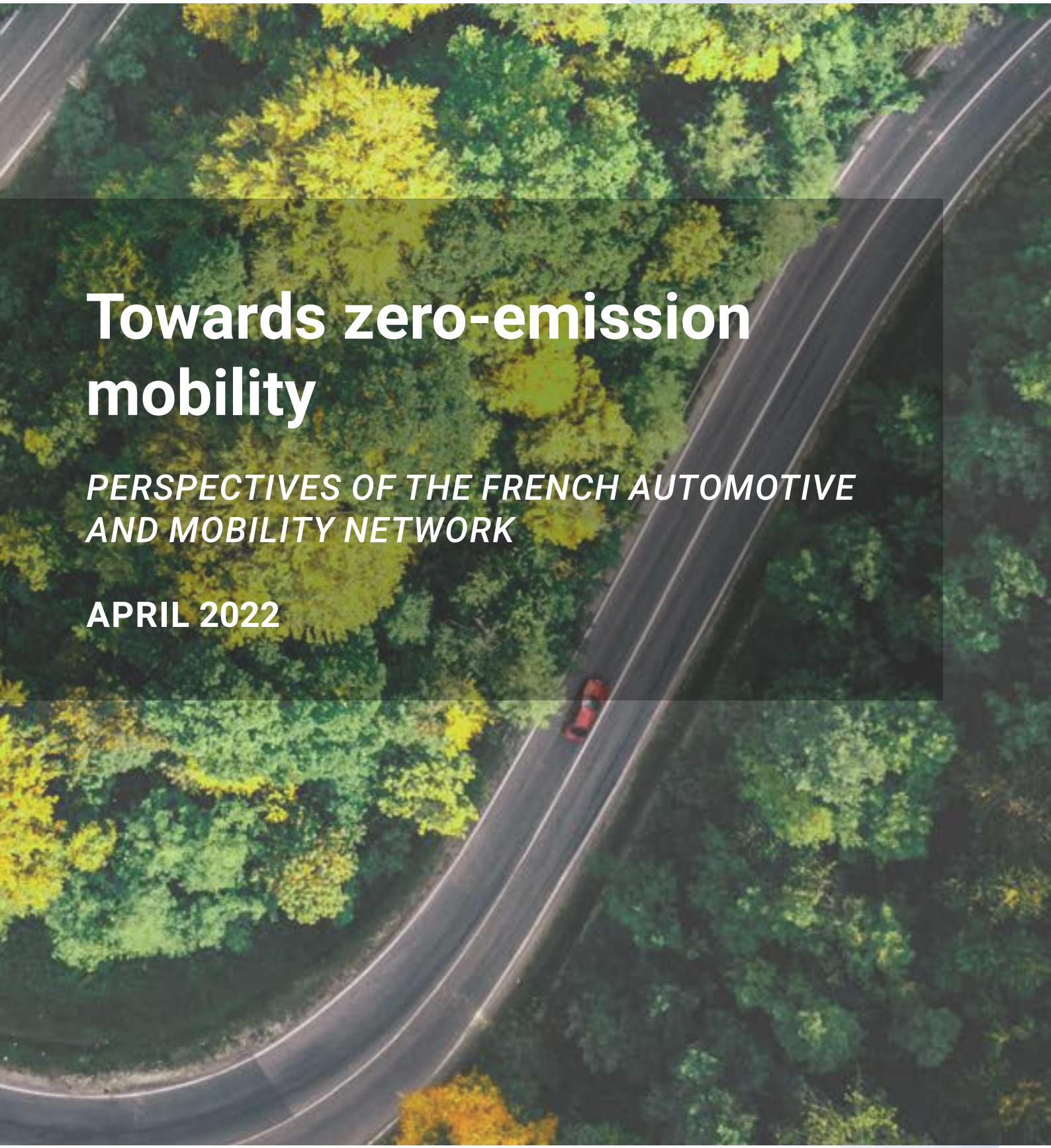
French Automotive & Mobility Network

Smart & Green



Towards zero-emission mobility

PERSPECTIVES OF THE FRENCH AUTOMOTIVE AND MOBILITY NETWORK

APRIL 2022

CARA AUVERGNE-RHÔNE-ALPES EUROPEAN CLUSTER FOR MOBILITY SOLUTIONS

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FOREWORD

French Automotive & Mobility Network (FAMN) is the umbrella organisation for the French automotive and mobility ecosystem at European level. Initiated by the PFA (French Automotive Platform) and the four automotive and mobility clusters – CARA, ID4CAR, NextMove, Pôle Véhicule du Futur – the FAMN initiative now represents nearly 1,450 members, including SMEs, large companies, universities, research centres and local authorities. Thanks to their regional establishment, the clusters deploy the PFA's roadmap throughout the French territory.

