Universität Basel

Research Project

The role of energy storage technologies in the context of the Swiss energy transition (“SwissStore”)

Third-party funded project

Project title The role of energy storage technologies in the context of the Swiss energy transition (“SwissStore”)
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Organisation / Research unit
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The role of energy storage is subject to an intense debate internationally reflecting a lack of consensus about the techno-economic potential and respective merits of the various energy storage technologies. This is largely due to the wide spectrum of possible applications, the potential to deliver multiple services (revenue stacking), and unclear market developments which make economic assessments difficult. To the best of our knowledge, no comprehensive cost-based analysis considering the potential role of bulk and distributed technologies for Switzerland has been performed to date that could inform a comprehensive national energy storage strategy. The objective of the proposed research project is to address this gap by performing a holistic investigation of the role of competing and/or complementary electric, thermal and chemical energy storage technologies in achieving greater penetration of renewable energy technologies and more efficient and effective use of energy in the context of the Swiss energy transition. In the first task, comprehensive, detailed and robust information and data on the status of, and prospects for, technical and cost performance of selected storage technologies will be collected to serve as a basis for an expert elicitation exercise. This will help identify drivers of future cost reduction and technical improvement, and deliver cost and performance estimates under a range of scenarios. All technologies retained after pre-screening will be characterized with a set of parameters describing these at an appropriate level of detail for techno-economic modelling and optimization.As second task, two distinct but complementary models will be developed to allow for a comprehensive investigation of energy storage in the Swiss energy transition:1.)A “single-layer model” adopting a ‘’social planner perspective” and used to identify the best mix of supply and storage technologies to achieve minimal cost or minimal energy use and/or CO2 emissions; 2.)A “double-layer model” used to investigate the influence of the dynamics of the electricity market, including long term (price, demand developments) and short/medium term (intermittent RES generation) uncertainties, and the value associated with the deployment of local energy storage capacity for different market actors in both rural and urban contexts. Finally, the third task will aim at a comparative analysis across various scenarios under the two modelling approaches, including sensitivity analysis around key boundary conditions. Conclusions will be drawn with regards to the feasibility and value proposition of a deployment of energy storage technologies at scale, of their potential role in the future of the Swiss energy system as well as of the role and implications of different policy measures.Results will be shared in the form of peer reviewed scientific papers in international journals, as well as dedicated workshops. Our close involvement in the different SCCERs will also provide opportunities to share the outcomes of the study during their respective annual conferences and/or

technical workshops. Finally, our results will also feed into the recently launched “Forum Energy Storage Switzerland”.

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