

Vehicle-to-Grid (V2G) Charging Hardware

ANMD-MRS16-159 · E-Mobility & Autonomous Transport Technologies

A Global Sustainability Due Diligence & Market Research Study

History 2020–2024 · Base Year 2025 · Forecast 2025–2032 · Outlooks 2035 / 2040 / 2050 · Currency US\$

WHY THIS REPORT

Vehicle-to-grid (V2G) charging hardware lets EVs return energy to the grid or home — turning parked vehicle batteries into distributed energy storage that supports grid stability and resilience. Spanning bidirectional AC and DC chargers, V2H/V2L hardware, fleet V2G systems and aggregation gateways, it unlocks new value from EV batteries. This decision-grade study sizes the global market three ways — value, units shipped and bidirectional capacity (MW) — across bidirectional technology, use case, application and end-user, across seven regions and four scenarios to 2032, with outlooks to 2050.

SUSTAINABILITY & SDG IMPACT — THE ANMD LENS

Sustainability is this report's backbone. V2G turns EVs into grid-stabilising storage that supports renewable integration and resilience, while raising battery-degradation and standards questions that responsible deployment must address.

Mapped Sustainable Development Goals:

SDG 7 Affordable Clean Energy	SDG 9 Industry & Innovation	SDG 11 Sustainable Cities	SDG 12 Responsible Consumption	SDG 13 Climate Action
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Measurable sustainability outcomes assessed:

- Grid-balancing revenue from parked vehicle batteries
- Home backup power and energy resilience
- Better renewable integration using vehicles as flexible storage
- Battery-degradation impact, interoperability and embodied materials as material risks

Framework alignment: Double materiality mapped to GRI, SASB, ISSB, TCFD, TNFD, CSRD and the EU Taxonomy, with greenwashing and SDG-washing screens applied throughout.

WHAT'S INSIDE AT A GLANCE

53 Chapters	9 Report Parts	7 Regions Covered	40+ Country Markets
2025–32 Forecast Horizon	4 Forward Scenarios	25+ Companies Profiled	5 SDGs Mapped

REPORT COVERAGE

Geographic scope: North America, Europe, Asia Pacific, Latin America, Africa, Middle East and Rest of World — with named country intelligence. Europe is the pilot leader (United Kingdom, Netherlands, Denmark) on flexibility markets and standards; North America scales on V2H resilience and fleet pilots; Asia Pacific grows on Japan's V2H leadership; other regions assessed on their own merits.

MARKET OVERVIEW

From pilots to early commercial deployment — where parked batteries become grid assets.

V2G is moving from pilots to early commercial deployment as standards and grid value mature. Demand is driven by grid flexibility, renewable integration and fleet-storage economics, against standards immaturity, hardware cost premium and battery-warranty concerns. The market is read three ways — value, units shipped and bidirectional capacity (MW) — and forecast under four scenarios, each region reported separately.

- **Europe leads V2G pilots** — the United Kingdom, the Netherlands and Denmark, where grid-flexibility markets and standards are most advanced
- **North America scales on resilience** — V2H backup demand, fleet pilots and emerging grid-service programmes
- **Asia Pacific grows on standards** — Japan's V2H leadership and Chinese and Korean bidirectional deployment
- **Fleet V2G is the differentiator** — predictable, aggregated fleet batteries unlock the grid-service economics single vehicles struggle to deliver

REGIONAL OUTLOOK

Across seven reporting regions, the report separates deployment leaders from high-growth and emerging markets — each profiled in full rather than aggregated into Rest of World.

Region	Stage	Lead Country Markets & Drivers
Europe	Pilot leader	United Kingdom, Netherlands, Denmark — flexibility markets, V2G standards
North America	Resilience-led	United States, Canada — V2H backup, fleet pilots
Asia Pacific	Standards-driven	Japan, China, South Korea — V2H leadership, bidirectional deployment
Middle East	Emerging	UAE — smart-grid pilots, sovereign investment
Latin America	Frontier	Brazil, Chile — early V2G and resilience pilots
Africa	Frontier	South Africa — backup and resilience use cases

KEY MARKET DRIVERS & RESTRAINTS

Drivers	Restraints
• Grid flexibility & renewable integration • Home backup & resilience (V2H / V2L) • Fleet-storage & grid-service revenue • Bidirectional-standard maturation (ISO 15118) • Distributed-energy & VPP growth	• Standards & interoperability immaturity • Bidirectional-hardware cost premium • Battery-warranty & degradation concerns • Grid-interconnection & regulatory barriers • Complex value-stacking & business models

