



extended

NEXT GENERATION OF MULTIFUNCTIONAL, MODULAR AND SCALABLE SOLID STATE BATTERIES SYSTEM

FIRST EDITION

Newsletter-January 2024



ABOUT THE PROJECT

EXTENDED, a Horizon Europe project, is a collaborative effort bringing together 19 partners from 10 EU countries! Our mission is to design, develop, and validate the next-generation battery pack systems that will drive the mass-market adoption of electric vehicles and applications.



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**Igniting Battery Advancements,
Fuelling a Sustainable Future.**



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MILESTONE MOMENTS

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FIRST GENERAL ASSEMBLY

June 2023

The highly anticipated **kick-off meeting** for the EXTENDED project unfolded in the vibrant city of **Brussels**. Hosted by our project coordinator, **ABEE**, the event marked the commencement of a groundbreaking initiative aimed at reshaping the landscape of energy storage and sustainable transportation.

SECOND GENERAL ASSEMBLY

December 2023

The Second General Assembly was hosted by **Siro Energy** in **Istanbul** and unfolded with excitement and inspiration.

On the first day, our consortium had the exceptional privilege of an exclusive visit to Siro Energy's cutting-edge facility.

The second day took place at the Conrad Istanbul Bosphorus. The stunning venue overlooking the Bosphorus served as an inspiring backdrop for a day filled with insightful discussions, presentations, and collaborative planning. The electric atmosphere fueled our collective dedication to advancing clean energy innovation.

In addition, the EXTENDED consortium also had the opportunity to explore the vibrant city of Istanbul. The iconic cityscape, rich history, and warm hospitality added an extra layer of excitement to our gathering.



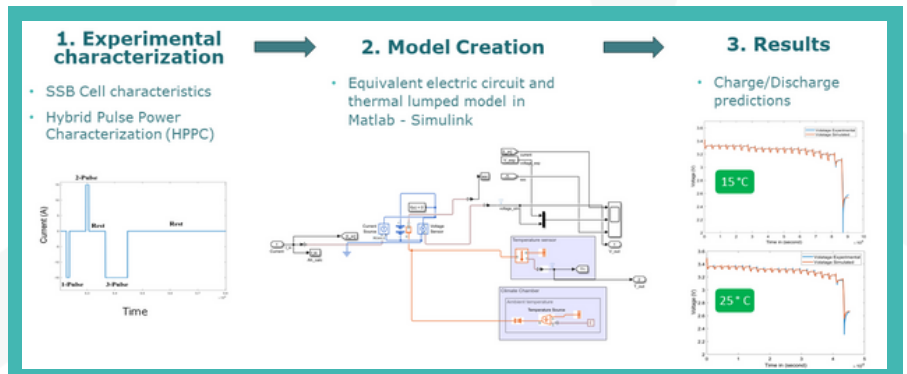
RECENT ACHIEVEMENTS

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ELECTRO-THERMAL MODEL FOR SOLID STATE BATTERY

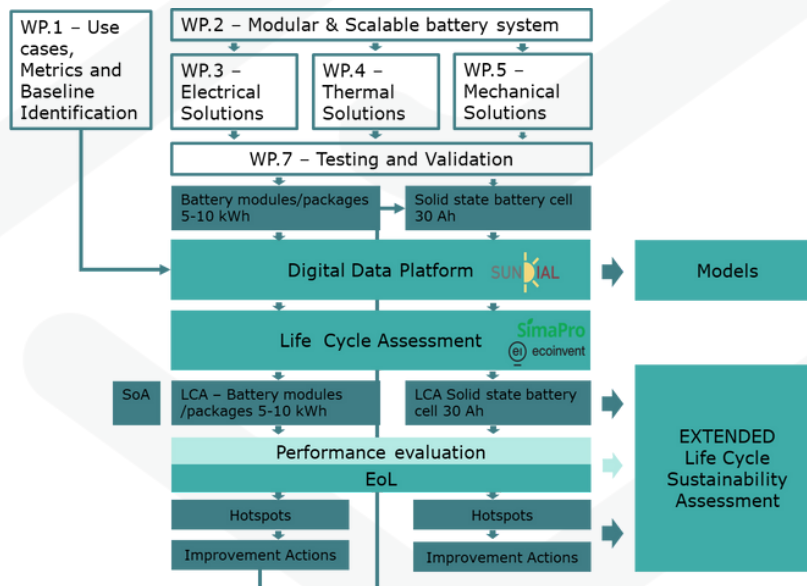
In Work Package 4, the objective is the design of the **thermal management system** of the module and the battery package. For this purpose, different simulations tools will be developed and implemented to assist in this matter. In Task 4.1, an experimental characterization of the performance of the Solid State Batteries has been carried out to provide information for the development of a cell electrical and thermal numerical model.

