ECG Business Intelligence

# Supply Chain Vulnerability Hits Industry

OEMs & Tier Suppliers Accelerate Vertical Integration Strategies

ECG Business Intelligence

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# Strategies to avoid disruption

OEMs and tier suppliers accelerating vertical integration and other mitigation strategies

# Prepping for future disruption?

Mitigation strategies vs adaptation strategies


# Strategies to avoid supply chain disruption

Different strategies are needed for different types of disruption, while some can be introduced immediately others are longer term.

**Current trend to accelerate semi-vertical integration (VI) strategies**

| Mitigation Strategies – immediate/short term | Adaptation Strategies – medium/long term |
|---|---|
| Value over volume: prioritising higher value products/vehicle production over lower margin vehicles. | **Semi-vertical integration strategies** where OEMs/suppliers introduce supply of components directly into supply chain via supply agreements, partnerships, JVs, co-development resulting in a semi-vertically integrated entity. |
| Build to order: manufacturing practice where product is built only when order is confirmed. | Full vertical integration strategies where companies purchase or acquire a majority stake in a company that makes a critical component or is a raw material supplier. |
| Shift from single-sourcing to multi-sourcing where possible. | Localisation of supply chain –where sources close to OEM production are sought, often with suppliers building plants near OEM base. |
| Enhancing 'end to end' visibility in supply chains to maximise real time view across supply chains and tier suppliers. | Tier 0.5 Model—where OEM owns tier supplier and supplier is OEM's 'wingman' taking over responsibility for major systems and module production. |

# Semi-vertical integration

## OEMs & top tier suppliers accelerate VI strategies to avoid future bottlenecks

**Vertical integration (VI)** is a corporate strategy that involves streamlining operations by integrating supply chains to cut down delays in delivery and transportation and increase efficiencies in production processes.

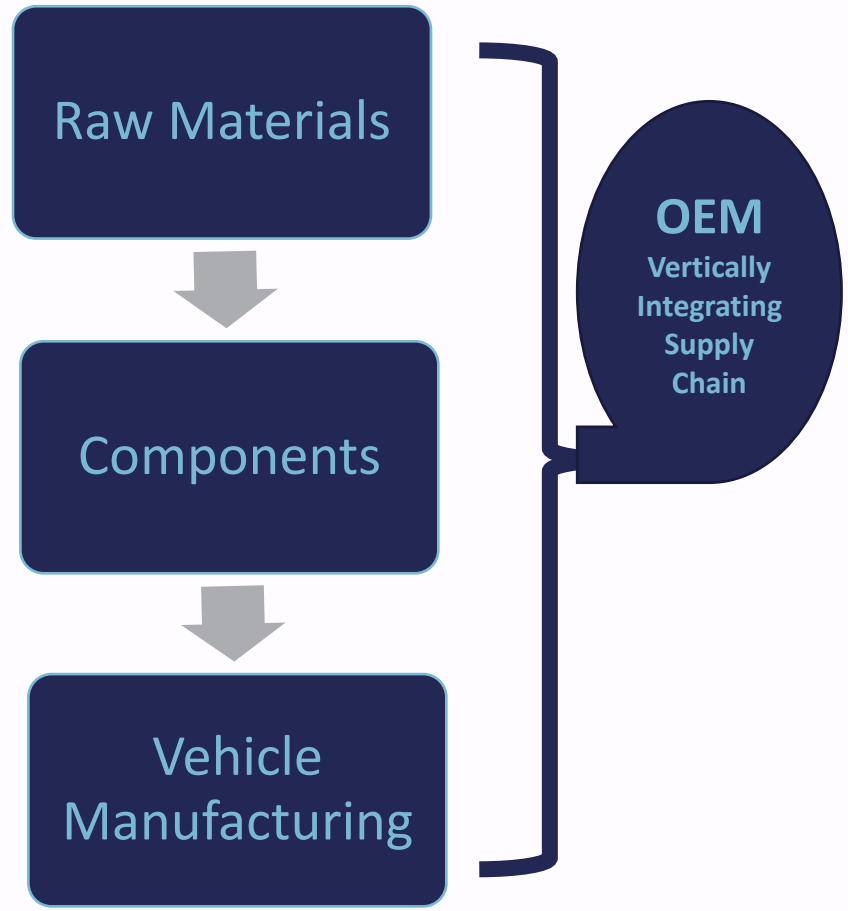
Automakers are accelerating semi-vertical integration strategies to avoid future supply chain disruptions.

