Ideas for action

NOVEMBER 2025

Accelerating the electrification of the automotive sector

Recommendations from multi-stakeholder dialogue

alinnea

alinnea

alinnea has been a key player in Spain's climate action ecosystem since mid-2024. As part of IE University and supported by the European Climate Foundation, alinnea specializes in comparative analysis, identification, and articulation of climate change measures and actions that engage the public and private sectors, as well as civil society

Operating under a multi-stakeholder, dialogue-research-action framework, Alinnea seeks to develop solutions that overcome climate action barriers while ensuring they are socially just, economically viable, and beneficial for the environment and biodiversity protection. Between May and October 2025, Alinnea held working sessions with more than forty stakeholders across the entire value chain—from the public and private sectors, civil society, and academia—with the aim of accelerating the electrification of the automotive sector. This process made it possible to gather critical analyses and highly relevant practical experiences.

Drawing on this dialogue, this report provides a detailed analysis of the main challenges facing the adoption of electric vehicles and sets out recommendations aimed at accelerating their adoption.

This report has been prepared by alinnea and Jaime Gil-Robles, a specialist in Mobility and Sustainability, who provided technical support for the working sessions.

Cite as:
Fundación Instituto de Empresa, *"Acelerando la electrificación del sector del automóvil"*, [Accelerating the Electrification of the Automotive Sector] Ideas for Action, Madrid, alinnea 2025.

Hosted by

ie FOUNDATION

With the support of

European Climate Foundation

alinnea.org

Table of contents

Executive Summary 01

Spain is at a turning point in its transition towards electric mobility. Despite being the second-largest car manufacturer in Europe, the country is advancing at a slower pace than its EU partners in electric vehicle adoption. In 2024, electrified vehicles accounted for just 8.5% of total production and 11.4% of new registrations, figures still far from the targets set in the 2023–2030 National Integrated Energy and Climate Plan (PNIEC), which foresees 5.5 million electric vehicles in circulation by 2030. Although the number of charging points increased over the past year, the charging infrastructure remains fragmented and shows high levels of inoperability. In addition, taxation and incentives are unevenly accessible and bureaucratic, slowing down demand.

Spain benefits from a strong industrial base, a growing battery innovation ecosystem, and an increasingly clean power mix. All these factors position the country to strategically lead a transformation that goes beyond technology and consolidates a new industrial, social and energy model. This momentum is reinforced by a favorable European framework: the Net-Zero Industry Act and the Critical Raw Materials Act strengthen industrial autonomy and the sustainable production of key components, while the AFIR Regulation accelerates the deployment of charging infrastructure across the Union. In Spain, the PERTE mechanism has mobilized more than €6 billion to consolidate the value chain for Electric and Connected Vehicles.

These frameworks present unique opportunities but also expose weaknesses: limited institutional coordination, complex incentive schemes, the absence of common life-cycle metrics, and a tax structure that does not reflect the real cost of carbon. Against this backdrop, the report prepared by alinnea seeks to articulate a shared framework for action that accelerates the automotive sector's transition towards climate neutrality, while strengthening industrial sovereignty, competitiveness and quality employment.

The report is the result of joint work by more than forty experts, including representatives from industry, public administration, the energy sector, trade unions, and civil society.

The report draws on the joint work of more than forty experts, including representatives from industry, public administration, the energy sector, trade unions and civil society. Its purpose is to identify the bottlenecks that constrain the electrification of the automotive sector in Spain and to formulate concrete recommendations that ensure a fair and competitive transition.

The analysis focuses on several core areas: industrial and financing policy, technological innovation and global competitiveness, the sustainability and circularity of the value chain, and talent development for the emerging electric mobility industry. These dimensions are addressed in an integrated manner, recognizing that progress on electrification requires coordination across economic, energy and social domains.

The diagnosis identifies seven major challenges shaping Spain's transition to electric mobility. There is a persistent dependence on critical raw materials such as lithium and nickel, without a national strategy to guarantee their sustainable extraction and recycling. Regulatory uncertainty hampers long-term investment planning in plants and gigafactories, while fiscal misalignment with countries offering more agile incentives or less stringent environmental standards creates unfair competitive pressures. The lack of technological standardization in batteries, software and charging systems raises production costs and limits interoperability, while the electricity grid remains underutilized due to the absence of a framework enabling vehicle integration as distributed storage (Vehicle-to-Grid). At the same time, skills shortages and retraining gaps risk creating mismatches between educational provision and emerging industrial needs. Finally, charging infrastructure remains insufficient and unevenly distributed across the country, undermining consumer confidence and slowing market expansion.

In this context, the report calls for the creation of a national raw-material sovereignty strategy to ensure a secure and sustainable supply; the definition of an integrated strategic timeline that coordinates innovation, taxation and skills development within a verifiable roadmap; and EU-wide tax harmonization based on carbon-footprint and life-cycle criteria. It also recommends promoting the standardization of batteries and software, fostering bidirectional electricity grids (V2G), and developing a National Talent Plan for Electric Mobility that integrates reskilling, dual vocational training, and university-industry collaboration. Finally, it proposes advancing towards an Interoperability and Smart-Charging Plan that guarantees transparent, harmonized access across the territory, and consolidating a National Just Transition Plan for the automotive sector to protect employment, strengthen territorial cohesion and promote social innovation.

The electrification of the automotive sector represents a historic opportunity to reindustrialize Spain under a more sustainable and resilient model.

Achieving the objectives of the PNIEC and the European Green Deal will require combining industrial policy, technological innovation and social justice under a shared vision. Only a planned, inclusive and competitiveness-driven transition will enable Spain not merely to adapt to change, but to lead it.

Introduction 02

This report analyses the current state of electric mobility in Spain carried out by the working group "Facing the Future: The Challenge of the Electric Automotive Sector", convened by alinnea between May and October 2025. The objective of the group was to identify the main challenges that currently shape the sector's development and may limit its contribution to the transition towards a more sustainable energy and climate model. Considering these findings, the report sets out a series of concrete measures to address the issues identified. The analysis draws extensively on the outcomes of the electric mobility working group sessions organized by alinnea, complemented by an exhaustive review of expert information published on the subject.

The report is structured as follows: First, it offers a detailed diagnosis of the state of electric mobility, including an overview of the main national stakeholders and an analysis of Spain's current standing at the international level. It then examines the impact of transport electrification on economic activity and particularly on employment. Next, it identifies the bottlenecks at present and offers proposals to address them. Finally, it presents the main conclusions.

We would like to express our special thanks to the members of this working group (see Annex 1) for sharing their ideas, reflections and time with the group, as well as to the experts who contributed their valuable knowledge through presentations.

The findings, analyses and conclusions presented in this report are based on the information available at the time of writing (obtained from primary sources or other research cited in the report and considered accurate and reliable). None of the collaborating individuals or institutions shall be held responsible for the interpretation of the information contained in this document, nor for any loss resulting from decisions of any kind taken based on the information contained herein. Likewise, recognition or acknowledgement of any organization does not imply its endorsement of the final text.

2.1. Objectives of the Working Group

The purpose of this report is to provide a comprehensive assessment of electric mobility in Spain, identifying the main challenges and opportunities that shape its development and proposing concrete measures to accelerate the transition towards a decarbonized, fair and competitive transport system.

Specifically, this document aims to:

- **Analyze the current state of electric mobility** in Spain, with particular attention to vehicle manufacturing, the status of charging infrastructure, and battery development.
- **Examine the existing regulatory framework** governing electric mobility in Spain.
- **Map the key stakeholders in the electric-mobility ecosystem**, including electric-vehicle manufacturers, stakeholders linked to the battery value chain, charging-infrastructure developers, and public operators.
- **Assess the regional distribution of the industry and mobility clusters**, identifying the areas with the greatest potential for electric-vehicle development.
- **Propose effective incentive structures for reindustrialization**, such as grants, tax credits or innovation support, that strengthen Spain's position in electric mobility.
- **Explore Spain's innovation capacity and competitive standing** in the European and international context, with a focus on batteries, autonomous transport and R&D.
- **Evaluate the impact of green mobility** on employment and skills development, identifying opportunities for job creation and professional training.

Together, these objectives seek to lay the foundations for a framework for action that enables Spain to move decisively towards transport electrification, in line with the commitments of the 2023–2030 National Integrated Energy and Climate Plan (PNIEC), which targets reaching 5.5 million electrified vehicles by 2030.

2.2. Methodology

This report is based on a comprehensive analysis of the current state of electric mobility in Spain, combining a review of bibliographic sources with the information gathered during the working group sessions.

The methodological approach included:

- Documentary and bibliographic review, incorporating official data from public administrations, reference reports from national and international organizations, and academic and sectoral studies related to transport electrification.
- Working sessions with key stakeholders in electric mobility, including companies from the sector, associations, public administrations and civil society organizations, whose contributions enriched the diagnosis and helped refine the recommendations.

Together, these tools provided the basis for an in-depth diagnosis, which in turn informed the bottlenecks identified and the recommended measures, with the aim of driving the transition towards a sustainable electric-mobility model that benefits society.

Four dialogue sessions were held between May and October 2025, featuring the following presentations from the entities listed below, to whom we also express our appreciation for their time and contributions:

- **Strategies to promote electric vehicles.** Rosario Díaz, Head of the Economic and Technical Area, Faconauto
- **How to strengthen Spain's industrial position in the face of the challenges posed by electric and autonomous vehicles.** Antonio Joaquín González, Director of Institutional Relations, STELLANTIS
- **Proposals to promote electric mobility.** Laura Vélez de Mendizábal, E-mobility expert, Transport & Environment (T&E)
- **Strategies for the decarbonisation of transport.** Mónica Galeote, Director of Public Policy and Sustainability, Amazon
- **Mercury Project.** Emilio Giner, Director of Services, Octopus Energy
- **Interoperability and standardizations.** David Huete, CCO, Zunder
- **Smart charging, EV integration into the electricity grid, and V2G (Vehicle-to-Grid).** Isabel Gómez, Senior Energy Foresight Analyst, Iberdrola
- **The role of the public sector in technological innovation in electric vehicles.** José Moisés Martín Carretero, Director General, CDTI
- **Carbon footprint for vehicles: context, methodology and results.** Javier Muñoz, Director General for Economic Policy, Ministry of Economy, Trade and Enterprise
- **China's race to dominate the electric-vehicle market: where do we stand?** Alicia Herrero, Chief Economist for Asia Pacific, Natixis

The working group received technical support from Jaime Gil Robles, specialist in Mobility and Sustainability and collaborator of alinnea, and facilitation support from Cristina Monge Lasierra.

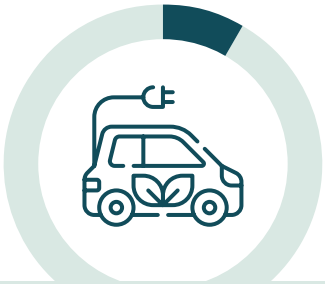
SITUATION ANALYSIS

Overview of Electric Mobility in Spain 03

Overview of Electric Mobility in Spain 03

3.1. Key stakeholders

This first section of the diagnosis provides a comprehensive overview of the stakeholders involved in Spain's electric-mobility industry. Grouped by category, these include vehicle manufacturers, battery innovators, charging-infrastructure developers, and other stakeholders connected more tangentially to the ecosystem, such as local authorities that incorporate electric vehicles into municipal fleets. A final subsection focuses on consumers.



202,555

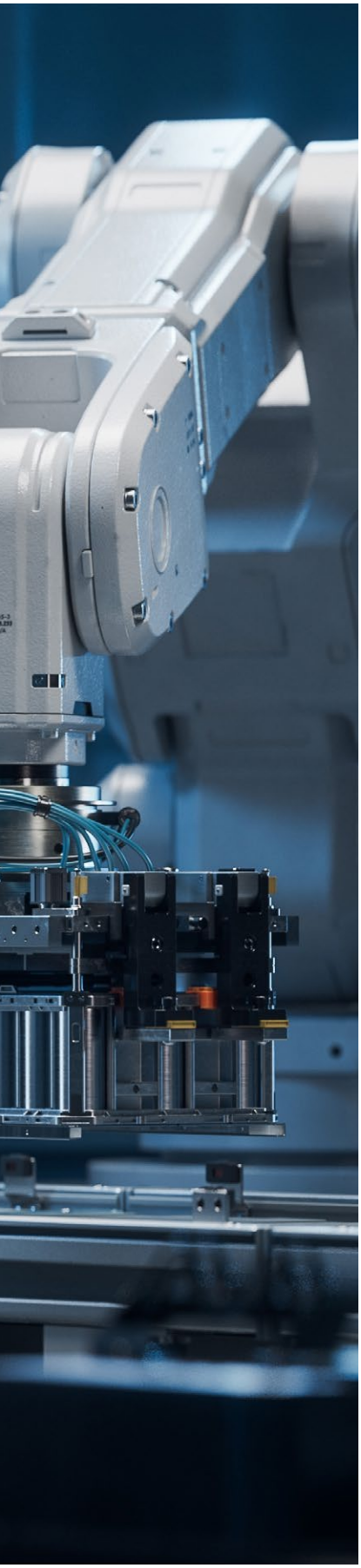
electrified vehicles (pure electric and plug-in hybrids) were produced in 2024, accounting for 8.5% of a total of 2,377,091 vehicles.

3.1.1. ELECTRIC-VEHICLE MANUFACTURERS

The Spanish Association of Car and Truck Manufacturers (ANFAC) publishes an annual report on the state of electric mobility in Spain. According to its latest edition, 202,555 electrified vehicles (pure electric and plug-in hybrids) were produced in 2024, accounting for 8.5% of a total of 2,377,091 vehicles. This share fell by 2.9 percentage points compared to the previous year, a decline explained by the increase in the production of gas vehicles (+0.5 p.p.) and, above all, non-plug-in hybrids (+7.6 p.p.). Among electrified vehicles, 87,768 or 3.7% of total production were plug-in hybrids (PHEVs), and 114,787 or 4.8% of production were pure electric vehicles.

For passenger cars alone, the percentages are similar: 176,183 electrified passenger cars were produced (9.2% of the total), a decrease of 2.3 percentage points. Again, the decline is largely explained by the rise in non-plug-in hybrids (+8.9 p.p.). The drop in diesel was also more pronounced among passenger cars (–4.4 p.p.) than across all vehicles (–2.4 p.p.). Among electrified passenger cars, 87,768 were PHEVs and 88,415 were pure electric vehicles, each representing approximately 4.6% of all passenger cars.

In 2024, nineteen models of electrified vehicles were manufactured in Spain. Stellantis produced fourteen of them in Madrid, Vigo and Zaragoza: Citroën E-Berlingo and E-Berlingo Van, Citroën E-C4 and E-C4X, Fiat e-Dobló, Opel Combo E-Life and E-Cargo, Opel Corsa-e, Lancia Ypsilon, Toyota Proace City, Peugeot E-208, Peugeot E-2008, Peugeot E-Rifter and Peugeot E-Partner. According to the company, it manufactured 93.5% of the fully electric vehicles produced in Spain, with 11,119 units in Madrid, 45,421 in Vigo and 50,855 in Zaragoza.



Next is Seat-Cupra, with three models produced in Martorell: Cupra Formentor, Cupra León and Seat León Sportstourer. Although the company does not report electrified production figures, it does publish 2024 sales data: 49,400 PHEVs and 48,000 BEVs, increases of 14.0% and 5.9% respectively. The company highlights its commitment to electrified mobility, with the launch of the Cupra Raval planned for 2025.

Mercedes-Benz produced two electrified models in Vitoria: the Mercedes E-Vito and the Mercedes EQV. Although detailed production data were not disclosed, several media outlets reported that, of the 120,355 vehicles manufactured in 2024 (24% fewer than the previous year), 4,543 were E-Vitos and 3,360 were EQVs.

Renault manufactures the Rafale in Palencia, producing 20,137 units in 2024, alongside the Austral and Espace models. Ford manufactures a PHEV variant of the Ford Kuga in Almussafes. Hispano Suiza produced very limited numbers of the Carmen, Carmen Boulogne and Carmen Sagrera models in Barcelona.

ANFAC (2024) also lists models planned for 2025, some of which are already in production. Notable examples include three Ebro models to be produced in the Zona Franca of Barcelona (Ebro s400, Ebro s700 and Ebro s800). Omoda plans to manufacture the Omoda 5 and Omoda 7 in the same plant under a joint venture. Finally, three models are scheduled for production at the Volkswagen plant in Pamplona in 2026: Volkswagen ID.2, Volkswagen ID.2X and Skoda Epiq.

3.1.2. BATTERY-PLANT MANUFACTURERS

Battery-plant construction has become one of the most prominent areas in the development of electric mobility in Spain, especially following the launch of the PERTE for Electric and Connected Vehicles (PERTE VEC), which will be detailed in a later section.

Several major projects are currently planned:

* The PowerCo (Volkswagen Group) gigafactory in Sagunto (Valencia) will be one of Europe's largest battery plants. With an investment of more than €3 billion, it will have an initial capacity of 40 GWh per year, expandable to 60 GWh, and will generate more than 3,000 direct jobs and up to 30,000 indirect jobs. Production is scheduled to begin in 2026, starting at 20 GWh and gradually scaling up to full capacity.
* Stellantis and CATL will build a gigafactory in Figueruelas (Zaragoza), with operations scheduled to begin in late 2026. The plant will reach a capacity of up to 50 GWh per year and will produce lithium-iron-phosphate (LFP) batteries. The committed investment amounts to €4.1 billion.

* AESC will build a gigafactory in Navalmoral de la Mata (Cáceres), with a planned total capacity of 94.24 GWh per year and an estimated investment of €2.5 billion. The project is expected to create around 3,000 direct jobs and will receive €300 million in public support through PERTE VEC II (€200 million in grants and €100 million in loans). Construction is expected to begin in the coming months, and the plant will produce large-scale batteries for electric vehicles.

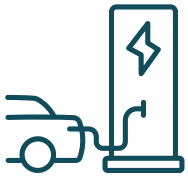
In addition to these three major projects, other smaller-scale initiatives have also benefited from Government support under PERTE VEC:

* Basquevolt is developing a pilot plant for solid-state batteries in Vitoria-Gasteiz, currently operating as a prototype laboratory (Asample). It has received a provisional grant of €14.69 million from PERTE VEC II for its pilot industrial facility with a capacity of 1 GWh. The objective is to achieve an annual production phase of 10 GWh by 2027, becoming a national benchmark in solid-state battery technology.

* As another example, BeePlanet Factory operates a plant in Navarra focused on the second-life use of electric-vehicle batteries for stationary storage systems.

3.1.3. CHARGING-INFRASTRUCTURE DEVELOPERS

The III AEDIVE Electric Mobility Yearbook (2025) presents the state of play in the rollout of charging infrastructure in Spain. In 2024, there were 34,049 charging points installed in Spain, of which 26,718 were in service and 7,331 remained out of operation. The yearbook also segments the network by power. Most points correspond to equipment below 22 kW, followed at some distance by the 22–50 kW and 50–150 kW ranges. High-power chargers (≥150 kW) are still the least numerous.



