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[OEM Highlights] BMW to introduce China-exclusive long-wheelbase version of X5 in April

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Outlook	The production volume of BMW Brilliance is forecast to reach around 730,000 units in 2023, compared with 602,460 units in 2020.

BMW AG

BMW will launch a long-wheelbase version of the X5 sport utility vehicle (SUV) in China. The model, which will be introduced as a variant of the BMW X5, is designed specifically to cater to the needs of customers in China and will be locally produced there by the BMW Brilliance joint venture (JV).

The long-wheelbase X5 will be available in China in two versions, the BMW X5 xDrive30Li and X5 xDrive40Li, with sales slated to begin from April. Production of the model will soon begin at the JV's Dadong plant in Shenyang. BMW said that production of the X5 will continue in the United States for the US market and for global markets at Spartanburg, South Carolina. "The capacity freed up as a result of the start of production in Shenyang will be immediately utilised to meet the high demand for the X models in the U.S. and across global markets," said the automaker in a company statement. The Spartanburg plant currently produces the two best-selling BMW models in the US – the X5 and X3 – among others and will also begin manufacturing the BMW XM, a high-performance SUV, towards the end of 2022. Compared with the US version of the X5, the wheelbase of the China-market models has been extended by 130 mm. The extra length is used to enhance seating comfort and legroom for second-row passengers. Features such as specially designed comfort seats and four degrees of extra backrest tilt for the rear seats, a panoramic glass sunroof, ambient lighting, as well as a bespoke M Aerodynamics package will be made available in the long-wheelbase X5 to appeal to Chinese customers. Electronically controlled dampers are standard on the two new models, while the X5 xDrive40Li will feature two-axle air suspension with automatic self-levelling as an option. As for the engine line-up, the X5 xDrive30Li will feature a four-cylinder gasoline (petrol) engine, while the X5 xDrive40Li will receive a more powerful six-cylinder in-line engine. Both engines are paired with an 8-speed transmission.

Outlook and implications

BMW is well poised to advance its sales to new levels in the Chinese market with the imminent production launch of the X5 at the Dadong plant. Market demand for the X5 has long been contained by the model's high price tags,

which start from CNY699,000 (USD110,000), not to mention the high-trim 3.0-litre version that goes above CNY750,000. However, growing customer appetite for premium larger SUVs is pushing up demand for X5 in recent years. S&P Global Mobility data suggest that sales of the X5 hit a new high last year to over 50,000 units, up from 37,692 units in 2019. The availability of the locally made X5 is set to further boost sales of this SUV, although the long list of premium features promised by the automaker suggests that the X5 will still seek to be a premium vehicle in the market as a high-margin model in BMW's SUV family.

BWM is already producing its high-volume models, the 3-Series sedan and the X1 and X3 SUVs, in China at its manufacturing base in Shenyang. The move to add the X5 to its China-made product line-up will give it an edge to compete with Audi and Mercedes-Benz in the larger SUV market. The Audi Q7 and Mercedes-Benz GLE are also sold with hefty price tags as imported models, which constrains their sales growth. From a market perspective, the China-made X5 also represents BMW's answer to defend its market share in the premium SUV market, where Chinese startup Li Auto last year topped the sales ranking of larger SUVs with more than 90,000 Li One extended-range electric vehicles (EVs) delivered. In S&P Global Mobility's latest forecast update, production output of BMW Brilliance is anticipated to continue to grow in the next two years, helped by the X5 and electrified models, including the battery electric version of the 3-Series sedan. The automaker's production volume is forecast to reach around 730,000 units in 2023, compared with 602,460 units in 2020.

[OEM Highlights] SAIC to begin deliveries of IM L7 EV in April

SAIC Motor Group (SAIC) has announced that the first model of the IM brand has already begun volume production at its Lingang plant in Shanghai. The L7, a full-size electric sedan, will be introduced by Zhiji Motor, a joint venture (JV) between SAIC and Alibaba Group, and deliveries will begin in April in China. The model is a similar size to the NIO ET7, which will begin deliveries in China by the end of March. Customers can already place reservations for the dual-motor version of the L7 with a pre-sale price of CNY408,800 (USD64,757). Its two electric drive motors can produce a combined output of 425kW, enabling the driver to accelerate from zero to 100kmh in just 3.9 seconds. It features a 93-kWh battery pack and has a range of 615 km.

Outlook and implications

The IM brand, an electric vehicle (EV) brand introduced by SAIC in 2021, represents the Chinese automaker's latest effort to join the premium EV market with a new identity. The L7 will compete with models like the NIO ET7 in the premium EV market. To support the development of the IM brand, SAIC has set up a team of 200 staff dedicated to research and development activities. The L7 is a well-equipped model with a full range of comfort and intelligent features. SAIC said the L7 can perform automated driving on highway and city streets thanks to its

intelligent driving system, which consists of a Nvidia Jetson Xavier chip-set, 12 high-precision cameras, 5-mm wave radars, and 12 ultrasonic sensors.

