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THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

Project Summary

Fugitive and Unburned Methane Emissions from Ships Part 2 (FUMES 2)

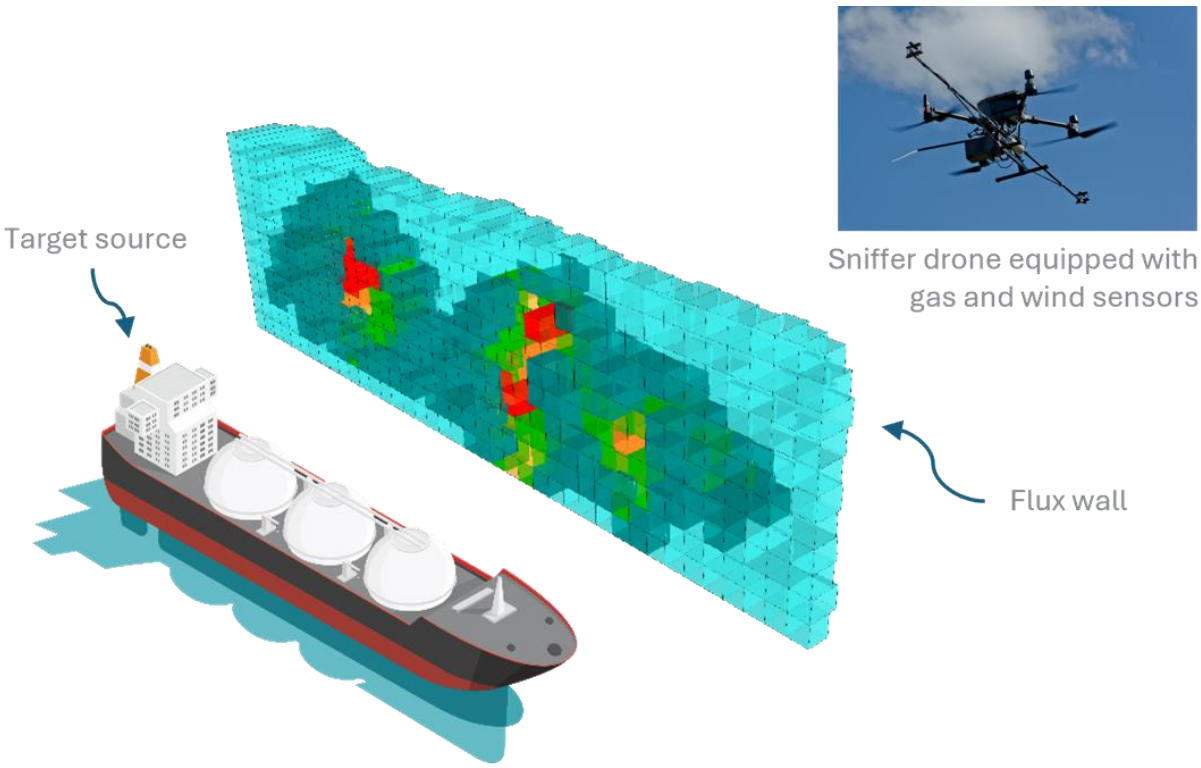
The Fugitive and Unburned Methane Emissions from Ships Part 2 (FUMES 2) project will provide new analysis of methane emissions from various sources and operational modes of liquefied natural gas (LNG)-powered vessels and address areas not fully covered by previous studies. Led by the International Council on Clean Transportation (ICCT), the project includes partners Explicit ApS, the Netherlands Organization for Applied Scientific Research (TNO), Queen Mary University of London, and the Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping.

This research initiative builds on the achievements of the FUMES 1 project, which focused on quantifying methane slip from four-stroke marine engines. FUMES 2 expands the scope to include methane emissions from two-stroke LNG engines, onboard fugitive emissions, and emissions generated during LNG cargo handling operations. The project will use a mix of onboard sensors and drone-based technology.

Measurements and data collection

Onboard measurements will be conducted on at least five LNG dual-fuel engines and the focus will be particularly on two-stroke engines, which are used for propulsion on many new large cargo ships. Data from onboard continuous emissions monitoring systems (CEMS) will also be analyzed. In addition, the project will quantify methane emissions from sources other than the engine, such as fuel tanks, cargo tanks, vents, boil-off gas, and gas combustion units, and this will be done on at least five different voyages to ensure that a wide range of real-world conditions are captured.

Drones equipped with sniffer technology will measure methane emissions from at least 20 instances of LNG cargo handling operations. The drone will be flown in a pattern to construct a “flux wall” that can quantify both methane emissions originating from the equipment used to load or unload LNG and methane from the ships’ exhaust. This is illustrated below.



Impact

The data we gather will contribute to developing future regulatory measures by the International Maritime Organization (IMO) and the European Union, including the IMO LCA Guidelines and associated greenhouse gas measures, the FuelEU Maritime initiative, and the EU Emissions Trading System (EU ETS). The data will help regulators develop effective greenhouse gas reduction policies for the maritime sector by providing more accurate well-to-tank and tank-to-wake emission factors, which are used for calculating the full life-cycle well-to-wake impact of using LNG as a marine fuel.

Beyond its contribution to regulatory policies, FUMES 2 will help ship operators, engine manufacturers, and other stakeholders seeking to implement best practices to measure and mitigate methane emissions. The findings will be shared through peer-reviewed publications, a public report, and a public presentation to ensure transparency and broad accessibility of the results. The goal is not only to inform policymakers but also to drive industry-wide changes to reduce methane emissions and help achieve climate goals.

EXPLICIT emissions data · TNO innovation for life · Queen Mary University of London · Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping