

HIGHLIGHTS IN THIS ISSUE ►►

BY SAM FIORANI

An industry in transition between ICE and EV is showing up in so many ways. The on-going semiconductor shortage is hampering the shift while manufacturers are exploring new niches, like Ford's new F-150 Lightning and Jeep's 4xe lineup. Corporate boards are focusing on the electric side as they spin off the legacy petroleum-based side to make investors see these century-old brands as new and progressive.

And this shift is giving automakers a chance to explore new markets that would have been unimaginable just a few years ago. We're here to shed light on where the industry is going and where the pitfalls might be hiding.

Automakers have production issues but niches beckon, as Ford's F-150 Lightning EV shows



NEWS BY SAM FIORANI

Global markets still pessimistic

Markets around the world are trying to fight off the expected downturn. With global inflation running higher than economists would prefer, slower sales across many industries have raised the specter of a recession. Central banks are doing all they can to limit price rises but increasing interest rates have the additional result of lowering investment and hampering sales and production. While the automotive sector is at low points in North America and Europe, especially in Eastern Europe, a strong recession could hurt them further.

Renault splits EVs and ICE

Legacy automakers are dividing their businesses into "old" and "new" units and Renault is the latest to take this direction. Its "old" division, known as Horse, takes over the ICE-related business and the "new" division, known as Ampere, focuses on electric vehicle development and production. Renault is looking for investors in Horse and among the investors lined up for this company are Chinese automaker Geely and Saudi Arabia-backed oil company ARAMCO. Geely already took a large stake in a similar move made by Volvo.

BYD expands into Japan

As part of its global expansion plans, BYD of China is looking to begin sales of its vehicles in Japan. BYD's EV-rich lineup will enter a market that has been light on pure battery-electric

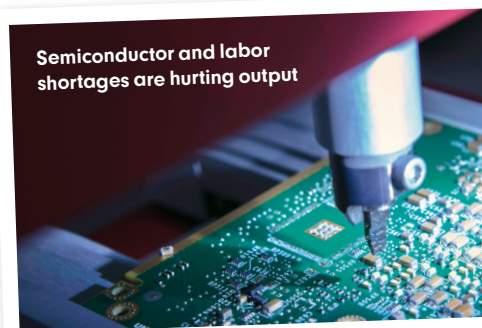


The Seal is one of three EV models in BYD's opening move to gain a foothold in the tough Japanese market

models with three offerings including the Dolphin and Seal. The introduction of the brand into the notoriously tough Japanese market will be a strong test as BYD looks to expand its sales in Europe and, eventually, enter the U.S. and Canadian markets. Even limited success in Japan will be a win since import brands rarely find many buyers in the country.

Labor issues at US Stellantis plant

UAW union members voted to strike at the Stellantis Kokomo (Indiana) Casting Plant in early September. More than 1,000 workers went on strike after negotiations broke down between UAW Local 1166 and the automaker. The union argued against deteriorating conditions at the plant and presented a number of health and safety demands in order for production to



'JAPAN WILL BE A STRONG TEST FOR BYD AS IT LOOKS TO EXPAND ITS SALES IN EUROPE'

resume, many of which were met quickly and workers returned to the plant later the same day. Kokomo Casting is planned to provide engine blocks for a new 1.6L engine destined for upcoming hybrid models. Separately, a strike by U.S. railroad workers, which could have hurt the already disrupted supply chain, was avoided at the last minute.

And labor is an issue globally

Finding people to make vehicles and parts has been a growing issue for years. However, the problem has been compounded other factors within the industry. Supply chain bottlenecks – including the semiconductor shortage, COVID-related closures and the war in Ukraine – have slowed production around the world over the past two years. A labor shortage is compounding the problem. There are reports that the global pandemic has encouraged more people to retire or find work in industries where workers are not in close contact with each other and this is working against the need for supply chain and assembly employment. The shortage of available workers will lead to increased automation, where possible, and high wages, which could result in further increases in inflation and costs passed onto consumers.

Porsche targets lower price in IPO

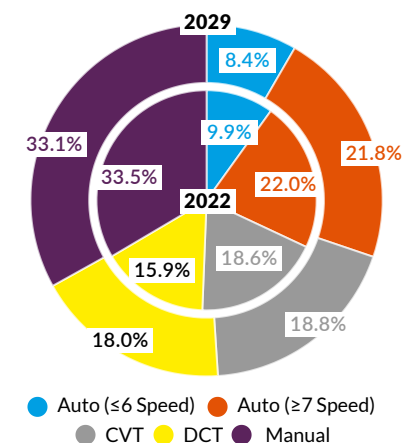
The initial public offering of Porsche was previously reported to be valued at as much as US\$85 billion. As the IPO date neared, parent Volkswagen revised its target price for the new stocks, aiming for a market cap below



€57 billion (US\$57.1 billion). The discount has been attributed to the current state of the automotive industry, with its tight inventory levels and supply chain issues as well as the potential for a regional or global recession in late 2022 or early 2023. Finding buyers for shares of the sports car maker will not be difficult and investment funds around the world are lining up for a piece of Porsche.

TRANSMISSION CONSUMPTION BY TYPE

Excludes BEVs



Source: AutoForecast Solutions

GLOBAL ELECTRIC VEHICLE INITIATIVES

BY CONRAD LAYSON

South Korea argues with U.S. over EVs

High-level representatives from the U.S. and South Korea met in mid-September to discuss easing or modifying the impact of the U.S.'s Inflation Reduction Act (IRA) on Korean-made electric vehicles. As written, the IRA provides a US\$7,500 tax credit to U.S. buyers provided that their EV is assembled in the U.S. and its battery contains neither minerals nor components sourced from China. Currently, the Hyundai and Kia brands assemble their EVs in Korean plants.

In May, Hyundai Motor announced plans to invest US\$7.5 billion to construct the company's first all-electric vehicle assembly plant in Bryan County, Georgia. After the passage of the IRA, reports surfaced that Hyundai was considering plans to accelerate the new plant's construction, currently expected to be completed in late 2024. The purpose of the trade

negotiations appears to be finding a way to allow Hyundai products to qualify for the US\$7,500 consumer tax break while its North American EV assembly plant is under construction. While South Korea enjoys a bilateral free trade relationship with the U.S., that would not cover the IRA's U.S. manufacturing requirement.

South Korea is delaying filing a protest with the World Trade Organization while direct negotiations continue. Later this month, the South Korean

government will also bring the IRA's restrictions up with European trade representatives, who are similarly affected.

SVolt investing in Europe

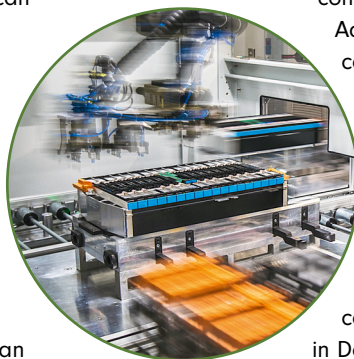
Chinese battery cell manufacturer SVolt, a spin-off from Chinese OEM Great Wall, announced its intention to build a second battery cell manufacturing facility in Germany. SVolt's existing cell manufacturing and packing facility in Saarlouis, Germany, produces 24GWh worth of cells per year. SVolt's Saarlouis plant supplies Stellantis with enough cells to produce up to 240,000 pure electric vehicles every year.

The new facility is situated near the Tesla Model Y plant, also in the state of Brandenburg. SVolt will locate the new factory in Lauchhammer on property purchased from a manufacturer of wind turbines. Construction and renovation will start in Q4 2022, with cell production beginning in 2024. The new plant's planned capacity will be 16GWh,

enough to power 160,000 battery-electric vehicles per year. There is no word yet on which OEM will consume the facility's output.