This information has been used to calibrate the different parameters of an equivalent circuit model scheme. The result of this work is a numerical tool that can replicate the performance and behavior of the real Solid State Batteries, to be implemented in more advance designing tasks included in this and other Work Packages.



extended APPROACH FOR THE DEVELOPMENT OF LIFE CYCLE MODEL

Methodological approach that INEGI is following to develop the Life Cycle Model of EXTENDED and perform the Life Cycle Sustainability Assessment

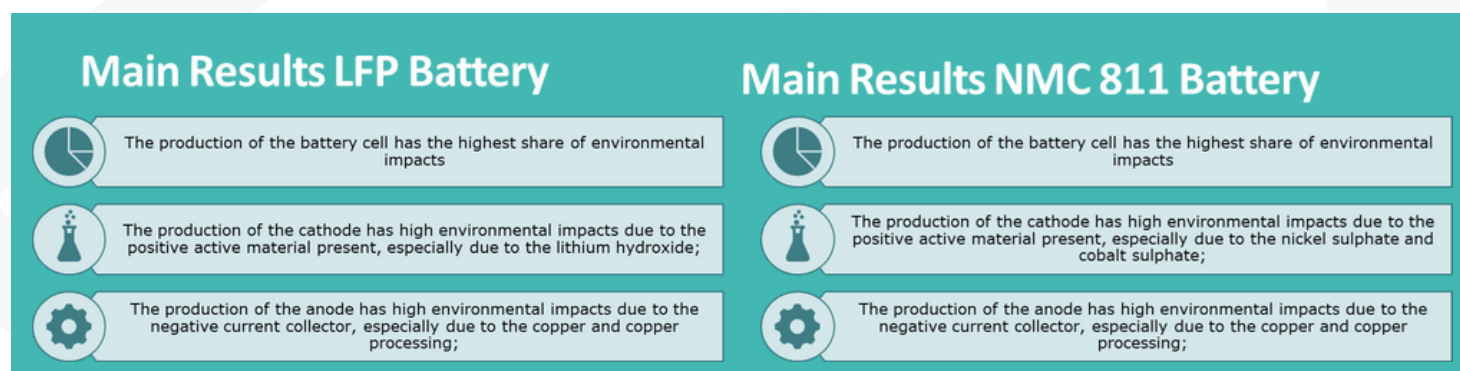


RECENT ACHIEVEMENTS

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STATE OF ART ANALYSIS

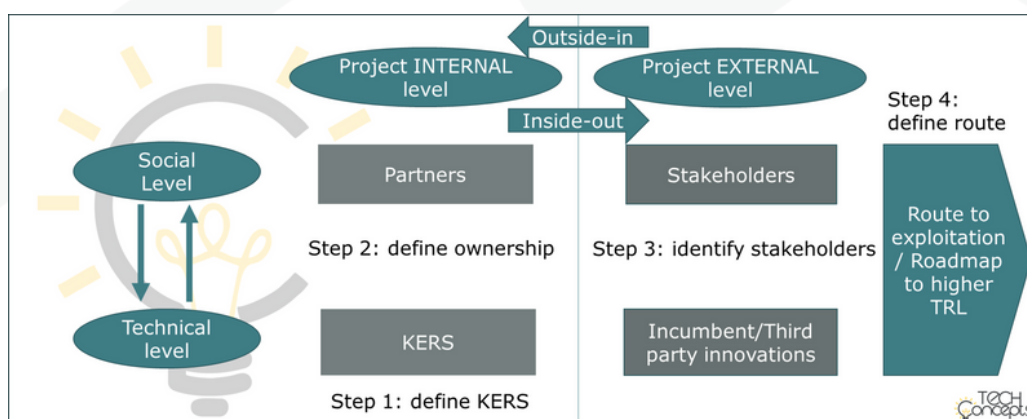
INEGI has been working on researching and gathering information in the literature on the state of the art of baseline batteries for each use case, NMC 811 and LFP. The data collected was used to build the Life Cycle Inventory of the batteries, followed by the calculation of the Life Cycle Assessment for each. With this important work, it was possible to identify the hotspots in the production of these batteries. These inputs will be important to identify potential hot spots and improvement opportunities to be implemented within the EXTENDED project.



INITIAL BUSINESS MODELS AND EXPLOITATION PLAN

TechConcepts has successfully delivered the preliminary business models and exploitation plan. This comprehensive document outlines TechConcepts' 4-step approach for exploitation. Additionally, a well-defined plan for consortium workshops has been established, aiming to collaboratively develop and refine the exploitation plans and business models.