[Technology & Mobility Highlights] Autonomous trucks to transform landscape of logistics industry

S&P Global Mobility perspective	
Implications	The logistics industry is going through profound changes with digitilisation and other technological advances that have the potential to decrease significantly the cost of transporting goods over land. Although autonomous passenger cars are receiving the most attention, autonomous technology is expected to have a greater impact on the global trucking and logistics industry. Autonomous technology players have shifted their attention increasingly to trucking to support uninterrupted supply chain logistics of the growing e-commerce sector, which is driven by the rapid increase of online shopping and demand for faster deliveries.
Outlook	Increased vehicle safety is one of the primary motivations for deploying autonomous technology in vehicles. Apart from safety, autonomous vehicles have the potential to result in less congestion on the roads, reduced emissions, and lower fuel consumption. As autonomous trucking becomes more popular, consumer perceptions of autonomous technology's safety will affect its acceptance and adoption, acting as an accelerator or a deterrent.

Waymo

The logistics industry is going through profound changes with digitilisation and other technological advances that have the potential to decrease significantly the cost of transporting goods over land. Although autonomous passenger cars are receiving the most attention, autonomous technology is expected to have a greater impact on the global trucking and logistics industry. Autonomous technology players have shifted their attention increasingly to trucking to support uninterrupted supply chain logistics of the growing e-commerce sector, which is driven by the rapid increase of online shopping and demand for faster deliveries. Autonomous freight transportation is an attractive option as one of many potential business use cases of autonomous vehicles (AVs). The expectation is that, eventually, being able to eliminate the cost of a human driver could make transportation services far more affordable for both the merchant and the consumer. Therefore, these trucks are gaining a great deal of traction in the transportation industries because of a growing shortage of drivers, improved efficiency, and increased safety.

Growing shortage of drivers

A truck driver shortage is adding to global supply chain challenges, preventing the trucking sector from fulfilling the increased demand driven by a boom in e-commerce. In the US, according to an October 2021 estimate by the American Trucking Associations, the shortage of truck drivers was at an all-time high of 80,000. The shortfall might increase to more than 160,000 drivers by 2030, according to the industry body, due to an ageing workforce

and an expected freight increase. Similar shortages exist in Europe and China, which is worsened by the coronavirus disease 2019 (COVID-19) virus pandemic. In addition, limits on the number of hours drivers can work consecutively restricts operations. Thus, autonomous truck developers can be a valuable partner to firms that are trying to address the truck driver shortage.

Underutilisation and inefficient load procurement

Another huge challenge in the logistics industry is underutilisation and inefficient load procurement; hence, these trucks will enable autonomous loading and unloading of containers in yards and ports, resulting in increased efficiency. The low utilisation rates not only reduce the efficiency of operations and distribution for the rest of the supply chain, but also increase the number of trucks on the road, resulting in increased greenhouse gas emissions. These inefficiencies are capable of being addressed through automation. The deployment of hardware components for AVs, such as LiDAR, cameras, and radar, is made easier in freight yards than on roads because of the shorter distances, lower speeds, and closed environment involved. These distribution hubs are likely to serve as an important link in the supply chain, transporting goods from warehouses and factories to the road system. Many companies are looking at opportunities to automate operations to improve throughput, efficiency, and cargo monitoring, as well as to reduce pollution and improve safety. For instance, Chinese truck manufacturer Sinotruk partnered with the Tianjin port services company to develop and operate intelligent autonomous trucks at the Chinese port and the first truck went into operation in April 2018. These trucks form part of automated container wharves at the port with the aim of improving efficiency. According to a Tianjin Port Group press release, in 2018 and 2019, autonomous trucks enabled Tianjin port to increase efficiency and cut operational costs and energy spending by 25% and 50% respectively.

Increased safety

One of the most promising aspects of autonomous truck technology is the potential to increase truck safety. Operating a Class 8 truck is a complex task because of its huge size and weight, making the consequences of accidents very severe. Fatalities of truck drivers have been increasing each year since 2015 and currently the cause of over 90% of accidents is human error. According to the Federal Motor Carrier Safety Administration, an agency of the US Department of Transportation that regulates the trucking industry, 5,237 large trucks and buses were involved in fatal crashes in the United States in 2019, a 2% increase from 2018. Distracted drivers and impaired driving are considered the biggest causes of the increased number of fatalities, which autonomous trucking technology is expected to solve as the systems provide a 360-degree view of the surroundings, process more information, and react faster compared with a human driver.