Semi-vertical integration involves supply agreements, MOUs, alliances, partial acquisitions, joint ventures etc.

Full vertical integration means part acquiring, investing and merging with partners in areas where bottlenecks are expected; especially in battery raw materials, battery production and semiconductor chips.

Key Question: Is vertical integration more expensive?

**Key Answer: YES. Higher costs due to lower volume, but lower risk of supply chain shocks and thus lower medium to long term costs.**



# Chip shortage & raw materials continue to cause disruption accelerating VI strategies

REUTERS®

## Daimler Truck sees high demand cushioning raw material price impact

May 17, 2022

Semiconductor supply bottlenecks were the main cause of inventory backlogs, Goetz said, with chips being shuffled between regions to accommodate orders.

Automotive News Europe

## Automakers face soaring metal costs with Russian supplies at risk

March 08, 2022 04:30 AM

Automotive News Europe

## Mercedes, VW, BMW warn chip shortage could last until 2023

## Audi cuts production in Germany on parts shortages

May 16, 2022 03:46 AM

Automotive News Europe

OEMs & Top Tier suppliers accelerate move to vertically integrate supply chain to mitigate future shocks

# Key takeaways:

1. Automobile manufacturers enter raw material supply chain semi–vertically integrating through supply agreements & partnerships in anticipation of future bottlenecks, thus employing adaptation strategies.

2. Automakers form alliances to semi-vertically integrate chip supply due to ongoing supply risks, using adaptation strategies to alleviate future generation chip supply crunch.

3. Tier suppliers vertically integrate chip design & production in response to ongoing bottlenecks, thus employing adaptation strategies to make sure future chip supply is guaranteed.

4. Automotive supply chains are going through a transformative period with more focus on mitigation and adaptation strategies which result in stronger vertically integrated supply chains.

5. Vertically integrated companies, which include raw materials and products at various stages of the supply chain, have higher costs but lower risks from supply chain disruption than horizontally integrated companies who focus on a single component/manufacturing process and can use economies of scale but face higher potential risks due to dependency on others.

# Raw Materials

OEMs accelerate vertical integration strategies to enter raw material supply chain

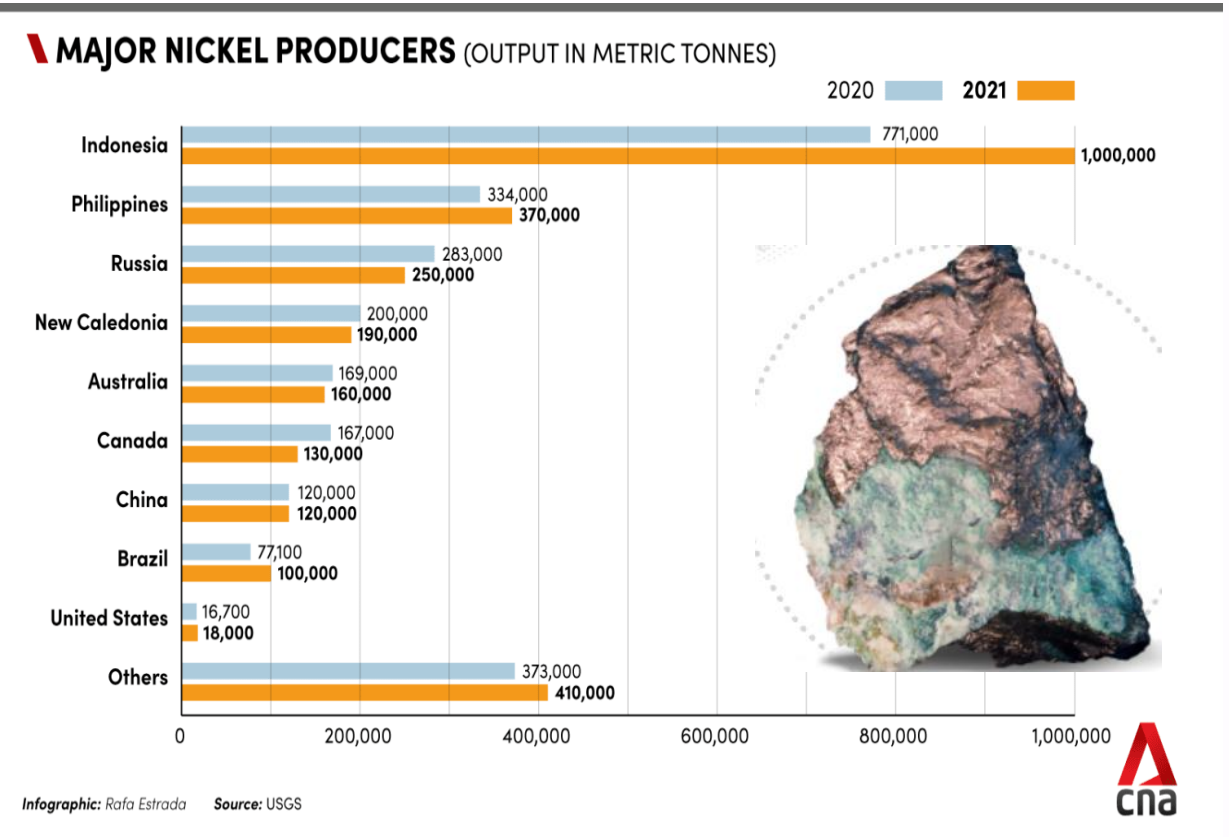
# Tesla enters nickel raw material supply chain