The goal is to reach up to **11,700** ultra-fast points in Spain and Portugal, the company's core geographical area, by 2030, with more than one thousand already in operation in 2025.

The ANFAC barometer provides updated data for the second quarter of 2025: Spain then had 47,892 public access points, an increase of 1,534 compared to the previous quarter. However, 13,792 were out of service, representing 22% of the total. Most are still low capacity (<22 kW), while there are 1,803 fast and ultra-fast chargers (≥150 kW). Of the total, 28,314 were in urban areas.

In terms of operators, the landscape is made up of energy utilities, oil companies in transition and specialized players. Iberdrola has the most extensive network in the country, with more than 11,000 public points by mid-2025. In parallel, its alliance with bp pulse focuses on high-power charging: the goal is to reach up to 11,700 ultra-fast points in Spain and Portugal, the company's core geographical area, by 2030, with more than one thousand already in operation in 2025.

Endesa X Way manages more than 6,000 points, with a significant share of capacities above 50 kW. Its rollout combines urban locations and interurban corridors, supported by agreements with car parks, shopping centers and public entities. Its plan foresees around 600 ultra-fast chargers by 2026. Repsol, for its part, has a proprietary network of more than 2,500 points, leveraging its service-station network and agreements with shopping centers and ADIF (Administrador de Infraestructuras Ferroviarias, the railway infrastructure manager).

Among independent operators, Zunder has established itself as a benchmark in high-power charging: at the end of 2024 it had 764 ultra-fast charging points (>150 kW) in operation in Spain. Wenea has more than 1,200 active charging points and has set itself the target of reaching 5,000 by 2026 in Spain, Portugal and the United Kingdom. Tesla operates 76 Supercharger stations in Spain, with more than 700 points in total, and has already begun rolling out the new V4 generation, with power ratings of up to 350 kW. EDP, meanwhile, has almost 2,500 contracted charging points in Spain. In addition, other players such as Eranovum, Powerdot, TotalEnergies and Ionity also have a presence in the country.

Octopus Energy has launched Electroverse in Spain, its public charging platform for electric vehicles, available since October 2023. With a single card or app, it provides access to more than 500,000 charging points in 40 countries, offering users a unified experience. In parallel, it is promoting the Mercury Project, an open protocol that seeks to standardize communication in the electricity grid by harmonizing transmission times and measurement parameters. The initiative brings together multiple companies and proposes a common technical and security language to facilitate interoperability across all devices.

3.1.4. OTHER STAKEHOLDERS: LOCAL AUTHORITIES

To complete the overview of stakeholders involved in the rollout of electric vehicles in Spain, it is worth highlighting the fleet-electrification policies being implemented by municipal authorities in some of the country's main cities.

In Madrid, at the end of 2024 the city council counted 429 electric vehicles in its municipal fleet, representing 16.6% of the total. One milestone in this process is the full electrification of the Mobility Agents' fleet, with 196 zero-emission units, including cars, motorbikes and bicycles. In public transport, the Madrid Municipal Transport Company (EMT Madrid) operated 432 electric buses in March 2025, a figure that will rise to 463 by the end of the year, with 40 routes served entirely by battery-powered vehicles.

In Barcelona, the new cleaning and waste-collection contract includes 850 vehicles and pieces of equipment, 66% of which are electric. At the same time, the local police force (Guardia Urbana) has incorporated 84 hybrid and electric vehicles, and electric and hybrid models now account for nearly half of its fleet. In public transport, TMB operates 196 electric buses and has tendered a further 19 that will begin service in 2026.

In Valencia, the Municipal Transport Company (EMT) introduced the first 20 electric buses in 2023 and in 2025 approved the purchase of 94 additional electric vehicles. This will bring the fleet to 167 fully electric units. The investment plan also envisages that the fleet will be virtually clean by 2028, with 215 new electric and hybrid buses. The modernization of depots includes the installation of 167 charging points.

3.1.5. CONSUMERS

Spanish consumers are increasingly adopting electric mobility, but the pace of integration depends largely on the use and characteristics of each segment.

Regarding consumer uptake, ANFAC's 2025 annual report shows that registrations of electrified vehicles in Spain in 2024 reflect steady progress, although with significant differences between vehicle types. For passenger cars, electric models already account for 11.4% of the market, with more than 115,000 units, indicating growing confidence among buyers in electric vehicles compared to traditional combustion vehicles, which continue to lose ground. In light commercial vehicles, market penetration is more moderate, at 4.3%, while in heavy vehicles it barely reaches 1.2%, highlighting a more complex transition in segments with greater range and load requirements. Buses, by contrast, stand out with an electrified share of 15.3%, driven by commitments to more sustainable public transport. Overall, these results indicate that although Spanish consumers are increasingly adopting electric mobility, the pace of integration depends largely on the use and characteristics of each segment.

According to the same report, the electrification of the passenger-car market in Spain reached a share of 11.4% in 2024, driven mainly by battery electric vehicles (BEVs), which grew to 5.6% of total registrations. Plug-in hybrids (PHEVs), however, reduced their share compared with previous years, standing at 5.8%. The commercial offering continues to expand, with 273 electrified models available (152 BEVs and 122 PHEVs). BEVs still account for less than half of the electrified market, which shows that the shift towards fully electric vehicles is progressing gradually.

In terms of the most popular models, the 2024 ranking shows Tesla in the lead, with the Model 3 and Model Y as the best-selling BEVs, followed by models from brands such as MG, Volvo and BMW. For PHEVs, the Mercedes GLC 300 and the Ford Kuga top the list, confirming the importance of established brands in this segment. By purchase channel, the corporate market continues to be the main driver of electrification, with a significant share, although the private channel is also showing steady growth, especially in BEVs, where it accounts for 7.1% of total registrations. This indicates that while companies still lead the way, private consumers are increasingly opting for electric mobility, consolidating a gradual shift in the structure of the market.

3.2. Geographical Distribution

Having examined the key stakeholders in the sector, it is now necessary to introduce a geographical dimension to the analysis, situating the development of electric mobility within the national territory. To this end, the following section presents the main existing industrial clusters, assessing where the greatest development potential may lie. It then analyses the degree of electric-vehicle adoption based on indicators such as infrastructure availability and market penetration.

3.2.1. REGIONAL ELECTRIC-MOBILITY CLUSTERS

Below is a summary of the main regional clusters:

* The Galician Automotive and Mobility Business Cluster (CEAGA) brings together the manufacturer (Stellantis Vigo), CTAG, and more than 200 companies. Although it originated as an automotive cluster, it now promotes programs in electrification, connectivity and digitalization in collaboration with manufacturers and SMEs in the region.

* The Catalan Automotive Industry Cluster (CIAC) brings together more than 190 companies, including manufacturers, suppliers, technology firms, universities and R&D centers. It is a broad-based cluster with specific projects on electric and connected vehicles, batteries and digitalization, developed in cooperation with technology start-ups and major manufacturers.

* The Basque Automotive Cluster (ACICAE) includes around 300 entities linked to the automotive value chain in the Basque Country, including Gestamp, CIE Automotive, Basquevolt and Tecnalia. Although generalist in nature, it plays an active role in projects related to electric mobility, battery components and electrification systems. Also in the Basque Country, the Mobility and Logistics Cluster (MLC ITS Euskadi) brings together transport companies, logistics operators, technology firms, and research and training centers.

* The Automotive and Mobility Cluster of the Valencian Community (AVIA) comprises around 120 member companies, including multinationals such as Ford Almussafes, SME suppliers, technology centers and public universities. While its scope covers the entire automotive sector, it develops active projects in electric mobility, batteries, digitalization and the circular economy, including initiatives for battery collection, recycling and second-life applications.

* The Aragón Automotive Cluster (CAAR) includes more than 130 members, among them Stellantis, a broad base of SME suppliers, and R&D centers such as the Aragón Institute of Technology (ITAINNOVA). Although its activity covers the automotive sector, it has promoted the Mov&Elect project for the development of batteries and electric mobility in the region.

In summary, Galicia, Catalonia, the Valencian Community, Aragón and the Basque Country currently concentrate a significant share of Spain's leading industrial hubs for electric mobility—whether due to their volume of electrified-vehicle production, their specialization in components, or their strategic projects in batteries and propulsion systems. Catalonia and Galicia stand out in the manufacture of electrified passenger cars and vans; Aragón has strengthened its position through new projects in Figueruelas; the Valencian Community is advancing through the Sagunto gigafactory and the electrification of Ford Almussafes; and the Basque Country is consolidating a strong auxiliary industry with projects in batteries and electrification systems. Other relevant hubs include Navarra and Castile and León.

3.2.2. GEOGRAPHICAL PENETRATION OF ELECTRIC MOBILITY

Indicators of electric-vehicle penetration from the ANFAC Electromobility Barometer (Q2 2025)—based on parameters such as market share and penetration among the motorised population—reveal a highly uneven landscape across autonomous communities. The Community of Madrid, Navarra and Catalonia lead the ranking, while Asturias, Extremadura and the autonomous cities occupy the lowest positions.

In the European context, Spain scored

21.4 out of 100,

below the European Union average (25.4) and far behind countries such as Norway and the Netherlands.

In the European context, Spain scored 21.4 out of 100, below the European Union average (25.4) and far behind countries such as Norway and the Netherlands. According to the ICCT EV Transition Check (2025), Spain reached an 8% share of battery-electric-vehicle registrations in the first half of 2025, still below the European average. The study notes that adoption in Spain has recently rebounded, although it continues to lag behind more advanced markets such as Norway and the Netherlands. This reflects both the country's growth potential and the challenges that remain in the transition toward electric mobility.

The same barometer indicates that, in terms of electrified-vehicle market penetration, the leading regions were Navarra, Catalonia and the Basque Country—all above the national average of 22.9 points. At the opposite end were the Canary Islands, Asturias and the autonomous cities.

The barometer also details penetration among the motorized population and the weight of pure electric vehicles (BEVs) within the electrified market. In the former, Madrid stands clearly ahead, followed by the Valencian Community and Catalonia. In the latter, Navarra, the Balearic Islands and Catalonia lead the ranking, with Madrid in a significantly lower position.

With respect to charging infrastructure, the report likewise shows uneven territorial rollout. Castile and León, Cantabria and Navarra lead the rankings, while Galicia, Andalusia and the autonomous cities are at the bottom. In terms of charging-infrastructure penetration relative to the motorized population, the highest figures correspond to Cantabria, Catalonia and Castile and León, while the lowest appear in Galicia, Andalusia and the autonomous cities.

For high-power charging infrastructure (≥50 kW), Castile and León, Aragón and Castile-La Mancha rank highest, with Navarra in fourth place (12.0), posting values nearly double the national average. By contrast, the Balearic Islands, the Canary Islands and the autonomous cities show the lowest levels.

According to the same ANFAC barometer for Q2 2025, Spain scored 11.9 points for the availability of publicly accessible charging points—far below the EU-27 average of 23.4. Countries such as France (28.7) and Germany (24.3) nearly double the Spanish figure, while European leaders show a dramatic gap: the Netherlands leads with 95.3 points, followed by Norway with 82.4. Portugal (16.5) and the United Kingdom (15.4) occupy intermediate positions, surpassing Spain and closer to the EU average.

Using indicators for both vehicle penetration and charging infrastructure, ANFAC (2024) presents a combined index in which Madrid, Navarra, Catalonia, Cantabria and Castile and León appear— in that order—above the national average. At the bottom are Extremadura, Andalusia and the autonomous cities.

3.3. Associations and civil society

The electric-mobility ecosystem in Spain has a diverse network of associations that brings together users, companies, workers and civil-society organizations, all of which play an important role in transforming the sector.

3.3.1. USER ASSOCIATIONS

Citizen participation is channeled mainly through electric-vehicle user associations. Among them, AUVE (Association of Electric Vehicle Users) stands out, with a nationwide presence and a very active community. Its work focuses on defending users' interests in areas such as charging interoperability and transparency, access to incentives and the removal of administrative barriers. It also plays an important role in awareness-raising and peer support, helping individuals to adopt electric vehicles.

3.3.2. INDUSTRY AND TRADE ASSOCIATIONS

The business ecosystem has a well-established network of associations that brings together manufacturers, suppliers, charging operators and other auxiliary industries.

The business ecosystem has a well-established network of associations that brings together manufacturers, suppliers, charging operators and other auxiliary industries.

AEDIVE (Business Association for the Development and Promotion of Electric Mobility) brings together around 150 entities from across the value chain: vehicle manufacturers, charging companies, technology firms, R&D centers and start-ups. It has become the main platform for dialogue within Spain's electromobility industry, coordinating innovation projects and promoting public-private cooperation to accelerate the rollout of infrastructure and services linked to electric vehicles.

SERNAUTO (Spanish Association of Automotive Suppliers) plays a complementary role, representing more than 85% of automotive equipment and component manufacturers in Spain. Although its remit covers the entire industry, it has stepped up its engagement in the transition to electric mobility by promoting R&D&I, collaborating in PERTE VEC and disseminating good practices in sustainability and digitalization. Its work strengthens the link between electrification and Spain's strong supplier base.

The associative landscape has also expanded with the creation of AORU (Association of Ultra-Fast Charging Operators), which includes companies such as Tesla, Fastned, Electra, Zunder, Allego and Powerdot. Its objective is to

represent the interests of operators specializing in chargers of 150 kW and above, considered ultra-fast, by promoting a more suitable regulatory framework for the rollout of this infrastructure and seeking to remove existing barriers that slow its development.

3.3.3. TRADE UNIONS

The transition to electric mobility also affects employment and working conditions for the large number of workers in Spain linked to the automotive sector, as well as for those who rely on vehicles for work-related travel. In this context, the main trade unions, CCOO and UGT, have developed specific strategies to ensure that the transition is fair. Both call for electrification to be accompanied by reindustrialization plans, professional retraining and job protection, particularly in regions where traditional component manufacturers may be most exposed.

Particularly noteworthy is the "Roadmap for the Promotion of Electric Vehicles" presented by UGT FICA, UGT en Verde and Transport & Environment (T&E), which sets out a ten-point plan to accelerate the decarbonization of the Spanish automotive sector in a fair and orderly way. Its main recommendations include: creating an industrial map to identify affected jobs and new positions in demand; promoting training and retraining to avoid job losses; reforming taxation to favor electrification; establishing stable incentives for the purchase of electric vehicles; streamlining procedures for the rollout of charging infrastructure; and fostering a local, circular value chain.

The document also recommends limiting the use of hydrogen and synthetic fuels to the sectors that are hardest to electrify (such as aviation and maritime transport), while prioritizing direct electrification in land transport.

3.3.4. ENVIRONMENTAL ORGANIZATIONS

Environmental NGOs are another key actor in the process, acting as a counterweight and watchdog for transport decarbonization policies. T&E, which has a presence in Spain, runs campaigns and produces studies that advocate accelerating fleet electrification, promoting clean transport and raising the ambition of emissions standards. Greenpeace and WWF also support electric mobility but frame it within a broader shift in the mobility model: less use of private cars, more public transport and active mobility, and electrification powered by renewables. ECODES promotes electric mobility in Spain by driving public policies, forging strategic alliances and organizing events that bring together key stakeholders to accelerate a fair, innovative and decarbonized transport transition.

These organizations also monitor how measures are implemented, and demand data transparency and regulatory coherence across the life cycle. Taken together, their work helps to balance business narratives and ensure that the transition is guided by sustainability, improved air quality and social justice, avoiding regressive effects and guaranteeing affordable access to clean mobility.

Incentive plans 04

Incentive plans 04

By 2030, at least
40%
of the EU's annual demand for net-zero technologies should be met by European manufacturing by 2030.

4.1. Current situation

The development of electric mobility in Spain is supported by an increasingly cohesive regulatory framework between the European Union and the national level. At EU level, the Commission has outlined the Clean Industrial Deal as a roadmap for turning decarbonization into a lever for competitiveness, in line with the Green Deal Industrial Plan. This framework is reinforced by the Net-Zero Industry Act (NZIA), adopted in 2024, which sets a benchmark that at least 40% of the EU's annual demand for net-zero technologies should be met by European manufacturing by 2030, and includes an indicative target of 15% of global production by 2040. The NZIA covers key areas for electromobility—batteries, charging systems and digital technologies—and streamlines permitting and market conditions to scale up industry within the bloc.

On infrastructure, the Alternative Fuels Infrastructure Regulation (AFIR) replaces the previous Directive 2014/94, setting binding targets for the rollout of charging and refueling infrastructure for alternative fuels. Notable obligations include the presence of charging areas for passenger cars at least every 60 km along the Trans-European Transport Network, as well as requirements on interoperability, price transparency and ad hoc payment by card or commonly used electronic means, all with a view to ensuring a consistent and competitive user experience across the EU.

This regulation is complemented by other EU-level instruments: CO_2 standards for passenger cars and vans, with the aim that new registrations will be zero-emission by 2035; the Batteries Regulation, which addresses aspects such as carbon footprint, recycled content, due diligence and the battery passport; the Critical Raw Materials Act, which sets 2030 targets for the extraction, processing and recycling of critical raw materials; and the revision of the Energy Performance of Buildings Directive, which promotes the installation of charging facilities in car parks of residential and non-residential buildings. In parallel, the EU innovation program Horizon Europe—in particular Cluster 5 (Climate, Energy and Mobility)—funds R&I projects focused on clean mobility, storage and the digital integration of transport electrification.

At national level, industrial policy is structured around PERTE VEC, which channels Recovery Plan funds into a complete value chain for electric and connected vehicles. Through successive calls, it has driven investments in

The Climate Change and Energy Transition Law established specific obligations for charging infrastructure, including the installation of high-power chargers at high-volume service stations.

battery gigafactories, assembly plants, high value-added component projects, and industrial digitalization and sustainability processes. Complementing this, the CDTI (Centre for Technological Development and Innovation) strengthens the innovation ecosystem: its Misiones program funds applied-research consortia in areas such as safety, power electronics and new propulsion systems, while NEOTEC supports early-stage technology start-ups.

Alongside the supply-side push, Spain maintains a policy of direct demand support based on the MOVES programs, managed by IDAE (Institute for Energy Diversification and Saving). MOVES III is the main instrument to support the purchase of electric vehicles and the installation of private and public charging points; it has been extended until 2025 with an additional €400 million and a territorial allocation scheme that allows autonomous communities to tailor calls to their needs. MOVES Fleets addresses the electrification of corporate fleets operating in several regions. MOVES Singular Projects II supports innovation projects and experimental developments linked to electric mobility and fuel cell vehicles, including prototypes, pilots and technological improvements, to help them reach commercial maturity.