Additionally, battery manufacturers continue to expand in Europe and are firmly entrenched in the supply chain. Contemporary Amperex Technology Co. Ltd. (CATL) is supplying Tesla, BMW and Mercedes from its existing facility in Erfurt, Germany. CATL announced the construction of a 100GWh facility in Debrecen, Hungary, which will

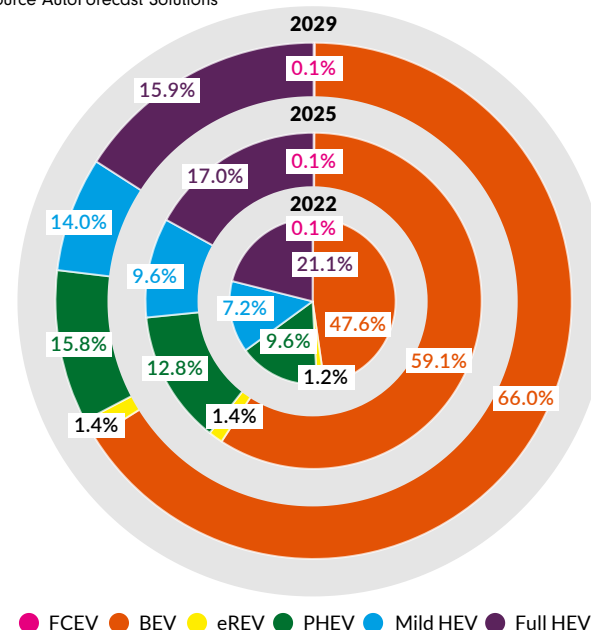
SVolt, VW Group and Toyota are all boosting battery cell production



GLOBAL LIGHT VEHICLE ELECTRIFICATION

Percentages based on electrified vehicle market only

Source: AutoForecast Solutions



Japan. Toyota Battery Manufacturing North Carolina (TBMNC) is a joint venture between the OEM and supplier Toyota Tsusho Corporation, which already had a US\$1.29 billion, four-line cell production facility under construction in Liberty, North Carolina. Toyota pledged an additional US\$2.5 billion to the project to increase capacity and efficiency for future electric and electrified vehicle production. Plans have been modified to increase the number of cell production lines from the existing four to a total of six.

Toyota's expenditure of US\$3.1 billion is for the Prime Planet Energy

also supply German OEMs. Volkswagen Group is constructing four cell-making facilities for its own consumption. When completed, the four VW battery factories will employ LFP chemistry and cell technology from Chinese firm Hefei Gotion High-Tech Power Energy Co., in which VW has a financial stake.

Toyota expanding battery cell production

Toyota signaled a major shift in strategy announcing an investment of US\$5.6 billion to make battery cells in both the U.S. and

Solutions plant in Himeji, Japan. Prime Planet Energy Solutions, a joint venture between Panasonic and Toyota, supplies battery cells and packs for Toyota's hybrids. The upgrades will increase output to 40GWh and allow Toyota to begin to meet the growing EV demand in both the Asian and North American markets. Late to begin serious BEV development, Toyota now plans to meet Europe's 100% BEV sales goal by the 2035 deadline. EV adoption is increasing in North America while all markets have experienced a decline in HEVs, likely linked to their eventual withdrawal from Europe. Toyota will see the additional battery cell-making capacity come on line by 2026.

GLOBAL LIGHT VEHICLE PRODUCTION OUTLOOK

BY SAM FIORANI

COVID-19 IS STILL affecting production in China as the country has a “zero COVID” policy to control the spread of the virus. New lockdowns in Chengdu and Shenzhen have made everything difficult in the metropolises. Light vehicle production in just these two cities should have totaled more than 100,000 units in September, but this will obviously not occur.

Production around the world has been hampered by supply chain issues and even Iran is not immune. Incomplete vehicles have been piling up for a long time as Iran’s major manufacturers, Iran Khodro and SAIPA, have been unable to complete all of their vehicles. In the past month, that stockpile of incomplete vehicles has been largely eliminated, thanks in part to an automotive alliance between Iran,

Turkey and Russia. For true growth to return to Iran, the removal of some, if not all, sanctions led by the U.S. would be necessary and that does not seem to be in the near-term plan.

Trends around the world have shown a continual softening of the outlook in every region this year. Production in Western Europe is expected to finish the year at around 10.3 million units of light vehicles while Eastern Europe continues to struggle with a war and the associated repercussions, dragging the outlook to 5.8 million. North American output will have a tough time getting to 14.5 million units, still a sizable improvement over last year’s 13.1 million tally. Production in South America this year will finish below 2.8 million, a slight improvement over 2021.



Ferrari enters new segment

Purosangue will chase big profit rather than big volume



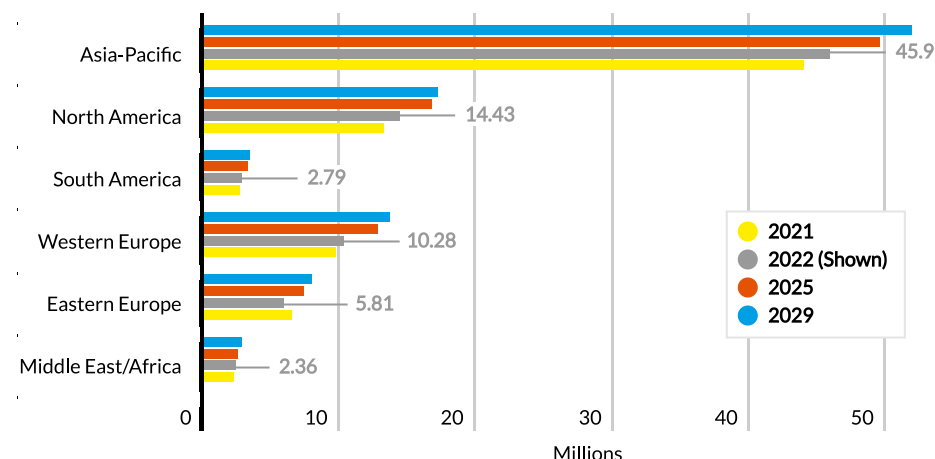
● The most anticipated new product to come out of Italy has been shown and it will be both the best and worst thing for the brand. Ferrari’s long-awaited Purosangue utility vehicle is the first production four-door model in the company’s 75-year history.

Sporty high-end crossovers have found success at Porsche, but Ferrari cannot be

considered in the same, relatively high-volume league as the German brand.

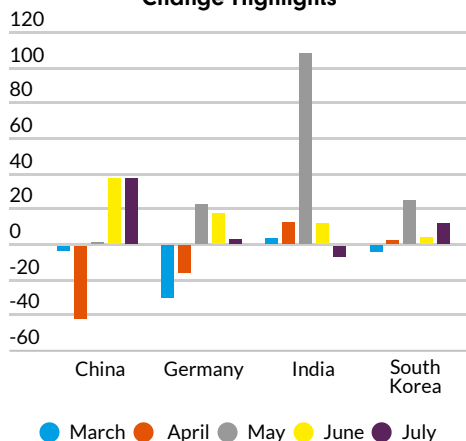
New buyers will be undoubtedly drawn to the Purosangue as it offers the kind of usefulness Porsche buyers found in the Cayenne. Ferrari’s new 12-cylinder model will limit those potential buyers with its sky-high price, which starts at €390,000 (US\$391,000).

GLOBAL LIGHT VEHICLE PRODUCTION OUTLOOK



Source AutoForecast Solutions

Year-Over-Year Production Change Highlights

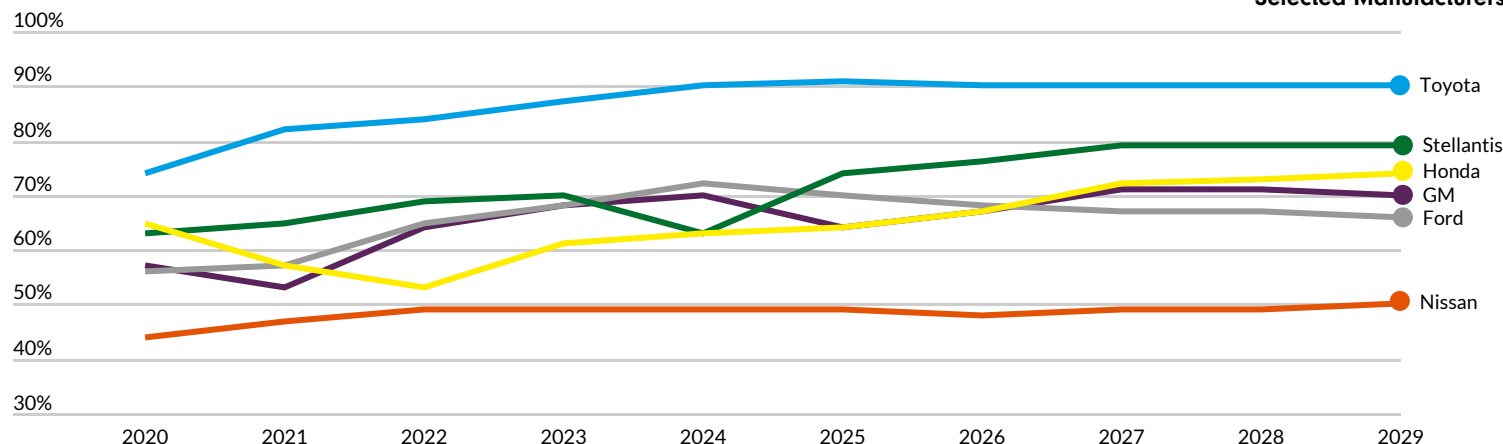


The AFS Forecast covers 60 countries.
Chart shows changes 2022 over 2021.