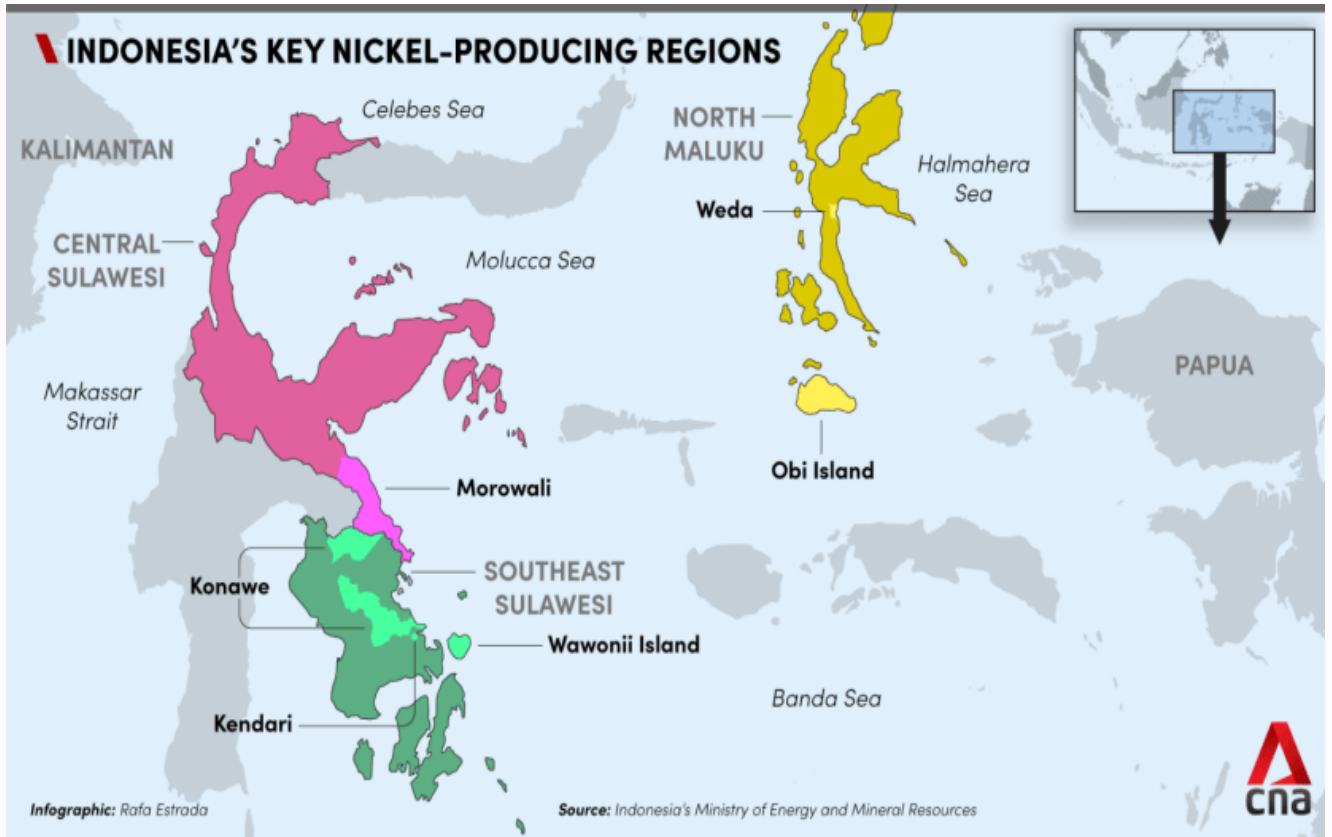
Rio de Janeiro, May 6, 2022 – Vale confirms it signed a long-term contract with Tesla Inc to supply Class 1 nickel in the United States from its operations in Canada.

