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Extract from the annual report 2020
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7 AFFORDABLE AND CLEAN ENERGY

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12 RESPONSIBLE CONSUMPTION AND PRODUCTION

ENERGY STORAGE SYSTEMS OF THE NEXT GENERATION

Fewer emissions, more climate protection. In order to reduce CO_2 emissions and preserve the environment, electrification requires advances in the development and production of stationary and mobile energy storage systems. The Fraunhofer Institute for Surface Engineering and Thin Films IST is addressing these challenges. At the Fraunhofer Project Center for Energy Storage and Systems ZESS in Braunschweig, next-generation energy storage devices are being developed, such as lithium solid-state batteries which, in contrast to established Li-ion batteries, use a solid as opposed to a liquid electrolyte. The advantages are more power and increased safety. In addition to the manufacture of energy storage systems, the focus of the Fraunhofer IST at ZESS is the engineering of their entire product life cycle, including raw material extraction, production, use, and end of life.

New research building in Braunschweig for battery development

At the Research Airport Braunschweig, which covers more than 5,000 m², modern working environments and laboratories for research on stationary and mobile energy storage systems are being built. The heart of the building is formed by a drying room with almost 400 m² of production space, and whose ambient air enables the safe processing of battery materials. In this environment, energy storage systems are to be developed and manufactured in accordance with industry-oriented standards. Through comprehensive networking of the building and plant technology, interactions between material properties, process parameters and product performance can be examined and the production environment optimized.

The design of the drying room, laboratories and working environments has already achieved a high level of detail. The new Fraunhofer ZESS building is scheduled for completion in 2023.

Research start in the transitional technical center

The production of energy storage systems places high demands on the flexibility of the facilities and the conditioning of the production environment. In order to conduct practical research activities prior to the completion of the new building, a transitional technical center has been established at the Automotive Research Centre Niedersachsen (NFF) of TU Braunschweig. At this center the entire process chain is mapped from material synthesis through to formation. Here, the Fraunhofer institutes IST, IKTS and IFAM, which are participating in the Project Center ZESS, apply their expertise in battery research to further develop and evaluate the production processes on a laboratory scale. The technical equipment for processing, analysis and measurements were put into operation at the end of 2020. This includes three gloveboxes that enabled the processing of sensitive materials in an inert gas atmosphere (see Figure 3). The production processes can subsequently be implemented on a resized scale in the research infrastructure of the new building.

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1 *Illustration of a holistic approach to battery cell production.*
2 *Planned new ZESS building.*
3 *Gloveboxes in the new technical center.*

Outlook: Sustainable energy supply and mobility

The goal of the Fraunhofer Project Center for Energy Storage and Systems ZESS is to develop efficient, climate-friendly energy storage systems up to industrial maturity.

Our application-oriented research benefits not only the environment but also economic sectors which develop solutions for sustainable energy supply and mobility. An essential component of project success is collaboration with strong partners. At the Fraunhofer ZESS, the Fraunhofer institutes for Manufacturing Technology and Advanced Materials IFAM, for Ceramic Technologies and Systems IKTS, and for Surface Engineering and Thin Films IST are working together with TU Braunschweig to develop system solutions for batteries and fuel cells in the field of electromobility, and stationary storage systems.

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