# Looking forward to 2023

## Key themes for the year ahead

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As 2022 draws to a close, we use our new Talking Heads series to engage with AutoTechInsight's practice leads to find out what challenges and opportunities face their domains in 2023.

The current year has again been dominated by the chip crisis. Overlaid on this has been the worsening macroeconomic position due to the fallout from the Russia-Ukraine conflict, which has had knock-on effects for the industry in terms of demand surety. In turn this has brought an end to the era of cheap capital, which has served to slow the burgeoning mobility startup ecosystem. In the broader sense the sector looks set to be heading to a phase where demand-side considerations replace the current supply-side fixation.

### Matteo Fini

#### Vice President, Automotive Supply Chain, Technology and Aftermarket, S&P Global Mobility

If one looks across the sector, I sense that the topic of supplier resiliency will come to the fore in 2023. The macro environment is not conducive to success for those suppliers who've not got a good handle on costs or a degree of operational flexibility to manage the headwinds. This is most apparent in Europe,

High energy costs combined with stagnant volumes and rising financing costs will create major pressures for suppliers in the region. The risk factors appear heightened in Germany. Smaller tier-1 suppliers there – those with revenues between EUR100 and EUR500 million – and tier2 suppliers seem the most exposed.

In the last couple of months, we saw German suppliers Ruester (vibration/damping products) and Dr. Schneider (ventilation and interior trim parts) file for insolvency. Ruester's case is quite interesting as they faced liquidity problems following two acquisitions and rising input costs. I would expect this becomes a theme in 2023.

Additionally, energy intensive parts of the value chain, such as metal foundries, that also rely on volumes for returns will have to navigate the maelstrom. Indeed, any company that overstretched itself in 2021 and early 2022 with major investment programs contingent upon a return of pre-crisis volumes will have to reconsider its priorities for survival.

### Jeremie Bouchaud

#### Director, Semiconductor, E/E and Autonomy practice, S&P Global Mobility

*Semiconductors*

The structural capacity deficit will take years to solve. While there was plenty of investment in capacity in 2021 and 2022 it takes time to bring additional capacity online. The lead time for equipment increased from one to two quarters to between two and two-and-a-half year. That means that some of the investment and CAPEX boom in 2022 will not result in significant additional capacity before 2024 or 2025.

While the supply-side issues won't see any immediate relief the demand side will bring some respite. As we had predicted in January, more of the existing capacity in the sector was allocated to automotive in H2 2022 and this will continue early into 2023 and this arose because of a slowdown in other chip-hungry industries like telecoms and consumer electronics. Additionally, aggregate demand conditions are deteriorating globally due to the war in Ukraine, inflationary pressures, and a generally moribund economic outlook. These conditions may mask the capacity issues in 2023 but one should not be fooled. The average chip content per car is increasing at an accelerated rate because of electrification and the capacity deficit will become visible again as soon as demand from other industries picks up again.

Analog will remain the main bottleneck in 2023 though due to several factors. First, due to the number of analog chips per car increases faster than the number of MCUs. Additionally, analog chips don't shrink as well as SoCs or MCUs; this means production remains on mature process nodes where there is not enough capacity and not enough investments. Lastly, the demand for analog is strong in other mass markets – especially mobiles phones.

To mitigate semiconductor risks we expect that for 2023 and beyond that will rethink the way electronics are designed in their vehicles. They will work on increasing the standardization of chips and reducing the fragmentation/variety of chips they use. For example, we expect them to make sure their Tier 1 suppliers use fewer ASICs/ASSPs (custom chips or chips designed for a single applications) and use more general-purpose chips. In Japan we're also seeing some effort, led by the government there, to simplify chip qualification across OEMs and Tier 1s. Reduced customization and the use of more multipurpose chips will mean that OEMs can increase their vehicle output for a given chip capacity because there are fewer single points of failure. Also, it is easier to reallocate optimally available chips across different systems.

Revenue growth for automotive semiconductors will slow in 2023 to around 13%, after an estimated 22% in 2022. This is a soft landing for the sector, but one cannot rule out a harder crash for automotive semiconductors. Much will depend on how the demand for vehicles evolves. It is unclear how much of the inventory will be burnt and when.

*Autonomy*

The robotaxi race is about to get interesting in 2023. There's been a lot of focus on Ford and VW pulling out of Argo AI, but that shouldn't detract from what's happening in autonomy.

Regarding robotaxis I believe we are about to see a reshuffling of the pack. At the moment, the tech companies like Waymo are seen as winning the race. But I don't see first mover status as necessarily conferring any sustainable competitive advantage. If we stretch the race metaphor further, the tech companies – like Cruise and Baidu - have done a great job of reacting to the starter's pistol and getting out of the blocks first. But the first part of the race is akin to the technological demonstration. To deliver the robotaxi future, I think the much more difficult piece to execute against is commercialization.