NORTH AMERICAN CAPACITY UTILIZATION BY VEHICLE MANUFACTURER

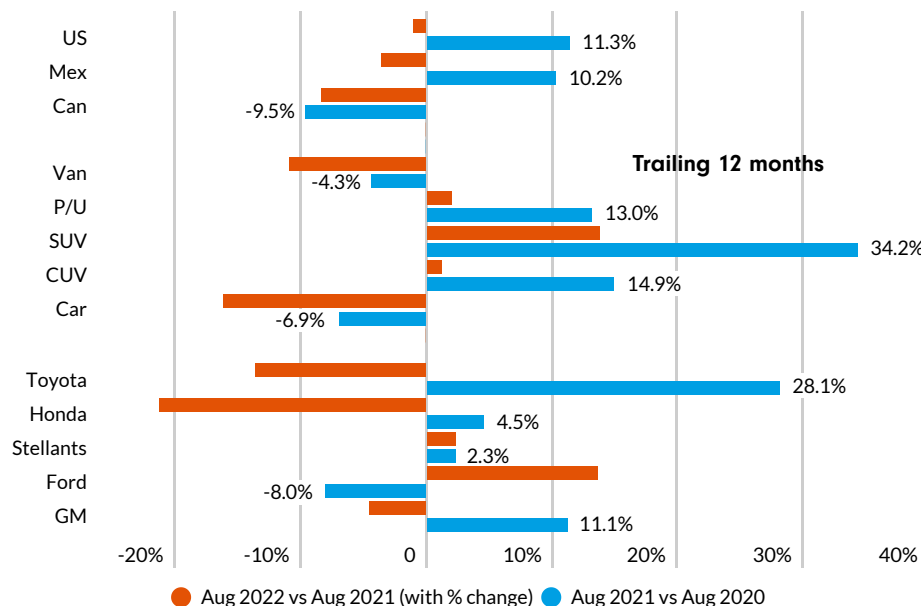
Source AutoForecast Solutions

Selected Manufacturers

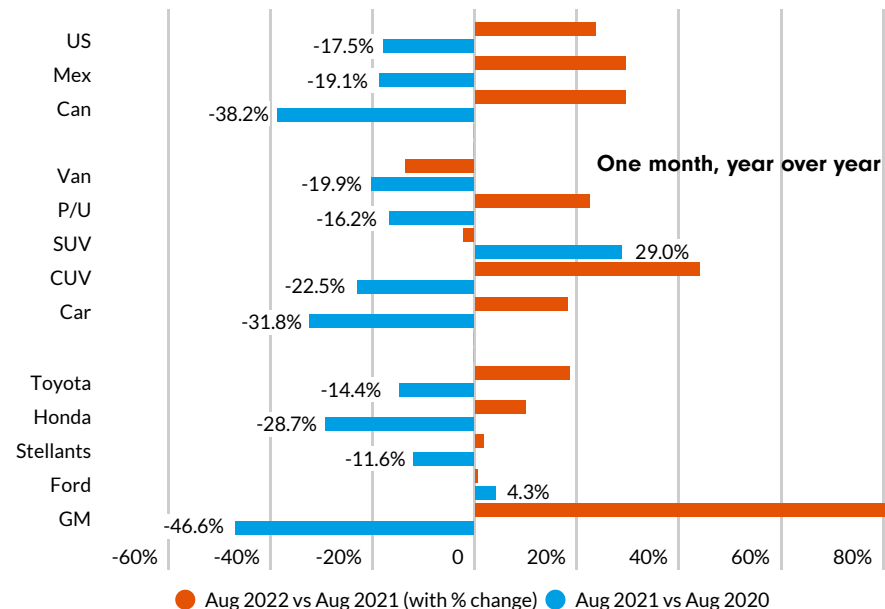


NORTH AMERICAN PRODUCTION CHANGES

Source AutoForecast Solutions



Trailing 12 months represents 12-month period vs the year-prior period



One month represents single month over prior single-month change

GLOBAL LIGHT VEHICLE SALES OUTLOOK

BY SAM FIORANI

ANALYSTS ARE ALL abuzz about the regional improvements in light vehicle sales. Some countries in Western Europe are showing single-digit gains year over year. However, these gains are based on awful sales numbers last August. While an improvement is an improvement, these examples are not positive enough to offset the negative numbers over the past year. One data point is not enough information to anticipate continued improvements, but it does not discount the possibility of a market upturn.

That optimistic buzz has even permeated the U.S., where sales have been down month after month, with double-digit losses going back through last August. However, this August perked up a bit. A 3.3% increase is a definite improvement, although this equates to just 35,493 units over last year, which was down 17.1% over the prior August. Just below 1.15 million units, sales last month were nearly 170,000 below August 2020 and more than 475,000 below August 2019. The optimism is a bit premature and the forecast for the full year was lowered to 13.72 million units.

A gain of slightly more than 10,000 units is small compared to the bounce in the U.S., but the Mexican market is also much smaller. That jump in sales equates to a strong 13.1% improvement over the prior year. Also better than August 2020, last month was significantly weaker than any prior month back to 2012. Revising the market up for 2022 only lifts the forecast to 1.045 million units, keeping Mexico well below the totals reported prior to 2020.

Canada continues to struggle with light vehicle sales. August marked the seventh straight month of year-over-year losses and last month was the

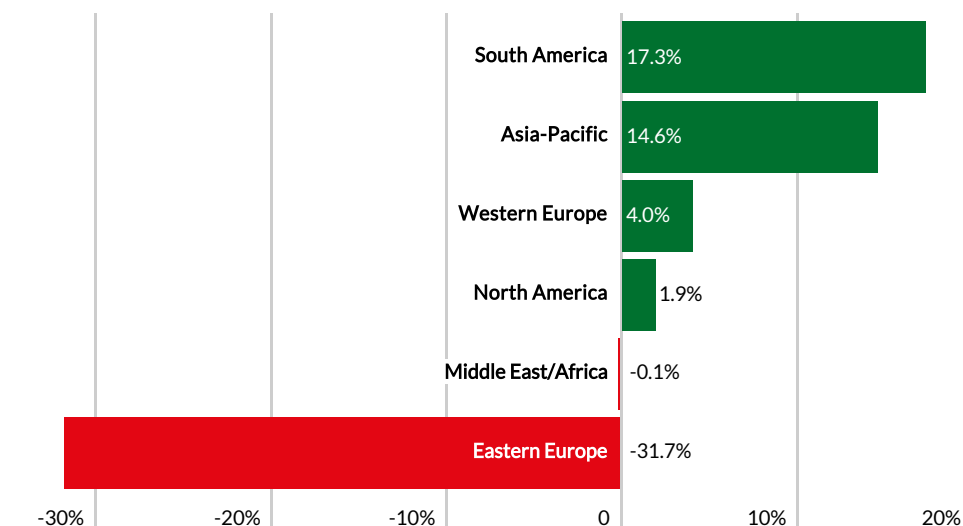
worst August volume in well over two decades. The streak and poor showing last month pushed the 2022 outlook down to 1.514 million units, which would be the worst year since 2008 and the second worst in nearly a quarter century.