Current state of autonomous trucking industry

Technology companies have been conducting a variety of autonomous truck pilots and currently these programmes deploy trucks in limited areas where their movement is confined within defined geographies. These pilots are undertaken with the expectation of validating an AV system, starting with linehaul, on-highway applications on simple interstate scenarios and in fair weather conditions. Then, the aim is to expand the pilots to more-challenging driving conditions, aimed at increasing the adoption of automated features in trucks from SAE (Society of Automotive Engineers) Level 1 to fully autonomous capabilities (Level 5). Most of the autonomous truck testing is conducted in the US, as autonomous Class 8 truck testing is allowed in 43 states, and out of those, 24 states permit the commercial deployment of autonomous trucks. Autonomous trucking technology is gaining traction in states such as Arizona, New Mexico, and Texas. However, California, which serves as a global centre of high technology and innovation, has proposed regulations under which companies can test only light-duty

autonomous delivery trucks on public roads. In April 2019, the California Department of Motor Vehicles (DMV), which administers the US state's AV testing programme, allowed companies to test autonomous delivery vehicles weighing less than 10,001 pounds (4,536 kilograms), which are Class 1 and Class 2 trucks. All the other classes, from Class 3 to Class 8, including semi-trucks, buses, and heavy-duty construction vehicles, are not allowed as autonomous test vehicles under this permit system in California.

Outlook and implications

Increased vehicle safety is one of the primary motivations for deploying autonomous technology in vehicles. Apart from safety, AVs have the potential for less congestion on the roads, reduced emissions, and lower fuel consumption. As autonomous trucking becomes more popular, consumer perceptions of autonomous technology's safety will have an impact on acceptance and adoption, acting as an accelerator or a deterrent. A strategic plan to accelerate the development and adoption of commercial AVs includes four dimensions: a legal framework, new regulations, appropriate road infrastructure, and collaboration with manufacturers. Both federal authorities and industry participants should acknowledge that public acceptance of autonomous systems is a critical factor in the commercial adoption of autonomous trucks. Autonomous technology providers must put more pressure on local governments to develop urban environments such as dedicated lanes, clear signage, and certain purpose-built or adapted highways. Governments from different countries are devising policies to allow the testing of autonomous trucks on public roads, which, in turn, is expected to boost the growth of autonomous technology. In addition, industry leaders have formed a coalition with the goal of informing the public about AVs and their potential. Another regulatory aspect affecting AVs is insurance liability. The insurance liability in the event of accidents, as vehicles progress from non-autonomous status to driver-assistance systems and full autonomy, is likely to shift from the consumer to the auto manufacturer. This is because the vehicle's onboard computer will make most of the driving decisions.

Even though autonomous trucking still faces several challenges, including regulation, technology, and commercial return on investment, the industry is expected to demonstrate the first viable business case for the implementation of autonomous technology. Autonomous trucks have the potential to reshape the logistics industry in a fundamental way, bringing tremendous challenges as well as opportunities for stakeholders at all stages of the value chain.

[Technology & Mobility Highlights] Mapping company eMapgo to supply tech for Ford's smart vehicles in China

Mapping company eMapgo Technologies (EMG) is to provide mapping services for two new Ford vehicle models in China, according to a company statement. The Ford Evos and Mustang Mach-E electric vehicle are equipped with automaker's BlueCruise active driving-assistance system, which will use mapping technology provided by EMG. BlueCruise supports Level 2 automated operation, requiring the driver's supervision at all times. EMG's mapping services cover the majority of highways and city expressways in mainland China and updates are performed using over-the-air (OTA) technology to provide technical reliability support for BlueCruise.

Outlook and implications

Ford has a 50:50 joint venture (JV) in China with Changan Automobile, Changan Ford. In December 2021, Ford started deliveries of the Mach-E to customers in China. Ford’s BlueCruise system, which offers hands-free driving on highways, is similar to Tesla's Autopilot system and the Supercruise system from General Motors. EMG is a subsidiary of Luokung Technology and offers electronic and HD maps of China to users with navigation systems. EMG’s map database covers 9 million kilometres of road networks in mainland China, Hong Kong SAR, and Macao SAR.

