Ontario's Automotive and Mobility Supply Chain at a Crossroads: Reinforcing Competitiveness in a Time of Global Change

Annual Comprehensive Sector Report

Ontario Vehicle Innovation Network

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Contents

Minister's Foreword

Ontario's automotive and mobility sector is one of the province's greatest economic strengths, supporting tens of thousands of good-paying jobs, driving investment, and serving as a pivotal industry to many communities across the province.

With the global economy changing at a rapid pace, strong and reliable supply chains have become more important than ever. As companies across the globe make decisions about where to invest, where to source materials, and where to build the next generation of vehicles and mobility solutions, Ontario is stepping up to meet this moment.

Ontario brings together the key strengths needed to compete, including a world-class manufacturing base, a highly skilled workforce, clean and reliable energy, critical minerals, leading research institutions, and a strong network of suppliers and technology companies. These advantages have helped Ontario attract billions of dollars in investment across the auto supply chain since our government took office.

The Ontario Vehicle Innovation Network (OVIN) continues to play a critical role in building on this momentum by helping Ontario companies develop, test, and bring new automotive and mobility technologies to market. This work is especially important as the sector continues to evolve, with the future of Ontario's automotive industry not only about building cars, but the broader ecosystem of batteries, charging infrastructure, advanced manufacturing, connected technologies, dual-use applications serving both commercial and defence-related needs, and the SMEs innovating across these areas. By strengthening our supply chains and supporting homegrown innovation, Ontario can help more businesses grow, compete, and access new markets.

Our government is taking bold, decisive action to protect workers, attract investment, and strengthen the industrial base that supports Ontario's economy. By continuing to work with industry, entrepreneurs, researchers, and communities, we can build on this strong foundation and ensure Ontario remains a trusted and competitive place to lead the next generation of automotive and mobility growth.

The Honourable Victor Fedeli

Ontario Minister of Economic Development, Job Creation and Trade

1. Executive Summary

Global automotive and mobility supply chains are undergoing a period of profound transformation. Shifts in production geography, evolving trade and industrial policies, geopolitical uncertainty, and rapid technological change are reshaping how vehicles, components, and critical inputs are designed, sourced, manufactured, and traded. At the same time, the transition to electrified, connected, and software-defined vehicles is altering where value is created across the automotive ecosystem and changing the capabilities required to compete. As these changes unfold, jurisdictions are competing to attract investment, secure critical supply chains, strengthen industrial resilience, and position themselves within emerging automotive and mobility value chains.

Global production patterns continue to shift toward Asia, particularly China, which has strengthened its position as both the world's largest vehicle producer and a dominant force in battery manufacturing, critical minerals processing, and electric vehicle exports. These developments are reshaping global trade flows and increasing competitive pressures across established automotive jurisdictions. At the same time, governments are increasingly treating automotive supply chains as strategic assets, deploying tariffs, industrial policies, domestic content requirements, and incentive programs to influence investment, manufacturing, and sourcing decisions. Across North America, Europe, and Asia, automotive competitiveness is becoming more closely linked to economic security, supply chain resilience, and trusted production networks.

The transition to electrified vehicles is accelerating this restructuring. Batteries, power electronics, software, and critical minerals are capturing a growing share of automotive value, while demand for many traditional internal combustion engine components is expected to decline over time. New dependencies have emerged around battery materials, mineral processing, and advanced manufacturing technologies, creating both opportunities and vulnerabilities across the supply chain. At the same time, battery chemistry diversification, changing OEM strategies, and intensifying cost competition are reshaping the distribution of value across suppliers, technologies, and regions. These dynamics are prompting manufacturers to reassess sourcing strategies, investment priorities, and supplier relationships as they adapt to evolving market conditions.

Supply chain resilience has become a defining strategic consideration across the automotive sector. The disruptions experienced during the pandemic, semiconductor shortages, geopolitical tensions, trade disputes, and critical mineral concentration have highlighted the risks associated with highly optimized global production networks. In response, automakers and suppliers are pursuing diversification, regionalization, and digital integration strategies that improve visibility, strengthen resilience, and reduce exposure to concentrated supply sources. Cybersecurity, traceability, and digital trust are also emerging as increasingly important factors, as connected vehicles, software-defined systems, battery passports, and supply chain transparency requirements become embedded within automotive production and procurement frameworks.

The automotive value chain itself is evolving beyond traditional manufacturing. Software-defined vehicles, advanced connectivity, artificial intelligence, system integration, and digital services are capturing an increasing share of value creation. Vehicle platforms are becoming more integrated, with software, electronics, sensors, and data systems playing a larger role in vehicle functionality and lifecycle revenue generation. These trends are driving demand for capabilities in software engineering, cybersecurity, systems integration, advanced manufacturing, and data management, while creating new opportunities in connected mobility, interoperability, digital infrastructure, and trusted supply chains. The convergence of these technologies is also expanding the relevance of automotive capabilities into adjacent sectors, including logistics, infrastructure, public safety, and defence-related applications.

Ontario enters this period of transformation with a strong industrial foundation. The province remains the centre of Canada's automotive industry, supported by five major vehicle assemblers, an extensive supplier network, advanced manufacturing capabilities, a growing battery ecosystem, critical mineral resources, and globally recognized strengths in engineering, software, artificial intelligence, and cybersecurity. Ontario's integration within the North American production system, combined with its access to clean electricity and established research and innovation infrastructure, provides a strong platform for continued participation in evolving automotive and mobility value chains.

At the same time, Ontario faces important challenges. Tariff uncertainty, shifting investment patterns, rising competition for automotive and battery investment, supply chain vulnerabilities, and changing technology requirements are creating new pressures across the sector. Several major EV-related investments announced between 2022 and 2024 have been delayed, restructured, or suspended as manufacturers respond to changing market conditions and policy uncertainty. These developments highlight the importance of maintaining competitiveness while supporting supplier adaptation and workforce transition through a period of significant industry change.

The findings suggest that Ontario's long-term competitiveness will depend on its ability to build on existing industrial strengths while expanding into higher-value segments of the automotive and mobility value chain. Opportunities exist to strengthen Ontario's position as a trusted North American production jurisdiction, modernize and retain the existing supplier base, expand participation in battery and critical mineral value chains, accelerate supplier transition into electrified and software-defined vehicle systems, advance trusted digital supply chains, broaden adoption of AI and advanced manufacturing technologies, leverage cross-sector and dual-use applications, and develop the talent required to support the next generation of automotive production.

OVIN is positioned to continue to play an important role in advancing these opportunities by supporting technology adoption, workforce development, research and commercialization, supplier modernization, and real-world testing and validation. Through initiatives spanning innovation infrastructure, demonstration environments, talent development, industry partnerships, and SME support, OVIN continues to help strengthen Ontario's ability to compete in an increasingly complex and interconnected automotive landscape. Overall, the transformation of automotive and mobility supply chains presents both challenges and opportunities. While competitive pressures are intensifying, Ontario's combination of manufacturing depth, innovation capacity, clean energy, critical minerals, and strong ecosystem assets provides a foundation from which to build long-term resilience, competitiveness, and growth.

2. Global Trade, Policy, and Supply Chain Environment

Global automotive trade and supply chains are being reshaped by shifting production patterns, evolving policy frameworks, and rising focus on resilience and security. These forces are changing how and where vehicles and key components are produced, sourced, and traded.

This section examines the global trade, policy, and supply chain conditions shaping the automotive and mobility sector and the implications for integrated production jurisdictions such as Ontario.

2.1 Global Trade and Supply Chain

Global automotive production is undergoing a structural shift, including changes in the geographic distribution of production, driven by evolving cost structures, and the transition toward electrified vehicle platforms. While established manufacturing regions in Europe and North America continue to account for a substantial share of production, emerging producers in Asia are capturing a growing proportion of global output. These changes are altering long-standing patterns of production, trade flows, and investment within the industry.

At the same time, supply chain configurations are being reshaped by both economic and geopolitical considerations. Trends such as nearshoring and friendshoring are influencing sourcing decisions, while increased attention to supply chain resilience is affecting how businesses structure production networks and manage risk exposure.

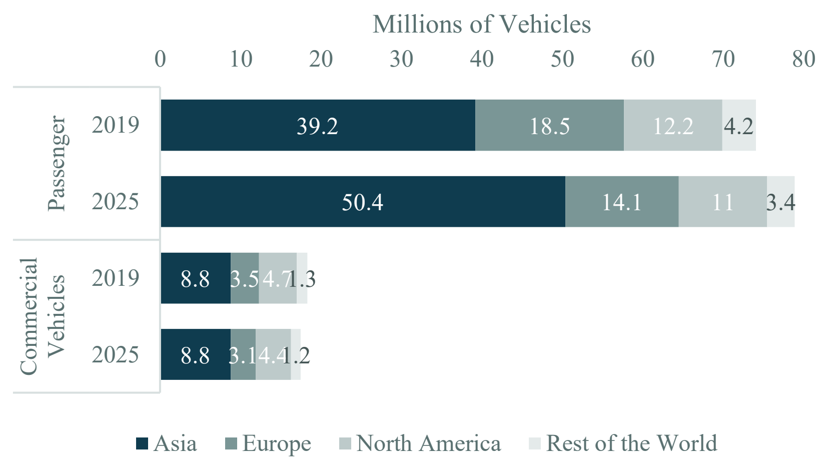
Global Production Landscape and Shift Towards Asia

Vehicle production remains concentrated in a small number of major manufacturing jurisdictions. According to the European Automobile Manufacturers' Association (ACEA) data released in April 2026, global motor vehicle production (including passenger and commercial vehicles) rose to 96.5 million units in 2025, an increase of 3.8 percent year-over-year. [1] This growth was driven primarily by Asia, which accounted for 61 percent of global vehicle production in 2025.

Figure 1 compares vehicle production by region globally between 2019 and 2025. Since 2019, production in Asia has increased by 23 percent, while production in Europe and North America has declined by 22 percent and 9 percent respectively.

In 2025, China produced nearly 30 million passenger vehicles, an increase of roughly 10 percent over 2024, consolidating its position as the world's largest vehicle-producing country.[2] This dominance reflects sustained state-led investment in manufacturing capacity, vertically integrated electric vehicle (EV) supply chains, and rapid expansion of vehicle exports. Between 2009 and 2023, China's EV sector received an estimated USD 231 billion in state support through subsidies, tax exemptions, infrastructure investment, public procurement, and demand-side incentives. [3] Independent analysis by Rhodium Group identifies vertical integration, scale economies, and lower overhead as the primary structural cost advantages that allow Chinese automakers to consistently underprice western peers, with state support amplifying these structural advantages.[4]

Figure 1: Global Vehicle Production (In Millions) by Region, 2019 vs 2025



Source: OICA News Release (April 23, 2026), ACEA Economic and Market Report. Global and EU auto industry Full year 2019 and 2025, and MNP Analysis

Japan remained a major production base at 8.4 million vehicles in 2025 as the second-largest producer of vehicles in Asia.[1 5] India has emerged as the other major growth market, with vehicle production increasing by 47 percent between 2019 and 2025. Passenger vehicle production rose from 3.6 million to 5.3 million units over the period, while commercial vehicle production increased from 0.9 million to 1.3 million units.[1 6]

Europe remains the second largest production region despite seeing production of passenger vehicles decline by approximately 24 percent from 18.5 million units produced in 2019 to 14.1 million units produced in 2025. In the passenger vehicle market, European car manufacturers increasingly compete with Chinese made vehicles, particularly more affordable electric vehicles.[1 7] Similarly, the production of commercial vehicles in Europe declined by 11 percent from 3.5 million units in 2019 to 3.1 million units in 2025.

In North America, total production was roughly 15.4 million units in 2025, down from 16.9 million in 2019. The decline in North American production reflects a combination of supply chain disruptions, changing consumer preferences and competition from lower cost regions.

The U.S. accounted for 65 percent of North American passenger vehicles produced in 2025.[1] Relative to 2024, production was down slightly while Mexico's production remained stable at approximately 4 million passenger vehicles[8]. For Mexico, lower demand for vehicles and U.S. import tariffs affected the number of units exported.[9]

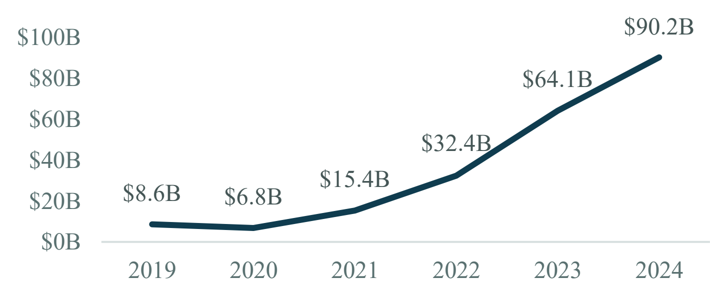
Canada produced approximately 1.3 million passenger vehicles in 2025, a 0.05 percent decrease relative to 2024. [10] While U.S. tariffs and weak demand did affect production, Canadian production has been on a downward trajectory driven by high labour costs and lower economies of scale compared to the U.S. and Mexico.[11] Ontario accounts for the majority of Canadian production, representing 84.6 percent of national employment in motor vehicle manufacturing and 84.7 percent of national sector Gross Domestic Product (GDP).[12]

China's Export Surge and Foreign-Market Displacement

While production volumes provide insight into the geographic distribution of the industry, the more significant distinction between established and emerging producers lies in their export performance. The value of Chinese vehicle exports rose from USD 8.6 billion in 2019 to USD 90.2 billion in 2024, a more than ten-fold increase that has fundamentally reshaped global automotive trade flows. [13] Figure 2 illustrates this trajectory, showing the scale and pace of China's emergence as the world's dominant vehicle exporter. While UN Comtrade data does not provide data for 2025 at the time of this report, China's General Administration of Customs' data estimates the export value for automotives at 142.4 billion USD, growing 21 percent compared to their 2025 estimates signaling ongoing growth of Chinese vehicle exports.[14]

Chinese manufacturers have rapidly expanded into markets historically supplied by European, Japanese, or Korean producers. For example, 7 percent of vehicles sold in the European Union in 2025 were made in China.[1] In Europe, Chinese brands have been gaining share, with electric car imports from China accounting for a growing proportion of EV sales across the continent.[15] For automakers maintaining assembly operations across multiple jurisdictions, the issue is no longer whether Chinese Original Equipment Manufacturers (OEMs) will affect their core markets, but how quickly Chinese production capacity will influence competitive conditions in those markets. This dynamic is reshaping global sourcing and investment decisions, including in regions such as North America, where Chinese vehicle presence remains limited.

Figure 2: China Vehicle Export Value, 2019 to 2025 (USD Billions)



Source: UN Comtrade (2019-2024)

Geopolitical Realignment and Supply Chain Restructuring

Production shifts are being shaped by a broader realignment of industrial policy in which governments increasingly treat automotive supply chains not only as commercial systems but as elements of national economic security. This introduces policy tools that directly influence where production is located and from whom components are sourced. The 2025 U.S. National Security Strategy explicitly frames supply chains, manufacturing capacity, and critical minerals as core components of national economic security, calling for the reshoring of critical and emerging technology production and closer industry–government partnerships to secure infrastructure and production capacity.[16]

Policy tools designed to decouple supply chains along geopolitical lines include semiconductor export controls, Foreign Entity of Concern (FEOC) restrictions in EV battery supply chains, and proposed restrictions on connected vehicle components sourced from adversarial nations.[17] These dynamics have given rise to two related strategies that are now central to automotive supply chain planning: nearshoring and friendshoring.

Nearshoring and Friendshoring

Nearshoring refers to the relocation of supply chain operations closer to end markets. Friendshoring restricts participation to geopolitically allied nations. Both strategies have gained prominence since 2022. A 2024 Kearney Reshoring Index survey found that 96 percent of North American CEOs had already implemented or were evaluating reshoring or nearshoring strategies, with automotive among the most active sectors.

Source: Kearney Reshoring Index (2024)[18]; McKinsey Global Institute (2024)[19]

These strategies are influencing the location of manufacturing investment, and the set of jurisdictions considered trusted partners within integrated production networks. For jurisdictions that combine proximity to major end markets, preferential trade access, deep automotive supplier bases, and access to clean electricity, nearshoring and friendshoring create a structural opportunity to attract investment. Realizing that opportunity, however, depends on maintaining competitiveness relative to jurisdictions offering aggressive incentive regimes.

EV Transition and Ontario's Supply Chain Exposure

The transition to electrified powertrains represents a significant structural change in the automotive industry, altering where value is created and which inputs are required across the supply chain. Global EV sales surpassed 17 million units in 2024 and exceeded 20 million in 2025, with EVs accounting for 25 percent of global new car sales according to the International Energy Agency (IEA) Global EV Outlook 2026.[20] This transition could potentially replace traditional internal combustion engine (ICE) components, including engines, transmissions, exhaust systems, and fuel injection systems, with batteries, electric motors, inverters, and thermal management systems.

In a battery electric vehicle (BEV), the battery pack can represent 30 to 40 percent of total vehicle cost, compared to 10 to 15 percent for the powertrain in a conventional ICE vehicle. This concentration of value in a single component has significant implications for where investment flows, which suppliers capture margin, and how automotive value chains are structured.[21] The shift introduces new upstream dependencies on critical minerals. Lithium demand grew nearly 30 percent in 2024 alone, while demand for nickel, cobalt, graphite, and rare earth elements grew between 6 and 8 percent, driven primarily by EV and battery storage applications.[22] This realignment reduces demand for the precision-machined metal parts that have historically anchored automotive supply chains in established producing regions.

The implications of this shift extend across the supplier ecosystem. Parts manufacturers built to serve ICE powertrains face declining demand for their core products, while new demand is emerging for battery cells, cathode and anode materials, power electronics, and software-defined vehicle systems. At the same time, the composition of OEMs anchoring production in key jurisdictions is evolving.

In Canada, Japanese automakers Toyota and Honda, account for more than two-thirds of national vehicle production at their Ontario assembly plants, a notable change since historic dominance of the U.S.-based, Detroit Three (General Motors, Ford, and Stellantis) in Canadian assembly.[23] This change has important implications for the supplier base, as differences in OEM production models, sourcing strategies, and platform requirements can affect procurement patterns and supplier relationships across the broader parts sector.

These dynamics carry particular significance for Ontario, which directly employs more than 100,000 workers across auto assembly and parts manufacturing and is home to five major vehicle assemblers: Ford, General Motors, Honda, Stellantis, and Toyota.[12] As the industry transitions to electrified platforms, the province's extensive parts manufacturing base is adapting to serve new production requirements, with workforce development and supplier modernization emerging as strategic priorities. Ontario has moved to anchor the emerging EV battery supply chain through landmark investments in battery manufacturing and EV production, including Volkswagen's PowerCo gigafactory in St. Thomas and the LG Energy Solution NextStar battery plant in Windsor.[24] [25]

The transition has also proven more challenging than many early forecasts anticipated. Slower-than-expected EV adoption, shifting policy environments, and evolving market conditions have prompted manufacturers to reassess investment plans and production timelines. Several major automakers have reported significant write-downs on EV-related investments, while battery and vehicle projects across North America and Europe have been delayed, restructured, or suspended. In Ontario, these dynamics have been reflected in Honda's suspension of its planned EV value chain investment in Alliston, Ford's delay of EV production plans in Oakville, and GM's discontinuation of the BrightDrop program in Ingersoll.[26] These developments highlight that, while electrification remains a major long-term industry direction, the pace and pathway of the transition remain uncertain and will require continued adaptation by OEMs, suppliers, and policymakers.

2.2 Trade Policy, Market Access, and Regulation

The trade policy environment governing the global automotive industry is undergoing a period of substantial change, characterized by shifting tariff regimes, evolving incentive structures, and increasing regulatory complexity across major producing jurisdictions. Recent policy actions, particularly in the U.S. and among key trading partners, are influencing cost structures, trade flows, and investment decisions across integrated supply chains.

U.S. Tariff Actions and Impacts

On March 26, 2025, the U.S. announced a 25 percent tariff on automobiles and auto parts under Section 232 of the Trade Expansion Act which came into effect on May 3, 2025.[27] For vehicles originating from Canada and Mexico that qualify under Canada-United States-Mexico Agreement (USMCA) rules of origin, the 25 percent tariff applies only to the vehicle's non-U.S. content, reducing tariff exposure for automakers with significant U.S. production and sourcing. Since its introduction, the tariff framework has evolved through bilateral and multilateral arrangements. Agreements with the European Union, Japan, and South Korea established a reduced combined tariff rate of 15 percent on their automotive exports, while the United Kingdom secured a 10 percent rate within defined quota limits.[28] The U.S. Department of Commerce also introduced a temporary import adjustment mechanism, allowing manufacturers with U.S. assembly operations to offset a portion of their parts tariff burden by up to 3.75 percent of vehicle manufacturer's suggested retail price (MSRP) through April 2026, and 2.5 percent of aggregate MSRP for eligible vehicles produced between May 2026 and April 2027.[29]

Canada responded with a 25 percent tariff on non-USMCA-compliant vehicles and retaliatory levies on steel and aluminum imports,[30] alongside an auto remission framework that allows duty-free vehicle imports from the U.S. provided the importer maintains Canadian production commitments.[31] This mechanism is designed to preserve investment incentives for manufacturers operating on both sides of the border.

USMCA Rules of Origin

Under the USMCA, vehicles must meet a 75 percent Regional Value Content (RVC) threshold to qualify for duty-free treatment, up from 62.5 percent under NAFTA. A Labour Value Content (LVC) requirement further mandates that 40 to 45 percent of vehicle content be produced by workers earning at least USD 16 per hour. These provisions incentivize production within North America and ensure that trade preferences support higher-wage employment in the region.

Source: USMCA Chapter 4 – Rules of Origin [32]

In the first year following the tariff action, cumulative costs to the automotive industry exceeded USD 30 billion, contributing to a 10.4 percent increase in average vehicle suggested retail prices, according to Cox Automotive's Kelley Blue Book.[33] While North American vehicle sales were up slightly in 2025, S&P Global Mobility is forecasting modest declines in sales due to affordability challenges.[34]

Trade data indicates only a modest decline in automotive exports from Canada to the U.S. between 2024 and 2025 immediately after the introduction of significant tariff measures. As shown in Table 1, total exports from Canada to the U.S. decreased from CAD 75.3 billion in 2024 to CAD 71.5 billion in 2025, representing an approximate 5 percent decline. Ontario, which accounted for 86 percent of Canada's total exports to the U.S., saw exports decline from CAD 68 billion in 2024 to CAD 65 billion in 2025, or roughly 4.3 percent.[35] The industry's proactive response to anticipated trade restrictions following the election of President Trump helped moderate the decline as automotive manufacturers imported substantial inventory prior to the introduction of tariffs.[36]

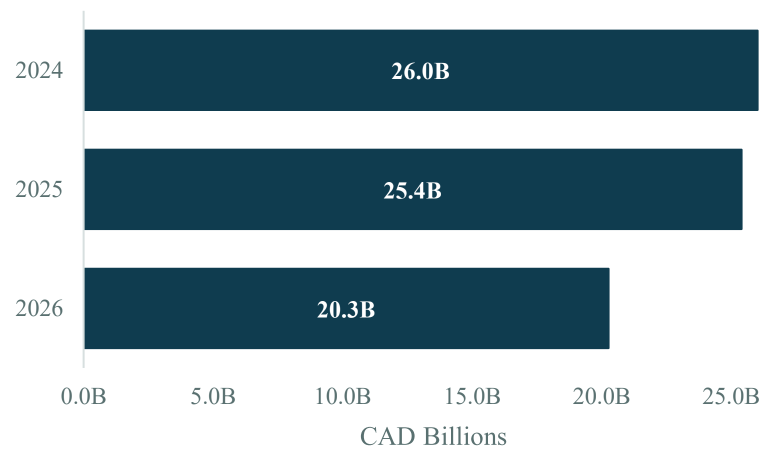
Table 1: Canada and Ontario Exports to U.S. (CAD)

Exports to U.S.	2024	2025
Canada (including Ontario)	$ 75.3 Billion	$ 71.5 Billion
Ontario only	$ 64.8 Billion	$ 62.1 Billion

Source: Statistics Canada. Table 12-10-0175-01 International merchandise trade by province, commodity, and Principal Trading Partners (x 1,000)

Comparing export values over the first four months of 2024 through 2026 highlights the impact of the tariffs. As shown in Figure 3, Canadian exports to the U.S. totaled approximately CAD 26.0 billion between January and April 2024, declining by 2.4 percent to CAD 25.4 billion over the same period in 2025.[35] Exports declined further in 2026, falling to CAD 20.3 billion for the January–April period, equivalent to a 22.1 percent decrease compared to 2024 levels.

Figure 3: Canada Exports to the U.S. (January to April)



Source: Statistics Canada. Table 12-10-0175-01 International merchandise trade by province, commodity, and Principal Trading Partners (x 1,000)

According to Statistics Canada data, Ontario experienced a 20.7 percent decline in total trade with the U.S. when comparing the January–April period in 2024 and 2026, showing the tariff impacts on the automotive industry which relies on cross-border exports for vehicles and manufacturing parts.[35]

Importers have also begun reorienting their sourcing, with the U.S. share of vehicles imported to Canada falling to a record low while Mexico's share increased by 2 to 3 percentage points as buyers shifted toward lower-tariff origins.[37] These data points indicate that the tariff regime may be producing structural rather than cyclical effects on Canada's automotive trade position. Oxford Economics projects that permanent tariffs could reduce Canada's motor vehicle exports by 10 percent by 2029, reduce sector output by CAD 1 billion, and eliminate approximately 6,000 jobs.[38]

A broader concern for integrated North American supply chains is the disproportionate impact of prolonged tariff exposure on smaller suppliers. Tier 2 and Tier 3 firms, particularly those supplying upstream materials and intermediate inputs, typically operate on thinner margins and have limited capacity to absorb cost increases or reconfigure production across jurisdictions. Prolonged uncertainty is, therefore, raising concerns about firm viability, with potential cascading effects on the resilience and competitiveness of the broader supply chain. These pressures are further compounded by incentive competition across major producing jurisdictions, which is shaping not only how tariff costs are managed but also where new investment and production capacity are ultimately located.

Competing Incentive Regimes

Governments across major automotive-producing jurisdictions are deploying competing incentive regimes to attract and retain manufacturing investment, particularly in EV and battery production. The scale and structure of these packages are reshaping the competitive landscape for investment attraction.

In the U.S., the Inflation Reduction Act (IRA), enacted in 2022, established a comprehensive policy framework to support domestic EV production and adoption. Key measures include Section 45X production tax credits for battery components, a consumer EV tax credit of up to USD 7,500, and significant Department of Energy loan programs to finance clean energy manufacturing facilities.[39] However, the One Big Beautiful Bill Act, enacted in 2025, terminated consumer EV credits as of September 2025, although the production-side 45X credits remain in place.[40] The retention of production tax credits signals continued U.S. commitment to domestic battery manufacturing, while the removal of consumer incentives may slow demand growth and reduce the near-term commercial case for additional assembly capacity.

Beyond federal incentives, U.S. states compete aggressively for automotive investment through their own incentive packages. Michigan approved USD 666 million in support for General Motors' Ultium battery and EV assembly projects,[41] alongside USD 200 million for battery startup "Our Next Energy".[42] Georgia secured Rivian's USD 5 billion assembly plant[43] and the Hyundai Motor Group Metaplant through multi-billion-dollar packages combining capital grants, tax abatements, and infrastructure investment.[44] Tennessee attracted Volkswagen's Chattanooga EV expansion and the SK Innovation battery plant through similar instruments.[45] These state-level incentives, which operate independently of federal programs, represent a competitive layer that producing jurisdictions such as Ontario need to contend with alongside federal measures.

In Canada, the federal government offers a 30 percent Clean Technology Manufacturing Investment Tax Credit, and in February 2026, introduced a new CAD 2.3 billion Electric Vehicle Affordability Program to replace zero-emission vehicle (ZEV) sales mandates, which were formally repealed.[46] Canada has also matched or exceeded U.S. production-level incentives on a project-specific basis to secure anchor battery investments. The Volkswagen PowerCo and Stellantis-LG NextStar deals each included federal production subsidy commitments structured to be competitive with Section 45X credits. The Parliamentary Budget Officer estimates total government EV support could reach up to CAD 52.5 billion.[47] [48] At the provincial level, Ontario has maintained its commitments through programs such as Driving Prosperity, the Ontario Automotive Modernization Program (O-AMP), the Ontario Vehicle Innovation Network (OVIN), and Ontario's Regional Development Program: Advanced Manufacturing and Innovation Competitiveness Stream, which provides targeted support for business expansion, technology adoption, productivity improvements, and investment attraction in advanced manufacturing.[49] Together, these programs extend over CAD 85 million in combined funding to support supplier modernization, technology adoption, and workforce development.[50]

The European Union (EU) has pursued a regulatory-led approach through the Net-Zero Industry Act and the EU Battery Regulation, maintaining its target of 100 percent zero-emission vehicle sales by 2035 while establishing stringent supply chain traceability requirements for battery materials.[51]

China's approach has been the most sustained and comprehensive. Between 2009 and 2023, an estimated USD 231 billion in cumulative state support was directed to the EV sector through subsidies, tax exemptions, infrastructure investment, public procurement, and demand-side incentives.[3] Through 2025, China maintained a full purchase tax exemption for new energy vehicles (NEVs) worth up to RMB 30,000 (approximately USD 4,170) per vehicle. From January 2026, this was halved to a 5 percent rate capped at RMB 15,000, alongside continued vehicle trade-in subsidies of up to 12 percent of vehicle price and an ongoing NEV production mandate requiring automakers to meet minimum electrified vehicle production quotas.[52] Table 2 summarizes the current status of key incentive mechanisms across major automotive-producing jurisdictions, illustrating the diversity of approaches and the competitive dynamics that manufacturers must navigate when making investment and location decisions.

