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The new power struggle

EV batteries: Rewiring risk across the auto industry

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WHAT'S COVERED?

- → Structural shift: From tiered supply chains to value chain oversight
- → Consideration of 8 risk categories
- → Cross-cutting risk dynamics
- → Strategic implications and actions
- → Offering clarity to a complex value chain

The transition to electric vehicles (EVs) represents a reset in the automotive value chain. As Original Equipment Manufacturers (OEMs) move further toward in-house battery production, they shift from a relatively modular supplier ecosystem to a deeply integrated, capital intensive, and globally exposed one.

This transformation introduces a new class of interconnected risks, where compliance, sustainability, regulation, sanctions, reputational, and other operational exposures converge in the battery ecosystem.

And risks associated with the move to in-house battery production are unlikely to come along one-at-a-time in a convenient order, they have the potential to be systemic and amplifying each other across multi-tier supply chains, geographies, and regulatory regimes.

Automotive Case Study: Battery vertical integration strategy

CONTEXT

As part of its broader electrification strategy, a large international automotive manufacturer (Company Z) was pursuing increased control over its battery value chain to support cost efficiency, security of supply, and technological differentiation. However, the company was not targeting full self-sufficiency but instead adopting a balanced "make and buy" approach.

STRATEGIC APPROACH

To execute its vision, Company Z established a dedicated battery subsidiary business responsible for in-house cell development and manufacturing. Through this subsidiary, Company Z was:

- → Designing a standardized "Unified Cell" architecture to streamline production across vehicle platforms
- → Building and operating gigafactories across key locations, in Europe and North America
- → Developing internal capabilities in battery manufacturing processes and production technologies
- → Expanding upstream through partnerships and joint ventures to access critical battery materials
- → Investing in battery recycling and circular supply chains to secure long-term sustainability

EXTENDING UPSTREAM INTEGRATION

Company Z's ambitions were beyond battery pack assembly, with a focus on higher-value components within the supply chain.

An example was a joint venture, which focused on production of cathode materials, a critical and value-intensive element in battery cells. This initiative reflected Company Z's objective to vertically integrate elements of the battery value chain.

In parallel, Company Z strengthened its position in raw material sourcing through long-term supply agreements and targeted investments, reducing reliance on spot-market procurement.

BALANCED "MAKE AND BUY" MODEL

Despite its significant in-house investments, Company Z was not pursuing full vertical integration. Instead, adopting a hybrid sourcing strategy:

→ Its subsidiary company was expected to supply a substantial share of battery cell demand

→ The remaining volumes would continue to be sourced from established external suppliers

THE TAKEAWAY?

Company Z's strategy reflected its focus on building greater resilience across its value chain while balancing control with flexibility. By selectively integrating across its battery value chain and maintaining strong supplier relationships, Company Z sought to strengthen its competitive position without assuming the full complexity and risk of end-to-end vertical integration.

While this approach can reduce reliance on external suppliers and increase control over battery production, it also changes the company's risk profile. Greater ownership of the value chain brings increased exposure to regulatory, operational, geopolitical, financial and cyber risks. As a result, strong risk management capabilities are needed alongside operational execution.

As Company Z expands its role across the battery value chain, its approach to risk management must evolve from supplier oversight to end-to-end value chain governance. The goal is to turn greater operational control into lasting competitive advantage while effectively managing the broader range of risks that come with it.

1. A structural shift from tiered supply chains to value chain oversight

As Jim Farley, CEO of Ford said back in 2023 in Ford Authority: "On vertical integration, this is the most fundamental change... We are in-sourcing batteries... This level of integration... will allow us to significantly reduce material cost."

Battery production is changing how OEMs operate. Instead of relying on tiered suppliers, many are becoming more directly involved in upstream activities such as sourcing raw materials (e.g., lithium, cobalt, nickel, graphite), as well as cell manufacturing and recycling.

This shift brings added capital investment and operational complexity. It can also increase reliance on a relatively small number of suppliers, often located in higher-risk jurisdictions. At the same time, supply chains may be exposed to resource constraints and geopolitical disruption across multiple regions.

As a result, the role of OEMs would evolve from managing supplier relationships to overseeing risk across the entire value chain.

2. Consideration of 8 risk categories

A more integrated approach to risk management may support businesses, as battery value chains can introduce interconnected exposures that extend across operations, suppliers, and jurisdictions. Rather than addressing risks in isolation, organizations may need to assess how regulatory, operational, financial, and ecosystem risks interact and reinforce one another across the full value chain.

