



Act - Mobilize - Accelerate

France 2030's national battery strategy: at the heart of decarbonizing mobility



#IndustrieVer



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Editorial by Bruno Le Maire



Bruno Le Maire, French Minister of the Economy, Finance and Industry
Industrial and digital sovereignty

To halt five decades of massive relocation, the French President has made the reindustrialization of France one of the priorities of our economic policy. Many had talked about it before him, but no one had really given it the means.

Since 2017, the Government has taken action with concrete measures on tax relief, simplification of procedures, support for training and investment. Our country has also been a driving force in Europe, working with its neighbors to build a genuine industrial policy for the continent, capable of rivaling that of the United States, China and the United States.

These efforts are beginning to bear fruit. The results are now visible: France is opening more factories than it is closing, creating more industrial jobs than it is destroying, becoming increasingly attractive to investors and strengthening its strategic autonomy by producing more critical goods, particularly in green technologies - which will dictate new geopolitical dependencies in the future.

The inauguration of the ACC mega-battery factory at Douvrin Billy-Berclau is a perfect embodiment of this winning strategy, which reconciles European and French sovereignty, prosperity and climate, industrial heritage and forward-looking innovation.

This project, the fruit of a Franco-German initiative launched in 2018 with my counterpart Peter Altmaier, is particularly close to my heart, as it is the first milestone in this new French industrial sector. It is a decisive step in our automotive strategy, focused on a rapid transition to electric vehicles - 2 million electric vehicles manufactured in France by 2030 - and mastery of the entire value chain, from mining to recycling, refining and assembly. This new plant also consolidates the Hauts-de-France region as a battery valley, thanks to its 4 mega-plant projects, its companies and their subcontractors.

ACC's success should inspire us and give us confidence, as on May 16 we presented a bill for a green industrial revolution, which marks a decisive turning point and must become a national cause. It is proof that France has everything it takes to become more independent, more prosperous and more ecological. Thank you to all the public and private players who made this project possible, in record technical and administrative timeframes.

Editorial by Agnès Pannier-Runacher



Agnès Pannier-Runacher,
French Minister for
Energy Transition

The national battery acceleration strategy is a triple necessity.

- A necessity if we are to make a success of our energy transition: batteries enable us to electrify and decarbonize our economy, particularly mobility, and thus reduce our greenhouse gas emissions;
- A necessity to ensure our industrial independence: mastery of the key value chains of the zero-carbon economy, particularly those of batteries, is essential to enable our reindustrialization and to be able to create more wealth and sustainable, well-paid jobs. on our territory;
- This is essential if we are to move away from any form of energy dependency, at a time when the zero-carbon economy is taking us from an era of hydrocarbons to an era of metals - critical components of batteries in particular - which is as much a threat as an opportunity.

In just a few years, our country has created a genuine battery industry, thanks to the determination of the President of the Republic and the Government, but also thanks to an extremely attractive territorial ecosystem in the north of France. The aim of our energy and industrial policy is to revive regions such as these, which have suffered from severe deindustrialization. This shows the relevance of schemes like Territoires d'Industrie, which I supported when I was Minister Delegate for Industry. ACC's Gigafactory for manufacturing electric batteries, which will soon equip our electric vehicles, is a perfect illustration of this success. Our national strategy does not stop there. Beyond gigafactories, our aim is to master the entire battery value chain: the manufacture of cathode materials, the extraction and refining of critical metals, and the recycling of batteries, in an "urban mining" approach. To achieve this, we have launched several initiatives since 2022 to strengthen our arsenal:

- France 2030's call for "critical metals" projects to support R&D and the deployment of industrial capacity in this sector;
- the Observatoire français des ressources minérales pour les filières industrielles (OFREMI), which brings together French geological and diplomatic expertise for the benefit of industry.
- An investment fund dedicated to critical minerals and metals to secure industry's supply of these key components of the energy transition.

And we will continue to do so! This is the vision of the President of the Republic, and this is the direction of history.

Editorial by Roland Lescure



Roland Lescure,
Minister Delegate for
Industry

The month of May 2023 is a milestone in the history of French industry.

Following the French President's presentation of his reindustrialization strategy on May 11, the announcement of unprecedented foreign investment at the Choose France summit on May 15, and the presentation of the "Green Industry" bill to the Council of Ministers on May 16, we are now seeing the concrete expression of a political commitment to electric batteries that was born just a few years ago.

ACC is an emblematic construction company European, as was Airbus in its day: several countries have decided to join forces to support the creation of a European electric battery industry from scratch.

Today, ACC is inaugurating France's first mega-plant for manufacturing the batteries that will power our electric vehicles. It's another step towards building a complete electric vehicle value chain in France.

The ACC story is also an inspiring one for the future of industry in our country. Thanks to the mobilization of all concerned, only two years elapsed between the application for environmental authorization and the inauguration of the plant: two years of coordinated work between government departments, local authorities and the company. This case, exceptional these days, must become the norm in the future: that's the whole point of the "Green Industry" bill that we're promoting with Bruno Le Maire, and whose examination in Parliament begins in the next few weeks.

Introduction

Demand for batteries is growing fast, and is set to increase 14-fold by 2030, driven mainly by the electrification of transport.

Given the strategic nature of the battery sector and its economic weight, the emergence of a French and European industrial offering is a priority project for the government. The environmental, economic and industrial benefits of such a competitive national offering are threefold:

- An environmental challenge, to reduce CO₂ emissions from transport, in line with European regulations and the goal of climate neutrality by 2050, set by the 2015 Paris Accords and targeted by the Stratégie Nationale Bas Carbone.
- An economic challenge for the automotive industry, since the battery represents around 35% of the added value of an electric vehicle.
- Last but not least, industrial sovereignty is at stake, as nearly 70% of the world's production capacity for electric vehicle batteries is currently located in China.