As Table 2 illustrates, the diversity of approaches creates a competitive dynamic in which manufacturers must weigh not only the scale of available incentives but also the stability and predictability of the policy environment in each jurisdiction. For integrated production regions such as Ontario, the gap between U.S. production-side incentives and Canadian offerings remains a factor in OEM investment decisions. These competitive tensions are further complicated by the review of the trade agreement that governs how vehicles and components move across North American borders.

Table 2: Examples of Competing Incentive Frameworks Across Major Automotive Jurisdictions (2026)

Jurisdiction	Key Mechanism	Status (2026)
U.S. (Federal, Inflation Reduction Act / Section 45X)	Section 45X production credits (USD 35 per kilowatt-hour for cells; USD 10 per kilowatt-hour for modules)	Consumer credits ended September 2025; Section 45X production credits preserved
U.S. (State-level)	Capital grants, tax abatements, workforce subsidies (Michigan, Georgia, Tennessee, and others)	Active; multi-billion-dollar packages competing for battery and electric vehicle plants
China	New energy vehicle purchase tax exemption; vehicle trade-in subsidies; production mandate	Tax exemption halved January 2026 (5 percent rate, 15,000 renminbi cap); trade-in subsidies continued

Jurisdiction	Key Mechanism	Status (2026)
Canada (Federal)	30 percent Clean Technology Manufacturing Investment Tax Credit; project-level production subsidies matching Section 45X; CAD 2.3 billion Electric Vehicle Affordability Program	Zero-emission vehicle mandate repealed; aspirational 75 percent zero-emission vehicle target by 2035
Ontario	Driving Prosperity; Ontario Automotive Modernization Program; Ontario Vehicle Innovation Network	Active; CAD 85 million extension
European Union	Net-Zero Industry Act; Battery Regulation	100 percent zero-emission vehicle sales target by 2035

USMCA Review and Regulatory Fragmentation

The tariff and incentive dynamics described above are unfolding within a period of significant change in North America's trade architecture. By July 2026, the three USMCA parties are required to conduct the agreement's first mandatory joint review and determine whether to extend it for a further 16-year term.[53] Failure to agree at that review would not immediately terminate the agreement but would trigger annual reviews through the remainder of the current term. If no extension is agreed before 2036, USMCA would expire, potentially removing the preferential trade framework that has underpinned North American automotive integration for three decades.[53]

The review is expected to revisit automotive rules of origin, with the U.S. likely to push for more restrictive regional value content requirements and tighter provisions on circumvention, particularly regarding Chinese-origin components and investment. The outcome carries material consequences for plant-level competitiveness across the continent.

Complicating the review is a growing divergence in EV policy between Canada and the U.S. Canada's decision to repeal its ZEV sales mandate and replace it with aspirational targets contrasts with the U.S. approach of eliminating federal EV consumer subsidies and rescinding California's emissions waiver.[54] [55] These policy divergences introduce a risk that the USMCA review could impose new conditions on how vehicles, particularly EVs and battery components produced in partner countries, qualify for preferential treatment.

Beyond the USMCA, the broader regulatory environment for automotive trade is growing more complex. The EU's UNECE Regulations 155 and 156 have established baseline cybersecurity management and software update requirements, while the U.S. Department of Commerce has proposed separate rules restricting connected vehicle hardware and software from countries of concern.[56] The EU's Battery Regulation further requires a digital battery passport for all EV batteries, introducing supply chain traceability requirements from mineral extraction through end-of-life.[51] For manufacturers and suppliers exporting to multiple markets, maintaining parallel compliance across these frameworks is an increasing cost of doing business, but also a potential source of competitive differentiation for jurisdictions and firms that invest early in the required systems.

2.3 Supply Chain Resilience, Risk and Security

The pressures arising from trade policy and geopolitical shifts are reinforcing a broader set of structural risks within automotive supply chains. The COVID-19 pandemic and its aftermath between 2020 and 2022, including semiconductor shortages, port congestion, and cascading supplier shutdowns, exposed the fragility of cost-optimized, just-in-time global production networks and elevated supply chain resilience to a board-level priority across the industry. McKinsey's 2025 survey of 100 global supply chain leaders found that 90 percent encountered resilience challenges in 2024, alongside a decline in visibility beyond Tier 1 suppliers.[57] This reduction in multi-tier transparency indicates that many firms entered the 2025 tariff environment with more limited capacity to anticipate and manage supply chain risk.

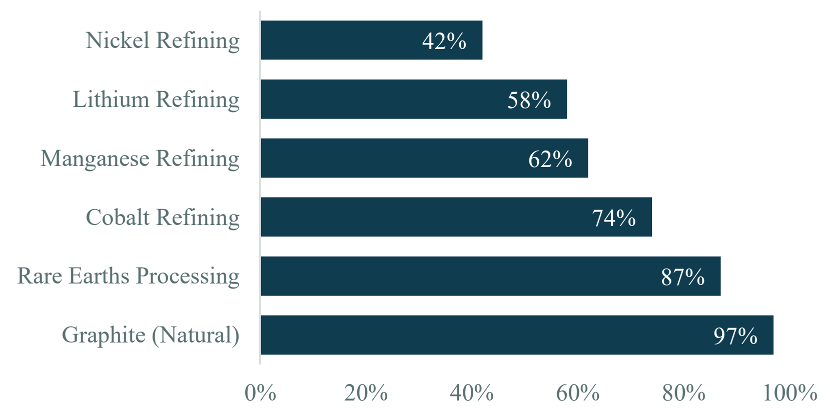
This subsection examines the primary sources of supply chain risk and the strategies being adopted in response. It focuses on critical mineral concentration and geopolitical exposure, the implications of trade volatility for integrated production networks, and emerging resilience strategies.

Critical Minerals Concentration and Geopolitical Risk

The transition to electrified powertrains has introduced a new category of supply chain vulnerability centred on critical minerals. Lithium, cobalt, nickel, and rare earth elements are essential inputs for EV batteries, electric motors, and power electronics. Their extraction, refining, and processing are concentrated in a small number of countries to a degree that creates systemic exposure for the global automotive industry. More than 80 percent of global rare earth element processing and over 50 percent of lithium refining capacity are concentrated in China.[58] Research published in Nature Communications found that minerals refined in China are present at some stage of processing in 80 percent of nickel-manganese-cobalt (NMC) cathodes and 92 percent of lithium iron phosphate (LFP) cathodes. Because most cathode chemistries depend on Chinese processing at more than one refining stage, the cumulative dependency across the value chain is materially greater than the concentration observed at any single stage.[59]

Figure 4 illustrates the degree of Chinese dominance across key mineral processing stages, highlighting the breadth of this concentration across the battery value chain. The geopolitical dimension of this concentration became sharply apparent in April 2025, when China required government approval for seven categories of rare earth exports before moving to a full suspension pending new regulations.[60] In October 2025, China expanded these controls to cover a broad range of lithium-ion battery supply chain materials, including cathode precursors, anode materials, and battery production equipment, demonstrating the vulnerability of supply chains that depend on a single dominant processor.[61] According to Bain and Company, announced supply capacity for critical minerals in allied nations is insufficient to meet expected U.S. and European demand through 2030, with the shortfall extending to refining, processing, and component manufacturing.[62]

Figure 4: China's Share of Critical Mineral Processing by Commodity



Source: IEA (2025); S&P Global (2025); Nature Communications (2024); Resilinc (2025)

In response, governments and industry are pursuing strategies to reduce this concentration risk, including investment in domestic and allied-nation mineral processing capacity, diversification of sourcing across Africa, Latin America, and Australia, development of battery chemistries that reduce dependence on the most concentrated minerals, and the creation of strategic stockpiles.[63] [64] However, building alternative processing capacity is capital-intensive and takes years to reach commercial scale. As a result, the dependency on concentrated sources will likely persist through at least the medium term. For automotive supply chains, this implies that critical mineral risk will remain a defining feature of the strategic landscape. These upstream vulnerabilities are compounded by another category of risk which is the exposure of tightly integrated production networks to trade volatility and policy shifts at the border.

Exposure to Trade Volatility in Integrated Supply Chains

The integrated nature of North American automotive production amplifies the effects of trade disruptions. The North American supply chain operates as a deeply interwoven system; a single vehicle assembled in the region may incorporate components that have crossed the U.S., Canadian, and Mexican borders multiple times before final assembly.[65] Ontario’s parts manufacturers are particularly integrated into cross-border production networks with Michigan, Ohio, and other Great Lakes states. This deep integration underscores the importance of maintaining stable, predictable trade conditions. In the current trade environment, however, this same integration has become a vector for risk transmission. Tariffs, border delays, and regulatory changes at any point in the network can ripple across the entire production system. These effects are already visible. Corporate profits for U.S. fabricated metal manufacturers, a proxy for supplier-chain health, fell 30 percent between Q4 2024 and Q2 2025,[66] reflecting both direct tariff costs and the secondary effects of production uncertainty.

OEM and Supplier Resilience Strategies

As a response to this evolving risk landscape, automakers and major suppliers have restructured their supply chain strategies around three interconnected priorities: diversification of sourcing, regionalization of production, and digital integration for enhanced risk visibility. Figure 5 summarizes these strategic pillars, which collectively represent a shift from cost-optimized, globally dispersed supply chains toward more resilient, regionally anchored networks.

Diversification involves reducing dependence on single-source or single-country suppliers for critical inputs. OEMs are qualifying alternative suppliers across multiple geographies and, in some cases, investing directly in upstream processing capacity to secure supply. **Regionalization** reflects the shift toward building production capacity closer to end markets, reducing exposure to cross-border tariffs, logistics disruptions, and geopolitical risk. This trend is closely related to the nearshoring and friendshoring dynamics described in Section 2.1. **Digital integration** refers to the deployment of advanced supply chain visibility platforms, including Artificial Intelligence (AI)-enabled risk monitoring, real-time inventory tracking, and predictive analytics, to detect and respond to disruptions before they cascade across the network.

Figure 5: Three Pillars of Automotive Supply Chain Resilience

Diversification	Regionalization	Digital Integration
• Qualify alternative suppliers • Reduce single-source dependencies • Invest in upstream capacity	• Build capacity closer to end markets • Reduce tariff exposure • Nearshoring/ friendshoring	• AI-enabled risk monitoring • Real-time tracking; predictive analytics for disruption response

Source: MNP analysis

These strategies are reshaping the criteria by which OEMs evaluate potential production locations and supplier relationships. Jurisdictions that can offer secure, diversified, and digitally integrated supply chain environments are increasingly attractive to manufacturers that have experienced the costs of disruption firsthand.

Trusted Systems and Digital Supply Chain Security

As vehicles become more connected and software-defined, automotive supply chain risk is increasingly shaped by digital exposure as well as physical disruption. Connectivity enables functions such as vehicle-to-infrastructure communication, vehicle-to-cloud services, and over-the-air software updates, but it also expands the attack surface across hardware, software, communications, and data layers. As a result, cybersecurity, data governance, software-update integrity, and lifecycle monitoring are becoming embedded requirements across the automotive value chain.[67] [68]

The implications for suppliers are structural. Transport Canada states that responsibility for securing the vehicle ecosystem extends beyond OEMs to suppliers, subcontractors, and third-party vendors. [69] International Organization for Standardization / Society of Automotive Engineers (ISO/SAE) 21434 applies cybersecurity risk management across the lifecycle of vehicle electrical and electronic systems and is intended for OEMs, Tier 1 and Tier 2 suppliers, and other organizations involved in vehicle electrical and electronic systems. [70] This means cybersecurity compliance increasingly requires secure design, software validation, contractual security requirements, supplier assurance, and lifecycle monitoring to be integrated into production and procurement processes.

At the system level, this is contributing to the emergence of trusted automotive supply chains, where sourcing decisions are influenced by both regulatory alignment and digital-security requirements. The U.S. connected-vehicle rule restricts certain vehicle hardware and software linked to China or Russia,[71] while the European Commission has linked connected-vehicle cybersecurity to economic-security standards and supply chain risk.[72] For jurisdictions such as Ontario, this creates a dual requirement: maintaining integration within North American production networks while ensuring that domestic firms can meet evolving cybersecurity, traceability, data governance, and software-integrity expectations.

3. Automotive and Mobility Value Chains and System Transformation

Automotive and mobility value chains are undergoing significant transformation. The shift to electrified platforms is concentrating value in batteries, power electronics, and critical minerals, while reducing the role of traditional internal combustion components. At the same time, software and digital systems are capturing a larger share of value, reshaping how vehicles are designed, updated, and monetized over their lifecycle.

Production is becoming more integrated, with manufacturing, logistics, data, and software operating through coordinated networks rather than sequential processes. These changes, together with the trade, policy, and resilience dynamics outlined in Section 2, are reshaping where production occurs and which jurisdictions capture emerging value. This section examines these structural shifts and their implications for manufacturers, suppliers, and jurisdictions, including Ontario.

3.1 Value Chain Structure and Supplier Ecosystem

Upstream, Midstream, and Downstream Value Creation

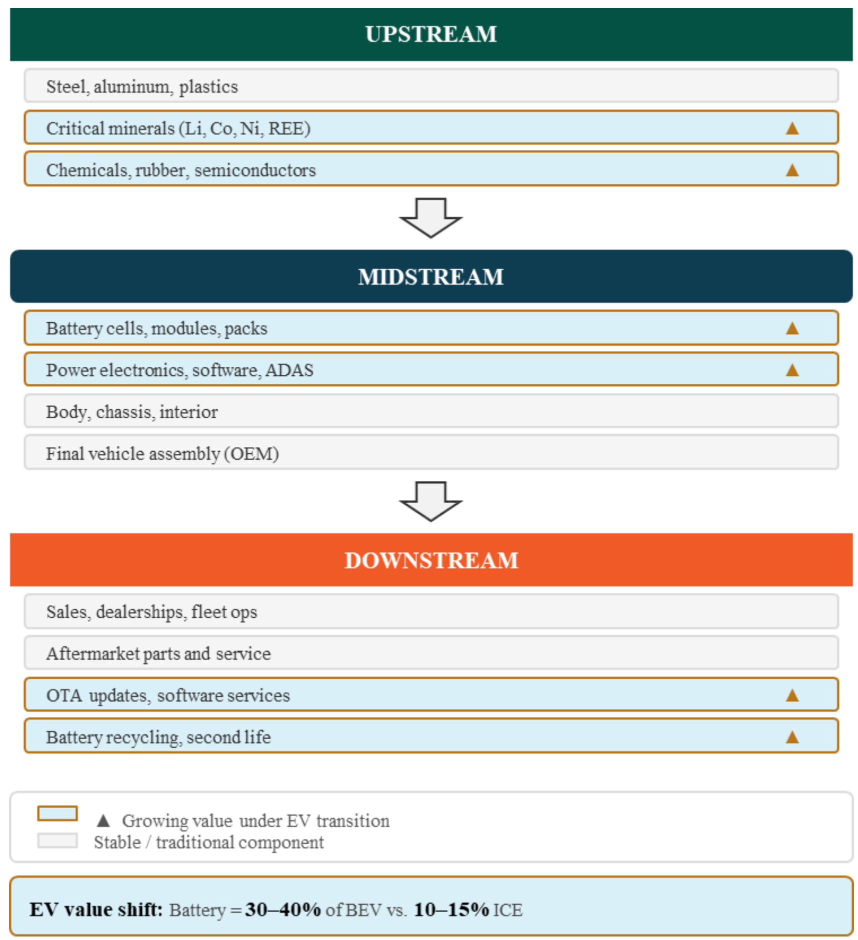
The automotive value chain spans raw material extraction, component manufacturing, vehicle assembly, distribution, and end-of-life management. It is undergoing a structural reconfiguration as electrification, evolving sourcing strategies, and shifting global production dynamics reshape where value is created and how it is captured across the system.

Three interrelated forces are driving this transformation. First, value is shifting toward batteries, power electronics, and software, reducing the share captured by ICE-specific components. Second, the supplier landscape is being restructured, with battery cell manufacturers, semiconductor firms, and software providers entering as Tier 1 or strategic partners. Third, the scale, cost structure, and speed of Chinese OEMs and battery producers are setting new competitive benchmarks that are influencing global sourcing and investment decisions. Together, these dynamics are reshaping supplier positioning and altering the geographic distribution of automotive production.

These changes are reflected across the three core stages of the value chain. Upstream activity is increasingly defined by the extraction and processing of critical minerals, including lithium, cobalt, nickel, and rare earth elements, which have become essential inputs for battery production. Midstream activity, encompassing component manufacturing and vehicle assembly, is shifting from mechanical systems toward battery packs, electric drivetrains, and software-integrated architectures. Downstream activity is expanding beyond traditional sales and servicing to include software-enabled revenue streams, such as over-the-air updates and subscription-based features that extend the vehicle lifecycle.

As a result, value distribution across the vehicle bill-of-materials is being reconfigured, with direct implications for which suppliers, jurisdictions, and capabilities capture the largest share of economic activity.[21]

Figure 6: Illustrative Example of the Automotive Value Chain



Source: MNP analysis

Figure 6 illustrates the structure of the automotive value chain, from upstream material inputs through midstream manufacturing and assembly to downstream distribution and lifecycle management, highlighting where the EV transition is creating the most significant shifts in value distribution.

The activities shown in Figure 6 are not carried out by a single manufacturer. Each stage depends on a network of specialized firms organized through a tiered supplier structure, which governs how materials and components move from raw inputs to finished vehicles.

The Tiered Supplier Ecosystem

The automotive industry operates through a tiered supplier structure in which OEMs sit at the centre of a network of specialized suppliers organized by their proximity to the final assembly process. This structure has defined the industry for decades and continues to shape how components are sourced, manufactured, and integrated into finished vehicles.

The Automotive Tier Structure

Tier 1 suppliers manufacture complete systems and modules sold directly to OEMs, such as seating systems, braking modules, powertrain assemblies, and infotainment units. Tier 2 suppliers produce the sub-components that Tier 1 firms incorporate into their products, including castings, forgings, sensors, and circuit boards. Tier 3 suppliers provide the raw materials and basic processed inputs, such as steel coils, plastic resins, rubber compounds, and specialty chemicals, that feed into higher-tier manufacturing. Together, these tiers form the backbone of the automotive parts sector.

A conventional ICE vehicle is comprised of approximately 25,000 to 30,000 individual parts, sourced from hundreds of suppliers across multiple tiers and geographies. Toyota Motor Corporation's published account of its production system describes vehicles as made up of more than 30,000 parts sourced not only from Toyota's own facilities but from a network of business partners that must work in complete synchronization to deliver finished vehicles.[73] This complexity has supported deep specialization across the supplier ecosystem. OEMs have typically retained design authority and final assembly, while major Tier 1 suppliers such as Bosch, Denso, Continental, ZF Friedrichshafen, and Magna International have evolved into system-level partners that manage their own sub-supplier networks.[74] [75] The EV transition is now disrupting this established structure.

This disruption is occurring in several ways. Electric drivetrains contain dramatically fewer moving parts than conventional ICE powertrains. A UBS Evidence Lab teardown of the Chevrolet Bolt documented 24 moving parts in the Bolt's electric powertrain compared with 149 in a comparable Volkswagen Golf ICE powertrain, a roughly six-fold reduction in mechanical complexity.[76] This simplification reduces the demand for precision-machined metal parts that have historically anchored Tier 2 and Tier 3 suppliers in established manufacturing regions. At the same time, EVs introduce new component categories, including battery cells and modules, battery management systems, power electronics, thermal management systems, and high-voltage wiring harnesses, each requiring distinct materials, manufacturing processes, and technical expertise.[77]

Major OEMs are responding to the EV transition with dedicated electric platforms and reconfigured supplier ecosystems. Stellantis, a multinational automotive manufacturer, is rolling out four global STLA platforms (Small, Medium, Large, and Frame),[78] supported by battery plants including NextStar Energy in Windsor, Ontario.[79] General Motors has built its Ultium battery and propulsion architecture[80], supported by its Ultium Cells joint-venture plants with LG Energy Solution in Ohio, and Tennessee.[81] Ford has reorganized its EV operations under a dedicated Model e division, which focuses on software, electrified powertrains, and supplier integration.[82]

These platform commitments show how incumbent OEMs are adapting to the EV transition. They are also reshaping the supplier hierarchy. Battery cell makers, power electronics specialists, and software firms are increasingly entering vehicle programs as Tier 1 or strategic partners in roles that did not exist a decade ago.

Shifts in Value Distribution

The transition from hardware-centric vehicles to software-defined platforms, where critical functions such as battery optimization and automated driving are increasingly governed by software rather than mechanical systems, is also redistributing value across major vehicle component categories. Industry analysis projects that the global software-defined vehicle (SDV) market will grow from approximately USD 475 billion in 2025 to USD 1.6 trillion by 2030.[83]

Table 3 compares the approximate value distribution across key component categories in a conventional ICE vehicle vs. a BEV, illustrating the structural shift in where automotive value is concentrated.

Table 3: Approximate Value Distribution by Component Category, ICE vs. BEV

Component Category	ICE Vehicle	BEV	Direction of Change
Powertrain / Battery	10–15%	30–40%	▲ increase
Electronics & Software	15–20%	25–35%	▲ increase
Chassis, Body, Interior	35–40%	25–30%	▼ decline
Transmission & Exhaust	8–12%	< 2%	▼ decline
Thermal Management	2–3%	5–8%	▲ increase

Source: CLEPA / PwC Strategy&, EV Transition Impact Assessment 2020 to 2040; MNP visualization

The implications of this shift are significant for both suppliers and jurisdictions. Manufacturers that have built their capabilities around ICE-specific components, such as engine blocks, fuel injection systems, exhaust components, and multi-speed transmissions, face structural demand decline. In contrast, suppliers that develop capabilities in battery technology, power electronics, advanced thermal management, and vehicle software are positioned to capture a growing share of value.

This dynamic is particularly relevant for established automotive regions with deep ICE parts manufacturing bases. Canada, for example, is home to more than 700 automotive parts suppliers, many of which have historically specialized their operations in precision-machined ICE components.[84] The pace at which this supplier base can diversify into electrified and software-defined vehicle programs will be a significant determinant of the province's long-term competitiveness.

Battery Chemistry and Cost Compression

Within the categories shown in Table 3, the battery is the most consequential, accounting for 30 to 40 percent of total BEV value and concentrating the greatest share of cost, technology investment, and supplier competition. Global EV battery deployment reached approximately 1.2 terawatt-hours in 2025, representing an order-of-magnitude increase from the start of the decade, with particularly rapid growth in electric trucks and other heavy-duty vehicle segments.[20]

At the same time, battery costs are declining. According to BloombergNEF's 2025 Lithium-Ion Battery Price Survey, the global volume-weighted average battery pack price fell to USD 108 per kilowatt-hour in 2025, down 8 percent over 2024 and 87 percent below 2013 levels in real terms.[85] BEV packs averaged USD 99 per kilowatt-hour, marking the second consecutive year below the USD 100 threshold. In China, average pack prices fell to USD 84 per kilowatt-hour, roughly 44 percent below North American levels.

These trends are reshaping OEM sourcing strategies and margin structures. Manufacturers are dual-sourcing across cell chemistries, shifting volume between LFP and nickel-rich packs based on platform requirements, and applying intensifying cost pressure on Tier 1 and Tier 2 component suppliers around the battery as the cell itself absorbs a growing share of vehicle bill-of-materials. Tesla, for example, sources LFP cells from CATL and BYD (some models made in China) for standard-range Model 3 and Model Y vehicles, while continuing to use nickel-rich cells from Panasonic and LG Energy Solution for long-range trims and the Cybertruck.[86] Ford has introduced LFP packs in the base trim of the Mustang Mach-E and the F-150 Lightning while retaining nickel-rich chemistries for extended-range variants.[87] Rivian offers an LFP option in standard-range R1S and R1T configurations alongside nickel-rich packs for higher-performance trims.[88] Performance and market positioning differences between LFP and nickel-rich battery chemistries are summarized in Table 4.

Table 4: LFP and Nickel-Rich Battery Chemistries Performance and Market Positioning

	Lithium iron phosphate (LFP)	Nickel-rich (NCA/NMC)
Strengths	Lower cost; no nickel/cobalt; durable; thermally stable; good for frequent charging	Higher energy density; better for long range and high output
Trade-offs	Lower energy density; generally shorter range for same pack size/weight	Higher material cost; uses nickel/cobalt or high nickel content; greater supply chain exposure
Best fit	Standard-range, price-sensitive, fleet/commercial, high-cycle use	Long-range, performance, premium, cold-weather applications

Source: IEA Global EV Outlook 2025; LiFePO4 Battery Blog

Price declines mask a significant divergence in battery chemistries, with direct implications for mineral demand, supplier positioning, and regional competitiveness. LFP cells, which do not use nickel or cobalt, averaged USD 81 per kilowatt-hour in 2025, compared with USD 128 per kilowatt-hour for NMC cells.[85] Chinese manufacturers, led by BYD's Blade Battery[89] and CATL's Shenxing platform,[90] have scaled LFP for volume passenger-EV production. In contrast, Western OEMs continue to pursue higher-energy-density nickel-rich chemistries including Tesla's 4680 cylindrical cells and the NCM cells used by Panasonic[91], LG Energy Solution, and Samsung SDI.[92]

LFP is gaining share in standard-range passenger vehicles and stationary storage applications, where cost is the primary consideration. Nickel-rich chemistries remain more relevant for long-range and performance segments. As a result, suppliers tied to different mineral inputs and processing pathways are increasingly competing in parallel rather than within a single value chain. This also means that jurisdictions with strengths in one set of battery minerals may not be equally well positioned across all chemistry pathways.

The cost-compression dynamics described above are part of a broader shift in the automotive value chain. Chinese OEMs and battery manufacturers are intensifying cost compression across the automotive value chain by combining scale, vertical integration, and rapid product development cycles. For Tier 1 and Tier 2 suppliers, this pressure is transmitted through OEM procurement, where cost expectations are increasingly pushed downstream, compressing margins and accelerating consolidation among smaller firms. At the same time, Chinese OEMs are bringing EV models to market in 18 to 24 months, compared with 36 to 48 months for other mass market OEMs, through vertical integration, smaller vehicle and component portfolios and accelerated development and testing enabled by digital technologies. In turn, this is forcing suppliers to shorten development timelines and absorb higher upfront costs.[93] Together, these dynamics are reshaping competitive benchmarks, requiring suppliers and OEMs to adapt to lower cost structures and faster innovation cycles to remain viable in global markets.

Battery Recycling and Circular Value Chains

Recycling and circularity are emerging as distinct downstream segments of the battery value chain, rather than end-of-life considerations. As global gigafactory production scales, the volume of cell scrap, defective modules, and end-of-life battery packs available for recovery is increasing. Recyclers are responding by scaling processes that recover nickel, cobalt, lithium, and copper for reuse in battery production. Li-Cycle operated a recycling hub in Kingston, Ontario[94] until 2024. In 2025 it was acquired by Glencore and incorporated into Glencore Battery Recycling.[95] Redwood Materials in the U.S. is developing closed-loop processes for recovered cathode materials,[96] and in Europe, Northvolt developed a closed-loop recycling program at its Revolt Ett facility in Skelleftea, Sweden, designed to recover nickel, cobalt, lithium, and manganese for reuse in new cell production. Following Northvolt's bankruptcy proceedings, the facility was acquired by Lyten in March 2026, with plans to restart recycling operations at the site.[97]

Second-life applications are extending the commercial value of battery assets beyond their initial vehicle use. In these applications, retired EV packs are repurposed for stationary energy storage, supporting grid and renewable-energy integration. Regulatory frameworks are accelerating these trends. The EU Battery Regulation, which entered into force in 2023, establishes minimum recycled-content requirements for new cells starting in August 2027,[51] while the U.S. Inflation Reduction Act provisions create related incentives for closed-loop sourcing.[39] [98] For OEMs, traceable and verifiably recycled inputs are becoming a procurement consideration rather than a disposal issue.

These dynamics have direct implications for Ontario. The province's nickel deposits in the Sudbury basin and cobalt resources in northeastern Ontario align with the nickel-rich chemistries used by many North American battery manufacturers, including the NextStar facility in Windsor.[24] At the same time, the growth of LFP introduces a chemistry-driven shift in mineral demand. Since LFP batteries do not use nickel or cobalt, their expansion could reduce the relevance of some of Ontario's upstream mineral strengths, particularly where those strengths are tied to nickel-rich battery chemistries.

Evolving Supplier Relationships

The restructuring of the automotive value chain is introducing new categories of suppliers with capabilities that extend beyond traditional manufacturing. These include battery joint-venture investors, semiconductor and software platform providers, and a new generation of OEMs built around software and vertical integration from the outset.

Battery cell manufacturers are no longer competing only on chemistry and cost. Their investment decisions and plant locations are now directly shaping the geography of EV production. Volkswagen's PowerCo, established in 2022 as the Group's dedicated battery subsidiary, is developing three global gigafactories in Salzgitter, Germany, Valencia, Spain, and St. Thomas, Ontario.[99] The St. Thomas site was selected based on Ontario's clean electricity, access to battery raw materials and critical minerals, an established automotive ecosystem, and access to the North American market.[100] [101] The LG Energy Solution NextStar Energy facility in Windsor, Ontario, provides a second example of this shift.[102] [103] While portions of the battery value chain may need further development, particularly in battery materials processing, refining, precursor cathode active materials (PCAM), cathode active materials (CAM), and other intermediate battery inputs, the province's industrial base, critical mineral assets, and manufacturing ecosystem continue to provide a foundation for future value chain integration.

Semiconductor and software firms are also becoming central to vehicle programs as electronic and software content increases. Industry analysis estimates that semiconductor content per electric vehicle is roughly 2.3 times that of a conventional ICE vehicle, driven by power electronics, battery management systems, advanced driver assistance, and infotainment.[104]

Beyond traditional automotive semiconductor suppliers, specialist technology firms are entering vehicle programs in new roles, in some cases, bypassing the traditional tier structure. NVIDIA's DRIVE platform provides central computing architecture for OEMs including Mercedes-Benz, Jaguar Land Rover, Volvo, and BYD,[105] while Qualcomm's Snapdragon Digital Chassis powers connectivity and cockpit systems across OEMs including GM, BMW, Stellantis, Volvo, Honda, and Renault.[106] Other firms are reshaping specific vehicle layers: Google's Android Automotive OS has replaced in-house infotainment software at Volvo, Polestar, GM, Ford, Honda, and Renault, among others.[107] Intel-owned Mobileye supplies advanced driver-assistance systems (ADAS) silicon and software across more than 300 vehicle models, with advanced programs active across nine of its ten largest OEM customers.[108] Huawei's HarmonyOS Cockpit and DriveONE platforms have become central to several Chinese new entrants.[109] These firms compete with traditional Tier 1 suppliers for vehicle value and often engage directly with OEM senior leadership rather than through procurement channels.