We have categorized these risks into the following eight categories:

2.1 REGULATORY AND COMPLIANCE RISK

Battery vertical integration brings OEMs more directly within the scope of expanding global regulation, including sustainability disclosure, human rights obligations, trade controls, and product-specific requirements. Regulatory expectations are increasingly applied across the full value chain rather than at individual points.

This shift is reflected in end-to-end due diligence requirements, compliance requirements, such as anti-bribery and corruption, alongside a broader move from disclosure toward accountability. Organizations are expected to demonstrate compliance across multiple tiers, supported by greater traceability and reporting from raw material sourcing through to end-of-life.

The implications can be significant. If organizations cannot demonstrate compliance, they may face import restrictions, financial penalties, or reduced market access. Compliance also increasingly depends on robust data, systems, and controls, while differing requirements across jurisdictions can add further complexity.

2.2 SUSTAINABILITY RISK

Battery production can be sustainability-intensive, driven by the carbon footprint of mining and processing, human rights concerns such as forced labor and unsafe working conditions, and environmental impacts including water usage, deforestation, and pollution. These factors can extend across the value chain, often concentrated in upstream activities.

Regulatory frameworks are increasing expectations in this area, so organizations may need to assess,

for example, both financial and impact materiality and to integrate sustainability considerations into strategy, risk management, and reporting processes.

Sustainability considerations are often of reputational concern to businesses, but they are also becoming a core operational concern. Limited visibility into lower-tier suppliers means risks have the potential to accumulate, while non-compliance may lead to regulatory and financial consequences, as well as damage to a brand's reputation.

2.3 SANCTIONS, EXPORT CONTROLS, AND GEOPOLITICAL RISK

Battery supply chains may be exposed to higher-risk geographies, and at the same time, sourcing of critical materials tends to be concentrated in politically sensitive jurisdictions. As a result, risk factors such as export controls, tariffs, and sanctions regimes can affect both access to materials and the use of certain technologies.

These dynamics could lead organizations to reroute supply chains to avoid restricted regions, while also increasing the risk of sudden disruption in the event of, for instance, geopolitical escalation.

Supply chain design then has the potential to become a strategic geo-economic consideration rather than a purely operational decision. And if an organization was unable to comply with an export restriction, the consequences could include shipment detentions, asset freezes, or other legal exposure. In addition, efforts to diversify or nearshore supply chains may increase overall costs.

2.4 SUPPLY CHAIN, OPERATIONAL, AND BUSINESS CONTINUITY

Battery ecosystems can introduce supply chain and operational fragility, driven by concentrated reliance on specialized upstream suppliers, limited regional battery production capacity, and single points of failure across multiple tiers. Disruption may stem from natural events affecting mining regions, industrial incidents such as plant shutdowns, or shortages of critical inputs like semiconductors.

These risks can evolve from isolated component issues into system-level disruptions, where failures cascade across the value chain and impact production. Battery manufacturing may also increase exposure to physical and climate-related risks, particularly in environmentally sensitive mining locations and energy-dependent production facilities.

2.5 FINANCIAL AND INVESTMENT RISK

Vertical integration in battery production can involve significant capital investment in areas such as gigafactories, technology development, and strategic partnerships. It may also increase exposure to volatility in raw material prices and uncertainty in demand.

At the same time, suppliers across the value chain may face financial pressure due to factors such as pricing dynamics, inflation, and liquidity constraints. Disruptions upstream can further affect cost structures and may lead to margin pressure or underutilized assets.

OEMs may therefore take on balance sheet exposure that was previously borne by external suppliers, while financial risk can become more closely linked to operational performance and supply chain stability.

As a result, organizations may shift from just-in-time models toward more resilience-focused sourcing and planning. Business continuity efforts may also extend further upstream, where physical and sustainability risks are less visible but increasingly relevant to operational and compliance considerations, with implications for sourcing, production stability, and reporting.

2.6 REPUTATIONAL RISK

Battery supply chains are increasingly subject to scrutiny. Media coverage has highlighted issues such as forced labor, environmental damage, and regulatory non-compliance, while expectations from investors, regulators, and consumers are often shaped by sustainability considerations.

Recent examples have illustrated how compliance gaps can contribute to brand damage and public relations issues, which may in turn impact operations and commercial relationships.

