FROST & SULLIVAN

OEM STRATEGIES ON NEXT GENERATION ELECTRIC VEHICLES, GLOBAL

KEY OEM TRENDS IN GLOBAL ELECTRIC VEHICLES MARKET

1. Optimization of global production by OEMs
2. Value chain integration and supply chain diversification
3. Focus on modular and universal platforms
4. Industry convergence: EV charging infrastructure
5. Emphasis on green energy security
6. Exploration of alternate battery chemistries
7. Transition towards 800V architecture

Source: Frost & Sullivan

OEM POWERTRAIN STRATEGIES

Powertrain Strategies for Market Participants

BMW

- Plans to achieve 50% EV sales globally by 2030
- More Battery Electric Vehicles (BEV) models to be launched by 2030

BYD

- Mix of both BEV+PHEV
- Setting up production facilities in new regions as a part of its global expansion strategy

Ford

- Mixed powertrain portfolio for near and mid-term (Some EVs, full hybrids, range extenders with gradually declining ICE)

GM

- GM plans to become carbon neutral globally by 2040
- Likely to follow Ford's mixed powertrain portfolio for near and mid term

Hyundai

- Plans to achieve 60% electrification (EV + hybrid) by 2030
- Plans to introduce 15+ EV models by 2030

Nio

- Achieved 100% electrification.
- Expanding globally through battery swapping technology and multiple brands

OEM POWERTRAIN STRATEGIES

Powertrain Strategies for Market Participants

Mercedes-Benz Group

- Planned go all-electric by 2030, but has revised its plans and will continue to produce ICE throughout the decade

Stellantis Group

- Aims to achieve 100% electrification by 2030 in Europe and 50% in the United States
- Net-zero across products and operations by 2038

Tesla

- Has a pure EV strategy.
- Low-priced EV to be launched by 2027

Toyota Group

- Toyota to continue Hybrid Electric Vehicle(HEV), PHEV, Fuel Cell Electric Vehicle (FCEV), and BEV strategy.
- New BEV models to be launched by 2030

VinFast

- Fully Electric Powertrain portfolio.
- Expanding globally by setting up new EV manufacturing facilities.

VW Group

- Each model (across VW brands) is expected to have either hybrid, PHEV in hybrid or BEV by 2030.
- Launch of low priced EVs by 2027.

OEM Electrification Strategies

BMW GROUP: ELECTRIFICATION STRATEGY

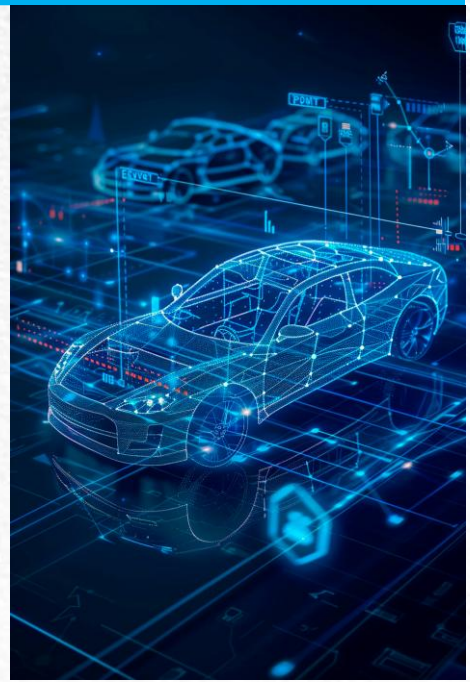
The BMW Group has made strategic moves in terms of investments, technology, and partnerships

PLATFORM
- Has 10 platforms for its BEV and PHEV lineup
- Plans to transition to a fully electric Neue Klasse platform from the CLAR and FAAR WE platform
- Neue Klasse EVs to hit market by 2026

INVESTMENTS
- Billion-dollar investments towards plant upgrades, retooling, and in- house battery production
- Around €200 million towards the development of a components manufacturing facility at Landshut

TECHNOLOGY
- Adoption of 3D printing to build large-scale complex sand cores and components
- V2X technology for future models
- Production automation through robots and advanced computer vision

SUSTAINABILITY AND CIRCULAR ECONOMY
- Low carbon supply chain
- 3D printing technology to decrease production emissions, improve energy efficiency, and reduce waste
- Partnerships for battery recycling



BYD: ELECTRIFICATION STRATEGY

BYD is accelerating electrification through global expansion.