The third group is a new generation of OEMs that has emerged outside the established markets that historically defined automotive value chains. These entrants embody many of the scale, cost, and speed dynamics described above. Chinese manufacturers such as BYD, NIO, Li Auto, and Xpeng have built EV-only platforms and software-led organizations from the ground up. BYD is the clearest example, with internal production of LFP cells, power electronics, semiconductors, and electric motors supporting its rapid scale-up to millions of annual vehicle sales.[4] NIO and Xpeng have differentiated through software, with NIO's NIO Pilot autonomous-driving stack and battery-swap network, and Xpeng's XNGP advanced driver-assistance system supporting expansion into Europe and Southeast Asia.

U.S.-based entrants such as Rivian and Lucid have followed a similar approach in premium and commercial-fleet segments. Both have built proprietary software platforms and structural battery systems from the outset, rather than adapting legacy ICE programs. Research indicates that more than 40 percent of Research & Development (R&D) employees at these new OEMs specialize in software, compared with approximately 15 percent at incumbent European OEMs.[110] For Tier 1 and Tier 2 suppliers, the implication is structural. The speed and cost pressures reshaping the industry reflect a fundamental shift in how new OEMs organize their value chains, rather than a temporary cyclical adjustment.

Vehicle Platforms and Modularity

A vehicle platform is the shared structural architecture, including the floor assembly, suspension mounting points, wheelbase dimensions, and electrical systems, upon which multiple vehicle models are built. Modularity refers to the design principle of constructing vehicles from standardized, interchangeable sub-systems (modules) that can be combined in different configurations. Together, platform and modular strategies allow OEMs to reduce development time, share components across models, and achieve cost efficiencies through higher production volumes per platform.

3.2 Integrated Industrial Systems

Platform-Based Manufacturing and Modular Production

One of the most significant developments in automotive manufacturing is the shift toward platform-based production architectures. Rather than designing each vehicle model as a discrete program, OEMs are increasingly developing shared platforms including standardized vehicle underbodies and structural architectures that can support multiple models, body styles, and powertrain types. This approach allows manufacturers to spread engineering investment across a broader product range, achieve economies of scale, and retain flexibility as market demand shifts.[74]

Several platform programs illustrate the scale of this shift. Volkswagen's Modular Electric Drive Matrix (MEB) platform underpins the ID.3, ID.4, ID.5, ID.7, Audi Q4 e-tron, Cupra Born, and Skoda Enyaq across the Group's brands, with the development of battery cells integrated into the value chain through PowerCo.[111] Hyundai's Electric Global Modular Platform (E-GMP) serves the Hyundai Ioniq 5 and Ioniq 6, Kia EV6 and EV9, and the Genesis GV60, with battery co-development through LG Energy Solution and SK Innovation.[112] General Motors' Ultium architecture and Stellantis' STLA Small, Medium, Large, and Frame platforms use a similar approach in the North American market.

For parts suppliers, platform-based manufacturing creates both opportunities and constraints. Firms whose components are specified across a platform can benefit from larger production volumes and deeper integration into OEM programs. At the same time, platform consolidation can reduce the number of unique part numbers and concentrate procurement among fewer, larger suppliers. For Ontario, where Ford, General Motors, Honda, Stellantis, and Toyota each operate assembly plants on different platform architectures, multi-platform exposure that supports multiple models, body styles, and powertrain types, is an immediate feature of the province's strength in integrated production model.[113]

Just-in-Sequence Production and Supply Chain Coordination

Automotive assembly operates on just-in-time (JIT) and just-in-sequence (JIS) principles. Under these systems, components arrive at the assembly line in the precise order and timing required for installation, reducing inventory costs and improving production efficiency. This level of coordination requires close integration between OEM production systems and supplier operations, supported by electronic data interchange (EDI) systems and, increasingly, cloud-based supply chain platforms. This coordination is particularly important in the Ontario–Michigan automotive corridor, where components often cross the border multiple times before final assembly. As a result, efficient cross-border logistics and predictable trade conditions are essential to maintaining production flow.[30]

The vulnerability of the JIT model became clear during the semiconductor shortage of 2020 to 2022, when shortages of relatively low-cost electronic components forced production shutdowns across major automakers.[114] In response, OEMs and suppliers have moved toward hybrid inventory strategies that preserve the efficiency benefits of JIT while adding strategic buffers for critical components. This shift reflects a broader recognition that supply chain efficiency and resilience must be managed together.

The same logic is also reshaping OEM–supplier relationships. As vehicles become more electronically complex, and as EV platforms introduce new component categories that must operate as integrated systems, supplier coordination is extending beyond physical parts flow. Increasingly, it also includes software, data, calibration, and system-level functionality.

OEM and Supplier System Integration

The relationship between OEMs and suppliers is evolving from transactional procurement toward deeper system-level integration. Major OEMs are increasingly requiring Tier 1 suppliers to provide not only physical components, but also the embedded software, calibration data, and integration support needed to ensure those components function within the vehicle's broader digital architecture.[115] This trend is most pronounced in EV and software-defined vehicle programs, where the battery management system, power electronics, and vehicle operating system must operate as a coordinated system rather than as separate components.

For suppliers, this shift requires investment in software engineering, data management, and systems integration capabilities that extend beyond traditional mechanical and electrical manufacturing expertise. The difference in R&D staffing between Chinese new entrants and Western incumbents (e.g., with BYD reportedly allocating approximately 11 percent of global staff to engineering and R&D compared with roughly 8.8 percent at Volkswagen) illustrates the growing importance of engineering depth.[116] A similar pressure is now extending across the supplier base, where firms increasingly need software and systems capabilities to participate in SDV programs.

Table 5 summarizes the major EV platform architectures currently in production or development, along with the supplier integration model selected by each OEM. It illustrates the range of strategies being pursued and the diversity of partnership structures that suppliers must navigate.

Table 5: Examples of Major EV Platform Architectures and Supplier Integration Models

OEM	Platform	Approach to Supplier Integration
Volkswagen Group	Modular Electric Drive (MEB); Scalable Systems Platform (SSP)	Open platform shared across VW, Skoda, Audi brands; battery partner CATL; software joint venture with Rivian
Hyundai Motor Group	Electric Global Modular Platform (E-GMP)	Shared across Hyundai, Kia, and Genesis brands; battery co-development with LG Energy Solution and SK Innovation
Tesla	Structural battery pack (integrated into chassis)	Vertically integrated strategic multi-sourcing for battery cells and semiconductor components; limited reliance on traditional Tier 1 suppliers
Toyota	e-TNGA platform; Arene vehicle operating system	Hybrid approach; proprietary software with established supply partners including Denso and Aisin
GM / Stellantis	Ultium (GM); STLA platforms (Stellantis)	Dedicated EV platforms; strategic battery joint ventures (e.g., Ultium Cells with LG Energy Solution); expanding in-house software

Source: Company disclosures; McKinsey Center for Future Mobility (2025); S&P Global Mobility (2025)

Aligning Industrial Capabilities with System-Level Needs

As automotive production becomes more integrated, the capabilities required of manufacturers and suppliers are extending beyond the factory floor. Vehicle electrification requires coordination with grid infrastructure, charging networks, and energy management systems. Similarly, connected and autonomous vehicle deployment depends on alignment with municipal transportation systems, telecommunications networks, digital identity frameworks, and cybersecurity requirements that span sectors and jurisdictions.

Examples of this system-level alignment are already emerging across the industry. The rapid consolidation around Tesla's North American Charging Standard (NACS), now adopted or supported by many major OEMs, such as General Motors, Ford, Volvo, BMW, Hyundai, Stellantis, and several others, has reduced connector fragmentation in the passenger EV market and illustrates how a technical standard can quickly become a market expectation.[117] Similar dynamics are visible in frameworks for vehicle-to-grid coordination, cross-network charging roaming, and supply chain data sharing, including OpenADR, Hubject, and Catena-X. Across these areas, alignment is shifting from a voluntary practice to a condition of competitive participation in integrated automotive value chains. Catena-X registration, for example, is now a procurement-level requirement at BMW Group and several other European OEMs.[118]

The ability of these systems to function at scale depends on the infrastructure and digital capabilities that support production. Energy networks must be able to serve both manufacturing operations and a growing fleet of electrified vehicles. Digital connectivity must be fast, reliable, and secure enough to support real-time coordination across suppliers, logistics providers, and OEMs. Software platforms must be interoperable across organizational boundaries, while cybersecurity requirements must be embedded across the system. These enabling conditions are examined in the next subsection.

3.3 Enabling Infrastructure, Digital Systems and Operational Performance

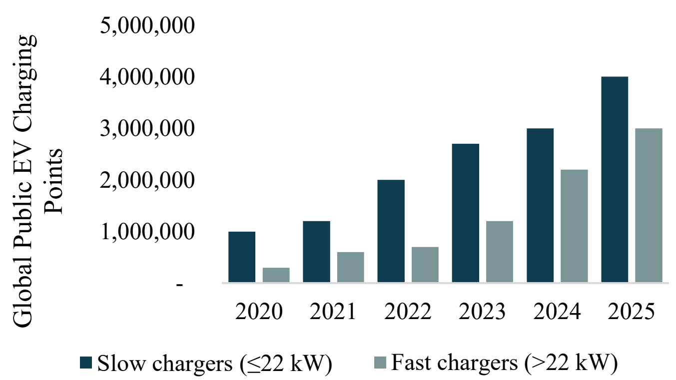
The integrated production systems and reconfigured value chains described in Sections 3.1 and 3.2 depend on a foundational layer of physical and digital infrastructure. Energy systems, charging networks, digital connectivity, software platforms, cybersecurity frameworks, and AI-enabled operations together determine whether advanced manufacturing and connected mobility can be deployed reliably and at scale. This subsection examines how this enabling infrastructure is being developed and deployed to support modern automotive production systems.

Energy Systems and EV Charging Infrastructure

The electrification of the vehicle fleet is placing two distinct demands on energy systems. The first is large, continuous industrial loads from battery and vehicle manufacturing. The second is a distributed network of charging infrastructure for end users. Battery cell production is among the most energy-intensive manufacturing activities. Gigafactories typically require 200 to 400 megawatts of continuous power, with electricity accounting for 20 to 30 percent of total production costs. As a result, both the availability and carbon intensity of power are now key determinants of plant location decisions.[119]

At the same time, public charging deployment has accelerated. According to the International Energy Agency, nearly 1.8 million public charging points were added globally in 2025, a 33 percent increase over 2024, bringing the worldwide total to more than 7 million.[120] In Ontario, the province's ChargeON program led by OVIN has supported the installation of 270 public EV charging stations across the province.[121] Figure 7 shows the growth in global public EV charging infrastructure from 2020 to 2025, illustrating the pace of deployment and the growing share of fast and ultra-fast chargers in the global stock. Growth is also shifting toward higher-power equipment. Ultra-fast chargers (≥150 kW) are increasing their share of installations, improving charging speed but placing greater demands on local grids.[120] This shift is driving investment in distribution infrastructure, demand management systems, and, in many cases, on-site energy storage to manage peak loads.

Figure 7: Global Public EV Charging Points, 2020 to 2025



Source: International Energy Agency, Global EV Outlook 2026, Electric Vehicle Charging chapter

For jurisdictions seeking to attract battery manufacturing and scale EV adoption, electricity is becoming a strategic asset. Low-carbon power reduces the embedded emissions of vehicles and supports emerging lifecycle reporting requirements under frameworks such as the EU Battery Regulation. As a result, energy systems are no longer a background condition. They are a core factor shaping competitiveness across the automotive value chain.

Freight Electrification and Megawatt Charging

While the expansion of public charging has largely supported passenger vehicles, the fastest growth in battery demand is now occurring in the heavy-duty segment. Global sales of medium- and heavy-duty electric trucks reached approximately 65,000 units in 2024, an increase of about 80 percent year over year.[122] Despite this growth, electric models still represent only a small share of new truck sales in most markets. Freight electrification is reshaping the infrastructure stack. It is increasing demand for larger battery packs, placing new requirements on grid capacity and depot infrastructure, and concentrating value in fleet software, route optimization, and energy management.

Megawatt Charging Systems (MCS)

Megawatt Charging Systems are an emerging class of ultra-high-power chargers designed primarily for heavy-duty electric trucks and commercial vehicles. Operating at power levels exceeding 1,000 kW (1 MW), MCS can significantly reduce charging times for large battery packs, a critical factor for the electrification of long-haul freight. The first megawatt charging stations were installed globally in 2024, marking an important milestone for heavy-duty electric transport. Deployment of MCS at scale will require substantial investment in electrical grid capacity and smart energy management.

Source: CharIN e.V.; IEA Global EV Outlook 2026.

Electrifying long-haul freight requires charging at power levels far beyond conventional stations. The MCS, an open international standard developed by CharIN, is designed for a maximum current of 3,000 amps at up to 1,250 volts DC, supporting a peak charging rate of approximately 3.75 megawatts.[123] Early commercial deployments, operating in the 1.2 to 1.5 megawatt range, began in 2024 and 2025 at depot and corridor locations in Europe and North America, marking the transition from pilot projects to operational infrastructure.

Real-world freight electrification deployments are already emerging at scale. Volvo Trucks has delivered more than 5,700 electric trucks globally across 50 countries since 2019, including more than 700 Volvo VNR Electric Class 8 trucks now operating in the U.S. and Canada, with the fleet logging more than 20 million zero-emission miles supported by a network of more than 80 certified EV dealers.[124] Daimler Truck's Freightliner eCascadia has been deployed by carriers including

Schneider National, Sysco, and Penske Truck Leasing across regional duty cycles.[125] Additionally, the North American Council for Freight Efficiency (NACFE) has published operating data from its Run on Less Electric DEPOT demonstration program which tracks 22 battery-electric vehicles across 10 fleet depots in California, New York, and British Columbia. The breadth of this data reinforces the commercial viability across a range of regional applications.[126]

Operating data from pilot deployments demonstrates that battery-electric trucks are commercially viable for specific regional applications. The Run on Less Electric DEPOT program found that vehicles operating on predictable, short-haul routes, such as urban delivery and return-to-base logistics, were able to complete daily duty cycles within existing battery ranges while charging overnight at depot facilities. Fleets also reported lower operating costs per kilometre in some use cases, driven by reduced fuel and maintenance requirements, alongside high vehicle uptime when supported by dedicated charging infrastructure.[127]

These results indicate that electrification is already viable in controlled, regional applications with defined routes, centralized charging, and stable duty cycles. However, performance remains more constrained in long-haul and variable-duty operations, where range, charging time, and infrastructure availability continue to limit broader deployment.

For Ontario, freight electrification carries direct implications. The Highway 401 corridor is one of North America's busiest freight routes, with the Windsor–Detroit crossing alone handling roughly one quarter of Canada–U.S. merchandise trade.[128] The addition of the Gordie Howe International Bridge, which opened in July 2026, further expands cross-border capacity.[129]

As pilot deployments demonstrate that battery-electric trucks are viable in short-haul, return-to-base applications, corridor readiness becomes a key determinant of broader adoption. The availability of depot-based charging, grid capacity, and emerging megawatt charging infrastructure will shape whether these use cases can scale across regional freight networks. In this context, Ontario's ability to support electrified drayage and regional logistics operations along the Great Lakes corridor will influence its capacity to capture associated manufacturing, infrastructure, and supply chain opportunities.

Digital Connectivity and Vehicle-to-Everything (V2X) Systems

A modern vehicle is no longer an isolated machine. It is a connected node that exchanges data with other vehicles (V2V), roadside infrastructure (V2I), cloud-based services (V2N), and, increasingly, connected devices carried by pedestrians (V2P). Together, these capabilities are referred to as vehicle-to-everything, or V2X.

The scale of investment in V2X reflects the strategic importance of this layer. The global automotive V2X market is estimated at approximately USD 2.9 billion in 2025 and is projected to reach USD 18.7 billion by 2030, a compound annual growth rate of more than 40 percent.[130] Underlying these projections is the displacement of legacy dedicated short-range communication (DSRC) by cellular V2X (C-V2X) standards. These technologies, enabled by 5G and its evolution to 5G-Advanced, place increasing demands on telecommunications and roadside infrastructure.

Real-world deployments illustrate how V2X is moving from pilot to production. Audi's Traffic Light Information service, which delivers signal-phase data into the instrument cluster of equipped vehicles, has expanded from initial deployment in Las Vegas to more than 30 U.S. cities.[131] General Motors' Super Cruise hands-free driving system, which relies on cellular connectivity, high-definition mapping, and over-the-air updates, is operational across more than 750,000 kilometres of compatible highways in North America.[132]

The U.S. Department of Transportation's Connected Vehicle Pilot Deployment in New York City created one of North America's largest operational connected-vehicle testbeds, deploying V2V and V2I technologies across Manhattan and Brooklyn. Early project announcements targeted up to 8,000 equipped fleet vehicles and V2I upgrades across key Manhattan and Brooklyn corridors, while the final safety evaluation was based on approximately 3,000 equipped vehicles and 470 roadside units.[133]

The pilot tested real-time communication between vehicles and infrastructure to support applications including forward collision warning, emergency electronic brake lights, blind-spot and lane-change warnings, intersection movement assist, pedestrian-in-signal warnings, and other V2I safety functions. Evaluation reports found that the pilot demonstrated the feasibility of large-scale connected-vehicle deployment in a dense urban environment and provided evidence of safety benefits, while also highlighting technical and operational challenges that limited impacts for some applications.[133]

In Ontario, through the Queen Elizabeth Way (QEW) Innovation Corridor, OVIN supports the deployment and testing of connected vehicle technologies on a 40-kilometre highway testbed between Toronto and Burlington. The corridor incorporates enabling infrastructure, including V2X management systems, communications networks, roadside units (RSUs), and security credential management systems, providing a real-world environment for innovators to validate and deploy advanced connected mobility solutions.[134]

For manufacturers and suppliers, V2X readiness is becoming a condition of market access. As regulators in the European Union, the U.S., and China advance requirements for connected vehicle capabilities, firms that can demonstrate operational deployments and interoperable system designs are positioned to participate in OEM platform programs and in the broader connected-mobility procurement pipeline.

Interoperability, Data Sharing, and System Reliability

The value of connected systems depends on their ability to exchange and interpret data reliably. A vehicle that can communicate with a traffic signal has limited utility if data formats, security protocols, or communication standards are not aligned. The same constraint applies across automotive production. Large volumes of data are generated across design, manufacturing, logistics, and in-service operations, but their value is realized only when they can move seamlessly across organizational and system boundaries.

Industry-led standards are addressing this gap. Catena-X, the European automotive data ecosystem, a structured network of stakeholders, platforms, and standards that enables secure, interoperable data sharing and collaboration across an industry, operated through the Catena-X Automotive Network e.V., has matured into a live, global ecosystem, with major OEMs including BMW, Volkswagen, Mercedes-Benz, and Ford confirmed as committed ecosystem partners.[135]

In April 2025, BMW Group made Catena-X registration an integral part of its procurement process for new supplier nominations, marking a shift from voluntary participation to a condition of competitive access.[136] In June 2025, the Automotive Industry Action Group (AIAG) launched a North American Catena-X hub, providing a pathway for regional suppliers, including those in Ontario, to participate in the ecosystem.[137]

Adjacent standards reinforce this pattern. OpenADR supports vehicle-to-grid and demand-response coordination, while Hubject's intercharge e-roaming network connects more than 2,750 B2B partners across over 70 countries, enabling interoperability across more than one million charging points globally.[138] At the same time, industry consolidation around Tesla's North American Charging Standard has resolved longstanding connector fragmentation.[139] Across these examples, the common dynamic is clear: interoperability is becoming a requirement for market participation, and system reliability is increasingly determined at the level of integrated infrastructure rather than individual components.

Software-Defined Vehicles (SDVs) and the Digital Architecture Shift

The vehicle architecture itself is being redefined. SDVs, in which core functions are managed through centralized computing and continuously updated via over-the-air software, represent a fundamental shift in how value is created and captured across the automotive value chain. This transition extends beyond technology. It reshapes revenue models, redistributes value across the supply chain, alters supplier bargaining power, and elevates the strategic importance of software capabilities within a jurisdiction's industrial base.

Software-Defined Vehicles (SDVs)

A software-defined vehicle is one in which core functions, including powertrain control, advanced driver assistance, infotainment, and connectivity, are managed by centralized computing platforms and can be updated or reconfigured through over-the-air software updates after the vehicle is sold. This shifts the vehicle from a static product to a dynamic platform capable of improving over its lifetime, enabling new business models such as subscription-based features and continuous performance optimization.

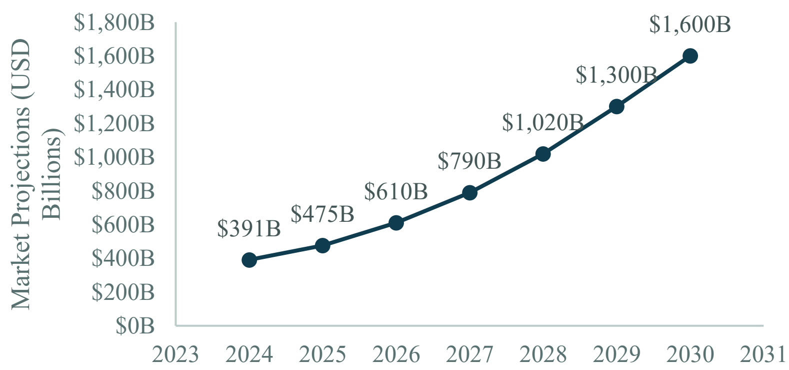
Source: McKinsey Center for Future Mobility

Historically, vehicle revenue concentrated at the point of sale, with limited ongoing OEM income after delivery. Under an SDV model, OEMs and their software partners capture revenue across the vehicle's life through over-the-air feature releases, subscription functionality, and connected-services fees. Tesla's Full Self-Driving capability, initially offered alongside a one-time USD 8,000 purchase, transitioned to a subscription-only model at USD 99 per month in early 2026, reflecting the broader industry shift toward recurring software revenue.[140]

General Motors' connected services platform, anchored by OnStar and the Super Cruise subscription model, generated nearly USD 5 billion in software and services revenue (including deferred revenue) in the first three quarters of 2025, with more than 500,000 active Super Cruise subscribers.[141] Stellantis launched Mobilisights, a dedicated business unit selling vehicle data and connected services to third parties, with a stated ambition of roughly EUR 20 billion in software-enabled revenue by 2030.[142]

Figure 8 illustrates the scale of the shift toward software-defined vehicles. The global SDV market is projected to grow from approximately USD 475 billion in 2025 to USD 1.6 trillion by 2030, reflecting a compound annual growth rate of more than 27 percent.[143]

Figure 8: Software-defined vehicle market projections (USD billions)



Source: BCC Research (2025); MarketsandMarkets (2025)

Within this new revenue architecture, value is also shifting to firms that control the computing platforms, operating systems, and software stacks on which vehicles are built. NVIDIA's DRIVE platform powers autonomous and assisted driving systems for a growing roster of global OEMs, including Mercedes-Benz, Stellantis, Lucid, BYD, Hyundai, and Kia.[105] Google's Android Automotive OS has been adopted by Ford, General Motors, Volvo, Polestar, and Renault as an embedded infotainment operating system.[107] Mobileye, whose technology is deployed in more than 230 million vehicles worldwide, provides advanced driver-assistance computing for a broad base of global automakers.[108] In China, Huawei's HarmonyOS Cockpit and DriveONE platform are deployed across brands including Aito, Stelato, and Avatr, with cumulative deliveries across the Harmony Intelligent Mobility Alliance exceeding 900,000 units.[109] These platform providers are positioning themselves to capture a growing share of SDV value, extending competition beyond traditional automotive suppliers to include technology firms with direct influence over vehicle functionality and performance.

The SDV transition is also contributing to a consolidation of vehicle electronic architectures. Traditional vehicles relied on dozens or even hundreds of distributed electronic control units (ECUs), each responsible for a specific function. Modern SDVs are moving toward centralized or zonal architectures in which a smaller number of high-performance computing platforms manage multiple vehicle domains. This transition reduces hardware complexity, improves software deployment, and can lower system weight by up to 30 percent while enabling faster development cycles and more efficient software deployment.[144] It also reshapes supplier dynamics. Firms that provide integrated hardware–software systems retain or strengthen their position, while those focused on discrete components face increasing commoditization as value shifts to the software layer.

Ontario hosts firms with globally significant positions in vehicle software, including BlackBerry QNX, headquartered in Ottawa, whose real-time operating system is embedded in more than 275 million vehicles worldwide, including platforms used by major OEMs for ADAS, digital instrument clusters, and vehicle connectivity. The broader Toronto-Waterloo innovation corridor contributes additional depth in AI, cybersecurity, and software engineering.[145]

Cybersecurity, Trusted Systems and Traceability

As vehicles become more software-intensive and more deeply connected, they also become more exposed to digital threats. Cybersecurity is therefore emerging as a baseline requirement for market access. The United Nations Economic Commission for Europe's Regulations 155 and 156 require manufacturers to implement cybersecurity and software update management systems across the full vehicle lifecycle as a condition of type approval in markets representing approximately 60 percent of global production. The ISO/SAE 21434 standard provides the corresponding engineering framework for managing cybersecurity risk across the road-vehicle development lifecycle.[146] In the U.S., the Department of Commerce's Connected Vehicle Rule, finalized in January 2025, introduces additional constraints by restricting hardware and software sourced from designated countries of concern.[56]

Together, these frameworks embed cybersecurity, software governance, and data control into the regulatory architecture of the automotive sector, linking compliance directly to the geopolitical and trade dynamics outlined in Section 2.3. Table 6 summarizes key regulatory frameworks shaping these requirements across major markets.

Table 6: Key Regulatory Frameworks for Connected and Software-Defined Vehicles

Framework	Jurisdiction	Scope and Requirements
UN Economic Commission for Europe (UNECE) Regulations 155 and 156	EU (mandatory); adopted by 60+ countries	Requires manufacturers to implement cybersecurity management systems and software update management systems across the full vehicle lifecycle
EU Artificial Intelligence Act	European Union	Risk-based regulatory framework for AI in high-impact applications,

Framework	Jurisdiction	Scope and Requirements
		including autonomous and assisted driving systems
U.S. Department of Commerce Connected Vehicle Rule	U.S.	Proposed restrictions on connected vehicle hardware and software sourced from countries of concern (China, Russia)
EU Battery Regulation	European Union	Requires digital battery passport with supply chain traceability from mineral extraction through end of life
International Organization for Standardization / Society of Automotive Engineers (ISO/SAE) Standard 21434	International	Engineering standard for cybersecurity risk management across the road vehicle product development lifecycle
Transport Canada Motor Vehicle Safety Standards (CMVSS)	Canada	Aligned with U.S. Federal Motor Vehicle Safety Standards (FMVSS); Transport Canada consulting on connected and automated vehicle safety framework, including cybersecurity provisions

Source: UNECE; European Commission; U.S. Department of Commerce; ISO; Transport Canada

Traceability and battery passports are evolving from compliance mechanisms into core elements of commercial strategy. Across OEM procurement and end-market access, the ability to demonstrate verifiable supply chain provenance, from mineral extraction through cell production, assembly, and end-of-life, has become a key determinant of supplier participation, commercial terms, and margin outcomes. Investment decisions are being reframed, making traceability not primarily about regulatory adherence, but about securing market access, capturing value, and substantiating environmental claims.

One outcome is the integration of traceability into supplier selection. OEMs with commitments to lower-carbon and ethically sourced supply chains are embedding traceability data directly into procurement processes. Volkswagen Group's S-Rating program, for example, requires approximately 63,000 suppliers to disclose ESG data, including carbon footprint, labour practices, and human rights, with performance influencing new business awards.[147] BMW Group's requirement for supplier participation in Catena-X similarly links data transparency to access within its procurement ecosystem.[136]

Traceability is also becoming a condition of market access. The EU Battery Regulation will require digital battery passports beginning in 2027,[51] establishing a formal link between provenance and entry into one of the world's largest automotive markets. Similar expectations are emerging in proposed Canadian critical-minerals disclosure framework,[148] and in U.S. procurement policy under the Inflation Reduction Act, particularly through production-linked incentives and domestic sourcing requirements.[149] However, recent policy changes, including the removal of consumer EV incentives and broader shifts in U.S. industrial policy, have introduced greater uncertainty around the pace and consistency of these requirements.

A further implication is the growing importance of traceability in lifecycle value recovery. Verified material provenance enables structured recovery of high-value inputs at end of life, supporting the development of closed-loop supply chains. Battery manufacturers and recyclers are incorporating traceability into these models. CATL has participated in the Global Battery Alliance's 2024 Battery Passport pilot, which tracks key materials such as lithium, cobalt, and nickel, alongside independently verified carbon footprint data.[150]

Traceability is also enabling carbon-based differentiation. As procurement frameworks increasingly weight embedded emissions, manufacturers operating in low-carbon jurisdictions can translate energy advantages into measurable commercial value, provided those advantages are supported by credible data. The Global Battery Alliance's Battery Passport initiative, launched at the World Economic Forum in 2023 and expanded through subsequent pilots involving CATL, LG Energy Solution, and Samsung SDI, is establishing the data standards required to verify both carbon intensity and material provenance across the value chain.[151]

AI, Automation, and Operational Performance

Artificial intelligence and advanced automation are increasingly embedded across automotive manufacturing and logistics, delivering measurable operational value across supply chain visibility, production performance, and logistics optimization.

