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NAVIGATING THE ROAD AHEAD FOR BATTERY TECH

SPECIAL REPORT
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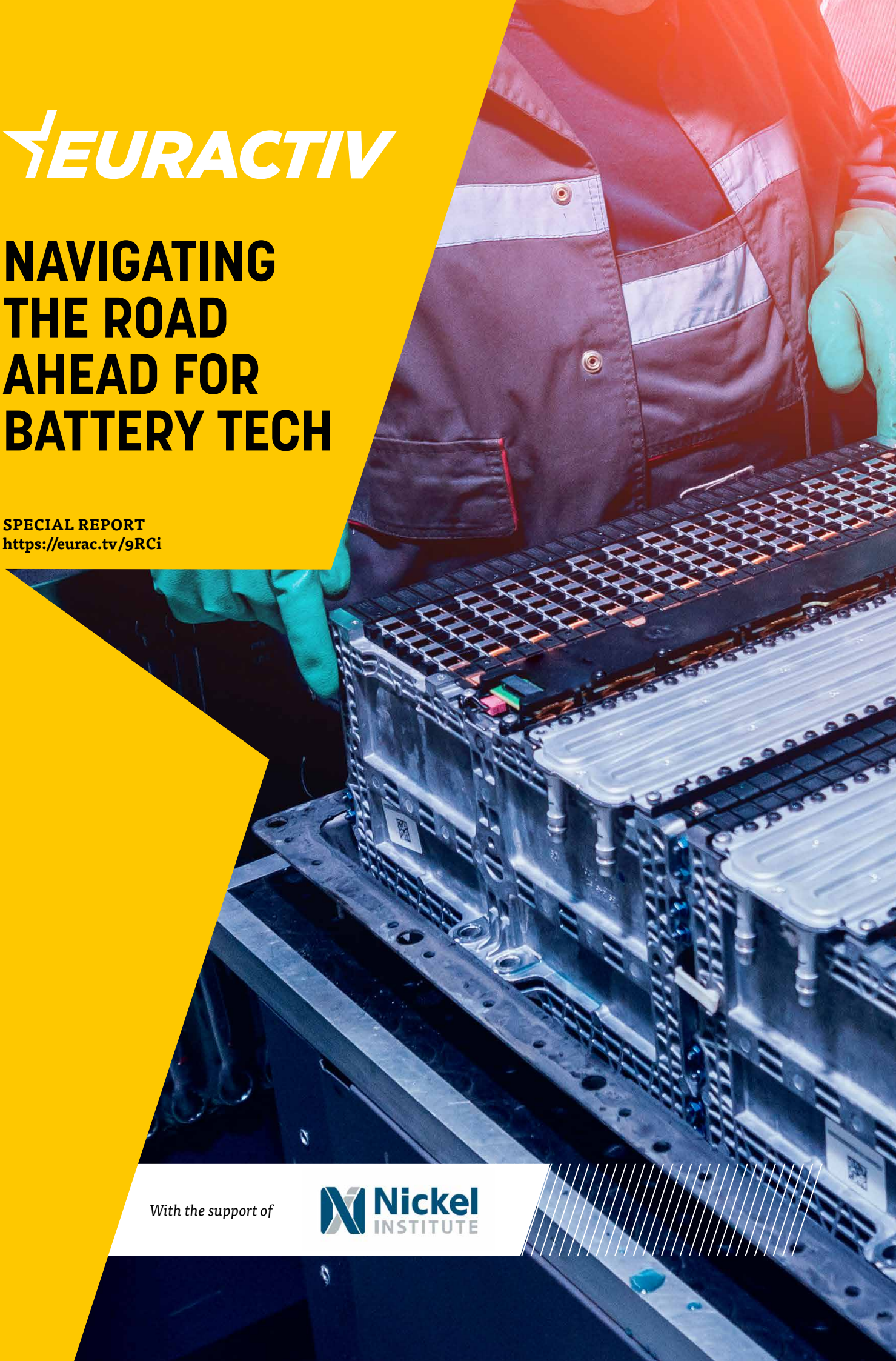

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Europe's climate agenda and willingness to tag its virus-recovery efforts to green objectives mean that electric-battery technology is due for a great decade.

In this Special Report, EURACTIV looks at the milestones ahead for the industry, including how European governments want to corner the global market and ensure that battery production is in line with environmental policies.