PLATFORM

- The BYD New Architecture (BNA) platform and BYD ePlatforms; BYD will build future EVs on these
- The Super E-platform for high-performance EVs with 1000V high-voltage architecture and megawatt charging capabilities.

INVESTMENTS

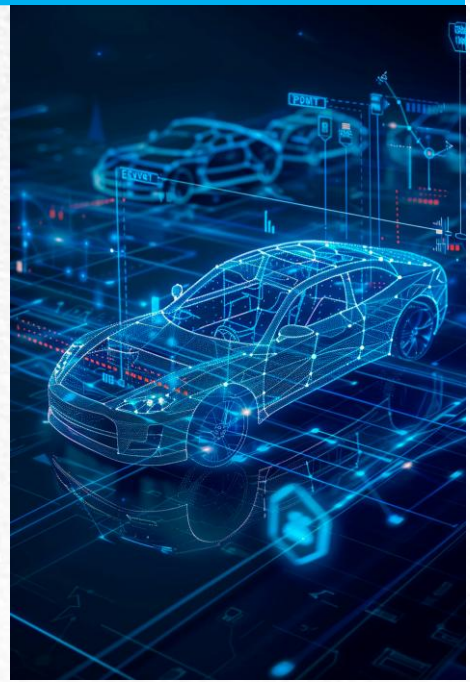
- Global expansion through local production.
- Large investments towards setting EV manufacturing facilities across Indonesia, Thailand, Brazil, India and Europe

TECHNOLOGY

- BYD OS
- In-wheel motors
- Cell-to-body technology
- Intelligent in-vehicle systems
- Bidirectional charging
- Alternate battery chemistries

SUSTAINABILITY AND CIRCULAR ECONOMY

- Adoption of green energy to accelerate carbon neutrality
- Projects for energy conservation
- Second-life applications of spent EV batteries
- Battery recycling facilities



FORD: ELECTRIFICATION STRATEGY

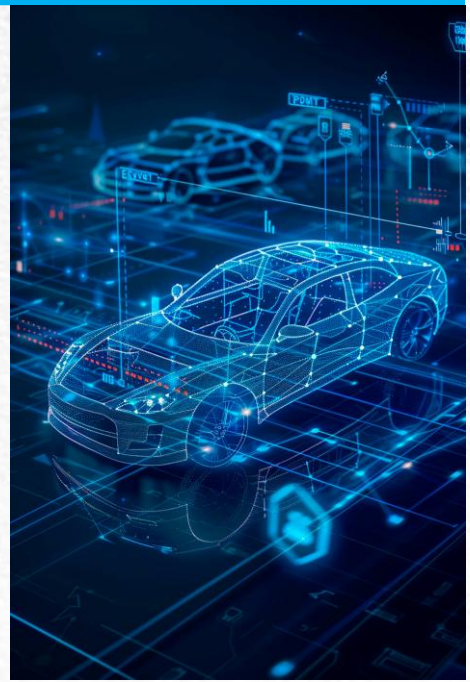
Ford's strategy of universal platform, new assembly processes, and vertical integration will accelerate electrification.