In supply chain management, firms are deploying AI-enabled multi-tier visibility platforms to monitor public data sources, supplier performance, and disruption signals in near real time. Following the disruptions of 2020 to 2022, OEMs and Tier 1 suppliers have accelerated investment in these systems to improve risk detection and response. Resilinc, for example, operates supply chain risk programs for more than 200 enterprise customers, with its EventWatchAI platform monitoring over 100 million data sources daily to identify disruptions across multi-tier supplier networks.[152] Comparable platforms from Everstream Analytics and Interos provide enterprise-scale risk, climate, and concentration analytics, enabling procurement teams to identify single-source dependencies and adjust sourcing strategies before disruptions cascade into production stoppages.[153] [154]

Within manufacturing operations, AI is being applied to quality inspection and predictive maintenance. BMW Group's iFactory program deploys its AIQX system across multiple plants, combining machine vision with sensor-derived process data to reduce defect rates and inspection labour requirements.[155] Stellantis has implemented AI and 3D vision-enabled systems at its Mirafiori Complex, reporting a 40 percent reduction in quality issues since 2021.[156] Toyota's Woven by Toyota division is integrating AI into production scheduling and inline quality monitoring, reflecting a broader shift toward data-driven manufacturing systems.[157] These applications are supported by a wider ecosystem of industrial AI platforms, including Siemens Industrial Edge, Bosch Nexeed, and Rockwell Automation's FactoryTalk Optix, which enable predictive maintenance, energy optimization, and real-time process control across automotive production environments.[158] [159] [160]

AI is also reshaping logistics and distribution networks. Maersk's Captain Peter platform, supported by fleet-wide Internet of Things (IoT) connectivity, improves arrival-time forecasting and cargo monitoring across container and refrigerated operations.[161] DHL Supply Chain is deploying generative AI tools to enhance warehouse optimization and data management.[162] In North American automotive logistics, firms such as Penske Logistics and Ryder System are using AI-driven route optimization to reduce empty miles and improve on-time performance.[163] These capabilities directly support the cross-border, just-in-time networks on which Ontario's automotive sector depends.

The benefits of these technologies are not uniformly distributed across the supplier ecosystem. Adoption depends on data quality, workforce readiness, and the ability of smaller Tier 2 and Tier 3 suppliers to invest in digital infrastructure. As a result, the challenge is not only scaling AI within OEMs and Tier 1 firms, but extending its use across the broader supplier base to avoid widening performance gaps within the supply chain.

3.4 Transition to Higher-Value, Cross-Sector, and Dual-Use Capabilities

The transformation of the automotive value chain is generating capabilities that extend beyond vehicle production. Advances in manufacturing precision, software engineering, sensing, secure communications, and systems integration are increasingly applicable across defence, public safety, logistics, and critical infrastructure. As these capabilities have matured to support electrified vehicles and SDVs, they have become transferable to adjacent sectors.

This expansion has implications for both economic diversification and strategic positioning. Jurisdictions that can connect automotive capabilities to cross-sector applications are better positioned to capture higher-value activity and reduce exposure to cyclical vehicle demand. At the same time, the convergence between commercial automotive technologies and defence or public-sector requirements is creating new pathways for technology transfer, investment, and industrial collaboration.

This subsection examines how these higher-value opportunities are emerging across system integration, mobility platforms, dual-use applications, and public-sector deployment, and the frameworks required to support secure, multi-sector integration.

From Vehicle Manufacturing to System Integration

The automotive industry is shifting toward a model in which system integration captures a growing share of value. The global automotive software market is projected to grow from approximately USD 19.3 billion in 2025 to USD 30.3 billion by 2030.[164] More fundamentally, OEMs and suppliers are repositioning to capture revenue across the vehicle lifecycle through over-the-air updates, subscription features, usage-based services, and fleet management solutions, rather than relying primarily on point-of-sale transactions.

Tier 1 suppliers are responding by expanding from component manufacturing into integrated systems that combine hardware, software, and computing capabilities. Magna International's MAX4 platform integrates sensors, computing, and software into a unified autonomous driving system.[165] Continental's Smart Cockpit High-Performance Computer consolidates instrumentation, infotainment, and connectivity within a centralized architecture.[166] Bosch's Vehicle Motion Management software coordinates braking, steering, and powertrain functions across vehicle domains.[167] ZF Friedrichshafen (ZF), a global technology company supplying advanced mobility products and systems for passenger cars, commercial vehicles and industrial technology, has introduced "ProAI" platform that provides scalable computing for ADAS and autonomous applications.[168]

These developments shift value toward system integration, where control architectures, software, and data-driven functionality increasingly determine performance and differentiation. As a result, suppliers delivering integrated hardware–software systems are better positioned to capture higher margins and influence OEM platform strategies, while firms focused on discrete components face growing commodification.

The same capabilities underpin expansion into adjacent markets. Integrated systems in sensing, computing, and connectivity developed for ADAS, autonomous driving, and vehicle management are directly applicable to sectors such as defence, logistics, and critical infrastructure. Platforms developed for ADAS, autonomous driving, and vehicle system management can be adapted for applications such as autonomous navigation, infrastructure monitoring, and secure communications, creating pathways for cross-sector deployment and dual-use innovation.

Mobility-as-a-Service and Connected Mobility Platforms

The convergence of electrification, connectivity, and AI is enabling mobility service models that operate at the intersection of automotive manufacturing, digital platforms, and urban transportation. Mobility-as-a-Service (MaaS) integrates multiple transport modes, including public transit, ride-hailing, car-sharing, micromobility, and on-demand shuttle services, into unified digital interfaces that support route planning, booking, and payment within a single application.

Recent deployments illustrate both the potential and commercial challenges of MaaS. Scooty, a Brampton-born micromobility startup, has developed a transit payment API that integrates public transit fare systems with shared micromobility services, enabling one payment system across multiple transportation options. With support from OVIN, including CAD 1 million in provincial funding as part of a CAD 3 million project, Scooty completed the second phase of its fare integration work and has helped equip more than 50 Brampton transit stations with shared e-scooters, with 60 percent of trips directly connected to transit stations.[169]

Whim, launched in 2017 by MaaS Global, integrated multiple transport services across cities such as Helsinki, Vienna, and Tokyo. However, the company filed for bankruptcy in March 2024 as the subscription model proved difficult to scale profitably.[170] The Whim technology was subsequently acquired by Dutch operator umob in April 2024.[171] Moovit, acquired by Intel in 2020, provides multimodal trip planning to more than 1.5 billion users across 3,500 cities in 112 countries,[172] demonstrating the scalability of platform-based mobility services. Autonomous mobility deployments, including Waymo's robotaxi services in U.S. cities, illustrate a parallel model at limited commercial scale.[173] General Motors' Cruise program was wound down in December 2024 following regulatory and operational setbacks.[174]

While MaaS remains at an early stage in most markets, its development is driving demand for integrated mobility platforms, backend data systems, fleet management solutions, and interoperable digital infrastructure. These capabilities extend directly into adjacent sectors, including logistics optimization, smart-city infrastructure, and public transportation systems, where similar data integration, routing, and coordination functions are required.

For Ontario, this creates a pathway to participate in higher-value, platform-based segments of the mobility ecosystem. The Greater Toronto and Hamilton Area provides a strong foundation, with PRESTO enabling integrated fare payment across regional transit systems and Metrolinx piloting on-demand transit services alongside fixed-route networks.[175] This existing coordination reduces integration barriers and positions the region to support the digital infrastructure, data systems, and service layers that underpin MaaS.

Dual-Use Capabilities and Defence-Adjacent Applications

Many technologies developed for connected, autonomous, and electrified vehicles, including sensing systems (e.g., Light Detection and Ranging [LiDAR], radar, and computer vision), secure communications, edge computing, autonomous navigation, and ruggedized electronics, have direct applications in defence, public safety, and critical infrastructure. This convergence is increasingly shaping allied defence and industrial policy. Its relevance to the automotive sector is growing as vehicles become more digitally sophisticated and integrated with broader system architectures.

Dual-Use Technologies

Dual-use technologies are those developed for commercial markets that also have defence and security applications. In the mobility sector, this includes autonomous navigation systems, secure V2X communication, AI-enabled surveillance and monitoring, ruggedized electronics and sensors, and cybersecurity platforms. Countries that develop and commercialize these technologies in the automotive sector can derive both economic and strategic advantages, as commercial-scale production drives down costs and accelerates capability development for defence applications.

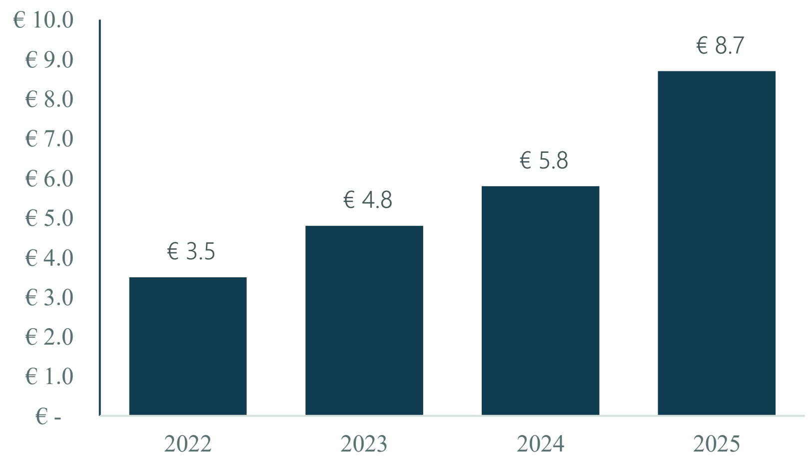
Source: NATO DIANA; NATO Innovation Fund.

The growing strategic importance of dual-use technology is reflected in investment trends. As shown in Figure 9, venture funding for European defence, security, and resilience (DSR) startups reached a record EUR 8.7 billion in 2025, representing a 55 percent year-over-year increase and nearly four times the level of five years earlier.[176] These trends underscore the rising importance of dual-use innovation at the intersection of commercial and defence markets.

Specific investments illustrate the convergence between commercial technology capabilities and defence demand. Anduril Industries, headquartered in California, builds autonomous defence systems on commercial sensing and AI architectures, including the Sentry Tower platform and the Lattice AI software layer. The company raised USD 1.5 billion in August 2024 at a USD 14 billion valuation,[177] followed by USD 2.5 billion in June 2025 at a USD 30.5 billion valuation.[178] Shield AI, which develops autonomous systems for defence such as the V-BAT drone and Hivemind autonomy software, was valued at approximately USD 5.3 billion following a USD 240 million Series F-1 round in March 2025.[179] Saronic Technologies builds autonomous maritime vessels with software-native architecture, producing platforms from the six-foot Spyglass to the 180-foot Marauder for the U.S. Navy and allied forces.[180] In Europe, Helsing raised approximately USD 489 million in 2024 for AI-based defence software.[181] Quantum Systems secured EUR 340 million across 2025 rounds, reaching a valuation above EUR 3 billion, with applications spanning military and civilian use cases including agriculture, mapping, and infrastructure inspection.[182]

At the institutional level, this convergence is reinforced by coordinated investment frameworks. NATO's Defence Innovation Accelerator for the North Atlantic (DIANA), launched in 2023, has selected more than 250 dual-use firms across its 2024 to 2026 cohorts, including 150 firms in 2026 alone.[183] The NATO Innovation Fund, a EUR 1 billion multi-sovereign vehicle backed by 24 member countries, further anchors investment in this segment, supporting the scaling of dual-use technologies across allied markets.[184]

Figure 9: Dual-Use Technology Venture Funding (EUR Billions)



Source: NATO Innovation Fund / Private Markets Profile (2026)

These investment patterns reflect a broader shift in how defence-adjacent capabilities are developed. Commercial-scale automotive production is now driving cost reduction and faster iteration cycles for technologies that can be adapted to defence applications. Sensor and computing platforms deployed across millions of vehicles can be reconfigured for autonomous defence systems at far lower unit cost than purpose-built alternatives. As a result, jurisdictions with industrial bases that span both automotive manufacturing and adjacent technology development are positioned to capture value across both markets. Defence procurement and infrastructure spending are increasingly reinforcing capabilities first proven at commercial scale, strengthening the link between automotive innovation and defence-related demand.

Ontario's industrial base already includes firms with established dual-use capabilities spanning civilian and defence applications. L3Harris WESCAM in Burlington produces electro-optical and infrared imaging systems used in defence, border security, and search-and-rescue operations.[185] MDA Space in Brampton supplies space-based imaging and surveillance systems, including the RADARSAT Constellation Mission, which supports both civilian and defence use cases.[186] General Dynamics Land Systems Canada in London manufactures light armoured vehicles that integrate commercial automotive engineering with military requirements.[187] The Toronto-Waterloo corridor also hosts a growing cluster of AI and cybersecurity firms serving both commercial and defence markets. This capability base is reinforced by national policy. Canada's defence strategy, *Our North, Strong and Free* (April 2024), commits CAD 8.1 billion over five years and CAD 73 billion over twenty years, including significant investment in NORAD modernization and defence innovation.[188]

Public Safety, Emergency Response, and Infrastructure Monitoring

Beyond defence, connected and autonomous vehicle technologies are being deployed in public safety, emergency response, and infrastructure management. Waze for Cities, operated by Alphabet, exchanges real-time traffic, hazard, and road-closure data across more than 1,500 partner cities, road authorities, and emergency services, leveraging the same crowdsourced data layer as its consumer platform.[189] HAAS Alert's Safety Cloud delivers real-time alerts about approaching emergency vehicles through integration with connected-vehicle and navigation systems, using automotive-grade telematics and cloud infrastructure.[190] At the same time, vehicle-mounted sensor arrays originally developed for autonomous driving are being adapted for road-condition monitoring and infrastructure assessment. Iteris provides pavement and traffic-asset analytics to transportation agencies and municipalities through its ClearMobility platform.[191] Michelin's DDi platform offers pavement-condition assessment services using similar vehicle-mounted sensing technology.[192]

These applications deliver measurable public value beyond personal transportation and face fewer deployment barriers than defence use cases. As a result, public-safety deployments are often the first scaled demonstrations of automotive-derived technologies outside the vehicle context, creating early proof points for broader cross-sector adoption.

In Ontario, similar capabilities are already deployed at scale. The Ministry of Transportation operates the COMPASS Freeway Traffic Management System, which provides real-time monitoring and incident response across the QEW and 400-series corridors, including segments in the Greater Toronto Area, London, Niagara, Ottawa, and Sarnia.[193] The Ontario 511 traveller information service delivers real-time conditions to motorists and freight operators across the province.[194] At the municipal and asset level, Toronto's Vision Zero road safety strategy applies data-driven monitoring approaches to urban transportation.[195]

Ontario-based Visual Defence provides another example through CityROVER, an AI-powered smart camera system that automates road infrastructure scanning and maintenance reporting. Developed with Durham Region and supported by the Government of Ontario through OVIN's R&D Partnership Fund, the project received nearly CAD 1 million from OVIN, matched by CAD 2.2 million in partner contributions, for a total project value of nearly CAD 3.2 million. The third generation of CityROVER expands automated detection, asset data collection, maintenance standard compliance, and integration with work management and repair systems, helping municipalities improve public works and asset management workflows.[196]

The Greater Toronto Airports Authority's Pearson LIFT program, a multi-billion-dollar infrastructure modernization initiative, is deploying smarter airfield technology with digital control and management systems.[197] Together, these deployments demonstrate how automotive-derived technologies are being integrated into public infrastructure systems.

Secure Deployment and Multi-Sector Integration

Deploying automotive-derived technologies across defence, public safety, and infrastructure systems requires more than technical capability. It depends on governance, standards, and trust frameworks that enable interoperability across organizational and sectoral boundaries without extensive re-engineering.

These frameworks are increasingly being formalized. The United Nations Economic Commission for Europe's WP.29 forum is advancing harmonized regulations for connected and automated vehicles, including R155 and R156, alongside emerging requirements for automated driving systems.[198] The Automotive Information Sharing and Analysis Center (Auto-ISAC) supports industry-wide cybersecurity threat intelligence sharing among OEMs and suppliers, while ISO/SAE 21434 establishes a common engineering framework for managing cybersecurity risk across the vehicle lifecycle.[146] In parallel, cross-sector data-sharing initiatives, building on models such as Catena-X, are enabling integration across automotive, infrastructure, energy, and public-safety systems through standardized data architectures and certification pathways.

Taken together, these developments are embedding interoperability, cybersecurity, and data governance into the foundations of multi-sector deployment. For jurisdictions at the intersection of automotive manufacturing, advanced technology development, and allied defence partnerships, the ability to support trusted, standards-aligned environments is becoming a source of competitive advantage.

4. Ontario’s Position, Capabilities and Industrial Readiness

Ontario’s automotive sector enters this period of change with a well-established industrial base, built on more than a century of vehicle production and strong integration within North American manufacturing networks. Major shifts in trade, policy, and technology are reshaping competitive conditions, directly influencing the province’s economic prospects. While these dynamics create new opportunities within the evolving automotive landscape, they also expose Ontario to emerging structural pressures.

This section assesses Ontario’s position and readiness in this context. It examines the province’s industrial capacity, supply chain integration, and workforce capabilities, and evaluates how effectively these assets can be aligned to respond to ongoing industry transformation.

4.1 Role in Regional and Global Supply Chains

Ontario as the Anchor of Canada's Automotive Sector

Ontario is the centre of Canada's automotive industry and a key node in the North American production system. The province hosts assembly operations for five global automakers, Ford, General Motors, Honda, Stellantis, and Toyota, which together operate eleven major assembly facilities across southwestern Ontario.[199] This footprint is supported by a deep and diversified industrial ecosystem, including nearly 700 parts manufacturers anchored by firms such as Magna International, Linamar, and Martinrea International, more than 500 tool, die, and mould firms, and more than 300 additional companies active in connected, autonomous, and electric vehicle technologies.[200] Table 7 presents assembly facilities operated by the five global automakers in Ontario.

Table 7: Ontario Vehicle Assembly Facilities, 2025- mid-2026

OEM	Plant (location)	Current production	2025- mid 2026 status
Ford	Oakville Assembly Complex (Oakville)	F-Series Super Duty trucks (pre-production began April 2026; commercial production targeted later in 2026)	CAD 5 billion retool supported by CAD 464.5 million federal Strategic Response Fund (May 2026). 1,800 new jobs; capacity for 100,000 trucks per year at full operation.
General Motors	Oshawa Assembly (Oshawa)	Chevrolet Silverado and GMC Sierra light-duty trucks	Multi-shift truck assembly. Full-scale operations anchor for GM Canada.
General Motors	CAMI Assembly (Ingersoll)	Currently idle	Electric-vehicle-capable assembly facility (most recently produced BrightDrop electric commercial vans). Approximately 1,200 unionized workforce.
Honda	HCM Plant 1, HCM Plant 2, and Honda Engine Plant (Alliston)	Civic sedan (Plant 1). CR-V (Plant 2). Engines for both assembly plants (Honda Engine Plant)	Honda's only Canadian assembly footprint. Three integrated facilities. Approximately 4,200 workers.
Stellantis	Windsor Assembly (Windsor)	Chrysler Pacifica, Pacifica Hybrid, Voyager, Grand Caravan, and Dodge Charger Daytona	Operating on Stellantis' multi-energy STLA Large platform, designed for flexible production across electric, hybrid, and internal combustion drivetrains.

OEM	Plant (location)	Current production	2025- mid 2026 status
Stellantis	Brampton Assembly (Brampton)	Currently idle	STLA Large platform-ready capacity. Approximately 3,000 unionized workforce on layoff.
Toyota	TMMC Cambridge North and Cambridge South (Cambridge)	Lexus RX and Lexus NX (Cambridge North). RAV4 (Cambridge South)	Canada's only luxury vehicle assembly facility (Lexus RX, Lexus NX).
Toyota	TMMC Woodstock (Woodstock)	RAV4 hybrid and gasoline. Next-generation RAV4.	In-house battery pack assembly being added.

Source: ISED Canadian Automotive Industry[84]; Trillium Network for Advanced Manufacturing[23]; Ford Oakville[201 202 203]; Stellantis Windsor and Brampton[204 205]; Toyota Cambridge and Woodstock[206]; Honda Alliston EV[207 208]; GM CAMI / BrightDrop[209]

Table 7 summarizes Ontario's assembly footprint and capabilities as of Spring 2026. However, several major facility-level adjustments occurred between 2024 and 2026 in response to slowing North American electric vehicle demand, shifting OEM production priorities, and the tariff environment described in Section 2.1. These developments reflect the uncertainty associated with the EV transition, rather than a full shift in Ontario's automotive ecosystem.

Ford's previously announced CAD 1.8 billion EV transformation of its Oakville facility was cancelled in 2024 and replaced by a CAD 5 billion retooling program for Super Duty production, which was in pre-production in Spring 2026.[202 203] At General Motors' CAMI Assembly plant, BrightDrop electric commercial van production was paused in April 2025 and discontinued in October 2025, with no replacement program announced to date.[209] Similarly, Honda's CAD 15 billion EV value chain investment, announced in April 2024 with up to CAD 5 billion in public support, was indefinitely suspended in May 2026 prior to any disbursement of funds.

At Stellantis' Brampton facility, retooling for the STLA Large platform was paused in early 2025. The company subsequently shifted planned Jeep Compass production to the U.S. and faced federal action related to its Strategic Innovation Fund agreement. A separate proposal to assemble electric vehicles using a knock-down kit model was not approved, reflecting policy and labour considerations.[205]

Taken together, these examples point to a more cautious and fluid investment environment, in which OEM strategies are being recalibrated in response to market conditions, cost pressures, and policy constraints. While these changes affect the medium-term trajectory of assembly investment, they do not alter the core footprint of Ontario's automotive sector. The existing base of assembly operations, supplier networks, and skilled labour continues to define Ontario's value proposition as the sector moves into the next phase of electrification and supply chain integration.

Ontario's Supplier Ecosystem

Ontario's role in North American vehicle production is underpinned by a deeply integrated and evolving supplier base. This ecosystem combines a mature network of incumbent firms with newer clusters emerging in response to electrification and SDV technologies.

Ontario holds a significant role in the broader supplier ecosystem, as Ontario suppliers are connected into the global design and production systems of OEM engineering centres across the globe. The locations of these global OEM engineering centres include Dearborn (Michigan), Warren (Michigan), Auburn Hills (Michigan), Tokyo (Japan), Tochigi Prefecture (Japan), Toyota City (Japan). For Ontario-based suppliers, this trend highlights the strategic importance of flexibility and cross-program integration in maintaining competitiveness.

This integration is supported by a supplier ecosystem structured in two layers. The first is a mature supply base built over six decades of integration with the Detroit Three (General Motors, Ford, and Stellantis), anchored by a concentrated group of Tier 1 firms with multi-OEM platform reach. This base delivers platform-scale engineering, tooling, and component manufacturing across legacy and current vehicle programs. It provides the scale, production depth, and cross-border integration that underpin Ontario's position in regional supply chains.

The second comprises emerging clusters that have developed in response to the EV and SDV transitions. These include firms active in battery components, power electronics, advanced materials, and vehicle software, alongside new entrants and expanding players positioning around system integration and digital capabilities. Investments such as the NextStar Energy battery plant in Windsor and Volkswagen's PowerCo facility in St. Thomas are anchoring this transition, linking Ontario's supplier base to new, high-value segments of the automotive value chain.

Taken together, these segments reflect an ecosystem that combines a well-established industrial base with emerging areas of growth and transformation. Incumbent suppliers are adapting to declining demand in ICE components, while newer firms are building capabilities in areas where value is shifting, including batteries, software, and integrated systems. The interaction between these segments is increasingly shaping the competitiveness of the broader supplier base.

This interaction is illustrated by the Automotive Parts Manufacturers' Association (APMA) Project Arrow program. Phase 1., unveiled in January 2023 at the Consumer Electronics Show, it integrated components from more than 55 Canadian companies, predominantly Ontario-based, into Canada's first domestically developed zero-emission concept vehicle. Phase 2.0, unveiled in February 2026 at the Canadian International AutoShow, expanded participation to more than 80 suppliers and ecosystem partners.[210] Together, these phases demonstrate the capacity of Ontario's supplier base to collectively design, engineer, and integrate a complete zero-emission vehicle. At the same time, they highlight that Ontario's ecosystem remains stronger in component engineering, manufacturing, and system integration than in some of the highest-value segments of the EV stack, including software integration, battery cell production, and full-stack vehicle architecture. Strengthening linkages between established manufacturers and emerging technology firms will be critical to ensure that Ontario captures a larger share of value as automotive production shifts toward electrified and software-defined platforms.

Integration into North American Production Networks

Ontario's automotive footprint is deeply integrated with the U.S. Great Lakes industrial cluster. Ontario's Tier 1 suppliers serve assembly plants on both sides of the border, with an estimated 30 to 40 percent of the parts used in Michigan's auto plants originating in Canada.[211] OEM engineering activity is similarly distributed, linking Detroit-area technical centres in Warren, Auburn Hills, and Dearborn with Canadian facilities in Markham and Oshawa, which draw advanced engineering work into the Ontario supplier base.

At the same time, the movement of inputs and finished vehicles is concentrated through a limited number of border crossings. As a result, the performance and reliability of border infrastructure play a direct role in shaping Ontario's competitiveness within the integrated production system. The Windsor–Detroit corridor provides a clear illustration of how this integration functions in practice, as well as where it is most exposed.

The Windsor-Detroit Corridor

The Windsor–Detroit corridor is the most critical physical and economic linkage between Ontario's automotive sector and the U.S., reflecting the scale of trade, concentration of industrial assets, and reliance on a limited number of crossings.

Scale of trade: The Ambassador Bridge, the primary commercial crossing, carries approximately 25 percent of all Canada–U.S. merchandise trade by value, the highest share of any land crossing in North America, while the Blue Water Bridge at Sarnia supports additional cross-border automotive flows.

Capacity expansion: Capacity within the corridor is set to expand with the addition of the Gordie Howe International Bridge, a six-lane crossing expected to open in 2026. It introduces modernized customs and port-of-entry infrastructure and is the first major expansion of cross-border capacity in southwestern Ontario in decades.

Supplier density at the border: The corridor is also defined by a high concentration of production and engineering assets. Within a 200-kilometre radius are Stellantis' Windsor Assembly Plant, the NextStar Energy battery facility, more than 400 Ontario-based parts manufacturers, and the engineering and technical headquarters of General Motors, Ford, and Stellantis in Detroit. This density concentrates cross-border component flows into a single geographic corridor, creating a critical chokepoint where customs performance, infrastructure capacity, and tariff exposure directly influence system-wide efficiency.

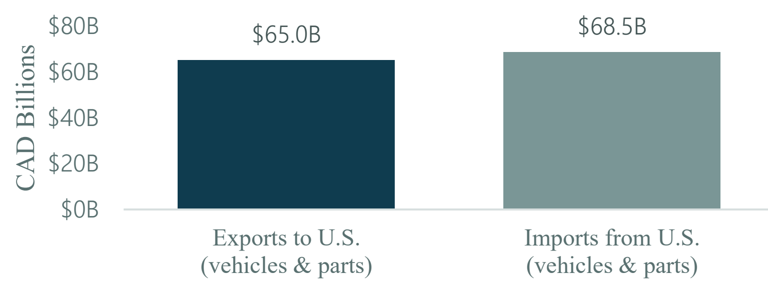
Source: APMA; Windsor-Detroit Bridge Authority; Stellantis; NextStar Energy.

Cross-Border Trade Flows

Automotive trade between Ontario and the U.S. operates at substantial scale and is relatively balanced in both directions, reflecting the depth of cross-border integration. This balance also means that disruptions can affect both exports and imports, exposing Ontario's production system to risks on either side of the border.

In 2024, Ontario's merchandise exports to the U.S. were valued at CAD 64.8 billion. They also represented 28 percent of Ontario's merchandise imports from the U.S., valued at CAD 68.5 billion.[35] This two-way flow is reinforced by the structure of Canadian vehicle production: approximately 92 percent of vehicles assembled in Canada are exported to the U.S.[212] Ontario accounted for 86 percent of all Canadian motor vehicle and parts exports to the U.S. in 2024.[35] Figure 10 illustrates the scale and balance of these cross-border flows.

Figure 10: Ontario–U.S. Automotive Trade, Vehicles and Parts, 2024 (CAD Billions)



Source: Statistics Canada. Table 12-10-0175-01 International merchandise trade by province, commodity, and Principal Trading Partners

These 2024 figures are used as baseline for comparison to gauge the impacts of tariffs introduced in March as trade still benefited from increased inventory imported before the tariffs took into effect.[36] As noted in Section 2.2, Canadian exports to the U.S. contracted 22.1 percent when comparing the January to April period between 2024 and 2026 due in part to the impact of tariffs.[35]

Given the concentration of Canada's automotive sector in Ontario, the province absorbed a disproportionate share of this adjustment. Through

2025, several Ontario assembly and parts facilities reported shift reductions and layoffs, underscoring how quickly tariff exposure can transmit through an integrated production system.

Position within Global Mobility Supply Chains

Beyond North America, Ontario's role in global automotive and mobility supply chains is concentrated primarily in midstream activity, where the province has established strengths in vehicle assembly, parts production, tooling, and advanced manufacturing. This position gives Ontario scale and production depth, but it also places the province in a segment of the value chain where competitive pressures are intensifying as value is shifting to upstream (i.e., critical-mineral refining, battery materials, and cell production), and downstream (i.e., vehicle software platforms, connected services, integrated mobility systems, and post-sale software revenue) activities.

Ontario's midstream strength is therefore both an advantage and a constraint. The advantage lies in the province's ability to support full-vehicle assembly and a multi-tier supplier ecosystem at a scale that few jurisdictions of comparable size can match. The constraint is that many of the fastest-growing value pools are developing outside Ontario's traditional areas of specialization. Suppliers remain exposed to globally sourced inputs, including critical minerals and processed battery materials, which can affect production costs, investment decisions, and supply continuity even when those inputs do not physically move through the province.

