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# REVITALISE completes the loop with final seminar on greener battery recycling

**The REVITALISE project brought researchers, industry and stakeholders together in Trondheim and online on 19th October. What was shared: the results of three years of work towards cleaner, more efficient and more circular approaches to lithium-ion and sodium-ion battery recycling.**




*The REVITALISE final seminar underway – discussing new approaches to simplifying hydrometallurgy. Photograph supplied by Muhammed Sarmad Khan, NTNU.*

Hosted by NTNU, the hybrid event, “Loop Complete: Greener Battery Recycling, and What it Takes to Deliver it Together”, showcased the project’s final results, considered the challenges involved in progressing recycling innovations towards industrial application, and reflected on the experience of delivering collaborative European research.

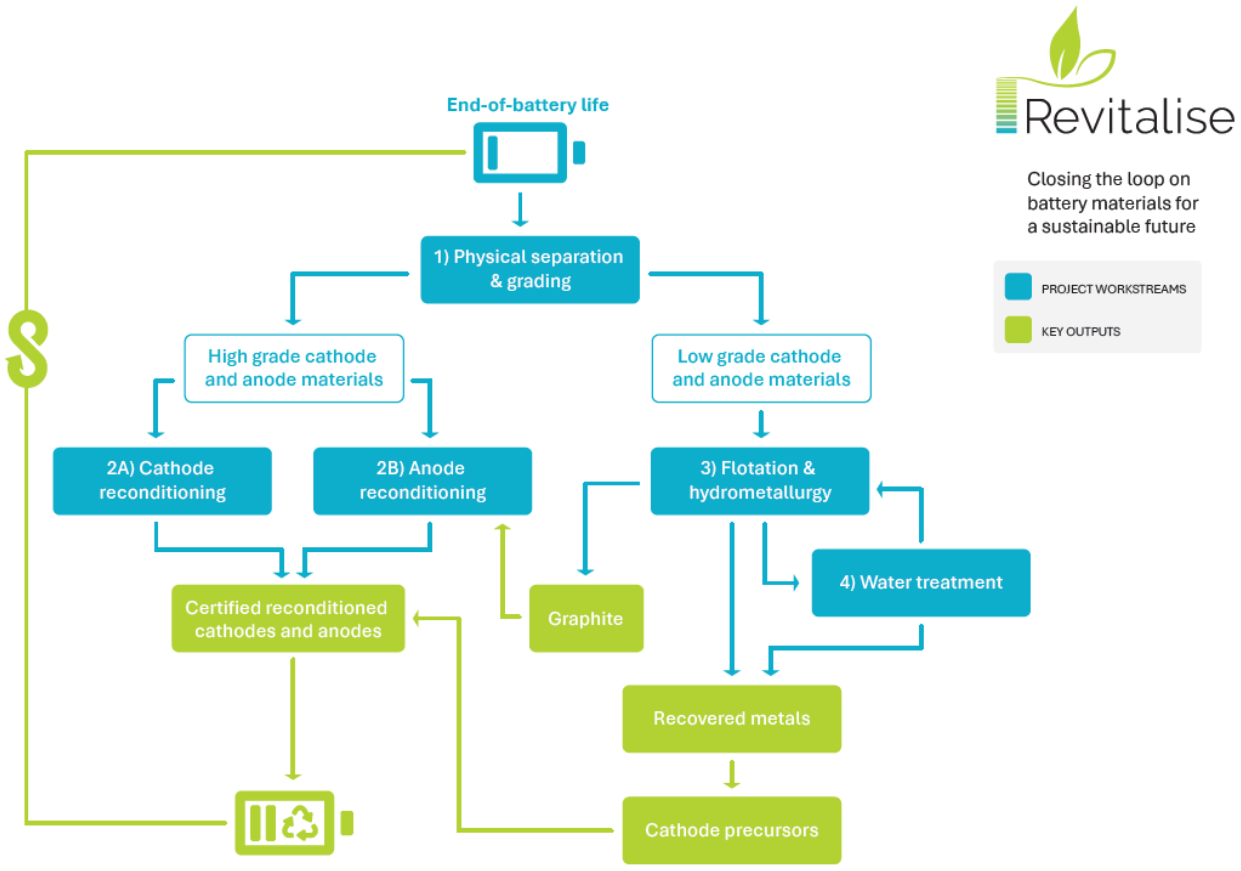
The seminar marked an important moment as REVITALISE approached the end of its three-year programme. The Horizon Europe project brought together nine partners across seven countries to investigate ways to improve the recovery of battery materials through smarter pre-processing, direct recycling, hydrometallurgical recovery and closed-loop water treatment.

