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NEMO project set to considerably extend battery life and make the management system safer

The new project aims at advancing the state of the art of battery management systems (BMS) by engaging advanced physics-based and data-driven battery models and state estimation techniques.

Battery management plays a crucial role in providing efficient and safe battery operation yet, existing BMS often rely on a small amount of observed data as well as semi-empirical battery models. This scarcity of knowledge regarding the battery's overall state when it is in use leads to suboptimal utilisation.

NEMO is a project funded by the European Climate, Infrastructure and Environment Executive Agency (CINEA) to address this issue and demonstrate optimized battery

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management. The partners seek to develop new physics-based battery models that allow for significant performance improvements for stationary and automotive use cases.

As battery systems are highly complex, this goal requires a wide range of inter-disciplinary fields: from the understanding of electro-chemical processes over the development and implementation of associated algorithms on constraint-based and safety-critical processing equipment, to the provision of accurate and stable services for battery state estimation. Within NEMO, the entire range of the required inter-disciplinary fields is well represented.

With its good balance between research and industrial partners, the project's consortium will combine innovative hard- and software concepts that exploit sensor information. This will allow the team to identify different electrochemical processes inside battery cells, and to track how they change over time.

Onboard and continuous electrochemical impedance spectroscopy (EIS) will be used within the project as a primary new information source. Together with temperature, voltage and current measurements, this will enable the development of a variety of new and innovative models that capture the physics of electrical, thermal, and mechanical characteristics.

The consortium held the project's kick-off meeting in Brussels on 16 and 17 May. In the words of NEMO's coordinator, Md Sazzad Hosen (Vrije Universiteit Brussel - VUB), "NEMO is taking the ambitious challenge of advancing the novel and/or established modeling techniques based on electrochemical impedance spectroscopy to their application. This exciting project will focus on developing a more reliable and safe battery management by integrating physical models. NEMO will discover the path to achieving future battery systems which will be intelligent and resilient to the known challenges".

Eventually, NEMO's solutions will considerably extend battery life and make the battery system safer within long-term operation since every individual cell will be monitored, controlled, and studied. These solutions are expected to be validated by industrial partners and to take a considerable share of the market in later years.

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