Fleet Renewal and Retrofit for Emission Reductions in Offshore Logistics

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Abstract

To achieve the emission reduction targets set by the maritime industry, large investments must be made in renewing and retrofitting the existing fleets in various shipping segments. This paper studies the strategic supply vessel fleet renewal and retrofit problem (SVFRRP) for guiding the transition towards a greener fleet of platform supply vessels (PSVs) used for offshore oil and gas logistics. Since the future costs of the different relevant fuel types are uncertain, we propose a new two-stage integer stochastic programming model for the SVFRRP.

In each time period of the planning horizon, the model includes strategic decisions to meet the specified emission requirements. Existing vessels might be retrofitted to a new power system, or scrapped, while new vessels can be acquired and introduced to the fleet. Furthermore, the fleet deployment is considered, controlling the use of each vessel in order to fulfill the required cargo demands at each offshore installation serviced by the PSV fleet.

We perform an extensive assessment of available fuel technologies for PSVs and use this in computational analyses for two real case studies from the Norwegian oil and gas industry. We compare the optimal fleet renewal strategies and corresponding costs from different emission reduction trajectories, and the results from the analyses provide valuable insights to the impact of various emission reduction policies to the optimal fleet renewal strategies.