FAMN is involved in several fields of action with the ambition of supporting the transition towards a greener, more connected, and safer mobility. Electric mobility is one of these key areas. Therefore, FAMN is implementing concrete actions in Brussels aiming at raising awareness among European institutional stakeholders of the concerns of French sector members.

As part of the *Green Deal*[1] – – a pact to make Europe climate neutral by 2050 – **the European Commission has set a clear ambition for the mobility sector**: to reduce vehicle emissions by 55% by 2030 (Climate *Fit For 55*)[2]. The overall ambition is to initiate a transition to greener mobility involving clean, and affordable transport, including peripheral regions.

FAMN shares this vision and promotes a profound and rapid transformation of the automotive and mobility sector. Through research and innovation, our network seeks to bring out a multiplicity of technological solutions to respond in the most optimal way to the environmental challenge, considering the diversity of uses, and keeping the price of vehicles at an affordable level to encourage the rapid renewal of the vehicle fleet.

" We must make the environmental agenda a growth lever for the automotive industry. We will be players in the fight against global warming and the improvement of air quality, simply because it is our engineers who will provide the technological solutions. "

Luc CHATEL, President of the PFA

[1] Communication and Roadmap on the Green Deal for Europe, COM (2019) 640 final, 11 December 2019, Brussels

[2] Communication: "Fit For 55: delivering the EU's 2030 Climate Target on the way to climate neutrality", COM(2021) 550 final, 14 July 2021, Brussels

SUMMARY

PRIORITY 1 :

Develop and deploy technologies for low-carbon mobility

In order to significantly increase the share of zero emission vehicles, FAMN members are working on innovative systems with lower environmental footprint. Electric mobility is seen by our sector as the main solution to achieve this goal. At this stage, we are focusing on two technologies to achieve 100% carbon, nitrogen oxide and particulate neutral new vehicles within 15 years: batteries and hydrogen fuel cells. As a complementary way of greening the vehicle fleet, the potential of biofuels and, in the future, of alternative fuels (e-fuels, including biomethane and hydrogen) will also be addressed, all in accordance with the technological neutrality principle.

DEVELOP A EUROPEAN INDUSTRIAL SUPPLY-CHAIN IN THE FIELD OF BATTERIES

At the end of 2020, the European Commission published a regulation on batteries , which aims to ensure that batteries placed on the EU market are sustainable and safe throughout their life cycle and ultimately to promote the production of green and sustainable batteries in Europe. FAMN supports this requirement for traceability, sustainability, performance, and safety of batteries.

In terms of research and innovation, **FAMN is involved in the implementation of the European public-private partnership BATT4EU**[4] as a member of the BEPA association. The ambition of this partnership is to establish the world's most advanced innovation ecosystem in Europe by 2030 to stimulate a competitive, sustainable, and circular European battery value chain and thus support the transformation towards a carbon neutral society. FAMN is in line with the main objectives set by the BATT4EU partnership:

- Contribute to the largest development of electric mobility;
- Enable European industrial leadership by creating growth and jobs;
- Provide safer and more sustainable batteries and processes.

FAMN is also supporting the implementation of the IPCEI (Important Project of Common European Interest) on Batteries[5] launched in early 2022, complementing the first IPCEI of 2019. It has two parts, both aiming to promote battery production: *IPCEI on Batteries* and *IPCEI European Battery Innovation (EuBatIn)*. Bringing together actors based in 12 EU Member States, including France, the project integrates R&I and the first phase of industrial deployment of battery components in a coordinated way. In summary, the objectives are as follows:

- Develop disruptive technologies for Li-ion batteries (liquid and solid electrolyte) meeting cost, performance and safety objectives;
- Support the environmental sustainability of the Li-ion battery value chain;
- Contribute to job creation and growth;
- Contribute to the development of a European battery ecosystem;
- Create a fully competitive value chain in the EU.

[3] Proposal for a regulation concerning batteries and waste batteries, repealing Directive 2006/66/EC and amending Regulation (EU) No 2019/1020, COM(2020) 798 final, 10 December 2020, Brussels
[4] "The BATT4EU Partnership", website bepassociation.eu
[5] "About ICPEI", website ipcei-batteries.eu

PRIORITY 1 :

Develop and deploy technologies for low-carbon mobility

Finally, **FAMN is aligned with the strategic axes of the report on securing the industry's supply of mineral raw materials**[6], , in particular battery metals (nickel, cobalt, lithium) and permanent magnets (rare earths), which are particularly critical for electromobility. This report, commissioned to Philippe Varin, former CEO at PSA Group, and presented in January 2022, has been retained by the French government. FAMN believes that it would be relevant to translate its ambitions to the EU level:

1. **Prepare the constitution of a European investment fund in strategic metals, in order to secure the supplies of French and European manufacturers;**
2. **Set up an observatory for critical metals, bringing together industry and the administration, and appoint an interministerial delegate to secure strategic metals;**
3. **Draw up a technological roadmap shared by industry and public research (CNRS and CEA) on metals for the next generation of batteries;**
4. **Transpose the concept of "responsible mining" into a standard or a certifiable label, in line with the battery regulation currently being examined at European level.**

[6] French Ministry of Ecology: "Investing in the France of 2030: submission to the government of the Varin report on securing the supply of mineral raw materials and opening of a dedicated call for projects", 10 January 2022, Paris

Develop and deploy technologies for low-carbon mobility

CREATE A COMPETITIVE HYDROGEN SECTOR AND DEVELOP ITS USE-CASES IN TRANSPORT

Hydrogen has several clear advantages for mobility, allowing the development of zero-emission mobility, reducing the time needed to recharge vehicles and allowing the use of a longer range (compared to battery electric vehicles). It should be noted that hydrogen mobility will initially be developed for professional use (transport of goods - light commercial vehicles and heavy vehicles, passenger transport).

FAMN perceives Hydrogen as a fully European issue. . In this sense, its members are involved in **European initiatives in the field of hydrogen**. France and its industrial actors have actively participated in the *European Clean Hydrogen Alliance* (ECH2A), created by the European Commission with the aim of organising and coordinating the collective work of stakeholders. A weekly coordination meeting is held gathering the French industry, to prepare archetypal projects for the ECH2A, and more broadly to ensure the proper coordination between the national strategy and the work carried out at the European level.

FAMN has also mobilised for the construction of an IPCEI on Hydrogen which allows for the joint financing of the creation of a value chain on a European scale for Hydrogen (following the example of the IPCEI Batteries). The general objective is to remove barriers (regulatory, normative, financial) to promote the emergence of a sustainable and resilient European value chain. Six French projects on hydrogen mobility have been submitted to this IPCEI.

At the national level, an interministerial mission bringing together the ministries concerned and the new energy systems and automotive national strategic sector committees (CSF). Its role is to drive the implementation of a national Hydrogen plan, announced at €9.1 billion. Finally, a National Hydrogen Council (CNH) under the umbrella of France Industry and the National Industry Committee (CNI), has the role of guaranteeing the actions that will enable the roadmap of the National Hydrogen Plan to be respected[7].

[7] French National Strategy for the Development of Decarbonated Hydrogen in France, French Government, 8 September 2020, Paris

Develop and deploy technologies for low-carbon mobility

In line with all these initiatives, FAMN supports the emancipation of the European Hydrogen value chain in line with the European Communication (2020)[8], the conclusions of the Council of the European Union[9] and the Hydrogen Act[10]. We identify four pillars to develop:

1. **Guarantee the independence of the European industry through regulatory mechanisms** – In order to facilitate the industrialisation of a Hydrogen sector integrating the whole value chain (production, use and end of life), France has two mechanisms which should be systematised at national level and deployed at European level:
   - Pooling of public orders with a convergence of visions and means;
   - Implement innovation partnerships to ensure a market share for R&D&I players.
2. **Scenarios of use on interregional pilot studies** – Following the example of the IPCEI on Hydrogen, FAMN is part of a cross-border collaboration approach by working on joint large-scale investment projects. Building on the existing projects developed under the Hydrogen Valleys, FAMN strives to link these initiatives in order to deploy a coherent network in Europe. In this sense, FAMN supports the development of experimentation projects on long distance corridors aggregating all market actors from energy production to the end user.
3. **Structure a coherent offer of skills development at different scales** – Under the umbrella of the Pact for Skills[11], the European Skills Strategy[12] and the Automotive Skills Alliance[13], FAMN, thanks to its knowledge of the sector and its complete value chain, supports the transition of professions and people. The objective is to mobilise the European H2 ecosystem more and more for richer contents and attractiveness of the sector to young people.

USE ALTERNATIVE FUELS AS A TRANSITIONAL SOLUTION

Low carbon alternative fuels can be a key instrument for the decarbonisation of the fleet, passenger and freight intensive road transport, especially long distance. While the adoption of electrification will require time and significant investment in fleet turnover and infrastructure, these low-carbon fuels are an effective way to reduce emissions from internal combustion engine vehicles in the short term. FAMN prioritises the use of these fuels for applications with the least mature technological alternatives to date (heavy and industrial vehicles, coaches). New developments around the hydrogen combustion engine are also underway and could provide a new zero-carbon technological solution.

As electrification will contribute to achieving the EU's carbon neutrality in 2050 in road transport of people and goods, but will not be able to cover all use cases at an affordable cost in the short term, FAMN identifies several pathways to develop:

1. **Demonstrate the viability on an industrial scale of hydrogen as a fuel or synthetic fuel made from decarbonised hydrogen, as potential solutions towards a carbon-neutral transport of the French ecosystem.**
2. **Adopt legislation to support the rapid growth of investment.**
3. **Leverage the excellence of the petrochemical, transport and energy sectors and develop synergies.**

[8] Communication from the Commission: «A Hydrogen Strategy for a climate neutral Europe», COM(2020) 301 final, 8 July 2020, Brussels
[9] Council Conclusion, Towards a Hydrogen Market for Europe, 11 December 2020, Brussels
[10] Hydrogen Europe, Hydrogen Act : "Towards the Creation of the European Hydrogen Economy", April 2021
[11] European Commission: "Pact for Skills", 10 November 2021, Brussels
[12] Communication from the Commission: European Skills Strategy for Sustainable Competitiveness, Social Equity and Resilience, COM(2020) 274 final, 1 July 2020, Brussels
[13] Website automotive-skills-alliance.eu

PRIORITY 2 :

Promote a European strategy for power electronics

In view of the seven-fold increase in the number of electric vehicles in the coming years, power electronics is a major challenge shared by the mobility, electricity production and distribution, and electronics sectors. To meet this challenge, a working group bringing together these sectors was set up at national level. It has produced an action plan aimed at building a strong industrial initiative in France around this rapidly changing field.

A FIELD WITH GREAT POTENTIAL AND IN FULL MUTATION

By 2030, the European automotive market will be 100% electrified. Hybrid vehicles (12V, 48V, plug-in hybrids) will represent more than 2/3 of the market, and battery electric vehicles will have the strongest growth over this period. (Source: WAPO PFA-BIPE 2021 study[14]).

Power electronics is at the heart of a technological revolution, with the arrival of two new wide-band semiconductor materials (WBG): Silicon Carbide (SiC) and Gallium Nitride (GaN). These materials will make it possible to significantly reduce the size of components, the idea being to be able to launch the industrialisation of systems that are as compact and light as possible.

Power electronics has a very strong economic potential for industrial development. The turnover of power electronics in Europe, 1.6 billion € in 2020, should reach 10.5 billion € in 2030. Power electronics components will tend to become imperative for the manufacture of cars. For the electronics industry, this is also a high-potential market whose share will grow strongly in the years to come. France is well positioned to develop a power electronics industry: it currently has 23 factories, 24 R&D centres and 35 research laboratories capable of working on it.

Moreover, the industry is facing a very rapid transformation in power electronics with a reduction in weight, volume and price of WBG technologies due to the two new materials GaN and SiC, to which it is necessary to adapt rapidly.