Vale is the world's largest producer of nickel, and also supplies Northvolt. Vale operates mines in Brazil, Canada & Indonesia.


Indonesia, May 2022: Tesla visits nickel production hubs in Morawali on Sulawesi Island, investment proposal submitted in February 2021.

Tesla's Elon Musk meets Indonesian President Joko Widodo with nickel deal rumoured to be near. Indonesia largest global source of nickel.



# Volkswagen enters cobalt, nickel supply chain

March 2022: Volkswagen will form joint ventures (JV) with Huayou Cobalt and Tsingshan Group for nickel and cobalt supplies.

VW, Huayou Cobalt and Tsingshan signed two MOUs for a joint venture in Indonesia for nickel and cobalt production.

VW will form a second JV with Huayou for refining of nickel and cobalt sulfates in Guangxi (China) for precursor and cathode material production.

“The two partnerships target to contribute to the Group’s long term target of a 30-50% cost reduction on each battery,” VW said.


VOLKSWAGEN

GROUP CHINA

Media information

Volkswagen Group China intends strategic partnerships for battery raw material supply chain

- Volkswagen Group China signed two Memorandums of Understanding (MOUs) with Huayou Cobalt and Tsingshan Group to set up two Joint Ventures (JV) to cover the upstream and downstream of the cathode supply chain.
- The projects aim to improve cost efficiency and secure a sustainable supply chain of battery raw materials for new energy vehicle growth in China.

**Beijing, March 21st, 2022. Volkswagen Group China has signed two memorandums of understanding (MOU)**

# 03

# Semiconductor Chips

OEMs & top tier suppliers seek to avoid disruptions by vertical integration strategies to secure chips for the future