PLATFORM
- Universal EV production system for the future EV lineup
- Universal EV platform to build an affordable EV for the future
- Support of multiple vehicle segments on a single platform

INVESTMENTS
- 5 billion for new platform, production system, and battery plant
- Significant investments towards manufacturing facilities upgrade and retooling
- Value chain integration through new battery production facilities

TECHNOLOGY
- Multiple battery chemistries approach
- Robotics and computer-vision-enabled manufacturing for high efficiency
- Advanced semiconductors and cloud infrastructure

SUSTAINABILITY AND CIRCULAR ECONOMY
- Green PPAs
- On-site renewable energy generation
- Low carbon material procurement
- Towards circularity, partnering with Redwood Materials



GM GROUP: ELECTRIFICATION STRATEGY

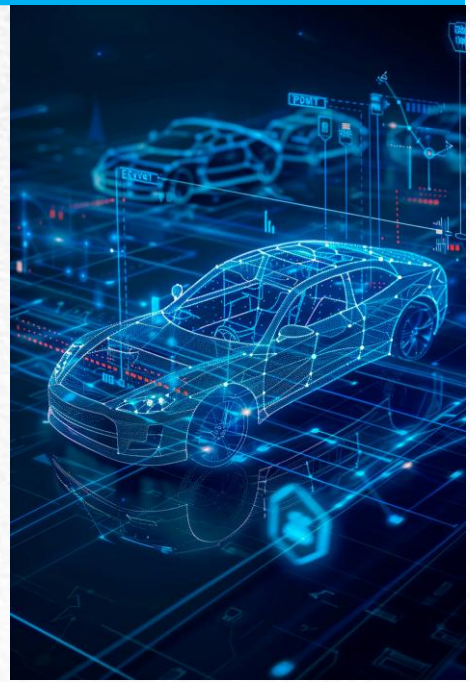
The GM Group is accelerating electrification by continuously investing in plant upgrades and cutting-edge technologies.

PLATFORM
- 4 platforms for the EV lineups.
- ‘Skateboard’ design for BEV3 platform; will be widely used in the coming years
- BV1, BEV Prime, and BT1

INVESTMENTS
- Large investment towards supply chain diversification.
- $4 billion committed towards manufacturing facilities in the United States
- $2.2 billion towards Factory ZERO Detroit

TECHNOLOGY
- Robotics and AI-enabled manufacturing
- Advanced battery materials and alternate battery chemistries
- Bidirectional charging

SUSTAINABILITY AND CIRCULAR ECONOMY
- Carbon neutral by 2040
- 100% renewable energy by 2035
- Embedding circularity right from design to the end of life
- Fostering remanufacturing.



HYUNDAI GROUP: ELECTRIFICATION STRATEGY

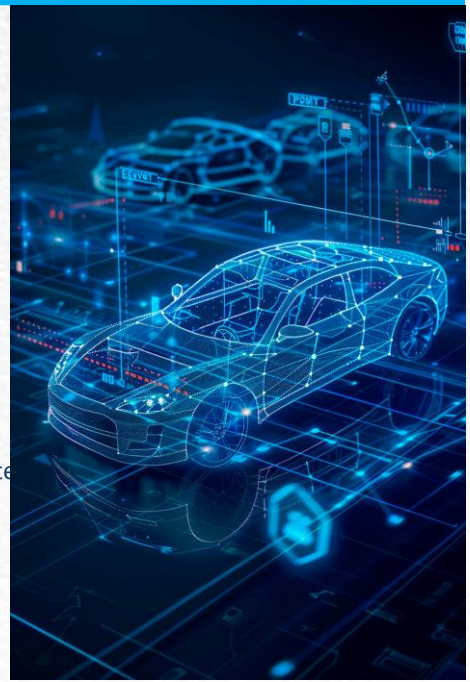
The Hyundai Group is set to ramp up global annual EV production to over 3.6 million units by 2030

PLATFORM
- Hyundai Group to build EV on shared architecture
- Transition from cell-to-pack to cell-to-frame
- E-GMP to be replaced by IMA platforms

INVESTMENTS
- Committed to invest €21 billion for US operations
- Spent $1.5 billion towards the Ulsan plant upgradation.
- Partnership with several companies to accelerate electrification

TECHNOLOGY
- Robotics to improve production processes
- AI to develop digital twins
- Cutting-edge software solutions for software-defined Vehicles and Advanced Driver Assistance Syste