The European Union saw a gain in August sales of light vehicles, providing a glimmer of hope that the region hasn't seen in more than a year. One month does not a trend make, though, and the current direction of the EU points toward the region reporting a third straight year of declining sales. At nearly 10% below 2021 levels, this year is expected to be the trough before the region climbs by about 5% in 2023. Despite the forecast, 2023 will still



Despite lots of new product, such as Cadillac's Lyriq, the 2022 forecast for U.S. light vehicle sales has fallen

SEPTEMBER 2022 YOY LIGHT VEHICLE SALES CHANGE

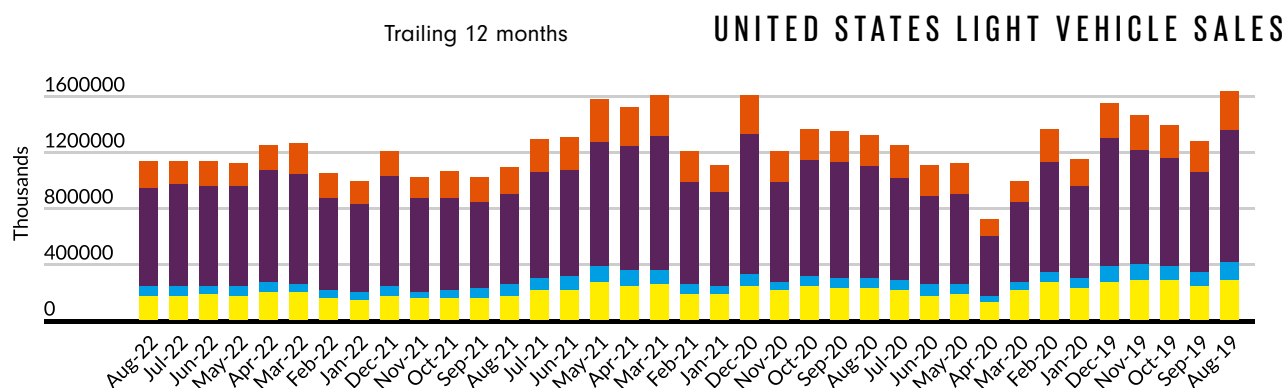
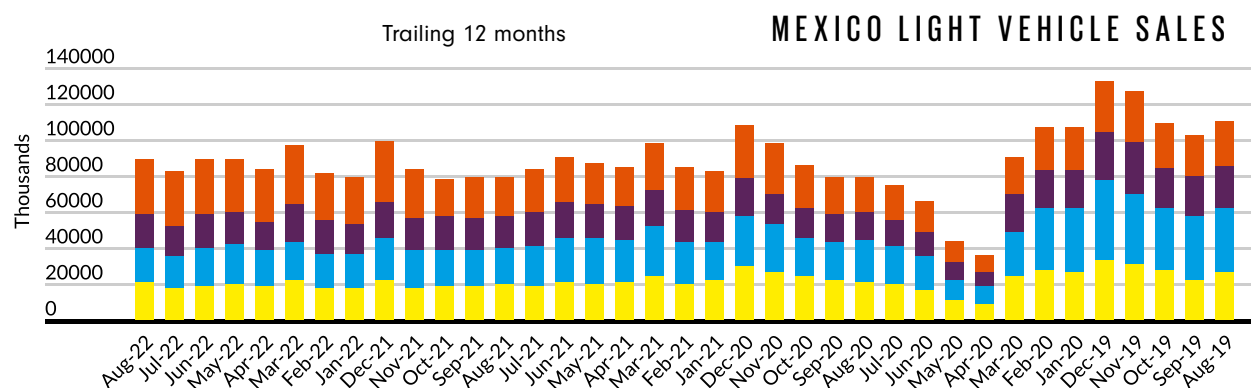
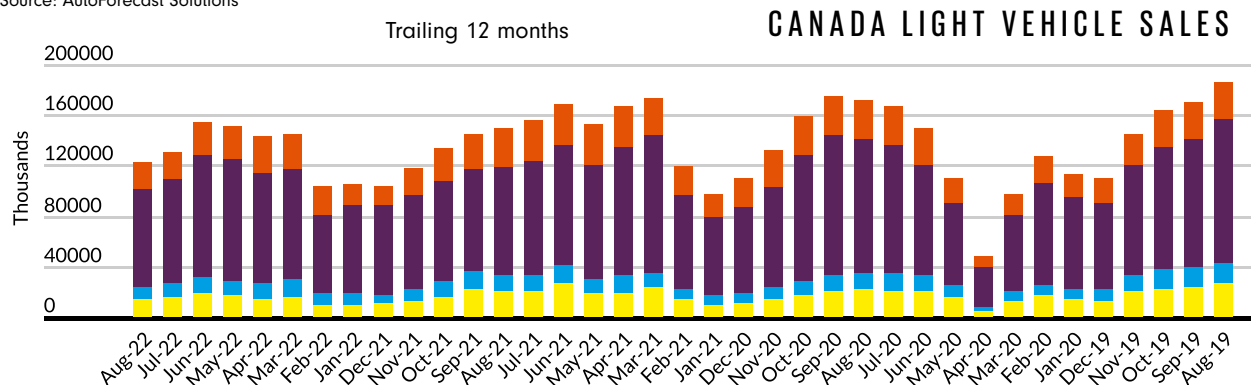


Source: AutoForecast Solutions

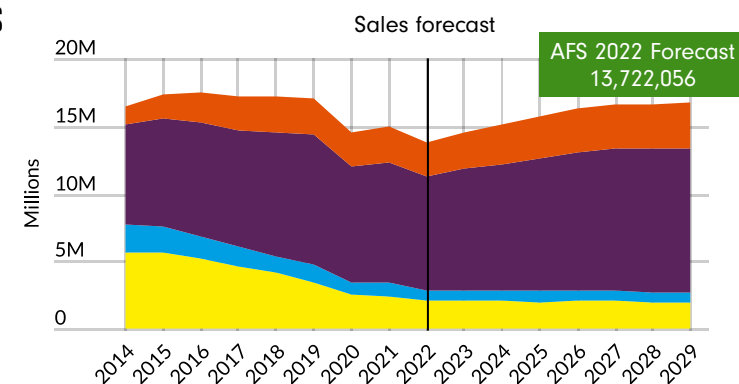
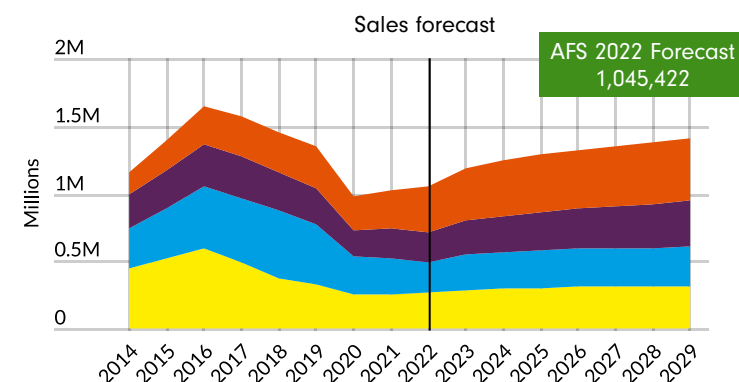
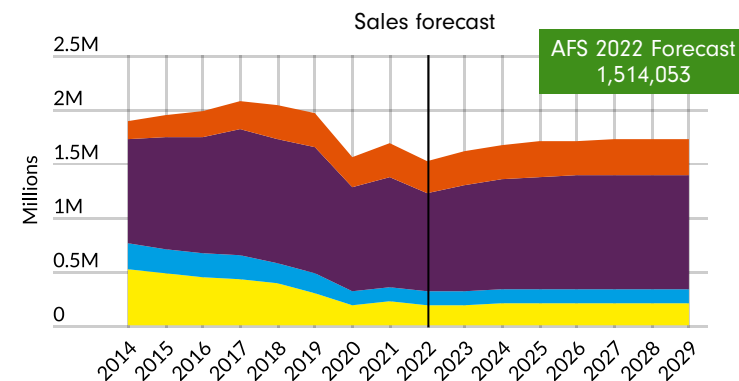
be the second worst year in the past decade.

As the Chinese market blossomed over the past decade or so, the world's automakers expected to find a ready market. Unfortunately for many, imported vehicles are typically too expensive to be competitive and local production is necessary. This hasn't stopped many companies from finding local partners for production of various models, but not all have met with success. Stellantis's Jeep brand, which broke into the region in the 1980s when it was owned by American Motors, recently walked back its local plan with partner GAC. Also in the Stellantis family, Opel's expansion plans into China have been curtailed in the face of local market competition. Sales in the country are recovering from market downturn over the past few years, but they are not expected to return to the peak of 2017 for five more years. This year, China should sell more light vehicles than in 2021, marking the first uptick in sales since 2017.

