

RESPONSIBLE INVESTING SERIES

Rapid Transition to Electric Vehicles Will Upend Global Auto Industry

By Nancy Poz, Director, Research Analyst
Fundamental Research

The global auto industry is on the cusp of a transformation. Electric vehicles are projected to rapidly gain market share, thanks to government regulations and investor pressure to eliminate the greenhouse gas emissions tied to climate change. Market leadership will be scrambled, as incumbent players are forced to adapt or lose share, and new players emerge.

Whether or not they care about the environment, investors are paying close attention to identify the likely winners and losers. Change is here. Only 10 years after introducing its first car, Tesla has emerged as the global leader in unit sales of all-electric vehicles, ahead of traditional automakers (Figure 1). Though several traditional automakers have far larger total unit sales, revenues and profits than Tesla, many equity investors think Tesla will dominate the vehicle market of the future. Tesla reported net income of \$5.5 billion in 2021, up from \$721 million in 2020, its first year in the black. Its stock soared, making Tesla the global automaker with the largest equity market capitalization.

Debt investors can't invest in Tesla because it doesn't have any public debt outstanding. The MacKay Shields Global Credit team is searching the industry for other opportunities to invest in the automotive revolution underway. We gravitate toward issuers that recognize the secular change underway and have a clear strategy to confront it. Such issuers should also have the financial strength to make disciplined investments related

to electric vehicles and to scale up production, while managing costs. Most of our auto-related investments are in legacy original equipment manufacturers (OEMs) and established auto parts suppliers. We are cautious about the "pre-revenue" auto companies with unproven technologies or business models.

Here, we review how the industry is adapting and the challenges ahead.

FIGURE 1: TESLA LEADS GLOBAL INDUSTRY IN BATTERY ELECTRIC VEHICLES

TOP TEN OEMS BY GLOBAL ELECTRIC VEHICLE SALES: 2021

Rank	OEMs	YTD Sales	YTD Market Share
1	Tesla	934,190	19%
2	GM	504,219	11%
3	VW	455,819	10%
4	BYD	325,621	7%
5	Hyundai	242,079	5%
6	Ren/Niss/Mits	213,227	4%
7	Stellantis	204,379	4%
8	SAIC	161,242	3%
9	Great Wall	137,238	3%
10	GAC	124,900	3%
TOP 10 BEV SALES (YTD)		3,302,914	69%
OTHER BEV SALES		1,491,890	31%
TOTAL BEV SALES YTD		4,794,804	100%

BEV – Battery Electric Vehicles

Source: EV volumes.com, Morgan Stanley Research: Morgan Stanley's Autos & Shared Mobility Report - Dec EV Tracker, January 28, 2022.

New Rules Force Change

The global transportation sector contributes about 20% of total greenhouse gas emissions; in the U.S., the sector contributes 29%, with passenger vehicles and trucks the biggest sources. Many countries and companies are determined to drive

emissions down to mitigate climate change. Before and during the COP26 United Nations climate conference in November 2021, many countries pledged to reduce emissions in the decades to come. Europe appears to be on a legislative path to achieve climate neutrality by 2050. China pledged to cut down on coal consumption and investment, so that emissions will peak before 2030 and then decline.

Political stalemate has slowed progress in the U.S., but President Biden recently signed an executive order to achieve five key goals, including 100% carbon pollution-free electricity by 2030, and 100% of all vehicles sold being emissions-free by 2035, with 50% electric-powered by 2030. Emissions-free electricity is needed to reduce emissions related to transportation: Without an emission-free source of electricity to charge EV batteries, the electric transformation of road vehicles would just move emissions from tailpipes to smokestacks.

Traditional automakers are pledging to electrify their fleets, many of which have signed the COP26 declaration to transition to zero-emission vehicles globally by 2040, and no later than 2035 in major markets. Even before COP26, several were planning to become all-electric by 2030. One traditional automaker recently revealed plans to go all-electric by 2028. Another European manufacturer is focused on accelerating its initiatives for battery electric and plug-in hybrid vehicles. The leading Japanese and Korean brands also unveiled similar plans to advance their electric offerings.

Given these pledges and capital investments underway, global sales of all-electric vehicles are projected to soar past 100 million in two years, from zero in 2015. With sales of traditional, internal combustion-engine vehicles expected to plunge, market share of all electric vehicles is expected to soar from 3% in 2020 to 93% in 2050 (Figures 2, 3).