## Three years of innovation, from spent batteries to recovered materials

Centre Director, Professor Hilde Venvik introduced the NTNU Department of Chemical Engineering, and the importance of collaborative projects to the university. Then, opening the project results session, Associate Professor Sulalit Bandyopadhyay of NTNU placed the technologies developed through REVITALISE in the context of a growing challenge for the battery sector: how to manage increasing volumes of diverse end-of-life batteries while recovering more of their constituent materials and reducing the energy, chemicals and waste associated with recycling.

The final project overview demonstrated how the technologies investigated by REVITALISE could form parts of a connected recycling system. Batteries and production scrap can first be sorted and graded so that different material streams are directed towards an appropriate recovery route. Suitable materials may undergo direct recycling, preserving more of the value already embedded in active materials, while other streams can be treated using hydrometallurgical processes. Wastewater treatment can support additional lithium recovery and water reuse.

The project tested five battery chemistries across three recycling routes and generated results covering material separation, direct regeneration, hydrometallurgical recovery, water remediation, environmental performance, economics and process safety. The work was guided by an ambition to recover at least 89% of critical raw materials from end-of-life batteries. Final results presented at the seminar showed strong performance in several individual process steps, while the project's overall contribution lies in demonstrating and assessing complementary technologies across the wider recycling chain.




*REVITALISE integrated and flexible process flow.*

## Smarter routes for direct recycling

Rob Sommerville and Professor Emma Kendrick of the University of Birmingham presented the project's work on direct recycling, an approach intended to preserve the value already embedded in battery active materials rather than fully breaking them down into constituent metals and rebuilding them.

Their presentation highlighted the importance of careful pre-processing and separation. Direct recycling requires clean, well-separated material with low levels of aluminium, copper and other contaminants. The team investigated shredding, density separation, screening, magnetic separation and purification, alongside approaches for recovering and regenerating cathode and anode materials.

One approach explored through the project, known as "ice-stripping", showed potential to reduce water consumption, processing time and energy use while recovering high-grade material.

## Recovering more from battery black mass

Erik Prasetyo and Usman Saleem of NTNU presented work to emphasise the hydrometallurgical processing of NMC battery black mass. The research examined how operating conditions, including temperature, acid concentration and pulp density, affect recovery across different NMC chemistries.

Recovering lithium early in the process was a key focus, helping to limit losses before subsequent separation and recovery steps. The process also incorporated solvent recycling and impurity removal as part of a more compact, closed-loop approach. Results presented by the team included recovery of lithium sulphate at greater than 99% purity and total NMC recovery at the same level within the process tested. Routes for LFP batteries were also explored, including the recovery of lithium sulphate and iron phosphate.

## Building safety into future scale-up

Alongside technical performance, REVITALISE considered what would be required to progress emerging recycling technologies beyond the laboratory. Eurecat presented a Process Hazard Analysis covering project recycling technologies. Twelve technologies included in the analysis were validated, identifying hazards and the mitigation measures that would be needed as processes develop towards larger-scale operation.

The assessment found no critical safety barriers to future scale-up within the technologies analysed, while emphasising that engineering controls, waste management and more detailed safety assessments will become increasingly important as processes move towards industrial scales.

## Beyond the technology

The seminar concluded with a panel focused on experience sharing in running collaborative EU projects. Bringing together perspectives from universities, research organisations and industry, the session provided an opportunity to reflect on the practical experience of delivering ambitious European research through international collaboration. The event programme framed the discussion around what works, and what does not, when running a collaborative EU project.

The event itself demonstrated the breadth of the community interested in the challenges REVITALISE has been addressing. A total of 100 people participated, with 37 attending on site in Trondheim and 63 joining online. Around 45 organisations and projects were represented, and 48 attendees came from outside the REVITALISE consortium.

Participation extended beyond the project's immediate European network, and the audience included universities and research organisations, industry and service providers, and representatives from nine related EU projects, including BATMASS, BeyondBattRec, CIRCUBATT, iLCA4SSbD, PLANETS, RENOVATE, REUSE, SafeLiMove and Upraise.