The implications are meaningful. Reputation can act as an early indicator of potential financial and regulatory exposure. As a result, organizations may place emphasis on monitoring adverse media and sustainability-related controversies in their supply chains.

2.7 THIRD-PARTY ECOSYSTEM RISK

Battery ecosystems may involve joint ventures, technology partners, and market entrants, creating more complex operating models. This can lead to deeper dependencies on non-traditional suppliers, including startups who may have less established track records.

These dynamics may introduce risks, including varying levels of governance and compliance maturity across partners, as well as cybersecurity, intellectual property, and operational risks within increasingly digitalized battery systems. Visibility may also be limited beyond tier-one suppliers, making it difficult to assess exposures across an ecosystem.

OEMs might consider broadening their focus from managing individual suppliers to overseeing risk across a wider partner ecosystem. In addition, governance approaches could extend to joint ownership and partnership structures to support consistent oversight.

2.8 CYBER RISK

The growing digitalization of battery ecosystems may increase exposure to cyber risk across both OEM operations and supplier networks. As organizations expand in-house capabilities, interconnected IT and operational technology systems can broaden the attack surface and introduce new points of vulnerability.

Cyber incidents may have direct impacts, such as disruption to production systems or data integrity, as well as indirect impacts where affected suppliers are unable to deliver critical materials or services. Regulatory expectations, including frameworks, such as NIS2, are placing greater focus on cyber resilience and third-party risk oversight.

In response, organizations may strengthen controls, while extending cyber risk assessment and monitoring to suppliers and partners, with implications for operational continuity and sourcing decisions.

3. Cross-cutting risk dynamics

Risk area	Summary
Regulatory & compliance risk	OEMs are increasingly accountable for compliance across the full value chain, with growing expectations for traceability, data, and alignment across jurisdictions.
Sustainability risk	Sustainability considerations are moving beyond reputation and becoming embedded in sourcing, operations, and risk management.
Sanctions, trade & geopolitical risk	Trade controls, sanctions, and concentration of critical materials in sensitive regions can reshape supply chains and increase disruption risk.
Supply chain, operational, and business continuity risk	Concentration of risk and interdependencies may increase system fragility, while exposure to physical and infrastructure disruptions may require greater visibility and planning across upstream supply chains.
Financial & investment risk	Vertical integration can increase capital intensity and link financial performance more closely to supply chain and operational stability.
Reputational risk	Supply chain issues can influence brand perception and may signal wider financial and regulatory exposure.
Third-party ecosystem risk	Expanding partner ecosystems require oversight beyond traditional suppliers, including joint ventures and technology partners.
Cyber risk	Expanding digital ecosystems increase exposure to cyber threats across both OEM operations and suppliers, where incidents may disrupt production systems directly or indirectly impact delivery across the value chain.