# Continental enters faster chip architecture

Frank Petznick head of ADAS, Continental

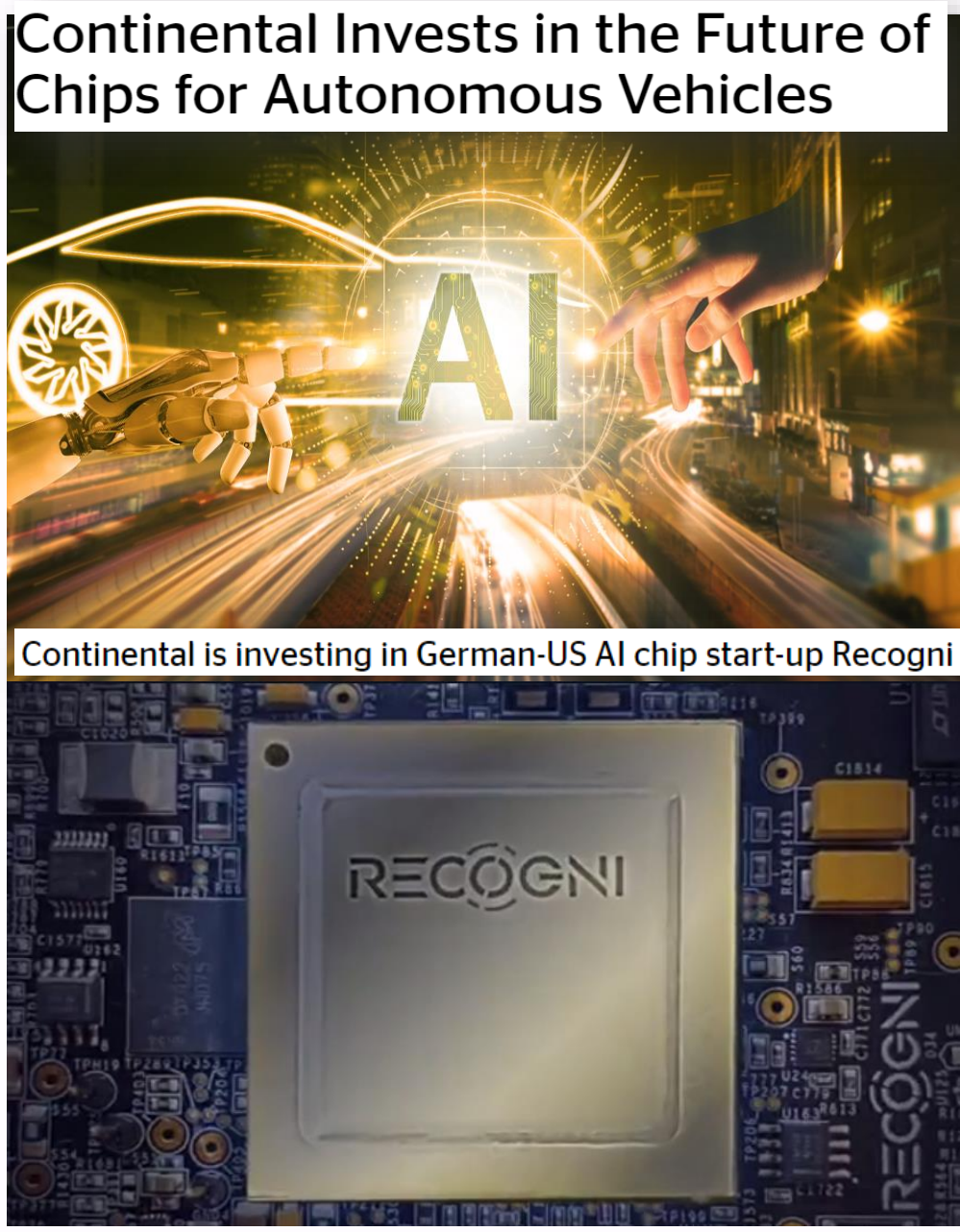
"Without faster chips, there will be no networking, no automation and no autonomous driving," says Frank Petznick, head of the Advanced Driver Assistance Systems business unit at Continental.

"In the future, the actual performance from the combination of chip and algorithm will be decisive. And you have to differentiate here. The supposed performance data of various chips from different manufacturers are currently outdoing each other."

While a lane departure warning system used to require just a simple black-and-white camera, the autonomous vehicles of the future will in some cases use more than 20 high-resolution vehicle-surroundings sensors such as radar, camera and lidar simultaneously.

The collaboration between Continental and Recogni was initiated by Continental's own start-up organization, co-pace.

"We are talking about a possible SOP in 2026," says Petznick.



# Bosch enhances chip production in Germany

Question: Does Bosch already produce chips, and now the Dresden plant will make other chips?

*"Bosch is producing chips already today in its wafer fab in Reutlingen (near Stuttgart, Germany) based on 150 and 200 millimeter wafers. In our new wafer fab in Dresden, Germany, Bosch will produce chips based on 300 millimeter wafers."*

Question: Does Bosch still need to purchase wafers to make these chips?

*"The wafers that we are buying for the production are about 1 millimeter thick. When they leave the production, the thickness is about 100 – 60 micrometers. ( 1 millimeter = 1000 micrometers)".*

The new wafer fab in Dresden is Bosch's response to the surging number of areas of application for semiconductors. Bosch is investing around one billion euros in the high-tech manufacturing facility, which will be one of the most advanced wafer fabs in the world.

Bosch Spokesperson
Technology & Innovation

# Ford collaborates to boost chip supply to Ford

Jim Farley
President
& CEO
Ford

Nov 18,2021: Ford Motor Company announced a strategic collaboration to advance semiconductor manufacturing and technology development within the United States, aiming to boost chip supplies for Ford and the U.S. automotive industry.

“It’s critical that we create new ways of working with suppliers to give Ford – and America – greater independence in delivering the technologies and features our customers will most value in the future,” said Jim Farley, Ford president and CEO.