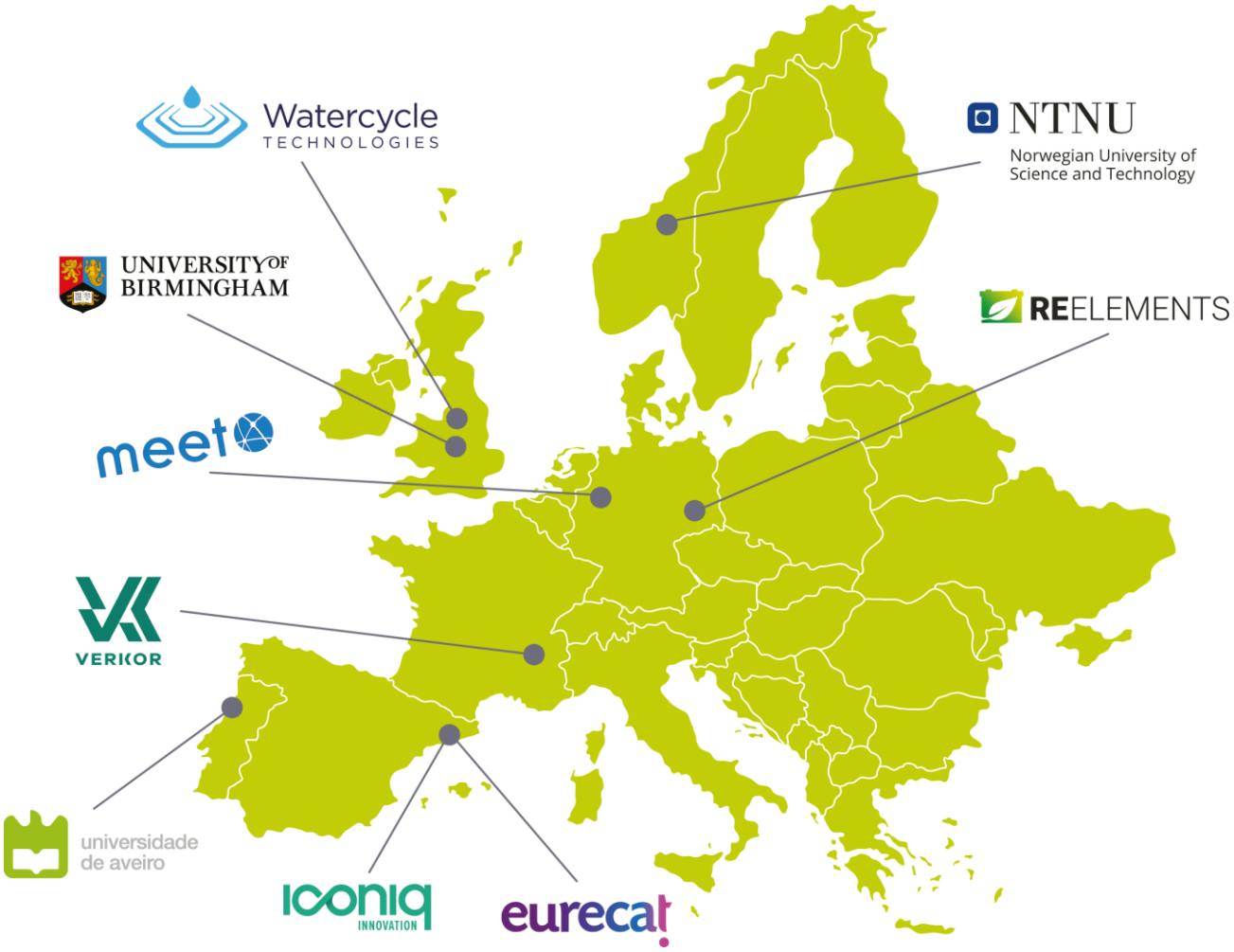
This broad participation provided a fitting setting for REVITALISE's final seminar, bringing together not only the partners that developed the technologies, but also the research, industry and project communities that can help carry the project's knowledge forward.

## Leaving a foundation for more circular battery recycling

REVITALISE began in November 2023 with the ambition to develop recycling routes capable of recovering more of the materials contained in lithium-ion and sodium-ion batteries, while reducing environmental impacts and making better use of materials that conventional processes can overlook.

Three years later, the project has shown how smart pre-processing, direct recycling, greener hydrometallurgy, modelling, and water remediation can contribute complementary elements to a more circular recycling strategy. The technologies, data and practical learning developed through REVITALISE provide a foundation for further research, validation, scale-up and collaboration as Europe works towards a more circular and sustainable battery value chain.

As REVITALISE reaches its formal conclusion, the final seminar offered an opportunity to share and celebrate the project's progress while looking beyond its lifetime. Its longer-term impact will depend on continued development, collaboration and application of the knowledge generated by the consortium.




*Geographical spread of the REVITALISE consortium.*

## Find out more

For more information, please contact our project coordinator, or visit our social media channels:

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## About REVITALISE

REVITALISE is an EU-funded project investigating battery recycling technologies that combine direct recycling of active materials, greener hydrometallurgical processing and closed-loop water treatment. The project runs from 1 November 2023 to 31 October 2026 and brings together nine partners across seven countries.

The REVITALISE project has received funding from the European Union's Horizon Europe research and innovation programme. Additional funding has been provided by Innovate UK through the Horizon Europe Guarantee Fund. Views and opinions expressed are those of the author(s) only and do not necessarily reflect those of the European Union, or Innovate UK. Neither the European Union, or Innovate UK can be held responsible for them.

## Notes for editors

- Event: REVITALISE Final Dissemination Seminar, 19 October 2026, hosted by NTNU in Trondheim, Norway, with online participation.
- Attendance: 100 participants, comprising 37 on-site and 63 online participants; approximately 45 organisations and projects represented; 48 participants from outside the consortium.