at 14.5% of sales this year and targets an 11% ratio by 2027. Elsewhere, declining ICE demand and reductions to electric penetration assumptions have prompted OEMs such as Ford, General Motors and Honda to dial back on their EV launches and investments. The move protects near term margins and free cashflow but bears the risk of intensifying the tech and cost gap relative to leaders such as Tesla and BYD. Given the distance from full cost parity relative to ICE, the risk of unprofitable EVs raises the spectre of write-down of investments that OEMs made into first generation platforms.

The energy transition throws up additional challenges, introducing new areas of focus into the capital allocation mix. These congregate around the four forces of electrification, software-defined products, new business models, and autonomous driving. Most represent new territory outside of the core competencies of legacy auto OEM's and create material execution risk. Decisions in these areas on what core disciplines to focus on, how far to vertically integrate, and when to take the partnership route will have important implications both for future competitive position and investment levels. Cost leadership, achieved by the likes of BYD and to a lesser extent Tesla comes from high vertical integration that leverages cost lead in battery cells (BYD), powertrain and electronics modules, and state of the art software (Tesla) via years of development and investment.

Even if momentum has slowed in recent months, the march towards an electric future will continue. Those domiciled in Europe have no choice but to invest to meet regulatory demands, and as Chinese vehicle export capacity grows, electrification will become even more pressing to compete overseas and protect market share at home. To date, losses from EVs are likely to be in the multi-billions across the industry, with only Ford brave enough to break out the detail. The U.S. auto manufacturer recently guided for losses of $5.0 billion to $5.5 billion at its Model E EV business in 2024. In our view, investments in first generation EVs are unlikely to secure cost advantages but allow legacy players to "stay in the game" competitively as they accumulate the expertise, know-how, and technology to create a suite of desirable products at scale that can achieve attractive profit margins.

A Clear Destination Without a Roadmap

As the transition continues, states are incentivised to support and defend domestic manufacturers using a range of policy tools. The growth in EV market penetration in China rests in part on the fact that Chinese OEMs have enjoyed a type of support that is difficult to expect in the U.S. and Europe, across the broad sweep of industrial policy tools and undisturbed by divergent political priorities in subsequent governments. While there are industries that experience this type of support in Europe and the U.S., OEMs and the battery supply chain have historically not been part of that group. Industrial policy must consider the ecosystem in which EVs operate, supporting production and the development of manufacturing capacity, raw material inputs and batteries, charging stations and energy prices, and ultimately the price the consumer pays at the dealership. The depth and breadth of policy is just as necessary as ambition.

While demand for EVs will continue to grow across markets in Asia, North America and Europe, the speed of that growth will be governed by the degree to which regulation eases consumers' pain points. Policymakers can help to accelerate this growth, and crucially provide greater clarity and support for OEMs and consumers to ensure an orderly transition. A clear and granular assessment of policy and industrial support on a region-by-region basis is crucial to understand the pathways available to OEMs as they navigate a nonlinear but increasingly plausible transition to an electrified future.

Like any megatrend, the transition to an electrified road transport system will have complex impacts on OEMs and the broader value chain of the automotive industry. The transition will impact legacy OEMs simultaneously at multiple pressure points, from manufacturing processes to supply chains to consumer tastes and demand. Given the scale of capital investment required by OEMs to transition to an electrified business model, investors within debt capital markets have a critical facilitative role to play, both as capital allocators and through engagement, working with companies to ensure ambition in EV strategies as part of a sound business strategy. Investing in the energy transition requires a mix of optimism about the long-term prospects of a low carbon transport system and ongoing vigilance to understand how legacy OEMs balance and integrate flexibility and scalability, ambition and prudent planning.

Endnotes

[1] https://www.iea.org/reports/net-zero-by-2050
[2] Global EV Sales for 2023 - EV Volumes (ev-volumes.com)
[3] https://www.coxautoinc.com/wp-content/uploads/2024/01/Q4-2023-Kelley-Blue-Book-Electric-Vehicle-Sales-Report.pdf
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