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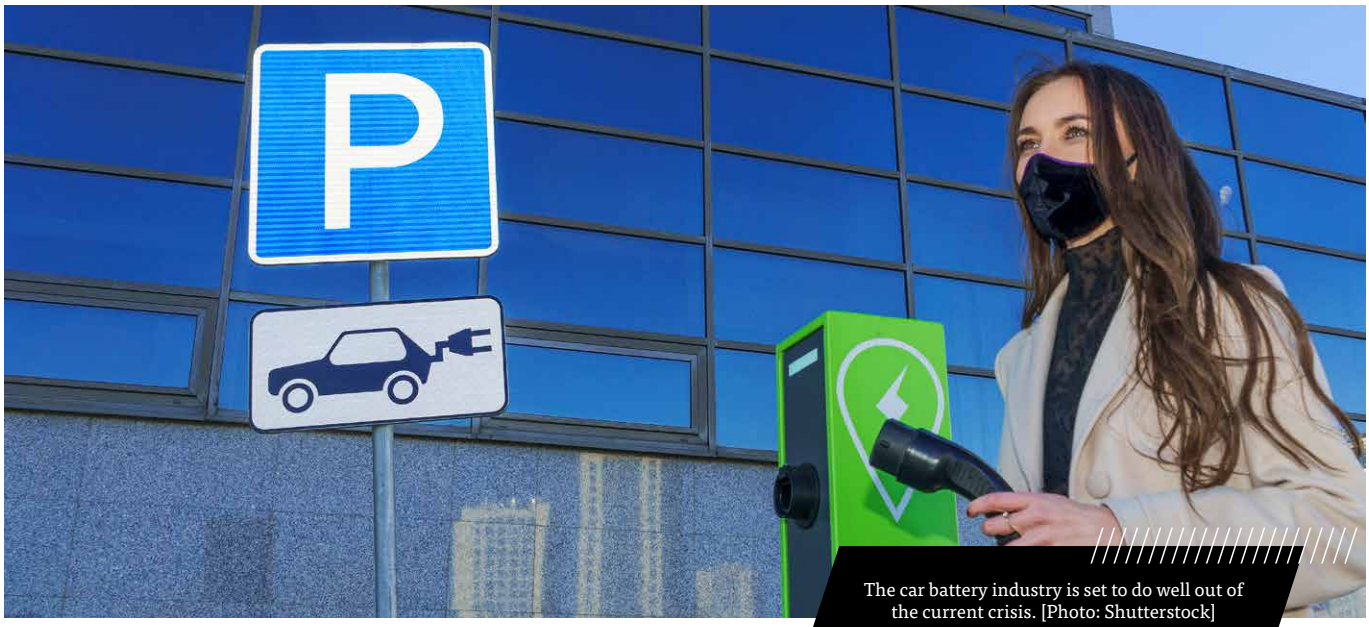
Coronavirus and the great electric-battery dividend

By Sam Morgan | EURACTIV.com



The car battery industry is set to do well out of the current crisis. [Photo: Shutterstock]

The global health pandemic has dealt a body blow to many areas of the economy but the battery industry looks set to reap significant rewards, even if it will also have to put up with a short-term slump in demand.

Coronavirus lockdown measures, changing habits and shifting investments have altered the course of energy and transport policy, not just in Europe but worldwide, as governments mull the best way to shore up their economies in the wake of the pandemic.

Investments in traditionally safe projects like coal power plants are starting to fall apart as investors see the long-term and low-risk payoffs of sectors like renewable power generation as the more attractive option.

One of the worst-hit areas is the auto industry, which was already bracing to absorb lower sales figures this year even before the virus outbreak hit. Some of the bigger firms have applied for financial assistance to cushion the blow.

The French, German and Spanish governments have duly obliged, putting together aid packages and state aid deals in order to protect jobs and shore up an industry that contributes a significant amount to their respective GDPs.

According to the terms of those deals, carmakers will have to boost electric vehicle production while motorists will be given incentives to either buy a cleaner car or trade in their old model for a new one.

"We need a motivational goal: make France Europe's top producer of clean vehicles by bringing output to more than one million electric and hybrid cars per year over the next five years," President Emmanuel Macron said while unveiling an €8 billion stimulus plan.

Electric vehicle subsidies will be bumped up to €7,000 and manufacturer Renault will commit to joining a pan-European push to corner the battery market. Rival Peugeot is already a member of the so-called EU Battery Alliance.

That particular initiative is powering on, according to European Commission Vice-President Maroš

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Šefčovič, who said in mid-May that he was "pleased to see that despite the pandemic, the EU Battery Alliance has remained on track in its crucial work."

The European Investment Bank is also bullish on the technology's prospects, expecting investments to top €1bn this year across all areas of the production value chain.

Spanish Prime Minister Pedro Sánchez said during the launch of a €3.75bn aid package that "the automotive industry is a strategic pillar for our country and this government is not going to leave it behind".

Spain-based firms will be expected to increase electric vehicle output to at least 700,000 units per year, so as to protect Spain's 12% share of the European car market. The sector will also have to help promote the rollout of charging points.

Germany, meanwhile, will increase its electric car subsidies to €6,000. The government also batted off lobbying from its all-powerful auto lobby, which had called for a 'cash for clunkers' scheme aimed at stimulating new car purchases.