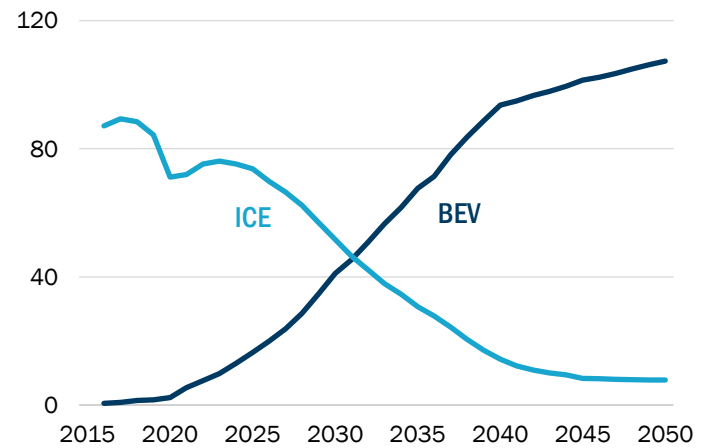
Traditional Players Plan Transition

Most traditional automakers are seeking to manage the slow decline of vehicles powered by internal combustion engines (ICE) by gradually rolling out hybrid-electric vehicles, which produce some tail pipe emissions, and all-electric models which produce none. Profits from their ICE vehicles are being reinvested in the transition.

For example, a North American manufacturer recently outlined a plan to spend \$30 billion by 2025 on next-generation electric vehicles, with deliveries beginning in 2022 of pickups, cars and light commercial vehicles. Its first commercial customer is

FIGURE 2: GLOBAL EV SALES AND MARKET PENETRATION PROJECTED TO RISE SHARPLY

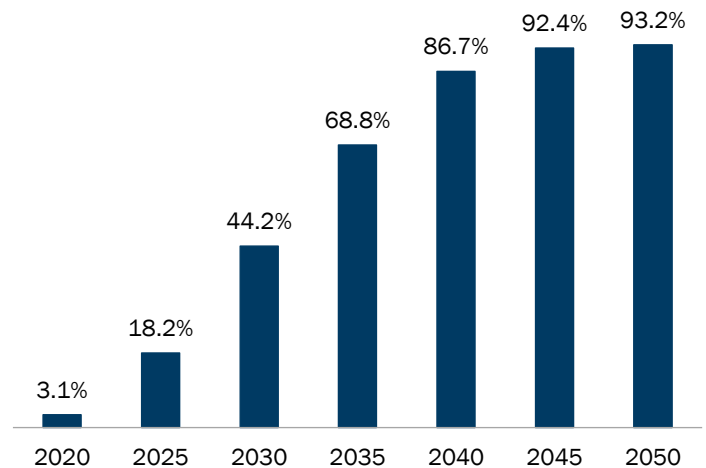
BATTERY ELECTRIC VEHICLES (BEV) VS INTERNAL COMBUSTION ENGINE (ICE) VEHICLE SALES | MILLIONS



Source: Morgan Stanley Research: Morgan Stanley's Autos & Shared Mobility Report - Dec EV Tracker, January 28, 2022.

FIGURE 3: ELECTRIC VEHICLES' GLOBAL MARKET SHARE IS POISED TO SOAR

BATTERY ELECTRIC VEHICLES AS PERCENT OF TOTAL VEHICLE SALES



Source: Morgan Stanley Research: Morgan Stanley's Autos & Shared Mobility Report - Dec EV Tracker, January 28, 2022.

a major courier company. In addition, this automaker just previewed a new electric pick-up truck. The company's goal is to produce 30 EV models globally through 2025 (about 1 million vehicles), with two-thirds available in North America. Its target is to start offering all-electric new light duty trucks with

zero tailpipe emissions by 2035, moving to a fully zero emissions future by 2040.

Another North American manufacturer plans to reach carbon neutrality before 2050, and to make 50% of its global vehicle volume fully electric by 2030. While it didn't make the top 10 list of EV makers in 2021, it is aiming to produce 2 million EVs by 2026. Last year, it introduced its first EV, and another is scheduled to hit the market this year. This manufacturer recently increased spending from \$30 billion to \$50 billion, in part to double the planned factory capacity for this plug-in vehicle.

Many traditional auto parts makers are taking the same route, working to increase sales of content for electric vehicles or develop new products to meet the specific demands for such vehicles. One, for example, is aiming to produce a tire made from 100% sustainable bio-based or recycled sources by 2030. They have a proven track record of producing tires with properties that electric vehicles require, such as reduced rolling resistance, which improves fuel efficiency and reduces greenhouse emissions.

New Players

New entrants to the industry include one which showcased an EV three years ago and introduced a prototype electric SUV at this year's CES tech conference, but has not yet begun production. Large global tech firms are sometimes rumored to also be looking at the EV market, too. These global giants have experience in electronics and scaling production, ample access to capital. That's not true of most other new entrants to the market.