The structuring of an industrial sector covering the entire battery value chain is a real challenge, and one to which the French government and numerous companies are fully committed. From the outset, France has supported the European Battery Alliance, the Commission's initiative to develop a European battery offering.

Back in 2018, France launched its first Battery Plan to accelerate the emergence of a battery production industry in France. Its aim was to set up gigafactories in France in the short term, and then promote the competitiveness of these plants, notably by maintaining the R&D effort. As part of two pan-European battery projects (PIIEC), the Batteries Plan has led to the emergence of the ACC battery gigafactory project and materials projects led by Solvay, Arkema and Tokai Carbone Savoie.

In 2021, the National Battery Strategy took over, integrated into the France 2030 objectives, to continue and amplify the actions of the first Battery Plan. It targets the electric mobility market, as well as other battery applications such as stationary electricity storage¹. In all, the 4 gigafactories in France (ACC, Envision, Verkor and ProLogium) should generate battery production capacity of between 100 and 120 GWh, and create around 10,000 direct jobs by 2030. As the French President reminded us in Dunkirk on May 12, 2023, the emergence of French battery production is emblematic of reindustrialization through decarbonization, which strengthens our industrial sovereignty while creating jobs and preserving the climate.

This production will make a decisive contribution to France 2030's target of 2 million electric vehicles produced in France, by enabling these vehicles to be equipped with French batteries. At the same time, the French industry has historic strengths and strong development potential in the production and integration of batteries for mobility applications other than electric road vehicles (so-called industrial batteries): aircraft, satellites, trains, submarines, etc. These markets are characterized by a large number of products, both in terms of electrochemistry and systems, and small production runs.

¹Automobiles (light vehicles, commercial vehicles), heavy vehicles (buses, trucks, etc.), sea and river transport, rail transport.

Ensuring the supply of these gigafactories is now a priority to guarantee our strategic autonomy and achieve climate neutrality. To continue our efforts to build up a complete national supply, we are now focusing on the emergence of projects in the upstream and downstream segments of the battery value chain:

- extraction, refining and processing of critical raw materials, manufacture of battery materials and components, innovative production processes and machinery.
- collection, reuse, reconditioning, recycling, reincorporation of materials.

It's also important to consolidate the French industry's ability to position itself for the next generation of batteries (all-solid, and new alternative chemistries to lithium-ion).

Key figures for France 2030

4 gigafactories

the first of which - ACC - will start production in 2024

100 to 120 GWh

battery production capacity and 10,000 direct jobs created by these gigafactories by 2030

More

903 M

aid from France under the two PIIEC programs for batteries

To date, **38** battery-related **projects** have been supported through France 2030 schemes, representing €233 million in aid and generating €1.1 billion in investment* (*excluding PIIEC batteries. N.B. The RRR and Critical Metals AAPs are financed by the "Recyclability, Recycling and Reincorporation of Recycled Materials" strategy of France 2030):

- Batteries" research program (PEPR): €19 million in funding
- Pre-Maturation/Maturation" call for projects: €15 million in grants
- Innovative solutions and technologies for batteries" call for projects: €79 million in funding
- Innovative solutions for improving the recyclability, recycling and reincorporation of materials" (RRR) call for projects: €30 million in aid
- Critical Metals" call for projects: €48 million in funding
- Première Usine" call for projects: €7 million in grants
- Skills and professions of the future" call for expressions of interest: €35 million in aid** (**subject to finalization of state aid analysis)
- Investment fund dedicated to critical ores and metals, managed by Infravia, with government participation of up to €500 million

Rapid development of gigafactories in France

As of 2017, the European Commission and member states have made numerous efforts to support the development of an innovative and sustainable battery industry in Europe. In 2017, the Commission launched the **European Battery Alliance**. In December 2018, Bruno Le Maire and Peter Altmaier published a joint declaration to create a Franco-German battery industry eventually integrating the entire battery value chain.

Following this declaration, the intense efforts of the Member States, their manufacturers and the Commission led to the creation of two projects of common European interest ("PIIEC") to support research, innovation and industrialization in the battery value chain:

- The first PIIEC ("IPCEI on batteries"), coordinated by France, was authorized in December 2019. It involves seven member states, who will mobilize €3.2 billion in public funding, combined with a further €5 billion in private investment.
- The second PIIEC ("EuBatIn"), coordinated by Germany, was authorized in January 2021. It involves twelve member states - including France - which will provide up to 2.9 billion euros in public funding, combined with more than 9 billion euros in private investment.

In total, the "Battery Alliance" now comprises 63 industrial projects in 12 member states, representing 20 billion euros of investment. The projects cover the entire battery value chain, from the extraction of raw materials to the design and manufacture of cells and battery packs, and their recycling. They put the European Union on a par with our Chinese and American partners in terms of annual investment in this value chain. In France, the PIIEC program has enabled the emergence of ACC's gigafactory in Douvrin, and supported 4 projects to develop essential materials for batteries, led by Solvay, Arkema and Tokai Carbone Savoie. France has granted a total of €903 million in aid under these two PIIEC battery projects.