Here, neither investors nor the capital markets will continue to pay the bill if there is no revenue generated. As we enter the commercialization phase, the challengers will not just emerge from robotaxi tech peers like Pony, WeRide and Waymo but also from the car manufacturers. The car manufacturers have some advantage here in that they're already operating large fleets complete with automated driving functions like Level 2+. Tesla and XPENG are targeting the delivery of robotaxis in 2023. They are training the software with data that comes free of charge from the millions of vehicles already on the market. Meanwhile, robotaxi companies are burning cash to collect richer data from a far smaller pool of vehicles on the roads. Data is the new oil. Trained software, built on real-life data, is a more scalable path forward, and will be augmented by simulation to cover edge cases. However, that said, it has not yet been proven that automated vehicle content can be successfully leveraged into L4 on-road deployment—or if these automakers can deliver on promises that have gone unfulfilled before.

When we look at the commercialization and productization issues, cost discipline and awareness is a bread-and-butter competency of the OEMs. If Tesla and XPeng can demonstrate this approach in 2023, we're going to see more legacy OEMs jostle for position in the robotaxi marathon. But tech companies like Waymo and Baidu do have the enormous cash reserves that will be necessary to sustain a position in the race on the long runway before profits takeoff.

## Dr Tawhid Khan

### Director, Software practice, S&P Global Mobility

Two key things stand out for me in 2023. Despite mounting tensions in US-China relations, there are no signs that Germany's industry is ready to participate in a united western front. The recent visit to China by the German Chancellor Olaf Scholz, during which he was accompanied by German industry leaders such as the VW and BMW CEOs - Oliver Blume and Oliver Zipse respectively – has reinforced this view. Comments from both CEOs emanating from the visit reinforced this view with both adamant that transforming their companies is reliant on the Chinese market and being able to manufacture cars in the

country, particularly in the EV era. Perhaps more telling was a comment from the previous VW CEO, Herbert Diess who stated, 'Without the deals with China, inflation would continue to explode'. Given the energy crisis that's hitting Europe, and Germany particularly hard, the continuing focus on China in the face of the contradictory noises and policies coming from allies such as the US and the UK indicates that German industry will continue to place large bets on China. This is seen as a strategic move to alleviate the pains of the energy crisis and the accompanying stagflation.

Second, and more directly related to my domain, there's the looming question of who will win the automotive software wars. Will it be the automakers, or will it be big tech? If not giving us an answer, 2023 will give us more clues as to the direction the battles will take. Consumers are beginning to adapt to, and embrace, the new philosophy of tech-focused transportation. The pressure to deliver the new groundbreaking technologies is enormous for the OEMs. To deliver, the OEMs require a massive influx of talented software developers. The market for software talent is highly competitive – OEMs are competing with their supply base for this talent as well as the tech companies. The automotive sector has a couple of obstacles in its path if it wants to develop its own software ecosystems. The industry is bound by process and legislation, and this doesn't make the sector particularly attractive to young software graduates. Finding a way to attract the necessary talent to the industry will be key. The reinvention of the industry to try and win the talent battle will be interesting to observe. Already we've seen VW's CARIAD – an attempt to create company with big tech behaviors - struggle to deliver. It will be fascinating to see what other players in the sector do to try and lure the best talent to the industry.

# Brian Rhodes

## Associate Director, Connected Car and Vehicle Experience, S&P Global Mobility

*Connected car*

The tumultuous economic and supply chain situations of the previous two years+ have put a focus on margin performance by automakers, which have soared to record highs. This renewed focus on margin performance will evolve as demand for new vehicles faces headwinds. As a result, the potential for margin growth from add-on features and services have garnered not only more attention – but more commitments to Wall Street. These connected services and paid updates can achieve a margin of greater than 70%, which makes this space incredibly attractive for an industry seeking cover from the cyclical nature of selling vehicles.

A sampling of 2030 revenue targets related to software and services:

- General Motors – $25b, software, services, subscriptions
- Stellantis – $23b, software
- Renault – 20% of revenue, data, mobility, energy services
- Volkswagen – 20% of revenue, subscriptions, mobility services

2018-20 were years of deployment, with many automakers both standardizing connectivity hardware in regions that don't traditionally support higher option pricing as well as the release of new generations of TCU (telematics control unit) hardware that will keep a connection active much longer. 2020-21 saw releases of new innovative service-oriented business models beyond Tesla, and 2022 was underscored by leading automakers leveraging the flexibility of these services to adjust packaging, pricing, and availability of features. We expect 2023 to be the launching pad for similar features, with much broader use cases, from mainstream follower automakers. This development will be critical to moving the concept of built-in upgradable content from headlines to reality for consumers with newer vehicles.