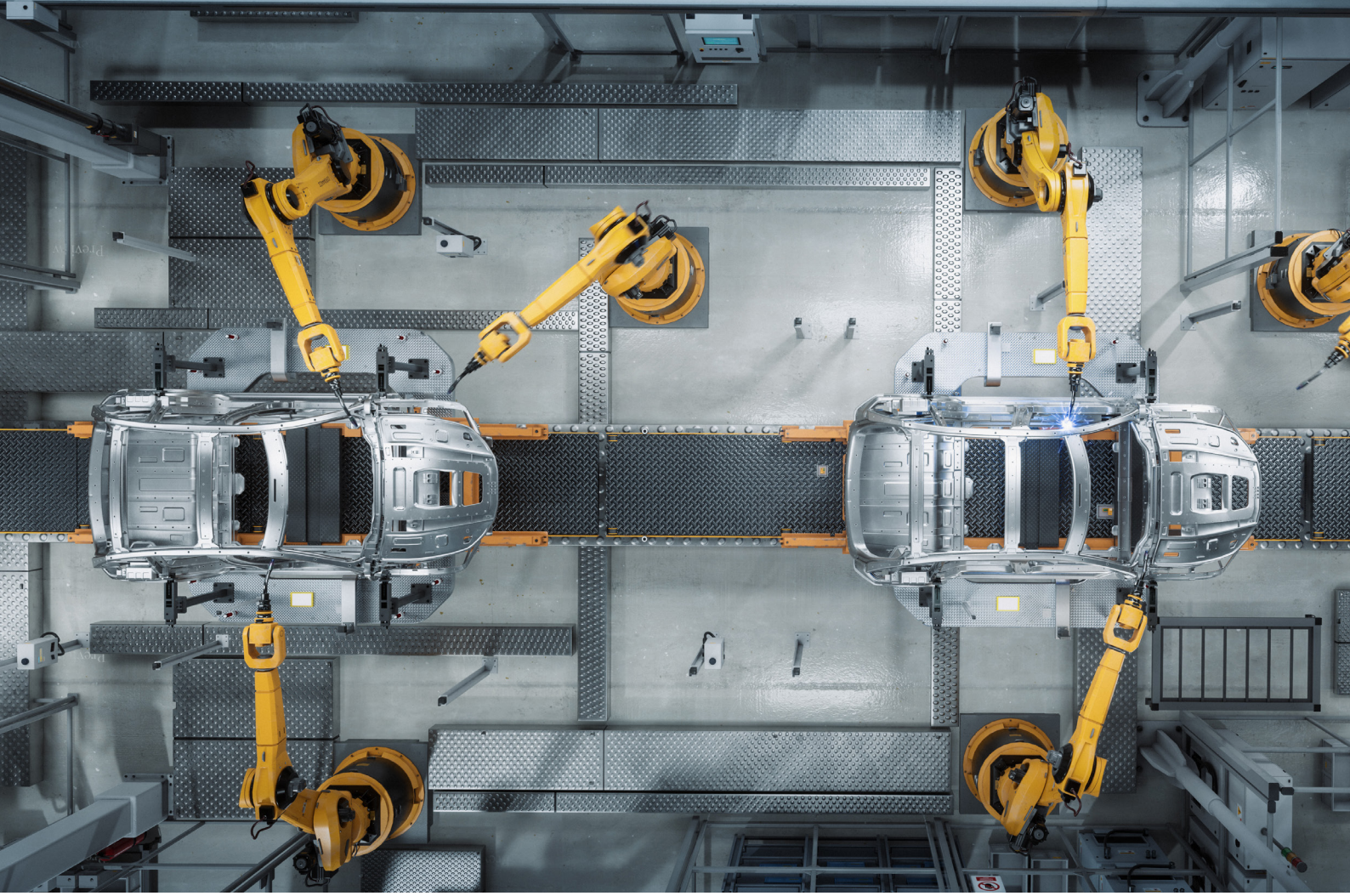
4. Strategic implications and actions

In an article in Logistics Viewpoints earlier this year, Jim Frazer, VP of the Arc Advisory Group, wrote that battery supply chain capabilities are becoming “too strategic, too fragile, or too tightly linked to product performance to outsource comfortably.”

To navigate this new risk landscape, automotive OEMs are increasingly moving from fragmented, function-led risk assessment and mitigation approaches toward more integrated, data-driven models of value chain risk governance.

This transition may involve steps such as developing greater end-to-end visibility across multi-tier supply chains, moving from point-in-time assessments toward more continuous monitoring practices, and bringing together regulatory, sustainability, financial, and operational risk perspectives. It may also include embedding risk considerations more directly into strategic sourcing decisions and long-term capital allocation planning.

Battery vertical integration can represent more than a manufacturing shift; it may reflect a broader reconfiguration of how enterprise risk is understood and managed. In this context, organizations may need to view risk as more systemic and interconnected, build capabilities to monitor and assess exposures across the full value chain, and treat compliance, sustainability, and resilience as strategic considerations that can influence long-term performance, rather than as standalone constraints.



5. Offering clarity to a complex value chain

As OEMs expand further into battery production, navigating risk across fragmented data sources, evolving regulations, and multi-tier supply chains can become complex. Moody's data and workflow solutions are designed to support greater visibility across entities, suppliers, and jurisdictions, helping organizations build a more connected view of risk across the value chain.

By combining curated data, analytics, and configurable workflows, Moody's supports organizations in assessing third-party risk, monitoring areas of regulatory exposure like forced labor, and identifying potential issues such as sanctions exposure, adverse media, and supply chain dependencies. These capabilities can be integrated into existing processes to support more consistent risk assessment, ongoing monitoring, and informed decision-making across sourcing, compliance, and investment activities.

For OEMs developing in-house battery capabilities, this approach may help align risk insights with broader strategic priorities, supporting a more coordinated response to the interconnected challenges shaping the battery ecosystem.

Get in touch

For more information about Moody's data and workflow solutions, decision grade intelligence, and insights for risk management in the auto industry, please **get in touch** with the team at any time. We would love to hear from you.

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