ACC: a pioneering battery production project in Europe

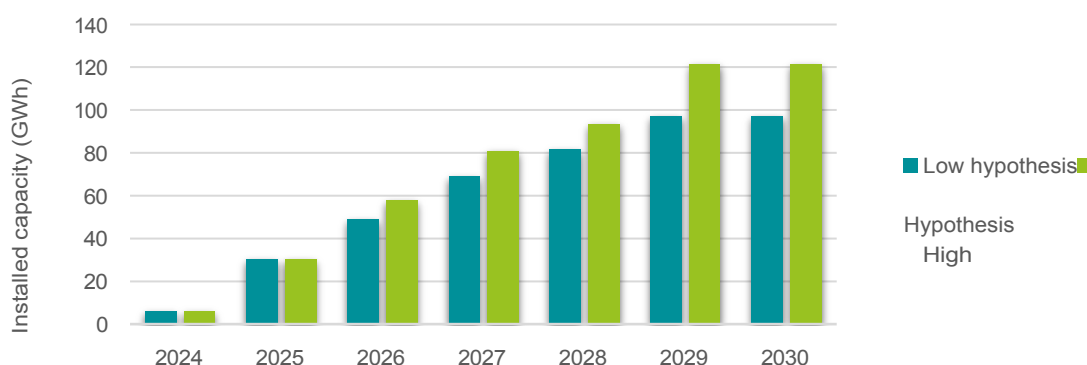
A joint venture between Stellantis, Saft and Mercedes, ACC is developing advanced (and eventually all-solid) lithium-ion battery cells and modules, and building 3 gigafactories in France, Germany and Italy. ACC has chosen to locate its research and development activities in Bruges, near Bordeaux, while its pilot plant - designed to test the production process before scaling up - is located in Nersac (Charente), close to a historic Saft factory. Its French gigafactory is located in Billy-Berclau Douvrin (Pas de Calais), on a 34-hectare site belonging to Stellantis (Française de Mécanique), historically dedicated to the manufacture of

production of internal combustion engines. **The Billy Berclau Douvrin gigafactory, inaugurated on May 30, 2023, is scheduled to supply Stellantis and Mercedes from early 2024. By 2030, it will have an annual capacity of 40 GWh, equivalent to around 500,000 electric vehicles. The plant will employ 2,000 people by 2030.** This is the first gigafactory for lithium-ion batteries for electric vehicles in France.

As part of the **first battery PIIEC**, the European Commission has authorized France (State and local authorities) to grant ACC €846 million in aid for this project. The French aid will support research and development activities in Bruges and Nersac, and the ramp-up of the gigafactory in Billy-Berclau Douvrin. In all, the project represents a total investment of almost €3 billion in France, including €2.5 billion for the Gigafactory.

Generally grouping together the manufacture of electrodes (cathode and anode), then cells and modules, gigafactories represent the heart of the battery value chain (see diagram p. 10). This segment is crucial, as it accounts for a significant proportion of the added value and carbon footprint of batteries. In addition to ACC, the gigafactories of Envision (Douai), Verkor and ProLogium (both Dunkirk) will start production in 2025 and 2028 respectively. Thanks to these four projects, we are well on the way to achieving our target of 100 to 120 GWh of battery production by 2030. These massive investments in gigafactories demonstrate France's attractiveness as a location, and will act as a catalyst for future investments in the upstream and downstream segments of the battery value chain, with a view to building a complete competitive ecosystem.

**Installed production capacity
of electric vehicle batteries in France**



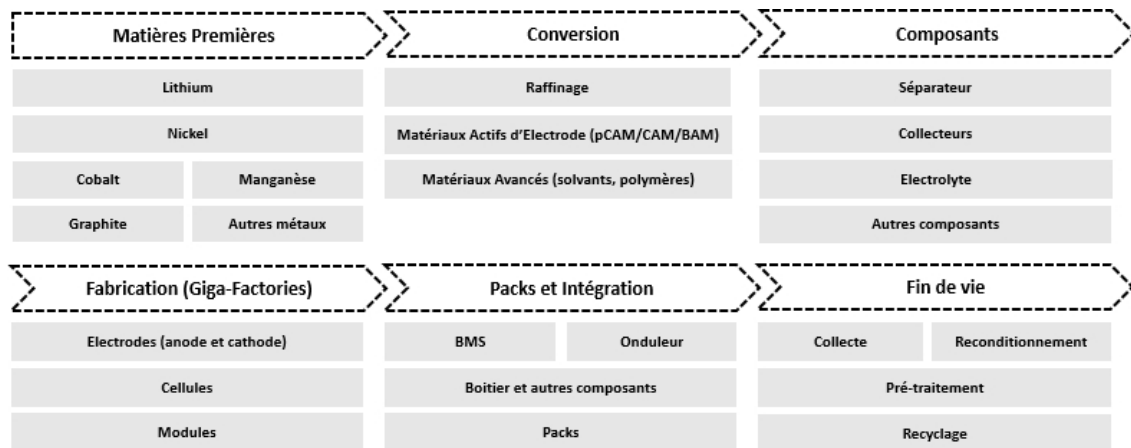
The electric battery value chain

Gigafactories are at the heart of the battery value chain. They manufacture the electrodes and assemble them with the other components - separator, current collectors, electrolyte - to form a unit called a cell, which they then generally stack to form a module.

Upstream of these gigafactories is the **extraction** of the metals needed to manufacture the cells and, in particular, the electrodes. These metals (lithium, nickel, manganese, cobalt) must then be **refined** to battery grade, then processed to obtain the **active electrode materials and their precursors** (pCAM then CAM or *cathode active material* for the cathode, BAM or *battery anode material* for the anode). **Advanced materials** needed to manufacture the various components are also produced, such as the polymers often used to make separators.

Downstream of the gigafactories, the **packs** that make up the actual "battery" are manufactured. The packs consist of several modules assembled together with various components - BMS or *battery management system*, inverter - within a metal case. The battery is then **integrated into** electric vehicles by automakers.

End-of-life batteries - and gigafactory rejects - are collected and **pre-treated**, before being **recycled**. The critical metals recovered in this way can then be reincorporated into new batteries to achieve circularity. Before being recycled, some batteries can also be **reconditioned** to extend their lifespan, for example to serve as stationary storage units for the power grid.



