



DEPARTMENT OF ENERGY TECHNOLOGY
AALBORG UNIVERSITY

PhD Public Defence

Title: Energy Management of Shipboard Power System

Location: Pontoppidanstræde 111, auditorium

Time: Thursday 1 August at 13.00

PhD defendant: Muzaidi Bin Othman

Supervisor: Professor Josep Guerrero

Moderator: Associate Professor Sanjay Chaudhary

Opponents: Associate Professor Daniel-Ioan Stroe, Dept. of Energy Technology, Aalborg University (Chairman)
Professor Doris Sáez Hueichapan, University of Chile, Chile
Associate Professor Muzamir Isa, Universiti Malaysia Perlis (UniMAP), Malaysia

All are welcome. The defence will be in English.



Abstract:

Recently, the shipboard power system is moving toward energy efficient, less emission and minimum operational cost. Furthermore, there is a restriction in ship operation introduced by the maritime authority regarding the pollutant emission limits and operation from the ship, respectively. The introduction of electric propulsion to replace traditional propulsion in the ship has later led to Integrated Power System (IPS) in the ship. From the past two decades, the evolution in power electronics has enabled the power conversion to be more efficient, which contributes to the overall system efficiency and fuel saving. Furthermore, the advancement of technology in the energy storage system (ESS) also contributes to the energy efficiency in the ship. To this end, the energy management system in the ship is very crucial in order to ensure the efficiency of the power system onboard. Several diesel generators (DG) are managed to dispatch the power with better fuel consumption while satisfying the technical constraint.

This study proposed an energy management system strategy or supervisory level of control mainly on scheduling the energy dispatch unit based on DG and ESS in the shipboard power system which also considered technical constraint toward energy efficient and fuel saving. Scheduling power in the hybrid ship is explored based on methods such as rule-based and optimization based on Mix Integer Non-Linear Programming (MINLP) to address the solution in order to reduce the fuel cost from the DG. The method implements at the highest level in the control system, which gives the power reference to each unit to dispatch power. Result of scheduling energy in shipboard is presented based on three case studies for fix and variable speed for AC and DC distribution, respectively.