[EV & Energy Efficiency Highlights] Magna eyes opportunities in electrification, data

Automotive components and assemblies supplier Magna sees its size, scope, and ability to offer complete systems as a brand differentiator, enabling the company to generate more business in electrified and connected vehicles. Automotive News reports Magna CEO Swamy Kotagiri as saying at a media event this month, “Having different systems come together and how well they interact with each other is going to be the significant value that Magna brings to the table… Although electrification began as a solution to address climate change and emissions regulations and requirements, we are seeing it more and more as a brand differentiator [for automakers].” The CEO reportedly also sees the relationship between suppliers and automakers continuing to evolve, saying, “It's important to have the balance to say, ‘I work with these OEMs; here are their strategies and here's what I'm doing for them today, but here's the path for the next step.’ It's not just saying, ‘Tell us what you want and we'll give it to you’.” Reportedly, about 70% of Magna’s current engineering projects relate to electric vehicles (EVs). According to the report, an example of Magna products is a new battery-electric four-wheel-drive powertrain system for pick-up trucks, which is able to be integrated into current light trucks without redoing a vehicle architecture called EtelligentForce. Automotive News reports Tom Rucker, president of Magna Powertrain, as saying, “You can actually just drop it into a regular pickup truck. It uses the same points, the same suspension. You don't even have to do major changes to your assembly line and manufacturing processes.” In addition, Kotagiri highlighted opportunities in data for Magna, reportedly saying, “When we say Magna is a mobility company, we don't constrain ourselves to say we're only supplying systems and components. That means we could play a role in the infrastructure management side, whether it's data or data storage. As vehicles and subsystems become more connected, there is a play there.” Also highlighting the EtelligentForce system as an example, Kotagari said Magna has the potential ability to use data across systems, not consumer data, but using vehicle operational data for greater system efficiency. Kotagari also reportedly said the EtelligentForce system has the potential to improve the performance of a system in winter. He said, “It detects slip. It looks at traction every 10 milliseconds or so. Now, imagine you could do that predictively. That means I'll need to work with the ADAS systems. Well, we do ADAS. As different groups are talking to each other, we're able to bring that consolidation of different systems and take advantage of that. That's what I mean by data… I'm talking about data that's coming from the systems and how we can further optimize it to improve efficiency or safety.”

Outlook and implications

Magna laid out its electrification business plans in April 2021. Since then, Magna has begun work with Jaguar Land Rover on a joint battery electric vehicle (BEV) architecture project and is set to begin production of the all-electric Fisker Ocean. Magna also entered into an EV powertrain joint venture (JV) with LG and acquired an autonomous vehicle design company. Although the company is increasing its work in EVs and its activities involving a number of systems does enable the business scope that Kotagiri has discussed, the company reports

its business in its traditional segments, body exteriors and structures, power and vision, seating and complete vehicles.

[EV & Energy Efficiency Highlights] Hyundai partners with Shell on vehicle electrification, carbon neutrality

Hyundai has signed a memorandum of understanding (MOU) with global energy major Shell to collaborate on electric vehicle (EV) charging infrastructure, hydrogen, digitalisation, and low-emission energy solutions, reports the Maeil Business Newspaper. The two companies will establish EV chargers at the latter's gas stations initially in Asian countries as local demand for EVs is on the rise, and then add more regions to the network in stages. Shell currently operates around 45,000 gas stations across 80 countries. Furthermore, Hyundai and Shell will provide various charging perks for greater driver convenience in the European market, which already has more charging infrastructure. In Germany, the United Kingdom, and Switzerland, Genesis and Shell Recharge Solutions are considering forming a mobility service-provider relationship. They will also increase the use of renewable energy to reduce emissions at their facilities, with the goal of making all manufacturing facilities in the globe totally renewable by 2045 through the implementation of renewable energy solutions. Shell plans to deploy Hyundai's hydrogen fuel-cell trucks and EVs in its global facilities. Efforts will also be made to improve the hydrogen ecosystem and expand the use of hydrogen vehicles globally. Hyundai Motor North America struck an agreement with Shell in October 2021 to build 48 hydrogen charging stations in California. In the digital sector, connectivity services such as those for vehicle management and smart maintenance will be expanded, highlights the report.

Outlook and implications

Under the partnership, Hyundai aims to accelerate its transition into vehicle electrification and the achievement of its carbon neutrality goal, while Shell anticipates gaining momentum for an expanded green energy business. Hyundai Motor Group has expressed its desire to achieve zero emissions and stressed the importance of addressing climate change. Carbon neutrality can be achieved either by balancing carbon emissions with carbon removal or by cutting carbon emissions entirely. Both Hyundai and Kia have announced their plans to achieve carbon neutrality by 2045 and sustainable and profitable growth in future through vehicle electrification and energy solutions investment. S&P Global Mobility forecasts that global production of Hyundai Motor Group’s alternative-powertrain light vehicles, including those of affiliate Kia, will grow to around 2.2 million units in 2025, up from about 922,000 units in 2021.