CHARGED UP

The combined effect of those national policies means that electric cars, plus batteries as a result, are guaranteed to do well in the medium- and long-term, even if the impact of the coronavirus looks set to end the technology's strong run of good fortunes.

According to estimates by Bloomberg New Energy Finance, demand for rechargeable batteries will decline for the first time in 2020. Analysts expect shipments to slump 14% and for 2021 to feel the pinch too, largely due to the pandemic's cooling effect on motor sales.

Electric car manufacturers rank among the biggest users of batteries and although giants like Volkswagen are pushing ahead with the launch of new models, demand is not expected to recover until at least next year.

But the crisis was arguably well-timed for the battery industry, as costs have plummeted enough over the last decade for the sector to ride out the economic slump. Prices have dropped by nearly 90% thanks to economies of scale and technological developments. Costs are expected to hit the magic $100 per kilowatt-hour benchmark around 2024, according to Bloomberg NEF, which is the point at which electric car and combustion engine vehicles are predicted to reach price parity.

By the end of the decade, a battery pack's share of a vehicle's total cost – currently hovering around the 30% mark – should fall to about 15%.

"The long-term outlook for EVs remains bright, as fundamental cost and technology improvements outweigh the short-term impacts of the pandemic," Bloomberg NEF says in its latest Electric Vehicle Outlook.

Its analysts predict that EVs will make up 10% of global sales by 2025 and 28% by 2030. EU CO_2 regulations and China's credit system are among the factors that will dictate the speed of adoption.

PLUG POWER

By 2030, the amount of recharging infrastructure could start to restrain passenger car sales, rather than price or model choice, both of which should no longer be precluding elements by that point.

National policies will again determine how serious a problem that shortage might be. At the moment, a lot of charging is done at people's homes or workplaces.

Chancellor Angela Merkel's stimulus plan includes an obligation for refuelling stations to offer charge points, which further cements battery power's status in the Bundesrepublik's future mobility plans.

On Friday (19 June), the European Commission approved €18 million in state aid support provided by the federal government of Schleswig-Holstein for charging infrastructure, including charge points for buses.

"The contribution to EU environmental and climate goals of the scheme outweighs any potential distortion of competition and trade brought about by the support," the EU executive said in an explanatory note.

The Commission has also allocated an extra €1.5bn in its latest EU budget plan for the Connecting Europe Facility instrument, which is seen as a major avenue of funding for countries that want to roll out more infrastructure.

Its proposal for a €750bn recovery instrument – yet to get the necessary green light from EU member states – also identifies charge points as an area that will need heavy investment over the next seven years.

When it became clear that the pandemic would have a substantial impact on the EU economy, the Commission was quick to tout its European Green Deal as the right strategy around which to base a recovery plan.

The EU executive's flagship policy, which President Ursula von der Leyen insists is the bloc's "growth strategy", primarily targets climate-neutrality by 2050 as its main objective but also delves into sectorial goals like tweaking CO_2 standards for passenger cars.

Industry groups have already balked at the thought of even stricter targets getting the green light but any increase in ambition would likely have a stimulating effect on carmaker plans to boost EV production, which are already in motion.

The coronavirus may cool the Commission's commitment to ratcheting up its regulations but the course charted by influential national governments might yet signal to Brussels that there would be support for rule changes.

Denmark's e-ferry passes sea trials in style

By Sam Morgan | EURACTIV.com

E-ferries might have bigger upfront costs but could quickly pay off that investment in both financial and environmental savings. [Photo: Ærø EnergyLab]

The world's largest all-electric ferry completed 10 months of trials last week, as the EU-funded project revealed that battery-powered boats will save operators money compared to their diesel counterparts during their decades of service.

Ellen is a 60 metre-long car and passenger ferry, plying a route between two Danish islands in the Baltic Sea. It is most notable for being exclusively powered by 4.3 megawatts of battery power.

In August 2019, Ellen – which received funding from the EU's Horizon 2020 research programme – began operating a 40km return-trip route. High-performance chargers top up the battery between sailings, so passengers do not need to wait long to depart.

After nearly a year of service, the e-ferry's operators concluded that the entire system has an energy efficiency rating of 85%, nearly twice that of diesel boats. That success has a direct impact on how much it costs to run the vessel.

"Perhaps most important of all for the dissemination of e-technology, pure electricity is simply the cheapest solution now," the Ellen project team said in a statement, adding that although the upfront costs are still high, operating costs are much lower.

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According to their calculations, an e-ferry that cost just over €15 million to put in the water will reach financial parity with an older diesel vessel in its fourth year of service and achieve the same feat versus a new boat in its fifth year.

"Depending on the conditions, technical and regulatory, that apply to the route", an e-ferry will be the most economical option after a maximum of eight years, Ellen's operators said, adding that "significant savings" can be made given that ferries typically have a shelf life of 30 years.

Over the 10 months of voyages, passengers were asked to complete a survey about their experience. Almost all were very happy with the quieter trip and lack of diesel fumes on deck due to lack of engine. None voiced concerns at being on an electric boat at sea.