At the same time, Ontario has attributes that position it favourably within trusted and allied automotive supply chains. Its clean-electricity base, proximity to the U.S. market, established trade relationships, advanced manufacturing capacity, and emerging capabilities in automotive cybersecurity and vehicle software strengthen its relevance as OEMs and suppliers place greater emphasis on secure, low-carbon, and geopolitically aligned production networks. The strategic opportunity for Ontario is to use its midstream scale as a platform for expansion into higher-value upstream and downstream activities, including battery materials, cell production, software integration, and connected mobility

NextStar Energy and Ontario's first commercial-scale battery cell plant

NextStar Energy in Windsor represents a major step in Ontario's effort to extend its automotive supply chain beyond assembly and parts production into battery cell manufacturing. The 49.5 gigawatt-hour facility, originally announced in 2022 as a joint venture between Stellantis and LG Energy Solution and fully acquired by LG Energy Solution in February 2026, is Canada's first commercial-scale lithium-ion battery plant. Its location within a major automotive corridor links Ontario's established assembly and supplier base to a higher-value segment of the EV supply chain.

Investment and scale. The project reflects approximately CAD 5 billion in committed investment, including at least CAD 530 million from Canada's Strategic Innovation Fund, and is expected to support around 2,500 jobs at full capacity. By early 2026, more than 1,300 workers had been hired, with a further 1,200 anticipated as operations scale. Beyond its direct employment and investment impact, the plant strengthens Ontario's ability to participate in battery-related manufacturing at commercial scale.

Operational status. Production ramp-up has progressed steadily. Battery module production began in October 2024, followed by commercial cell production in November 2025. By February 2026, the facility had produced more than one million cells and it was formally inaugurated in March 2026. Initial output has focused on stationary energy storage system applications, with flexibility to transition toward EV battery production as demand evolves.

Source: NextStar Energy and LG Energy Solution joint releases; Government of Canada Strategic Innovation Fund services. The NextStar Energy facility in Windsor provides an early example of this upstream extension.

4.2 Ecosystem Assets, Capabilities and System Integration Potential

Manufacturing Base, Clean Energy, and Supplier Adaptation

Ontario’s manufacturing base remains a core strength, but its competitiveness is increasingly shaped by how effectively suppliers adapt to electrified and software-defined production. As vehicle platforms evolve, capabilities in electrified systems, advanced materials, and software integration are becoming more critical, while legacy ICE-focused activities face growing pressure. The following analysis examines how Ontario’s supplier base, energy advantages, and industrial capabilities are positioning the province within this transition.

Ontario's Tier 1 anchors have repositioned their portfolios for the electrified transition. Magna International operates a battery enclosures facility in Brampton, a CAD 265 million investment. This facility produces structural battery enclosures and was designed to support Ford F-150 Lightning, as well as future OEM electric platforms. The facility supports approximately 560 jobs at full capacity and forms part of a broader CAD 470 million expansion across six Ontario locations focused on Magna's electrification portfolio.[213] Linamar has also committed CAD 1.1 billion through its Innovation Driving Green Technology project to develop electrified driveline products, battery systems, and EV component manufacturing in Ontario, building on its dedicated electrification group, eLin, established in 2021.[214] Martinrea International is similarly expanding content in lightweight aluminum structures, battery enclosures and trays, and thermal and fluid management systems for electrified platforms.[215]

This shift is also extending into Ontario’s tool, die, and mould cluster, particularly in Windsor-Essex. Production capabilities are moving beyond ICE powertrain work toward battery pack enclosure dies, battery management system (BMS) housings, and stamping for electrified body structures. Ontario’s advantage in this layer lies in the combination of large Tier 1 anchors and deep adjacent tooling capacity. Together, these assets allow the province to support the dies, fixtures, and stamping requirements of electrified platforms within the regional supply base, rather than relying more heavily on imported tooling.

Beyond the Tier 1 anchors, Ontario’s small and medium-sized enterprises (SMEs) are contributing specialized components and software to the electrification transition. Miovision, headquartered in Kitchener-Waterloo, provides connected mobility infrastructure deployed in more than 80 countries.[216] Effenco Development, subsequently acquired by Martinrea, supplies electrification solutions for heavy-duty commercial vehicles. Exro Technologies’ integration of its Coil Driver inverter technology into Linamar’s electric axle product line further illustrates how Ontario’s SME layer is increasingly being connected to larger Tier 1 platforms rather than operating separately from them.[217]

Ontario’s electricity system adds another strategic advantage. The province’s grid operates with more than 90 percent emissions-free generation, anchored by nuclear and hydroelectric power. In 2024, nuclear generation accounted for approximately 49 percent of total supply, while hydroelectric generation contributed a further 23 percent.[218] This low-carbon generation mix strengthens Ontario’s position as a manufacturing jurisdiction for energy-intensive automotive activities, including battery components, electrified platforms, and advanced manufacturing processes where carbon intensity is becoming a more important competitiveness factor.

The strategic value of Ontario’s low-carbon electricity has increased as automotive trade and regulatory requirements place greater emphasis on total embedded environmental impact. Battery cell manufacturing, cathode active material processing, and vehicle assembly are all energy-intensive activities. As a result, the emissions profile of electricity used in these processes is increasingly becoming part of market access, procurement, and supplier selection considerations.

For Ontario-based suppliers, this means the province's grid is more than an operating advantage. It can support competitiveness in markets where OEMs, regulators, and public-sector buyers are placing greater value on lower-carbon production inputs. This strengthens Ontario's position in battery and EV-related manufacturing, while also making grid capacity, reliability, and scalability critical to sustaining that advantage as electrification, advanced manufacturing, and data-centre demand grow.

Research Institutions, SMEs, and Demonstration Environments

A strong supplier base is underpinned by a complementary research and innovation infrastructure. In Ontario, automotive research capacity is concentrated within a small number of universities that have developed specialized capabilities in electrification, battery technologies, and software over several decades. These institutions play a dual role in supporting supply chain transition. First, they generate the technology pipelines that underpin next-generation vehicle systems, including advances in battery chemistries, power electronics, electric motors, validation methodologies, automotive cybersecurity, and advanced materials. These research outputs form the basis for future commercialization by suppliers and technology firms. Second, they produce the engineering and skilled talent required to support the evolving supplier ecosystem, particularly as demand shifts toward EV and SDV platforms. Table 8 summarizes the principal institutions and the research centres and laboratories through which they connect to industry. Ontario's university-based research centres operate as part of a coordinated innovation network that links academic research with commercialization pathways. The Regional Technology Development Sites (RTDS) play a central role in this system by connecting post-secondary institutions, incubators, and SMEs through a province-wide platform backed by approximately CAD 70 million in investment from OVIN, industry matched contributions, and broader public sector contributions.[219] Rather than functioning as standalone research hubs, the RTDS network provides the infrastructure through which applied research is translated into industry deployment. The nine sites span key regions, including Durham, Hamilton, Kingston, Windsor–Essex,

Case Study: Ontario Battery and Electrochemistry Research Centre (OBEC)

From a University of Waterloo project to a global connected-infrastructure platform

The Ontario Battery and Electrochemistry Research Centre (OBEC), launched in 2024 with $5 million in funding from the Canada Foundation for Innovation and the University of Waterloo, integrates battery material synthesis, cell fabrication, testing, and advanced characterization within a single facility. Co-led by Dr. Linda Nazar and Dr. Michael Pope, the centre supports research across next-generation chemistries, including solid-state, metal-air, metal-sulfur, and sodium-ion batteries.

OBEC is closely aligned with Ontario's emerging battery production ecosystem. Its mandate includes training researchers and developing intellectual property for EV battery investments by firms such as Volkswagen, Stellantis, Umicore, and BASF. As a result, the centre functions as a direct workforce and innovation pipeline, linking academic research to large-scale battery manufacturing rather than operating as a standalone research initiative.

Source: University of Waterloo OBEC; Electric Autonomy Canada (2024)

Toronto, Ottawa, Waterloo, and northern Ontario, and are structured to support collaboration across firms, researchers, and end users.

This model is reflected in the range of pilot and demonstration activities supported through OVIN. Initiatives include the Technology Pilot Zone (TPZ) Project by the City of Toronto in collaboration with OVIN and telecommunications partners which tests AI and 5G-enabled traffic management systems,[220] as well as the OVIN Demonstration Zone in Vaughan, which has supported more than 100 startups and SMEs developing autonomous, micro-mobility, and accessible mobility solutions.[221] Through this integrated platform, research outputs are embedded within the supplier and innovation ecosystem, accelerating their movement from development to commercialization. The result is a system in which intellectual property, talent, and applied technologies are more directly aligned with the requirements of production and deployment.

Table 8: Examples of Ontario Universities Supporting Automotive Supply Chain Transformation

Institution	Centres, Laboratories, and Supply Chain Contribution
University of Waterloo	Waterloo's automotive research is anchored by two centres. The Ontario Battery and Electrochemistry Research Centre (OBEC) covers next-generation battery chemistries, cell materials, and fabrication, and is positioned as a direct workforce and intellectual property pipeline for the gigafactory investments of Volkswagen PowerCo, Stellantis, Umicore, and BASF.[222] The Centre for Automotive Research (CAR) brings together more than 60 faculty researchers across connected and autonomous vehicle systems, software, and vehicle electronics.[223]
McMaster University	The McMaster Automotive Resource Centre (MARC) anchors the university's automotive research and hosts a Canada Excellence Research Chair Laureate Program in electrification, supported by multi-decade industry partnerships with major automakers and battery firms.[224] The Magnetic Resonance and Materials for Energy Storage Lab provides specialized characterization capabilities for battery materials and electrochemistry, including techniques relevant to cell degradation and safety.[225]
University of Toronto	The Department of Mechanical and Industrial Engineering, Electric Vehicle Innovation Ontario (EVIO), and the University of Toronto Robotics Institute together cover vehicle systems, power electronics, autonomous systems, and EV commercialization. The institutional environment combines technical research with an active venture pipeline supported by MaRS Discovery District. The autonomous-trucking firm Waabi originated in this environment.
University of Windsor	Three centres anchor Windsor's role in the supply chain transition. The Centre for Automotive Research and Education (CARE) leads work on EV powertrains, motors, and power electronics.[226] The SHIELD Automotive Cybersecurity Centre is Canada's first dedicated automotive cybersecurity centre and anchors the province’s positioning in software-defined vehicle compliance markets.[227]

Institution	Centres, Laboratories, and Supply Chain Contribution
Ontario Tech University	The Automotive Centre of Excellence (ACE) operates Canada's only full-vehicle climatic wind tunnel facility, supporting full-vehicle testing under extreme cold and heat conditions, and serves as the lead build partner for the APMA Project Arrow Phase 1 and Phase 2.0. The Clean Energy Research Laboratory hosts national hydrogen demonstrations relevant to commercial vehicle and heavy-duty applications.[228]
Western University	Western's Faculty of Engineering contributed the conceptual design for Project Arrow Borealis (2026) through its Emergent Mobility for Resilient Communities Lab, which focuses on connected, electric, and accessible transportation for under-served communities.
Carleton University	Carleton's Faculty of Engineering and Design designed the Project Arrow Phase 1 concept vehicle (2023), positioning Canadian industrial design and engineering capabilities at the heart of the country's first domestically-developed zero-emission concept vehicle.

Critical Minerals and the Mine-to-Mobility Opportunity

Ontario's critical mineral endowment provides the foundation for extending its automotive supply chain into upstream segments. The province is a globally significant producer of nickel, copper, platinum group elements (PGE), palladium and cobalt and ranks among the leading jurisdictions for mineral exploration.[229] [230] [231] [232] Additional resources, including lithium, graphite, and rare earth elements are present in deposits at various stages of development.[233]

Figure 11 outlines how this endowment extends Ontario's automotive supply chain.

The strategic significance of Ontario's critical minerals endowment lies in its proximity to Ontario's manufacturing base. Key mining regions are located within several hundred kilometres of battery plants, assembly facilities, and supplier clusters in southern Ontario. This geographic alignment creates the potential for a vertically integrated "mine-to-mobility" value chain, in which minerals are extracted, processed, and manufactured into batteries and vehicles within the province, rather than exported in raw or semi-processed form.[234]

This opportunity is anchored across three primary regions. The Sudbury Basin and Timmins area in northeastern Ontario host established producers and advanced-stage projects, while the Red Lake and Thunder Bay areas in northwestern Ontario support a mix of active operations and emerging developments. The Ring of Fire, located approximately 500 kilometres northeast of Thunder Bay, represents the province's largest undeveloped critical mineral prospect. However, it remains at an earlier stage of development, with first production not expected before 2030. Progress depends on the construction of all-season transportation infrastructure and continued engagement with First Nations communities, whose territories and ecologically sensitive peatlands are directly affected.[233] Table 9 summarizes the principal critical mineral projects across these regions by stage of development.

Figure 11: Ontario’s Mine-to-Mobility Value Chain Concept

Extraction

Nickel, cobalt, lithium, and graphite mined in Sudbury, Timmins, and the Ring of Fire region

UPSTREAM

Processing and Refining

Raw minerals refined into battery-grade materials, supported by the province’s CAD 500 million Critical Minerals Processing Fund

MIDSTREAM

Battery Materials and Cell Production

Battery cells and modules manufactured at Ontario plants, including Volkswagen PowerCo (St. Thomas) and NextStar Energy (Windsor)

MIDSTREAM

Vehicle Assembly

Electric and hybrid vehicles assembled by Ontario’s five OEMs: Ford, General Motors, Honda, Stellantis, and Toyota

DOWNSTREAM

Source: MNP Analysis, based on Government of Ontario critical minerals materials

Near-term development of Ontario’s critical minerals sector is anchored in existing production and advancing projects rather than in large, undeveloped deposits. Established nickel and cobalt operations in the Sudbury Basin and the Timmins area already supply inputs to battery manufacturing, while a pipeline of lithium and nickel projects is progressing through permitting and positioned to enter production within a shorter timeframe. In parallel, investments in refining and processing capacity are enabling the conversion of these materials into battery-grade chemicals within the province, supporting greater domestic value capture.[234 236] Together, these elements form the basis of Ontario’s near-term opportunity to extend its role in the automotive supply chain beyond manufacturing into upstream inputs.

Table 9: Major Ontario Critical Mineral Projects, 2025-2026

Project (location)	Status and Scale
Vale Sudbury operations (Sudbury Basin)	One of the world's largest integrated nickel operations. Active producer for more than a century. Supplies nickel, cobalt, copper, and PGE.
Glencore Sudbury operations, including Onaping Depth (Sudbury Basin)	Active nickel, copper, and cobalt producer.
Canada Nickel Company, Crawford Project (Timmins)	Feasibility stage. Among the larger nickel projects globally by resource size.
Frontier Lithium, PAK Project and Thunder Bay refinery (northwestern Ontario)	First fully integrated lithium project in Canada. Capital budget of CAD 943 million. First project advanced under Ontario's One Project, One Process (1P1P) fast-track approvals framework (October 2025). Final investment decision targeted

Project (location)	Status and Scale
	for 2027 and first production targeted for 2030 to 2031.
Wyloo Metals, Eagle's Nest Project (Ring of Fire)	Most advanced Ring of Fire project. First production targeted by 2030, contingent on access road construction, environmental permitting, and First Nations agreements.
Avalon Advanced Materials, Rock Tech Lithium, Green Technology Metals (northwestern Ontario)	Three additional lithium developers pursuing separate mine and refinery plans alongside Frontier Lithium.
Electra Battery Materials (Temiskaming Shores)	Project of approximately CAD 100 million. North America's first cobalt sulfate refinery. Federal and Ontario funding secured.
Umicore (Loyalist Township)	Cathode active materials and precursor cathode active materials plant with total project envelope of approximately CAD 2.76 billion, of which CAD 2.1 billion was committed for the first stage. Construction paused in July 2024 amid EV market shifts and a strategic review of Umicore's battery materials business. No public funds disbursed as of 2025.
Asahi Kasei (Port Colborne)	Battery separator film plant of approximately CAD 1.5 to 1.7 billion in partnership with Honda. Commercial production retargeted to first half of 2029 following Honda's May 2026 indefinite suspension of its Alliston EV value chain.

Project (location)	Status and Scale
Ucore Rare Metals & Cyclic Materials (Kingston)	Partnership to test and qualify recycled rare earth oxides from Cyclic Materials at Ucore's Kingston demonstration facility. Intended to support development of a domestic rare earth recycling and processing supply chain and evaluate future commercial supply arrangements.

Ecosystem Integration and Commercialization Architecture

Ontario's supplier base, research infrastructure, and critical mineral endowment form a competitive system when effectively integrated. Coordinated programs and commercialization platforms link SMEs, OEMs, and academic research, enable faster translation of innovation into production. This integration is a key determinant of how effectively Ontario scales capabilities in automotive and mobility supply chains.

OVIN occupies a central coordinating role within Ontario's automotive and mobility innovation architecture. It funds and connects a network of programs and platforms, including the RTDS and targeted talent and partnership initiatives spanning industry, post-secondary institutions, municipalities, and government ministries.[235] [236] The Automated Vehicle Pilot Program has provided the regulatory framework for connected and automated vehicle testing on Ontario roads since 2016. Through these mechanisms, OVIN establishes both the infrastructure for applied research and the regulatory and testing environments required to advance connected and automated vehicle technologies.

Next Generation Manufacturing Canada (NGen), headquartered in Hamilton, supports industry-led consortia focused on advanced manufacturing technologies, including critical minerals processing, traction batteries, power electronics, fuel cells, and lightweight materials. [237] Ontario Centres of Innovation (OCI) provides commercialization and matching programs that link SMEs with OEMs and research partners, while also administering initiatives such as the Evolution of Networked Services through a Corridor in Quebec and Ontario for Research and Innovation (ENCQOR) 5G Demonstration Program, which supports testing and deployment of next-generation connectivity applications. [238]

MaRS Discovery District plays a venture acceleration role, supporting mobility startups such as Waabi and Miovision as they scale from early-stage development to market entry.[239] The ENCQOR platform further strengthens this ecosystem by providing pre-commercial testing

Case Study: Frontier Lithium PAK Project and Thunder Bay Refinery

Canada's first fully integrated lithium development

The PAK Project, located in northwestern Ontario near Red Lake, is paired with a downstream lithium chemicals conversion facility in Thunder Bay. Together these facilities represent Canada's first fully integrated lithium development, linking extraction with in-province refining to produce battery-grade materials. Supported by a federal partnership announced in March 2025, the project aligns with the Canadian Critical Minerals Strategy and aims to reduce reliance on foreign processing.

Frontier became the first project to advance under Ontario's One Project, One Process (1P1P) framework in October 2025, which is designed to shorten permitting timelines. With a capital budget of CAD 943 million, the project targets a final investment decision in 2027 and first production between 2030 and 2031, subject to permitting, infrastructure development, and funding agreements.

This project is part of a broader cluster of lithium developers in northwestern Ontario, including Avalon Advanced Materials, Rock Tech Lithium, and Green Technology Metals. Its strategic importance lies in enabling domestic refining capacity for battery materials currently sourced from abroad. If developed on schedule, these projects could localize a critical step in the EV supply chain and supply downstream processing and battery investments across the province.

Source: Government of Canada; The Northern Miner and Mining.com; OVIN infrastructure for advanced connectivity technologies, including applications in connected and autonomous vehicles, smart cities, and the IoT. It has supported more than 800 SMEs across Ontario and Quebec.[240] At the industry level, the APMA anchors coordination across the supplier base and leads collaborative initiatives such as the multi-supplier Project Arrow program, which integrates capabilities across firms and institutions.[210]

Case Study: Project Arrow Phase 2.0

Ecosystem integration as a national vehicle program

Project Arrow is a multi-supplier electric vehicle initiative led by the Automotive Parts Manufacturers' Association, demonstrating the integration capacity of Canada's automotive ecosystem. Phase 1, unveiled in 2023, brought together more than 55 predominantly Ontario-based companies to design and build Canada's first domestically developed zero-emission concept vehicle, supported by CAD 5 million in FedDev Ontario funding. Phase 2.0, launched in February 2026 with two prototype vehicles, expanded participation to more than 80 suppliers and secured an additional CAD 7 million in funding.

The program illustrates a coordinated commercialization model, linking research, demonstration, and market development within a single initiative. University-led research supports early-stage innovation, while the multi-supplier prototype enables system-level validation and integration. Industry-led promotion extends these capabilities into global markets. With a target of a commercially viable prototype by 2028, the initiative highlights the ability of Canada's supplier base to move from concept development toward integrated, market-ready vehicle systems.

Source: APMA Project Arrow;[210] FedDev Ontario

Taken together, these institutions support the core commercialization functions. Discovery is driven by university-based research and early-stage innovation. Demonstration and validation occur through RTDS facilities, pilot programs, and industry-led projects. Venture acceleration and scale-up are supported through OCI, MaRS, and public-sector funding mechanisms. These functions are not sequential in practice. Technologies often move iteratively across platforms, with development, testing, and commercialization occurring in parallel across multiple institutions.

Beyond its commercialization function, Ontario's institutional architecture is a source of market access advantage. As discussed earlier, automotive markets in the U.S., the European Union, and parts of Asia are introducing stricter requirements related to cybersecurity, software governance, and battery traceability. Compliance with these requirements depends not only on firm-level capabilities, but also on access to recognized testing, validation, and certification environments.

Ontario's research and demonstration infrastructure positions the province within these compliance ecosystems. Institutions such as SHIELD at the University of Windsor, BlackBerry QNX in Ottawa, and OBEC at the University of Waterloo anchor capabilities in automotive cybersecurity, embedded and certified software, and battery materials and traceability.[227] [222] [241] These assets enable Ontario-based firms to validate products against emerging regulatory and industry standards within established North American and allied networks.

4.3 Investment and Industrial Capacity Development

Investment Trends and the Role of Public and Private Capital

Ontario's recent investment pattern reflects a structural shift in capital deployment across the automotive value chain. Rather than concentrating primarily in final vehicle assembly, recent commitments have increasingly targeted battery cells, battery materials, EV components, and related supply chain infrastructure. This shift indicates a move toward a more vertically integrated industrial model, with Ontario evolving from a mature assembly jurisdiction into a broader electrified manufacturing platform anchored by battery production and upstream component capacity.

The province's largest commitments illustrate this transition. Volkswagen PowerCo's St. Thomas gigafactory, supported by approximately CAD 7 billion in capital investment, is designed to establish large-scale battery cell production in Ontario, with planned annual capacity of up to 90 GWh, production targeted for 2027, and approximately 3,000 direct jobs. [100] [101] Public support, including federal production subsidies estimated by the Parliamentary Budget Officer at up to CAD 16.3 billion over the agreement period, [242] alongside approximately CAD 500 million in provincial funding, highlights the scale of public capital being deployed to secure strategically significant battery manufacturing assets.

> **Infrastructure readiness** refers to the extent to which physical, energy, digital, and logistics systems are in place to support automotive production and ecosystem development.
>
> **Scalability** refers to the ability of Ontario's automotive ecosystem to expand production, capacity, supply chains, and supporting infrastructure in response to growing demand.
>
> **Resilience** refers to the ability for the Ontario automotive ecosystem to withstand abrupt changes in the marketplace and maintain long-term competitiveness.

The LG Energy Solution NextStar Energy in Windsor reflects a complementary dimension of this trend: the localization of battery manufacturing within Ontario's existing assembly corridor. Backed by approximately CAD 5 billion in investment, the 4.23-million-square-foot facility represents Canada's first commercial-scale advanced battery manufacturing plant and is expected to create up to 2,500 direct jobs at full capacity. [243] Together with PowerCo, it indicates that capital is concentrating in the battery segment of the value chain, where production scale, supply security, and proximity to North American assembly demand are increasingly critical. This shift is significant, as batteries represent one of the highest-value components in EVs.

Honda's proposed CAD 15 billion EV ecosystem in Alliston further illustrates that investors are evaluating Ontario not only as a production location, but as a platform for vertically integrated EV manufacturing spanning assembly, batteries, and battery materials.[207] While the project was delayed in 2025 and subsequently suspended in 2026 amid tariff uncertainty and softer EV demand, its scale and design remain indicative of prevailing investment logic, with capital directed toward integrated value chain development rather than stand-alone assembly expansion.

Taken together, these developments suggest that Ontario's present-day investment trend is defined by the buildout of an electrified industrial ecosystem, in which public and private capital are jointly deployed to secure strategic production capacity, deepen vertical integration, and position the province for subsequent rounds of advanced automotive investment.

Infrastructure Readiness, Scalability, and Resilience

Infrastructure readiness, scalability, and resilience are emerging as core determinants of Ontario's ability to attract and sustain investment in electrified automotive production.

Infrastructure Readiness

Ontario's electricity system is a strategic enabler of large-scale automotive investment due to its predominantly low-carbon generation mix which aligns with increasingly stringent emissions and procurement requirements. The strength of this position, however, depends on the system's capacity, reliability, and ability to scale with rising industrial demand. Electrified manufacturing, battery production, and related infrastructure are expected to place sustained pressure on generation and transmission systems. As a result, the grid's performance is becoming a critical factor in investment decisions and operational continuity. Maintaining this advantage will require continued investment in grid modernization. Technologies such as advanced metering, real-time system monitoring, predictive analytics, and distributed energy integration are increasingly necessary to manage load growth and system complexity. In this context, digital energy infrastructure is not only a supporting asset, but a core component of industrial readiness for Ontario's evolving automotive sector.[244]

Federal and provincial investments are expanding the enabling infrastructure required to support EV adoption and production. At the national level, the Canada Infrastructure Bank has committed CAD 1.5 billion through its Charging and Hydrogen Refuelling Infrastructure Initiative to accelerate the deployment of charging and refuelling networks, supporting both consumer adoption and broader system readiness. This program has contributed to the installation of more than 30,000 public charging ports across the country.[245]

Additionally, the province of Ontario has expanded its 2025 to 2026 budget to reflect a targeted investment approach to advancing EV infrastructure across the province. The province's expansion of the ChargeON program led by OVIN includes an additional CAD 92 million, bringing total provincial investment in public charging infrastructure to approximately CAD 180 million.[246] The program supports more than 1,300 charging ports across over 270 projects, delivered through a dual-stream model that combines public deployment with partnerships involving private, non-profit, and Indigenous stakeholders. Priority has been placed on underserved and rural regions, where infrastructure gaps continue to constrain adoption. These investments support demand-side conditions while reinforcing Ontario's position within the broader automotive value chain. Charging availability remains a key determinant of EV uptake, which in turn underpins investment in assembly and related manufacturing capacity.

A related dimension of infrastructure readiness is the availability of shovel-ready industrial sites. For large-scale EV and battery investments, site readiness increasingly depends on the completion of critical pre-development activities, including land preparation, environmental permitting, and the provision of core utility and transportation connections. These measures reduce project lead times, lower execution risk, and improve the competitiveness of jurisdictions seeking to attract globally mobile capital. The preparation of Volkswagen PowerCo's 140-hectare site in St. Thomas demonstrates how coordinated investment in land servicing and enabling infrastructure can strengthen Ontario's attractiveness for major automotive and battery manufacturing projects.[247]

Scalability

Scalability in Ontario's automotive industry is reflected in its capacity to expand production, deepen supply chains, and support high-volume EV manufacturing through coordinated, large-scale investments. Anchor projects such as the Volkswagen battery plant in St. Thomas are designed to produce batteries for up to one million electric vehicles annually. Honda's proposed EV hub in Alliston was similarly structured to reach 240,000 vehicles per year alongside integrated battery production.[248] [249] These projects signal a shift toward globally competitive production volumes and more integrated manufacturing models. Although the project was suspended in 2026, its scale reflects the type of vertically integrated production model that Ontario has the capacity to attract and support. Scaling this capacity depends on aligning upstream inputs, supplier networks, and innovation systems.

Ontario's critical mineral base, expanding supplier capabilities, and coordinated investment environment are strengthening the conditions required to support higher production volumes and deeper supply chain integration. With more than CAD 46 billion in EV and battery sector investment commitments across Canada[250] and the province's CAD 500 million Critical Minerals Processing Fund,[251] Ontario is moving beyond individual project attraction toward a more integrated and scalable industrial platform.

In this context, scalability extends beyond increasing output. It reflects the capacity to translate early-stage investment into repeatable, commercially viable production across multiple stages of the value chain. As processing capacity, battery manufacturing, supplier capabilities, and innovation infrastructure expand in parallel, Ontario is better positioned to reduce bottlenecks, improve input security, and support larger-volume production for North American and export markets. This in turn improves the province's ability to attract follow-on investment, enhances the durability of anchor projects by embedding them within a broader industrial ecosystem.

Resilience

Ontario's automotive resilience is increasingly defined by the sector's ability to absorb supply chain disruption, respond to geopolitical and trade-related volatility, and sustain competitiveness through the transition to electric vehicle manufacturing. [252] Recent evidence underscores the immediacy of this shift. In 2025, the Canadian Federation of Independent Business reported that 49 percent of Ontario automotive SMEs had paused or cancelled investments because of the U.S.–Canada trade conflict, while one in three firms had shifted toward domestic suppliers to reduce exposure to external shocks. [253] Resilience is therefore emerging as a core competitive attribute shaping investment continuity, sourcing strategies, and supplier adaptation.

Public policy and strategic co-investment have reinforced this shift by directing capital toward supplier modernization, domestic production capability, and EV-related manufacturing capacity. In February 2025, FedDev Ontario announced more than CAD 10 million for seven southern Ontario EV supply chain manufacturers to upgrade equipment and strengthen production capability.[254] In February 2026, the federal government's new automotive strategy further positioned resilience as a policy objective through support for modernization, advanced technologies, and measures to mitigate tariff pressures and improve domestic supply chain performance.[255] Together, these developments strengthen Ontario's capacity to retain production, attract follow-on investment, and reduce reliance on more fragmented offshore supply networks.