The national "Batteries" strategy: a key focus of France 2030 on sustainable mobility

In 2021, the **National Battery Strategy** has taken over from the Batteries Plan to continue and amplify its actions. Coordinated by the Direction Générale des Entreprises (DGE), it focuses on four priority objectives:

- pursue efforts to develop a national offering, from the extraction of strategic materials to recycling, by supporting research, innovation and the industrialization of relevant projects;
- promote the advantages of this national offer, in particular by encouraging the most environmentally responsible and virtuous batteries;
- support demand for batteries, in particular by speeding up the transition in the transport sector;
- respond to the recruitment and training needs of the industry, for which access to skilled workers in electrochemistry and materials science, as well as the availability of technicians and operators, is a major challenge.

Strong support for research and innovation

France 2030 relies on upstream research (TRL 1 to 4) to develop new generations of batteries that are more efficient, safer, less expensive and last longer.

longer than those currently on the market. To this end, the **"Program and Equipment Priority Research Projects" (PEPR)** dedicated to batteries, piloted by CNRS and CEA, aims to support industrial sectors with technological innovations that can be transferred to other sectors

economic players in the short-to-medium term. It will also lay the foundations for the future development of the

the longer term. While electric mobility is the first application targeted, the aeronautics, space, stationary storage and Internet of Things sectors are also concerned.

Over and above the necessary change of scale in industrial production, the challenges to be met if electric mobility is to be economically viable, controlled and sustainable are essentially technological in nature. They range from the design of eco-responsible alternatives to Li-ion systems, which are now unavoidable, to battery recycling technologies to recover electrodes, active materials and components, thus minimizing the consumption of primary resources.

To meet these challenges, PEPR has identified three priority research areas:

- Innovative chemistry for new generations of materials and processes, including reducing dependence on critical metals (Ni, Co, Li), developing all-solid and post-Li-ion technologies (Na-ion, K-ion, organic), and developing manufacturing processes with a smaller environmental footprint and lower energy consumption.
- Battery management systems (BMS) adapted to widespread use by defining battery condition indicators and developing sensors and tools for processing signals collected in real-life conditions and throughout the life of the battery.
- Advanced numerical tools for materials characterization and multi-scale simulation.

The battery PEPR has a total budget of €45.7 million from France 2030, and involves research teams from universities, Grandes Ecoles and national organizations, spread over throughout France. On the one hand, it funds five major targeted projects (€18 million - see (see box), led by teams of internationally renowned researchers, and two projects equipment. These projects, each lasting 6 years, will involve around 30 PhD students and as many post-docs, who will benefit from top-level training.

On the other hand, PEPR will fund the winners of a call for projects launched in November 2022 and operated by ANR, for a total of €15 million. The research projects supported under this scheme will be complementary to the five targeted projects mentioned above. The winners will be consortia of public research teams. The projects are scheduled to start in summer 2023, and last between 4 and 5 years. The "Batteries" PEPR will operate in synergy with the "Recycling, Recyclability, Re-use of Materials" PEPR, which includes battery recycling among its priorities.

5 targeted projects responding to identified research priorities

The **LIMASSE** project aims to develop reliable prototypes of "all-solid" batteries, using lithium metal as the negative electrode, with improved energy densities and good capacity retention.

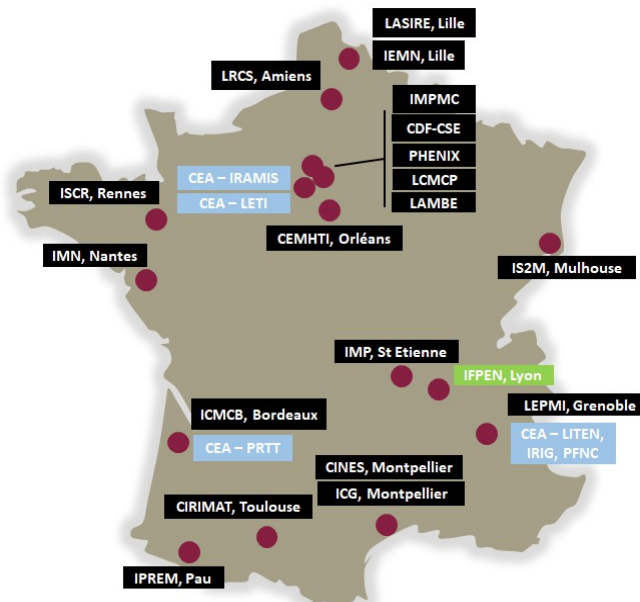
The **HIPOHYBAT** project, focused on high-power systems, addresses two technologies: sodium-ion, for which we'll be looking to increase energy density and durability, and hybrid batteries to replace lead-acid batteries.

The **SENSIGA** project aims to improve the diagnosis of batteries during operation, in order to increase their performance, reliability and lifespan through non-invasive cell monitoring and control of their state of health, charge, energy, power and safety.

The **OPENSTORM** project will develop experimental characterization techniques, from the laboratory to large-scale instruments, to accelerate the development of future generations of batteries (all-solid, power and post-lithium-ion) through a better understanding of their operating and ageing mechanisms.

The **BATMAN** project aims to introduce artificial intelligence into the development of next-generation batteries. Specifically, work will focus on high-throughput screening of optimized electrolytes and materials for high-power devices, understanding the chemical reactions that occur at interfaces, and developing digital twins to optimize battery manufacturing processes.