But most new players are following Tesla's example, starting as pure-play, private companies focused on producing entire vehicles or separate components, such as battery cells, chassis, and data/networking systems, and infrastructure advances. The list keeps growing. These companies face a long road to production and consistent profitability. Tesla was founded in 2003, delivered its first cars in 2008, and didn't become profitable until 2020. Another company founded in 2009 is bringing its first two vehicles to market this year. In

documents for its November 2021 initial public offering, it said it is prioritizing growth before profits to build a new business.

Better Batteries Are Key

The industry cannot execute the emissions-reducing shift from ICE to EV without batteries, and new and established companies alike face battery-related challenges. First, the lithium, cobalt and other raw materials needed are both scarce and expensive. Furthermore, governments, ESG-oriented investors and the public are likely to demand that cobalt, lithium, and the nickel, copper and aluminum needed for EV batteries be sustainably mined and produced. Mining operations for these metals often destroy landscapes, poison water, air and soil, and generate greenhouse gases that partly offset the emissions-reduction benefit of electric vehicles.

Second, people won't choose EVs over ICE vehicles en masse if EVs remain relatively expensive. The cost of electric batteries has come a long way in the last decade, from about \$1,100 per kilowatt hour to about \$157 in 2019. To reach cost parity with ICE vehicles, however EVs need batteries that cost less than \$100 per kilowatt hour. Government subsidies may be needed on an interim basis for EVs to gain the market share that governments want. Electric utility capacity will also have to increase to support new roadside battery-charging infrastructure, as well as increased demand at home, where about 80% of EV battery recharging now occurs.

EV batteries must also be safer, longer lasting, have greater energy density, and support longer driving range on a single charge. Getting there will require innovation and capital-intensive production. Some automakers are developing and producing their own batteries; others are outsourcing it, creating the opportunity for parts makers. We are carefully monitoring their progress, to determine which automakers and parts makers will be able to gain share profitably.

There are many risks along the way to producing a profitable, mass-market battery electric vehicle, but progress is underway. Not too far down the pike, however, is another technological transition that may prove to be even more disruptive: autonomous driving.

NOTE TO EUROPEAN INVESTORS

This document is intended for the use of professional and qualifying investors (as defined in the Alternative Investment Fund Manager's Directive) only. Where applicable, this document has been issued by MacKay Shields Europe Investment Management Limited, Hamilton House, 28 Fitzwilliam Place, Dublin 2 Ireland, which is authorized and regulated by the Central Bank of Ireland.

IMPORTANT DISCLOSURE

Availability of this document and products and services provided by MacKay Shields LLC may be limited by applicable laws and regulations in certain jurisdictions and this document is provided only for persons to whom this document and the products and services of MacKay Shields LLC may otherwise lawfully be issued or made available. None of the products and services provided by MacKay Shields LLC are offered to any person in any jurisdiction where such offering would be contrary to local law or regulation. This document is provided for information purposes only. It does not constitute investment or tax advice and should not be construed as an offer to buy securities. The contents of this document have not been reviewed by any regulatory authority in any jurisdiction.

This material contains the opinions of certain professionals at MacKay Shields but not necessarily those of MacKay Shields LLC. The opinions expressed herein are subject to change without notice. This material is distributed for informational purposes only. Forecasts, estimates, and opinions contained herein should not be considered as investment advice or a recommendation of any particular security, strategy or investment product. Information contained herein has been obtained from sources believed to be reliable, but not guaranteed. Any forward-looking statements speak only as of the date they are made and MacKay Shields assumes no duty and does not undertake to update forward-looking statements. No part of this document may be reproduced in any form, or referred to in any other publication, without express written permission of MacKay Shields LLC. ©2022, MacKay Shields LLC. All Rights Reserved.

USE OF SECURITY, ISSUER AND COMPANY NAMES

All security, issuer and company names cited herein are done so for informational purposes only. The securities, issuers and companies cited herein are educational in nature, for illustrative purposes only and is only intended to illustrate the portfolio management team's investment process and discipline. All such names are not intended, nor should they be construed to be, a recommendation to buy and sell any individual security. None of MacKay Shields LLC, its affiliates or representatives is suggesting that the recipient or any other person take a specific course of action or any action at all. Nothing presented herein is, or is intended to constitute, investment advice. Different types of investments involve varying degrees of risk, and there can be no assurance that any specific investment will either be suitable or profitable for a client's investment portfolio. There is no assurance investment objectives will be met. Nothing herein should be considered predicative of future transactions or commitments made by MacKay Shields LLC nor as an indication of current or future profitability.