The Spanish legal framework underpins this rollout. The Climate Change and Energy Transition Law established specific obligations for charging infrastructure, including the installation of high-power chargers at high-volume service stations. Royal Decree-Law 29/2021 introduced urgent measures to simplify procedures and promote electric mobility and self-consumption; and Royal Decree 184/2022 regulates the provision of energy-charging services: it defines the roles of charging point operators and electric-mobility service providers, lays down transparency obligations, service criteria and minimum operating conditions, and sets out the regime for authorizing public-access and high-power charging infrastructure. In addition, the 2022 update of the Technical Building Code incorporated pre-installation requirements for charging points in new buildings and in certain refurbishments, with the aim of structurally integrating electromobility into urban and building planning.

Finally, national energy planning through the PNIEC 2023–2030 sets a target of 5.5 million electric vehicles by 2030. However, the plan does not set a specific target for the rollout of charging points, which is paradoxical given that this infrastructure is essential to sustain that level of electric-vehicle penetration. Taken together, the European and Spanish frameworks create a clear and predictable environment that drives industrial investment, accelerates infrastructure rollout, reduces administrative barriers and supports demand, with the aim of consolidating electric mobility as a central pillar of competitiveness and climate neutrality.

4.2. Proposals from the sector

Despite intense regulatory activity, sector stakeholders stress that key measures are still missing and put forward several proposals.

4.2.1. COUNTRY STRATEGY AND MULTI-LEVEL GOVERNANCE

Most stakeholders agree that Spain needs a clear direction that aligns all stakeholders. In their report on electric mobility, Value chains driven by the electrification of mobility in Spain, T&E and **alinnea** (2025) propose measures such as strengthening interministerial coordination, approving a 2025–2035 roadmap with a regulatory timetable, incentives and flagship projects, and promoting a National Charging Infrastructure Plan. EY, for its part, underlines the importance of a long-term industrial policy that reinforces Spain's international position by attracting manufacturing plants, building robust supply chains and capitalizing on software and digitalization. AEDIVE (2025) proposes a Forum for Transport Sustainability as a permanent platform bringing together public authorities, operators and industry to anticipate bottlenecks and ensure continuity in the process.

4.2.2. CHARGING INFRASTRUCTURE AND TECHNICAL PLANNING

ANFAC (2025) proposes a ten-point local action plan that addresses real-world barriers. First, it recommends creating municipal governance bodies to coordinate mobility, urban planning and power-system planning to avoid parallel decision-making. Second, it calls for targeted training and clear procedures for technical staff, with adequately resourced teams to speed up permits and licenses. Third, it stresses the importance of anticipating grid capacity through a framework that publishes available transmission and distribution capacity by city, guiding project developers and avoiding blind investments.

On public-private collaboration, ANFAC (2025) advocates well-designed land tenders—technically and economically robust—for the installation and operation of charging infrastructure by private operators, as well as using the renewal of service-station concessions on municipal land to convert them into "multi-energy stations". It also calls for planning charging facilities in residents' and mixed-use public car parks, and for agreements with key sectors such as hotels and shopping centers, so that public access to charging goes beyond minimum legal requirements. In addition, it proposes revising local tax ordinances, leveraging the flexibility granted by Royal Decree-Law 29/2021 to favor charging, and bringing forward municipal public-procurement CO_2-reduction commitments by five years relative to the private sector.

On sizing, ANFAC (2025) provides methodologies for urban environments and emphasizes that there is no single strategy, giving concrete examples: homogeneous low-power grids (e.g. Paris), high-power hubs (e.g. London) and mixed models (e.g. Berlin) can coexist, depending on mobility patterns and grid availability.

To underpin implementation, AEDIVE (2025) calls for a specific plan to streamline administrative procedures, quantified rollout targets and continuous publication of data on public charging points to improve transparency, competition and the user experience. For high-energy-demand segments, AEDIVE (2025) proposes the PIRVEP (Heavy Vehicle Charging Infrastructure Plan) to enable freight corridors and logistics hubs. T&E and alinnea build on this by proposing a National Charging Infrastructure Plan with a roadmap to 2030—adapted to low population density and the lack of private garages in many Spanish cities—and the creation of a National Rollout Centre to ensure coherence and consistency across the territory.

4.2.3. USER EXPERIENCE AND DIGITAL INTEROPERABILITY

Payment Innovation HUB and AFI stress that improving access, and the charging experience is crucial to meeting the requirements of AFIR and citizens' expectations. They propose measures such as expanding ultra-fast charging in corridors and metropolitan hubs, simplifying procedures and ensuring full interoperability—meaning the ability to locate, activate, pay for and bill charging sessions without friction. On payments, they recommend enabling universal contactless payment across the whole infrastructure —physical and digital— without prior registration or proprietary apps, supported by simple, accessible schemes. EY (2025) adds that software and data management are becoming a strategic asset for the automotive sector, generating new value-added services for users, while AEDIVE (2025) insists on the need to provide real-time information on the availability of charging points.

4.2.4. DEMAND, TAXATION AND STABLE INCENTIVES

In its report, EY (2025) proposes incentivizing fleet renewal, using fiscal instruments such as redesigning tax benefits for corporate fleets and promoting schemes that reward the scrappage of older vehicles. T&E and alinnea (2025) call for a reform of taxation and subsidies to reduce complexity and volatility. AEDIVE (2025) proposes establishing a permanent tax incentive, eliminating the Economic Activities Tax applied to charging points, and amending the registration tax to align it with environmental objectives and the total cost of ownership of electric vehicles.

On subsidies, AEDIVE (2025) calls for a simplified, updated MOVES Plan: advance payments, automated processing, and an extension of programs for corporate fleets and MOVES Singular Projects. ANFAC (2025) and EY (2025) also call for sustained institutional campaigns, in collaboration with key sectors, to accelerate social acceptance and the network effect.

4.2.5. TALENT AND SKILLS

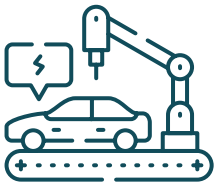
EY (2025) emphasizes that electrification and digitalization require large-scale upskilling and reskilling plans that connect manufacturing plants, supply chains and dealerships with emerging needs. The critical areas identified include electrical engineering, cybersecurity and artificial intelligence, domains in which a significant share of companies already report talent shortages. AEDIVE (2025) proposes a comprehensive training plan for electric mobility, with measures such as creating new vocational training pathways, providing teacher training in the manufacture and maintenance of components, and designing specialised reskilling programmes. It also calls for stronger public–private cooperation, leveraging Spain's existing business ecosystem with experience in electromobility, including the potential use of corporate training centres to support regulatory and technical capacity-building.

4.2.6. FLEETS AND SPECIFIC APPLICATIONS

AEDIVE (2025) proposes city-level taxi electrification plans with binding targets, the development of a logistics-sector electrification plan, and specific attention to off-highway applications. In the field of shared mobility, it recommends a local best-practice guide to harmonise standards and simplify administrative procedures. ANFAC (2025) adds that public car parks and municipal concessions should evolve into multi-energy hubs capable of serving both light- and heavy-duty vehicles.

Competitiveness in electric mobility 05

Competitiveness in electric mobility 05



In 2024, it remained the EU's second-largest vehicle manufacturer, with

2.37 M

million units produced, second only to Germany.

5.1. Spain's position in the global context

5.1.1. AUTOMOTIVE INDUSTRY

Según el Informe Anual 2024 de ANFAC, España conserva una de las bases automotrices más sólidas de Europa. En 2024, España se mantuvo como el segundo fabricante de vehículos en Europa, con una producción total de 2,37 millones de unidades, únicamente por detrás de Alemania. En materia de electrificación, la producción española alcanzó en 2024 un total de 202.555 vehículos electrificados, lo que supone un 8,5 % del total nacional. Esta proporción es inferior a la media europea, situada en torno al 20,7 %, y está claramente por debajo de los niveles alcanzados en economías como Alemania, Francia o Portugal, donde los eléctricos puros e híbridos enchufables representan un peso mayor dentro de la producción total. Pese a ello, el volumen absoluto coloca a España entre los principales productores de vehículos electrificados de la Unión, por encima de otras economías del sur y del este de Europa.

5.1.2. MARKET ADOPTION

Demand-side data from ANFAC (2025) indicate that electrified passenger cars—battery electric vehicles (BEVs) and plug-in hybrids (PHEVs)—reached a 16.8% market share in Q2 2025. Although the trend is positive compared to previous years, Spain remains in the lower tier of European markets, ahead only of Italy, the Czech Republic and Hungary. In the ANFAC penetration index (2025), a base-100 indicator measuring progress towards the target of 60% electrified sales by 2030, Spain scores 25.4 points, compared with an EU-27 average of 41.1.

5.1.3. CHARGING INFRASTRUCTURE

ANFAC (2025) also shows that Spain continues to lag behind major European markets in charging infrastructure rollout. Spain scores 11.9 points on the infrastructure index (a base-100 measure of progress towards 2030 targets for network density and charging power), compared with the EU-27 average of 23.4. Whereas countries such as the Netherlands, France and Germany concentrate most of Europe's publicly accessible charging points and have a higher proportion of fast and ultra-fast chargers, Spain maintains a smaller network still dominated by low-power equipment.

5.1.4. OPPORTUNITIES FOR SPAIN

Spain enters the transition with a large-scale, export-oriented automotive industrial base. Its network of factories, suppliers and skilled labor is attractive for electric-vehicle and battery projects, which, in turn, strengthen export capacity. Reportlinker (2024) identifies Spain as a credible destination for new investments and industrial partnerships linked to this transformation.

Scientific and technological capacity further reinforces this position. The Ministry of Science, Innovation and Universities (2025) reports that public investment in R&D&I has increased 2.5-fold since 2020 (from €7.069 billion to €17.797 billion), with greater participation by companies. According to INE (2024), internal R&D expenditure reached €22.379 billion in 2023 (1.49% of GDP), accompanied by growth in research personnel. This environment supports the development of high-value technologies in Spain: batteries and advanced materials, power electronics, vehicle software, artificial intelligence and connectivity.

In the area of autonomous and connected vehicles, ANFAC (2023) reports that Spain already has an enabling regulatory framework for their rollout, though further development is required to allow higher levels of automation such as SAE Level 4.

The association also underscores that Spain hosts some of Europe's benchmark testing and validation centers, positioning the country well to spearhead the development and trial of advanced solutions in this domain.

Socio-economic impact 06

Socio-economic impact 06

6.1. Impact on economic growth

The electrification of mobility can be considered a key driver of economic growth. The PNIEC 2023–2030 set a target of 5.5 million electric vehicles by 2030, which will require substantial investment in vehicle acquisition, the rollout of public and private charging infrastructure, and the adaptation of networks linked to electrified transport. To meet this target, energy spending is expected to shift from imported fossil fuels to renewable electricity. This will have significant implications for Spain's external balance, which is a critical factor in a context of global trade uncertainty.

The economic multiplier effect of electric mobility is also considerable. According to AEDIVE (2024), every euro invested in electric mobility generates €1.8 in GDP and has impacts across more than twenty economic sectors. For the period 2021–2030, AEDIVE forecasts €60 billion in investment, translating into an average annual contribution of €11 billion and the equivalent of 17.2% of industrial GDP, as well as 55,000 jobs per year.

McKinsey (2024) reports that in 2023 the European automotive industry generated around USD 1.9 trillion, of which approximately USD 620 billion came from the export of vehicles and related technologies. .

With the transition to electric mobility, after-sales services and associated activities could contribute an additional USD 240–300 billion by 2035.

However, the report also warns that the economic value of production could fall by as much as USD 400 billion if Europe does not consolidate its supply chain in critical areas such as batteries and power electronics.

6.2. Impact on employment

The energy transition is already having visible effects on employment in Spain. According to the PNIEC (MITECO 2024), the Spanish economy could create up to 560,000 additional net jobs by 2030 compared to a baseline scenario. Specifically in the field of electric mobility, AEDIVE (2024) estimates that the €60 billion investment over ten years could create or maintain around 55,000 jobs annually, representing approximately 2% of industrial employment in Spain. At the European level, T&E (2025) estimates that, with stable climate objectives and a robust industrial policy, electric vehicle manufacturing and its value chain would maintain aggregate employment and generate more than 100,000 new jobs in batteries and 120,000 in charging infrastructure by 2035. In the opposite scenario, up to one million jobs could be lost compared with 2025.

Social partners are also adapting their agendas. UGT (2025) calls for a roadmap for electric vehicles that includes early identification of at-risk jobs and just transition measures (training, reskilling, dual training pathways, and relief contracts). CCOO (2025) proposes incorporating these issues into collective bargaining, integrating electric mobility into workplace mobility plans and training commitments.

CCOO (2025) also notes that a labor mobility model based predominantly on private combustion vehicles has severe environmental, social, and economic consequences. It therefore argues for recognizing workers' right to sustainable mobility within trade union action and collective bargaining. To this end, it proposes the "Sustainable Mobility to Work Plan," aimed at reducing private car use and promoting alternatives such as shared mobility and electric vehicles. UGT (2025) calls for the urgent implementation of a national roadmap for the deployment of electric vehicles in Spain, based on an ambitious, rapid, fair, and orderly transition. It emphasizes the need to anticipate employment impacts and guarantee alternatives for workers through training, reskilling, and the creation of high-quality green jobs. It also proposes developing an industrial map to identify production centers and future needs, integrating the sector into the Just Transition Strategy planned for 2025, and using tools such as relief contracts, working-time reductions, and dual training to adapt workforces and foster sustainable mobility.

From a public policy standpoint, the challenge is to anchor job creation within domestic markets and value chains.

From the business perspective, the working group shared fleet and taxi case studies that highlight the competitiveness of electric vehicles due to lower operating costs and new digital services. Employment is also emerging among charging point operators, which run 24/7 control centers and increasingly large software teams.

From a public policy standpoint, the challenge is to anchor job creation within domestic markets and value chains by increasing the national content of investment (batteries, power electronics, software) and accelerating the economically viable rollout of charging infrastructure, so that the resulting employment impacts are retained in Spain.

Bottlenecks identified 07

Bottlenecks identified 07

7.1. High dependence on critical raw materials

There is a high degree of dependence on critical raw materials (lithium, nickel, manganese, graphite, etc.) for battery manufacturing. Spain has significant deposits (e.g. lithium in Extremadura, nickel in Badajoz, and manganese in Huelva and Ciudad Real), whose development must be embedded within a Just Transition policy that both enables their sustainable use and ensures coexistence with the territories and communities affected.

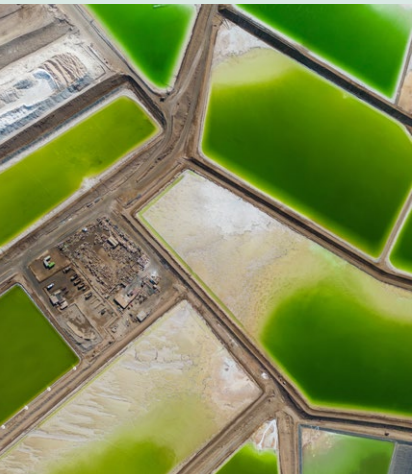
Electric batteries, which are essential for the transition to cleaner energy, require a range of critical raw materials. Among the most relevant for battery production are lithium, cobalt, nickel, manganese and graphite, all of which are key to improving battery efficiency and storage capacity. In Spain, lithium deposits are particularly noteworthy in Extremadura, where important reserves have been identified. Although Spain is not currently a major producer of cobalt, nickel or manganese, exploration and development projects are currently underway that could boost production of these materials in the future.

Transport and Environment estimates that Spain holds

13%

of the 8.8 million tonnes of lithium oxide identified in European reserves, mainly in Extremadura.

Transport & Environment (T&E) estimates that Spain holds 13% of the 8.8 million tons of lithium oxide identified in European reserves, mainly in Extremadura and particularly in the Valdeflorez and Las Navas deposits. These reserves will be essential for improving the efficiency and storage capacity of batteries (Ministry of Defense, 2025). Regarding nickel, Spain is home to the largest nickel deposit in Europe, at the Aguablanca mine in Monesterio (Badajoz). This mine holds estimated reserves of 3 million tons and is identified as one of seven priority European strategic supply projects. Finally, although there are no robust quantitative estimates for graphite reserves, there are some known, albeit scarce deposits mainly in Málaga, Huelva, Segovia and Toledo. Declaring these resources strategic would, first, prioritize their development, allowing the government to streamline mining permits and concessions and thereby facilitate investment and the rollout of new projects.



It would also entail stronger public regulation and oversight of the production and marketing of these materials, ensuring the prioritization of domestic supply. This could include tax incentives, exploration subsidies or even direct state participation in projects. At the same time, such a declaration would send a clear signal to the market, encouraging domestic and foreign private investment. Finally, it should be accompanied by a regulatory framework requiring the application of best environmental and social practices, ensuring that mining development is sustainable and responsible.

Spain is not yet a global leader in the production of rare earths, but it has the potential to contribute significantly to the supply chain of critical raw materials for electric batteries.

In short, while Spain is not yet a global leader in the production of these materials, it has the potential to contribute significantly to the supply chain of critical raw materials for electric batteries.

The strategy will need to remain flexible in the face of technological changes in batteries (e.g. increased use of sodium or new chemistries) and possible market imbalances (lithium overproduction, the rollout of solid-state batteries), in order to avoid stranded investments and adjust planning to the actual evolution of material demand.

7.2. Uncertainty over regulatory changes in industrial development planning

The automotive industry operates on very tight timelines: technological decisions on models to be produced over the next five years have already been taken. Any new policy therefore needs to be accompanied by a comprehensive timetable covering innovation, investment, fiscal measures and regulation, to provide certainty and avoid disorderly impacts along the value chain. At the same time, rapid technological change means that these timetables must remain flexible and revisable, to anticipate obsolescence risks and avoid stranded investments.

If policies aimed at industrial restructuring are not underpinned by a clear and realistic timetable agreed with all sector stakeholders, then they will fail to heed the lead times that both vehicle manufacturers and their suppliers require to adapt to new standards. This may result in uncertainty and a lack of clarity about the scope and impact of policies, with potentially negative effects such as job losses, business failures and disruptions to the value chain. There is also a risk of rushing measures through and denying companies the time they need to prepare, invest in emerging technologies and adequately train their workforce.

From the manufacturers' financial perspective, failure to adopt this approach can create a climate of insecurity that prompts the postponement or cancellation of previously announced investments, due to uncertainty about the future regulatory environment and its impact on products destined for the market.

7.3. Fiscal framework and unfair competition

The lack of a harmonized fiscal framework in Europe is generating unfair competition between countries and weakening the position of the industry vis-à-vis non-EU imports. In Spain, the complexity of public support schemes limits their effectiveness, while higher-income consumers benefit disproportionately from existing incentives, raising concerns about social equity in access to electric mobility. This becomes particularly evident when comparing vehicle manufacturing dynamics between Spain and Central and

Eastern European countries. While Spain has traditionally been a highly productive automotive hub, countries such as Slovakia, Hungary and Romania have attracted significant investment from major car manufacturers, due in part to more flexible tax policies and lower labor costs, which act as a magnet for large-scale production. A more harmonized fiscal framework could help level the playing field, ensuring that competitiveness is grounded in innovation and quality rather than in the search for lower regulatory standards.