[GSP] Global Sales and Production Commentary -2022.02

Global sales

January 2022: -3.6%; 6.36 million units vs. 6.59 million units

For 2022, global supply chain conditions remain a key factor in governing an elusive production recovery, which is necessary to drive demand. The auto chip “famine” remains a major issue, but we also acknowledge pressures on other key components, logistics, commodity prices, raw materials, and workforces, alongside evolving COVID-19 and geopolitical impacts. The path of the pandemic remains an important driver of the auto demand cycle, especially the “race” between vaccine and variants. Vaccination programs should continue to protect population immunity levels for key markets, with many Northern Hemisphere nations cautiously emerging from winter COVID-19 Omicron infection waves. Specific Omicron impacts on auto demand appear limited—additional economic effects would have to be very significant to lower auto demand below already-imposed supply constraints.

January 2022 global demand fell 3.6%, with mixed recovery signals as semiconductor supply remains a lingering constraint, while the latest COVID-19 Omicron wave appears to be plateauing in many key markets. Struggling vehicle output levels are expected to affect vehicle lead times for some time, pressuring depleted inventory levels and delaying fulfillment of prevailing order levels.

Demand continues to trend well below pre-pandemic levels, with 2021 global sales posting a provisional 79.85 million units, up by 3.5% year on year (y/y). We expect a limited recovery for 2022 (+3.8%), with growth rallying into 2023 (+8.6%) as supply chains continue to adapt. The longer the supply squeeze lasts, the more potential there is for some “lost” or “destroyed” demand, reflecting fading pent-up demand and a reduced market push. Recent bias toward the upside for vehicle output provides some hope for vehicle demand levels in 2022-23. Risks to the forecast remain, notably cost of living concerns (especially energy prices) and the tense Russia-Ukraine situation. Our forecast assumes that there will be no interstate war with Ukraine.

The global economy slowed abruptly in January as the Omicron variant sent new COVID-19 cases to record highs. Following a 3.4% contraction in 2020 and an estimated 5.6% rebound in 2021, world real GDP is projected to increase 4.0% in 2022, 3.4% in 2023, and 3.1% in 2024. The JPMorgan Global Composite Output Index (compiled by S&P Global Mobility) fell 2.9 points to an 18-month low of 51.4. Both manufacturers and service providers reported slower growth in output and new orders. While input cost inflation eased, output prices increased at the fastest pace in three months. The price of Dated Brent is projected to average USD82/barrel in 2022, and USD71/barrel in 2023 (USD71/barrel in 2021).

Mainland Chinese demand posted 23.8 million units, up by 0.4%, reflecting a mild improvement in deliveries at the tail-end of 2021 into 2022, perhaps including completion of partly built vehicles. Risks remain as ongoing chip shortages are compounded by the zero-COVID policy and property sector deleveraging. The year 2022 is set to 24.6 million units (+3.5% y/y). More meaningful recovery is expected for 2023—back above pre-crisis levels to 26.7 million units, up by 8.3% y/y.

US auto demand remains ultra-low on struggling production, hit hard by chips and worker shortages, with dealer inventories running dangerously low, perhaps less than half of normal levels. Year 2021 posted 15.08 million units (+3.4% y/y), with 2022 forecast at 15.5 million, up by just 2.8% y/y. More typical demand is expected for 2023, up by 8.9% to 16.9 million units, as supply normalizes.

European autos remains mired in uncertainty as improving virus infection levels interact with ongoing supply chain woes and rising concerns on Russian-Ukraine tensions. The 2021 Western and Central European demand forecast posted 13.9 million units, up just 0.2% y/y. Demand in 2022 should post 14.9 million units (+7.6%). The region looks set to experience modest recovery growth for 2023, to 16.4 million units, only recovering above 17 million units in 2024 (at the earliest).

In the last 6-12 months, there has been an unprecedented flurry of OEM announcements on electrification ambitions for the coming 5-15 years. Electric vehicles (EVs) are fast evolving from a compliance side hustle into fully fledged core offerings for many OEMs. Inspired by COP26, policy makers and regulators have also been sharing their visions for a greener future. Transformational change is firmly on the agenda and making sense of this arms race of ambition represents an ongoing challenge.

Global production

January 2022: -5.6%; 6.38 million units vs. 6.75 million units

Production in late 2021 finished on a strong note, and some of that strength is expected to carry into early 2022. This has been supported by several factors linked to the normalization of activity in Malaysia and the more efficient use of available chips by OEMs and tier-1 suppliers. A one-time surplus of semiconductor chips was effectively built up while Malaysian back-end processes were disrupted. This has meant that as these operations have come back online, they have been able to increase the number of deliveries to automotive customers. The effect is expected to be one-off, as once this surplus is absorbed, the levels of supply will fall back in line with underlying capacity within the semiconductor supply chain, which has not changed significantly since the issues first emerged in late 2020 or early 2021. The combination of robust chip demand from nonautomotive sectors and increasing automotive semiconductor content levels will keep pressure on the semiconductor supply chain over the next 12 to 18 months.