[14] PFA technical note: Contribution of light and heavy vehicles to the reduction of energy demand and CO2 emissions by 2035 in the world, November 2018, Paris

PRIORITY 2 :

Promote a European strategy for power electronics

UNDERTAKE A JOINT EUROPEAN PROJECT ON POWER ELECTRONICS

In France, the respective Strategic Committees of the electronics and automotive & mobility industries have decided to **launch a national programme** to develop and industrialise power electronics in France. This is a joint programme between the automotive and electronics industries which is necessary for competitiveness and to ensure the supply chain.

1. **The ambition is to have a complete and competitive value chain in Europe**, and in particular in France, from components to final assembly. This would allow France to contribute to a strong European industry with more than 20,000 jobs dedicated to automotive electronics (R&D and automotive plants only). 2021 marked an acceleration of the programme, with a consolidation of the research plans of French laboratories to maximise synergies and accelerate time to market. European cooperation will be a priority. It should be noted that this programme will have positive spin-offs for other industries: aeronautics, charging stations, railways. The concrete objective is to be ready for production in Europe from 2025.
2. **We insist on the need for a new IPCEI** *(Important Project on Common European Interest)* on electronics with a power electronics component. French industry is working closely with the French Ministry of Industry on this subject. The challenge of this IPCEI would be to enable the emerging sector to remain competitive with international competitors and thus to remain located in Europe and to enable the creation of thousands of jobs and to support the transition to low-carbon mobility.
3. **Concerning skills**, France has a large proportion of generalist engineers, which should be an asset to support the development of a new sector. Furthermore, the automotive and electronics industries are working together to develop academic curricula to attract future engineers/technicians to the hardwares. We are currently in a period where the increase in skills must be accelerated.
4. **Concerning global competition and ambitions in terms of market share**, the French sector will have to be competitive with US, Japanese and Chinese competitors. The ambition in the long term is to have 80% of the European market and to extend it to the global level. It should be noted that Tesla is already taking advantage of ST Microelectronics' assets, which demonstrates the global influence of the sector.

PRIORITY 3 :

Innovate in recharging infrastructure for high environmental footprint use cases

The growth of the zero-emission vehicle fleet by 2050 depends on the deployment of charging infrastructure. In addition to charging stations for passenger cars, our network is working on the development of static and dynamic solutions for the use cases where the contribution to GHG emissions is the greatest to date: freight transport.

ENSURE A SUFFICIENT NETWORK OF CHARGING STATIONS

CO2 emission reduction targets (cars, light and heavy-duty vehicles) can only be achieved if they are accompanied by equally ambitious and binding infrastructure targets for the 27 EU Member States. Ainsi, **FAMN therefore welcomes the European Commission's proposal for a regulation on the deployment of alternative fuel infrastructure (AFIR[15])**. The objective is to install in all countries enough recharging points and hydrogen refueling stations.

The French sector, in particular the OEMs, is aligned with the AFIR proposal, which addresses the requirements of all types of vehicles – not only passenger cars, but also light and heavy-duty vehicles. However, **FAMN remains sceptical about the overall ambition of the AFIR proposal:** what real obligations will States have?

The expected mass adoption of electric vehicles will also require the creation of accessible, powerful, and intelligent recharging infrastructures, all of which the current directive does not sufficiently support.

[15] Proposal for a regulation on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU, COM/2021/559 final, 14 July 2021, Brussels

PRIORITY 3 :

Innovate in recharging infrastructure for high environmental footprint use cases

DEPLOY STATIC CHARGING SOLUTIONS

FAMN joins the position of the Working Group Electric Mobility of the Four Motors for Europe (4M)[15]. As a reminder, 4M is a European network bringing together several European regions (Auvergne-Rhône-Alpes, Baden-Württemberg, Catalonia, Lombardy at the origin) and which is active in different sectors. Concerning transport, the vision of the 4M is the following:

- To support and shape the transformation process of the automotive industry;
- To contribute to the necessary reductions in CO2 emissions from the sector.

Currently, **the transport sector is impacted by the *Green Deal***. Encouraged to drastically reduce their CO2 emissions, long-distance freight transport players want to develop more electric trucks and high-powered recharging infrastructure over the next few years.

