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## Recent results of the development of redox flow batteries for storage of renewable energies

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The storage of electrical energy will become a key issue with increasing amounts of fluctuating renewable energies in a grid. Different technologies are established or in development to solve the need for storage at low cost. One of the technologies is redox flow batteries which can be separately scaled in terms of power and energy. Thus leads to potentially low storage cost if the storage medium has low cost and the storage time is in the range of some hours. During this talk we will present an overview about the recent results of our ongoing research and developments of redox flow batteries from fundamental half-cell studies up to the development of a 2 MW/20MWh vanadium redox flow battery. Our focus is mainly contributed with the studies of vanadium systems, but also includes organic, hydrogen/bromine, zinc/bromine, vanadium/air and other chemistries. We studied electrochemical reaction mechanisms with different electrochemical and spectro-electrochemical methods, electrolyte properties, aging of materials, cell; stack and system behavior. Our developments focused on cost reduction of flow batteries by improved production methods and materials like carbon nanotube based and mouldable thermoplastic electrode materials, injection molded components and system optimization. Additionally we will report about a kW-class vanadium air system, a super-cap vanadium redox flow hybrid uninterruptable power supply for telecommunication and the development of a 2 MW/20MWh experimental vanadium redox flow battery for the storage of wind energy at the Fraunhofer ICT campus.

### Biography

Jens Noack studied Chemical and Environmental Engineering at the Hochschule für Technik und Wirtschaft in Dresden. Since 2007, he has worked at the Fraunhofer Institut für Chemische Technologie in the Department of Applied Electrochemistry, mainly on the development of redox-flow batteries. From 2009 until 2011, he was acting group leader of the newly formed redox-flow battery group. Since 2011, he has been carrying out PhD research at the Karlsruhe Institut für Technologie (KIT). He also works at the Fraunhofer ICT as Project Leader and Senior Development Engineer. His research is concerned with energy storage and conversion systems. He is Chairman of the German redox flow battery standardization group and member of several international standardization groups.

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