

## Kongres Container

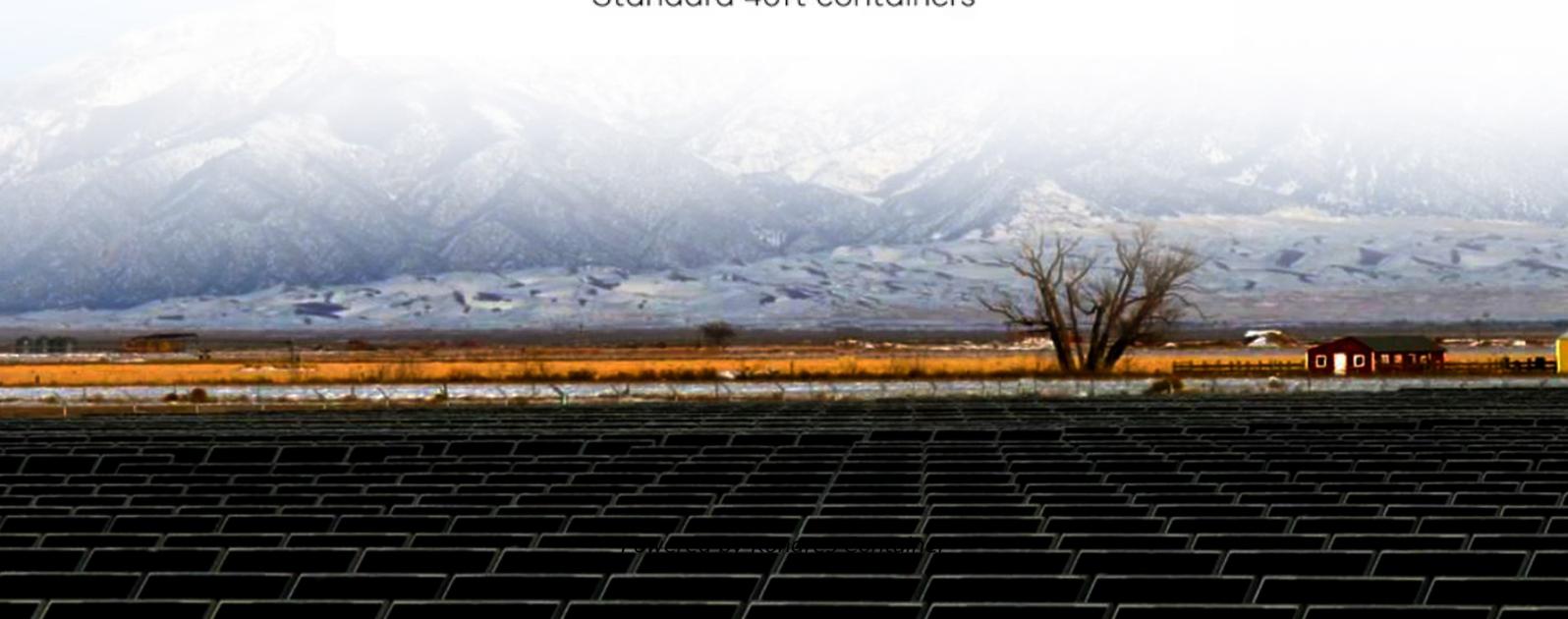
# Modular design of off-grid energy storage batteries



Standard 20ft containers



Standard 40ft containers



## Overview

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This paper presents a novel modular, reconfigurable battery energy storage system. The proposed design is characterized by a tight integration of reconfigurable power switches and DC/DC converters. Are battery energy storage systems scalable?

Battery Energy Storage Systems (BESS) offer scalable energy storage solutions, especially valuable for remote, off-grid applications. However, traditional battery packs with fixed series-parallel configurations lack reconfigurability and are limited by the weakest cell, hindering their application for second-life batteries.

What is a battery energy storage system (BESS)?

To address this challenge, battery energy storage systems (BESS) are considered to be one of the main technologies. Every traditional BESS is based on three main components: the power converter, the battery management system (BMS) and the assembly of cells required to create the battery-pack.

What is a modular battery?

Modular battery technologies are also leveraging advanced cooling-plate designs. Individual plates for each module allow greater flexibility in cell arrangement and enable better customisation for specific vehicle architectures. This modular approach minimises thermal gradients within the pack, improving overall safety and performance.

Why do we need battery energy storage systems?

Fluctuations in electricity generation due to the stochastic nature of solar and wind power, together with the need for higher efficiency in the electrical system, make the use of energy storage systems increasingly necessary. To address this challenge, battery energy storage systems (BESS) are considered to be one of the main technologies.

Why is modular battery development important?

Similarly, modular designs benefit from standardisation in cell sizes, which balances performance with cost and simplifies integration. Another aspect of modular battery development is the trade-off between energy density and installation space. A universal approach introduces compromises.

Does a modular battery architecture affect performance?

Consequently, the topic of modular battery architectures is analyzed in this paper from the system's point of view, as a detached change in one component might at the same time have a negative influence on another component of the drive train leading to an overall negative result for the performance and system losses.

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