[Supplier Highlights] Chinese battery startup QingTao plans to invest USD790 million in solid-state battery plant

The project entails total investment of USD790 million and is expected to generate an annual output of USD1.58 billion at peak production

Source: Getty Images

Chinese electric vehicle (EV) battery startup ChingTao Energy Development broke ground on a solid-state lithium battery project in Kunshan city, eastern Jiangsu province, on 26 February 2022, a report filed by cnevpost.com said on 1 March 2022, citing a press release from the local government. The company plans to invest CNY5 billion (USD790 million) in setting up a battery plant, which is slated to have an annual capacity of 10GWh per year. According to the report, the said battery plant is expected to bring an annual output of CNY10 billion when it would reach production. Citing the press release, the report further mentioned that the timeline associated with the construction and commencement of operations at the battery plant remains undisclosed.

Outlook and implications

EV battery startup QingTao was founded in 2014 and is known to have completed series-A and series-B financing in 2016. Later in 2017, QingTao completed its series-C financing round with a valuation of CNY1.25 billion, it said, adding that it completed its series-D funding round in 2019 and series E+ and E++ rounds in 2021. The amount raised in each funding round remains undisclosed. QingTao's chairman, Feng Yuchuan, and the core members of his team come from Tsinghua University and have been granted over 300 patents to date, the report said.

It further added that in 2020, the battery startup had also completed a solid-state lithium battery production line with a capacity of 1 GWh per year. QingTao also saw the Neta U and BAIC prototypes with its solid-state batteries roll off the line in 2020, the report said, citing the company website.

[Supplier Highlights] Qualcomm develops new snapdragon digital chassis connected car technologies

It will support out-of-the-box connectivity, integrated analytics and a cloud and device developer environment

Source: Getty Images/Jackie Niam

Qualcomm Technologies has unveiled a new feature for its Snapdragon Car-to-Cloud Services called Connectivity-as-a-Service, it said in a press release on 28 February. The new service will support out-of-the-box connectivity, integrated analytics and a cloud and device developer environment.

Qualcomm also highlighted the Snapdragon Telematics Applications Framework, an integrated application framework for developing telematics and cloud-connected applications and services. It introduced is a new Wi-Fi 6E automotive chipset for high bandwidth applications.

“By expanding our in-vehicle connectivity offerings to provide a transformative, scalable, extensive suite of solutions through the Snapdragon Digital Chassis, we are confident the automotive industry will be able to deliver the unmatched next-generation driving experiences customers deserve,” said Nakul Duggal, senior vice president and GM, automotive, Qualcomm Technologies.

Outlook and implications

Snapdragon Car-to-Cloud Services can expand system performance and features, while enabling new digital services. Connectivity-as-a-Service expands these capabilities to provide global connectivity on Snapdragon Telematics SOC-based NAD modules. The Snapdragon Telematics Application Framework, which is expected to be available soon, is compatible with present and future platforms within the Snapdragon Digital Chassis.

[Special Article 2] S&P Global Mobility's pessimistic scenario on Ukraine sees 3.5 mil. lost units of light-vehicle production in 2022

S&P Global Mobility perspective	
Implications	S&P Global Mobility's pessimistic scenario of the impact of the invasion of Ukraine by Russian armed forces will wipe up to 3.5 million units off global light vehicle production in 2022.
Outlook	This is an initial assessment of what could be the worst-case scenario, focused on further disruption to semiconductor production, as Ukraine and Russian both provide gases and other materials used in this process.

S&P Global Mobility

S&P Global Mobility has published an alternative production forecast contingency that focuses on the potential disruption to semiconductor production as a result of the Russian armed forces' invasion of Ukraine that took place on 24 February. The pessimistic scenario will wipe 3.5 million units off our most recent forecast for global light-vehicle production for 2022 as a result of sustained semiconductor manufacturing supply disruption. The pessimistic case is based on the semiconductor manufacturing industry relying on gases, particularly neon and other input materials such as palladium, which Ukraine and Russia has traditionally provided a large proportion of. In the pessimistic scenario we are assuming that supplies of gases and materials are significantly disrupted by the invasion, which appears increasingly likely given the extent of the conflict and the sanctions regime that has been imposed on the Russian government and financial system. It is also highly possible that sanctions will include some neon purification plants located in the breakaway republics of eastern Ukraine. This scenario would mean alternative supply sources will be found, although we would assume several semiconductor plants are forced to run intermittently at suboptimal speeds between the third quarter of 2022 and the second quarter of 2023. This lost production is unrecoverable, given limited additional capacity at fabrication plants and lost chips ultimately means lost vehicle production and lost vehicle sales.