SUSTAINABILITY AND CIRCULAR ECONOMY
- Green energy transition
- Green PPAs across the globe
- Circularity and zero-waste initiatives



MERCEDES-BENZ: ELECTRIFICATION STRATEGY

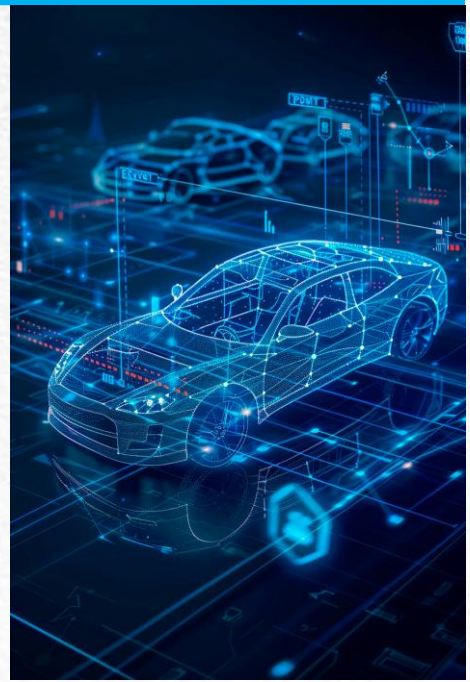
Mercedes-Benz is fast-tracking its electrification through the rethink, reduce, repair, and recycle strategies.

PLATFORM
- Launch of fully electric and hybrid variants on the MMA platform.
- New fully electric platforms: MB.EA, AMG.EA, and VAN.EA
- Other platforms that BEVs and PHEVs are built upon: MFA2, MRA2, MHA, MSA, EVA1, EVA2 &VS20

INVESTMENTS
- Commitment to invest $70 billion (€60 billion) for electrification by 2026
- $1 billion towards the development EV charging network across the United States
- Several partnerships for technology, recycling, and renewable energy

TECHNOLOGY
- AI across vehicle platforms
- Mercedes-Benz Operating System (MB.OS)
- Adoption of pyrolysis to recover secondary materials.
- Integration of solid-state batteries.

SUSTAINABILITY AND CIRCULAR ECONOMY
- Ambition 2039: A step towards carbon neutrality
- Several partnerships towards recycling, recovery, and sustainability.
- Reduction in energy, water usage, and waste in production.



NIO GROUP: ELECTRIFICATION STRATEGY

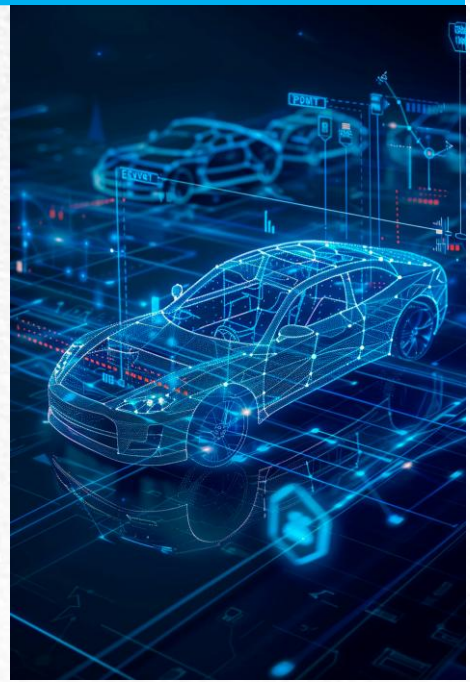
The Nio Group is accelerating its electrification through vertical integration and partnerships.

