NUS RightShip Hackathon 2024

It’s the End

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**Reducing Greenhouse Gas Emissions at Port of Singapore**

**\* - note we have assumed that non applicable fuel types for auxiliary engines have undergone electrification as the 2 other fuel types cover all other fuel types that an auxiliary engine can use.**

The International Maritime Organisation (IMO) is a United Nations agency responsible for the safety and security of shipping, and the prevention of pollution by ships. In this paper, we will be highlighting the prevention of pollution by ships, specifically GHG emissions. Singapore strives to achieve net zero GHG emissions by 2030. The key area of focus for our solution is the electrification of vessels berthed at ports. Through our analysis, we have found out the amount of GHG emissions at Singapore ports alongside the energy requirements of vessels at berths or terminals and came up with a suitable solution backed by evidence to sustain the reduction of GHG emissions whilst meeting energy requirements to counter the phenomenon of utilizing fossil fuels to power vessels.

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First and foremost, we must ask ourselves the ever-important question: Is it possible to further reduce the amount of GHG emissions produced by humans, with the arsenal of laws and measures we have to counter such emissions?

With our data analysis, we believe that we have discovered a sure-fire way to reduce GHG emissions, specifically CO2 emissions by vessels at ports using electrification.

Our solution is to implement port chargers at every port to power the vessels, storage for cargo, and machinery.

According to our findings, the CO2 emissions at anchorage polygons and alongside/hotel polygons are 69913tonnes and 155tonnes respectively for auxiliary engines that have not underwent electrification. We can compare this to the CO2 emissions\* of auxiliary engines in vessels that have not underwent electrification. From this, we have found that there is a % decrease in GHG emissions between the two. Furthermore, we should schedule more trips for vessels in the morning compared to at night, as the electrical load demand is higher at night, as seen from our findings, with daytime requiring 156986kilowatt and nighttime requiring 744722kilowatt.

Additionally, there have already been plans to build port chargers in Singapore, one such example being the Jurong Port. Moreover, they did not plan to allow the storage of cargo and powering of machinery to undergo electrification as well. As seen from this report from the INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION (ICCT), the United States have implemented my idea, and collected data for a [paper](https://theicct.org/wp-content/uploads/2023/02/Ports-electrification_wp_final2.pdf) showing that CO2, PM10, and NOx, would be reduced by 64%, 70%, and 66% in the full electrification scenario. In absolute terms, this represents over 130,000 tonnes of CO2, 57 tonnes of PM10, and 2,000 tonnes of NOx reduced by port electrification in a year, based on the results for 2019. This further bolsters my idea of implementing this in every port within every port in the country.

To conclude my study, I will once again emphasize on the efficacy of my solution for electrification with the various sources of evidence backing it up. I will also be providing a flow chart of how the system will work.

**A diagram of a ship and a ship

Description automatically generated**



**A graph showing a line of blue and white

Description automatically generated with medium confidence**