Source: AutoForecast Solutions



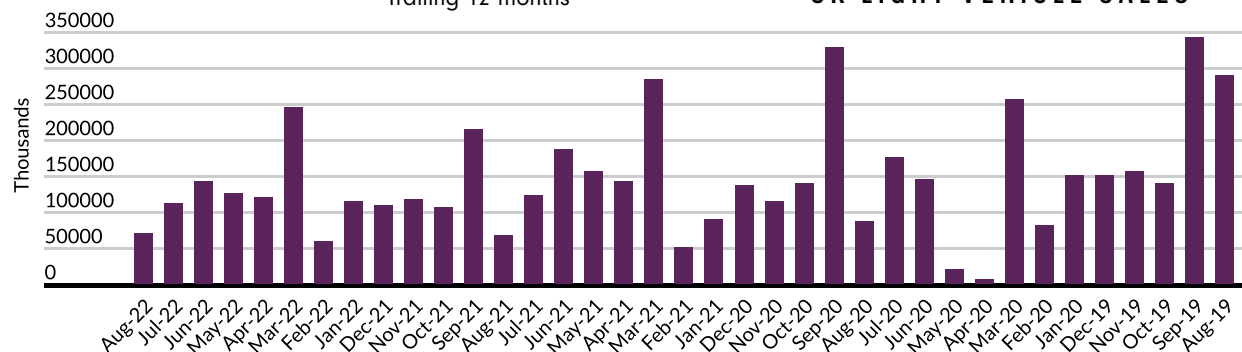
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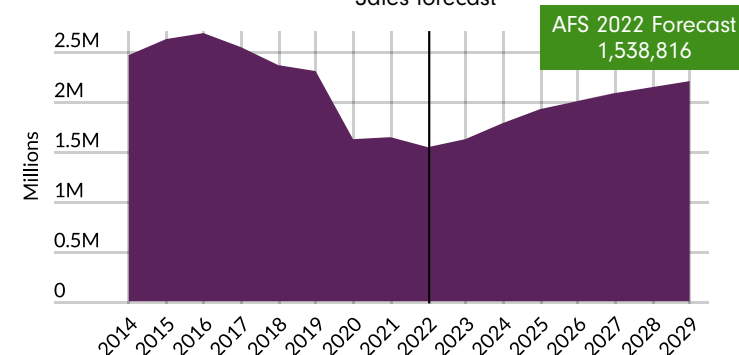
Source AutoForecast Solutions

Trailing 12 months

UK LIGHT VEHICLE SALES

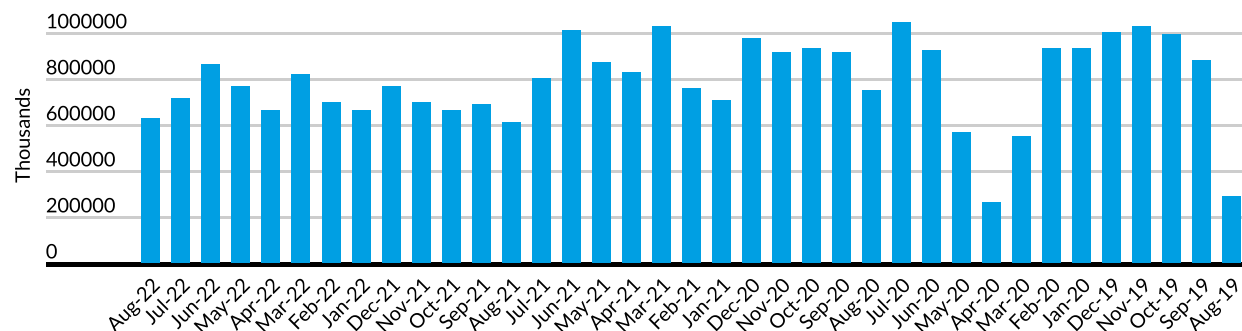


Sales forecast

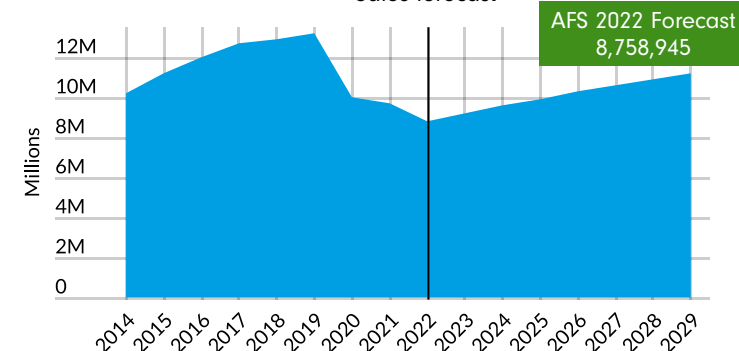


Trailing 12 months

EUROPE LIGHT VEHICLE SALES

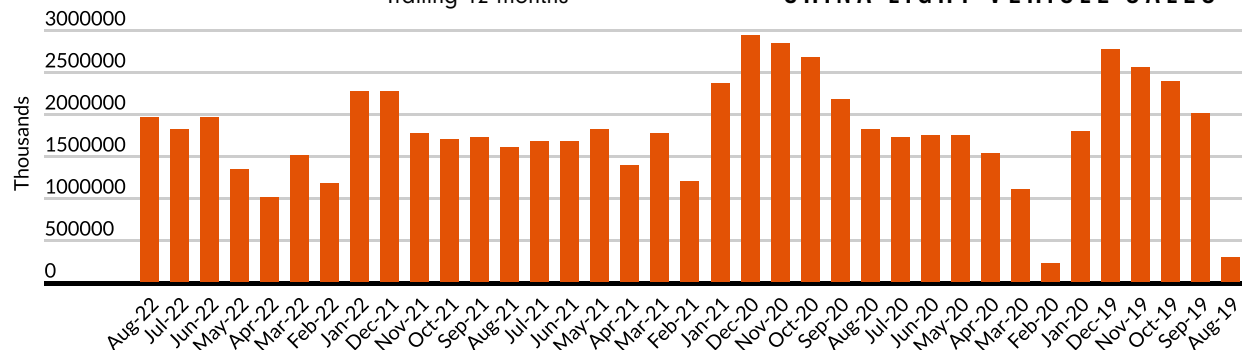


Sales forecast

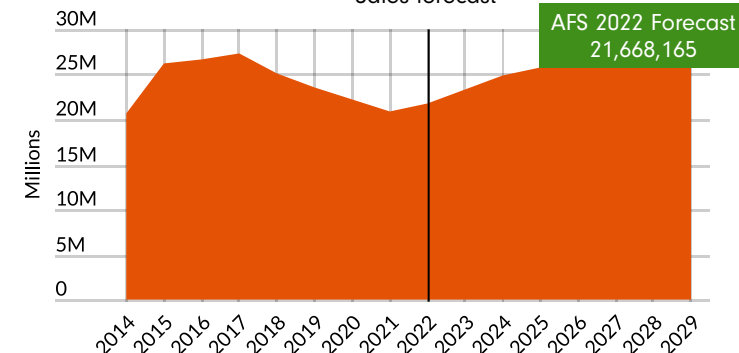


Trailing 12 months

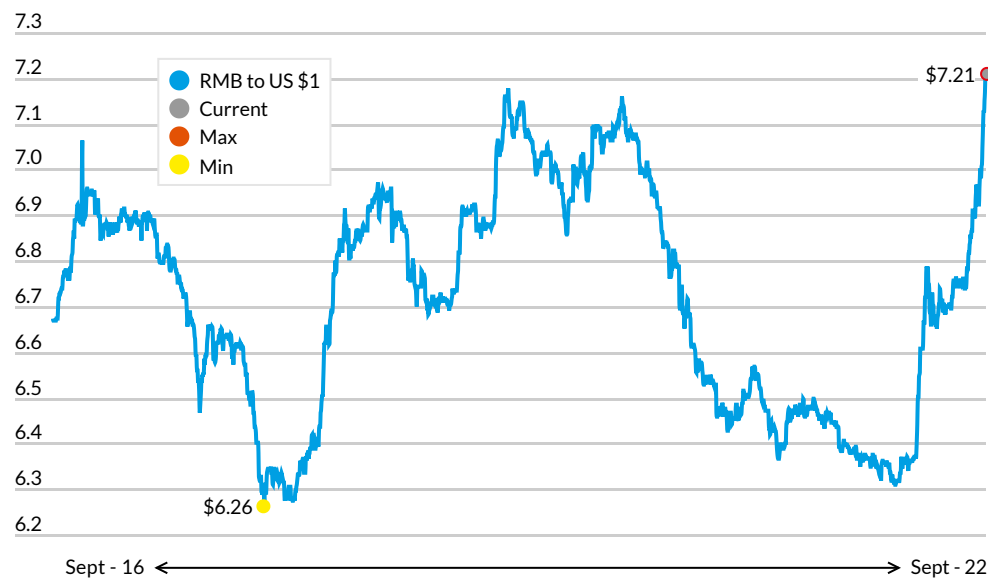
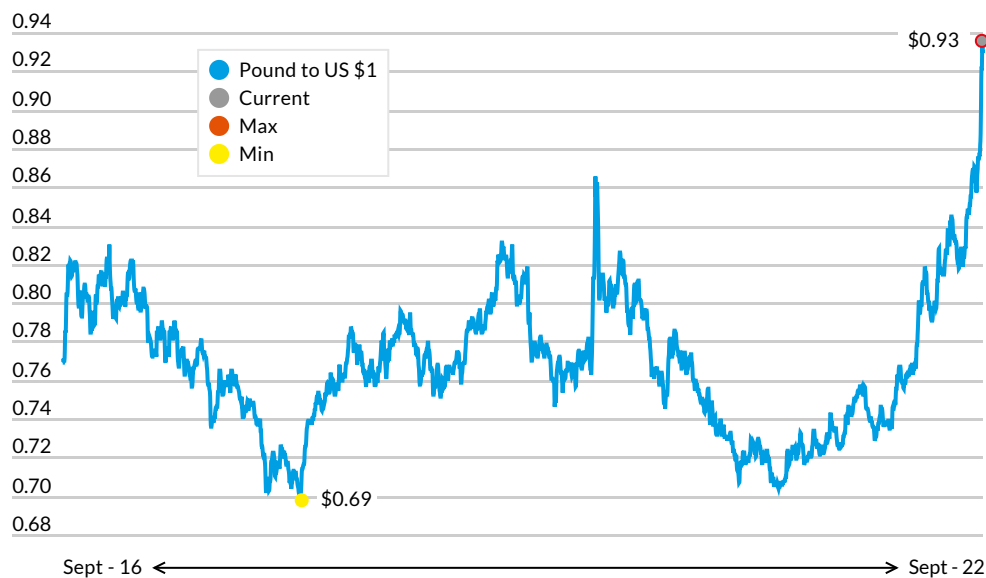
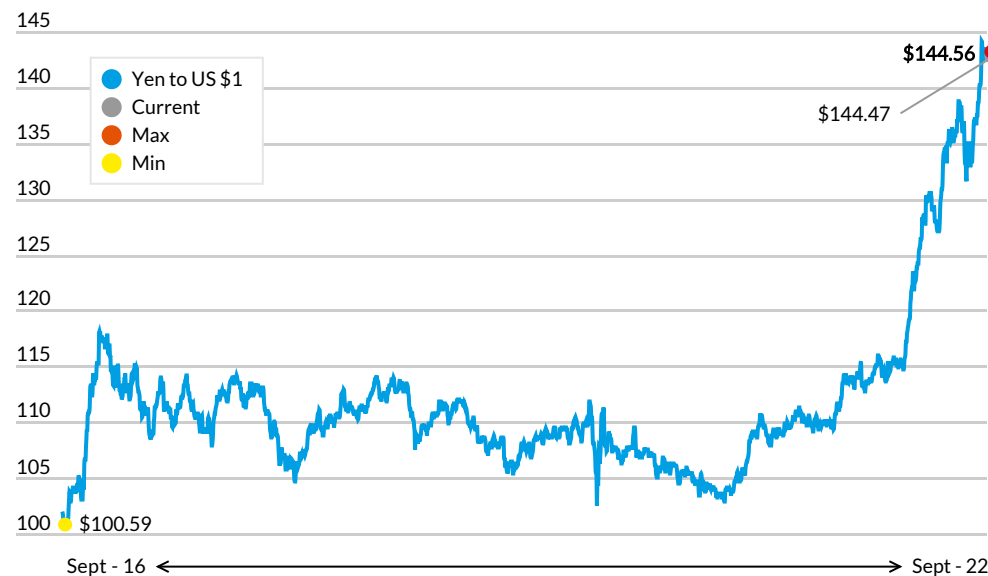
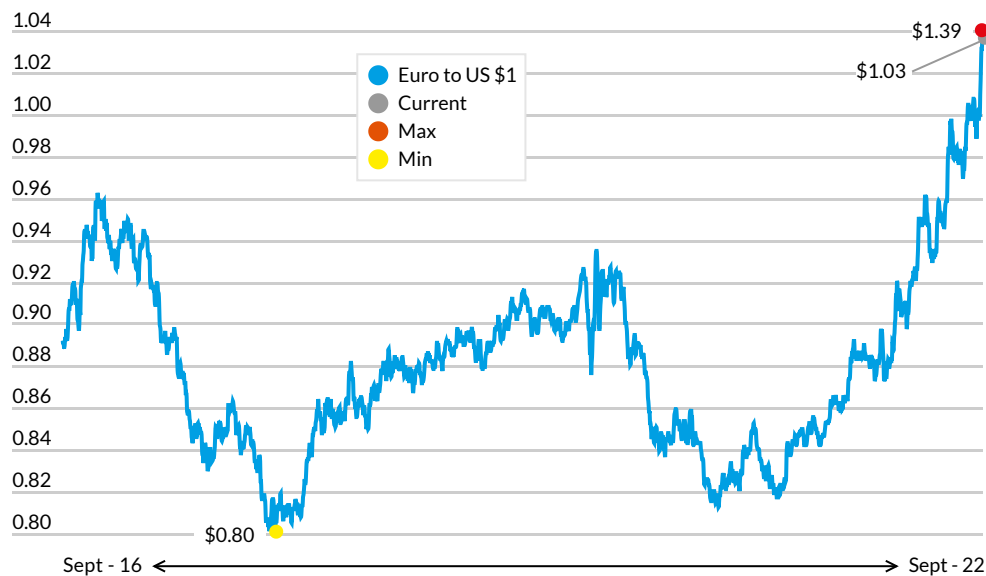
CHINA LIGHT VEHICLE SALES



Sales forecast



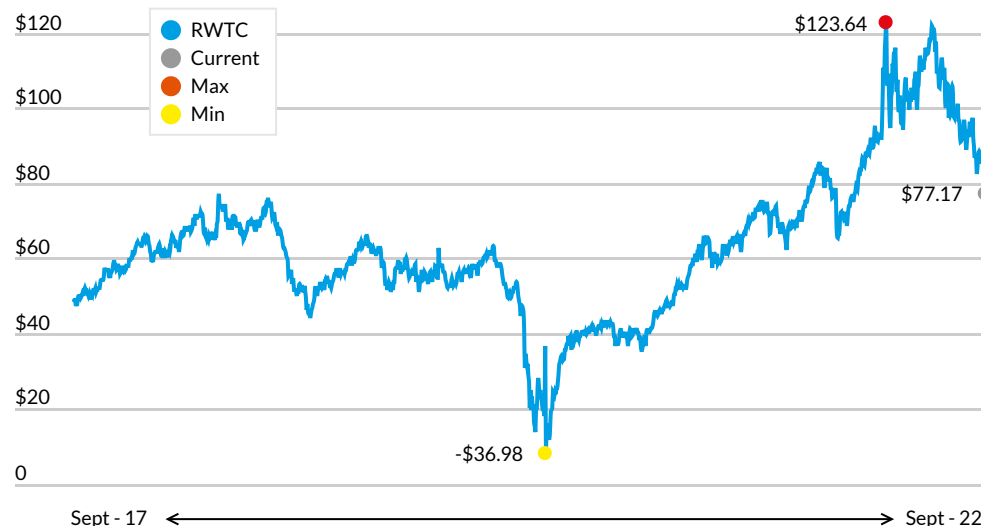
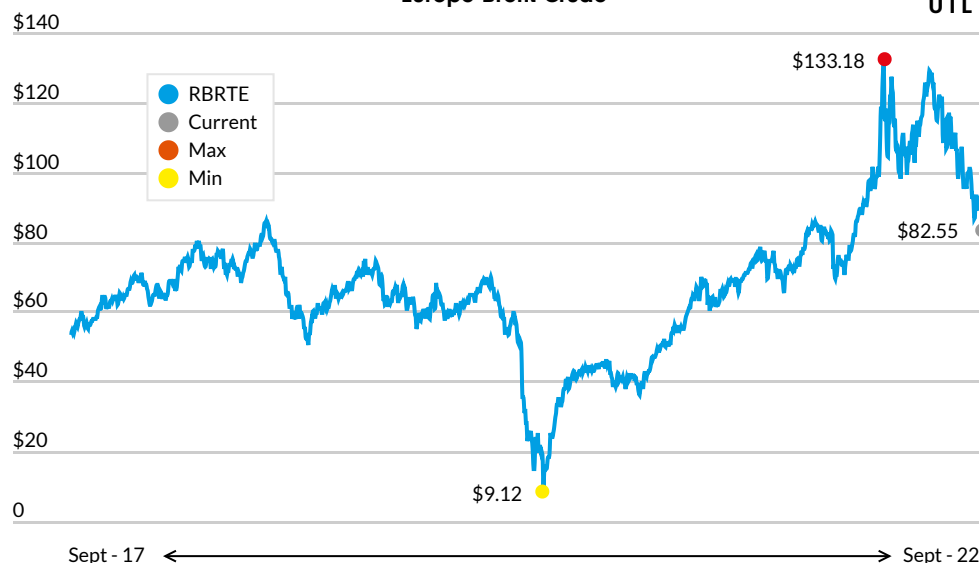
EXCHANGE RATES VS U.S. DOLLAR