Tariffs also play a crucial role in protecting the European automotive industry. When properly applied, they help prevent dumping or exporting vehicles at prices below production costs.

Tariffs also play a crucial role in protecting the European automotive industry. When properly applied, they help prevent dumping or exporting vehicles at prices below production costs to gain market share unfairly. This is especially relevant today, given the surge in electric-vehicle exports from China, which benefit from extensive state subsidies. Beyond China, countries such as Morocco and Turkey have also emerged as significant vehicle manufacturing centers. Although their import duties into the EU are generally low or even zero under existing trade agreements, these arrangements may need to be reviewed if unfair practices are identified. It is also important to note that many of these countries do not apply environmental standards comparable to those of the EU, enabling them to manufacture vehicles at a lower cost but with a greater ecological footprint.

7.4. Lack of standardization for electric vehicle batteries and software

The standardization of electric vehicle (EV) batteries is one of the most significant technological and design challenges today. The diversity of chemical compositions—such as lithium iron phosphate (LFP), nickel manganese cobalt (NMC), or nickel cobalt aluminum (NCA)—and the different cell formats (cylindrical, prismatic or pouch) meet varying requirements for energy density, safety, durability and cost. According to the International Energy Agency, more than 70% of EVs sold in Europe in 2024 used different battery chemistries, illustrating the absence of a common standard. Establishing a standard would restrict innovation and could exclude emerging technologies that may offer superior performance in the future. At present, lithium batteries are overproduced (IEA, 2024), while solid-state batteries are just beginning to reach the market, increasing the risk of stranded investments.

At the commercial and strategic level, standardization presents significant challenges related to intellectual property and supply chain structure. Battery design and management—particularly through battery management systems (BMS)—is one of the key differentiating elements among manufacturers. Each company develops its own software and hardware, protecting them as strategic assets. In addition, major automotive groups have established strategic alliances with suppliers such as CATL, LG Energy Solution and Panasonic, and have invested in dedicated gigafactories. A large-scale standardization process could negatively affect these partnerships and investments, dismantling supply chains optimized for proprietary designs.

In conclusion, although standardization could reduce costs and facilitate both recycling and second-life applications, the automotive industry is currently undergoing intense technological competition.

Continuous innovation, protection of intellectual property and optimization of supply chains all pose substantial barriers. Progress in this direction would require sector-wide consensus and regulatory incentives that balance the need for technological innovation with the benefits of standardization, like what has taken place in sectors such as mobile communications and computing where interoperability has proven key to market development.

Differences in environmental regulation also create a competitive disadvantage for European companies, which must comply with more stringent standards. This makes the role of tariffs even more important in levelling the playing field. The issue extends far beyond tailpipe emissions: it encompasses the full life-cycle carbon footprint. Vehicles manufactured in other countries may have a higher total carbon footprint due to less clean production processes, greater use of energy from non-renewable sources or less efficient transport logistics. Considering the entire life cycle of a vehicle, from raw material extraction to end-of-life, reveals the true environmental impact and underlines the need for tariffs to reflect these hidden costs.

Added to this is the pressure from manufacturers outside the EU who sell vehicles under conditions of social, financial and environmental dumping. For this reason, the fiscal framework must ensure a level playing field that protects both the competitiveness of the European industry and consumer rights.

7.5. Electrical infrastructure and vehicle integration into the grid (charging and V2G)

The rollout of charging infrastructure in Spain faces significant shortcomings. First, the coexistence of multiple types of connectors and platforms increases costs and creates barriers to the adoption of electric vehicles. While progress has been made in fast charging, AC charging points in urban areas and residential neighborhoods have been neglected. In addition, the currently low average occupancy rates at charging stations undermine their profitability, which threatens investment in the sector.

The growth of the electric vehicle (EV) fleet in Spain also represents a strategic opportunity for the electricity system, thanks to the ability of EV batteries to operate using Vehicle-to-Grid (V2G) technology. V2G enables vehicles not only to consume energy but also to feed it back into the grid, acting as decentralized energy storage units. This is crucial for managing demand peaks and for integrating renewable energy sources, such as solar and wind, which are inherently intermittent. By delivering energy to the grid at times of high demand and recharging during off-peak hours, EVs can contribute to system stability and reduce the need to activate more polluting and costly backup power plants.

In Spain, current regulation prohibits V2G except in non-remunerated self-consumption settings, which limits the rollout of this technology. Unlocking its potential requires a legal and market framework that incentivizes EV owners to participate. V2G could enable users to generate income from the energy they return to the grid, reducing the cost of electric mobility and turning them into active participants in the energy transition.

Coordinating this distributed battery network through intelligent management systems is essential to optimize energy flows and ensure grid reliability.

Ultimately, the effective implementation of V2G can transform electric vehicles from simple energy consumers into key components of a more resilient, efficient and sustainable electricity grid.

7.6. Lack of talent and retraining for the industrial transition

The transition to electric vehicles depends not only on technology or industrial investment, but also on the sector's ability to attract, train and retrain talent. The Spanish workforce, highly specialized in the automotive industry and competitively priced, is ageing rapidly and is not evolving at the pace of technological change. Without an effective retraining strategy in vocational education and lifelong learning, many workers risk being displaced during industrial restructuring.

The shift towards electric mobility is radically transforming the skills required in the workplace, with growing demand for specialized profiles. EV manufacturing reduces and transforms certain operations, which may reconfigure labour needs and create temporary imbalances in existing plants. Reducing absenteeism, strengthening versatility and accelerating retraining are key levers for maintaining productivity during the transition. New skills will be required in batteries, power electronics, software and data, accompanied by active organizational change management (versatility, shift redesign).

7.7. High industrial energy costs and strong international competition

Although Spain's pure energy cost is low, network charges and levies raise the final industrial bill to levels 30 to 40 percent above the European average. At the same time, pressure from new international competitors, often described as the "Chinese tsunami", is intensifying competition and placing additional strain on the industry. This context makes it essential to redefine value chains to ensure the long-term viability of domestic production.

7.8. Lack of unified metrics to assess the life cycle of electric vehicles

European regulation on vehicle emissions tends to prioritize the use phase of vehicles over other life-cycle stages, without adequately accounting for emissions linked to manufacturing, transport, recycling and end-of-life. This over-represents vehicles produced far from the point of sale and does not capture local efforts in efficiency or circularity. This partial view benefits manufacturers operating in countries with lower environmental requirements or privileged access to clean energy and penalizes industries such as Spain's, which face stricter standards and higher energy costs.

The absence of an official metric that considers the full life cycle of EVs distorts competition, obscures the circularity and energy-efficiency efforts of domestic manufacturers and hinders the design of industrial policies that reward responsible and local production.

Recommendations for action 08

Recommendations for action 08

8.1. Promote a strategy for raw material sovereignty

Description

The aim of this proposal is to reinforce the industrial sovereignty of Spain's automotive sector by promoting the efficient and responsible use of domestic resources, particularly strategic resources such as critical raw materials. It proposes developing a policy framework that prioritizes the extraction, processing and use of these materials within Spain, alongside stronger coordination at European level to build capacity not only nationally but across the EU. The goal is to reduce import dependence and ensure the availability of critical raw materials for battery manufacturing and other components essential to the transition to electric mobility.

The initiative also introduces mechanisms to enforce the highest environmental and social standards across the entire value chain, from mining to industrial processing, thereby driving sustainable and responsible development. The proposal should be explicitly incorporated into the next update of the PNIEC, strengthening raw material sovereignty through sustainable extraction, processing, recycling and reuse in Spain. This approach aligns with European initiatives such as the European Battery Alliance to reinforce the battery value chain.

Any measures linked to this proposal must include a detailed timetable with milestones, deadlines and dependencies to enable proper assessment of their impact on industry and suppliers, as emphasized in the working group discussions.

The governance, timetable and monitoring mechanisms of this strategy would follow the common framework set out in the proposed **National Just Transition Plan**, ensuring coherence and multilevel coordination.

Objective

The main objective of the proposal is to ensure that the Spanish automotive industry maintains and strengthens its competitiveness and sustainability in the global shift towards electric mobility.

The main objective is to ensure that the Spanish automotive industry maintains and strengthens its competitiveness and sustainability in the global shift towards electric mobility. Securing stable and reliable access to the raw materials required to produce batteries, electric motors and other key systems is essential. This would help consolidate Spain's position within the European automotive value chain, attract investment, foster innovation and create quality employment. It also seeks to ensure that the transition to a greener and more digital industry is inclusive, with benefits shared across stakeholders, particularly workers and local communities, through the generation of local green jobs.

In parallel, the proposal aims to protect the social and economic fabric of mining regions by ensuring a Just Transition. It includes anticipating technological changes in battery chemistries to adjust demand for raw materials and minimize the risk of stranded assets.

The measures that follow focus on strengthening extraction, processing, recycling and second-life capabilities, alongside enhanced traceability and technology monitoring to avoid stranded assets.

Specific measures

a. Include a dedicated Just Transition policy for the strategic raw materials sector in the next update of the PNIEC. This policy should provide investment incentives, streamline administrative procedures and ensure mechanisms for the participation of all stakeholders.

b. Promote structural support, both financial and fiscal, for companies engaged in the exploration, extraction, processing and recycling of rare earths and other critical minerals in Spain, with particular emphasis on innovation and process sustainability.

c. Support R&D&I projects that develop new technologies for the more efficient and environmentally responsible extraction, treatment and reuse of raw materials. Specific calls should be established and access to national and European funds facilitated.

d. Create an interministerial coordination committee involving the Ministries of Ecological Transition, Industry, and Science and Innovation, together with representatives of regional governments, to align strategies, share best practices and oversee implementation, accounting for environmental and local considerations.

e. Develop specialized technical training campaigns in sustainable mining, battery chemistry and recycling, complementing the retraining programs of the Just Transition Plan.

f. Establish a timetable with milestones and monitoring indicators, to be reviewed annually.

g. Strengthen industrial capacities for recycling and second life (support schemes and pilot projects) to reintroduce critical materials into the value chain and reduce dependence on extraction.

h Establish a technology and market monitoring mechanism (e.g. sodium batteries, solid-state batteries, lithium overcapacity) to adjust permitting and investment decisions and avoid stranded assets.

i. Coordinate with the European Battery Alliance and EU programs to standardize traceability and sustainability criteria for raw materials and batteries.

j. Activate co-investment vehicles and financing instruments with the financial sector for responsible extraction, recycling and materials-focused R&D projects.

Stakeholders involved

1) **PUBLIC SECTOR (NATIONAL LEVEL)**

a. **Ministry for Ecological Transition and the Demographic Challenge (MITECO):** Lead the critical raw materials strategy, ensure alignment with climate and biodiversity objectives, and integrate Just Transition criteria in mining regions.

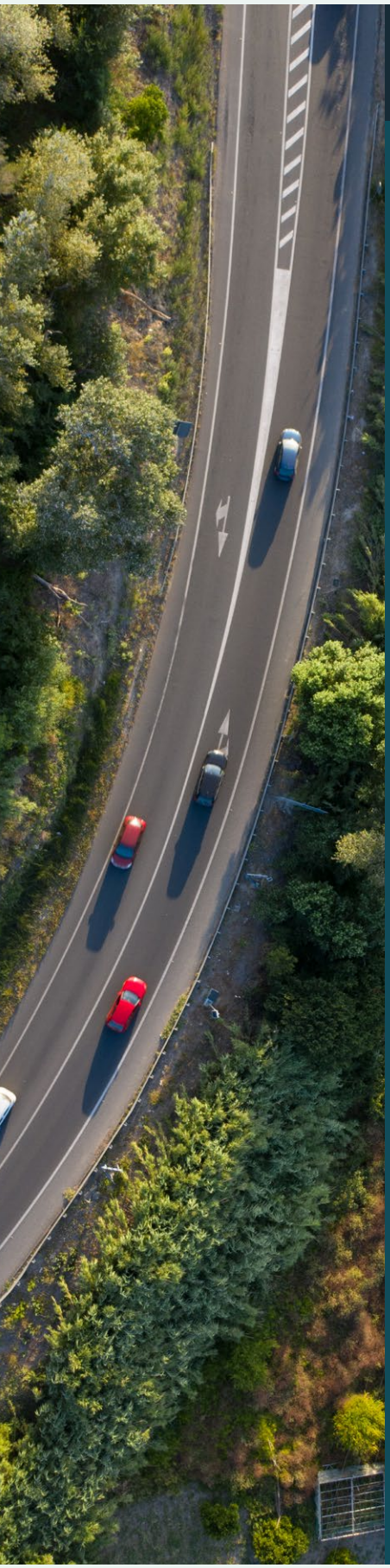
b. **Ministry of Industry and Tourism (MINTUR):** Define incentives for industrial reconversion and the implementation of processing and recycling projects; design direct subsidies and fiscal measures to support local production of critical materials.

c. **Ministry of Science and Innovation and Ministry of Universities:** Finance R&D&I in new battery chemistries, sustainable extraction and recycling through programs such as Science and Innovation Missions and CDTI calls; promote public-private consortia.

d. **Ministry of Education, Vocational Training and Sport:** Update vocational training curricula in sustainable mining, battery chemistry, electromobility and recycling; establish retraining pathways in affected regions.

e. **Ministry of Finance and Public Service:** Design a tax framework that favors investment in strategic projects (deductions, accelerated depreciation, reduced VAT for recycled critical inputs) and align taxation with European standards on life-cycle emissions and carbon footprint.

f. **Ministry of Foreign Affairs, European Union and Cooperation:** Promote European governance of raw materials, defend strategic interests and participate in international alliances for secure supply.



g. **CDTI and public R&D programs:** Prioritize calls focused on durability, recyclability and substitution of critical materials, fostering consortia between companies and technology centers.

2) **EUROPEAN UNION (EUROPEAN COMMISSION, EUROPEAN PARLIAMENT AND COUNCIL)**
Define traceability and sustainability criteria for critical raw materials and harmonize environmental and labor standards for their extraction and processing, in line with the Critical Raw Materials Regulation and the European Battery Alliance.

3) **PRIVATE SECTOR (MANUFACTURERS AND SUPPLIERS)**
Automotive manufacturers and suppliers should actively participate in industrial reconversion plans, adapting production processes to maximize the use of domestic materials. They should also engage in continuous training for their workforce to build competencies in technologies associated with electric mobility and the circular economy.

4) **REGIONAL AND LOCAL ADMINISTRATIONS**
Collaboration with regional governments and local authorities is essential to adapt measures to territorial specificities, optimize resource use and support the social and economic integration of mining and industrial projects.

5) **OTHER STAKEHOLDERS (TRADE UNIONS AND ASSOCIATIONS)**
Trade unions such as CCOO and UGT, and other representative organizations, play a key role in ensuring a Just Transition. They must safeguard labor rights, promote training and retraining, and support the creation of quality jobs and new career opportunities.

Associations representing local communities and environmental interests should be involved to reflect territorial concerns and environmental protection perspectives.

6) **RESEARCH CENTERS AND UNIVERSITIES**
Academic and scientific institutions should lead R&D&I projects, support knowledge transfer and train specialized professionals for sustainable raw materials management, contributing to technological progress and sector competitiveness.

7) **FINANCIAL SECTOR AND INVESTMENT FUNDS**
Mobilize capital towards responsible extraction, recycling and processing facilities, applying ESG criteria and linking returns to progress against the established timetable.

Potential barriers

a. **Financing and private investment.** Despite the existence of European and national mechanisms, activities linked to critical raw material development require very substantial investment. In addition, the European Union currently invests far less than China in this area, which may limit competitiveness if sufficient financial resources and public-private partnerships are not mobilized.

b. **Social and territorial acceptance.** The development of lithium or rare earth deposits in Spain is likely to generate strong local opposition, potentially escalating into conflict. It is therefore essential to incorporate a Just Transition approach that enables extractive projects to coexist with local communities and the environment. Without social consensus, projects may be halted and fail to progress.

c. **Regulatory and administrative barriers.** Rare earth mining involves lengthy permitting and authorization procedures. If these processes are not streamlined within a clear regulatory framework, project timelines may not align with companies' return-on-investment needs or with the industrial schedules required by the automotive sector over the next 5 to 10 years.

d. **Risk of technological obsolescence.** The shift toward new battery chemistries could reduce demand for lithium or other minerals. This creates a risk of stranded assets if mining investments are made without effective mechanisms for technology monitoring and sufficient flexibility.

e. **European fragmentation.** Without a harmonized fiscal and tariff framework at EU level, there is a risk of intra-European competition for strategic investment projects that would reduce Spain's attractiveness compared to other Member States.

8.2. Preparation and development of a comprehensive strategic timetable

Description

The solution to this bottleneck lies in the creation and implementation of a comprehensive and jointly agreed strategic timetable for monitoring industrial policies. This is not a simple calendar but a detailed and guiding roadmap that enables continuous planning, coordination and evaluation of actions, ensuring consistency among stakeholders, transparency in processes and the ability to adapt to changes in the economic and technological environment.

This timetable must be developed with a long-term vision and with the active participation of all relevant stakeholders. It should serve as a living, revisable roadmap, operating under a regulatory sandbox-type mechanism that enables continuous adjustments based on lessons learned throughout the process.

The plan will include distinct phases dedicated to innovation, industrial investment, taxation, skills development and circularity, ensuring an orderly, inclusive and sustainable transition.

Objective

The objective is twofold. First, to provide the certainty and predictability that industry needs to plan its operations and investments. Knowing in advance the key dates for new regulations to enter into force or for incentives to become available allows companies to make informed decisions. Second, the aim is to ensure a fair and efficient transition that minimizes negative impacts and takes environmental and local considerations into account. A well-designed timetable allows for gradual adaptation, reducing the risk of mass unemployment and loss of productive capacity. It also helps avoid stranded assets linked to rapid technological change and ensures that Spanish industrial policy remains aligned with European guidelines, where key manufacturing decisions are shaped.

Specific measures

a. **Joint diagnosis and planning.** Government, industry, trade unions and experts should jointly carry out an honest diagnosis of the current situation and set realistic deadlines. This cannot be an imposed plan but a shared vision. It must also include technological and market risk analysis.

b. **A multifaceted timetable.** The timetable must go beyond regulatory entry-into-force dates, including:

i. *Innovation phases:* Deadlines for the development and adoption of new technologies. For example, defining when support for solid-state battery research will be available.

ii. *Investment calendar:* Dates when public funds will be available for companies to invest in new production lines or adapt existing plants.

iii. *Tax timetable:* A clear schedule for implementing tax incentives or, conversely, taxes intended to discourage obsolete technologies.

iV. *Skills roadmap:* A detailed plan with defined deadlines for training workers in new skills, linked to agile vocational training and worker retraining.

c. **Flexibility and communication.** Although the timetable should set clear milestones, there must be mechanisms for periodic review to adjust to technological developments and global market conditions. Rather than a rigid plan, the timetable should be reviewed annually through an open, transparent regulatory update mechanism. This sandbox approach enables policy to adjust to the pace of technological innovation and builds confidence among stakeholders. Continuous, transparent communication is essential to maintaining trust in the process.

d. **The timetable must be coordinated with the Clean Industrial Pact**, the AFIR Regulation and the 2035 zero-emission target to ensure coherence and avoid regulatory misalignment.