“This agreement is just the beginning, and a key part of our plan to **vertically integrate** key technologies and capabilities that will differentiate Ford far into the future.”

The companies have signed a non-binding agreement to create further semiconductor supply for Ford’s current vehicle line-up and joint R&D for feature-rich chips to support the automotive industry.

GlobalFoundries, Ford to Address Auto Chip Supply and Meet Growing Demand

# BMW Group secures future chip supply

Andreas Wendt, Board Member For Purchasing & Supplier Network

November 8, 2021: To secure semiconductor supplies for the long term the BMW Group has signed a direct supply assurance agreement with microchip developer INOVA Semiconductors and semiconductor manufacturer GlobalFoundries.

The agreement guarantees the BMW Group the supply of several million microchips per year.

“We are deepening our partnership with suppliers at key points in the supplier network and synchronising our capacity planning directly with semiconductor manufacturers and developers. This improves planning reliability and transparency around the volumes needed for everyone involved and secures our needs for the long term,” says Dr Andreas Wendt, member of the Board of Management of BMW AG responsible for Purchasing and Supplier Network.


BMW Group Signs Agreement with Inova Semiconductor and GlobalFoundries to Secure Supply

# General Motors mitigates risk by co-developing

Mark Reuss, GM President

**GM Will Co-Develop Chips With Several Producers to Secure Supply** Bloomberg

**GM to work with leading semiconductor suppliers, Reuss says**

Developers will draw from three families of chips, put together by partnerships between the automaker and various suppliers. November 18, 2021 Automotive News

"We see the semiconductor requirements more than doubling over the next several years as the vehicles we produce become more of a technology platform," General Motors Co. President Mark Reuss said

GM will be working to develop the chips with Qualcomm Inc., STMicroelectronics NV, Taiwan Semiconductor Manufacturing Co., Renasas Electronics Corp., ON Semiconductor Corp., NXP Semiconductors NV and Infineon Technologies AG, Reuss said.

05

# Battery supply chain

OEMs accelerate battery production as vertical integration strategies increase

VOLVO

# Volvo Trucks opens battery plant in Ghent

## Shorter lead times and increased circularity

Roger Alm
President
Volvo Trucks

"By integrating the battery assembly process in our production flow, we can shorten lead times for our customers and secure high-performing batteries, while at the same time increase circularity, " says Roger Alm, President of Volvo Trucks.

May 2022: Volvo Trucks has opened its very first battery assembly plant in Ghent, Belgium.

The plant will supply ready-to-install batteries for Volvo Trucks' full electric heavy-duty trucks.

Cells from Samsung SDI will be assembled into battery packs that are tailor-made for Volvo Trucks´ heavy-duty electric range: Volvo FH, Volvo FM and Volvo FMX.  Series production starts in the third quarter of this year (2022).

# Skoda launches battery production

## MEB battery systems started in Czech Republic

Thomas Schäfer

CEO ŠKODA AUTO & COO VW Passenger Cars

17/05/2022

"Today we're celebrating another milestone in ŠKODA AUTO a.s.'s transformation process: We're officially launching the production of MEB* battery systems in Mladá Boleslav!

This makes our main plant the only production facility for Volkswagen AG's MEB battery systems in Europe outside Germany – another important step towards transforming the Czech Republic into an e-mobility hub and thus securing jobs over the long term.

Around 250 employees will soon be assembling more than 250,000 MEB battery systems a year on our newly constructed production line. In addition to ŠKODA vehicles, these will also be installed in MEB models made by Volkswagen, AUDI AG and SEAT SA."

*Modular Electrification Toolkit

# GM & LG Energy Solution make cells

## JV Ultium Cells invests USD 2.6 billion in 3rd site

Mary Barra
CEO GM

"This significant investment demonstrates our commitment to strengthen our Michigan and U.S. manufacturing presence and grow good-paying jobs," said Mary Barra, GM Chair and CEO. "We will have the products, the battery cell capacity and the vehicle assembly capacity to be the EV leader by mid-decade."

Ultium Cells, a joint venture of LG Energy Solution and General Motors, announced a $2.6 billion investment to build its third battery cell manufacturing plant in the United States. The facility will be located in Lansing, Michigan.

The Ultium Cells Lansing site joins Ultium Cells battery cell manufacturing sites being constructed in Ohio and Tennessee.