Infrastructure Security, Data Integration, and Operational Continuity

The Ontario Cybersecurity Excellence Initiative (OCEI) represents a targeted investment in strengthening Ontario's cybersecurity capabilities across advanced manufacturing and mobility systems. Supported by CAD 5 million from the Government of Ontario and CAD 3.8 million from Rogers Communications, alongside in-kind contributions, the program totals CAD 10 million over three years.[256]

The initiative focuses on enhancing cybersecurity capacity across six priority sectors, including automotive, advanced manufacturing, smart infrastructure, and mining. Within the automotive sector, it supports the development and adoption of cybersecurity solutions, provides firms with access to specialized expertise to integrate cybersecurity into products and production systems, and helps companies meet evolving global supply chain security requirements.[257] This investment reflects a broader shift in Ontario's industrial strategy, in which cybersecurity is increasingly treated not only as a risk management function, but as a core component of competitiveness for firms participating in advanced manufacturing and integrated automotive supply chains.

The Ontario automotive industry is advancing data integration through the adoption of digital manufacturing systems and connected mobility ecosystems, supported in part by the O-AMP. With cost-shared funding of up to CAD 150,000 per project, the program enables small and medium-sized automotive firms to improve operational efficiency, strengthen competitiveness, and expand product offerings through the adoption of Industry 4.0 technologies, new product development tools, and lean manufacturing processes.[258]

In practice, this includes investments in enterprise resource planning systems, production tracking, predictive analytics, AI-enabled manufacturing applications, computer vision, and digital process-monitoring tools. These technologies improve the flow of information across production lines, suppliers, and operators, enabling more timely decision-making and stronger coordination across the value chain. Beyond internal efficiency, they support greater supply chain visibility, improved production responsiveness, and enhanced compliance with quality and traceability requirements in increasingly integrated automotive markets.

Operational continuity is being reinforced through a combination of supply chain diversification, technological upgrading, and ecosystem-level coordination. Ontario's approach is focused on reducing reliance on concentrated external suppliers while strengthening domestic production capacity and adaptive manufacturing capabilities. The province's broader automotive strategy, *Driving Prosperity*, targets the development of an end-to-end ecosystem spanning critical minerals, batteries, components, assembly, and connected mobility technologies, to improve resilience and retain a greater share of value within the provincial economy.[259]

This direction is supported by targeted investment programs. In 2025, OVIN supported more than CAD 56 million in combined public and private investment to help 30 Ontario-based automotive and mobility SMEs scale technologies in electrification, EV charging, and smart mobility, while improving integration into global supply chains.[260] Complementing provincial efforts, federal support has targeted supplier modernization more directly. At the federal level, FedDev Ontario approved up to CAD 9.3 million in February 2026 for Kumi Canada Corporation to modernize operations through advanced manufacturing technologies aimed at improving competitiveness and mitigating tariff-related pressures.[261]

Taken together, these initiatives reflect a shift toward a more digitally enabled and resilient supplier base. Ontario's strategy is not limited to attracting large-scale investments, but increasingly focused on strengthening firm-level capabilities and system-wide coordination to maintain operational continuity under conditions of trade disruption, input volatility, and ongoing sectoral transition.

4.4 Workforce and Capability Development

Shifting Skills Toward Advanced Manufacturing and Digital Capabilities

Ontario's motor vehicle, body, trailer, and parts manufacturing sector directly employs approximately 148,300 workers.[262] As the industry transitions toward EV production, labour market disruptions are anticipated across both assembly operations and the broader automotive supply chain. Electrification reduces the number of mechanical components required per vehicle, lowering demand for certain ICE-related roles. At the same time, EV manufacturing processes are characterized by increased technological sophistication, necessitating a workforce with advanced technical competencies, particularly in areas such as computer numerical control (CNC) systems, robotics, and integrated manufacturing software. This transition is increasing demand for workers who possess hybrid skill profiles that integrate traditional manufacturing competencies, such as machining, automation, and quality assurance, with EV-specific technical expertise, including high-voltage systems, battery technologies, power electronics, and embedded software.[263] Looking ahead, growth in EV production is expected to generate new employment opportunities across manufacturing, maintenance, and engineering functions. Clean Energy Canada projects that the EV sector could support up to 184,000 jobs by 2030, growing at an annual rate of 39 percent.[264] This includes both manufacturing, infrastructure installation and maintenance and automotive service positions.

At the same time, labour market outcomes remain contingent on the sector's ability to address shifting skills requirements. Without coordinated investment in reskilling and upskilling, particularly in battery pack assembly, electrical safety, EV diagnostics, and software-enabled manufacturing, workforce adjustment is likely to be uneven, increasing the risk of short-term displacement.[263]

Table 10 summarizes these changes by comparing the core capabilities associated with conventional automotive manufacturing and those required in emerging electrified and software-defined production environments.

Table 10: Illustrative Shift in Required Workforce Capabilities

Skill Category	Conventional (ICE) Production	Electrified, Software-Defined Production
Core Production Skills	Precision machining of powertrain components	Battery assembly, cell integration, high-voltage systems
Manufacturing Processes	Mechanical assembly and maintenance	Power electronics, thermal management, advanced materials
Technical Systems Knowledge	Mechanical systems and fluid dynamics	Electrical systems, battery chemistry, energy management
Digital & Software Capabilities	Limited software interaction	Embedded software, data systems, cybersecurity integration
Work Organization	Discrete, role-specific tasks	Cross-functional, systems-level roles
Tools & Technologies	Conventional machining and tooling	Robotics, automation, AI-enabled manufacturing systems
Quality & Validation	Component-level testing	System-level validation, diagnostics, and software updates

Source: Job Bank Canada; MNP Analysis

Education, Training, and Workforce Development Programs

Ontario has introduced targeted workforce investments to address emerging skills gaps associated with electrified and technology-integrated vehicles. The province has expanded its use of experiential and work-integrated learning to strengthen the automotive talent pipeline. In June 2025, OVIN launched the Automotive Innovation Challenge Program, engaging more than 700 post-secondary students in applied mobility and manufacturing challenges. Supported by over CAD 1.2 million in combined public and industry funding, the program connected students with employers through hackathons, innovation sprints, and industry-led problem-solving activities.[265] These initiatives focused on applications such as artificial intelligence in manufacturing, operational efficiency, and standardized training approaches, reinforcing industry-relevant digital and advanced manufacturing capabilities.

Complementary initiatives are strengthening earlier-stage entry points into the workforce through post-secondary pathways. Provincial funding has supported school board and college-led programs, including those delivered through St. Clair College, to introduce students to automotive and mobility careers and support pathways into apprenticeships and technical training.[266]

Talent development is further supported through the OVIN Talent Development Fellowship Program, which embeds PhD graduates and postdoctoral researchers within industry-led projects. Participants contribute to applied research in areas such as battery technologies, advanced materials, and connected and autonomous systems, while supporting the adoption of AI-enabled and hardware-integrated solutions, particularly among small and medium-sized enterprises.[267]

5. Opportunities for Ontario

As the automotive and mobility sector continues to transform, new and ongoing opportunities for Ontario unfold. The province's established manufacturing base, integration within North American supply chains, clean electricity system, critical mineral assets, research capacity, and emerging software and cybersecurity strengths provide a strong platform for future competitiveness.

At the same time, shifting trade conditions, evolving OEM investment strategies, cost pressures, and the move toward electrified, software-defined, and digitally connected vehicles require a more focused approach to industrial development. This section identifies priority opportunity areas where Ontario can protect and modernize its existing automotive base while expanding into higher-value segments of the future mobility supply chain.

5.1 Reinforcing Ontario as a Trusted North American Production and Supply Chain Location

Ontario has an opportunity to position itself as a trusted, resilient, and North American-aligned production location at a time when OEMs and suppliers are reassessing global sourcing and manufacturing footprints. Trade volatility, geopolitical risk, tariffs, rules-of-origin requirements, and restrictions on connected vehicle hardware and software are encouraging firms to reduce exposure to concentrated or higher-risk supply chains. This creates an opening for jurisdictions that can offer secure market access, mature industrial capacity, low-carbon production, and strong alignment with North American and allied-market requirements.

Ontario's existing position within the Great Lakes automotive corridor is a major advantage. The province is deeply integrated with U.S. assembly and engineering centres, particularly in Michigan and the broader Midwest, and remains central to cross-border vehicle and parts flows. This integration supports scale, specialization, and just-in-sequence production. It also means that Ontario's competitiveness depends on predictable trade conditions, efficient border infrastructure, and the ability of suppliers to meet evolving compliance requirements.

Interview findings suggest that supply chain resilience is increasingly being treated as a commercial requirement, rather than only a policy objective. OEMs are pushing localization, compliance, traceability, and supplier oversight deeper into the value chain. This is especially important for Tier 2 and Tier 3 suppliers, where visibility gaps, thinner margins, and limited internal capacity can create vulnerabilities across the broader production system.

Ontario can strengthen its trusted supply chain proposition by supporting supplier localization, improving multi-tier supply chain visibility, advancing digital compliance tools, and helping firms demonstrate rules-of-origin, labour, cybersecurity, and provenance requirements. In doing so, the province can position itself not only as a place where vehicles and components are produced, but as a jurisdiction where OEMs and suppliers can reduce operational, geopolitical, and compliance risk.

5.2 Retaining and Modernizing the Existing Automotive Industrial Base

Ontario's near-term competitiveness will depend heavily on retaining and upgrading the industrial base already in place. The province's assembly plants, supplier networks, tooling capabilities, and skilled workforce remain foundational assets. However, these assets are under pressure from tariffs, cost competition, policy uncertainty, shifting EV demand, OEM platform changes, and the gradual decline of ICE-specific components. Modernization should therefore be treated as an economic resilience strategy.

Ontario's existing suppliers need support to improve productivity, adopt automation, integrate digital production systems, and transition toward EV, hybrid, software-defined, and platform-based vehicle programs. This is particularly important for SMEs, which often face the greatest barriers to capital investment, technology adoption, workforce training, and OEM engagement.

Ontario can build on programs such as the Ontario Automotive Modernization Program, OVIN-supported SME initiatives, NGen, and related federal and provincial supports to accelerate supplier modernization. Strengthening capabilities in robotics, AI-enabled quality control, predictive maintenance, digital production monitoring, lean manufacturing, advanced tooling, and flexible production systems can help suppliers improve productivity, adapt to evolving OEM requirements, and compete across a broader range of vehicle platforms and powertrain technologies.

This opportunity area is fundamental to Ontario's long-term competitiveness. The province needs to maintain the strengths that underpin its automotive sector today while supporting the evolution of its industrial base toward the next generation of automotive and mobility value creation.

5.3 Targeting Strategic Gaps in the Battery, Critical Minerals, and Circular Supply Chain

Ontario has a credible opportunity to extend its role beyond assembly and parts production into higher-value segments of the EV battery and critical minerals value chain. The province has significant upstream mineral assets, a low-carbon electricity system, major battery manufacturing investments, and proximity to North American assembly demand. Together, these assets provide the foundation for a more integrated "mine-to-mobility" supply chain.

The opportunity is not to pursue every battery segment equally. Rather, Ontario should focus on filling strategic gaps that strengthen the resilience, completeness, and commercial relevance of its EV ecosystem. The findings indicate that Ontario's critical mineral endowment and emerging battery ecosystem are well aligned with nickel- and cobalt-intensive battery value chains. However, the growing adoption of LFP and other lower-cost chemistries highlights the importance of broadening capabilities that can support a wider range of battery technologies and evolving supply chain requirements.

Interview findings also highlight Ontario's strategic opportunity to further integrate the supply chain given the availability of critical minerals. Priority areas include mineral processing, battery-grade materials, cathode and precursor materials, separators, battery modules, battery enclosures, thermal management, battery management systems, recycling, and end-of-life recovery. These segments can help Ontario capture more value from its mineral endowment and manufacturing base, while reducing dependence on offshore processing and concentrated global supply chains.

Circular battery supply chains could be a particularly important opportunity. Battery recycling, production scrap recovery, second-life applications, and traceable recovered materials can improve supply security, reduce environmental impacts, and support compliance with emerging battery passport and recycled-content requirements. Ontario's proximity between mining regions, battery plants, assembly facilities, and industrial users creates a practical foundation for closed-loop models.

5.4 Accelerating Supplier Transition into Electrified, Software-Defined, and Integrated Vehicle Systems

Ontario's supplier ecosystem is a major strength, but it should continue to adapt as vehicle value shifts from mechanical complexity toward batteries, power electronics, software, sensors, data systems, and integrated vehicle architectures. Traditional ICE-related components remain important in the near term, particularly given the uneven pace of EV adoption, but long-term competitiveness will depend on the ability of suppliers to move into higher-value systems.

The findings identify several areas where value is expanding, including battery enclosures, thermal management, lightweight structures, high-voltage systems, power electronics, electric driveline components, embedded software, cybersecurity, and system-level validation. These are areas where Ontario's advanced manufacturing base, Tier 1 anchors, tooling capacity, research institutions, and SME ecosystem can be leveraged to strengthen competitiveness in higher-value segments of the automotive value chain.

Additionally, interview findings suggest that SME adaptation is one of the most important transition challenges. Smaller suppliers often have technical depth but may lack the scale, capital, market intelligence, or OEM access required to pivot into new programs. Supporting these firms will be critical to ensure that Ontario's broader supplier base remains competitive as OEM procurement consolidates around platform architectures and integrated systems.

Ontario can respond by strengthening commercialization pathways that connect SMEs to OEMs, Tier 1 suppliers, research institutions, demonstration environments, and export markets. This includes continued support for validation, prototyping, joint development, standards readiness, and participation in collaborative consortia. The objective should be to help suppliers move beyond discrete component production toward integrated product and system capability. This transition is central to capturing future value. Suppliers that can combine manufacturing excellence with software, electronics, materials, and systems integration will be better positioned to remain embedded in global vehicle programs.

Ontario's established strengths in advanced manufacturing, supplier development, and technology commercialization provide a strong foundation for this transition. Existing programs, including O-AMP and OVIN and incubators such as the MaRS Discovery District, already support technology adoption, supplier modernization, and integration into emerging EV and software-defined vehicle value chains. Continued investment in these areas can help Ontario suppliers compete in higher-value segments of the evolving automotive industry.

5.5 Building Leadership in Trusted Digital Supply Chains, Cybersecurity, and Traceability

As vehicles and supply chains become more digitally connected, competitiveness is increasingly shaped by trust. Cybersecurity, software-update governance, supply chain traceability, battery passports, embedded carbon data, labour compliance, and material provenance are becoming core requirements for market access and supplier participation. Ontario has an opportunity to position itself as a leading jurisdiction offering trusted digital systems for the automotive and mobility supply chain.

The findings indicate that regulatory requirements and customer expectations are placing greater emphasis on secure, traceable, and standards-aligned production. Frameworks such as UNECE cybersecurity and software update regulations, ISO/SAE 21434, connected vehicle security restrictions, Catena-X-style data-sharing requirements, and the EU Battery Regulation are extending these expectations across the automotive value chain. As a result, requirements that were once concentrated among OEMs are increasingly affecting Tier 1, Tier 2, and Tier 3 suppliers.

Ontario has several assets that support this opportunity, including BlackBerry QNX, the Toronto-Waterloo technology corridor, the University of Windsor's automotive cybersecurity capabilities, OVIN-supported demonstration infrastructure, and a growing base of firms active in AI, software, and connected mobility. Ontario's low-carbon electricity system could also provide a growing source of competitive advantage as OEMs and regulators place greater emphasis on embedded emissions and lifecycle carbon reporting. Realizing this advantage will depend on firms' ability to verify and demonstrate emissions performance through robust traceability and digital reporting systems.

Interview findings also suggest that digital tools are becoming essential for mapping supply chains, tracking material origins, and demonstrating compliance across multiple supplier tiers. Ontario can support firms by helping them adopt traceability platforms, cybersecurity practices, data governance systems, and digital documentation tools that align with emerging OEM and regulatory expectations.

This opportunity area is both a risk-management imperative and a market-access strategy. Firms that can demonstrate secure software, verifiable provenance, low-carbon production, and compliance readiness will be better positioned to compete in trusted North American and allied supply chains.

5.6 Broadening AI and Advanced Manufacturing Adoption Across the Supplier Base

Ontario cannot rely on cost alone to compete with lower-cost jurisdictions or large-scale incentive regimes. Its long-term competitiveness will depend on productivity, precision, flexibility, and the ability to deploy advanced manufacturing technologies across the supplier base. AI, automation, robotics, digital production systems, and advanced analytics are becoming essential tools for improving efficiency, quality, and responsiveness in an increasingly complex automotive environment.

The findings highlight how AI and automation are already being applied across automotive production and logistics, including quality inspection, predictive maintenance, supply chain risk monitoring, production planning, energy management, and route optimization. However, adoption remains uneven across the supplier ecosystem, particularly among SMEs that often face greater capital, technical, and workforce constraints. As OEMs demand shorter development cycles, higher quality standards, and greater supply chain visibility, these gaps risk widening competitiveness differences across the sector.

Ontario has a strong base from which to scale these capabilities. Its manufacturing ecosystem includes large Tier 1 suppliers, a deep SME base, post-secondary applied research institutions, automation firms, and programs supporting Industry 4.0 adoption. Ontario can strengthen this opportunity by expanding practical supports for technology adoption, including advisory services, demonstration projects, shared testing facilities, and capital support for SMEs.

Existing initiatives such as the O-AMP, OVIN's Regional Technology Development Sites, its Research & Development Partnership Fund, the QEW Innovation Corridor, the TPZ project, and industry-led commercialization and demonstration programs already provide a foundation for technology adoption and validation. Continued support for these platforms can help accelerate the deployment of robotics, machine vision, AI-enabled inspection, predictive maintenance, digital twins, production monitoring, enterprise resource planning integration, and real-time supply chain analytics across the supplier base.

This opportunity reinforces multiple objectives at once. It improves productivity, strengthens resilience, supports supplier transition, and helps firms meet evolving quality, traceability, and delivery expectations.

5.7 Leveraging Cross-Sector and Dual-Use Mobility Applications

Ontario’s automotive and mobility capabilities have growing relevance beyond traditional passenger vehicle production. Technologies developed for connected, autonomous, electrified, and software-defined vehicles can be applied in defence, public safety, emergency response, mining, logistics, infrastructure monitoring, and critical systems. These include sensing, secure communications, edge computing, autonomous navigation, ruggedized electronics, fleet management, cybersecurity, and advanced materials.

This opportunity builds on Ontario's established automotive and mobility ecosystem. The province’s strengths in advanced manufacturing, systems integration, engineering, and technology development create pathways into adjacent markets where reliability, security, and operational performance are critical. Ontario already has relevant assets, including defence-adjacent manufacturers, AI and cybersecurity clusters, public infrastructure systems, mining operations, and applied research institutions. Together, these assets provide a foundation for adapting automotive and mobility technologies to applications beyond traditional vehicle production.

OVIN and related ecosystem partners can help firms identify adjacent market opportunities, navigate procurement requirements, validate technologies, and connect with end users. Priority applications could include autonomous inspection, emergency response routing, resilient logistics, secure fleet management, mine-site mobility, infrastructure monitoring, and connected public-safety systems.

This opportunity area can help Ontario diversify demand, increase technology commercialization pathways, and capture value from capabilities developed within the mobility ecosystem.

5.8 Building the Talent Required for the Next Supply Chain

Ontario’s ability to capture value from the opportunities identified above will depend on whether its workforce, firms, and commercialization system can adapt quickly enough. The automotive and mobility supply chain increasingly requires hybrid capabilities that combine manufacturing, electrical systems, battery knowledge, software, cybersecurity, automation, data analytics, and systems integration.

The findings indicate that the workforce transition is not simply a shift from ICE manufacturing jobs to EV manufacturing jobs. It is a broader capability shift. Firms will need workers who understand high-voltage systems, battery assembly, power electronics, embedded software, AI-enabled manufacturing, robotics, traceability, and cybersecurity. Suppliers will also need management and technical capacity to adopt new technologies, navigate regulatory requirements, and engage with OEMs in more complex platform-based procurement environments.

Ontario has a strong foundation through its universities, colleges, applied research centres, the OVIN Talent Development Fellowship Program, and industry-academia supported challenge-based initiatives. The opportunity is to align these programs more directly with the strategic needs of the next supply chain.

Interviewees consistently identified Ontario's research capacity and skilled workforce as important competitive advantages. Fully leveraging these strengths will require continued collaboration among industry, post-secondary institutions, and ecosystem partners to accelerate knowledge transfer, talent development, and the commercialization of emerging technologies.

Building these capabilities will require continued investment in supplier-focused upskilling, micro-credentials, applied training, post-secondary industry placements, and technical programs aligned with batteries, software-defined vehicles, automation, cybersecurity, and digital manufacturing. Workforce development should also be closely linked to commercialization, ensuring that research talent, SME capabilities, and industry needs are connected through practical deployment and market adoption pathways.

Overall, Ontario’s opportunity is to use its existing automotive manufacturing base as the platform for a more resilient, higher-value, and digitally enabled mobility supply chain. The province does not need to compete only on scale or cost. Its strongest value proposition lies in the combination of trusted North American production, clean electricity, critical minerals, advanced manufacturing, software and cybersecurity capabilities, research depth, and a skilled workforce.

The analysis suggests that Ontario’s long-term competitiveness will depend on its ability to build on existing industrial strengths while expanding into higher-value segments of the automotive and mobility value chain. This includes batteries and critical minerals, electrified and software-defined vehicle systems, trusted digital supply chains, AI-enabled manufacturing, and the talent, innovation, and commercialization ecosystems that support these activities.

Taken together, these opportunity areas point to a coordinated strategy that help retain the foundation, upgrade supplier capabilities, fill strategic gaps, and position Ontario as a trusted, integrated, and innovation-ready jurisdiction for the next phase of automotive and mobility supply chain development.

6. Glossary

1P1P	One Project One Process
ACE	Automotive Centre of Excellence
ACEA	European Automobile Manufacturers' Association
ADAS	Advanced Driver Assistance Systems
AI	Artificial Intelligence
AIAG	Automotive Industry Action Group
APMA	Automotive Parts Manufacturers' Association
AUTO-ISAC	Automotive Information Sharing and Analysis Center
BEV	Battery Electric Vehicle
BMS	Battery Management System
CAR	Centre for Automotive Research
CARE	Centre for Automotive Research and Education
CMVSS	Canada Motor Vehicle Safety Standards
CNC	Computer Numerical Control
C-V2X	Cellular Vehicle-to-Everything
DIANA	Defence Innovation Accelerator for the North Atlantic
DSR	Defence, Security, and Resilience
DSRC	Dedicated Short-Range Communication

ECU	Electronic Control Units
EDI	Electronic Data Interchange
E-GMP	Electric Global Modular Platform
ENCQOR	Evolution of Networked Services through a Corridor in Quebec and Ontario for Research and Innovation
EU	European Union
EV	Electric Vehicle
EVIO	Electric Vehicle Innovation Ontario
FEOC	Foreign Entity of Concern
FMVSS	Federal Motor Vehicle Safety Standards
GDP	Gross Domestic Product
ICE	Internal Combustion Engine
IEA	International Energy Agency
IoT	Internet of Things
IRA	Inflation Reduction Act
ISO/SAE	International Organization for Standardization / Society of Automotive Engineers
JIS	Just-in-Sequence
JIT	Just-in-Time
LFP	Lithium Iron Phosphate
LiDAR	Light Detection and Ranging
LVC	Labour Value Content
MaaS	Mobility-as-a-Service

MARC	McMaster Automotive Resource Centre
MCS	Megawatt Charging System
MEB	Modular Electric Drive Matrix
MSRP	Manufacturer’s Suggested Retail Price
NACFE	North American Council for Freight Efficiency
NACS	North American Charging Standard
NEV	New Energy Vehicle
NGEN	Next Generation Manufacturing Canada
NMC	Nickel Manganese Cobalt
O-AMP	Ontario Automotive Modernization Program
OBEC	Ontario Battery and Electrochemistry Research Centre
OCEI	Ontario Cybersecurity Excellence Initiative
OCI	Ontario Centre of Innovation
OEM	Original Equipment Manufacturer
OVIN	Ontario Vehicle Innovation Network
PGE	Platinum Group Elements
QEW	Queen Elizabeth Way
R&D	Research and Development
RSU	Roadside Units
RTDS	Regional Technology Development Sites
RVC	Regional Value Content

SDF	Skills Development Fund
SDV	Software-Defined Vehicle
SME	Small and Medium-sized Enterprise
SSP	Scalable Systems Platform
TPZ	Technology Pilot Zone
U.S.	United States
USD	United States Dollar
USMCA	Canada-United States-Mexico Agreement
V2I	Vehicle-to-Infrastructure
V2N	Vehicle-to-Network
V2P	Vehicle-to-Pedestrian
V2V	Vehicle-to-Vehicle
V2X	Vehicle-to-Everything
ZEV	Zero-Emission Vehicle

7. OVIN Team

Information on OVIN team members and relevant contacts for outreach is available on OVIN's website at: https://www.ovinhub.ca/connect/team/

8. Disclaimers

This report was commissioned by the Ontario Centre of Innovation (OCI) through a Request for Proposals titled "Ontario Vehicle Innovation Network (OVIN) – Annual Comprehensive Sector Report & Quarterly Specialized Reports," dated September 26, 2025, and has been prepared by MNP LLP. It is one of five reports covering an analysis of Ontario's automotive technology, electric vehicle and smart mobility landscape while incorporating implications for the sector's skills and talent landscape.

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9. References

[1] ACEA (April 2026). Economic and Market Report. Global and EU Auto industry. Full year 2025. https://www.acea.auto/files/Economic_and_Market_Report-Full_year_2025.pdf

[2] Government of China. (2026, January 14). China's auto output, sales reach new highs in 2025. The State Council of the People's Republic of China. https://english.www.gov.cn/archive/statistics/202601/14/content_WS6967432ec6d00ca5f9a088ff.html

[3] CSIS (2024). The Chinese EV Dilemma: Subsidized Yet Striking; Wins and Losses: Chinese Industrial Policy's Uneven Success. Scott Kennedy and Ilaria Mazzocco. https://www.csis.org/blogs/trustee-china-hand/chinese-ev-dilemma-subsidized-yet-striking

[4] Rhodium Group / CNBC (2026). China's EV Cost Advantage: Vertical Integration vs. Subsidies. March 2026. https://www.cnbc.com/2026/03/06/china-ev-cost-advantage-vertical-integration-byd-tesla-rhodium-report.html

[5] OICA. (April 23, 2026). Auto industry growth shifted east in 2025 amid global repositioning. https://oica.net/auto-industry-growth-shifted-east-in-2025-amid-global-repositioning/

[6] Asian Automotive Analysis (April 20, 2020). India's 2019 Automobile Production Decreases Due to Shrinking Domestic Sales. https://aaa.fourin.com/reports/9d90f510-8054-11ea-96a0-8913bebfa4b6/indias-2019-automobile-production-decreases-due-to-shrinking-domestic-sales

[7] European Parliamentary Research Service (October 2024). The Crisis facing the EU's automotive industry. https://www.europarl.europa.eu/RegData/etudes/ATAG/2024/762419/EPRS_ATA(2024)762419_EN.pdf

[8] National Institute of Statistics and Geography (INEGI). (2026). Administrative record of the light vehicle automotive industry. Production of vehicles. https://en.www.inegi.org.mx/app/descarga/ficha.html?tit=105761&ag=0&f=csv

[9] Antonio Vilela (2026). Mexico: Automobile Industry Ends 2025 with Production of 3.95 Million Vehicles and Exports of 3.38 Million. Latam Mobility. https://latamobility.com/en/mexico-automobile-industry-2025-production/

[10] Canadian Vehicle Manufacturer's Association (2026). Automotive Industry Statistics. https://www.cvma.ca/industry/stats/

[11] Evan Jozkowski (Oct 2025). Automobile & Light-Duty Motor Vehicle Manufacturing in Canada. IBIS World. https://my.ibisworld.com/ca/en/industry/33611CA/products-and-markets.

