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Opinion of the European Economic and Social Committee

Enhancing EU strategic autonomy and developing a greener and bluer economy: the potential of the sodium battery manufacturing sector

(exploratory opinion requested by the European Commission)

(C/2026/2542)

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1. Conclusions and recommendations

1.1. The European Economic and Social Committee (EESC) considers sodium batteries a strategic complement to lithium batteries and calls for decisive, coordinated EU action to establish a sovereign, competitive sodium battery manufacturing industry as part of a forward-looking industrial policy.

1.2. Scaling sodium technologies requires a robust ecosystem approach that covers research, industry, workforce and governance, as well as strong policy alignment. The EESC urges the European Commission to update the industrial pathway for batteries – covering both lithium and sodium – and to strengthen coordination through the European Battery Alliance (EBA). The EESC expresses its willingness to actively contribute to this work.

1.3. Battery ecosystem development must be closely linked to the wider energy system, particularly for grid stability, and coordinated through vertical partnerships between industry, regulators and RTOs (Research and Technology Organisations).

1.4. To strengthen technological sovereignty, the EU should play a proactive role by stimulating demand and aligning funding with strategic goals. The EESC recommends investment subsidies, production tax credits, targeted project calls, investment vouchers for industry cooperation with RTOs and local content clauses in public procurement, while keeping current lithium-ion factories running to leverage existing knowledge. Large-scale pilot and demonstrator markets should validate performance, reassure investors and attract key customers as anchor investors to prove industrial viability.

1.5. Cooperation with innovation leaders (especially in Asia) should not be neglected, but should follow 'as open as possible, as closed as necessary' principle. At the same time, the sodium battery manufacturing industry will need safeguards to counterbalance China's market dominance and ensure a level playing field. In addition, knowledge transfer should be a prerequisite for international partners establishing plants in Europe.

1.6. The industrial pathway should include a roadmap addressing workforce and social needs, so that industrial development leads to socially inclusive and regionally balanced growth. This requires investment in skills, workforce mobility and strategic SME involvement, as well as attracting top talent to foster brain gain and prevent brain drain. The Committee underlines that this roadmap must be developed through fair and structured social dialogue at company, sectoral and national levels, ensuring the participation of all relevant stakeholders in defining strategies and standards. Furthermore, public acceptance of new plants depends on transparent communication, fair transition planning and attention to local needs.

1.7. Sodium batteries can be produced entirely from European raw materials. The EU should prioritise energy-efficient, low-impact manufacturing that avoids PFAS (per- and polyfluoroalkyl substances) and reduces the use of critical raw materials. Eco-design and recycling must be integrated from the outset, giving Europe the opportunity to establish a circular sodium battery value chain.

1.8. The EESC calls for flexible public support that avoids premature lock-ins and for stronger collaborative R&D co-funded by governments and industry. Persistent bottlenecks to scaling – from pilot-to-industrial transfer to SME participation – must be addressed through applied R&D, targeted investment in technological infrastructures (TIs) and collaboration between industry, RTOs and academia. RTO involvement can reduce risks for companies during scale-up and industrial deployment.

1.9. The EESC sees strong potential for Europe to take a technological lead in sodium–saltwater battery systems. Continued R&D should prioritise the development of solid electrolytes with a focus on sodium.

1.10. FP10 plays a key role and should allocate at least EUR 220 billion (as called for in the Heitor report), with a reinforced Pillar II and strong support for TIs as key enablers of Europe's technological sovereignty and industrial transformation. Furthermore, for research to unlock its full potential, red tape must be cut to enable faster approvals and more flexible research projects. This must be paired with a European intellectual property strategy for sodium.

2. **General comments**

2.1. *The central role of energy storage systems in meeting the EU's strategic goals*

2.1.1. Investment in renewables is vital for the EU's climate goals and for ensuring industry remains competitive and strategically autonomous. The global energy transition requires an overhaul of energy production, distribution and storage systems ([1]), with batteries central to both mobility and stationary storage.

([1]) Considering that Europe's primary energy consumption as of the year 2018 is 21 399,2 TWh and that renewables are made up of 45 % solar power, 45 % wind and 10 % biomass, a daily energy storage capacity of 19 TWh and an annual energy storage capacity of 1 278 TWh is needed to serve the whole of Europe (*Source: Na-ion and Na-metal Batteries, Stefano Passerini, talk 2025*).

