Abstract:
Motivation Grid energy storage systems have vast potential to enable more renewable and decentralized energy supply in the grid. This has resulted in an increasing demand for more battery energy storage in order to buffer power oversupply or overcome energy shortage. With decreasing costs of lithium-ion batteries, they have become more and more interesting for such applications. At the moment there is only a short track record for mid and large scale grid battery storage systems in the market. The current available systems contain enormous amounts of energy up to several MWh. Due to the increasing number of battery storage systems in the market, it becomes necessary to perform pilot projects in order to minimize risk. At the moment there is almost no access to information about the safety of these systems operated under real conditions. Approach 1. Risk analysis approach based on legislative and normative research: To ensure safety, it is necessary to research the relevant legislative and normative requirements on battery based grid storage systems. Currently for grid energy storage development,
there are almost no standards available for risk analysis. Based on this lack of guidelines, a machine risk assessment method described in DIN ISO 12100, is applied and fitted to the specific battery storage requirements. Relevant legislation (such as 2006/42/EG) demands for a risk assessment to ensure the safety for the users of a machine. In this directive, the definition of a "machine" is as follows: "[…] an assembly, fitted with or intended to be fitted with a drive system […]". Nevertheless, an energy storage system is seen as a machine because of its multitude of safety devices installed. The DIN EN ISO 12100 standard describes an approach (figure 1) for such an assessment. 2. Development of energy storage specific framework for ideation process: Experts identify mechanical, thermal, electrical and chemical dangers according to a newly defined framework, containing the phase development, testing, production, warehousing, delivery, operation, maintenance and post-operation (Figure 2). For each specific danger, probability of occurrence and extent of impact is defined. The ALARP (As Low As Reasonably Practicable) principle is applied to categorize the risks. Protective measures are used to reduce the risk to an acceptable level. 3. Proof of concept by the EEBatt Energy Neighbour: A 200 kWh grid lithium-ion (LFP-cells) storage is used as a pilot project in order to assess the risk analysis approach.

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