

NaSTOR- ionic-liquid-based novel sodium based battery technology for ultra low cost electricity stor

Publieke samenvatting / Public summary

Aanleiding

NaSTOR is a novel sodium-based battery technology. It aims to realize ultra-low-cost stationary energy storage, targeting a cost of storage of 0.03 €/kWh. Energy storage becomes increasingly essential for large-scale buffering and time-shifting of variable renewable generation. It will play a key role in achieving the necessary flexibility in our grid infrastructure as more and more renewables are deployed. NaSTOR-II will help meet this need in an economically sound fashion. The NaSTOR cells use sodium and sulfur as key elements. Currently, the team is developing battery cells for use in prototype residential energy storage systems. Such units can be used, e.g. to drastically increase the self-consumption of generated solar electricity while simultaneously serving as back-up power in case of a black-out. The first generation provides an outlook on production costs of 100 €/kWh (LCOS = 0.03 €/kWh). During the development, it has been discovered that the liquid cathode, a sodium salt solution in a commodity organic solvent, provides the largest contribution to the internal cell resistance, while it also makes up half of the projected production costs (>50% of 100 €/kWh).

Doelstelling

To lower costs and further improve cell performance, initial experiments and secondary research revealed a special type of ionic liquids to

Projectinformatie / Project information

Projectnummer / Project number
TEUE518006

Subsidiebedrag / Grant amount
€ 968.030,00

Algemene informatie / General information

Penvoerder / Secretariat
Exergy Business Development and Consultancy

Volg Topsector Energie op X / Follow Topsector Energie on X

@TSEnergie

be an attractive candidate (enabling higher efficiencies as well as improved power and energy density). In particular, the exploitation of special types of sulfur-containing complexes in these ionic liquids, a field in which the new NaSTOR partner AkzoNobel Chemicals has dedicated expertise and know-how, can lead to cells with substantially improved properties.

Korte omschrijving

This project aims to build on the NaSTOR technology through the development of such improved cathode as describe above, to change the cell design accordingly, and to demonstrate (improved) cell performance with respect to: - Higher power density (more than doubled), based on amongst others doubling cell voltage from 2V to 4V (higher than Li-ion cells); - Superior energy density (> 3 times higher; based on active constituents: >700 Wh/kg); - Long life stability (> 4000 deep cycles; secondary research by the team points to excellent long-term cell stability for this novel chemistry); - Intrinsic safety; by using inflammable chemicals and by utilizing a hybrid flow concept with only minimal amounts of active components in close vicinity; - Ultra-low-cost: decrease of ~30% for the battery compared to NaSTOR I, i.e., projected volume production unit cost decrease from 100 to 70 €/kWh.

Resultaat

The combination of these improvements will render NaSTOR as a best-of-class battery technology, provides outlook on ultra-low storage costs and makes it a technology suitable not only for residential storage but also for large-scale grid and utility storage applications. Project objectives/deliverables: - The development of ionic liquid-based cathode recipes with an energy density of > 350 Wh/kg, a power density of >400 mW/cm², with a volume production cost target for the novel cathode of <20 €/kWh (bringing the projected volume production costs to < 70€/kWh); - Hybrid flow cells (lab cells 1-10 Ah, scaled-up cells ca. 100 Ah) with increased membrane interfacial areas for high power (> C/4) and high round-trip efficiency (>

80%) at nominal power; - Characterization and mechanistic studies for fundamental ionic transport mechanisms in the ionic liquid cathode environment to understand key cell mechanisms; - Prototype cells and battery unit (5 kWh, C/4) to demonstrate fitness for use in residential as well as in larger grid-storage applications; - Techno-economic analysis, incl. basic engineering of battery production line and accompanying cost analysis.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.

Voor meer informatie over de Topsector Energie, ga naar www.topsectorenergie.nl.

Voor meer informatie over de TSE / Energie-Innovatie regelingen die RVO aanbiedt, ga naar www.rvo.nl/tse.