TechConcepts 4-STEP APPROACH for EXPLOITATION



VOICES OF IMPACT

FIRST EDITION

In this section we will conduct semesterly a brief interview with a key actor in EXTENDED field. In the first edition of EXTENDED newsletter, we are proud to feature **Dr. Rahul Gopalakrishnan- CEO of ABEE.**

What specific technological advancements in batteries is ABEE exploring within the framework of the EXTENDED project?

ABEE is at the forefront of exploring next-generation battery technologies. We are delving deep into the development of innovative materials and cell designs that have the potential to significantly enhance energy density and safety within batteries. This work encompasses not only the exploration of new chemical compounds but also the implementation of advanced cell architectures that could revolutionize how we store and utilize energy in electric vehicles, marking a significant milestone in sustainable mobility

Within the framework of the EXTENDED project, what is ABEE's focus on the development and implementation of advanced battery management systems to improve the efficiency and safety of solid-state batteries in electric vehicles?

ABEE plays a pivotal role in the development of cutting-edge battery management systems for solid-state batteries. Our focus is squarely on optimizing performance and ensuring the utmost safety of these batteries. This includes the integration of advanced sensors and intelligent algorithms that enable efficient thermal

What specific technological advancements in batteries is ABEE exploring within the framework of the EXTENDED project?

At ABEE, sustainability is a foundational pillar in our development process. We place a strong emphasis on minimizing environmental impact through the use of more eco-friendly materials and the adoption of sustainable manufacturing processes. This involves researching and utilizing materials that not only enhance battery performance but are also recyclable or have a reduced environmental footprint throughout their lifecycle. We strive to ensure that the batteries of the future are not only energy-efficient but also promote a greener and more sustainable mobility ecosystem.



Dr. Rahul Gopalakrishnan (M) received his bachelor's degree in chemical and Electrochemical Engineering from CECRI, India in 2011 and Joint master's degree on Materials for Energy Storage and Conversion from Université de Picardie Jules in France in 2013. He received his PhD in engineering sciences from Vrije Universiteit Brussel in 2020. From February 2019 until January 2020, he worked as Battery researcher/electrochemistry expert at Solvay Brussels in the field of Li-metal protection, gel polymer electrolyte. From February 2020, he joined ABEE and acts as the CTO and Vice-president of the company. Since July 2023, he has taken over the role of CEO, looking into the strategy and operational aspects at ABEE.

NAVIGATING EXCELLENCE

FIRST EDITION

Top Picks from EXTENDED partners



In this section, we will select a high-impact scientific article in the scope of EXTENDED project. In the first edition of the EXTENDED newsletter, we take great pride in presenting Álvaro Sanchez' top pick.



Álvaro Sanchez is an Electronic Engineer and Project Manager with three years of experience, specializing in battery projects for electric vehicles, with a strong focus on innovation and sustainability. Currently, he works at ABBE and is the project manager and coordinator of EXTENDED project.

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Review

Towards a business model for second-life batteries – barriers, opportunities, uncertainties, and technologies

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ABSTRACT

Electric vehicles (EVs) and the recent pandemic outbreak give cities a new trend to primarily private and shared mobility with low noise and less air pollution. Crucial factors for the widespread of EVs are the electrical charging infrastructure, driving range, and the reduction of the cost of battery packets. For this reason, there is a massive effort from manufacturers, governments, and the scientific community to reduce battery costs and boost sustainable electrical production and distribution. Battery reuse is an alternative to reduce batteries' costs and environmental impacts. Second-life batteries can be used in a wide variety of secondary applications. Second-life batteries can be connected with off-grid or on-grid photovoltaic and wind systems, vehicle charging stations, forklifts, and frequency control. The present work aims to analyze the main challenges imposed on the reuse of batteries, the leading technologies for their reuse, and the different types of batteries in terms of their feasibility for second-life use. The main novelty of this work is the discussion about the barriers, opportunities, uncertainties, and technologies for the second life market. Here we summarize the present state of the art in reusing lithium-ion batteries discussing technical and economic feasibility, environmental impacts, and perspectives. The results show five business models that have been proposed in the literature, three types of markets for trading second-life batteries, and the main opportunities and barriers for each actor in the battery supply chain. © 2022 Science Press and Dalian Institute of Chemical Physics, Chinese Academy of Sciences. Published by ELSEVIER B.V. and Science Press. All rights reserved.



“I selected this article because of its innovative approach towards the reuse and recycling of electric vehicle batteries. It addresses crucial aspects like sustainable business models, highlighting barriers and opportunities in the second-life battery market. This perspective is essential for the EXTENDED project, which aims to advance in solid-state battery technologies. Integrating these concepts can enhance the project's sustainability and efficiency, aligning with current and future trends in the electric vehicle market.”

Álvaro Sanchez

The **EXTENDED** newsletter is released semi-annually with the primary goal of fostering awareness about our project and its results, shedding light on the transformative impact of battery development on eco-friendly transportation.

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