It is not just financial savings that can be made by the vessel: the e-ferry can also curb emissions by 2,250 tonnes of CO_2 every year, if the power used to charge the battery is 100% renewable energy.

Denmark's typical energy mix, which also includes decreasing amounts of coal and gas, would limit the vessel's green impact to 2,010 tonnes.

The Scandinavian country is moving quickly on cleaning up its energy generating systems. Last week, its government agreed on a plan to cut emissions by 70% by 2030, which will include building wind-focused 'energy islands'.

It also foresees a carbon tax, which will be negotiated later this year, and more charging infrastructure for electric vehicles.

Governments will have to start thinking in earnest about how to reduce carbon emissions from the shipping sector, which in the EU makes up about 3.7% of total CO_2 output, if the bloc is to honour its commitments to the Paris Agreement on climate change.

Work is ongoing to include the sector in the EU's carbon market for the very first time, which would charge shippers for pollution permits. MEPs on the environment committee vote on 25 June on a draft report aimed at accelerating that legislative rollout.

LIFE-CYCLE STYLE

What goes for boats is also true for automobiles. Upfront costs for electric cars are still higher than those for equivalent petrol and diesel versions but the point at which the two powertrains will reach price parity is rapidly approaching.

Battery costs are decreasing at a stable pace, due to economies of scale and advancements in technology. Mobility experts predict that once power packs cost $100 per kilowatt-hour, they will be on the same footing as the internal combustion engine.

Bloomberg New Energy Finance estimates that parity will be achieved in 2024, although new multi-billion-euro aid packages unveiled by European governments, which include electric vehicle and battery-based objectives, could accelerate that timeframe.

The parity-point is seen by many car market analysts as a tipping point after which new sales of electric vehicles will escalate quickly and then only be limited by factors like access to charging infrastructure.

According to the e-ferry project operators, any emissions created during the manufacturing process of the vessel's battery would be offset in just three months, again due to the carbon-intensity of Denmark's electricity grid.

Calculating an electric vehicle's green credentials is more complex given that cars are not always driven on a fixed route, unlike a ship, and Europe's patchwork of energy mixes is so varied.

For example, driving an EV in Poland will emit 174g of CO_2 per kilometre because much of the electricity behind the plug is generated from polluting coal. In Sweden, however, it is just 51g, according to data supplied by mobility group Transport & Environment.

Despite the discrepancies, the full picture shows that electric cars emit on average three times less CO_2 than diesel and petrol equivalents.

Producing an accurate life-cycle assessment of a vehicle is a difficult task. US carmaker Tesla said in its recent report for 2019 that a number of glaring omissions are still made by some analysts that look to demonstrate the impact of its cars vs the combustion engine.

They include the use of emissions data from a now-outdated testing procedure that does not reflect real-world driving standards, inaccurate cost statistics about battery cells and the assumption that an electric battery will have to be replaced during the car's lifetime.

"Tesla's battery packs are designed to outlast the car. We estimate that a vehicle gets scrapped after 200,000 miles in the US and 130,000 miles in Europe. Creating a battery that could last for 1,000,000 miles would drastically reduce emissions per vehicle produced," the report says.

That objective is not as outlandish as it may seem, as Chinese firm CATL – which supplies both Tesla and Volkswagen – announced in early June it had engineered a power pack with those credentials and that it would only cost 10% more than a standard EV battery.

It is not clear yet whether CATL has developed the battery, which it claims will last 16 years, in collaboration with Tesla or if it is a separate project. The company is yet to reveal if any orders have been placed by other carmakers.

Firms start to believe in a battery afterlife

By Sam Morgan | EURACTIV.com

Used electric car batteries can be stored and repurposed for grid balancing and other applications. [Photo: Connected Energy]

By 2040, one out of every three passenger cars around the world is predicted to be electric-battery powered. But the power packs that drive those vehicles do not last forever, so what will become of them once they lose their charge?

Climate targets, new rules on CO_2 emissions, falling costs and shifting consumer habits mean that sales of electric vehicles (EVs) are going to rapidly increase over the coming decade, according to most market analysts.

The European Union and its industry-minded member states are now powering ahead with plans to ramp up domestic battery production, so as to secure a slice of a multi-billion-euro global market and cut dependence on Southeast Asian imports.

EVs have now been on the road in significant numbers for more than a decade, so the issue of what to do with a car's battery pack once its motoring days are behind it is coming to fore in the industry.

Two options are available, depending on the state of the battery and the needs of the company dealing with it: recycle or reuse.

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CIRCULAR BATTERIES

Recycling involves dismantling the battery, once it can no longer hold a charge sufficient enough to drive an EV motor, and harvesting materials like lithium, cobalt and nickel for use either in new battery production or other manufacturing processes.