Stakeholders involved

1) **PUBLIC SECTOR (NATIONAL LEVEL)**

a. **Ministry for Ecological Transition and the Demographic Challenge (MITECO):** Lead the strategy for critical raw materials, coordinate Just Transition policies in affected territories and ensure alignment with European decarbonization objectives.

b. **Ministry of Industry and Tourism (MINTUR):** Promote the conversion of factories and suppliers to electric vehicle production, support industrial innovation and drive a timetable agreed with manufacturers and trade unions.

c. **Ministry of Science and Innovation and Ministry of Universities:** Establish realistic deadlines for innovation program rollout.

d. **Ministry of Education, Vocational Training and Sport:** Adapt the design and deployment of training and retraining programs in line with the timetable, updating vocational training pathways to reflect new skills needs.

e. **Ministry of Finance and Public Service:** Establish a fiscal framework with incentives and clearly phased introduction of taxes or subsidies, ensuring consistency with the timetable and industrial competitiveness.

2) **PRIVATE SECTOR (MANUFACTURERS AND SUPPLIERS)**
Bring practical knowledge of production cycles and real operational constraints. Their participation is essential for realistic timelines.

3) **OTHER STAKEHOLDERS (TRADE UNIONS AND ASSOCIATIONS)**
Ensure that milestones reflect sectoral and workforce needs.

4) **RESEARCH CENTERS AND UNIVERSITIES**
Provide the scientific and technological expertise needed to guide investment towards the most promising solutions and design training programs.

5) **FINANCIAL SECTOR AND INVESTMENT FUNDS**
Align co-investments and financing instruments with the timetable.

6) **OPERADORES ENERGÉTICOS E INFRAESTRUCTURA DE RECARGA**
Adjust infrastructure rollout to regulatory milestones.

Potential barriers

a. **Lack of institutional coordination.** Developing a strategic timetable requires joint participation of ministries, industry and trade unions, which can be difficult to achieve.

b. **Technological uncertainty.** Rapid innovation in batteries, software and new chemistries makes it difficult to forecast stable timelines over five or more years. This can result in measures becoming outdated and create stranded investments if updates are not made swiftly.

c. **Industry resistance**. Since companies have already planned their investment cycles, any change not supported by a realistic timetable will be perceived as a threat, generating pushback and putting investments at risk.

d. **Labor and social impact.** The absence of clear deadlines for training and retraining may lead to job losses or precarious employment, especially among suppliers and SMEs with limited capacity to adapt.

e. **Financial constraints.** Public and private funds must be released on schedule. Delays in budget execution, ineffective tax incentives or a lack of financial sector commitment could compromise milestone achievement.

f. **European fragmentation.** If national timetables are not aligned with EU-level guidance, regulatory inconsistencies may arise, creating legal uncertainty and reducing competitiveness relative to other Member States.

8.3. Promoting competitiveness and tax harmonization for a sustainable automotive industry

Description

The proposal consists of establishing a harmonised fiscal framework at the European level, which avoids internal fragmentation and strengthens environmental and labour standards.

The proposal consists of establishing a harmonized tax framework at European level to avoid internal fragmentation and strengthen environmental and labor standards. This framework should incorporate tariffs linked to the vehicle's life cycle and carbon footprint, ensuring that imported vehicles comply with the same rules as those manufactured in Europe.

Public aid should also be simplified to make it accessible to households and small businesses, incorporating mechanisms such as social leasing that enable lower-income households to participate in the transition.

Complementary to the European framework, national fiscal measures will be promoted to support industrial competitiveness, reduce energy costs and advance the circular economy. These measures include incentives for investment in new electric vehicle lines and gigafactories, accelerated depreciation for digitalization and energy-efficiency equipment, and local tax rebates linked to green investments.

In parallel, mechanisms will be promoted to reduce the automotive sector's energy bill by expanding long-term contracts with renewable energy suppliers (PPAs), strengthening self-consumption and storage programs, and advancing the digitalization of energy processes.

Objective

The objective is to ensure fair access to electric mobility while protecting European industry from unfair competition. The aim is to guarantee that vehicles manufactured in Europe, subject to stringent environmental standards, are not disadvantaged by imports from countries with less demanding rules. Applying a fiscal cost based on emissions would help prevent the undervaluation of more polluting vehicles and encourage exporters to adopt cleaner production processes to access the European market. In this way, the transition to sustainable mobility would be both socially equitable and industrially robust.

Complementary national measures for tax incentives and energy-cost reduction will strengthen the competitiveness, productivity and investment attractiveness of the Spanish industrial base, supporting job creation and the modernization of existing plants.

Specific measures

a. Extend the Carbon Border Adjustment Mechanism (CBAM) to the import of motor vehicles, as is already the case for sectors such as cement, iron and steel, aluminum, fertilizers, hydrogen and electricity.

b. Develop a tax framework that accounts for emissions and environmental impacts across the entire life cycle of the vehicle, uniform across Europe.

c. Apply the life-cycle criterion to all aid schemes and incentives for the purchase of EVs.

d. Impose tariffs based on the vehicle's life cycle and carbon footprint.

e. To avoid competition between Member States, establish a harmonized tax framework at European level.

f. Complementary national tax and energy measures:

- Modification of the Construction, Installations and Works Tax (ICIO) to exclude industrial machinery from the calculation basis for new EV lines and gigafactories.
- Maximum allowances under the Business Activity Tax (IAE) and other local taxes linked to green investments.
- Accelerated depreciation for automation, digitalization, and energy-efficiency equipment.
- Extension of the Statute for Electro-intensive Consumers or the creation of a specific category for the automotive sector.
- Promotion of long-term PPAs with renewable-energy suppliers.
- Support for self-consumption, energy storage and digitalization of industrial processes.
- Promotion of national networks for battery reuse and recycling, with traceability and digital passports.
- Support for the second-hand EV market through incentives and quality guarantees.

g. National LCA methodology and environmental labelling

- Development of a national methodology for calculating emissions across the vehicle's life cycle, based on international standards, validated by independent technical bodies and subjected to periodic audits.
- Inclusion of the life-cycle criterion in vehicle type-approval, purchase incentives and environmental taxation, with clear and verifiable thresholds.
- Promotion of this metric in European forums as a tool for industrial and environmental fairness.
- Creation of a labelling system informing consumers about the vehicle's total impact, from extraction to recycling.

– Awareness campaigns on life cycle impacts to encourage responsible purchasing decisions.

This methodology will serve as the technical basis for the application of the automotive CBAM, as defined in this proposal.

Stakeholders involved

1) NATIONAL AND REGIONAL PUBLIC SECTOR

a. Ministry of Finance and Public Service:
Create and implement fiscal and tariff instruments

b. Ministry of Industry and Tourism (MINTUR): Ensure that fiscal measures reinforce industrial competitiveness and coordinate the integration of life-cycle criteria into regulations and support programs.

c. Ministry for Ecological Transition and the Demographic Challenge (MITECO): Incorporate life cycle and carbon-footprint criteria into the design of tariffs and incentives.

d. Ministry of Economy, Trade and Business:
Promote industrial digitalization and streamline fiscal procedures.

e. Autonomous Communities and Local Authorities:
Apply local tax rebates and facilitate licenses for self-consumption and circular-economy initiatives.

2) PRIVATE SECTOR (MANUFACTURERS AND SUPPLIERS)
Assess the carbon footprint of EVs imported from outside the EU, applying equivalent environmental standards. In parallel, participate in long-term energy contracts (PPAs) with renewable energy suppliers and promote the development of battery recycling and second-life networks, aligned with competitiveness and circularity objectives.

3) CONSUMERS AND CIVIL SOCIETY

a. Actively participate in new electric mobility access models, such as social leasing, enabling middle- and low-income households to access EVs at affordable prices.

b. Collaborate with public authorities designing and monitoring aid programs, identifying economic or administrative barriers to effectiveness.

c. Promote transparency regarding prices, incentives and real EV operating costs through consumer associations and public information campaigns.

d. Raise awareness of the environmental and economic benefits of EVs, supporting higher social acceptance of fiscal and tariff instruments linked to carbon footprint.

e. Participate in mechanisms that assess the distributive impact of fiscal measures, ensuring fair sharing of the costs and benefits of the transition.

4) **OTHER STAKEHOLDERS**

a. **Technical bodies and analytical centers**—such as IDAE, CIEMAT, INE, universities, technology centers and specialized think tanks: contribute to technical and economic assessments of the impact of applying CBAM to the automotive sector and of its effect on global emissions reduction.

b. **Sectoral associations and chambers of commerce:** Advocate before national and EU regulators for the inclusion of the automotive sector in the CBAM and propose equitable fiscal measures that strengthen industrial competitiveness.

c. **Standardization and verification bodies:** Provide data, analysis and certification ensuring harmonized carbon-footprint criteria and traceability and life-cycle verification in international vehicle trade.

d. **Technology centers and universities:** Develop tools and databases for environmental-footprint verification.

e. **Financial sector:** Integrate life-cycle criteria into investment assessments and provide green credit lines or preferential financing for automation, digitalization, and circularity projects.

f. **Trade unions:** Promote training for processes with certified environmental traceability.

Potential barriers

a. **Regulatory fragmentation in Europe.** The lack of consensus among Member States may delay tariff and tax harmonization, which perpetuates unfair competition and encourages investment to shift to countries with more flexible conditions.

b. **Administrative difficulties.** processing public aid has already proven complex and time-consuming in Spain. Without simplification, the new measures could reproduce the same obstacles and limit the reach of incentives, particularly for the self-employed and SMEs.

c. **Equity and social acceptance.** Tax incentives may continue to favor higher-income consumers, which poses a risk. If tools such as social leasing are not expanded, the perception that electric mobility is a privilege of the elites may become entrenched.

d. **Aggressive international competition.** Countries such as China can continue to heavily subsidize their electric vehicle exports. These practices could weaken the competitive capacity of European manufacturers, even in the presence of tariffs.

e. **Risk of trade retaliation.** The introduction of mechanisms such as an automotive CBAM may trigger diplomatic and trade conflicts with exporting countries, creating uncertainty in global supply chains.

f. **Transition costs for industry.** Implementing tariffs linked to carbon footprint or full life cycle may increase the initial costs of the transition, potentially affecting margins for manufacturers and vehicle affordability for consumers.

g. **Budgetary and fiscal constraints, and energy price volatility.** These may reduce the scope and effectiveness of incentives aimed at the automotive sector and at reducing energy costs.

8.4. Developing a battery standardization strategy to strengthen the value chain and reduce costs

Description

Resolving the challenge of battery standardisation for electric vehicles requires a progressive and collaborative approach that avoids drastic solutions and prioritises consensus-building.

Resolving the challenge of battery standardization for electric vehicles requires a progressive and collaborative approach that avoids drastic solutions and prioritizes consensus-building. It is essential to address both technical and commercial barriers, recognizing the complexity of aligning the interests of manufacturers, suppliers, regulators and recycling companies. This requires considering the industrial dynamics of EVs, recent successful standardization models in electronics (such as USB or network protocols), and the regulatory direction set by the European Battery Alliance, standardization consortia, the EU Battery Regulation, and recycling and technology platforms.

The strategy essentially aims to reduce costs by adopting common interfaces and modules that enable economies of scale in manufacturing and therefore lower the final price of batteries and vehicles. It also promotes the circular economy by facilitating reuse and recycling, simplifying repurposing for energy storage through design and communication standards, and maximizing material recovery. In parallel, standardization fosters interoperability between manufacturers, enabling batteries from different producers to operate safely and efficiently across different vehicle platforms and charging infrastructures. This reduces dependence on single-system architectures and increases market flexibility. The initiative also fosters sustainable innovation by directing technological development towards core aspects such as cell chemistry and efficiency, while establishing common interface standards that do not constrain competitiveness. Finally, it strengthens the supply chain by enhancing its resilience and reducing reliance on single suppliers as standardized modules can be manufactured by multiple companies.

The first step is the standardization of interfaces and software. This requires developing and adopting common communication protocols between batteries, vehicles, charging infrastructure and diagnostic systems, including defining a standard format for Battery Management System (BMS) data such as state of charge, temperature and state of health. This would enhance interoperability, maintenance, safety and second-life battery management. In parallel, the strategy should promote the creation of a modular ecosystem in which battery modules follow predefined physical and electrical specifications. Manufacturers may continue to innovate in cell chemistry and design, but these cells would be assembled into compatible, flexible modules, increasing efficiency in the supply chain and in vehicle platform architecture. This modularity would reduce costs and support technological adaptation across the sector.

Finally, to support the circular economy, design standards should be introduced to facilitate battery reuse and recycling, alongside universal classification systems to assess end-of-life battery condition.

Objective

The objective is to build a competitive industrial system that reduces manufacturing costs, avoids unnecessary duplication and ensures a robust circular economy by enabling efficient recovery of materials. The strategy seeks to increase the affordability of electric vehicles and reinforce Europe's technological and industrial autonomy.

Specific measures

a. Technical and Design Measures:
Focused on physical and digital standardization without limiting innovation in cell chemistry.

i. *Communication interface:* Establish a common communication protocol between the battery and the vehicle (BMS–ECU) and with charging stations. This would ensure interoperability and universal diagnostics, like a USB port for vehicles.

ii. *Modular design:* Define a standard set of dimensions and voltage ranges for battery modules. For example, create 5 kWh and 400 V building blocks that manufacturers can use as the basis for their battery designs, allowing flexibility while ensuring compatibility in assembly.

iii. *Connectors and ports*: Standardize physical connection points (plugs and sockets) for charging and diagnostics, reducing the need for multiple adapters and facilitating maintenance.

iv. *State of Health (SOH) classification system:* Implement a universal SOH classification system and require mandatory labelling of the battery's chemical composition to support reuse and recycling

v. *Standardization:* Promote the standardization of battery enclosures and modules to improve logistics, repair processes and the circular economy, even if this involves giving up highly customized range-optimized designs.

b. Regulatory and Governance Measures:

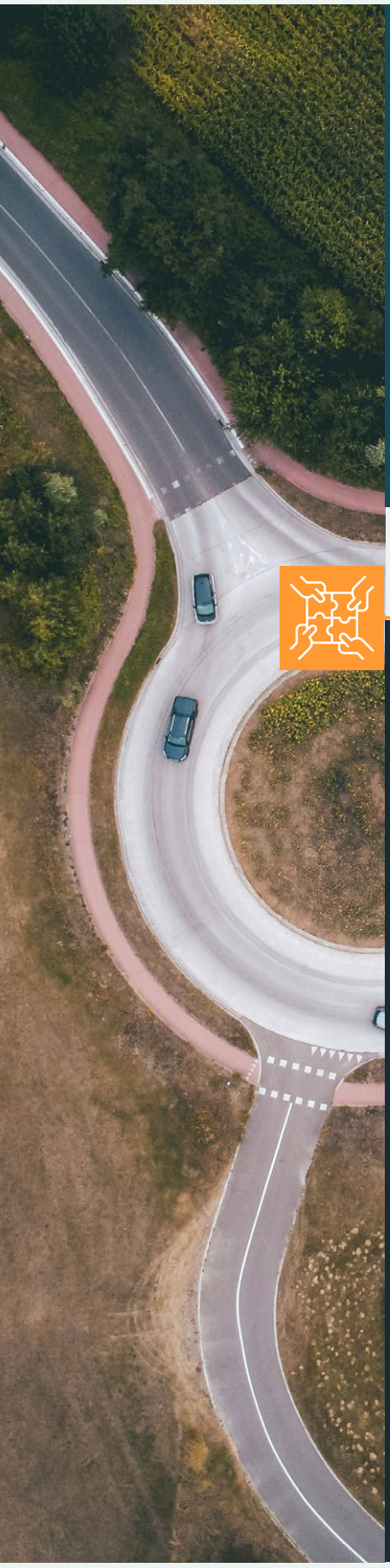
i. *Creation of a consortium* to develop and certify the new standards.

ii. *Incentives and obligations for companies adopting the standards.* Alternatively, regulatory mandates could be established requiring compliance with interoperability and recycling standards.

iii. *Single certification scheme:* Establish an independent certification body to validate compliance with battery standards and award an approval seal guaranteeing interoperability and sustainability.

iv. *Common formats:* Following the European example of universal chargers, regulatory mandates should require the adoption of common module and connector formats.

v. *Phased standardization:* Define phased standardization objectives, reviewable in line with technological advances.



c. **Measures for the Circular Economy:**
Sustainable batteries from design to end of life.

i. *State of Health (SOH) classification system*: Create a universal and transparent SOH metric to assess a battery's performance and remaining useful life, facilitating the second-life battery market for energy storage.

ii. *Standardized labelling:* Introduce mandatory labelling on each battery showing its chemical composition and content of critical materials (such as lithium, cobalt and nickel), simplifying sorting for recycling.

iii. *Design for disassembly:* Encourage or require the use of quick-release mechanisms and accessible components in battery design, making recycling and material recovery safer and more efficient.

iv. *Public-private partnerships:* Promote public-private partnerships to develop pilot projects for second-life batteries in stationary energy storage applications.

Stakeholders involved

1) **PUBLIC ADMINISTRATION**

a. **European Commission:**
Define the common regulatory framework and harmonize standards for modules, connectors and software, as it has already done with universal chargers.

b. **Ministry for Ecological Transition and the Demographic Challenge (MITECO):** Incorporate into the PNIEC a regulatory framework requiring chemical labelling, State of Health (SOH) information for batteries, and designs that facilitate recycling and second life.

c. **Ministry of Industry and Tourism (MINTUR):**
Make aid from PERTE VEC and other programs conditional on the adoption of common battery module standards and shared communication protocols.

d. **Ministry of Science and Innovation and Ministry of Universities:**
Finance R&D&I projects on battery software and hardware standardization, supporting technology centers, and universities through CDTI Mission calls.

e. **Ministry of Finance and Public Service:**
Create tax deductions for companies that certify the interoperability of their batteries and facilitate their recovery and recycling.

f. **Comunidades Autónomas y EELL:**
Promote pilot projects for second life and recycling plants, facilitate licensing and support regional innovation hubs.