PLATFORM
- Focused on battery swapping technology
- Partnering with CATL to expand battery swapping operations
- Nio platforms: NP1, NPD, NPE, and GEN I
- ALPS platform: GEN I

INVESTMENTS
- Approximately $345 million investment towards Nio Power
- Raised around $450 million to accelerate EV innovations
- Investment towards battery manufacturing facility

TECHNOLOGY
- Smart operating system
- Advanced chips and power electronics
- Smart manufacturing

SUSTAINABILITY AND CIRCULAR ECONOMY
- Green energy transition
- Reduced water consumption
- Recycling and circular economy



STELLANTIS GROUP: ELECTRIFICATION STRATEGY

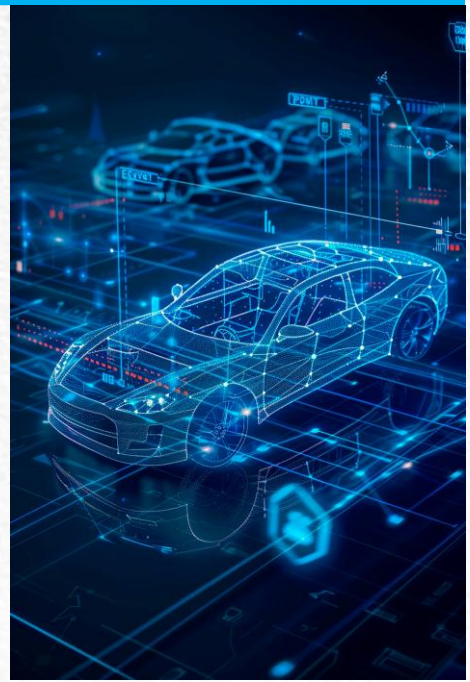
The Stellantis Group is strategically investing in potential business ventures to diversify revenue streams and aims to exceed multi-billion-dollar revenue through its sustainability business.

PLATFORM
- Multi-energy global platform
- STLA Frame platform: Designed for pickup trucks, LCVs, and SUVs
- STLA Small, STLA Medium, and STLA Large

INVESTMENTS
- Commitment to invest €50 billion for electrification
- Billions in investment to upgrade and retool manufacturing facilities to produce EVs
- €4.1 billion joint venture with CATL to build a battery plant

TECHNOLOGY
- Smart operating system
- Advanced chips and power electronics
- Smart manufacturing

SUSTAINABILITY AND CIRCULAR ECONOMY
- Green energy transition
- Reduced water consumption
- Recycling and circular economy



TESLA: ELECTRIFICATION STRATEGY

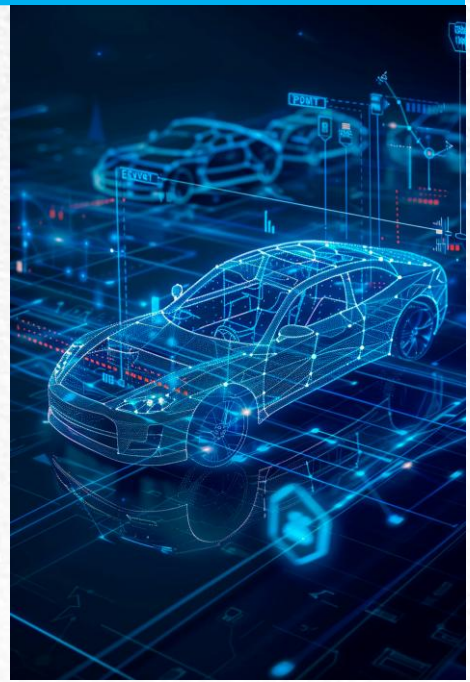
Tesla has made strategic moves in terms of investments, acquisitions, technology, and platforms to accelerate electrification.

PLATFORM
- Plans to build the future lineup on 4 main platforms: GEN III, GEN IV, Model S, and Cybertruck
- Affordable EVs to be built on the GEN IV platform

INVESTMENTS
- Multimillion-dollar investments towards vertical integration(acquisitions of several companies)
- Billion-dollar supplier agreement for batteries and other raw materials
- Around $5 billion towards Gigafactory Mexico

TECHNOLOGY
- AI-based solutions
- Accelerating semiconductor research
- Acquisition of specialized technology companies
- OTA updates

SUSTAINABILITY AND CIRCULAR ECONOMY
- Closing the loop in-house
- Recycling end-of-life Li-ion batteries
- Lowering greenhouse gas (GHG) emissions throughout the supply chain
- Use of green energy