SEGMENTATION SNAPSHOT

By Bidirectional Technology	Bidirectional AC · bidirectional DC · V2H / V2L · fleet V2G · aggregation gateways
By Use Case	Grid services · home backup · fleet storage · renewable firming
By Application	Passenger · commercial · two-wheeler / micro-mobility
By End User	OEMs · fleet operators · charge-point operators · consumers
By Business Model	Hardware sales · software / subscription · services
By Scale	Consumer · fleet · OEM / industrial-scale

TABLE OF CONTENTS — PARTS & CHAPTERS

The full report is organised into nine parts across 53 chapters, listed below. Detailed sub-headings, country tables and directories are provided in the full report.

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- › Chapter 2. Industry Discovery Summary — Vehicle-to-Grid (V2G) Charging Hardware
- › Chapter 3. Executive Intelligence and Decision Dashboard
- › Chapter 4. Strategic Findings, Materiality and Investment Verdict Preview

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- › Chapter 6. Market Dynamics
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- › Chapter 10. Pricing, Cost and Commercial Model Intelligence

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COMPETITIVE & INVESTMENT SNAPSHOT

The competitive field spans bidirectional-charger makers, V2G-aggregation specialists, and power-electronics and energy majors. Deal activity — M&A, technology acquisition and platform expansion — signals a market consolidating around scalable, bankable, deployment-ready solutions.

Representative players profiled in the full report:

Wallbox N.V. · Fermata Energy LLC · Nuvve Holding Corp. · ABB E-mobility B.V. · Enphase Energy, Inc. · and further profiled bidirectional-hardware and aggregation players

Investment intelligence: venture, infrastructure, development, climate and blended finance, green bonds and sustainability-linked loans — culminating in a bankability assessment and a clear investment verdict.

KEY QUESTIONS THIS REPORT ANSWERS

- ? How large is the global V2G hardware market, and how fast will it grow to 2032?
- ? Which regions, technologies and use cases offer the strongest risk-adjusted opportunity?
- ? How do standards, fleet aggregation and value-stacking change V2G economics?
- ? Who leads, and where is the competitive and patent white space?
- ? Is the investment case bankable — and under what conditions?
- ? How does the category align with the SDGs, grid-interoperability and battery-warranty regulation?

WHY ANMD — THE DIFFERENCE

Most market studies stop at tonnes and revenue. This report is built as a sustainability due diligence instrument — fusing market sizing with ESG, SDG, climate, carbon-integrity and natural-capital intelligence and a decision-ready bankability verdict in a single architecture.

- **Triangulated sizing** — every market read three ways (value (US\$), units shipped and bidirectional capacity (MW)) so value, capacity and volume views reconcile rather than conflict.
- **Region-honest forecasting** — Latin America, Africa and the Middle East reported in full, never hidden inside Rest of World, every forecast resolved to the 2025 base year.
- **Integrated evidence base** — company, patent and project databases linked to the analysis, with published-filing patents and FTO treated as an indicator, not a legal conclusion.
- **No-fabrication discipline** — every estimate carries a data-confidence rating and disclosed sources; gaps are flagged for further diligence, never filled with invented numbers.
- **Anti-greenwashing rigour** — SDG-washing and greenwashing screens plus claim-substantiation checks built into the ESG and project analysis.
- **Decision-first structure** — 9 Parts and 53 Chapters culminating in stakeholder playbooks and a clear, conditions-based investment verdict.

WHO SHOULD BUY THIS REPORT

Investors and venture / PE funds, charge-point operators and aggregators, power-electronics and energy firms, fleet operators and utilities, vehicle OEMs, policymakers, lenders and ESG teams, plus strategic corporate planners and decision-makers.

Access the Full Report

The complete report delivers all 53 chapters in full, with every sub-heading, country table, company and patent directory, forecast model and due diligence checklist.

Purchase at www.anewmarketdynamics.com · Standard & Premium licences · Single-Site (SSL) and Global-Site (GSL) options at checkout.

Want the Complete Detailed Table of Contents?

This prospectus lists the nine parts and 53 chapters. The complete detailed table of contents — every sub-heading, country table, exhibit, company and patent directory and annex — is available on request to registered users. To receive it, register with your official company email at www.anewmarketdynamics.com. The full detailed table of contents will be sent directly to your registered company email address.