For freight transport, a European vision is needed. Battery technology is a real alternative because it can be implemented quickly, is already ready for the market and is suitable for rest periods of 45 minutes every 4 hours.

The aim is to set up a European **charging infrastructure** for long-distance electric trucks along the main freight corridors in Europe. First, this ambition will go through a phase of analysis and evaluation of existing flows and infrastructure. This will lead to the development of an intelligent charging tool (interoperable parking and charging reservation system) and the implementation of high-power fast charging stations along the identified corridors.

Roadmap supported by FAMN :

1. **Identify the main corridors;**
2. **Identify potential sites for charging infrastructures;**
3. **Establish charging infrastructures along the corridors;**
4. **Collect data on tested vehicles and charging solutions.**

REALISE INNOVATIONS IN DYNAMIC CHARGING

To achieve the objectives of decarbonisation of road transport, solutions exist (LPG, biofuels, batteries, Hydrogen) but they have certain limitations. Electrified Road Systems (ERS) aim to overcome the existing constraints. ERS are systems that allow the powering of vehicles running on an equipped network (interurban, high traffic motorways). They can provide propulsion and/or recharge vehicle batteries.

At this stage, there are **three main families of technologies:**

- Catenary conduction (Siemens, Powerlines);
- Ground conduction (Alstom, Elways, Elonroad);
- Induction power (Primove, KAIST/OLEV, Vedecom).

[16] Website 4motors.eu

PRIORITY 3 :

Innovate in recharging infrastructure for high environmental footprint use cases

Several issues currently constrain the deployment of these solutions, including fleet selection, interoperability, cost-effectiveness thresholds, efficiency, etc. Each technology has different advantages and disadvantages in terms of efficiency, cost, resilience and durability, installation and maintenance.

From a European perspective, Sweden is the most advanced country with several test sites on open roads and a planned deployment of over 2000 km. In Germany, three tests on motorways (5 to 10 km) have been done to date.

In France, following discussions between stakeholders, **three working groups were set up** in early 2021 by the Ministry of Transport, leading to the publication of ministerial reports (GT1[17], GT2[18], GT3[19]). **Concrete recommendations are made:**

1. **Decarbonise road freight transport:**
   - Start European work on ERS in 2022, taking advantage of the French EU Presidency;
   - Obtain a pan-European decision on the technical solution by the end of 2023;
   - Set up a structure capable of preparing studies, public debates and governance proposals for the implementation of an ERS programme.
2. **Develop the technical solutions, exploit the potential and identify the obstacles:**
   - At this stage, reserve induction for urban use and static fast charging;
   - Experiment with the ground power solution on open roads over several kilometers
   - Catenary technology can meet the main requirements but has greater operating constraints than the other technology families.
   - Catenary technology as a solution if a sufficient TRL level has not been yet achieved.
3. **3. Large-scale experimentation of technologies, through the publication of a call for projects covering the entire ERS value chain:**
   - The testing of interoperable charging technologies on motorways;
   - Barriers, including non-technological barriers;
   - The tools for designing, building and operating the ERS in order to enable accelerated replication of the first demonstrators;
   - The skills of all the players in regions.

[17] French Ministry of Ecology, Report of the working group n°1 on electric road systems: «Decarbonising road freight transport through ERS, issues and strategy», July 2021, Paris
[18] French Ministry of Ecology, Rapport du groupe de travail n°2 sur les Système de route électrique : «Solutions techniques, potentialités et verrous», July 2021, Paris
[19] French Ministry of Ecology, Rapport du groupe de travail n°3 sur les Système de route électrique : «Expérimenter à grande échelle les ERS», July 2021, Paris

PRIORITY 4 :

Improve vehicle performance to reduce energy consumption

FAMN understands the reduction of a vehicle's ecological footprint by considering all its components. We consider that its performance involves several elements beyond the traction system. Our ecosystem would like to see topics such as vehicle weight reduction and body aerodynamics better reflected in future regulations and R&I funding programmes. Also, specific features directly associated with electric vehicles may raise new questions in terms of reliability, safety and efficiency throughout their life. In this sense, the role of tyres and brakes must be reconsidered.