One of the challenges facing recyclers is that not all batteries, especially those that are maybe approaching a decade of service, were designed to be opened up and stripped of their lucrative components.

EU rules on power packs, grouped under the bloc's Battery Directive, are also outdated and do not reflect the current state-of-play or needs of the industry. A review is on the European Commission's agenda.

Under the EU executive's updated work programme, a legislative initiative will be presented in Q4 and will "aim to better factor in circularity, improve sustainability and keep pace with technological developments."

The Commission has still not officially confirmed whether the proposal will involve modifying the existing directive or replacing it with a regulation, although sources indicate that it will be the latter.

Either instrument will "notably encompass end-of-life and sustainability requirements" and will be assessed by Germany's rotating presidency of the Council, which takes over the six-month-long helm from Croatia on 1 July.

Industry groups have called on the Commission to ensure the rules establish strong sustainability criteria, define what 'second-life usage' entails and implement clear labels to aid recyclers.

That current lack of clear regulatory framework has not stopped companies from pressing ahead with ambitious recycling plans, as the direction the wind is blowing clearly indicates that there will be big business in the circular economy in the years to come.

Swedish battery firm Northvolt, one of the big players on the European market, announced in early June that it would team up with global aluminium company Hydro to build a recycling plant in Norway, in order to take advantage of its large EV fleet.

More than 40% of new cars registered in 2019 were battery-powered, thanks to generous government subsidies, cheap renewable power and an easily accessible recharging network. On the streets of Oslo, you are seemingly never more than a few metres from a Tesla.

Under the joint-venture, 8,000 tonnes of batteries will be recycled every year initially, with increased capacity targeted afterwards. Hydro will keep any aluminium that is reclaimed, while Northvolt will reuse the battery's innards to make new power packs.

Hydro executive Arvid Moss said that it "represents a new step into an industry with considerable potential" and that it would enable his company to improve its environmental footprint by reusing recycled materials instead of smelting new metal.

Northvolt's Emma Nehrenheim added that her firm "has set a target for 50% of our raw material in 2030 coming from recycled batteries" and that the venture is "an important piece of the puzzle to secure an external feed of material before our own batteries begin returning back to us."

Strong environmental credentials are the backbone of Europe's efforts to compete on the global market, as domestic producers will struggle to match their Asian rivals on either price or volume in the short- or medium-term.

European Commission Vice-President Maroš Šefčovič, who oversees the EU's Battery Alliance, has repeatedly said that Europe's power packs have to be the greenest on the market in order to be successful.

LAZARUS BATTERIES

EV batteries degrade like any other over time, similar to a phone battery. Statistics vary on how long they last, depending on how they are charged, what model of car it is, what conditions it is driven in and battery age.

Manufacturers regularly offer an eight-year-long warranty, which is only set to increase as advancements in technology make batteries more robust, increase their ability to hold a charge and improve their chemical make-up so they stay healthy for longer.

Earlier this month, Chinese producer CATL – which supplies both Tesla and Volkswagen – said it had developed a battery that lasts for more than a million miles and can be reused even after that.

The firm claims that it would give the power pack an operating lifetime of 16 years and increase the current average total distance limit nearly six-fold.

CATL boss Zeng Yuqun told Bloomberg New Energy Finance that "if someone places an order, we are ready to produce" but did not reveal if any carmakers had already taken him up on the offer.

When the charge capacity of current batteries falls below a certain threshold, they may not be powerful enough to drive a car motor anymore but they still have their uses. Renault has recognised that potential and teamed up with raw material giant Umicore on a storage project.

The French marque will supply old batteries from its Kangoo model,

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which will be installed at a site in Belgium where they will provide 1.2MW of storage and grid-balancing capacity for Umicore's industrial facility.

According to the project's technology partners, the scheme promises to double the value of a battery and extend its lifetime by up to seven years. Other manufacturers like BMW are also looking into 'closed-loop' schemes of this nature.

MIT researchers said in a May study that used batteries could be applied to renewable energy facilities too. In a test case, they modelled a solar power farm and 2.5MW of storage, finding that it could turn a profit only if the batteries were secondhand.

New power packs would make it impossible for the initiative to generate money, according to the study, while the secondhand option using batteries at 80% of their original capacity could, so long as they were priced appropriately.

The study also raised more questions, such as whether it would be economically viable to remove batteries from cars and repurpose them in this way, how they should be screened to check their performance is good enough and whether batteries from different cars could be installed alongside one another.

"There's a lot of stakeholders who would need to be involved in this: You need to have your EV manufacturer, your lithium-ion battery manufacturer, your solar project developer, the power electronics guys," said researcher Ian Mathews.

The cost of EVs could also drop further if carmakers go down the path of effectively leasing the battery to motorists instead of selling it along with the rest of the car. Companies are also exploring the option of building battery-replacement services into the sales price.

EV market penetration could therefore increase even faster than expected, depending on how quickly the separate branches of the value chain can converge and close the battery loop.

