The liquefied natural gas infrastructure selection and tanker routing problem - A case study

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Abstract   In this talk we present a combined infrastructure selection and tanker routing problem in the liquefied natural gas (LNG) business that is based on a business case study with a major liner shipping company. The decision problem is of strategic nature and consists of selecting a realizable infrastructure option at each port of demand as well as defining the size and number of tankers and their shipping routes used to transport the LNG from its source port to the ports of demand. The goal is to minimize combined annual investment and operational cost in the long term.

Both the introduction of global limits on sulphur and nitro oxide emissions as well as expectations about rising oil prices have increased the interest in LNG as an alternative fuel for vessels, including container ships. As the global LNG infrastructure is still underdeveloped, it requires both strategic investment as well as tactical routing decisions to make LNG available at the points of demand. To the best of our knowledge, the combined problem has not been addressed before.

We solve the problem in two steps. First, a set of sub-solutions is generated through enumeration. In the second step we solve a set-partitioning problem to determine the best combination of the previously generated sub-solutions. An extensive sensitivity analysis is conducted to account for the limited predictability of key parameter values, to analyse the robustness of the obtained solution and to derive basic decision rules.