More than 24 laboratories, including CEA, CNRS and IFPEN, will be implementing these projects throughout France:



In addition to PEPR, the Battery Strategy supports the **transfer of low-TRL research results into innovation**. The BATMAT project, winner of the **cross-functional Prematuration-Maturation call for projects** within the scope of the Battery Strategy, will receive funding of 15 M€ to accelerate the transfer of public research by increasing the number of directly marketable results or the creation of start-ups, to the benefit of the strategy. Between 2023 and 2027, this project aims to finance more than 50 premature projects and around 30 maturation projects relevant to the batteries strategy.

BATMAT is supported by a consortium of 17 partners, including 2 lead partners, CNRS/CNRS Innovation and SATT Linksiem, as well as national research organizations, universities, SATTs and technology transfer bodies. Its mission is to detect, select, finance and support innovation projects in the field of battery cell components, new battery electrochemicals, battery manufacturing and reconditioning processes, and innovative battery systems and packs. These efforts have already borne fruit in recent years (excluding the BATMAT project) with the creation of start-ups such as Tiamat and Nawa Technologies, which have emerged from public research and now occupy an important place in the French battery ecosystem.

Further downstream, the **France 2030 call for projects (AAP) on "Innovative solutions and technologies for batteries"**, operated by Bpifrance, was launched in October 2021, to support innovative solutions and technologies for electric vehicle batteries and other applications such as aerial and stationary storage from TRL 4 to 6, towards reaching TRL 7 to 9 and thus the beginnings of industrialization. The aim of this AAP is to enable the pursuit of innovations in electrochemistry and battery packs currently being developed in public and private laboratories, and the exploration of complementary avenues. More specifically, it targets four themes:

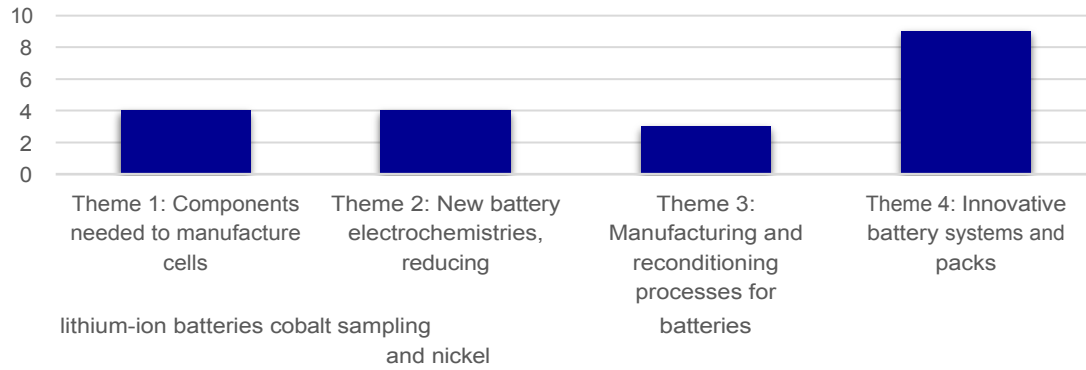
- Components needed to manufacture lithium-ion battery cells ;
- New battery electrochemicals to reduce cobalt and nickel consumption;
- Battery manufacturing and reconditioning processes ;
- Innovative battery systems and packs.

The 20 projects (and 33 applicants, through collaborative projects) selected in the four rounds represent more than €305 million of investment, which will be supported by €79 million of public funding from France 2030. The themes of battery systems and packs, new battery electrochemistries, and components for Li-ion battery cells dominate among the winning projects in the four rounds of the AAP, with a good representation of start-ups and SMEs among the winners. The three projects led by K-Motors, Nanomakers and Tecsup illustrate the diversity of applications that this scheme has helped to fund, including the electrification of heavy vehicles, stationary storage and the manufacture of high-performance components.

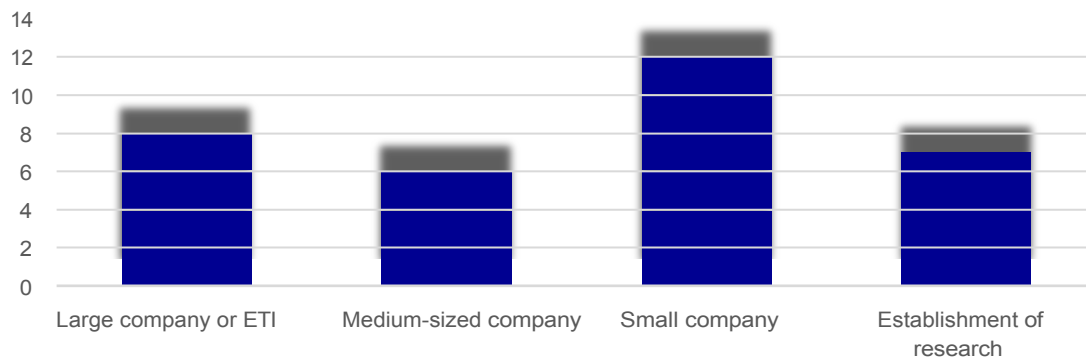
AAP winners in brief

"Innovative solutions and technologies for batteries"

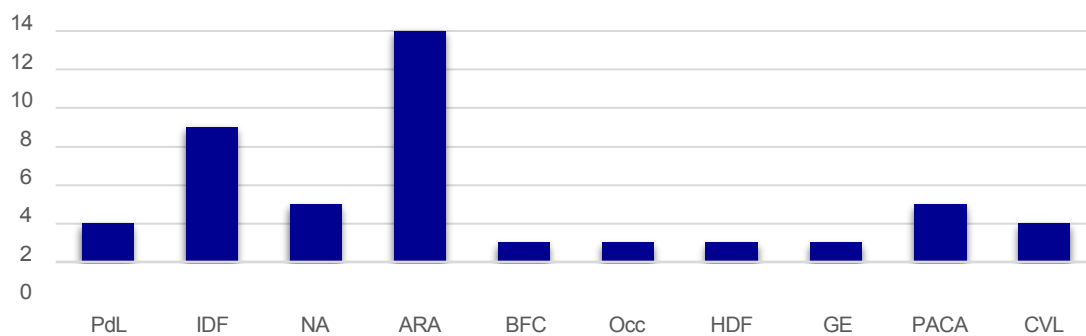
Project themes



Project owners



Locations



AAP "Innovative solutions and technologies for batteries": focus on 3 emblematic projects