Outlook and implications

It should be mentioned that this alternative forecast is based on disruption to semiconductor production at this time, and not on any other factors. The Volkswagen (VW) Group has already reported some lost vehicle production as a result of the disruption to wiring looms supplies from Ukraine, although this should be relatively limited as these components are mostly dual-sourced. S&P Global Mobility is aware of other supply chain disruptions that are likely over the next several months, which may even extend to raw material availability. However, at this stage our main focus has been on any further loss of semiconductor output – that has been the dominant bottleneck in the entire auto supply chain over the past year, and it remains so. In addition, the sharp

slowdown in the global economy and reduction in vehicle affordability we expect due to the Ukrainian crisis will not significantly lower global sales and production over 2022 or 2023. This is because production limitations will be the dominant constraint over this period. However, it will destroy potential demand during this period, which will mean less pent-up demand will be unleashed once production constraints are removed; as a result, we expect the medium-term sales recovery will be weaker over 2024–27. However, focusing on 2022, some semiconductor manufacturers have been relatively bullish about their ability to withstand any constraints on input materials normally sourced from Ukraine and Russia. According to a Financial Times (FT) report Micron, one of the largest memory chipmakers, claimed that it has a diversified supply of neon from a number of different sources. Intel, the largest US chipmaker, also described its supply chain as diverse and global, and added that it did not expect any further disruption. While this article outlines the pessimistic scenario in detail, our base case is likely to be in the region of 1–1.5 million units. In the pessimistic scenario, a fall in production could bring volumes down by up to 3.5 million units, taking global light-vehicle production for the year down to 80.6 million units.

[VIP ASSET] Semiconductor supply issue: Light-vehicle production tracker

S&P Global Mobility assesses the impact on light-vehicle production of the ongoing semiconductor supply issue.

Semiconductor
Shutterstock/Dario Lo Presti

Reports of disruption within the supply chain of semiconductors to the automotive sector began in late 2020 and is now continuing in the first quarter of 2022. Pressure built up as the automotive industry's recovery from the widespread coronavirus disease 2019 (COVID-19) virus pandemic-related lockdowns experienced during the first half of 2020 clashed with increasing demand from the wider consumer electronics sector, itself recovering strongly and, late in the year, building stocks for the holiday season. The situation was further exacerbated by other factors, including the fire at Renesas' Naka (Japan) facility on 19 March 2021, which only reopened fully in late June, and following the severe weather that hit the southwest US in February 2021. Other factors have also come into play more recently, such as the impact of the COVID-19 virus on parts of Southeast Asia, and especially Malaysia which undertakes many labour-intensive back-end tasks in the semiconductor supply process. Floods in Malaysia during December have been having an impact.

Many OEMs have been affected by this situation and will continue to be so. Here is a selection of key automakers that have been hit, the steps they have taken to mitigate the situation and their expectations going forward.

General Motors (GM)

GM's production has been affected across its operations in North America, South America, and Asia as a result of the semiconductor shortage in 2021, continuing into 2022. In North America, despite attempts to avoid experiencing impacts on some of its highest-margin products such as full-size pick-up trucks and sport utility vehicles (SUVs), production disruptions hit these products because of this component shortage mainly in the third quarter of 2021. In 2022, a site in the US and another in Mexico remain on the single-shift production schedule implemented in the fourth quarter of 2021. GM has been trying to maintain uptime by cutting some features from the specifications of certain vehicles.

There have also been significant ongoing disruptions at its Brazilian operations, with the Gravatai facility affected by a stoppage that lasted for around five months. The end-of-year shutdown was slightly longer than usual at two weeks, but a more substantial halt of around one month will take place over February and March 2022. At the São Caetano do Sul plant, the latest production stoppage extended the end-of-year break for longer than usual,

to four weeks and into 2022. There was also a three-week end-of-year stoppage at the São Jose dos Campos plant. Elsewhere, GM's two sites in South Korea have reduced output at various times during all four quarters 2021, with a halt at Pupyong also hitting the first week of 2022 for some models while others had output cut by 50% through January. In China, there were limited disruptions to production at the SAIC-GM joint venture (JV) in the second and third quarters of 2021; so far, no disruptions have been reported in 2022.

On the announcement of its fourth-quarter 2021 financials in early February 2022, the company highlighted that the semiconductor shortage continued to drag on its performance late in to that year. However, although wholesales continued to decline during the fourth quarter, this retreat was not as great as that in the third quarter. Furthermore, strong pricing has helped matters as customers are prepared to pay more for those vehicles that are available. Looking forward, the automaker expects wholesales to improve by between 25% and 30% during 2022, suggesting a greater supply of vehicles.