Electric motors generate very high torque at low speeds from the moment they are started, which can lead to very high forces on the tyres. In addition, because a battery-powered vehicle is heavier than its internal combustion counterpart and the weight distribution is different, a «conventional» tyre of a given size will therefore be subject to more stress and its performance will decrease, particularly in terms of rolling resistance, handling, and durability, thus compromising the safety, reliability and environmental impact of the vehicle. Consequently, the priorities for the development of tyres specifically for electric vehicles are as follows:

- Develop new technical solutions for electric vehicle tyres to ensure optimised rolling resistance and wear behaviour under increased load, using new materials (elastomers, rubber compounds and reinforcements) and new tyre designs;
- Reduce tyres emissions by developing optimised acceleration and deceleration profiles, minimising tyre slip and therefore abrasion.

The use of friction brakes may be limited to relatively rare situations when an energy recovery system is installed on an electric motor. This creates the problem of keeping disc brakes ready for these rare events despite the wear processes (oxidation, dust, etc.). On the other hand, this new requirement profile for brakes allows the development of lighter systems (mass reduction) using new materials, and the optimisation of brake mixtures and application profiles can reduce particulate emissions (nanoparticles). Therefore, the priorities for the development of electric vehicle specific brakes are as follows:

- Optimise the control of the deceleration profile to minimise particulate emissions from brakes by further limiting their use;
- Develop electric vehicle specific braking systems that are lighter and focus on residual braking tasks (e.g. emergency braking);
- Consider system level solutions for long downhill conditions.

Vehicle weight reduction is a key factor in overall efficiency. Since 1990, the average mass of cars (all engines) has increased continuously. The mass of electric vehicles is 150/600 kg higher than that of internal combustion cars. Although CO2 exhaust emissions are considered zero in European regulations, it seems necessary to reduce the weight of electric vehicles. A reduction in weight allows either a greater range or a smaller battery. Weight can be reduced by optimised design (e.g. use of hybrid materials, integration of functions) and by choosing the right material.

KEY RECOMMENDATIONS

1

Guarantee European strategic independence in the field of batteries, and to this end, set up a strategic metals investment fund to secure supplies of raw materials.

2

Translate the concept of «responsible mining» into a standard, from an environmental sustainability perspective considering the entire battery value chain.

3

Support cross-border collaboration on experimental projects on long-distance corridors involving all the players in the value chain.

4

Structure skills development by mobilising the European Hydrogen ecosystem for richer content and attractiveness of the sector to young people.

5

Consider alternative fuels as a transitional solution to reduce emissions from vehicles equipped with internal combustion engines.

6

Respect the principle of technological neutrality in regulation.

7

Continue at European level the joint work on power electronics carried out in France between the automotive, electrical and electronics industries.

8

Entreprendre un nouveau projet commun européen (IPCEI) sur l'électronique de puissance, afin de faire émerger une chaîne de valeur complète et compétitive en Europe.

9

Ensure a sufficient network of charging stations by including a strong obligation for Member States in the future AFIR regulation.

10

Make innovations in dynamic charging a reality and reach a pan-European decision by the end of 2023 on the choice of the technical solution to be prioritised.

11

Take better account of all components, such as tyres, brakes and vehicle weight reduction, in future regulations and R&I funding programmes.

ABOUT US

Created in 2007, the French Automotive & Mobility Network (FAMN) represents the French Automotive and Mobility Platform **(PFA) and the four associated competitiveness clusters at European level:**

- CARA (Auvergne-Rhône-Alpes)
- ID4CAR (Bretagne, Pays de la Loire, Nouvelle Aquitaine)
- NextMove (Ile-de-France, Normandie)
- Pôle Véhicule du Futur (Bourgogne Franche-Comté, Grand Est)

This unique coalition brings together more than 1450 members including SMEs, large companies, universities, research centres and local authorities. Industry members include OEMs, suppliers, and transport operators. FAMN in figures:

- 70% of jobs and income in the French automotive and mobility sector
- 400,000 of the sector jobs in France
- 6 billion euros invested in R&D by the sector (in 2018)

The stakes are high both for the industry in terms of technological transformation and for society in terms of the direct impact of the automotive sector on the quality of life of citizens. In order to achieve cleaner, safer and more sustainable mobility, we support our members in the development of innovative and market-driven solutions.

FAMN also has a representation in Brussels:

French Automotive & Mobility Network

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