GreenPower" project
K-Motors - SME (start-up)
Aubagne (13) - Provence-Alpes-Côte d'Azur



Start-up K-MOTORS operates in the electromobility sector to improve the efficiency, range and performance of electric batteries. The GreenPower project aims to develop a supercapacitor module that can be easily connected to lithium batteries, enabling power regulation of integrated on-demand electrical storage systems. Aimed in particular at heavy urban vehicles such as dump trucks, the project will create 16 direct jobs and 100 indirect industrial jobs.

GRESILION" project
Nanomakers - SMEs
Rambouillet (78) - Paris Region



The Gresilion project led by Nanomakers, in collaboration with Tokai COBEX Savoie and the LRCS laboratory, aims to prepare two new high-performance materials for the anodes (negative electrode) of Lithium-ion batteries. By combining the high storage capacity of silicon with the stability of carbon, these low-carbon footprint materials will have storage capacities up to 2 times greater than graphite, and will be easy to industrialize in France. More than 100 jobs will be created to develop this innovative and strategic process for the industry.

E2E Generator" project
Tecsup - SME
Allonzier-la-Caille (74) - Auvergne-Rhône-Alpes



Tecsup designs and manufactures energy storage and management systems such as battery chargers, energy conversion products and lithium batteries. The E2E Generator project aims to provide an environmentally-friendly alternative to generators to overcome their drawbacks: odors, chemical hazards, noise pollution and greenhouse gas emissions. To replace them, Tecsup is developing lithium batteries in series, optimized in terms of management, performance and lifespan, and controlled by electronics enabling access to higher instantaneous powers than those currently available on the market. This solution will be used in tunnels, emergency vehicles, high-density urban environments and industrial sites.

Support project industrialization across the entire value chain

In addition to supporting numerous research and innovation projects to accelerate their level of maturity, the French government, via France 2030, supports various players in the industrialization phases. This continuum of action at different levels of project maturity is helping to consolidate a complete ecosystem of battery industry players across the country. Efforts have focused on supporting the emergence of the first four French gigafactories, led by ACC, Envision, Verkor and ProLogium. It is now equally important to complete the French offer by encouraging projects upstream and downstream of the battery value chain: extraction and refining of metals, cathode and anode active materials, separators, reconditioning and recycling of batteries and production rejects to produce materials that can be reincorporated into new batteries and thus strengthen our strategic autonomy.

Following on from the Varin report on securing the supply of mineral raw materials to gigafactories, the French government has drawn up a strategy based on several pillars. On the one hand, the aim is to secure financing and supplies of critical metals that cannot be produced on French soil in the short term, by encouraging the conclusion of *offtake* agreements² and co-investment alongside manufacturers in strategic projects - for example, via the implementation of a **minerals and critical metals fund**. Gaining a better understanding of value chains and anticipating the disruptions and crises likely to affect them is also a major challenge. The economic and mineral intelligence tools of the **Observatoire Français des Ressources Minérales pour les Filières Industrielles (OFREMI)**, launched in November 2022 and supported to the tune of €6 million by France 2030, will provide greater visibility on the future of the strategic metals sector.

Investment fund dedicated to critical minerals and metals

Managed by InfraVia, this fund is intended to be invested by private partners, both industrial and financial, and will be topped up by the French government to the tune of 500 million euros as part of France 2030. Caisse des Dépôts will operate the fund on behalf of the French government. Including the State's investment, Infravia is aiming to raise a total of 2 billion euros.

Since 2021, France 2030 has been accelerating the emergence, industrialization and growth of businesses through funds and funds of funds that focus on priority sectors, particularly industries and sustainable development, which generate growth and jobs throughout the country.

² Long-term agreement to buy/sell part of future production

The France 2030 "**Critical Metals**" call for projects was also launched, with the aim of reducing industry's dependence on critical metals for France's priority industrial, environmental and climate policies, including securing supplies for the battery industry. Three projects relating to electric batteries have been selected for this scheme, covering different stages of the value chain: the EMILI 2 project, led by Imerys, for lithium extraction from mica; Viridian Lithium's CoRaLi project for refining; and Eramet's RELIEVE 2 project for Li-ion battery recycling.

Furthermore, on May 16, Orano announced its industrial partnership with the Chinese company XTC for the production of critical materials for electric vehicle batteries (a first plant for active cathode materials and a second for precursors) in Dunkirk.

A national "**Recyclability, Recycling and Reincorporation of Materials**" strategy has also been launched as part of France 2030. It aims to remove the barriers limiting the development of recycling, to develop and launch measures to support the supply of and demand for recycling raw materials, and to support the deployment of innovative solutions through complementary measures. Strategic metals for battery technologies are particularly targeted. As part of this strategy's AAP, which focuses on supporting innovative recycling processes, two projects for recycling scrap and end-of-life electric batteries have been funded, including the ScrapCO2MET project run by Mecaware, MTB Manufacturing and Verkor.

At the same time, the France 2030 "**Première Usine**" call for projects was launched, with the aim of accelerating the emergence of first industrialization successes by start-ups, SMEs and industrial ETIs, by providing financial support for projects to set up first factories in France for innovative production. Of all the winning projects to date, two are related to the battery sector, supporting the industrialization of certain segments of the battery value chain and thus strengthening the French industry.