Europe Brent Crude

OIL PRICES

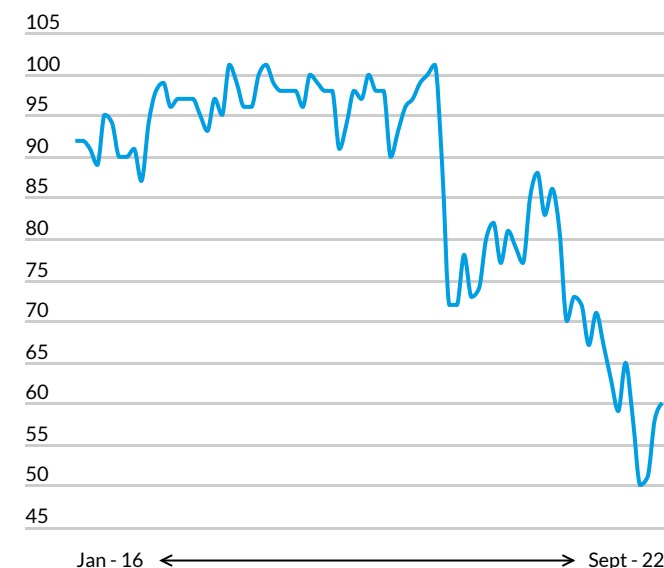
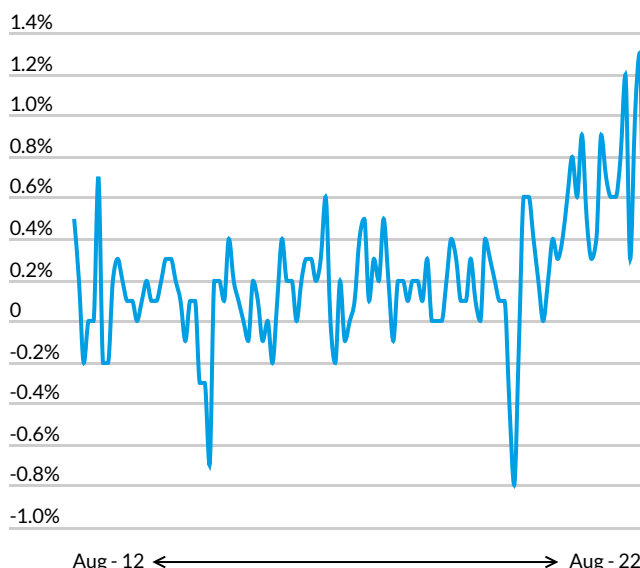
West Texas Intermediate



Change in Personal Consumption Expenditures

United States Consumer Price Index

Consumer Confidence



Federal Reserve Bank of St. Louis

U.S. Bureau of Labor Statistics

University of Michigan

SPECIAL REPORT

BY CONRAD LAYSON

Ford F-150 Lightning

FORD'S F-150 LIGHTNING is aptly named. The EV shares 80% of the structure of the ICE-powered F-150 and 100% of that design's virtues. This means that in the Standard Range 4X4 SuperCrew cab trim, the F-150 Lightning has enough cabin space to accommodate five adults, all over 6ft. in height. Base models come with supportive, well-upholstered cloth seats and rubber mats preserve the carpeted floor. The front center console features a shifter that folds flat when parked, so that the console's storage top can unfold into a flat, laptop-sized worktop for jobsite use.

The F-150 Lightning is a work truck, first and foremost. The front dash features USB, USB-C and a 12V cigarette lighter-style power port. The base of the console facing the rear passengers has those, plus a 120V standard household plug to run a small appliance or power tool. The F-150 Lightning features those 120V household plugs in other places such as the rear truck bed,

as well as inside the 399-liter (14.1-cubic-foot) frunk. The onboard power inverter allows for multiple tool use, provided the battery's state of charge is greater than 50%.

The EPA range of 230 miles for the Standard Range 108kWh battery sets the bar for future competing full-sized, all-electric pickups. Using the CCS plug in the front, left fender, a 150kW Level 3 charger would bring the battery to 80% charge in 44 minutes. Aggressive use of the throttle or hauling significant payloads will bring the real-world useful range down. But a full charge will get most people through a day's operation, with an opportunity to charge overnight.

Using the cabin's 11.3in. touchscreen to set the vehicle in Sport Mode allows the front and rear electric motors to produce 452HP (337kW) and 775lb.-ft. (1050Nm) of torque. Unlike the ICE-powered F-150, the power is put to the road in a startlingly smooth fashion by the double A-arm independent front suspension with coilover shocks, and a trailing arm independent rear suspension featuring coil springs with rearward-canted top perches.

The two electric motors are constantly modulated to provide a limited-slip differential function at the front and rear, as well as full-time four-wheel drive. The rear axle can be electronically "locked" on loose surfaces when required. The resulting dynamic behavior on everyday pavement reveals an F-150 that stops, goes and handles like a much smaller vehicle. Curves can be taken at speeds far above what the gas-powered version can achieve.

New drivers will be deceived: the F-150 Lightning is so smooth that it feels like it is going slower than it actually is.

The regenerative braking in one-pedal operation is aggressive and will need



F-150 Lightning uses an electric motor on each axle to provide four-wheel drive and delivers power smoothly

practice to make perfect. But if that's the only fault in a swift and sure package like the Ford F-150 Lightning, it's not enough for any buyer to rule this truck out. Buyers are in for a treat, as few vehicles are as welcoming to the electric vehicle experience as the Ford F-150 Lightning.



The amount of storage space available in the F-150 Lightning's frunk is similar to a mid-sized sedan's trunk

SPECIAL REPORT

BY JOSH SHASTAL AND SAM FIORANI

Jeep 4xe Day

STELLANTIS'S JEEP BRAND has been touting its electric and electrified plans for years now. With the success of the Jeep Wrangler 4xe plug-in hybrid, the brand just can't wait to get more plug-in models out in the public's hands. The anxiety was so palpable that it just had to take the wraps off of some of the new vehicles planned to be on the road over the next three years.

"Jeep 4xe Day" was September 8 and various Jeep executives showed the new models in a seven-minute introductory video, which quickly garnered millions of views. Chief Design Officer Ralph Gilles introduced the first vehicle, which

'THE 230-MILE RANGE SETS THE BAR FOR FULL-SIZED ELECTRIC PICKUPS'

he said "for now we're calling the Wagoneer S". The apparently temporary "S" stands for "speed," "striking" and "sexy." Fully electric, the Wagoneer S is expected to produce up to 600 horsepower, accelerate to 60mph in just 3.5 seconds and provide up to 400 miles of range. Unlike the truck-based body-on-frame Wagoneer and Grand Wagoneer models, the new "S" will ride on the STLA Large platform and will be more of a mid-sized crossover than a full sport-utility. The Wagoneer S will be displayed to the public next year and production will start in 2024 in North America. Reservations will begin in early 2023 for U.S. customers. The Wagoneer S will be sold in major markets around the world.

