The SOLID4B third clustering event titled "Bridging Policy, Research, and Industry: A Transversal Workshop on Solid-State Batteries" was held on the 17th of September 2025 in Brussels. The event showcased recent advances in solid-state battery research and facilitated discussions on aligning EU policy to accelerate SSB development and broader industry adoption. Multiple Horizon Europe projects are part of this cluster including: PULSELiON, SPINMATE, ADVAGEN, AM4BAT, HIDDEN, SEATBELT, SOLiD, PSIONIC, SOLVE, SPRINT, STELLAR, and ANGeLiC.

The EU Green Deal sets an ambitious goal for Europe to become the first net-zero continent by 2050. Achieving this vision requires robust energy storage solutions as energy storage is essential for balancing intermittent renewable sources, stabilising the grid, and enabling decentralised energy systems. For electric vehicles, advanced storage is critical to support widespread electrification and sustainable mobility. Solid-state batteries (SSBs) offer significant benefits, including enhanced safety, higher energy density, longer lifespan, and reduced reliance on critical raw materials. However, challenges such as unstable interfaces and high production costs remain. Addressing these barriers is essential to unlock the full potential of solid-state batteries for Europe's green future.

The event showcased the latest progress on solid state batteries from Horizon Europe-funded projects and initiated a startegic discussion on how European policy can accelerate the development and deployment of SSBs. The session was opened by Francisco Ngomo from PNO Innovation, a specialist in designing innovation projects and securing competitive funding with a focus on renewable energy and battery system integration. In the PULSELiON project PNO is responsible for Communication, Dissemination and Exploitation activities. Francisco welcomed participants and outlined the SSBs technology benefits such as enhanced safety due to the absence of liquid electrolytes and a reduced risk of fire and thermal runaway, higher energy density with potential up to twice enabling longer range, improved durability through longer cycle life, faster charging, and lower use of critical raw materials. He also highlighted the challenges encountered in the innovation real practise where only coin cells are feasible, high unstabilty of interfaces is usual, the scale-up remains a gap and the cycling performance remains below targets. This gap presented by Francisco constitutes the framework of the session to **explore how policy, research and industry can collectively close the gap between promise and current performance of SSBs.**

Firstly, Thomas Otuszewski, a business director at CLERENS and founder of Battery Innovation Days, began by stressing that batteries are essential for decarbonisation and energy security. He outlined two contrasting futures: one where Europe depends on Chinese batteries by 2035 and EVs are imported causing dependencies and vulnerability, and another where EU battery market succeeds, driving local production, innovation, and jobs. However, over the past six years, Europe's level of investment in this sector has been significantly lower than that of China and would have to accelerate for EU to stay competitive. To build a strong value chain, he urged focus on advanced materials, machinery, cell manufacturing, and EU-made EVs. He proposed four actions: targeted Innovation Fund calls, a reinforced Battery Partnership, incentives for European EVs, and strong Member State support to secure competitiveness and EU battery success.

Then, Dr. Ander Orue, a researcher at CIC energiGUNE, presented recent research outcomes related to solid electrolytes from SPINMATE, PULSELiON, ADVAGEN, SUBLIME and HELENA projects. Dr. Orue focused on various electrolyte types, including polymer-based, oxide-based, sulphide-based, halide-based, oxide-sulphide hybrids, and anode-less approaches. While each offers unique benefits, a common challenge persists: interface stability between solid electrolytes and electrodes. This instability limits performance and durability. He emphasised that advances in interface engineering are essential to overcome these barriers. Key strategies include developing protective interlayers, optimising electrolyte composition, and refining processing techniques such as layer engineering. Looking ahead, hybrid electrolytes and improved interface design will be critical to unlocking the full potential of solid-state batteries, enabling safer, higher-performing, and commercially viable solutions for the energy transition.

