

# Performance analysis of a cryogenic liquid air energy storage system coupled with LNG cold utilization and ORC

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## **Abstract :**

Cryogenic liquid air energy storage (LAES) is a physical energy storage technology with significant development. However, conventional systems suffer from problems such as high air liquefaction throttling loss, insufficient utilization of heat storage capacity, and low efficiency of system electrical to electrical conversion. Therefore, a liquid air energy storage system coupled with LNG cold utilization and waste heat type ORC (LAES-LNG-ORC) is proposed, which further improves the overall performance of LAES from the perspective of port LNG cold energy recovery and LAES system waste heat reuse. Analyzed the impact of energy storage pressure and heat storage temperature on system indicators. The research results show that the cycle efficiency of the optimized LAES-LNG-ORC system can reach 95.6%, which is about 40% higher than the benchmark LAES system; The heat utilization efficiency can reach 96.2%; The additional energy increment of the ORC system can achieve an electrical to electrical conversion efficiency of 82.0%, which is approximately 42.8% higher than the benchmark LAES system. The research results can provide certain technical references for the theoretical research and application of cryogenic liquid air energy storage.

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## **Submitters Country**

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**Authors:** Mr HAO, Jiahao (Technical Institute of Physics and Chemistry, CAS); Prof. ZHANG, Zhentao (Technical Institute of Physics and Chemistry, CAS); Dr YUE, Yunkai (Changsha Borui Power Technology Co., Ltd.); Prof. YANG, Junling (Technical Institute of Physics and Chemistry, CAS)

**Presenter:** Mr HAO, Jiahao (Technical Institute of Physics and Chemistry, CAS)

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