

# A Comparative Study on Sodium-Sulphur Batteries and Supercapacitors for Energy Storage System (ESS) – A Review

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**Abstract:** *The quest for efficient and sustainable energy storage solutions has led to the exploration of diverse technologies, with sodium-sulphur batteries and supercapacitors emerging as promising contenders. This paper presents a comprehensive comparative analysis of sodium-sulphur batteries and supercapacitors, focusing on their applicability and performance in energy storage systems (ESS). Sodium-sulphur batteries, known for their high energy density and extended cycle life, are evaluated against supercapacitors, renowned for their high power density and rapid charge/discharge capabilities. Key performance metrics, including energy density, power density, cycle life, efficiency, and cost, are scrutinized to provide insights into the strengths and limitations of each technology. Environmental considerations and safety aspects associated with sodium-sulphur batteries and supercapacitors are also discussed. The analysis aims to guide decision-makers and researchers in selecting the most suitable energy storage solution based on the specific requirements of diverse applications, ranging from grid-scale storage to portable electronics. Furthermore, the paper explores the potential for hybrid systems that harness the complementary attributes of sodium-sulphur batteries and supercapacitors, offering a holistic and synergistic approach to energy storage. This research contributes to the ongoing discourse on sustainable energy solutions, providing a nuanced understanding of the trade-offs between sodium-sulphur batteries and supercapacitors. It underscores the significance of tailoring energy storage choices to application-specific needs, fostering advancements that align with the goals of efficiency, reliability, and environmental sustainability in the realm of energy storage systems*

**Keywords:** supercapacitors

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