[12] Job Bank Canada (2026). Ontario Sectoral Profile: Motor Vehicle Mfg. https://www.on.jobbank.gc.ca/trend-analysis/job-market-reports/ontario/sectoral-profile-motor-manufacturing

[13] ICAEW (2025). Global Automotive Manufacturing: Industry Profile. Updated April 2025. https://www.icaew.com/library/industry-profiles/automotive-manufacturing

[14] ChinaEVHome (2026). *China's Auto Export Value Climbs 21% to $142.4 Billion in 2025*. Published January 19, 2026. https://chinaevhome.com/2026/01/19/chinas-auto-export-value-climbs-21-to-142-4-billion-in-2025/

[15] IEA (2026). Global EV Outlook 2026: Trends in Electric Cars. Published May 2026. https://www.iea.org/reports/global-ev-outlook-2026/trends-in-electric-cars

[16] Brookings Institution (2026). How China Reads the 2025 U.S. National Security Strategy. January 2026. https://www.brookings.edu/articles/how-china-reads-the-2025-u-s-national-security-strategy/

[17] Bipartisan Policy Center (2026). Unpacking the FEOC Provisions in the One Big Beautiful Bill Act. https://bipartisanpolicy.org/explainer/unpacking-the-feoc-provisions-in-the-one-big-beautiful-bill-act/

[18] Van den Bossche, P., Luo, S., & Rai, K. (2024). *2024 Kearney US Reshoring Index*. Kearney. https://www.kearney.com/service/operations-performance/us-reshoring-index/2024

[19] McKinsey Global Institute (2024). *Geopolitics and the Geometry of Global Trade*. January 17, 2024. McKinsey & Company. https://www.mckinsey.com/mgi/our-research/geopolitics-and-the-geometry-of-global-trade

[20] IEA (2026). Global EV Outlook 2026: Executive Summary. Published May 20, 2026. https://www.iea.org/reports/global-ev-outlook-2026/executive-summary

[21] PwC Strategy& (2025). Merge Ahead: Electric Vehicles and the Impact on the Automotive Supply Chain. https://www.pwc.com/us/en/industries/industrial-products/library/electric-vehicles-supply-chain.html

[22] IEA (2025). Global Critical Minerals Outlook 2025: Executive Summary and Overview. https://www.iea.org/reports/global-critical-minerals-outlook-2025/executive-summary

[23] Trillium Network for Advanced Manufacturing (2026). The Road Behind Is Not the Road Ahead. Data Bulletin, February 2026. https://trilliummfg.ca/data-bulletin/the-road-behind-is-not-the-road-ahead

[24] Government of Ontario. (2026, March 5). *Ontario celebrates grand opening of NextStar Energy's battery facility in Windsor*. https://news.ontario.ca/en/release/1007118/ontario_celebrates_grand_opening_of_nextstar_energys_battery_facility_in_windsor

[25] Government of Ontario. (2025, October 28). *Ontario celebrates PowerCo construction milestone in St. Thomas*. https://news.ontario.ca/en/release/1006659/ontario-celebrates-powerco-construction-milestone-in-st-thomas

[26] Jones, Al. & Casey, L. (2026, January 20). *Ontario pins hopes on storage batteries to sustain struggling EV supply chain.* CBC News. Ontario pins hopes on storage batteries to sustain struggling EV supply chain | CBC News

[27] Federal Register (2025). Proclamation 10908: Adjusting Imports of Automobiles and Automobile Parts Into the United States. 90 FR 14705, April 3, 2025.

https://www.federalregister.gov/documents/2025/04/03/2025-05930/adjusting-imports-of-automobiles-and-automobile-parts-into-the-united-states

[28] Congressional Research Service (2026). Section 232 Automotive Tariffs: Issues for Congress. IN12545, updated May 2026. https://www.congress.gov/crs-product/IN12545

29 U.S. Dept of Commerce (2025). Auto Tariff Offset Process. https://www.trade.gov/press-release/department-commerce-announces-new-auto-tariff-offset-process

30 Brookings Institution (2025). The Impact of US Tariffs on North American Auto Manufacturing and Implications for USMCA. https://www.brookings.edu/articles/the-impact-of-us-tariffs-on-north-american-auto-manufacturing-and-implications-for-usmca/

31 Government of Canada (2025). United States Surtax Remission Order (Motor Vehicles 2025). Canada Gazette, Part 2, Vol. 159, No. 10, May 7, 2025. https://gazette.gc.ca/rp-pr/p2/2025/2025-05-07/html/si-tr60-eng.html

32 USMCA Chapter 4 – Rules of Origin; USTR. https://ustr.gov/trade-agreements/free-trade-agreements/united-states-mexico-canada-agreement/agreement-without

33 Cox Automotive / Kelley Blue Book (2026). Tariff Costs: New Car Prices Up 10% Since Last Year. March 31, 2026. https://www.kbb.com/car-news/tariff-costs-new-car-prices-up-10-since-last-year

34 S&P Global Mobility (2026). 2025 automotive sales data highlights mixed global trends, January 2025. https://www.spglobal.com/automotive-insights/en/blogs/2026/01/2025-automotive-sales-data-global-trends

35 Statistics Canada. Table 12-10-0175-01 International merchandise trade by province, commodity, and Principal Trading Partners (x 1,000). https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1210017501&pickMembers%5B0%5D=1.1&pickMembers%5B1%5D=3.10&pickMembers%5B2%5D=4.2&cubeTimeFrame.startMonth=12&cubeTimeFrame.startYear=2025&cubeTimeFrame.endMonth=04&cubeTimeFrame.endYear=2026&referencePeriods=20251201%2C20260401

36 Canadian Auto Dealer. (July 18, 2025().U.S. tariff impacts and expectations on Canada's auto sector. https://canadianautodealer.ca/2025/07/u-s-tariff-impacts-and-expectations-on-canadas-auto-sector/

37 TD Economics / Retail Insider (2026). Canada Auto Sales Hit 6-Year High in 2025. February 20, 2026. https://retail-insider.com/retail-insider/2026/02/canada-auto-sales-hit-6-year-high-in-2025-but-tariffs-to-drive-decline-in-2026-td-report/

38 Oxford Economics (2025). *US Auto Tariffs Would Slam Canada's Motor Vehicle Industry*. Research Briefing, March 31, 2025. Oxford Economics. https://www.oxfordeconomics.com/resource/us-auto-tariffs-would-slam-canadas-motor-vehicle-industry/.

39 Bipartisan Policy Center (February 24, 2023). IRA EV Tax Credits: Requirements for Domestic Manufacturing. https://bipartisanpolicy.org/article/ira-ev-tax-credits/

40 Miller & Chevalier (2025). OBBBA Brings 45X Changes, Though Not Wholesale Repeal. https://www.millerchevalier.com/publication/obbba-brings-45x-changes-though-not-wholesale-repeal

41 Michigan Strategic Fund. (2022, January 25). General Motors LLC and Ultium Cells LLC request: Critical Industry Program grant request; Designated Renaissance Zone; Lansing Economic Area Partnership Strategic Site Readiness Program grant request. https://www.mackinac.org/archives/2022/GM%20Board%20Pack%20Award.pdf

[42] Michigan Economic Development Corporation. (2022, October 5). Gov. Whitmer announces 2,000 new jobs, investment of $1.6 billion as Michigan-based Our Next Energy builds battery manufacturing campus in Wayne County. https://www.michiganbusiness.org/press-releases/2022/10/whitmer-announces-2000-jobs-investment-of-$1.6-billion-michigan-based-our-next-energy-builds-battery-manufacturing-campus-wayne-county/

[43] Georgia Department of Economic Development. (2022, May 2). *Rivian agreement basics*. https://georgia.org/sites/default/files/2022-05/rivian_incentives_-_executive_summary.pdf

[44] Georgia Department of Economic Development. (n.d.). *Hyundai Motor Group Metaplant America*. https://georgia.org/hyundai-motor-group-metaplant-america

[45] Tennessee Advanced Energy Business Council. (2019, November 20). *Volkswagen breaks ground on electric vehicle expansion at Chattanooga plant*. https://www.tnadvancedenergy.com/volkswagen-breaks-ground-on-electric-vehicle-expansion/

[46] CBC News (2026). Goodbye EV Sales Mandate, Hello Purchase Rebates. Carney Shakes Up Canada's Auto Industry. February 5, 2026.

https://www.cbc.ca/news/politics/carney-dropping-ev-mandate-introducing-new-emissions-standards-9.7075302

[47] Government of Ontario (2025). Published Plans 2025–2026: Ministry of Economic Development, Job Creation and Trade. https://www.ontario.ca/page/published-plans-and-annual-reports-2025-2026-ministry-economic-development-job-creation-trade

[48] Office of the Parliamentary Budget Officer. (2024, June 18). *Tallying government support for EV investment in Canada*. https://www.pbo-dpb.ca/en/additional-analyses--analyses-complementaires/BLOG-2425-004--tallying-government-support-ev-investment-in-canada--bilan-aide-gouvernementale-investissement-dans-ve-canada

[49] Government of Ontario. (2026). *Regional Development Program: Advanced Manufacturing and Innovation Competitiveness Stream*. Ontario Ministry of Economic Development, Job Creation and Trade. https://www.ontario.ca/page/regional-development-program-advanced-manufacturing-and-innovation-competitiveness-stream

[50] Government of Ontario. (2026). *2026 Ontario budget: Chapter 1A: Protect Ontario*. Ontario Ministry of Finance. https://budget.ontario.ca/2026/chapter-1a.html

[51] European Commission (2023). Regulation (EU) 2023/1542 concerning batteries and waste batteries (EU Battery Regulation); Net-Zero Industry Act. https://eur-lex.europa.eu/eli/reg/2023/1542/oj

[52] China Briefing (2023, updated 2025). China Extends NEV Tax Reduction and Exemption Policy to 2027. https://www.china-briefing.com/news/china-extends-nev-tax-reduction-and-exemption-policy-to-2027/

[53] Government of Canada. (n.d.). *Chapter 34: Final provisions*. Global Affairs Canada. https://www.international.gc.ca/trade-commerce/trade-agreements-accords-commerciaux/agr-acc/cusma-aceum/text-texte/34.aspx?lang=eng

[54] Internal Revenue Service. (n.d.). *Clean vehicle tax credits*. U.S. Department of the Treasury. https://www.irs.gov/clean-vehicle-tax-credits

[55] U.S. Environmental Protection Agency. (2025, June 12). *EPA Administrator Zeldin celebrates President Trump officially ending California's electric vehicle mandate*. https://www.epa.gov/newsreleases/epa-administrator-zeldin-celebrates-president-trump-officially-ending-californias

[56] U.S. Department of Commerce, Bureau of Industry and Security (2025). Commerce Finalizes Rule to Secure Connected Vehicle Supply Chains from Foreign Adversary Threats. January 14, 2025. https://www.bis.gov/press-release/commerce-finalizes-rule-secure-connected-vehicle-supply-chains-foreign-adversary-threats

[57] McKinsey & Company (2025). Supply Chain Risk Pulse 2025: Tariffs Reshuffle Global Trade Priorities. December 2025. https://www.mckinsey.com/capabilities/operations/our-insights/supply-chain-risk-survey

[58] IEA (2025). Critical Minerals Market Review 2025; Resilinc (2025). Automotive Supply Chain Challenges 2025.

[59] Xu, L. et al. (2024). EV Battery Chemistry Affects Supply Chain Disruption Vulnerabilities. Nature Communications, Vol. 15, Article 3584. https://www.nature.com/articles/s41467-024-46418-1

[60] S&P Global (2025). Critical Minerals Shortages: A Looming Threat to the EV Industry. May 2025. https://www.spglobal.com/automotive-insights/en/blogs/2025/05/critical-minerals-shortages-looming-threat-ev-industry

[61] IEA (2025). With New Export Controls on Critical Minerals, Supply Concentration Risks Become Reality. Commentary, October 2025. https://www.iea.org/commentaries/with-new-export-controls-on-critical-minerals-supply-concentration-risks-become-reality

[62] Bain & Company (2024). Building a Resilient Global EV Supply Chain Amid Uncertainty. https://www.bain.com/insights/building-a-resilient-global-ev-supply-chain-amid-uncertainty/

[63]IEA (2025). Global Critical Minerals Outlook 2025. https://www.iea.org/reports/global-critical-minerals-outlook-2025

[64] Government of Canada (2022, updated 2025). Canadian Critical Minerals Strategy. https://www.canada.ca/en/campaign/critical-minerals-in-canada/canadian-critical-minerals-strategy.html

[65] Center for Strategic and International Studies. (2025, April 1). *The "stacking" effect of the Trump administration's auto tariffs*. https://www.csis.org/analysis/stacking-effect-trump-administrations-auto-tariffs

[66] RBC Economics (2025). Tracking the Impact of U.S. Tariffs on Five Targeted Canadian Industries. https://www.rbc.com/en/economics/canadian-analysis/featured-analysis/insights/tracking-the-impact-of-u-s-tariffs-on-five-targeted-canadian-industries/

[67] Ontario Centre of Innovation. (2023). *Driving towards a secure future: Automotive cyber security in Ontario*. Ontario Vehicle Innovation Network. https://www.ovinhub.ca/wp-content/uploads/2023/07/QSR4_Report-Driving-Towards-a-Secure-Future-Automotive-Cyber-Security-in-Ontario-Final-OCI-AODA.pdf

[68] National Highway Traffic Safety Administration. (2022). *Cybersecurity best practices for the safety of modern vehicles*. U.S. Department of Transportation. https://www.nhtsa.gov/sites/nhtsa.gov/files/2022-09/cybersecurity-best-practices-safety-modern-vehicles-2022-pre-final-tag_0_0.pdf

[69] Transport Canada. (2021). *Canada's vehicle cyber security guidance*. Government of Canada. https://tc.canada.ca/sites/default/files/2023-03/cyber_guidance_en.pdf

[70] Parasoft. (n.d.). *ISO/SAE 21434 automotive cybersecurity & compliance*. https://www.parasoft.com/solutions/iso-21434/

[71] Upstream Security (2025). The US Commerce Department Finalizes the New Cyber Rule, Reshaping Automotive Supply Chains. January 15, 2025. https://upstream.auto/blog/us-vehicle-cybersecurity-rule/

[72] European Commission. (2025, March 5). *Industrial action plan for the European automotive sector*. Council of the European Union. https://data.consilium.europa.eu/doc/document/ST-6843-2025-INIT/en/pdf

[73] Toyota Motor Corporation. Toyota Production System: Vision and Philosophy. Toyota Global Website. Direct citation: "A car is made up of more than 30,000 parts. These parts are made not only by Toyota but also at the plants of many of our business partners." https://global.toyota/en/company/vision-and-philosophy/production-system/

[74] Roland Berger (2025). Global Automotive Supplier Study 2025. Documents the structural transformation of Tier 1 suppliers into system-level partners, including five-key-trends analysis and supplier-transformation imperatives. https://www.rolandberger.com/en/Insights/Publications/Global-Automotive-Supplier-Study-2025.html

[75] Magna International. (2022, May 26). *The top 3 challenges for a stable automotive supplier network*. https://www.magna.com/inside-automotive/concept-creation/automotive-supplier-network

[76] UBS Evidence Lab (May 2017). Tearing Down the Chevy Bolt: Major Implications for Tech, Capital Goods, Chemicals, and Commodities. UBS Investment Research, Q-Series Global Research. Documents 24 moving parts in the Chevrolet Bolt EV powertrain versus 149 in a comparable Volkswagen Golf ICE powertrain. https://neo.ubomass.com/shared/d1mFW2YvNRvHXA/

[77] CLEPA (European Association of Automotive Suppliers) / PwC Strategy& (December 2021). Electric Vehicle Transition Impact Assessment 2020 to 2040: Study on the Workforce of Automotive Suppliers. Covers the new EV component categories (battery cells and modules, battery management systems, power electronics, thermal management systems, high-voltage wiring harnesses). https://clepa.eu/who-and-what-we-represent/ev-transition-impact-assessment/

[78] Stellantis (July 8 2021). Stellantis Presents Its Electrification Strategy. https://www.stellantis.com/content/dam/stellantis-corporate/investors/events/stellantis-ev-day-2021/ev_day_2021_presentation_slides.pdf

[79] Stellantis (February 6, 2026) LG Energy Solution to Acquire Full Ownership of NextStar Energy in Joint Strategic Decision with Stellantis.

https://www.stellantis.com/en/news/press-releases/2026/february/lg-energy-solution-to-acquire-full-ownership-of-nextstar-energy-in-joint-strategic-decision-with-stellantis

[80] General Motors (March 4, 2020). GM Reveals New Ultium Batteries and a Flexible Global Platform to Rapidly Grow Its EV Portfolio. Press materials announcing the Ultium battery and propulsion architecture and Ultium Cells joint venture with LG Energy Solution. https://investor.gm.com/news-releases/news-release-details/gm-reveals-new-ultium-batteries-and-flexible-global-platform/

[81] Ultium Cells. Where innovation meets excellence. https://www.ultiumcell.com/

[82] Ford Motor Company (March 2, 2022). Ford Accelerating Transformation: Forming Distinct Auto Units to Scale EVs, Strengthen Operations, Unlock Value

https://media.lincoln.com/content/fordmedia/fna/us/en/news/2022/03/02/ford-accelerating-transformation.html

[83] BCC Research (2025). Software-Defined Vehicles Market. https://www.bccresearch.com/market-research/engineering/software-defined-vehicles-market.html?srsltid=AfmBOorZRwEN2-jZ73DZUgtd4HhIzZwYuj_yoE6PsG-BNLdX9TP8Udra

[84] Innovation, Science and Economic Development Canada. (2026). Canadian automotive industry. https://ised-isde.canada.ca/site/canadian-automotive-industry/en?OpenDocument

[85] BloombergNEF (December 9, 2025). Lithium-Ion Battery Pack Prices Fall to $108 Per Kilowatt-Hour, Despite Rising Metal Prices: BloombergNEF https://about.bnef.com/insights/clean-transport/lithium-ion-battery-pack-prices-fall-to-108-per-kilowatt-hour-despite-rising-metal-prices-bloombergnef/

[86] CNBC (2021). *Tesla Will Change the Type of Battery Cells It Uses in All Its Standard-Range Cars*. October 20, 2021. CNBC. https://www.cnbc.com/2021/10/20/tesla-switching-to-lfp-batteries-in-all-standard-range-cars.html

[87] Ford Motor Company (July 21, 2022). Ford Releases New Battery Capacity Plan, Raw Materials Details to Scale EVs; On Track to Ramp to 600k Run Rate by '23 and 2M+ by '26, Leveraging Global Relationships. https://www.businesswire.com/news/home/20220721005511/en

[88] Car and Driver (June 2024). 2025 Rivian R1S and R1T Add 850-HP Tri Motor Model. Quad Now Has 1025 HP. https://www.aol.com/2025-rivian-r1s-r1t-add-160100603.html

[89] BYD Co. Ltd. (March 29, 2020). BYD's New Blade Battery Set to Redefine EV Safety Standards. https://en.byd.com/news/byds-new-blade-battery-set-to-redefine-ev-safety-standards/

[90] Contemporary Amperex Technology Co. Ltd. (CATL) (August 16, 2023). CATL Launches Superfast Charging Battery Shenxing, Opens Up Era of EV Superfast Charging. https://www.catl.com/en/news/6091.html

[91] Panasonic Energy of North America. Panasonic Energy Begins Mass Production at New Automotive Lithium-ion Battery Factory in Kansas, Aiming for Annual Capacity of 32 GWh. Press release covering 2170 cell production for Tesla and other OEMs. https://na.panasonic.com/news/panasonic-energy-begins-mass-production-at-new-automotive-lithium-ion-battery-factory-in-kansas-aiming-for-annual-capacity-of-32-gwh-to-accelerate-us-local-production

[92] Samsung SDI (2024). Batteries as the heart of electric vehicles. https://www.samsungsdi.com/business/index.html

[93] McKinsey & Company (2025). *Accelerating Automotive Product Development: New Horizons*. McKinsey & Company, 2025. https://www.mckinsey.com/capabilities/operations/our-insights/automotive-product-development-accelerating-to-new-horizons#/.

[94] Li-Cycle Holdings Corp. (March 2023). Kingston, Ontario Spoke Facility Operations. BusinessWire press release covering Canadian Prime Minister and European Commission President visit to Li-Cycle's lithium-ion battery recycling facility in Ontario, documenting Spoke operations, recycling capacity, and hub-and-spoke model. https://www.businesswire.com/news/home/20230307006021/en/Canadian-Prime-Minister-Justin-Trudeau-and-European-Commission-President-Ursula-von-der-Leyen-Visit-Li-Cycles-Lithium-Ion-Battery-Recycling-Facility-in-Ontario

[95] Glencore (nd) Li_Cycle. Li-Cycle

[96] Redwood Materials Inc. (October 2024). Building the Most Sustainable (and Scalable) Battery Materials Process. https://www.redwoodmaterials.com/news/sustainable-battery-materials-process/

[97] Northvolt AB / Revolt Recycling Program; Lyten Inc. acquisition (March 2026). Northvolt's Revolt Ett facility in Skelleftea, Sweden, was designed for closed-loop nickel, cobalt, lithium, and manganese recovery for new cell production. Following Northvolt's bankruptcy proceedings, Lyten acquired the facility in March 2026 with plans to restart recycling operations. https://lyten.com/2026/03/13/lyten-to-acquire-northvolt-revolt-battery-recycling-plant/

[98] U.S. Department of the Treasury. (2024, October 24). *U.S. Department of the Treasury releases final rules to boost clean energy manufacturing*. https://home.treasury.gov/news/press-releases/jy2671

[99] Volkswagen Group / PowerCo SE (March 13, 2023). Volkswagen Group Steps Up Activities in North America; Canada Chosen as Location for First Overseas Gigafactory of Its Battery Company PowerCo SE. https://www.volkswagen-group.com/en/press-releases/volkswagen-group-steps-up-activities-in-north-america-canada-chosen-as-location-for-first-overseas-gigafactory-of-its-battery-company-powerco-se-16930

[100] Government of Ontario. (2023, April 21). Volkswagen's new electric vehicle battery plant will create thousands of new jobs. https://news.ontario.ca/en/release/1002955/volkswagens-new-electric-vehicle-battery-plant-will-create-thousands-of-new-jobs

[101] Volkswagen Group. (2023, December 12). Volkswagen-backed PowerCo SE reaches significant milestone in St. Thomas gigafactory project. https://www.volkswagen-group.com/en/press-releases/volkswagen-backed-powerco-se-reaches-significant-milestone-in-st-thomas-gigafactory-project-17962

[102] Stellantis N.V. and LG Energy Solution (March 23, 2022). Stellantis and LG Energy Solution to Invest Over $4.1 Billion CAD in Joint Venture for First Large-Scale Lithium-Ion Battery Production Facility in Canada. Stellantis and LG Energy Solution to Invest Over $5 Billion CAD in Joint Venture for First Large Scale Lithium-Ion Battery Production Plant in Canada | Stellantis

[103] Stellantis N.V. and LG Energy Solution (February 6, 2026). LG Energy Solution to Acquire Full Ownership of NextStar Energy in Joint Strategic Decision with Stellantis. Covers LG acquisition of Stellantis' 49 percent equity stake and more than CAD 5 billion invested to date. https://www.stellantis.com/en/news/press-releases/2026/february/lg-energy-solution-to-acquire-full-ownership-of-nextstar-energy-in-joint-strategic-decision-with-stellantis

[104] Deloitte / Semiconductor Industry Association (SIA) (2025). *2025 Global Semiconductor Industry Outlook* and SIA *Automotive Semiconductor Content Analysis*. https://www2.deloitte.com/global/en/Industries/tmt/perspectives/semiconductor-industry-outlook.html; https://www.semiconductors.org

[105] NVIDIA Corporation. DRIVE Platform Customer Disclosures (Mercedes-Benz, Jaguar Land Rover, Volvo Cars, Polestar, BYD). NVIDIA Automotive product page documenting OEM platform partnerships. https://www.nvidia.com/en-us/self-driving-cars/partners/

[106] S&P Global Mobility (2025). Qualcomm's Automotive Business Hits High Gears. Covers Snapdragon Digital Chassis partnerships with GM, BMW, Volvo, Stellantis, Honda, Renault, and Great Wall Motor. https://www.spglobal.com/mobility/en/research-analysis/briefcase-qualcomms-automotive-business-hits-high-gears.html

[107] S&P Global Mobility (November 2025). Android Automotive Is Taking Over, but What About Google Automotive Services (GAS)? Covers AAOS adoption by Volvo, Polestar, GM, Ford, Honda, Renault, and others. https://www.spglobal.com/mobility/en/research-analysis/android-automotive-is-taking-over-but-what-about-google.html

[108] Mobileye Global Inc. (January 2025). Fourth Quarter and Full Year 2024 Results (SEC Form 8-K). Documents 313 ADAS program launches across car models, VW Group SuperVision advanced programs, and engagement with nine of top ten OEM customers. https://www.sec.gov/Archives/edgar/data/0001910139/000110465925007394/tm254379d1_ex99-1.htm

[109] Huawei Technologies Co. Ltd. (April 2025). Huawei Launches ADS 4.0 and HarmonyOS Cockpit 5 Driving Solutions. Covers HarmonyOS Cockpit and DriveONE platforms across Aito, Stelato, and Avatr models. https://www.huaweicentral.com/huawei-launches-ads-4-0-and-harmonyos-cockpit-5-driving-solutions/

[110] S&P Global Mobility (2025). EV New Entrants Tracker: OEM R&D Composition Analysis (BYD, NIO, Li Auto, Xpeng, Rivian, Lucid) and product-development cadence

[111] Volkswagen Group (September 4, 2023). Volkswagen Group Taps Into New Profit Pools with Sustainable Mobility. Covers MEB platform model coverage across VW, Skoda, Audi, and Cupra brands, MEB+ evolution from 2025, and unified cell technology. https://www.volkswagen-group.com/en/press-releases/volkswagen-group-taps-into-new-profit-pools-with-sustainable-mobility-17606

[112] Hyundai Motor Group (May 2022). How Hyundai's Electric-Global Modular Platform Reinvents EV Customers' Journeys. Covers E-GMP architecture, 800V charging, V2L capability, and platform scalability across Hyundai Ioniq, Kia EV, and Genesis GV60 models. https://www.hyundai.news/eu/articles/press-releases/how-hyundais-e-mp-reinvents-ev-customers-journeys.html

[113] Canadian Vehicle Manufacturers' Association (CVMA) (no date). *Importance – Canada's Auto Industry Drives the Economy.* https://www.cvma.ca/industry/importance/

[114] AlixPartners (September 23, 2021). Shortages Related to Semiconductors to Cost the Auto Industry $210 Billion in Revenues This Year, Says New AlixPartners Forecast. Covers $210 billion revenue impact, 7.7 million units of lost production, and production shutdowns across major automakers. https://www.alixpartners.com/newsroom/press-release-shortages-related-to-semiconductors-to-cost-the-auto-industry-210-billion-in-revenues-this-year-says-new-alixpartners-forecast/

[115] McKinsey & Company. (2021, August 4). *Rewiring car electronics and software architecture for the "roaring 2020s"*. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/rewiring-car-electronics-and-software-architecture-for-the-roaring-2020s

[116] Rhodium Group (February 19, 2026). *Why Are Chinese EVs So Cheap?* https://rhg.com/research/why-are-chinese-evs-so-cheap/

[117] J.D. Power (updated 2025). What Is the North American Charging Standard (NACS)? Documents OEM adoption timeline from Ford (May 2023) through Stellantis (November 2025), covering GM, Rivian, Volvo, BMW, Hyundai, Toyota, and others, plus SAE J3400 standardization. https://www.jdpower.com/cars/shopping-guides/what-is-the-north-american-charging-standard-nacs

[118] Catena-X Automotive Network e.V. (2025–2026). *Catena-X Annual Report*; *BMW Group Procurement Mandate Announcement* (April 2025). https://catena-x.net; https://www.bmwgroup.com

[119] IEA Global EV Outlook (2024). *Battery manufacturing and supply chains*. International Energy Agency. Available at: https://www.iea.org/reports/global-ev-outlook-2024/battery-manufacturing-and-supply-chains

[120] International Energy Agency (May 2026). Global EV Outlook 2026: Electric Vehicle Charging. Covers 2025 global stock exceeding 7 million public charging points, 1.8 million additions (33 percent increase), and ultra-fast charger growth. https://www.iea.org/reports/global-ev-outlook-2026/electric-vehicle-charging-chap-6-and-10

[121] Ontario Vehicle Innovation Network (OVIN) (November 3, 2025). *Ontario Expanding EV Charging Infrastructure Network*. https://www.ovinhub.ca/ontario-expanding-ev-charging-infrastructure-network/

[122] IEA Global EV Outlook (2025). *Trends in heavy-duty electric vehicles*. International Energy Agency. Available at: https://www.iea.org/reports/global-ev-outlook-2025/trends-in-heavy-duty-electric-vehicles

[123] CharIN e.V. (December 2022). Megawatt Charging System (MCS) Whitepaper Version 1.0. Specification of 3,000 A maximum continuous current at 400–1,250 V DC, supporting a peak charging rate of approximately 3.75 MW. https://www.charin.global/media/pages/technology/knowledge-base/c708ba3361-1670238823/whitepaper_megawatt_charging_system_1.0.pdf

[124] Volvo Trucks Electrification (October 28, 2025). *Volvo Trucks Leads Heavy-Duty Electrification*. Volvo Trucks North America. Press release reporting more than 700 VNR Electric trucks in North America, over 20 million zero-emission miles, global deliveries of 5,700+ electric trucks since 2019, and 80+ certified EV dealers. Available at: https://www.volvotrucks.us/news-and-stories/press-releases/2025/october/volvo-trucks-leads-heavy-duty-electrification/

[125] Daimler Truck North America / Freightliner (2024–2025). Freightliner eCascadia Product Page. Documents Class 8 battery-electric truck specifications, fleet customer deployments (including Schneider National, Sysco, and Penske Truck Leasing), and dealer/support ecosystem. https://freightliner.com/trucks/ecascadia/

[126] North American Council for Freight Efficiency (NACFE) and RMI (June 27, 2024). Run on Less Electric DEPOT: Scaling BEVs in the Real World. Final report covering 22 battery-electric vehicles tracked across 10 fleet depots in California, New York, and British Columbia; confirms commercial viability across regional duty cycles. https://nacfe.org/news/nacfe-releases-report-run-on-less-electric-depot-scaling-bevs-in-the-real-world/

[127] North American Council for Freight Efficiency, & RMI. (2024). *Run on Less – Electric DEPOT: Scaling BEVs in the real world*. https://nacfe.org/wp-content/uploads/2024/07/Scaling-BEVs-Report-2024.pdf

[128] Transport Canada Border Trade Statistics (2023). *Transportation in Canada: Annual Report*. Transport Canada. Reports that the Windsor–Detroit crossing handles approximately one-quarter of all Canada–U.S. merchandise trade, and identifies Highway 401 as one of the country's busiest freight corridors. Available at: https://tc.canada.ca/en/corporate-services/transportation-canada-annual-report

[129] Windsor-Detroit Bridge Authority (2025–2026). Gordie Howe International Bridge — Project Updates and Opening Information. Official project site covering construction completion, commissioning status, and expected 2026 opening of the new six-lane Detroit River crossing. https://www.gordiehoweinternationalbridge.com/en

[130] Mordor Intelligence (2025). Automotive Vehicle-to-Everything (V2X) Market Size, Share & Growth Report to 2030. https://www.mordorintelligence.com/industry-reports/automotive-v2x-market

[131] Audi Traffic Light Information (July 2021). *Audi Brings Traffic Light Information to Los Angeles, New York, and San Francisco*. Audi of America / Audi MediaCenter. Press release documenting expansion to 22,000+ intersections across 60+ U.S. cities and regions. Available at: https://media.audiusa.com/en-us/releases/485

[132] General Motors (February 15, 2024). GM Expands Super Cruise Network to 750,000 Hands-Free Miles, Largest in North America. Press release confirming expansion to approximately 750,000 miles (1.2 million kilometres) of compatible highways across the United States and Canada. https://investor.gm.com/news-releases/news-release-details/gm-expands-super-cruise-network-750000-hands-free-miles-largest/

[133] Intelligent Transportation Systems Joint Program Office. (2025). *Piloting connected vehicle technology in New York City's dense urban setting*. U.S. Department of Transportation. https://www.itskrs.its.dot.gov/success-strategies/case-study/piloting-connected-vehicle-technology-new-york-citys-dense-urban

[134] Ontario Vehicle Innovation Network (OVIN) (2026). *QEW Innovation Corridor – Partnerships Stream*. https://www.ovinhub.ca/programs/qew-innovation-corridor/

[135] Catena-X Automotive Network e.V. (September 2025). Catena-X Reaches Turning Point: Industry Leaders Confirm Commitment at IAA. https://catena-x.net/news/catena-x-reaches-turning-point-industry-leaders-confirm-commitment-at-iaa/

[136] BMW Group (December 2025). Catena-X Connects Digital Supply Chains. https://www.bmwgroup.com/en/news/general/2025/catena-x-connects-digital-supply-chains.html

[137] Automotive Manufacturing Solutions (January 2026). Catena-X Is Rewriting Automotive Production with Smart Factory Trends. https://www.automotivemanufacturingsolutions.com/smart-factory/why-catenax-is-becoming-critical-to-automotive-production/2583662

[138] Hubject / Blink Charging (September 22, 2025). Hubject Teams with Blink Charging to Further Expand Intercharge Network. https://blinkcharging.com/news/hubject-teams-with-blink-charging-to-further-expand-intercharge-network-across-north-america

[139] SAE International / Joint Office of Energy and Transportation (2024, updated 2026). SAE J3400 Charging Connector. Documents industry-wide adoption of the NACS connector, standardized as SAE J3400 in 2024, with all major automakers committed to adoption from 2025. https://driveelectric.gov/charging-connector

[140] Car and Driver / AOL (January 2026). Tesla Will Only Offer Its Full Self-Driving Mode as a Subscription. https://www.aol.com/articles/tesla-only-offer-full-self-163900009.html

[141] Nasdaq (October 2025). How GM Is Gaining Momentum in Software and Services Heading Into 2026. https://www.nasdaq.com/articles/how-gm-gaining-momentum-software-and-services-heading-2026

[142] Stellantis (January 5, 2023). New Mobilisights Business Unit Advances Stellantis' Growing Data and Connected Services Offer. https://www.stellantis.com/en/news/press-releases/2023/january/new-mobilisights-business-unit-advances-stellantis-growing-data-and-connected-services-offer

[143] BCC Research / GlobeNewsWire (August 5, 2025). Software Defined Vehicles Market to Reach $1.6 Trillion by 2030. https://www.globenewswire.com/news-release/2025/08/05/3127697/0/en/Software-Defined-Vehicles-Market-to-Reach-1-6-Trillion-by-2030.html

[144] BMW Group (2025, March 11). Four Superbrains for the Neue Klasse: More intelligent, more efficient, more powerful. https://www.press.bmwgroup.com/global/article/attachment/T0448372EN/633408

[145] BlackBerry Limited (October 2024 and December 2025), QNX embedded software: more than 255 million vehicles (TechInsights, October 2024) growing to more than 275 million vehicles (December 2025); deployments at BMW, Bosch, Continental, Geely, Honda, Hyundai, Mercedes-Benz, Toyota, Volkswagen, and Volvo in ADAS, digital cockpits, instrument clusters, and connectivity. https://blackberry.qnx.com/en; https://www.accessnewswire.com/newsroom/en/electronics-and-engineering/qnx-embedded-technology-powers-255-million-vehicles-on-the-road-today-929458

[146] ISO/SAE (2021). ISO/SAE 21434:2021 Road Vehicles, Cybersecurity Engineering. https://www.iso.org/standard/70918.html

[147] Volkswagen Group (2025). Sustainability in the Supply Chain. https://annualreport2025.volkswagen-group.com/sustainability-report/social-information/sustainability-in-the-supplychain.html

[148] Natural Resources Canada (2025). *Roadmap to Promote Standards-based Markets for Critical Minerals*. Government of Canada, October 31, 2025. https://www.canada.ca/en/natural-resources-canada/news/2025/10/roadmap-to-promote-standards-based-markets-for-critical-minerals.html

[149] Badlam, J., Cox, J., Kumar, A., Mehta, N., O'Rourke, S., & Silvis, J. (2022). *The Inflation Reduction Act: Here's What's in It*. McKinsey & Company, October 24, 2022. https://www.mckinsey.com/industries/public-sector/our-insights/the-inflation-reduction-act-heres-whats-in-it.