2) KEY INDUSTRY STAKEHOLDERS

a. Electric Vehicle Manufacturers (OEMs)

- Participate in the definition and adoption of common standards for batteries, connectors and software, ensuring interoperability between brands.
- Share technical information with standardization bodies and European consortia to accelerate technological convergence.
- Incorporate circularity and recyclability criteria into vehicle and battery design from the earliest development stages.

b. Battery Manufacturers

- Develop storage technologies compatible with European standards and provide access to technical data for standardization.
- Collaborate with vehicle manufacturers and regulatory bodies to establish minimum safety, durability and efficiency requirements.
- Integrate material traceability and carbon footprint systems throughout the supply chain.

c. Recycling and Reuse Companies

- Develop and implement efficient recycling and second-life processes aligned with future European standards.
- Collaborate with manufacturers and authorities to ensure selective collection and proper treatment of batteries at end of life.
- Provide information on recycling costs and performance to inform support policies and incentives.

3) C) SUPPORT AND GOVERNANCE STAKEHOLDERS

a. Standardization Bodies (ISO, SAE, CEN-CENELEC, etc.)

- Develop harmonized technical standards for battery design, safety, transport, labelling and recycling.
- Coordinate the participation of industrial and academic stakeholders in the development of global standards compatible with EU frameworks.
- Update standards regularly, in line with technological and market developments.

b. Governments and Regulatory Bodies (European Commission, national authorities)

- Establish legal frameworks that require or incentivize the adoption of common standards across the EU.
- Include standardization and circularity criteria in industrial, fiscal and public aid policies.
- Monitor regulatory compliance and facilitate dialogue platforms between industry, academia and civil society.

c. **Industrial Consortia and Alliances (such as the European Battery Alliance)**

- Coordinate collaborative innovation projects and share intellectual property under open or shared licenses.
- Promote the creation of resilient and sustainable regional supply chains.
- Lead pilot projects on standardization and recycling in cooperation with manufacturers and research centers.

4) **OTHER STAKEHOLDERS RELEVANTES**

a. **Financial Sector and Green Funds**

- Finance innovation and infrastructure projects related to battery standardization and recycling.
- Integrate sustainability and regulatory compliance criteria into credit and investment decisions.
- Promote public-private financing schemes to accelerate the adoption of common standards.

b. **Leasing and Renting Companies**

- Promote standardization to preserve the residual value of electric vehicles.
- Incorporate circularity criteria into contracts (reconditioning, second life, battery return).
- Facilitate access to electric vehicles through flexible and affordable usage models.

c. **Charging and Software Operators**

- Ensure physical and digital interoperability between charging networks and electric vehicles.
- Adopt common communication and cybersecurity standards.
- Collaborate with authorities and manufacturers to develop an integrated, accessible and secure European charging network.

Potential barriers

a. **Problems with technological innovation.**
Standardization can be seen as an obstacle to innovation, as it restricts manufacturers' freedom to differentiate themselves through new battery designs or new chemical compositions, particularly in emerging technological contexts such as solid state or sodium.

b. **Business competition and intellectual property.**
Battery management systems (BMS) are one of manufacturers' most important strategic assets. Imposing common standards could conflict with intellectual property rights and investments already made in proprietary solutions.

c. **Resistance from suppliers and manufacturers.**
Giga-factories with unique designs have been built by large battery and automotive groups, which have also established strategic alliances. A standardization process could require dismantling or adapting these structures, which could generate resistance.

d. **Regulatory complexity.**
Defining common standards requires coordination at European and international levels. Harmonization periods can be lengthy, which could delay anticipated benefits and create short-term uncertainty.

e. **Transition costs.**
Adapting production lines, certifying new standards and developing standardized modules entail extra costs for the industry. Without appropriate incentives, these costs could be passed on to consumers.

f. **Market adoption.**
The factors considered by buyers when purchasing products include range, charging time and durability. Social acceptance may decrease if standardization is perceived as sacrificing benefits compared to customized designs.

g. **International fragmentation.**
If global convergence is not achieved, Europe adopting standards not followed in Asia or the United States could reduce the international competitiveness of European producers and hinder supply chains.

8.5. Promoting bidirectional power flow in Spain

Description

The proposal to promote bidirectional power flow in Spain is based on combining self-consumption regulations with electric vehicle (EV) integration. The main objective is to establish a legal and economic framework that encourages citizen participation in the energy system, allowing consumers to actively generate, consume and manage their own electricity.

First, the proposal highlights the need to simplify and speed up procedures for installing solar panels in homes and businesses. It seeks to remove bureaucratic and financial barriers, facilitate permitting and establish clear and equitable mechanisms for surplus electricity compensation. Collective self-consumption in residential buildings is also promoted, with the aim of making installation processes for small systems almost automatic and accessible for both households and commercial users.

Finally, integrating electric vehicles through Vehicle-to-Grid (V2G) technology requires specific regulation allowing vehicles to feed energy back into the grid and act as mobile storage systems. To this end, it is essential to offer fiscal and economic incentives for participants, and to guarantee transparent pricing and fair compensation for the energy supplied, contributing to the stability and efficiency of the national electricity system. Incorporating the figure of the energy aggregator is key to making this model feasible, as it can consolidate thousands of users contributions' into a single entity with operational capacity on the electricity market. Furthermore, creating a regulatory sandbox can help to enable testing of V2G and bidirectional charging technologies in controlled environments.

Objective

The aim is to create a decentralized system in which consumers become prosumers, capable of generating and managing their own energy.

The objective of this measure is to modernize and transform the Spanish electricity system to make it more efficient, flexible and sustainable. Rather than a unidirectional grid, the aim is to create a decentralized system in which consumers become prosumers, capable of generating and managing their own energy. Designing a flexible infrastructure also helps avoid stranded assets, given the rapid evolution of battery technologies.

The proposed measure translates this general aim into concrete actions across several areas. Bidirectional grid operation enables electric vehicles and household batteries to function as distributed storage units capable of supplying energy during periods of high demand or low renewable generation, improving the resilience and stability of the system and reducing the need for more polluting backup plants. It also empowers citizens by giving them greater control over their electricity bills, allowing self-consumption and financial compensation for energy supplied to the grid, which increases the

attractiveness and profitability of investing in self-consumption technologies. Finally, the initiative drives innovation and job creation by fostering the development of advanced technologies such as V2G, equipment manufacturing and the growth of companies specializing in energy management, strengthening the competitiveness and industrial fabric of the energy sector in Spain.

Specific measures

a. **The need for specific regulations:** Current regulations in Spain, such as Royal Decree 184/2022 regulating charging services, focus on the unidirectional consumption function of electric vehicles. For EVs to be able to feed energy into the grid, a dedicated legal framework is needed that:

i. *Defines the role of the EV prosumer:* establishes the rights and obligations of an EV owner who feeds energy into the grid. A clear financial compensation scheme must be defined, based on dynamic tariffs that reflect renewable availability and system demand.

ii. *Regulates financial compensation:* determines how this energy will be valued and paid for, which could include dynamic tariffs or agreements with retailers.

iii. *Establishes technical and safety requirements:* defines communication protocols and safety standards for bidirectional chargers and vehicles.

b. **Investment in the grid:** for bidirectionality to become a reality, the following measures should be promoted:

i. *Strengthen the distribution network:* investments are needed to reinforce medium and low voltage infrastructure by installing more robust transformers and smart equipment.

ii. Smart charging stations must reach a minimum occupancy rate of 15 percent to ensure profitability.

iii. Prioritize the installation of bidirectional chargers in company fleets, where usage patterns are more predictable.

iv. As a temporary solution for delays in grid connection, mobile batteries or local storage stations can be used, a practice already adopted in logistics parks.

v. Adapt grid management systems: a smart grid management system must be developed and implemented to predict, control and coordinate bidirectional energy flows in real time. This would allow EV batteries to stabilize the grid and support peak demand management.

vi. *Collaborate with aggregators:* work closely with companies that collectively manage EV batteries.

vii. Promote mandatory V2G pilot projects in public fleets (police, municipal buses, ambulances) to build trust and gain practical experience.

viii. Promote the creation of local groups in small municipalities through energy cooperatives that bring together private vehicles.

ix. Create a public-private fund for bidirectional infrastructure, with returns linked to reductions in peak demand.

Stakeholders involved

Collaboration and commitment from several key stakeholders is essential to ensure the success of grid bidirectionality in Spain. The main stakeholders and the specific actions they must undertake are outlined below.

1) PUBLIC ADMINISTRATION

a. Ministry for Ecological Transition and the Demographic Challenge (MITECO): Creation of economic compensation mechanisms; determination of the rights and obligations of prosumers; and authorization of a precise and clear legal framework for V2G and bidirectionality.

b. Institute for Energy Diversification and Saving (IDAE): Coordinate funding programs and calls for V2G pilot projects, as well as support the creation of the public-private fund for bidirectional infrastructure. (belongs to MITECO).

c. Ministry of Industry, Trade and Tourism (MINTUR): Launch grant programs and direct aid for the acquisition and installation of chargers in companies, charging stations and fleets; and promote incentives for industrial projects related to bidirectional storage and charging.

d. Ministry of Transport and Sustainable Mobility (MITMA): Integrate aid programs aimed at installing bidirectional chargers in public transport fleets and mobility hubs.

e. Ministry of Finance and Public Service: Design tax incentives linked to the purchase and installation of bidirectional chargers and domestic batteries. Co-finance through state and European funds.

f. Ministry of Economy, Trade and Enterprise: Simplify administrative procedures through unified digital platforms and regulate the role of the energy aggregator.

g. European Union (European Commission): Define a harmonized framework for the integration of V2G into European energy regulation; provide European funds for bidirectional pilot projects.

h. Autonomous Communities: Autonomous Communities: Manage calls for aid and grant programs, and coordinate with the State on strategic electric-mobility projects.

i. **Local authorities (town councils and provincial councils):** Simplify and speed up the granting of municipal licenses; create one-stop shops; support pilot projects for self-consumption and V2G in municipal fleets or residential settings.

2) **REDEIA (transmission system operator)**

a. Supervise the capacity of the transmission network to integrate bidirectional flows and flexibility services from the distribution network, guaranteeing the stability of the electricity system.

b. Coordinate with distributors and aggregators to develop digital platforms that enable the management of V2G services and the participation of electric vehicles in balancing and flexibility markets.

c. Define and publish the technical requirements and communication protocols that V2G devices must comply with to interact safely with the network.

3) **ELECTRICITY DISTRIBUTION COMPANIES**

a. Make the necessary investments in the medium- and low-voltage network to reinforce the infrastructure in view of the increase in bidirectional charging and discharging points.

b. Implement smart-grid management and control systems capable of monitoring and coordinating bidirectional energy flow in real time.

c. Collaborate with aggregators and charging operators in V2G pilot projects, ensuring safety, quality of supply and connection capacity.

d. Facilitate access to the distribution network for local cooperatives and energy communities through simplified connection solutions.

4) **ELECTRIC VEHICLE OWNERS**

a. Actively participate in demand-management programs through their EVs, allowing their batteries to inject energy into the grid at times of high demand and recharge during lower-cost periods.

b. Invest in bidirectional chargers and self-consumption installations to generate and manage their own energy, becoming active agents of the energy transition.

c. Adopt the technology and understand its potential to reduce the cost of electric mobility and generate additional income, thus driving mass EV adoption.

5) PRIVATE COMPANIES
(Electric Vehicle Manufacturers, Energy Suppliers and Aggregators)

a. EV manufacturers should accelerate the inclusion of V2G technology as standard in their models, ensuring compatibility with electricity-grid standards.

b. Energy suppliers should offer tariffs and energy products that incentivize bidirectionality and provide attractive compensation for users who feed energy into the grid.

c. Aggregators must develop the technological platforms needed to collectively manage EV fleets, optimizing energy injection and consumption to maximize benefits for users and grid stability.

d. Insurance sector: design specific products that cover risks of battery degradation related to V2G use.

e. Charging-point operators and bidirectional-charger manufacturers: coordinate with distributors to ensure technical interoperability and safety certification; ensure minimum utilization of charging stations and their integration into smart-management systems.

6) OTHER STAKEHOLDERS

a. Local councils and public companies: promote V2G pilot projects in municipal fleets (police, urban transport, emergency services).

b. Local energy cooperatives: bring together private EV owners to participate collectively in self-consumption and distributed-storage projects.

Potential barriers

a. **Regulatory barriers.** Spanish law prohibits V2G except in self-consumption without remuneration. Unless specific regulations are approved recognizing electric vehicle owners as prosumers, the technology cannot be deployed on a large scale.

b. **Administrative complexity.** The procedures for self-consumption and charging installations are slow and complex. If these are not simplified, the legalization of bidirectional projects will limit adoption.

c. **Investment in the electricity grid.** Redeia and distribution companies will need to reinforce low- and medium-voltage networks and implement smart-management systems. Delays in these investments could prevent V2G from operating safely and reliably.

d. **Public acceptance.** Electric vehicle owners may be reluctant to use their batteries as grid-storage assets due to fears of degradation, which may limit participation.

e. **Risk of European misalignment.** If Spain moves forward in isolation without harmonisation with European regulations, incompatibilities and barriers to integration into the EU energy markets could arise.

8.6. Roll out a National Electric Mobility Talent Program

Description

The Spanish automotive industry, a pillar of the economy, is facing a massive and unprecedented structural shift towards electrification, which is creating significant challenges and vulnerabilities. The manufacture of electric vehicles (EVs) reduces and transforms certain mechanical operations compared to combustion vehicles, which may reconfigure labor needs in current plants

Unlike combustion engines, where value was distributed more evenly, value in EVs is concentrated almost entirely in the battery and software, requiring specialized job profiles in chemistry, machinery and software. The proposal involves designing a comprehensive professional retraining plan that combines formal education (universities, vocational training) with continuous training for active employees, strengthening the skills required in software, batteries, circular economy and power electronics.

Objective

The objective is to ensure a fair transition that does not eliminate jobs but rather turns them into quality opportunities. It seeks to ensure that there are professionals trained in digitalization and electric mobility to sustain the competitiveness of the Spanish automotive sector.

The objective is to ensure that there are professionals trained in digitalisation and electric mobility to sustain the competitiveness of the Spanish automotive sector.

The fundamental aim of the plan is to guarantee a fair and competitive transition, transforming the labor risks associated with technological change into opportunities for skilled and sustainable employment. The goal is for no worker to be left behind and for companies to have the talent needed to maintain and increase the competitiveness of the Spanish automotive sector in Europe.

The plan also seeks to align education and training with actual market demand, avoiding skills mismatches and strengthening the connection between industry and education. The intention is to create an environment of continuous learning, enabling workers, students and professionals to adapt quickly to the needs of electric mobility, consolidating Spain's position as a leader in talent, innovation and industrial sustainability.

Specific measures

a. Design a specific vocational training program in electric mobility, with qualifications that meet the needs of suppliers and manufacturers.

b. Launch a retraining program for employees in the automotive sector, with European funding and accredited training pathways.

c. Create centers of excellence in training and applied innovation, working jointly with universities and companies.

d. Ensure that every industrial investment includes a staff training plan, including mandatory training criteria in funded projects.

e. Implement communication and awareness campaigns to strengthen social perception in favor of electric mobility.

f. National Talent Plan: 6–12 month retraining pathways with micro-credentials in batteries, power electronics, artificial intelligence for operations and advanced maintenance.

g. Training of trainers and dual vocational training with placements in EV production lines and gigafactories.

h. Certification of skills (operator–technician–engineer) aligned with European standards.

Stakeholders involved and specific actions

a **Ministry of Education, Vocational Training and Sport:** Update vocational training curricula and roll out specific programs on electric mobility.

b. **Ministry of Universities:** Encourage universities to launch master's and bachelor's degrees in electric mobility.

c. **Ministry of Industry and Tourism:** Coordinate with manufacturers and suppliers to meet the demand for skills in new plants and gigafactories.

d. **Ministry of Science and Innovation:** Fund applied innovation projects in training and promote technology transfer.

e. **Ministry of Inclusion, Social Security and Migration:** Facilitate the retraining and redeployment of migrant workers.

f. **Autonomous Communities:** Develop dual vocational training programs and regional employment plans linked to the automotive industry.

g. **Local Authorities (Town Councils and Provincial Councils):** Support municipal training centers and local programs.

h. **Private sector:** Co-finance internal and continuing training programs.

i. **Trade unions:** Ensure that the training transition is fair and inclusive.

Potential barriers

a. **Mismatch between the skill supply and demand.** Updating vocational training and university curricula may not keep pace with the sector's demand for new skills.

b. **Ageing workforce and resistance to change.** A significant proportion of the automotive sector workforce is older and may be reluctant to participate in retraining processes.

c. **Territorial fragmentation.** autonomous communities' training competencies may generate regional inequalities in the training on offer, leading to imbalances across territories.

d. **Financial constraints.** Although European funds can support the process, continuity will depend on state co-financing and private sector commitment, which may prioritize other investments.

e. **Social acceptance.** Without effective communication campaigns, training in electric mobility may not be seen as an attractive opportunity, discouraging employees and young people from participating.

8.7. National Plan for Interoperability and Smart Charging

Description

The National Plan for Interoperability and Smart Charging aims to promote an electric charging network that is interoperable, accessible, scalable and economically sustainable throughout the country. This network must integrate different types of charging—fast, ultra-fast and AC—and ensure a consistent, transparent user experience without technological friction. The plan seeks to coordinate all public and private stakeholders involved (administrations, operators, manufacturers, distributors and users) under a common framework of technical, regulatory and data standards.

In addition, the plan envisages the development of a national interoperability platform that unifies information on the location, availability and prices of charging points, facilitating comparison, payment and real-time route planning. It will also promote smart and bidirectional charging (V2G and V2H), enabling electric vehicles to contribute to the stability of the electricity system and the integration of renewable energy. In this way, the aim is for the charging infrastructure not only to accompany the electrification of the vehicle fleet, but also to become a pillar of the country's energy and digital transition.

The plan also calls for the creation of a single governance structure that guarantees a harmonious rollout, not only geographically but also financially, and that covers not only passenger cars but also heavy-duty vehicles.

Objective

The main objective of the plan is to eliminate user concerns about charging by providing easy, reliable and universal access to a modern, interoperable and transparent infrastructure. The aim is to ensure that any driver can charge their electric vehicle anywhere in the country — or in the European Union — without needing multiple applications, contracts or cards, thus promoting the mass adoption of electric vehicles.

At the same time, the plan seeks to create an economically viable and technologically advanced charging ecosystem capable of attracting private investment, generating skilled employment and fostering innovation in digital energy services. It also aims to ensure territorial cohesion, preventing rural or low-density areas from being excluded from access to electric mobility, and to contribute to climate neutrality by reducing transport-related emissions.

Having a supervisor in place will help reinforce uniform and fair access to the charging infrastructure throughout the country.

Specific measures

a. Standardize communication protocols and payment systems so that any user can charge at any point without multiple applications.

b. Incentivize the installation of AC chargers in residential neighborhoods without garages, complementing the fast-charging network.

c. Set minimum occupancy targets to ensure the economic viability of charging stations.

d. Develop a European interoperability framework to ensure technical compatibility across the EU.

e. Promote roaming agreements between national and international operators to maximize access.

f. Establish a governance structure under the Ministry of Transport to ensure that the rollout covers the geographical areas that require it and serves all electric mobility needs.