Projects upstream and downstream of gigafactories, to secure their supplies as part of a circularity strategy

GeoVaLi" project
Lithium de France - SME
Bischwiller (67) - Grand-Est

Lithium de France
— GEOTHERMAL —

Lithium de France is a French company that aims to extract lithium, a strategic metal of prime importance to the battery industry, from France, where supplies currently depend on players outside Europe. Thanks to an innovative and ingenious process combining the exploitation of geothermal heat and the recovery of lithium present in geothermal brines, the company intends to produce 32,000 t/year of lithium, thus reducing France's dependence on imports. A total of 105 direct jobs will be created during the industrial launch.

CoRaLi" project
Viridian Lithium - GE
Strasbourg (67) - Grand-Est

VIRIDIAN
LITHIUM

The "CoRaLi" project, led by Viridian Lithium, will be France's first lithium refinery. Thanks to France's energy mix, it will produce battery-grade lithium with one of the lowest carbon contents in the world. Viridian is aiming for an initial production of 27,000 tonnes of lithium hydroxide per year by 2026, and eventually to fully meet the demand corresponding to the production of 2 million electric vehicles per year.

CO2MET Scrap Project
Mecaware - SMEs (start-ups)
Villeurbane (69) - Auvergne-Rhône-Alpes



Industrial start-up Mecaware is coordinating the "Scrap CO2MET" project, carried out in partnership with the Verkor gigafactory, pre-processing company MTB Manufacturing, and two research laboratories (ICBMS and LEPMI). This project will enable critical metals of the highest quality and purity to be produced in France, thanks to the implementation of an in situ recycling process for gigafactory production scrap, enabling metals to be reincorporated into the value chain. Mecaware's core process, an innovation stemming from French research, harnesses the qualities of CO2 derived directly from industrial emissions, without effluents. Particularly competitive in terms of environmental and economic impact, the project includes a pilot phase with a 50-ton-per-year line at Verkor's R&D center, followed by an industrial phase with a 7,500-ton-per-year capacity installed at the Gigafactory.

Meet recruitment and training needs

Finally, the strategy addresses the industry's recruitment and training needs. The ACC, Envision, Verkor and Prologium gigafactories are expected to create around 10,000 direct jobs in the Hauts-de-France region by 2030. Access to qualified personnel in the field of electrochemistry and materials science, as well as the availability of technicians and operators, is a major challenge to which the educational fabric must adapt in order to meet future demands.

France 2030's "Compétences et Métiers d'Avenir" call for expressions of interest is providing tens of millions of euros in support for battery diagnostics and training schemes, with the first concrete "Ecole de la batterie" project, led by a consortium headed by Verkor in Grenoble and focusing on engineering and design office profiles, to be launched in August 2022. Two other projects (Electromob, led by a large consortium including ACC, Verkor, Stellantis, Renault and Toyota; and Fodublive, led by Envision) are also winners in the Hauts-de-France region and are currently being contracted. In total, the 4 winning projects to date in connection with the "Batteries" strategy represent a total training budget of over €60 million, which will be supported by up to €35 million in state aid³. They will enable nearly 70,000 apprentices, at all levels of qualification, to be trained in the battery industry.

Among these projects, **Electromob** brings together 27 partners, including gigafactories, automakers, training organizations and public-sector purchasers of continuing training for jobseekers). Supported by the GIP FCIP and steered by ARIA Hauts-de-France, the project provides a collective response to the need to accelerate recruitment and training of employees in the electromobility industry, while also anticipating the needs of upstream gigafactory and battery recycling industries. Worth around €25 million up to 2027, the project has received a €14.2 million subsidy from the French government⁴, the largest amount of funding allocated under the AMI "Compétences et métiers d'avenir" at the time it was awarded. It will enable the training of 9,180 apprentices by 2027, and the creation of a "multi-partner regional electromobility academy". Training courses ranging from bac -3 to bac +5 will be developed in conjunction with manufacturers, building on the training already offered by vocational and technological high schools, universities, engineering schools, GREtas or AFPis and AFPAs (addition of themes complementary to the regional GOALS, such as characterization of battery electrochemistry; development of master's-level training courses linked to electrochemistry and the industrial performance of gigafactories). Electromob also aims to attract young people, notably by developing mobile attraction and communication systems for jobs in the battery manufacturing industry.

In addition, France is one of the first Member States, along with Hungary and Spain, to have entered into a partnership with EIT Innoenergy in July 2021 to create **the European Battery Academy** to accelerate the training of employees in the new battery professions. EIT Innoenergy's aim with this initiative is to train and retrain 800,000 European workers in the electric vehicle value chain by 2025, including 150,000 in France. Since September 2021, the battery academy has been rolling out in France. EIT InnoEnergy is working with French companies and training organizations to accelerate worker training with financial support from the European Union, by developing a training offer in the form of modules.

³ Subject to finalization of state aid analysis.

⁴ Subject to finalization of state aid analysis.