TOYOTA GROUP: ELECTRIFICATION STRATEGY

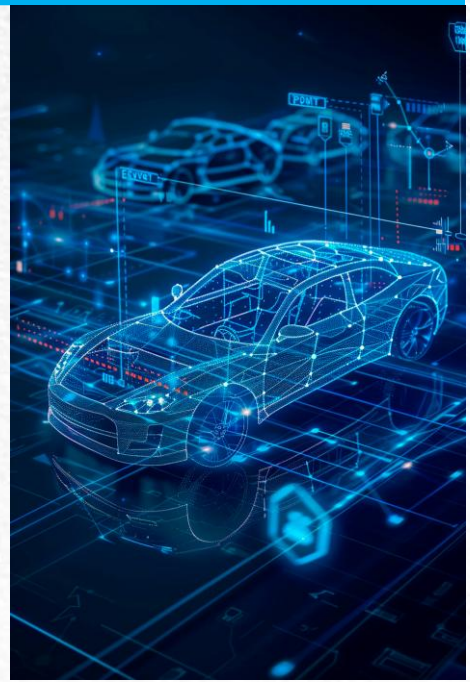
The Toyota group is accelerating its electrification through mixed powertrain portfolio and universal platforms.

PLATFORM
- Electric-Toyota New Global Architecture (e-TNGA): EV platform for the future.
- Large electric SUVs and pickup trucks to be built on the IMV (Innovative International Multi-Purpose Vehicle)
- NGA-C and NGA-K-SUV dedicated to PHEVs
- The fuel cell lineup is assembled on the Toyota New Global Architecture (TNGA) platform

INVESTMENTS
- Plant upgradations
- New plant for EV assembly
- Increasing battery manufacturing capacity across North Carolina and the Himeji plant.
- Semiconductor manufacturing in Japan

TECHNOLOGY
- Joint venture to develop in-vehicle semiconductors and advanced sensors
- Advanced robotics in logistics
- Integration of V2G technology
- Advanced in-vehicle software

SUSTAINABILITY AND CIRCULAR ECONOMY
- Hydrogen technology
- On-site solar and wind energy projects
- PPAs for green energy
- 3R strategy for circularity



VINFAST: ELECTRIFICATION STRATEGY

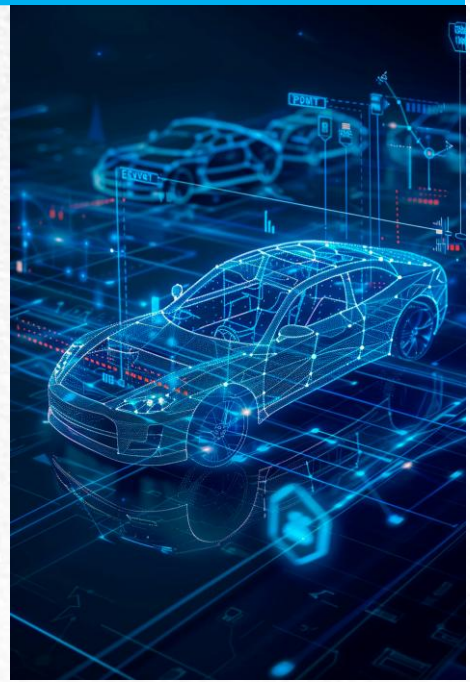
VinFast is expected to accelerate electrification through global presence in the coming years by establishing dealerships across Vietnam, Indonesia, China, India, the United States, Canada, France, Germany, the Netherlands, the UAE, and the Philippines

PLATFORM
- Skateboard design
- VinFast to build the EV lineup with 2 platforms (VMG-C/D and VMG-A/B)
- More models to be build on the VMG-C/D platform

INVESTMENTS
- Global expansion through new manufacturing facilities
- $1.5 billion for the Vietnam Hai Phong plant and $1.2 billion towards Indonesia, and around $2 billion towards
- North Carolina plant in the US.
- $500 million towards setting up manufacturing facilities in India