Stating that this was the latest entry to the premium "Wagoneer family", Gilles highlighted something that has been largely unspoken since the introduction of the Wagoneer and Grand Wagoneer. This lineup within the Jeep brand



Recon mixes a rugged Jeep feel with crossover comfort

is to highlight different features and attitudes, keeping the Jeep models (Renegade, Compass, Cherokee, Wrangler and Grand Cherokee) apart from the Wagoneer models (base, Grand and "S"), much like Land Rover has its standard models and Range Rover lineup. Even in advertising for the Wagoneer or Grand Wagoneer, the Jeep name is never mentioned and buyers are expected to visit a "Wagoneer retailer".



The Avenger will be Europe's first all-electric Jeep and sold in selected other markets as well but not the U.S.

'EVEN IN ADVERTISING FOR THE WAGONEER, JEEP IS NEVER MENTIONED'

Introduced by Antonella Bruno, Jeep's leader in Europe, was the brand's first fully electric European model. Named Avenger, the crossover will be smaller than the Renegade and will have up to 400km (249 miles) of range. Built in Poland, the Jeep Avenger will not be sold in the U.S. but it will also be offered outside of Europe in places such as Japan and South Korea. The Avenger will make its debut at the Paris Motor Show on October 17, with reservations opening on the same day. Deliveries will begin in 2023.

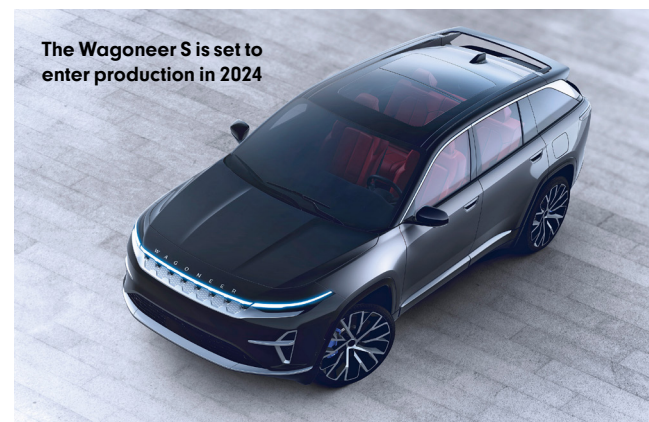
Jeep will offer electrified 4xe models across its lineup by the end of 2025, according to the brand's North America leader, Jim Morrison. He promised that four of those 4xe models will be fully electric. Among that quartet, Morrison introduced the Grand Wagoneer 4xe. The second fully electric model announced, this is a full-sized sport-utility with the expectation that it could travel up to 500 miles on a charge.

Gilles returned to unveil the third fully electric model. Promised "to put a smile on your face", the Jeep Recon is a crossover designed in the image of the Jeep Wrangler. Unlike some competitors, Jeep didn't just take an existing vehicle and

make it electric. Instead, the brand designed an all-new vehicle that stands out from the crowd. Fully removable doors and roof panels provide the same feeling as the hard-core Wrangler but with the on-road comfort of a crossover. With just enough Wrangler cues, this soft-roader is obviously targeting the Ford Bronco Sport. Unlike the pure crossover nature of the Ford product, the Recon takes a step closer to the more traditional models by connecting passengers to the outdoors rather than just getting it to look the part.

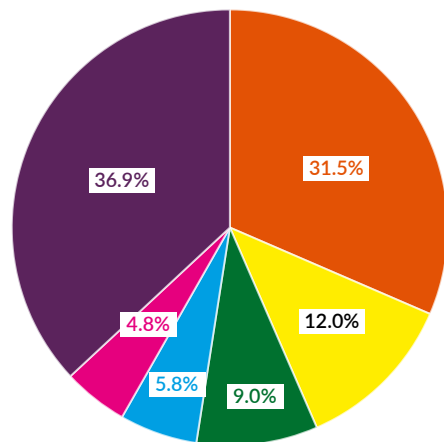
The Recon is promised to have "impressive on-road and off-road capability" with its all-electric drivetrain. While "inspired by the Wrangler", the Recon has a more modern look but retains the traditional Jeep short overhang, front and rear, to aid in off-road driving. The Jeep Recon will be displayed to the public in 2023, with reservations also starting early next year. Production will begin in 2024 in North America. The Recon will be available in major markets around the world.

"Zero-emission freedom" is the target for Jeep as the brand hopes to sell nothing but ZEVs in Europe and half of the U.S. sales will be fully electric by 2030.



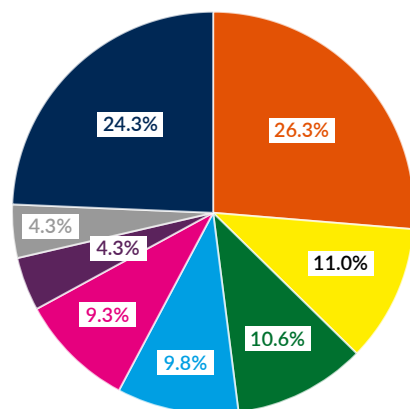
The Wagoneer S is set to enter production in 2024

2022 TOP 5 GLOBAL COUNTRIES



China United States Japan
India South Korea ROW

2022 TOP GLOBAL SEGMENTS



Small CUV Mid-Sized CUV Full-Sized Pickup
B D C Minivan Others

TOP 5 BRAND OWNERS

Brand Owner	2022 Production	Brand Owner	2029 Production
Toyota Motor	10,181,998	Toyota Motor	10,887,770
Volkswagen	8,054,925	Volkswagen	9,433,201
Hyundai Motor	6,967,427	Stellantis	8,172,434
Stellantis	6,944,289	Hyundai Motor	7,963,342
Renault-Nissan-Mitsubishi	6,763,580	Renault-Nissan-Mitsubishi	7,737,133

TOP 5 GLOBAL PLATFORMS

NGA-C	2,462,275	CMF-B HS	3,159,576
CMF-B HS	2,435,345	KP2	2,337,371
MQB A1	2,102,053	Gen III	2,336,766
NGA-K-SUV	1,918,524	NGA-C	2,321,935
N	1,813,807	NGA-K-SUV	2,246,319

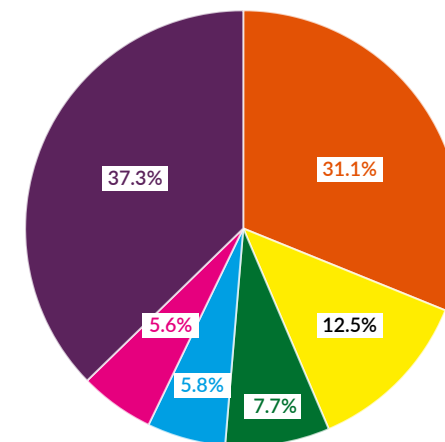
Renault-Nissan-Mitsubishi (CMF-B HS), Toyota Motor (NGA-C, NGA-K-SUV, NGA-C), Tesla (Gen III), Volkswagen (MQB A1), Hyundai Motor (KP2, N)

TOP 5 GLOBAL ASSEMBLY PLANTS

Manesar 1	1,057,871	Manesar 1	1,167,674
Chongqing Engine 1	994,446	Chongqing Engine 1	1,077,602
Liuzhou 2	743,787	Liuzhou 2	731,599
Xi'an 2	613,062	Beijing 1	676,428
Gigafactory 3	610,951	Gigafactory 3	628,157

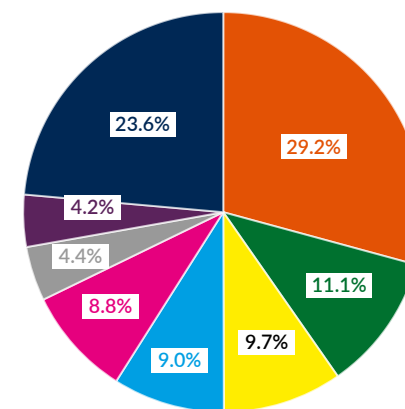
Maruti Suzuki (Manesar 1) Changan Auto (Chongqing Engine 1) SAIC-GM-Wuling (Liuzhou 2) BYD (Xi'an 2) Beijing Benz (Beijing 1) Tesla (Gigafactory 3)

2029 TOP 5 GLOBAL COUNTRIES



China United States Japan
India South Korea ROW

2029 TOP GLOBAL SEGMENTS



Small CUV Mid-Sized CUV Full-Sized Pickup
B D C Minivan Others

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