Stakeholders involved y acciones concretas

a. **Ministry for Ecological Transition and the Demographic Challenge (MITECO):** Regulate interoperability and support deployment with European funds.

b. **Ministry of Transport and Sustainable Mobility (MITMA):** Integrate charging infrastructure into logistics hubs and public transport and implement the governance framework supervising the charging infrastructure rollout.

c. **Ministry of Finance and Public Service:** Establish tax incentives for charging point installation.

d. **Ministry of Economy, Trade and Enterprise:** Promote digital platforms for interoperability and payment management.

e. **European Union:** Finance cross-border interoperability projects and establish common requirements to facilitate the user experience.

f. **Autonomous Communities:** Facilitate charging infrastructure rollout in their territories and support it through regional aid.

g. **Local authorities (Municipal and Provincial Councils):** Streamline licensing for charging points on public streets and in neighborhoods without garages.

h. **Private operators:** Ensure technical interoperability and tariff transparency.

i. **Charging operators and equipment manufacturers:** Ensure technical compatibility by adopting common protocols (OCPP, ISO 15118), guaranteeing price transparency and promoting roaming agreements that enable universal network use.

j. **Financial and insurance sector:** Provide green financing lines and specific products covering risks associated with the installation and operation of interoperable charging points.

k. **Trade unions and professional organizations:** Promote training and retraining programs for installers and technicians, ensuring common standards of quality and safety in the operation of charging infrastructure.

l. **Civil society and consumer associations:** Monitor tariff transparency, promote public price comparison tools and participate in awareness campaigns on responsible use of charging points.

m. **Local energy cooperatives:** Develop shared charging projects in residential neighborhoods or rural areas, ensuring equitable access and citizen participation in energy management.

Potential barriers

a. **Insufficient profitability.** The low average occupancy of electric charging stations (around 5%) threatens the viability of the business. If these occupancy levels do not increase, many fast and ultra-fast charging projects may not be economically sustainable.

b. **Technological fragmentation.** The coexistence of multiple connectors, applications and other elements hinders the user experience. Without clear standardization, full interoperability will remain a challenge.

c. **Regulatory and bureaucratic delays.** Difficulties in obtaining municipal licenses and excessive administrative procedures slow new charging point installations, especially in urban settings and residential neighborhoods.

d. **Territorial inequality.** The division of competences between autonomous communities and municipalities may generate marked regional disparities, particularly affecting rural areas.

e. **Limitations in the electricity distribution network.** Current charging, and especially ultra-fast charging, requires sufficient investment in distribution infrastructure, deployed quickly enough to keep pace with the rollout.

f. **User acceptance.** A lack of price transparency, multiplicity of applications and payment cards, and the perception that charging is complicated may slow the electric vehicle adoption.

g. **Lack of coordination at European level.** If a common framework for interoperability and cross-border roaming is not achieved, fragmentation between EU Member States could compromise international travel.

8.8. Promote a National Just Transition Plan

Description

The creation of a **National Just Transition Plan** for the automotive industry is proposed. This plan should be a state agreement with clear governance, a timetable and multi-year funding, taking the coal experience as a reference but adapting it to the automotive sector, and articulating the policies needed to address the shift from combustion engine vehicles to electric vehicles in an orderly and consensual manner.

The National Just Transition Plan aims to anticipate the social, economic and territorial impacts of the technological shift towards electric and sustainable mobility. Its implementation will be based on a comprehensive approach combining industrial, labor, and training policies, ensuring that no region or group is left behind. This plan will serve as a shared roadmap for public administrations, companies, trade unions and knowledge centers, to ensure that the sector's transformation becomes an opportunity to create quality jobs, strengthen industrial competitiveness and progress towards a low-carbon economy.

Objective

The main objective is to ensure an inclusive transition that benefits all stakeholders. This entails identifying jobs at risk, creating a retraining plan for affected staff, and promoting green jobs in relevant industrial areas. The plan seeks to help Spain evolve from being a mere 'assembler' to a creator of added value and home-grown talent. It also aims to identify jobs and skills at risk by plant or territory, design 6–12-month retraining pathways and activate internal and sectoral redeployment mechanisms. Promoting green and industrial jobs in affected areas will help retain talent.

It entails identifying jobs at risk, creating a retraining plan for affected staff, and promoting green jobs in relevant industrial areas.

Specific measures

a. **Leadership and coordination:** Leadership by the Institute for Just Transition, with a dedicated technical office for the automotive sector, a 2025–2030 roadmap, indicators and annual evaluation.

b. **Labor planning:** Skills mapping by plant and supplier, preparation of trainers, micro-credentials and mobility pools between centers to absorb mismatches.

c. **Agreements and conventions:** Promote framework agreements for redeployment, multi-skilling and productivity-linked shifts; promote tripartite agreements (government, companies and trade unions) with measurable targets for retraining and employment.

d. **Innovation ecosystem:** Promote R&D and demonstrators in batteries and software, support second life/recycling initiatives, and promote innovative public procurement to accelerate adoption in plants.

e. **Funding and support:** Promote combined funding windows (European, state and regional), provide incentives for projects with local employment impact, and support SME suppliers in areas such as digitalization.

Stakeholders involved and specific actions

a. **Ministry for Ecological Transition and the Demographic Challenge (MITECO):** Lead the plan through the Institute for Just Transition, coordinate funding and ensure that the transition reduces plants' energy costs.

b. **Ministry of Industry:** Ensure the sector's production capacity and lead the technological conversion towards electric and connected vehicles.

c. **Ministry of Transport and Sustainable Mobility:** Facilitate factories' connections to logistics hubs and public transport to support shift changes and redeployments.

d. **Ministry of Finance and Public Service:** Implement tax incentives for investment and training, allow deductions to be monetized, and relieve local taxes for transition-linked projects.

e. **Ministry of Economy, Trade and Enterprise:** Promote plant digitalization and digital-skills training, as well as platforms that facilitate retraining and change management.

f. **European Union:** Provide funding for just transition and innovation projects and set common requirements to promote talent mobility and circularity.

g. **Autonomous Communities:** Deploy dual vocational training and reskilling programs, support technology centers and streamline procedures for industrial investment.

h. **Local authorities:** Streamline licenses and permits, promote the implementation of projects in industrial estates and coordinate workforce-mobility services.

i. **Private operators:** Companies in the sector and their suppliers must implement productivity-enhancement and reskilling plans, agree on redeployments and develop repair, reuse and recycling networks linked to the new value chain.

j. **Trade unions and workers' organizations:** Negotiate transition agreements that guarantee employment protection, multi-skilling and retraining; participate in monitoring committees and in identifying jobs at risk by plant or territory.

k. **Business associations and sectoral clusters (ANFAC, SERNAUTO, etc.):** Collaborate with administrations on capacity planning, anticipate talent needs and coordinate joint projects in innovation, training and redeployment.

l. **Technology centers and universities:** Develop accelerated retraining programs (6–12 months) and R&D projects in batteries, software, digitalization, and circular economy; act as hubs for knowledge transfer to SMEs and suppliers.

m. **Financial sector and green funds:** Mobilize capital towards industrial projects with positive social and environmental impact; support supplier reconversion through preferential credit lines and public guarantees.

n. **Civil society and local development entities:** Promote green-employment and entrepreneurship initiatives in affected areas, encourage citizen participation in monitoring the plan and ensure territorial cohesion during the transition.

Potential barriers

a. **Resistance to change and lack of consensus.** The transition may generate tensions between companies, trade unions and administrations if there is no framework for ongoing dialogue and shared goals. Collective bargaining may slow the implementation of urgent measures.

b. **Temporal mismatch between retraining and labor demand.** Training programs may not keep pace with industrial restructuring, leading to temporary unemployment or shortages of personnel with the skills required for new technological processes.

c. **Difficulties in multi-level coordination.** The involvement of different levels of government (EU, State, Autonomous Communities and local authorities) may create overlaps, program inconsistencies and delays in fund implementation.

d. **Risk of exclusion for SME suppliers.** Smaller companies may lack the financial or technical capacity to adapt to new digital and environmental standards, leaving them behind in the transition.

e. **Lack of stable, sustained financing.** Dependence on European funds or annual calls may create discontinuity in retraining programs and in long-term industrial projects.

f. **Territorial inequality.** Regions with lower industrial density or training capacity may be excluded from major investments, exacerbating territorial disparities and hindering social cohesion.

g. **Social fatigue and loss of confidence.** If results (jobs created, investment attracted or improvements in working conditions) are not visible in the short term, social and trade-union support may weaken, affecting political continuity.

References

References

* ACEA —European Automobile Manufacturers' Association. (2024). *Charging ahead: Accelerating the roll-out of EU electric vehicle charging infrastructure.* https://alternative-fuels-observatory.ec.europa.eu/sites/default/files/document-files/2024-05/Charging_ahead_Accelerating_the_roll-out_of_EU_electric_vehicle_charging_infrastructure.pdf

* ACICAE-Cluster de Automoción del País Vasco. (s. f.). *ACICAE.* Retrieved 15 September 2025, from https://www.acicae.es

* AEDIVE —Asociación Empresarial para el Desarrollo e Impulso de la Movilidad Eléctrica. (s. f.). *Inicio.* AEDIVE. https://aedive.es

* AEDIVE. (2024, octubre). *Impacto socioeconómico de la movilidad eléctrica en España* [Socio-economic impact of electric mobility in Spain] (report). https://aedive.es/resources/docs/Informesocioeconomico_AEDIVE_oct-2024.pdf

* AEDIVE. (2025). *III Anuario de la Movilidad Eléctrica* [III Electric Mobility Yearbook (2024–2025)] [PDF]. https://aedive.es/resources/docs/III-Anuario-Movilidad-Electrica-AEDIVE.pdf
AEDIVE. (2025). *Propuestas del sector para el desarrollo de la movilidad eléctrica en España [PDF].* https://drive.google.com/file/d/1KrHRQNTRZwGBA71tTeJ58Yzb2uc43gJ_/view

* Aguablanca. (s.f.). Quiénes somos [About us]—Aguablanca. https://minaaguablanca.com/quienes-somos-2

* ANFAC—Asociación Española de Fabricantes de Automóviles y Camiones. (s. f.). *Inicio.* ANFAC. https://anfac.com

* ANFAC. (2023). *Informe ANFAC sobre el vehículo autónomo y conectado* [ANFAC report on autonomous and connected vehicles]. https://anfac.com/publicaciones/informe-anfac-vehiculo-autonomo-y-conectado

* ANFAC. (2024, 28 de noviembre). *Los vehículos autónomos podrían circular ya en España si existiera un marco normativo adecuado* [Autonomous vehicles could already be on the roads in Spain if an appropriate regulatory framework were in place]. https://anfac.com/los-vehiculos-autonomos-podrian-circular-ya-en-espana-si-existiera-un-marco-normativo-adecuado-segun-anfac

* ANFAC. (2025, 19 de marzo). *Informe Anual de Vehículo Electrificado 2024* [2024 Annual Report on Electrified Vehicles]. https://anfac.com/publicaciones/informe-anual-de-vehiculo-electrificado-2024

* ANFAC. (2025, 19 March). *Informe ANFAC para el despliegue de infraestructura de recarga de vehículos eléctricos en ciudades* [ANFAC report on the rollout of electric vehicle recharging infrastructure in cities] [PDF]. https://anfac.com/wp-content/uploads/2025/03/NP-Informe-ANFAC-para-el-despliegue-de-infraestructura-de-recarga-de-vehiculos-electricos-en-ciudades.pdf

* ANFAC. (2025, 4 de julio). *Barómetro de Electromovilidad—Segundo trimestre de 2025* [Electromobility Barometer—Second quarter 2025] [PDF]. https://anfac.com/wp-content/uploads/2025/07/NP-ANFAC-Barometro-Electromovilidad-2T-2025.pdf

* Ayuntamiento de Barcelona. (2023). *Nueva contrata de limpieza y recogida de residuos: mejora de la flota de vehículos* [New street-cleaning and waste-collection contract: Improvements to the vehicle fleet]. Barcelona City Council. https://ajuntament.barcelona.cat/neteja-i-residus/es/presentacion/nueva-contrata-de-limpieza-y-recogida-de-residuos/mejora-de-la-flota-de-vehiculos

* Ayuntamiento de Barcelona. (2024, 26 de julio). *La Guardia Urbana completa la renovación de la flota con 84 nuevos vehículos híbridos y eléctricos.* [The Guardia Urbana completes fleet renewal with 84 new hybrid and electric vehicles] Barcelona City Council. https://ajuntament.barcelona.cat/guardiaurbana/es/noticia/la-guardia-urbana-completa-la-renovacion-de-la-flota-con-84-nuevos-vehiculos-hibrids-i-electrics_1424207

* Ayuntamiento de Madrid. (2024). *Flota municipal de vehículos: el 16,6 % ya es eléctrica.* [Municipal vehicle fleet: 16.6% is already electric] Madrid City Council website. https://tinyurl.com/msa5uasx

* Ayuntamiento de Madrid. (2024, 4 de julio). *Madrid completa la electrificación del 100 % de la flota de vehículos de los Agentes de Movilidad.* [Madrid completes 100% electrification of the Mobility Agents' vehicle fleet] Madrid City Council website. https://www.madrid.es/portales/munimadrid/es/Inicio/Actualidad/Noticias/Madrid-completa-la-electrificacion-del-100-de-la-flota-de-vehiculos-de-los-Agentes-de-Movilidad

* Basquevolt. (s. f.). *BASQUEVOLT, la iniciativa vasca de producción de baterías de estado sólido, se pone en marcha con el objetivo de producir 10 GWh en 2027* [BASQUEVOLT, the Basque intitiative for the production of solid-state batteries is launched with the aim of producing 10GWh by 2027] . https://basquevolt.com/es/noticias/noticias/basquevolt-iniciativa-vasca-baterias-estado-solido-marcha-producir-10gwh-2027

- BOE. (2021, 20 de mayo). *Ley 7/2021, de Cambio Climático y Transición Energética.* [Law 7/2021 on Climate Change and Energy Transition] *Boletín Oficial del Estado, 121.* https://www.boe.es/buscar/act.php?id=BOE-A-2021-8447
- BOE. (2021, 21 de diciembre). *Real Decreto-ley 29/2021, de medidas urgentes en el ámbito energético para el fomento de la movilidad eléctrica, el autoconsumo y el despliegue de energías renovables* [Royal Decree-Law 29/2021 on urgent energy measures to promote electric mobility, self-consumption and the rollout of renewables] *Boletín Oficial del Estado, 305.* https://www.boe.es/buscar/act.php?id=BOE-A-2021-21096
- BOE. (2022, 8 de marzo). *Real Decreto 184/2022, por el que se regula la prestación de servicios de recarga de vehículos eléctricos.* [Royal Decree 184/2022 regulating the provision of electric vehicle recharging services]. *Boletín Oficial del Estado, 59.* https://www.boe.es/buscar/act.php?id=BOE-A-2022-4361
- CAAR—Clúster de Automoción de Aragón. (s. f.). *Inicio* [Home]. CAAR. https://caaragon.com
- CCOO—Comisiones Obreras. (2025). *Informe CCOO sobre movilidad eléctrica y formación sindical* [CCOO report on electric mobility and trade union training] [PDF] https://1mayo.ccoo.es/45bc7c8ab1a1ffcac2c5b8f78ea9fd57000001.pdf
- CDTI—Centro para el Desarrollo Tecnológico Industrial. (2024). *Programas de apoyo a la I+D+i empresarial* [Support programmes for business R&D&I] Government of Spain. https://www.cdti.es/apoyo-idi
- CEAGA—Clúster de Empresas de Automoción y Movilidad de Galicia. (s. f.). *Inicio* [Home]. CEAGA. https://ceaga.com
- CIAC—Clúster de la Indústria de l'Automoció de Catalunya. (s. f.). [Home]. CIAC. https://ciac.cat
- Clúster de Movilidad y Logística de Euskadi. (s. f.). *Clúster de Movilidad y Logística de Euskadi.* [Basque Mobility and Logistics Cluster]. Retrieved 15 September 2025, from https://mlcluster.com
- El Economista. (2025, 25 de marzo). *Nuevo avance en la construcción de la gigafactoría de baterías de Navalmoral de la Mata: ya tiene el derecho a compra de los terrenos.* [Recent progress in the construction of the battery gigafactory in Navalmoral de la Mata: now it has the right to purchase the land] https://www.eleconomista.es/industria/noticias/13294891/03/25/nuevo-avance-en-la-construccion-de-la-gigafactoria-de-baterias-de-navalmoral-de-la-mata-caceres-ya-tiene-el-derecho-a-compra-de-los-terrenos-aunque-aun-no-puede-iniciar-las-obras.htm
- El Observador. (2025). *Los beneficios de Mercedes-Benz España se desploman en 2024 tras el recorte en su producción: Mercedes ensambló 120 355 vehículos en Vitoria, incluyendo 4 543 E-Cell (Vito) y 3 360 E-Cell (Clase V).* [Mercedes-Benz Spain's profits plummet in 2024 after production cuts: Mercedes assembled 120,355 vehicles in Vitoria, including 4,543 E-Cell (Vito) and 3,360 E-Cell (V-Class)] https://www.elobservador.com.uy/espana/empresas-y-negocios/los-beneficios-mercedes-benz-espana-se-desploman-2024-el-recorte-su-produccion-la-planta-vitoria-n6008880
- El País. (2024, 6 de julio). *Una gigafactoría de baterías de litio pone su primera piedra en Extremadura para convertirse en la industria más importante de la región.* [A lithium battery gigafactory breaks ground in Extremadura to become the region's most important industry] https://elpais.com/espana/2024-07-06/una-gigafactoria-de-baterias-de-litio-pone-su-primera-piedra-en-extremadura-para-convertirse-en-la-industria-mas-importante-de-la-region.html
- Endesa X Way. (2024, 15 de marzo). *Endesa X Way cuenta con más de 400 puntos de recarga ultrarrápidos desplegados en España.* [Endesa X Way now has more than 400 ultra-fast charging points deployed in Spain] Endesa, Press Room. https://www.endesa.com/es/prensa/sala-de-prensa/noticias/transicion-energetica/movilidad-electrica/endesa-x-way-cuenta-mas-400-puntos-recarga-ultrarrapidos-desplegados
- Envision & SEAT. (2023, 15 de septiembre). *Envision y SEAT, nuevos proyectos aprobados por Industria dentro de la sección de baterías del PERTE VEC II.* [Envision and SEAT, new projects approved by the Ministry under the battery section of PERTE VEC II] Ministry of Industry, Trade and Tourism. https://www.mintur.gob.es/es-es/GabinetePrensa/NotasPrensa/2023/Paginas/20230915-envision-seat-perte-vec.aspx
- European Battery Tracker / New Automotive. (2025, 6 de agosto). *Spain EBT Case Study* (Spanish version) [PDF]. https://storage.googleapis.com/public_download_assets/reports/battery_tracker/20250806_Spain_EBT_Case_Study_ES.pdf European Commission. (2021–2027). Horizon Europe: Framework Programme for Research and Innovation. Brussels: European Commission. https://cinea.ec.europa.eu/programmes/horizon-europe_en
- European Commission. (2023). *Clean Industrial Deal.* Brussels: European Commission. https://commission.europa.eu/topics/eu-competitiveness/clean-industrial-deal_es
- European Commission. (2023). *Net Zero Industry Act.* Brussels: European Commission. https://single-market-economy.ec.europa.eu/publications/net-zero-industry-act_en
- EY. (2025.). *EY Highlights Automotive 2025* [PDF]. https://www.ey.com/content/dam/ey-unified-site/ey-com/es-es/insights/automotive/documents/ey-highlights-automocion-vf.pdf

