VIABLE RENEWABLE ENERGY OPTIONS FOR NAVAL SHIPS: A STUDY ON ECONOMICAL AND ECOFRIENDLY POWER ALTERNATIVES FOR NAVAL SHIPS

BY

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DECLARATION

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Abstract

Currently, global warming and climate change are the most widely discussed environmental issues, with emission of Carbon Dioxide by fossil fuel being the most critical cause for global warming. The shipping industry is responsible for transporting around 90% of total goods worldwide, and it's expansion contributes considerably to the amount of Green House Gases emitted annually. Therefore, introducing renewable energy sources for ships can be considered as a way of minimizing the use of fossil fuels for powering ships. It is high time to search possible ways of introducing different renewable sources for powering ships. For this purpose, different methods and techniques are being tested in the world; however, most of which are still in experimental stages. Renewable energy source and method to be used for a particular ship, are to be selected considering the type of the vessel. Specially, for naval ships, power requirements and operational feasibilities must be carefully considered in determining the most viable power alternative.

This study discusses various renewable energy sources and identified solar energy as the most viable option for naval ships. The study was carried out focusing on feasible ships in Sri Lanka Navy. All required ship specific data such as available free space, generator capacity, actual fuel consumption, area of operation, activities/operations and solar irradiance onboard were gathered practically from the naval ships. A comprehensive physical market survey was conducted to obtain a more accurate capital cost of solar system accessories today.

The study was able to develop a comprehensive model to assess the potential of solar energy for the classes of ships considered and the model was extended to enabling the use of this model to any class of ship operating worldwide subjected to defining of certain ship specific data by the user. The model provides the annual power generation, annual fuel saving, financial saving, capital cost, reduction of annual CO_2 emission and the payback period as the results which allows the user to decide introducing of solar energy his ship. Furthermore, the model gives guidance to user about azimuth angle, optimal year-round tilt angle, optimal tilt angle by season and optimal tilt angle by month which supports user to obtain maximum outcome from the system.

Key Words: Renewable energy, Naval ships, Solar, Wind, Wave, Biomass, PV

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