Next, Dr. Erin Perry, Cell & Prototyping Manager at Avesta, presented the lithium metal anode production technology, focusing on the company's PVD (Physical Vapour Deposition) coater. Dr. Perry emphasised key design goals: achieving high purity to prevent dendrites, producing ultra-thin lithium layers under 20 microns to boost energy density and reduce SEI formation, and ensuring uniform thickness and morphology for stability. Dr. Perry also outlined common failure mechanisms such as dendrite growth, dead lithium, pitting and SEI build-up, which can lead to short circuits and performance loss. She compared Li Metal Anodes manufacturing methods, including extrusion, electrochemical plating and vapour deposition, highlighting that PVD offers superior control and purity despite higher costs. Avesta's thermal evaporation PVD process enables smooth, dense, high-purity lithium with artificial SEI layers. In the framework of Horizon Europe, Avesta supplied Li Metal anodes to SPINMATE, ADVAGEN, SUBLIME, SAFELiMOVE projects. Moreover, during the Stellar Project Avesta aims to develop a modular, high-throughput Gen-2 PVD coater to scale the Li-M anode production.

Dr. Elías Martínez, working in IREC in the Energy Materials, Storing Energy Materials group, presented the materials development and interface optimization research conducted for the ADVAGEN project. He focused on the optimization of NMC811 cathodes synthesized from scratch by spray pyrolysis. This method is scalable and yields homogeneous precursor droplets that, after calcination form high-quality materials. The results stressed the importance of precise stoichiometry and the use of oxygen atmosphere during calcination to improve material properties. Additionally, Dr. Martínez shared insights from synchrotron measurements to study the dynamic changes in the structure of the material during electrochemical cycling. Early solid-state cell pellets showed high capacities at very low rates but limited durability, highlighting the need for interface engineering in ongoing work.

The talk of Dr. Andriy Kvasha from CIDETEC, introduced the SOLVE project, aiming to develop advanced solid-state cells with ultra-thin lithium metal anodes, hybrid polymer electrolytes, and high-loading NMC-based cathodes. The project targets pouch cells delivering 400 Wh/kg, 1000 Wh/L, and over 500 cycles, while also addressing sustainability and recyclability. Key challenges include achieving high cathode loading, optimising solid-state interfaces, and managing operational pressure, which is critical for reliable performance. Dr. Kvasha stressed the need to adopt a holistic cell-level design and testing and a multidisciplinary approach to balance performance, safety, and cost for future large-scale applications.

Then, Dr. Mohsen Akbarzadeh, Business Developer and Battery Systems Specialist at Flanders Make, presented the E-WAVE project and the role of advanced batteries in maritime transport. E-WAVE, which stands for Efficient High Voltage Electric Modular Battery and Distribution Systems for Sustainable Waterborne Vessels, aims to deliver safe, high-energy-density modular battery systems for ships. Key objectives include achieving 185 Wh/L energy density, 20% weight reduction, and scalable systems operating. Innovations involve NMC955 chemistry, wireless BMS, lightweight housings, modular converters, and advanced safety features. The project also explores second-life applications and battery passports to enhance sustainability. Demonstration will occur on a research vessel with a modular system. Overall, Dr. Akbar highlighted the growing electrification of maritime transport, the need for modular, high-energy solutions, and the potential of solid-state batteries to meet future performance and safety demands.

To conclude the event, Dr. Anish Patil, co-founder and senior consultant at Tech Concept, led an interactive session on the European battery sector and represented the ADVAGEN exploitation plan. The session included a round table discussion with speakers and audience members via Mentimeter. With Horizon Europe (FP9) set to conclude in 2027 and FP10 under development, discussions centred on how the next framework can provide targeted support for innovation, scale-up, and resilience. The session positioned Europe's battery sector at a strategic crossroads, emphasizing funding pressures, raw materials supply risks, high electricity costs in EU, and the need to bridge the gap between research and industrial deployment. Sustained, strategic funding was highlighted as essential to maintain competitiveness against the US and Asian markets. The debate emphasised forward-looking priorities:

- Infrastructure: Building the necessary production, recycling, and grid integration capacity.
- Regulation and policy: Simplifying frameworks to accelerate scale-up and deployment.
- Investments in R&D: Continued investment in advanced chemistries and solid-state solutions for next-generation technologies.

In summary, the discussion reflected on lessons from Horizon Europe and Batteries Europe to ensure future funding strengthens Europe's leadership in battery technology and secures its role in the green transition.