2.1.2. The 24-hour power cut in the Iberian Peninsula exposed grid fragility and dependence on electricity. Storage systems are a pillar of the energy ecosystem, enabling renewable integration and reliable supply across daily and seasonal fluctuations and a backup for outages.

2.1.3. Lithium-ion batteries have become indispensable from mobile devices to large-scale storage. But they face growing challenges: price volatility, environmental impacts, fire risks and reliance on raw materials concentrated in few countries. Sodium-ion batteries, though lower in energy density, are advancing fast and offer a safer, more sustainable complement where resource security is crucial.

2.1.4. Sodium-based batteries encompass a family of technologies at varying maturity levels. Sodium-ion batteries, already at TRL 8–9, and being commercialised in Asia, follow similar design principles to lithium-ion and are suitable for near-term deployment in stationary storage, micro-mobility, and decentralised systems. Next generation sodium-based batteries replace liquid with solid electrolytes. Among them, sodium–saltwater batteries hold high potential for seasonal and marine storage thanks to their high energy density and use of non-critical materials, though they remain at a lower TRL.

2.2. *The potential of sodium batteries*

2.2.1. Lithium-ion batteries remain the most widespread storage technology with high energy density, but they come with significant challenges (see 2.1.3).

2.2.2. Sodium batteries offer strategic advantages for the energy transition and supply chain resilience. While similar in design to lithium-ion, they use alternative materials ([2]), and sodium itself is abundant, inexpensive and widely available – including in Europe. As the second most abundant element in the Earth's crust (2,9 % vs. 0,0021 % for lithium), sodium can be sourced from saline deposits, sedimentary rocks and seawater.

2.2.3. Sodium-ion batteries can replace lithium-ion in small-scale uses, but seasonal storage may require solutions like sodium–seawater batteries. This low-readiness technology splits sodium chloride (NaCl) during charging and discharges it with seawater to generate electricity. With energy density slightly above liquid hydrogen, high content and no reliance on critical raw materials, it has strong potential. Progress and technological leadership depend on R&D and advances in solid electrolytes. Circularity can be embedded early through recycled or natural materials and design-for-recycling.

2.2.4. Sodium batteries can avoid cobalt and nickel, lowering costs and reducing dependence on imported critical materials, which in turn facilitates local manufacturing and recycling. They can also eliminate PFAS and other hazardous materials, easing end-of-life management. In addition, they offer greater thermal stability, tolerance to extreme temperatures, enhanced safety and a competitive service life.

2.2.5. Sodium batteries enable households, industries and communities to store excess renewable energy for peak demand, and help businesses optimise consumption and costs. They are also well suited for grid stabilisation and small electric vehicles.

([2]) Anode materials for sodium-ion batteries are mainly hard carbons from wood or food waste, making them abundant. Cathode materials vary and could be produced from recycled lithium-ion batteries or without critical raw materials. With PFAS regulation in mind, both anodes and cathodes should be manufactured using water as a solvent, without perfluorinated binders or hazardous organic solvents.

2.3. *The EU can play an important role in this emerging market*

2.3.1. Current market shares and projections

2.3.1.1. Despite progress, sodium-ion remains marginal next to lithium-ion. Yet, the IEA's Global EV Outlook 2025 notes growing interest, particularly in emerging markets, and for stationary storage. Falling costs and improving performance make sodium-ion an attractive option. Therefore, demand is projected to rise, particularly in regions such as Sub-Saharan Africa and Southeast Asia, where lithium-ion remains costly and infrastructure limited.

2.3.1.2. By 2030, China is expected to produce 70 % of global batteries with over 6 200 GWh capacity. Europe overall should reach around 1 200 GWh. About 85-90 % of gigafactories will still use lithium-ion, with the rest split between solid-state and sodium-ion batteries (~5 %). Yet these capacities remain far below Europe's storage needs (see 2.1.1).

2.3.1.3. The number of gigafactories is projected to rise from 240 to about 400 by 2030. Most sodium-ion sites are still under construction or in hybrid testing, but China is investing heavily to scale up, aiming for over 50 % of global capacity. Global competition is therefore set to intensify.