Previously, the automaker's president, Mark Reuss, has also said that the company is looking to reduce the number of unique semiconductors that it uses in its vehicles by 95%. It is said that the change could strengthen the flow of GM's semiconductors after the shortage. It also expects its semiconductor requirements will more than double over the next several years. GM will also consolidate core microprocessor chip purchases into three families, which will be co-developed, sourced, and built with leading semiconductor manufacturers.

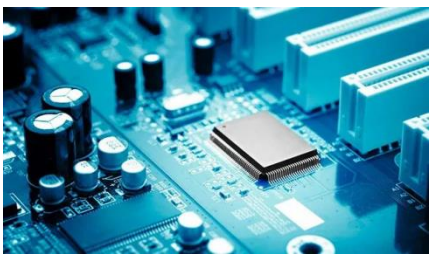
Stellantis

Stellantis's operations in North America have undergone some significant disruptions caused by the semiconductor shortage. The majority of sites were hit by multi-week production stoppages during 2021, including 23 weeks at Toluca (Mexico), 24 weeks at Belvidere (US) and 25 weeks at the Windsor (Canada) facility. Some sites avoided or managed to minimise the impact suffered, especially for new and profitable vehicles. These include the Mack Avenue (US), which manufactures the Jeep Grand Cherokee; and Toledo North (US), which builds the new-generation Jeep Wrangler. However, the Jeep Gladiator pick-up saw its production halted temporarily at the start of August, while the Saltillo Truck (Mexico) site, which mainly builds heavy-duty Ram pick-ups, stopped production for a week at the end of September and into the fourth quarter. The impact of the shortage on its wider production footprint seems to have been relatively limited during the fourth quarter of 2021, but a week-long stoppage took place at Windsor during January 2022 as well as some days in February, alongside a week-long stoppage of Belvidere the following month.

At its European operations, the situation has been mixed, but sites have been hit across the former Fiat Chrysler Automobiles (FCA) and Groupe PSA facilities over the course of 2021 to varying levels of severity. Among former FCA facilities, so far in 2022 Val di Sangro (Italy), which builds its large van range, while production at Cassino and Melfi (both Italy) have also been hit during the first quarter. The pain for former PSA sites has been shared

across locations that build vehicles based on its subcompact CMP and compact- and mid-size EMP2 architectures, which are assembled across Western and Central Europe, during 2021. As well as stoppages and cancelled shifts, for some popular models, overtime and additional work plans have been dropped. One of the most notable was the plan to halt production at Eisenach (Germany) throughout the fourth quarter. In Spain, its Vigo plant saw an agreement to extend the use of the ERTE temporary redundancy scheme for 60 days into 2022, which is extendable for a further 15 days, and was used so far in January and February. Use of ERTE at the Madrid facility has also been extended through 2022. Meanwhile, at Zaragoza, the ERTE has been extended to 60 days during 2022, allowing two days of stoppage at the beginning of the year and further shifts to be cancelled in February. On a more positive note, the automaker has introduced a second shift at its Mulhouse (France) production line in January to support increased production of the new generation Peugeot 308 as component availability becomes less constrained. However, this has been followed by more production halts in February, and delays to plans for a third shift to be implemented originally from mid-April, as well as at Rennes (France).

Another core production location for Stellantis is its Betim (Brazil) facility. Although it has been hit by disruptions during the first three quarter of 2021, intelligence suggests that the fourth quarter suffered the biggest impact so far. This is thought to be down to the automaker prioritising products built at its Pernambuco (Brazil) facility, which are more profitable.



On the announcement of its 2021 financial results in late February, Stellantis said that output was down by around 20% or around 1.7 million units compared to its planned production due to the shortage of this component. Further evidence of this can be seen in its global inventory. The company said inventory stood at 791,000 units on 31 December 2021, of which 96,000 units are in the automaker's own inventory and 695,000 at dealers. This compares to 1,256,000 vehicles in its inventory on 31 December 2020. It noted that dealer inventory in North America has fallen by 186,000 units in North America since the end of 2020, as well as dropping by 211,000 units in its Enlarged Europe region during the same time frame, primarily due to unfulfilled semiconductor orders. However, the data that Stellantis has released also suggests that the semiconductor situation and its impact on production is improving as inventory is up from the record low at the end of the third quarter of 2021 when it stood at 689,000 units, of which 148,000 units were in the automaker’s own inventory and 541,000 units at dealers.

Stellantis also announced in December that it has reached an agreement with Foxconn which looks set to streamline the different types of semiconductor that the automaker will use in future.

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