

Design of Electric Ship Charging Station Considering Renewable Energy and Storage Systems

Authors : Jun Yuan

Abstract : Shipping is a major transportation mode all over the world, and it has a significant contribution to global carbon emissions. Electrification of ships is one of the main strategies to reduce shipping carbon emissions. The number of electric ships has continued to grow in recent years. However, charging infrastructure is still scarce, which severely restricts the development of electric ships. Therefore, it is very important to design ship charging stations reasonably by comprehensively considering charging demand and investment costs. This study aims to minimize the full life cycle cost of charging stations, considering the uncertainty of charging demand. A mixed integer programming model is developed for this optimization problem. Based on the characteristics of the mathematical model, a simulation based optimization method is proposed to find the optimal number and rated power of chargers. In addition, the impact of renewable energy and storage systems is analyzed. The results can provide decision support and a reference basis for the design of ship charging stations.

Keywords : shipping emission, electricity ship, charging station, optimal design

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