2.3.1.4. In Europe, sodium-ion development is fragmented, but gaining support. The BATT4EU programme under Horizon Europe aims to build a battery sector beyond lithium, strengthening sovereignty and reducing environmental impact. Pilot projects in several Member States show progress, but dependence on Asian imports remains a barrier. Industrial leadership will require targeted R&D, large public–private initiatives and faster approvals. An EU-level actor such as BEPA could orchestrate efforts and investments.

2.3.1.5. In conclusion, sodium batteries advance globally, but Europe risks widening the gap and must increase support to stay competitive.

2.3.2. Immediate action must be taken to invest in sodium batteries in order to support the EU's industrial policy objectives

2.3.2.1. Establishing sodium battery gigafactories in Europe would boost **competitiveness** and create jobs across the value chain. Strategically located plants could revitalise regions with high unemployment, while local access to raw materials and markets would cut transport costs and lower environmental impact.

2.3.2.2. Strengthening Europe's battery **sovereignty** remains essential. Some estimates suggest the EU could meet much of its lithium-ion demand by 2026, while others warn that over half of planned capacity risks delay or cancellation ([3]). IEA projections (2025) put sodium-ion costs at USD 50/kWh by 2030, compared to about USD 100/kWh for LFP lithium-ion today. This cost advantage, plus greater safety and sustainability, makes sodium-ion a potentially disruptive technology.

2.3.2.3. Sodium can draw on abundant local resources for large-scale production and help restructure supply chains around regional, bio-based materials such as hard carbon from wood or agricultural waste, closing Europe's strategic gap in anode materials ([4]). With circular value chains – design-for-recycling, lower embedded carbon and reduced reliance on critical raw materials – sodium batteries support the objectives of the **EU Green Deal** and **strategic autonomy**.

([3]) Transport & Environment (2024) *An industrial blueprint for batteries in Europe*.
([4]) https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/the-battery-cell-component-opportunity-in-europe-and-north-america.

2.3.2.4. Sodium batteries could also support the **EU Blue Deal**, which seeks to address water resilience and freshwater scarcity. Desalination is central to this effort but generates a surplus sodium that often goes unused and can threaten biodiversity. Sodium batteries could provide a sustainable use for this by-product.

3. Specific comments on fostering the emergence of a European sodium battery ecosystem

3.1. *Coordinated strategic policy action*

3.1.1. Europe must take a proactive role to capitalise on the advantages of sodium batteries in a highly dynamic context ([5]), stimulating early demand and aligning funding with strategic goals. Key success factors and uncertainties include:

— **Economies of scale**: increasing factories' capacity will reduce unit costs and reach competitiveness thresholds compared to lithium-ion. TIs can play an important role when it comes to scaling.

— **Technological innovation**: improving energy density is crucial, especially for mobility. Progress is already under way, but further R&D is needed. FP10 plays a key role and should support the full TRL spectrum: high-TRL projects on sustainable sodium-ion technologies and raw material chains; mid-TRL work on flexible production techniques, including process technology transfer from lithium to sodium and low-TRL research on saltwater systems and electrolytes. BEPA's role in coordinating cooperation will be key to aligning efforts and speeding up deployment.

— **Public support**: Industrial policies (demonstrated by local subsidies in China, the IRA in the US, Green Deal, Blue Deal, Competitiveness Compass and the EU Preparedness Union Strategy in Europe) will play a key role in accelerating deployment.

— **Market acceptability**: the ability to convince OEMs (Original Equipment Manufacturers), network operators and local authorities to adopt this technology will be decisive.

3.1.2. Europe lacks commercial-scale sodium production, making rapid industrial deployment a key challenge. Yet expertise from lithium-ion manufacturing – factory design, materials processing and existing infrastructure – can be transferred. Maintaining these assets, even if not profitable in the short term, is essential.

3.1.3. With many industrial sites currently idle or closing, their conversion into sodium battery gigafactories would represent an efficient and environmentally responsible use of existing infrastructure, while helping preserve local know-how and regional economic activity, where possible.

3.1.4. Sodium battery deployment must address social and regional impact. New production sites can revitalise regions facing structural unemployment, but only if citizens are involved from the outset. Early social dialogue, transparency and fair transition planning are essential to build trust and ensure inclusive, regionally balanced development.