The companies that produce and use batteries are quickly starting to realise the financial potential contained within the power packs they install in their vehicles.

Finland: Europe's battery producing Shangri-La

By Sam Morgan | EURACTIV.com

An open-pit mine in Lapland. [Photo: NS Energy]

Europe's ambitions of cornering a substantial slice of the multi-billion-euro global battery market are best illustrated by Finland, which has all the raw materials needed to produce electric vehicle power packs and the right conditions needed to do it sustainably.

Due to growing demand for e-mobility and renewable energy storage options, Europe's battery market potential could reach €250 billion annually by 2025, according to some estimates. Electric vehicle (EV) sales are predicted to skyrocket globally and drive up demand.

That has prompted the European Union to launch a dedicated mini-industrial policy – known as the Battery Alliance – and to tweak existing legislation in order to make it easier for companies to enter the market and ramp up production.

Relaxed state aid rules granted to so-called Important Projects of Common European Interest (IPCEI) have unlocked billions for cross-border projects aimed at building factories, recycling used batteries and more.

But one of the most challenging factors facing Europe's industrial push is where to source raw materials like cobalt, lithium and nickel.

Non-EU countries that have large deposits often do not stick to the same level of human rights and sustainability standards, which undermines Europe's aim of producing

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"the greenest batteries on the market".

According to a 2016 report by Amnesty International, 20% of the Democratic Republic of Congo's (DRC) exported cobalt is produced via artisanal mining practices, which often involves the use of child labour. It is often difficult to determine where materials originally came from due to third-party vendors.

Work is ongoing at the European Commission to define strict battery criteria so manufacturers know where the goalposts are.

But unless those requirements immediately force change in countries like China and the DRC, the EU's supply needs will be a problematic issue.

FINNISH PIONEERS

That is where Finland comes into the equation, with its raw material deposits of nickel, copper, cobalt, lithium and graphite, active mining and metallurgical industries and growing manufacturing sector.

"There are ten active mines and exploration projects, at various stages of development, three of which produce nickel, copper and cobalt concentrates, which are mostly refined locally to supply the EU market," says a research paper published by the European Federation of Geologists.

As an EU member, Finland is bound to respect community laws on environmental standards, labour market rules and competition policy but also has the political and financial clout to pursue more sustainable industrial processes.

According to the study, one mine deploys "a unique and energy-efficient way to extract metals with about 40% less greenhouse gas emissions and 20% less energy consumption than the average for nickel production."

Finland is also well placed to ramp up clean energy capacity and its government has pledged to go carbon neutral by 2035. Neighbouring Sweden and Norway are also on track to scrub fossil fuels from their energy mixes within several decades.

The environmental impact of an electric car battery is a divisive matter, as full life-cycle assessments of a vehicle's footprint should take into account how the power pack was manufactured.

Low standards at the beginning of the value chain drags down the green credentials of EVs and can act as a limiting factor on vehicle sales, which are increasingly driven by consumer awareness of environmental factors.

Finland enjoys a plum position in Europe as the only country currently mining cobalt, which is still a crucial battery component, despite efforts by the likes of General Motors and Tesla to reduce the percentage needed by substituting it for aluminium or more nickel.

However, it is not the only European country that has cobalt deposits. According to the Joint Research Centre, resources are available in Spain and Sweden, while there are unconfirmed amounts in Cyprus, Slovakia, Austria, Czech Republic, Germany, Italy and Poland.

The study also cites the availability in EU-applicant countries and neighbours Albania, Greenland, North Macedonia, Norway, Serbia and Turkey.

FROM MINE TO ROAD

Despite plans to exploit these resources when financially viable and space-based prospecting efforts aimed at identifying new deposits, it is still likely that Europe will remain dependent on imports for the foreseeable future.

In order to try and guarantee the sustainability credentials of the raw materials going into battery production, the Technical Research Centre of Finland (VTT) and Geological Survey of Finland are working together on a joint €5.8bn project called BATTRACE.

The idea is to develop a viable and sustainable methodology for tracing materials all the way from the mine to the final product, so companies can guarantee that what they are putting into their batteries is the real McCoy.

"If it was possible to trace the production chain of battery materials from the battery plant all the way to the mine, certification could be given to sustainably produced batteries," said VTT's Päivi Kinnunen.

"This would give mines and metal refineries with responsible operating practices a competitive advantage, which would encourage the European production chain to develop and grow."

The three year project aims to identify unique regional-fingerprints of metals at an atomic level, which should survive throughout the entire manufacturing process. It would also help assess how much recycled material has been used.

Finnish Minerals Group chief technology officer Jani Kiuru said that "the need, and partly also the pressure, to develop traceability come from EV manufacturers and the European Green Deal initiative, which emphasises the use of sustainably produced raw materials."

The paper published by the European Federation of Geologists said that "there is clearly an urgent need to embrace these ideas and move towards more transparent and traceable raw materials flows along the battery raw material value chain."