Appendix - Battery projects funded under the "Innovative solutions and technologies for batteries" call for projects

PROJECT	ACTORS	DESCRIPTION
DEFIBATT	ARMOR Battery Films SAS / CNRS	With the DEFIBATT project, ARMOR Battery Films and the Institut des Matériaux Jean Rouxel in Nantes aim to design, develop and characterize coated current collectors for the future generations of batteries.
DIGIBATT	Olenergies	The DIGIBATT project aims to digitize Olenergies' future battery production plant in order to optimize every stage of the battery life cycle, batteries, from manufacture to recycling.
EleNa NVPF	Rhodia Operations	The project led by Rhodia Operations concerns the development, piloting and industrialization studies for NVPF, a material for a power cathode designed for the technology of Na-ion battery.
INGE-PROC	INGECAL	INGECAL's INGE-PROC project aims to develop processes and equipment for industrializing battery production, all solid electric future generation.
PEGASE - BEST	Limotech	The BEST - PEGASE project has a dual purpose for Limotech: to improve the industrialization of its starter battery and to adapt its product to new markets, aeronautical applications.
TaveliBIND	Solvay France	The TaveliBIND project supported by Solvay France aims to accelerate by 25% the development time of new binders for high performance Li Ion batteries, energy density.
BatteryAviationLMFP	SAFT / Amvalor	The aim of the LMFP Aviation Battery project, led by Saft and AMVALOR, is to develop a 28 V battery required for APU start-up and emergency power functions, aircraft, in Lithium-ion and as light as possible.
BATTERY X	MOB-Energy	With the BATTERY X project, MOB Energy aims to develop a standardized, safe, high-performance battery that can be made up of second-life batteries from different brands.

EPSILON	Solvionic	The EPSILON project led by Solvionic aims to develop and produce solid polymer electrolytes on a pilot scale for new-generation batteries and supercapacitors dedicated to mobility, with a production target of in 2026.
GRESILION	Nanomakers / Tokai COBEX / CNRS	The GRESILION project supported by NANOMAKERS, TOKAI COBEX SAVOIE and LCRS aims to prepare and validate new high-capacity materials. silicon graphite for Li-ion battery anodes.
HYBRID2	PowerUp	The HYBRID project led by PowerUp aims to enhance Li-ion battery performance indicators using an innovative approach combining semi-empirical models and Machine Learning.
GeoVaLi	Lithium de France	The GeoVaLi project, backed by Lithium de France, aims to extract lithium from geothermal brines using a process that combines this production with the exploitation of geothermal heat.
ELIAS	SAFT / CEA / Ingecal / Polymer Expert / CNRS	Supported by Saft, Ingecal, PolymerExpert and the CEA-LITEN, ICMMO (Univ. Paris Saclay) and ICR (Univ. Aix Marseille) laboratories, the ELIAS project aims to develop technological demonstrators and a pre-industrial production tool for high performance solid electrolyte batteries. performance level.
BADECOM	RETROFLEET	RETROFLEET's BADECOM project aims to standardize the retrofit process for heavy-duty vehicles, making it as competitive as possible. This approach includes a strong eco-design dimension, thanks to the coupling of mobility and energy. which will ensure the second life of the batteries.
E2E Generator bis	Tecsup	The E2E Generator bis project, led by Tecsup, aims to develop a low-carbon alternative to generator sets using batteries and battery banks optimized in terms of design and management. adapted to constrained environments.
Electrification2	John Deere	The Electrification2 project supported by John Deere aims to develop electrification solutions for off-highway vehicles and seize the opportunity to diversify the Orléans-Saran industrial site towards the production of batteries.

MATICS	Saint-Gobain / Enersens / CNRS / Verkor / Ineris	Supported by Saint-Gobain, Verkor, Enersens, Ineris and LEMTA, the aim of the MATICS project is to develop, evaluate and simulate safe battery modules containing thin material thermal barriers to prevent the propagation of a runaway from cell to cell. thermal.
BAT MOBILE	ITEN / CNRS / MicroOLED / Claude Bernard University Lyon 1	The BATMOBILE project, led by ITEN, MicroOLED, ENS Lyon and IRCER, brings together the development of innovative technologies designed to industrialize new generations of very high energy density solid Li-ion batteries for applications such as nomadic and mass-market.
GreenPower	KMOTORS	The GreenPower project led by K-Motors aims to develop a plug-and-play supercapacitor module for lithium batteries, regulating the power of electrical storage systems. integrated with demand.
FIXBATT	OZO	The FIXBATT project led by OZO involves the development of a new generation of batteries that can be easily dismantled and repaired.

PRESS CONTACT

Bruno Le Maire's office: 01 53 18 41 13 - presse.mineco@cabinets.finances.gouv.fr

Agnès Pannier-Runacher's office: 01 40 81 13 25 - presse.mte@climat-energie.gouv.fr

Roland Lescure's office: 01 53 18 46 19 - presse@industrie.gouv.fr

ABOUT FRANCE 2030

- ✓ **It reflects a dual ambition:** to transform key sectors of our economy (healthcare, energy, automotive, aeronautics and space) through technological innovation, and to position France not just as a player, but as a leader in the world of tomorrow. From fundamental research, to the emergence of an idea, to the production of a new product or service, France 2030 supports the entire life cycle of innovation, right through to industrialization.
- ✓ **is unprecedented in its scale:** €54 billion will be invested to help our companies, universities and research organizations make the transition in these strategic sectors a success. The aim is to enable them to respond competitively to the ecological and attractiveness challenges of the coming world, and to create the future leaders of our sectors of excellence. France 2030 is defined by two cross-functional objectives: to devote 50% of its spending to decarbonizing the economy, and 50% to emerging, innovative players, with no spending that is detrimental to the environment (in line with the *Do No Significant Harm* principle).
- ✓ **Will be implemented collectively:** designed and deployed in consultation with economic, academic, local and European players to determine the strategic orientations and flagship actions. Project leaders are invited to submit their applications via open, demanding and selective procedures, in order to benefit from government support.
- ✓ **Led by the Secrétariat Général pour l'Investissement** on behalf of the Prime Minister, and implemented by the Agence de la Transition Ecologique (ADEME), the Agence Nationale de la Recherche (ANR), Bpifrance and the Banque des Territoires.

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