3.1.5. Occupational health and safety must be integral to the industrial pathway, due to chemical, thermal and mechanical risks in manufacturing and recycling. Therefore, OHS monitoring and safe-by-design principles must be embedded throughout the value chain.

([5]) For an overview of current key developments, challenges, and trends, see this recent technology talk by BEPA: https://www.youtube.com/watch?v=87afjmRn4_E.

3.1.6. Complex permitting procedures, administrative burdens and slow approvals continue to delay the development of new manufacturing sites. These barriers discourage investment and hinder Europe's ability to scale production quickly. Overcoming them requires streamlined and predictable processes, faster decision-making and clear safety standards (see INT/1075).

3.2. *Ecosystem development*

3.2.1. Scaling sodium technologies in Europe requires a robust ecosystem across research, industry, workforce and governance. Many actors are active but still in silos. The EESC calls for stronger exchange between EU institutions and stakeholders through the EBA, and offers to contribute. The Commission should update the battery pathway – covering both lithium and sodium – and align it with energy infrastructure and regulation in cooperation with the EU Agency for the Cooperation of Energy Regulators (ACER) and the European Network of Transmission System Operators for Electricity (ENTSO-E).

3.2.2. Data and monitoring remain insufficient. Improved reporting and mapping with regular analysis of research and intellectual property dynamics, including licensing, would support better decision-making.

3.2.3. Battery ecosystem development must be integrated into the wider energy system, particularly for grid stability. Siloed initiatives slow progress, making stronger coordination between industry, regulators and research essential. Vertical partnerships – involving start-ups, suppliers, OEMs, RTOs and energy providers – should focus on standardising cell formats, sharing intellectual property and pooling risk. The EBA should play a central role, with the EESC actively involved. EIT RawMaterials and EIT Urban Mobility can further support ecosystem building.

3.2.4. Skills development is central across the battery value chain, requiring qualifications, workforce mobility and SME involvement (as SMEs are key providers of vocational training and local upskilling). RTOs can contribute through training and by fostering public–private collaboration, with targeted measures in manufacturing and electrochemistry. Priorities are attracting top talent, fostering brain gain, preventing brain drain and using mobility schemes. The industrial pathway should therefore include a skills roadmap (see CCMI/224) that pays close attention to health and safety considerations (see 3.1.5).

3.2.5. Persistent bottlenecks to scaling include pilot-to-industrial transfer, SME participation and fragmented recycling. SMEs can play a strategic role in the emerging ecosystem, as their flexibility and adaptability enable rapid prototyping and innovation, but they require targeted support. In addition, applied R&D – through collaboration between industry, RTOs and academia – can help develop scalable solutions.

3.2.6. Governments and industry should co-fund research on active materials, electrolytes and low-carbon manufacturing through public–private partnerships. IPCEIs or Horizon Europe can accelerate technological maturity. Success also requires cutting red tape in the R&D domain, faster approvals and more flexible research projects.

3.3. *Important wider policy alignment*

3.3.1. Developing a European sodium battery value chain requires breaking policy silos and ensuring coherence across sectors and governance levels. Alignment with key EU strategies – including the Green and Blue Deal, the Water Resilience Strategy, the Competitiveness Compass, the Preparedness Strategy and the Circular Economy Action Plan – is essential to make battery innovation serve Europe's strategic goals.

3.3.2. Horizon Europe – particularly Pillar II – should remain central for funding and collaborative research in strategic domains (see INT/1082). In FP10, this requires a significantly larger budget of at least EUR 220 billion ([6]), as justified in the Heitor Report, with a strong increase for Pillar II (compared to PI & PIII) to reflect its role in driving industrial transformation and technological sovereignty. Support should also cover a European licensing and intellectual property strategy to retain innovation benefits within the EU.

3.3.3. Europe should engage in international standard-setting and technology diplomacy through platforms such as the Science and Technology in Society Forum, building strategic partnerships while shaping global norms without compromising EU sovereignty.

Brussels, 19 February 2026.

The President
of the European Economic and Social Committee
Séamus BOLAND

([6]) According to current plans, the Commission foresees a total budget of around EUR 175 billion for FP10, which is below what key actors and recent reports have asked for. For an overview, see Table 1 in this document: https://zenodo.org/records/17425023.