END OF THE CHAIN

Finland has not yet cornered fully the production link of the value chain and only recently saw a Li-ion battery assembly plant open its doors in 2019, when Valmet Automotive converted an old cell phone factory.

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Neighbour Sweden has embraced the manufacturing side more aggressively and Northvolt, a company set up exclusively to tap into the lucrative EV battery market, has rapidly scaled up its productions and is forging ahead with construction on a new 'gigafactory'.

Recently, the firm also brokered a partnership with aluminium giant Hydro on a recycling venture that will see them split the usable components from old batteries between them.

France and Germany are both investing heavily in production capacity. President Emmanuel Macron and Chancellor Angela Merkel have both identified the sector as a future-proof industry that their countries have to prioritise.

In February, Macron cut the ribbon on a new battery factory in France's southwest and, as part of a €8bn bailout of the car sector, obligated Renault to sign up to the Battery Alliance, joining fellow marque Citroen among the list of large companies involved.

Germany is also set to follow in the footsteps of France in leading a multi-billion-euro IPCEI application, which will reportedly be notified to the Commission during the summer, with approval likely by the end of the year.

According to initial reports, that cross-border package will be worth significantly more than the French-led project and involve more countries than before.

It is clear that Finland will not be able to supply all of Europe's demands but the know-how and experience that it is building day-by-day will prove crucial to wider efforts aimed at increasing battery production.

The European Green Deal has survived the coronavirus outbreak largely unscathed and policies like the Just Transition Fund have come out the other end with a better hand than before.

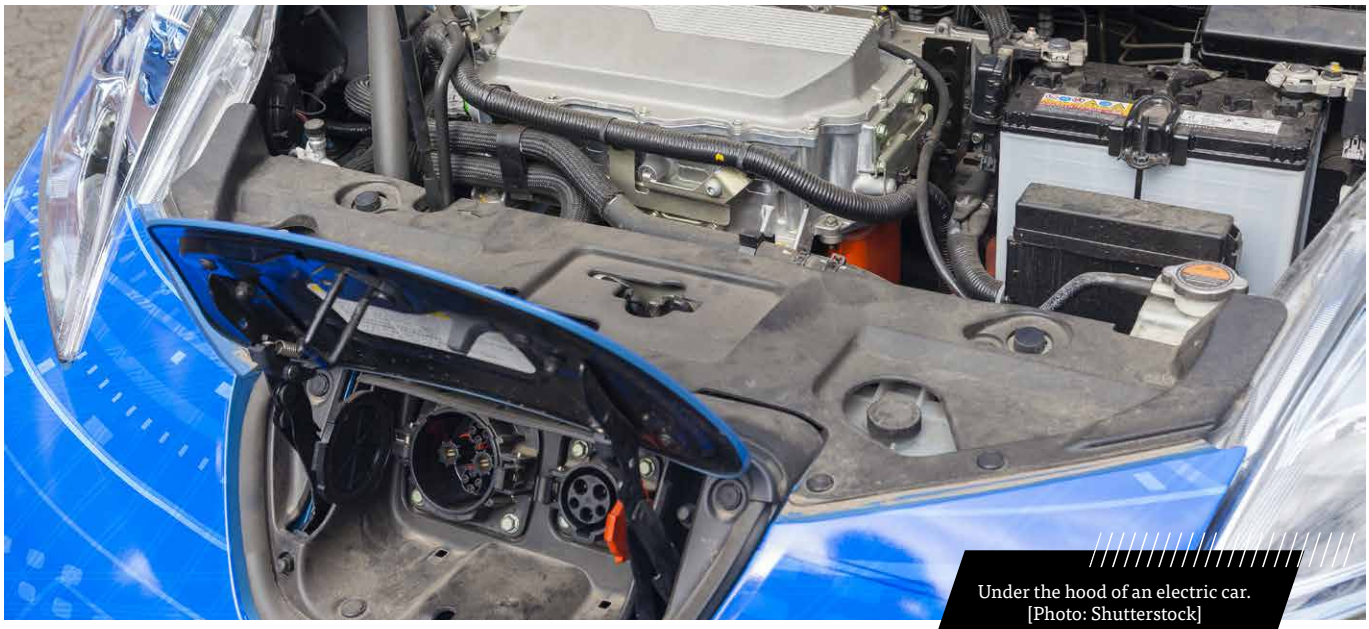
As EU members continue to pursue national and collective policies, Finland might yet be used as a model to follow, especially as regions and communities start to think about what they should adopt in place of polluting industries like coal mining.

OPINION

DISCLAIMER: All opinions in this column reflect the views of the author(s), not of EURACTIV Media network.

Is nickel sustainable in electrical vehicle batteries?