* EY & Eurelectric. (2025). *Plugging into potential: Unleashing the untapped flexibility of EVs.* EY. https://www.ey.com/content/dam/ey-unified-site/ey-com/es-es/campaigns/ey-insights/documents/ey-resumen-ejecutivo-plugging-into-potential.pdf

* Ford Europe. (s. f.). *Kuga.* Ford Media Center. https://media.ford.com/content/fordmedia/feu/en/products/suv/kuga/kuga.html

* Fundación Instituto de Empresa (alinnea); Transport & Environment. (2025, febrero). *Cadenas de valor impulsadas por la electrificación de la movilidad en España* [Value chains driven by the electrification of mobility in Spain] [Sector Study]. https://www.alinnea.org/wp-content/uploads/2025/07/P-Sectorial-Movilidad_Electrica.pdf

* Spanish government. (2024, 6 de julio). *Sánchez anuncia el inicio de la construcción de la gigafactoría de baterías en Cáceres, que contará con 300 millones de euros del PERTE VEC II.* [Sánchez announces the start of construction on the battery gigafactory in Cáceres, which will receive €300 million from PERTE VEC II]. Plan de Recuperación, Transformación y Resiliencia. https://planderecuperacion.gob.es/noticias/Sanchez-anuncia-inicio-construccion-gigafactoria-baterias-Caceres-perte-vec-prtr

* Hispano Suiza. (2024, 13 de junio). *Hispano Suiza Carmen Sagrera: celebra 120 años de legado.* [Hispano Suiza Carmen Sagrera: Celebrating 120 years of heritage]. Hispano Suiza. https://www.hispanosuizacars.com/es/nota-de-prensa/hispano-suiza-carmen-sagrera-reveal

* Iberdrola & bp pulse. (2023, 27 de julio). *Iberdrola y bp pulse lanzan su empresa conjunta de carga rápida y ultrarrápida en España y Portugal, con el objetivo de instalar 11.700 puntos en 2030.* [Iberdrola and bp pulse launch their fast and ultra-fast charging joint venture in Spain and Portugal, aiming to install 11,700 charging points by 2030]. bp Spain. https://www.bp.com/es_es/spain/home/noticias/notas-de-prensa/iberdrola-y-bp-pulse-lanzan-su-empresa-conjunta-de-carga-rapida-y-ultrarrapida-en-espana-y-portugal.html

* IDAE—Instituto para la Diversificación y Ahorro de la Energía. (2023). *Programa MOVES III.* [MOVES III programme] Government of Spain. https://www.idae.es/ayudas-y-financiacion/para-movilidad-y-vehiculos/programa-moves-iii

* IDAE—Instituto para la Diversificación y Ahorro de la Energía. (2023). *Programa MOVES Flotas.* [MOVES Fleets programme] Government of Spain. https://www.idae.es/ayudas-y-financiacion/para-movilidad-y-vehiculos/programa-moves-flotas

* IDAE—Instituto para la Diversificación y Ahorro de la Energía. (2023). *Programa MOVES Singulares II.* [MOVES Singular Projects II programme] Government of Spain. https://www.idae.es/ayudas-y-financiacion/para-movilidad-y-vehiculos/convocatorias-cerradas/programa-moves-proyectos

* INE—Instituto Nacional de Estadística. (2024, 27 de noviembre) [Statistics on R&D activities—2023]. *Estadística sobre actividades de I+D—Año 2023.* https://ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736176754&idp=1254735576669

* International Council on Clean Transportation. (2025, 22 de septiembre). *The EV Transition Check: Measuring progress towards zero-emission for passenger cars in the European Union.* https://theicct.org/ev-transition-check-2025

* International Energy Agency. (2024). *Global EV Outlook 2024: Moving towards increased affordability.* https://www.iea.org/reports/global-ev-outlook-2024

* International Energy Agency (IEA). (2025). *Global EV Outlook 2025.* https://www.iea.org/reports/global-ev-outlook-2025

* McKinsey & Company. (s. f.). *Europe's economic potential in the shift to electric vehicles.* https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/europes-economic-potential-in-the-shift-to-electric-vehicles?utm_

* MHC Mobility. (2024). *The EV maintenance skills gap in the EU.* https://www.mhcmobility.com/news-insights/industry-insights/the-ev-maintenance-skills-gap-in-the-eu/?utm

* MITECO—Ministerio para la Transición Ecológica y el Reto Demográfico. (2024). *Plan Nacional Integrado de Energía y Clima (PNIEC) 2023–2030.* https://www.miteco.gob.es/es/prensa/pniec.html

* Ministerio de Ciencia, Innovación y Universidades. (2025, julio). *España realiza el mayor esfuerzo presupuestario en I+D+i de la historia [informe de seguimiento EECTI 2024].* [Spain makes the largest R&D&I budgetary effort in its history] [EECTI 2024 monitoring report] Government of Spain. https://www.ciencia.gob.es/Noticias/2025/julio/EECTI-informe-seguimiento-2024-datos.html

* Ministerio de Defensa. (2025, 24 de abril). *Materias primas: La garantía de suministro en España* [Raw materials: Security of supply in Spain]. *IEEE—Instituto Español de Estudios Estratégicos, CESEDEN.* https://www.defensa.gob.es/ceseden/-/ieee/materias_primas_la_garantia_de_suministro_en_espana

* Ministerio de Industria, Comercio y Turismo. (2021). *PERTE del vehículo eléctrico y conectado* (VEC). [Strategic Project for Economic Recovery and Transformation for Electric and Connected Vehicles (PERTE VEC)] Government of Spain. https://www.mintur.gob.es/portalayudas/PERTE-VEC/Paginas/Index.aspx

* Ministerio de Industria y Turismo. (2023, 13 de septiembre). *Segunda resolución provisional de la sección A del PERTE VEC II: Industria da luz verde a seis nuevos proyectos de baterías por 21,5 millones de euros* [Second provisional decision on section A of PERTE VEC II: Ministry approves six new battery projects worth €21.5 million]. https://www.mintur.gob.es/es-es/gabineteprensa/notasprensa/2023/documents/20230913%20np%20nuevas%20adjudicaciones%20perte%20vec%20bater%C3%ADas.pdf

* Ministerio de Industria y Turismo. (2023, 11 de octubre). *Industria aprueba de manera provisional siete nuevos proyectos del PERTE VEC II de baterías por 87 millones de euros* [Ministry provisionally approves seven new PERTE VEC II battery projects worth €87 million]. https://www.mintur.gob.es/es-es/gabineteprensa/notasprensa/2023/documents/20231011%20np%20nuevas%20adjudicaciones%20perte%20vec%20bater%C3%ADas.pdf

* Ministerio de Industria y Turismo. (2023, 30 de octubre). *Industria aprueba de manera definitiva ocho proyectos de producción de baterías del PERTE VEC II* [Ministry gives final approval to eight PERTE VEC II battery production projects]. https://www.mintur.gob.es/es-es/GabinetePrensa/NotasPrensa/2023/Paginas/30102023-perte-vec-definitivo.aspx

* Ministerio de Industria y Turismo. (2024, 24 de mayo). *El Gobierno publica la convocatoria de ayudas a la línea de baterías del PERTE VEC III dotada con 300 millones de euros* [Government publishes call for applications for PERTE VEC III battery line with a budget of €300 million]. https://www.mintur.gob.es/es-es/GabinetePrensa/NotasPrensa/2024/Paginas/convocatoria-perte-vec-iii-linea-baterias-300-millones-euros.aspx

* Ministerio de Industria y Turismo. (2024, 10 de septiembre). *Industria aprueba 7 nuevos proyectos de la línea B del PERTE VEC II por valor de 39,7 millones de euros* [Ministry approves 7 new projects under line B of PERTE VEC II worth €39.7 million]. https://www.mintur.gob.es/es-es/GabinetePrensa/NotasPrensa/2024/Paginas/industria-adjudicaciones-perte-vec-ii-b.aspx

* Ministerio de Industria y Turismo. (2024, 5 de octubre). *Industria publica en su web los 15 nuevos proyectos aprobados de la línea B del PERTE VEC II con una dotación de 75,7 millones de euros* [Ministry publishes on its website the 15 new projects approved under line B of PERTE VEC II with a budget of €75.7 million]. https://www.mintur.gob.es/es-es/GabinetePrensa/NotasPrensa/2024/Paginas/nuevas-resoluciones-perte-vec-dos.aspx

* Ministerio de Transportes, Movilidad y Agenda Urbana. (2019). *Código Técnico de la Edificación* (CTE) [Technical Building Code]. Gobierno de España. https://www.codigotecnico.org

* Octopus Energy. (2023, 19 de julio). *Octopus Electroverse se expande a España, Francia e Italia con acceso a más de medio millón de puntos de recarga públicos* [Octopus Electroverse expands to Spain, France and Italy with access to more than half a million public charging points]. Octopus Energy Press. https://octopus.energy/press/electroverse-international-expansion

* Octopus Energy España. (2024, 18 de diciembre). *Octopus Electroverse se convierte en la mayor plataforma de recarga de vehículos eléctricos de Europa, con 850 000 puntos conectados* [Octopus Electroverse becomes Europe's largest electric vehicle charging platform, with 850,000 connected points]. Octopus Energy España. https://octopusenergy.es/octopus-electroverse-se-convierte-en-la-mayor-plataforma-de-recarga-de-vehiculos-electricos-de-europa

* Payment Innovation Hub; Afi (con la colaboración de CaixaBank, Visa y Arval). (s. f.). *Presente y futuro de la infraestructura de recarga del vehículo eléctrico en España* [Present and future of electric vehicle charging infrastructure in Spain]. https://paymentinnovationhub.com/es/informes/infraestructura-recarga-vehiculo-electrico-espana

* Red Eléctrica de España (REE). (2025). *Mapa REVE: red de puntos de recarga de vehículos eléctricos* (aplicación interactiva) [REVE map: Network of electric vehicle charging points—interactive application]. https://www.mapareve.es/mapa-puntos-recarga

* Renault Group. (s. f.). *Palencia Plant* (Spain). https://www.renaultgroup.com/en/group/locations/palencia-plant

* Repsol. (2024, 25 de julio). *Repsol supera los 2.500 puntos de recarga en España e integra más de 5.000 con acuerdos estratégicos* [Repsol surpasses 2,500 charging points in Spain and integrates more than 5,000 through strategic agreements]. Repsol, Sala de Prensa. https://www.repsol.com/es/sala-prensa/notas-prensa/2024/repsol-obtiene-resultado-neto-1792-millones-euros-un-36-por-ciento-menos/index.cshtml

* Reportlinker. (2024). *Spain Electric Vehicle Market Report—Q4 2024*. Reportlinker. https://www.reportlinker.com/dlp/6c570f4f7996555e109a8872bc2ec80f

* SEAT S.A. (2025, 10 de enero). *Las ventas de SEAT S.A. crecen un 7,5 % en 2024 pese a los retos de la industria del automóvil* [SEAT S.A. sales grow by 7.5% in 2024 despite challenges facing the automotive industry]. SEAT S.A. Media Center. https://www.seat-cupra-mediacenter.es/SEAT-SA/noticias-seat-sa/compania/2025/las-ventas-seat-sa-crecen-75-2024-pese-retos--industria-automovil

* SERNAUTO—Asociación Española de Proveedores de Automoción. (s. f.). *Inicio* [Home]. SERNAUTO. https://sernauto.es

* Stellantis. (2025, 22 de enero). *Stellantis afianza su liderazgo industrial en España, con el 41,3 % de la producción de nuestro país* [Stellantis consolidates its industrial leadership in Spain, accounting for 41.3% of national vehicle production] [Press release]. Stellantis Media. https://www.media.stellantis.com/es-es/corporate-communications/press/stellantis-afianza-su-liderazgo-industrial-en-espana-con-el-41-3-de-la-produccion-de-nuestro-pais

- Stellantis; CATL. (2024, 10 de diciembre). *Stellantis and CATL to invest up to €4.1 billion in joint venture for large-scale LFP battery plant in Spain* [Press release]. Stellantis. https://www.media.stellantis.com/es-es/corporate-communications/press/stellantis-y-catl-invertiran-hasta-4-100-millones-de-euros-en-una-joint-venture-para-una-planta-de-baterias-lfp-a-gran-escala-en-espana
- Transport & Environment (T&E). (2025). *Estado de la movilidad eléctrica en España en 2025* [State of electric mobility in Spain in 2025]. https://www.transportenvironment.org/te-espana/estado-de-la-mobilidad-electrica-en-espana-2025
- Transport & Environment (T&E). (2025). *Europe's automotive industry at a crossroads*. https://www.transportenvironment.org/articles/europes-automotive-industry-at-a-crossroads
- UGT—Unión General de Trabajadores. (2025). *UGT reclama la puesta en marcha de una hoja de ruta para el despliegue del vehículo eléctrico en España* [UGT calls for a roadmap for the rollout of electric vehicles in Spain]. https://www.ugt.es/ugt-reclama-la-puesta-en-marcha-de-una-hoja-de-ruta-para-el-despliegue-del-vehiculo-electrico-en?utm_
- Volkswagen Group—PowerCo. (s. f.). *Gigafactory Valencia: PowerCo gives starting signal for construction of second cell factory* [Press release]. Volkswagen Group. https://www.volkswagen-group.com/en/press-releases/gigafactory-valencia-powerco-gives-starting-signal-for-construction-of-second-cell-factory-17033
- Zunder. (2024, 20 de diciembre). *Zunder, número 1 en recarga ultrarrápida en España con 764 puntos de más de 150 kW* [Zunder, number 1 in ultra-fast charging in Spain with 764 charging points above 150 kW]. Zunder. https://www.zunder.com/wp-content/uploads/2024/12/Np_Zunder_no1_Espana.pdf
- Zunder. (2024, 30 de diciembre). *Zunder cierra 2024 con más de 170 estaciones y 950 puntos de recarga ultrarrápidos en España, Francia y Portugal* [Zunder ends 2024 with more than 170 stations and 950 ultra-fast charging points in Spain, France and Portugal]. Zunder. https://www.zunder.com/wp-content/uploads/2024/12/Np_Zunder_cierre_2024_.pdf

Appendix 1
Members of the alinnea working group

Name	Surname	Company	Position
Adela	**de Olano La Roche**	Grupo EYSA	Head of Sustainability & ESG
Ana Belén	**Sánchez**	Alinnea	Director
Angel	**Estrella**	AApp Mobility	CCO
Antonio	**Alvarez Caamaño**	ALSA	Technical Office Engineer
Antonio	**Lucas**	Zunder	Marketing Manager
Antonio Joaquin	**Gonzalez**	Stellantis	Director of Institutional Relations
Arancha	**García Hermo**	ANFAC	Director of Industry and Environment
Benjamin	**Bartsch**	Porsche	Business Development & Smart Mobility
Borja	**Arboleda**	ANFAC	Industry and Environment Department
Carlos	**Alonso Padrones**	Bilbao Metropoli 30	Innovation & Technology Manager
Consuelo	**Cembellín García**	Seat	Public Affairs & Corporate Operations
Cristian	**Quílez Salete**	ECODES	Project Manager
David	**Huete**	Zunder	CCO
Diego	**Rodriguez**	MOBI.E	Data Expert
Dolores	**Gonzalez**	Octopus Energy	Director of International Relations and Public Affairs
Emilio	**Prous Pindado**	Madrid Green Urban Mobility Lab	Coordinator
Emilio	**Giner**	Octopus Energy	Director of Services
Ernesto	**Barceló Rodríguez**	Gestamp	Corporate ESG Director
Felipe	**Dzik**	Ebury, Funds Earth	ESG Specialist
Gemma	**Bedia**	Alinnea	Gestora senior de Proyectos de Cambio Climático
Fernando	**Pina**	AUVE	Director
Iban	**Chico de la Felicidad**	Naturgy	Head of EV business development in the Iberian market

Name	Surname	Company	Position
Ignacio	**Rodríguez-Solano**	Fundación Renault Group	Director
Iñigo	**Bilbao Ubillos**	Fundación Mobility Lab Vitoria-Gasteiz	Director
Isabel	**Gómez Bernal**	Iberdrola	Senior Energy Foresight Analyst
Jorge	**San Vicente Feduchi**	European Climate Foundation	Senior Associate, Spain & Transport Programmes
Juan Fernando	**Martin**	Fundación Renovables	Head of Mobility
Keiran	**Bowtell**	Embajada Británica en Madrid	Climate Change and Energy Attaché
Laura	**Vélez de Mendizábal Alonso**	Transport & Environment	Spain e-mobility expert
Luis	**Filipe**	MOBI.E	New Business Coordinator
Manuel	**Riera**	UGT	Superior Technician in Climate Action and Just Ecological Transition.
María	**Peñahora Garcia**	Instituto para la transición justa	Advisor
Maria	**Romera**	AEDIVE	Director of Regulatory and Public Affairs
Mario	**Rodriguez Vargas**	ECODES	Associate Director of Just Transition and Global Partnerships
Miguel	**Carpintero**	MOEVE	Head of Public Policy and European Affairs
Miguel Angel	**Jimenez**	AEDIVE	Head of Public Policy and European Affairs
Miriam	**Bueno**	MITECO	Advisor to the Spanish Office for Climate Change
Monica	**Galeote**	Amazon	Head of Public Policy – Sustainability
Patricia	**Pascau**	Alinnea	Strategic Communication Specialist
Rosario	**Diaz**	Faconauto	Head of the Economic and Technical Department
Rubén	**Gonzalez**	CCOO Industria	Head of the automotive sector
Sara	**Candela**	Alinnea	Junior Manager

This report provides an analysis of the current state of electric mobility in Spain, with the aim of putting forward recommendations to address the main challenges that currently shape its development and may limit its role in the transition towards a more sustainable energy and climate model.

Design:
epoqstudio.com

Hosted by
ie FOUNDATION

With the support of
European Climate Foundation

alinnea