# Stellantis & LG Energy Solution invest in battery production

Carlos Tavares
CEO Stellantis

"Our joint venture with LG Energy Solution is yet another stepping stone to achieving our aggressive electrification roadmap in the region aimed at hitting 50% of battery electric vehicle sales in the US and Canada by the end of the decade," said Carlos Tavares, Stellantis CEO. "We are grateful to the Municipal, Provincial and Federal levels of government for their support and commitment to help position Canada as a North American leader in the production of electric vehicle batteries."

The joint venture company will invest USD 4.1 billion to produce leading edge lithium-ion battery cells and modules to meet a significant portion of Stellantis' vehicle production requirements in North America.

The plant in Ontario, Canada aims to have an annual production capacity in excess of 45 gigawatt hours (GWh).

# Stellantis & Samsung SDI form JV for battery production

Samsung SDI and Stellantis N.V. announced that they will establish a joint-venture manufacturing facility for EV cells and modules in Kokomo, Indiana, United States and invest over $2.5 billion.

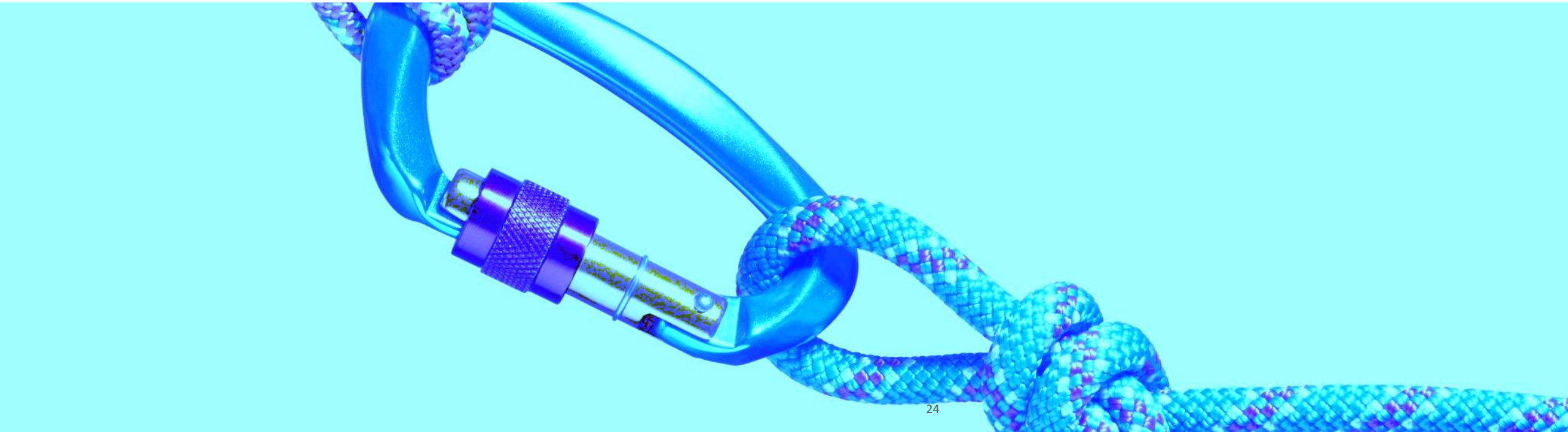
The joint-venture plant will begin the construction in the end of this year and start operation in the first quarter of 2025. The annual production capacity of cells and modules will be 23 gigawatt hours (GWh) initially, and is expected to be increased to 33 GWh with the investment increased to $3.1 billion.

“Just under one year ago, we committed to an aggressive electrification strategy anchored by five gigafactories between Europe and North America,” said Carlos Tavares, CEO of Stellantis. Stellantis plans to have global annual battery electric vehicle sales of five million vehicles by 2030, reaching 100% of passenger car BEV sales mix in Europe and 50% passenger car and light-duty truck BEV sales mix in North America.

# Conclusion

OEMs & top suppliers aim to pre-empt supply chain shocks

- **OEMs and tier 1 suppliers accelerate strategies to semi-vertically integrate crucial components & commodities**
- **OEMs and top tier suppliers increase adaptation strategies to prepare for future supply shocks**
- **Semi-vertical integration and adaptation strategies have higher upfront costs, but lower long-term risks and costs**



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