[150] Battery Tech Online (November 11, 2024). CATL Advances Transparency and Sustainability with Battery Passport Initiative. https://www.batterytechonline.com/lithium-ion-batteries/catl-advances-transparency-and-sustainability-with-battery-passport-initiative

[151] Global Battery Alliance (January 2023). GBA Launches World's First Battery Passport Proof of Concept. https://www.globalbattery.org/press-releases/global-battery-alliance-launches-world%E2%80%99s-first-battery-passport-proof-of-concept/

[152] Resilinc (2025). EventWatchAI: Agentic AI Supply Chain Monitoring. https://resilinc.ai/products/agentic-ai-supply-chain-monitoring/

[153] Everstream Analytics / BusinessWire (January 8, 2025). Everstream Analytics Unveils 2025 Annual Risk Report. https://www.businesswire.com/news/home/20250108551680/en/Everstream-Analytics-Unveils-2025-Annual-Risk-Report

[154] Interos / BusinessWire (October 14, 2025). interos.ai Launches itracing for Product-Level Supply Chain Visibility. https://www.businesswire.com/news/home/20251014687241/en/interos.ai-Launches-itracing-to-Deliver-Product-Level-Supply-Chain-Visibility-and-Safeguard-Operations-in-Real-Time

[155] BMW Group (November 27, 2023). How AI Is Revolutionising Production. https://www.bmwgroup.com/en/news/general/2023/aiqx.html

[156] Stellantis (September 18, 2024). Stellantis Deploys AI-Enabled Innovations to Boost Manufacturing Efficiency. https://www.stellantis.com/en/news/press-releases/2024/september/stellantis-deploys-ai-enabled-innovations-to-boost-manufacturing-efficiency-sustainability-and-improve-workplace

[157] Woven by Toyota (2025). Building Mobility for All. https://www.woven.toyota/en/

[158] Siemens (2025). Industrial Edge Platform. https://www.siemens.com/global/en/products/automation/topic-areas/industrial-edge.html

[159] Bosch Connected Industry (2025). Nexeed Industrial Application System. https://www.bosch-connected-industry.com/en/solutions/nexeed/

[160] Rockwell Automation (2025). FactoryTalk Optix. https://www.rockwellautomation.com/en-us/products/software/factorytalk/operationsuite/factorytalk-optix.html

[161] Maersk (May 5, 2025). Smart Shipping: Maersk Upgrades IoT Connectivity Across Its Fleet. https://www.maersk.com/news/articles/2025/05/05/maersk-upgrades-iot-connectivity-across-its-fleet

[162] DHL Group (October 24, 2024). DHL Supply Chain Implements Generative AI. https://group.dhl.com/en/media-relations/press-releases/2024/dhl-supply-chain-implements-generative-ai.html

[163] Penske Logistics (2025). Technology and Innovation. https://www.penskelogistics.com/technology-and-innovation

[164] MarketsandMarkets (2025). Automotive Software Market. https://www.marketsandmarkets.com/Market-Reports/automotive-software-market-107150498.html

[165] AftermarketNews (2017). Magna Unveils MAX4 Autonomous Driving Platform. https://www.aftermarketnews.com/magna-unveils-max4-autonomous-driving-platform/

[166] Continental AG (June 20, 2023). Smart Cockpit High-Performance Computer. https://www.continental.com/en/press/press-releases/20230620-smart-cockpit/

[167] Bosch Mobility (2025). Vehicle Motion Management. https://www.bosch-mobility.com/en/solutions/software-and-services/vehicle-motion-management/

[168] ZF Friedrichshafen (June 2025). ProAI Scalable Computing Platform. https://press.zf.com/press/en/releases/release_88128.html

[169] Invest Brampton (August, 23, 2025). *SCOOTY: A Brampton-Born Mobility Startup Shaping the Future of Transit*. P https://investbrampton.ca/scooty-a-brampton-born-mobility-startup-shaping-the-future-of-transit/.

[170] Traffic Technology Today (March 2024). MaaS Global Declares Bankruptcy. https://www.traffictechnologytoday.com/news/mobility-as-a-service/maas-global-declares-bankruptcy.html

[171] umob (April 2024). umob Acquires MaaS Global. https://umob.app/umob-acquires-maas-global-finnish-creator-of-mobility-app-whim/

[172] Moovit / Intel (2024). Moovit 2024 Global Report. https://moovit.com/press-releases/moovit-2024-global-report-usa/

[173] Waymo LLC (2025). Waymo One. Corporate page documenting autonomous ride-hailing service operations in Phoenix, San Francisco, Los Angeles, and Austin. https://waymo.com/waymo-one/

[174] General Motors (December 2024). GM Announces Decision to Stop Funding Cruise Robotaxi Efforts. https://investor.gm.com/news-releases/news-release-details/gm-announces-decision-stop-funding-cruise-robotaxi-efforts

[175] Metrolinx (December 19, 2024). Looking Back Over a Milestone Year with PRESTO. https://www.metrolinx.com/en/news/looking-back-over-a-milestone-year-with-presto

[176] Dealroom and NATO Innovation Fund (February 2026). European DSR Startups Smash Record with USD 8.7B Raised in 2025. https://www.nif.fund/news/dealroom-and-nato-innovation-fund-european-defence-security-resilience-startups-smash-record-with-8-7b-raised-in-2025/

[177] Crunchbase News (August 2024). Anduril Industries Series F. https://news.crunchbase.com/ai/defense-tech-anduril-industries-series-f/

[178] TechCrunch (June 5, 2025). Anduril Raises $2.5B at $30.5B Valuation. https://techcrunch.com/2025/06/05/anduril-raises-2-5b-at-30-5b-valuation-led-by-founders-fund/

[179] Shield AI (March 2025). Shield AI Raises $240M at $5.3B Valuation. https://shield.ai/shield-ai-raises-240m-at-5-3b-valuation-to-scale-hivemind-enterprise-an-ai-powered-autonomy-developer-platform/

[180] Fast Company (April 14, 2026). How Autonomous Warship Startup Saronic Is Reimagining Naval War. https://www.fastcompany.com/91503485/saronic-most-innovative-companies-2026

[181] TechCrunch (July 11, 2024). Defence AI Startup Helsing Raises $487M Series C. Confirms EUR 450 million round led by General Catalyst at USD 5.4 billion valuation for AI-based defence software. https://techcrunch.com/2024/07/11/defence-ai-startup-helsing-raises-487m-series-c-plans-baltic-expansion-to-combat-russian-threat

[182] Balderton Capital (November 2025). Quantum Systems Triples Valuation. https://www.balderton.com/news/quantum-systems-triples-valuation/

[183] NATO DIANA (2026). NATO DIANA Announces Largest-Ever Cohort: 150 Innovators Selected. https://www.diana.nato.int/connect/nato-diana-announces-largestever-cohort-150-innovators-selected-across-ten-challenge-areas-for-2026-challenge-programme.html

[184] NATO Innovation Fund (2025). About the NATO Innovation Fund. https://www.nif.fund

[185] L3Harris Technologies (2025). WESCAM MX-Series. https://www.l3harris.com/all-capabilities/wescam-mx-series

[186] MDA Space (December 4, 2025). MDA Space Awarded Initial Contract for RADARSAT Constellation Mission Replenishment. https://mda.space/article/mda-space-awarded-initial-contract-by-canadian-space-agency-for-radarsat-constellation-mission-replenishment-satellite

[187] General Dynamics Land Systems Canada (2025). Corporate Overview. https://www.gdls.com/

[188] Government of Canada (April 2024). Our North, Strong and Free: A Renewed Vision for Canada's Defence. https://www.canada.ca/en/department-national-defence/corporate/reports-publications/north-strong-free-2024.html

[189] Waze for Cities (2025). Program Overview (PDF). https://web-assets.waze.com/cms/Waze%20for%20Cities-Two-Pager_DIGITAL_Final.pdf

[190] HAAS Alert (2025). Safety Cloud. https://www.haasalert.com

[191] Iteris (2025). ClearMobility Platform. https://www.iteris.com/clearmobility

[192] Michelin DDi (2025). DDi Pavement-Condition Assessment. https://ddi.michelin.com

[193] Ontario Ministry of Transportation (2025). COMPASS Freeway Traffic Management System. http://www.mto.gov.on.ca/english/traveller/trip/compass.shtml

[194] Ontario 511 (2025). Ontario 511 Traveller Information Service. https://511on.ca

[195] City of Toronto (2025). Vision Zero Road Safety Plan. https://www.toronto.ca/services-payments/streets-parking-transportation/road-safety/vision-zero/

[196] Ontario Vehicle Innovation Network (OVIN) (March 6, 2024). Visual Defence Showcases AI Application for Road Maintenance in Partnership with the Ontario Vehicle Innovation Network. https://www.ovinhub.ca/visual-defence-showcases-ai-application-for-road-maintenance-in-partnership-with-the-ontario-vehicle-innovation-network/.

[197] GTAA / Newswire (May 2026). Toronto Pearson Enters a New Era. https://www.newswire.ca/news-releases/toronto-pearson-enters-a-new-era-launching-one-of-canada-s-largest-airport-infrastructure-programs-873087469.html

[198] UNECE (2025). World Forum for Harmonization of Vehicle Regulations (WP.29). https://unece.org/transport/vehicle-regulations

[199] Invest Ontario. Automotive Sector Profile. Automotive. A North American Leader in Automotive Manufacturing.. https://www.investontario.ca/automotive

[200] Government of Ontario (2025). Driving Prosperity: The Future of Ontario's Automotive Sector. https://www.ontario.ca/page/driving-prosperity-future-ontarios-automotive-sector

[201] CBC News (July 18, 2024). Ford to produce F-Series pickup trucks at Oakville plant starting in 2026. https://www.cbc.ca/news/canada/toronto/ford-motor-co-pickups-oakville-1.7267756

[202] Electric Autonomy (July 18, 2024). Ford scraps plans for $1.8-billion Oakville EV assembly plant. https://electricautonomy.ca/ev-supply-chain/manufacturing/2024-07-18/ford-oakville-ev-assembly-plant-gasoline-pickups/

[203] Drive Tesla Canada (May 2026). Ford gets $464M from Canada after pivoting Oakville plant away from EVs. https://driveteslacanada.ca/news/ford-oakville-super-duty-truck-plant-funding/

[204] CBC News (May 2022). Stellantis plants in Windsor and Brampton to get $3.6B in upgrades for EV production. https://www.cbc.ca/news/canada/windsor/stellantis-investment-3-6-billion-1.6437954

[205] Automotive News Canada (April 25, 2025). Stellantis' Brampton Assembly Plant still idle, 2 months after retooling paused. https://www.autonews.com/stellantis/anc-brampton-assembly-plant-still-down-stellantis-0425/

[206] Automotive News Canada (June 19, 2025). Toyota adding battery pack lines at 2 Ontario assembly plants to pave way for new RAV4. In-house battery pack assembly at Cambridge and Woodstock. https://www.autonews.com/toyota/anc-toyota-rav4-battery-pack-assembly-ontario-0619/

[207] CBC News (April 25, 2024). Honda's $15B Ontario plant announcement. Honda to invest $15B to build 4 new EV plants in Ontario | CBC News

[208] CBC News (May 14, 2026). Honda indefinitely suspends $15B EV plant in Ontario. https://www.cbc.ca/news/business/honda-suspends-ev-plant-indefinitely-9.7199175

[209] CBC News (September 9, 2025). CAMI production in Ingersoll, Ont., to resume in November with fewer workers and only 1 shift. https://www.cbc.ca/news/canada/london/cami-production-in-ingersoll-ont-to-resume-in-november-with-fewer-workers-and-only-1-shift-1.7628761

[210]Project Arrow (Feburary 12, 2026). https://www.projectarrow.ca/

[211] Automotive Parts Manufacturers' Association (APMA). Cross-border automotive integration analysis: Canadian parts content in Michigan auto assembly plants (30 to 40 percent). Why auto industry expert says Detroit-Windsor border is 'ground zero' for tariff impact

[212] Canadian Vehicle Manufacturer's Association (n.d.). Important Facts. https://www.cvma.ca/industry/facts/

[213] Invest Ontario (February 15, 2023). Magna expands Ontario EV operations with new Brampton plant and five upgraded facilities. CAD 265 million Brampton battery enclosure facility (approximately 490,000 square feet, 560 jobs, supporting Ford F-150 Lightning) within a broader CAD 470 million Ontario expansion across six locations. https://www.investontario.ca/press-release/magna-expands-ontario-ev-operations-new-brampton-plant-five-upgraded-facilities

[214] SustainableBiz Canada (January 28, 2025). Linamar to invest $1.1B in EV parts, batteries in Ontario. Announcement of the CAD 1.1 billion Innovation Driving Green Technology project covering electrified driveline products, battery systems, and EV component manufacturing in Ontario. https://sustainablebiz.ca/linamar-to-invest-over-1b-in-ev-parts-batteries

[215] Martinrea. (no date). Advanced Lightweighting Solutions. https://www.martinrea.com/advanced-lightweighting-solutions/

[216] MioVision (2026). About Us. https://miovision.com/company/

[217] Canadian Manufacturing. (June 17, 2021). Exro announces agreement with Linamar for electric drive solution to advance EV adoption. https://www.canadianmanufacturing.com/manufacturing/exro-announces-agreement-with-linamar-for-electric-drive-solution-to-advance-ev-adoption-270690/

[218] Ontario Energy Board. (2024). 2024-supply-mix-data-update.pdf

[219] Innovation Factory (February 6, 2026). The Ontario Vehicle Innovation Network (OVIN) Supports a Nearly $70 Million Investment to Establish Nine Regional Technology Development Sites Across Ontario. CAD 17.5 million OVIN contribution; CAD 32.8 million industry match; CAD 19.3 million broader public sector; total over CAD 69.6 million. https://innovationfactory.ca/the-ontario-vehicle-innovation-network-ovin-supports-a-nearly-70-million-investment-to-establish-nine-regional-technology-development-sites-across-ontario/

[220] City of Toronto (May 30, 2024). City of Toronto partners with the Ontario Vehicle Innovation Network (OVIN) to pilot urban mobility technologies. Memorandum of Understanding (MOU) to deploy traffic camera and sensor technologies using artificial intelligence and 5G wireless networks; SME funding up to $100,000 per pilot; collaboration with Bell Canada, Rogers Communications, and TELUS. https://www.toronto.ca/news/city-of-toronto-partners-with-the-ontario-vehicle-innovation-network-ovin-to-pilot-urban-mobility-technologies/

[221] Ontario Vehicle Innovation Network (December 2, 2024). OVIN Demonstration Zone Features Live Demonstrations of Leading-Edge Ontario-Made Automotive and Mobility Technologies. Vaughan-based showcase hosting more than 100 industry leaders, startups, SMEs, government officials, and ecosystem partners; live demonstrations of autonomous robots, micro-mobility, and accessible mobility solutions. https://www.ovinhub.ca/ovin-demonstration-zone-features-live-demonstrations-of-leading-edge-ontario-made-automotive-and-mobility-technologies/

[222] University of Waterloo, Ontario Battery and Electrochemistry Research Centre (OBEC). Centre announced March 2024; co-led by Dr. Linda Nazar (Canada Research Chair in Solid State Energy Materials) and Dr. Michael Pope (Department of Chemical Engineering). Initial funding of $5 million from the Canada Foundation for Innovation and the University of Waterloo. https://uwaterloo.ca/ontario-battery-electrochemistry-research-centre/

[223] University of Waterloo, Centre for Automotive Research (CAR). https://uwaterloo.ca/engineering-automotive-research/

[224] McMaster University, McMaster Automotive Resource Centre (MARC), Canada Excellence Research Chair Laureate Program in electrification. https://electrification.mcmaster.ca/

[225] McMaster University, Magnetic Resonance and Materials for Energy Storage Lab. https://science.mcmaster.ca/industry-partnerships-power-energy-storage-lab/

[226] University of Windsor, Centre for Automotive Research and Education (CARE). https://www.uwindsor.ca/engineering/research/422/centre-automotive-research-and-education

[227] SHIELD Automotive Cybersecurity Centre of Excellence at the University of Windsor, Canada's first dedicated automotive cybersecurity centre. https://www.shieldautocybersecurity.com/

[228] Ontario Tech University, Automotive Centre of Excellence (ACE), Canada's only full-vehicle climatic wind tunnel facility; Project Arrow lead build partner. https://ace.ontariotechu.ca/about_ace/index.php

[229] Government of Ontario, Ontario's Critical Minerals Strategy 2022-2027 and 2025 updates (Fortifying Ontario's Economy: Critical Minerals). https://www.ontario.ca/page/fortifying-ontarios-economy-critical-minerals

[230] Government of Ontario, Mineral Exploration in Ontario 2026 (May 2026). https://www.ontario.ca/files/2026-06/mem-mineral-exploration-ontario-2026-en-2026-06-03.pdf

[231] Government of Ontario (2026, March 25). Fortifying Ontario's Economy: Critical Minerals. https://www.ontario.ca/page/fortifying-ontarios-economy-critical-minerals

[232] IMPALA CANADA (no date). Operations. https://www.nap.com/operations/default.aspx

[233] Public Policy Forum (June 2025). What are critical minerals and the Ring of Fire. What are critical minerals and the Ring of Fire? - Public Policy Forum

[234] Ontario Vehicle Innovation Network (June 2025). Quarterly Specialized Report 3: Critical Minerals. https://www.ovinhub.ca/wp-content/uploads/2025/06/2025.06.17_Final_QSR3_Critical-Minerals_AODA.pdf

[235] Ontario Vehicle Innovation Network. (n.d.). Regional Technology Development Sites. Ontario Vehicle Innovation Network. https://www.ovinhub.ca/ecosystem/regional-technology-development-sites/

[236] Ontario Vehicle Innovation Network, Critical Minerals Talent Strategy (May 2024). https://www.ovinhub.ca/ontario-unveils-strategy-to-empower-future-automotive-mobility/

[237] Next Generation Manufacturing Canada (NGen), Advanced Manufacturing Supercluster. NGen Announces $76M in new ZEV Projects, 15 industry-led consortia; growing NGen's automotive project portfolio to CAD 140 million. https://www.ngen.ca/blog/ngen-announces-76m-in-new-zev-projects

[238] Ontario Centre of Innovation, Ontario Vehicle Innovation Network (OVIN) program portfolio and commercialization support. https://www.oc-innovation.ca/programs/ontario-vehicle-innovation-network-ovin/

[239] MaRS Discovery District, Accelerators portfolio (driving Ontario's transportation technology ecosystem and cleantech ventures). https://www.marsdd.com/accelerators/

[240] ENCQOR 5G Ontario, first Canadian pre-commercial 5G testbed for SMEs, connected and autonomous vehicles, and other innovation streams across Ontario and Quebec. https://encqor.ca/en/home/

[241] BlackBerry / Automotive World (October 15, 2024). QNX embedded technology powers 255 million vehicles on the road today. Year-over-year increase of 20 million; increase of 80 million since 2020. https://www.automotiveworld.com/news-releases/blackberry-qnx-embedded-technology-powers-255-million-vehicles-on-the-road-today/

[242] Office of the Parliamentary Budget Officer. (2023, June 14). *Fiscal analysis of Canada's support for Volkswagen's electric vehicle battery manufacturing plant*. https://www.pbo-dpb.ca/en/publications/RP-2324-008-S--fiscal-analysis-canada-support-volkswagen-electric-vehicle-battery-manufacturing-plant--analyse-financiere-soutien-canada-construction-usine-fabrication-batteries-vehicules-elect

[243] Ontario Newsroom. (March 5, 2026). Ontario Celebrates Grand Opening of NExtStar Energy's Battery Facility in Windsor. https://news.ontario.ca/en/release/1007118/ontario-celebrates-grand-opening-of-nextstar-energys-battery-facility-in-windsor

[244] Ontario Centre of Innovation (OCI). (2025, September). Executive summary: From plug to power: EV charging infrastructure and grid readiness in Ontario—Assessing infrastructure, grid capacity, and policy pathways for Ontario's electric mobility future (QSR4). https://www.ovinhub.ca/wp-content/uploads/2025/09/2025.09.18_Final_Exec-Summary_QSR4_EV-Charging-Infrastructure-and-Grid-Readiness.pdf

[245] Natural Resources Canada. (2026, February 10). *Canada advances new Auto Strategy by expanding EV charging infrastructure across the country*. Government of Canada. https://www.canada.ca/en/natural-resources-canada/news/2026/02/canada-advances-new-auto-strategy-by-expanding-ev-charging-infrastructure-across-the-country.html

[246] Westerheide, C. (2025, May 22). *Ontario commits $92M more to EV infrastructure*. Electrive. https://www.electrive.com/2025/05/22/ontario-commits-92m-more-to-ev-infrastructure/

[247] Infrastructure Ontario. (n.d.). *Electric vehicle battery cell plant (Volkswagen Group).* Electric Vehicle Battery Cell Plant (Volkswagen Group)

[248] Honda Motor Co., Ltd. (2024). *Honda Plans to Establish Comprehensive Electric Vehicle Value Chain in Ontario, Canada*. April 25, 2024. Honda Global Corporate Website. https://global.honda/en/newsroom/news/2024/c240425deng.html

[249] Hughes, A. (2026). *Honda Indefinitely Suspends $15B EV Plant in Ontario*. CBC News, May 14, 2026. https://www.cbc.ca/news/business/honda-suspends-ev-plant-indefinitely-9.7199175

[250] Parliamentary Budget Officer. (2025). *Tallying government support for EV investment in Canada*. https://www.pbo-dpb.ca/en/additional-analyses--analyses-complementaires/BLOG-2425-004--tallying-government-support-ev-investment-in-canada--bilan-aide-gouvernementale-investissement-dans-ve-canada

[251] Government of Ontario. (2025, May 29). *Ontario investing $500 million in critical minerals processing*. https://news.ontario.ca/en/release/1005969/ontario-investing-500-million-in-critical-minerals-processing

[252] KPMG Canada. (2026). *Disruption as usual: Canada's automotive outlook in an era of changing lanes and uncertain roads*. Disruption as usual

[253] Falzata, J., Basta, F., Balano, B.(2025). *The automotive anatomy of Ontario: Understanding the impact of tariffs on Ontario small businesses*. Canadian Federation of Independent Business. https://www.cfib-fcei.ca/hubfs/research/reports/2025/The%20Automotive%20Anatomy%20of%20Ontario%20(EN).pdf

[254] Government of Canada, Federal Economic Development Agency for Southern Ontario. (2025, February 14). *Government of Canada supports electric vehicle supply chain growth*. Government of Canada supports electric vehicle supply chain growth - Canada.ca

[255] Government of Canada, Federal Economic Development Agency for Southern Ontario. (2026, February 9). *Government of Canada is helping to protect, build and transform the auto industry*. Government of Canada is helping to protect, build and transform the auto industry - Canada.ca

[256] Canadian Cyber Threat Exchange. (n.d.). *Ontario cybersecurity excellence initiative*. https://cctx.ca/ontario-cybersecurity-excellence-initiative/

[257] Saddleton, L. (2023, August 28). *Ontario cybersecurity excellence initiative launched to drive cyber competitiveness*. Canadian Lawyer. https://www.canadianlawyermag.com/inhouse/news/general/ontario-cybersecurity-excellence-initiative-launched-to-drive-cyber-competitiveness/379165

[258] Government of Ontario. (2025, June 9). *Ontario automotive modernization program guidelines*. https://www.ontario.ca/page/ontario-automotive-modernization-program-guidelines

[259] Government of Ontario. (2019, February 14). *Driving prosperity: The future of Ontario's automotive sector*. Driving Prosperity: The Future of Ontario's Automotive Sector | ontario.ca

[260] Ontario Vehicle Innovation Network. (2025, May 9). *Ontario building future automotive supply chain with over $56M investment into homegrown automotive and mobility companies*. https://www.ovinhub.ca/ontario-building-future-automotive-supply-chain-with-over-56m-investment-into-homegrown-automotive-and-mobility-companies/

[261] Federal Economic Development Agency for Southern Ontario. (2026, February 9). *Government of Canada is helping to protect, build and transform the auto industry*. https://www.canada.ca/en/economic-development-southern-ontario/news/2026/02/government-of-canada-is-helping-to-protect-build-and-transform-the-auto-industry.html

[262] Government of Canada. (n.d.). *Sectoral profile – Motor vehicle manufacturing industry: Ontario*. Job Bank. https://www.jobbank.gc.ca/trend-analysis/job-market-reports/ontario/sectoral-profile-motor-manufacturing

[263] Automotive Policy Research Centre. (2024). *Focal EV skills: Understanding Canada's electric vehicle workforce transition*. https://www.automotivepolicy.ca/wp-content/uploads/2025/01/Focal-EV-Skills-Report-March-2024.pdf

[264] Government of Canada. (n.d.). *Zero-emission vehicles careers*. https://www.canada.ca/en/services/transport/zero-emission-vehicles/zero-emission-vehicles-careers.html

[265] Ontario Vehicle Innovation Network (OVIN). (2025, June 27). *Ontario is building the future automotive and mobility workforce through the Automotive Innovation Challenge Program*. https://www.ovinhub.ca/ontario-is-building-the-future-automotive-and-mobility-workforce-through-the-automotive-innovation-challenge-program/

[266] St. Clair College. (2026, February 3). *St. Clair College receives ONCAT grant to advance learner mobility and make it easier for learners to earn postsecondary credentials and enter labour market*. https://www.stclaircollege.ca/news/2026/st-clair-college-receives-oncat-grant-advance-learner-mobility-and-make-it-easier

[267] Ontario Vehicle Innovation Network (OVIN). (n.d.). *Talent development fellowships*. https://www.ovinhub.ca/programs/talent-development-fellowships/