TECHNOLOGY
- Adoption of ADAS technology
- Enabling V2G technology
- Smart car control system
- Acquisition of VinES (a battery production company)

SUSTAINABILITY AND CIRCULAR ECONOMY
- Circularity through second-life battery energy storage systems
- Adoption of green energy
- Reduce and reuse of water
- Partnerships for recycling



VW GROUP: ELECTRIFICATION STRATEGY

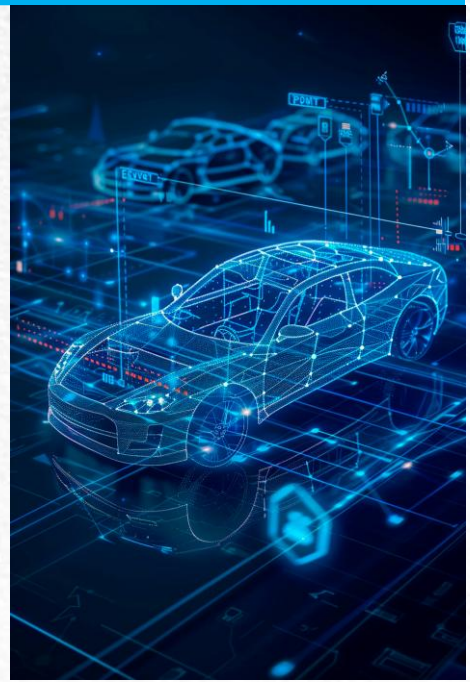
WV Group is accelerating electrification through an affordable range of EVs.

PLATFORM
- MEB (Modularer Elektrobaukasten) platform for modularity and low-cost EVs
- PPE (Premium Platform Electric) for a premium range of EVs
- SSP (Scalable System Platform), a scalable platform for the future

INVESTMENTS
- Battery manufacturing facility
- Over $13 billion committed towards plant upgrades and retooling
- New EV facilities and acquisitions

TECHNOLOGY
- V2G technology
- AI-powered robots in manufacturing
- Alternate battery chemistries
- Establishment of AI lab
- Advanced semiconductors

SUSTAINABILITY AND CIRCULAR ECONOMY
- Green energy usage
- PPAs
- Ethical sourcing of raw materials
- Circular economy through design
- Partnership for battery recycling.



OEMs Battery, Net Zero , Renewable Energy and Recycling Strategies

OEMS BATTERY STRATEGIES

OEMs are investing heavily in setting up in-house battery manufacturing facilities and are collaborating with industry leaders to achieve battery resilience

OEM Group	Key Cell Suppliers
BMW	• CATL • Samsung SDI • SVOLT
BYD	• In-House
Ford	• LG Energy Solutions • SK On • CATL • Samsung SDI • Panasonic-Sanyo
GM	• LG Energy • CATL • BYD • Ningfu New Energy
Hyundai	• SK On • LG Energy Solutions • CATL • BYD
Mercedes Benz	• CATL • LG Energy Solutions • Automotive Cells Company

OEM Group	Key Cell Suppliers
Nio	• CATL • CALB • BYD
Stellantis	• LG Energy Solutions • Samsung SDI • Automotive Cells Company • CATL
Tesla	• Panasonic • CATL • LG Energy Solutions • BYD • In-House Production
Toyota	• Panasonic • CATL • BYD
Vinfast	• In-House(VinES) • CATL
VW	• LG Energy Solutions • CATL • Samsung SDI • SK On • Panasonic-Sanyo

Why in-house battery production ?