# Graham Evans

## Director, Battery, Charging, Propulsion and Thermal practice, S&P Global Mobility

*Battery*

For batteries there are a couple of areas that will come more into focus in 2023, namely:

– The raw materials deficit, how the industry addresses that, and what are the additional implications for sourcing decisions on the carbon footprint. On one hand there's this massive need to secure raw material supplies, but they can't be secured at any cost because ESG considerations are gathering momentum. Added to this mix are the implicit needs of the US's Inflation Reduction Act (IRA), which has sparked many OEMs and suppliers into tearing up their battery playbooks for the US market to secure access to manufacturing subsidies and purchase subsides for their consumers.

- Secondly, as we know inflation is a burgeoning issue around the world due to the confluence of the pandemic's aftermath and the Russia-Ukraine conflict. This is putting pressure on consumers, and we could see a pivot from the OEMs to address the changed macroenvironment. For example, does this mean a switch to lower tech battery solutions (and implicitly lower cost batteries) such as those with LFP (Lithium-Iron-Phosphorous) based cathode chemistries to secure higher margins, or will it mean increasing demand for batteries with a lower capacity and therefore compromises on vehicle range?

*Charging*

In 2023, we might get a little closer to finding out whether a couple of nascent technologies that have been around BEVs for a while have a chance of mainstream adoption

- First, there's battery swapping and the question of whether it can be deployed outside China where government incentives and geospatial issues in cities have driven its initial success. Nio, a key player in China, is launching in Europe and already has a handful of stations in Norway – so that market, as ever with EVs, is an interesting petri dish for swapping in Europe. In the US, it'll be interesting to see if Ample, the Californian start-up, can drum up sufficient interest in the fleet sector it's targeting. However, swapping has more against it outside China. There's the propensity for home charging, the lack of governmental directive and the need to homogenize battery packs which would see OEMs and T1s surrender some of their IP.
- The second thread to charging is wireless charging developments and its deployment by mainstream OEMs. While BMW, Hyundai (both with WiTricity's Halo) and Volvo (with InductEV) have already dabbled with wireless charging, widespread adoption of the technology has the potential to challenge the current stand-off between battery size and range. Consumers will be able to charge more conveniently at home and adopt 'splash and dash' behaviors if dynamic wireless charging becomes widespread. The technology suits fleet applications well, such as taxis, but are mainstream consumers prepared to pay a premium for such convenience technology when the industry has already converged on the charging plug?
    - DC wallbox chargers are also something to lookout for the in the domestic charging sphere. They offer a halfway house between slow AC chargers and the superfast public DC chargers. Their wider deployment has potential to shift the balance in the domestic vs public charging conundrum. Furthermore, there are models available that facilitate V2G (vehicle to grid) operation, which could prove more appealing in these energy conscious and cost-sensitive times.

*Propulsion*

The Euro 7 implications are important for technology fitment on vehicles still fitted with an internal combustion engine, however supply chains ramping up to support E-motor applications are not without their challenges.

- The proposal for Euro 7 emissions was finally announced in October 2022. The limits were watered down from what had initially been signposted. This will cause many OEMs to pause for thought on their electrification plans – does Euro 7 make it worth investing in one more round of ICE updates? Or does it make more sense to focus on electrification and continue on the path of separating ICE and EV businesses in the way that the likes of Renault and Ford have already chosen?
- The electrical steel capacity crunch potentially has ramifications for the propulsion domain. A shortage of e-steel could mean that planned product mix could change in the short- to medium-term in favor of ICE and hybrid applications where there's a much-reduced demand for e-steel.
- The desire to squeeze more range and efficiency from existing BEV parameters should prompt more the in the industry to switch to silicon carbide (SiC) inverter technology. SiC inverters deliver efficiency in that they're able to extract more energy from a battery – thus improving range – and allow for faster charging and improved acceleration. Major power electronics suppliers such as Marelli, BorgWarner and Delphi Technologies have been increasingly active in this area recently, developing their products and securing orders which suggests that we'll see increasing SiC inverter adoption in the short-term.

*Thermal*

For the thermal domain one of the most pertinent issues presenting itself in 2023 relates to the EU's ruling on banning PFA (perfluoro alkoxy alkane). The decision is expected to be announced in January.

Here there are implications for the refrigerants R1234yf and R134a, which are widely used in vehicle HVAC systems. While there are alternatives to PFA refrigerants they'll necessitate a wholesale redesign of HVAC systems depending on the alternative that is decided upon. In addition to HVAC, the potential for a PFA ban adds complexity to EV batteries too as the incumbent chemical types are widely used to manufacture binders for battery electrodes.

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