By Dr. Mark Mistry | The Nickel Institute



Under the hood of an electric car. [Photo: Shutterstock]

Electric vehicles are becoming more popular and attractive as prices fall and charging infrastructure becomes more widespread. Dr Mark Mistry explains what factors affect the sustainability of one of the most important ingredients in a car's battery: nickel.

Dr Mark Mistry is senior manager for public policy at the Nickel Institute.

The COVID-19 crisis has almost made us forget that our society is confronted with severe long-term threats and challenges.

On the one hand, the growing world population will require more and better food, clean water, accommodation, health care – and is expected to require more mobility.

On the other, the climate change challenge requires us to reduce greenhouse gas (GHG) emissions significantly. The transport sector accounts for roughly a quarter of all GHG emissions globally. Green mobility is therefore essential to achieve the GHG emission reduction targets and at the same time provide transportation that society requires.

At the end of 2019, the new European Commission President, Ursula von der Leyen, stressed in the mission letter to her Commissioner for Transport, Adina Vălean, the importance of smart and sustainable mobility.

She also highlighted the necessity of "increasing the uptake of sustainable and alternative transport fuels for road, maritime and air transport".

The electrification of individual transport is one of the top priorities for the Commission, with electrical

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vehicles at their heart. Despite the COVID-19 crisis, the revision of the EU battery directive remains a priority and it shows the long term thinking of the European authorities.

A critical aspect in the revision of the EU battery directive is – for the first time – the inclusion of new battery technologies for electrical vehicles.

The Commission is committed to striking the right balance from the start. While the European Battery Alliance aims at establishing a full electrical vehicle battery value chain in Europe, the Commission wants to ensure that this is done without compromising other public policy targets, such as those outlined in the EU Green Deal or the new EU Circular Economy Action Plan.

The revision of the EU battery directive looks at all elements of battery value chains, from raw materials production to battery manufacturing and use, as well as their end of life. It will play a critical role to ensure that the targets of all affected policy initiatives are aligned.

Batteries rely on a range of raw materials. Cobalt, nickel, lithium, manganese and aluminium are the major inputs to battery cathodes, while the anode consists of graphite.

The environmental, social and economic aspects of raw materials are under scrutiny, and the Commission has therefore put a spotlight on them. The new battery regulation will ensure that raw materials going into EV batteries for example, are manufactured, used and recycled in a sustainable manner.

And this leads to several questions: are these raw materials produced, processed and used sustainably? Where are the sustainability challenges? And how can these be addressed in the new battery regulation?

Let's look at these questions from a nickel perspective.

Is nickel mined and produced in a responsible manner?

Major nickel producers comply with responsible sourcing codes and report on their environmental, health and safety performance. It is also very positive to see that partnerships are set up within the battery value chain, such as those between Nornickel and BASF; Umicore and BMW; or between Eramet, BASF and Suez.

Such partnerships ensure scrutiny of the origin of nickel, the environmental performance along the supply chain and throughout recycling, as well as measures to protect workers and local communities.

How significant is the nickel contribution to the total battery footprint?

The carbon footprint and sustainability of batteries is the subject of intense debate. The metals contained in batteries are sometimes considered significant contributors to the total carbon footprint of a battery.

It is true that the production of metals such as nickel is energy intensive and recent studies show that raw materials account for 15% of the total battery carbon footprint. The nickel share in batteries with nickel, manganese and cobalt in the battery cathode (NMC batteries) accounts for 7% of the battery carbon footprint.

A comparison of historic and recent life cycle data shows that since 2007, the nickel industry has reduced its greenhouse gas emissions by a further 9%. The industry continues to work on lowering greenhouse gas emissions, and further reducing the contribution of nickel to the carbon footprint of batteries.

How sustainable are nickel containing EV battery technologies during use?

Nickel is the cathode material of choice for high performing Li-ion batteries. Possessing a higher voltage and nearly twice the energy density of other materials, high nickel Li-ion batteries allow an electric vehicle to travel much farther between recharging and with less weight.

Single crystal nickel cathodes are also being commercialized that will increase the cycle-life of these batteries so that they can provide additional energy storage in powering residences while the vehicle is not being driven.

What is the sustainability performance of recycled batteries?

Nickel and other metals such as cobalt have a high economic value which incentivizes collection and recycling of EV batteries. Nickel and cobalt are recycled at highest recycling efficiencies – a clear sustainability advantage for nickel-containing batteries compared to other technologies where recycling currently remains unresolved.

And nickel-containing EV battery technologies also have an attractive second life. Their longevity means they can be repurposed – for example in renewable energy storage when their application in an EV reaches its end of life.

Reuse and recycling have a positive environmental impact on the battery's life cycle performance. The EU's new battery regulation therefore should promote the second use of batteries.

Sustainable throughout the value chain

In conclusion, the short answer to the opening question is: yes, nickel can be a sustainable material throughout the entire value chain, from mining, manufacturing, to use and end of life – if all actors throughout the value chain step up and take their responsibility.

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