- OEMS can significantly cut costs by controlling manufacturing and material sourcing
- It ensures high stability due to a controlled supply chain, reducing reliance on external vendors and price fluctuations
- It helps lower CO2 emissions as it supports the responsible sourcing of raw materials and reduces logistics emissions
- Localization can help OEMs comply with trade regulations and avoid tariffs

Source: Frost & Sullivan

NET-ZERO TARGETS AND RE 100

OEMs across the globe are accelerating the adoption of renewable energy usage through investments in power plants (solar and wind) and partnerships to achieve their net-zero targets

OEM Net-Zero Targets and Renewable Energy Usage, Global, 2025

OEM Group	Net-Zero Year	Renewable Energy Consumption	RE 100 Year
BMW	2050	48.50%	2050
BYD	2045	35%	2035
Ford	2050	50%	2035
GM	2040	77%	2035
Hyundai	2045	30%	2045
Mercedes Benz	2039	50%	2039
Nio	2045	56.6%	2050
Stellantis	2038	~25%	2030
Tesla	---	80% of the global sites	2026
Toyota	2050	100% in several plants	2035
Vinfast	2040	Part of consumption is renewable energy	2030
VW	2040	100% renewable energy across 73 global sites	2030

Note: RE 100 indicates commitment to use 100% renewable energy Source: RE100; Frost & Sullivan

OEMS BATTERY RECYCLING STRATEGY

OEMs are collaborating with industry leaders in battery recycling and the critical material recovery industry to close the loop and secure the future supply chain

Battery Recycling Strategy, Global

1	2	3	4	5
Partnerships reduce the burden of managing the complex and expensive process of battery recycling for OEMs	Professional recyclers can efficiently discharge, disassemble, recycle, and recover critical battery materials	OEMs can secure the future requirement of critical battery materials	Partners can identify batteries suitable for second-life applications, diversifying revenue streams	Partnerships can improve the ESG profiles of OEMs

OEMS BATTERY RECYCLING STRATEGY

OEMS ARE COLLABORATING WITH INDUSTRY LEADERS IN BATTERY RECYCLING AND THE CRITICAL MATERIAL RECOVERY INDUSTRY TO CLOSE THE LOOP AND SECURE THE FUTURE SUPPLY CHAIN

OEM Group	Key Partners
BMW	• SK Tes in Europe
	• Redwood Materials in North America
BYD	• XiXIan New District BYD Industrial Company in China
	• Envirostream Australia/Livium in Australia
Ford	• Redwood Materials in North America
	• Everledger in North America
GM	• Cirba Solutions in the US.
	• Redwood Materials in the US
Hyundai	• EcoPro
	• Lithion in Canada
	• Huayou Cobalt in China
Mercedes Benz	• Primobius in Germany
	• Burnp Recycling in China
	• Lohum in Asia

OEM Group	Key Partners
Nio	• Auto Recycling Nederland in Netherlands
Tesla	• Gigafactory Texas (in-house) in US
Stellantis	• Enel and ADR in Europe
	• Orano in Europe and North America
Toyota	• Cirba Solutions in North America
	• Redwood materials in North Amrica
	• Green Materials Battery Innovations (in-house) in Japan
	• Phoenix Recycling Group in New Zealand
Vinfast	• Li-Cycle in North America
	• BatX Energies in India
VW	• Redwood Materials in North America
	• Ecobat in UK

Source: Frost & Sullivan

CONCLUSIONS AND OUTLOOK

LEGACY OEMS TO UNDERGO COMPLETE TRANSFORMATION
- Plant upgrades
- Adoption of new technologies
- Retool the existing manufacturing facilities

GREEN ENERGY USAGE
- On-site green energy production
- Large green energy PPAs

LAUNCH OF THE FOLLOWING
- Universal/skateboard/modular platforms
- Affordable EVs (from $20,000) in the coming years
- EVs with 800V architecture

CLOSING THE LOOP
- Circularity in design to production
- In-house material recycling

ALTERNATE BATTERY CHEMISTRIES
- Adoption of sodium-Ion batteries to build affordable EVs
- Continuous research on alternate battery chemistries

LINK TO THE STUDY

OEM Strategies on Next Generation Electric Vehicles, Global, 2025–2031

Subscriber: Link to Download

Non-Subscriber (Store): MH92 Link to Purchase

Appendix

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AGENDA

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