



SOLVANG ASA

Conventional fuels + carbon capture:

AN AFFORDABLE ROUTE TO THE ZERO-EMISSION FUTURE

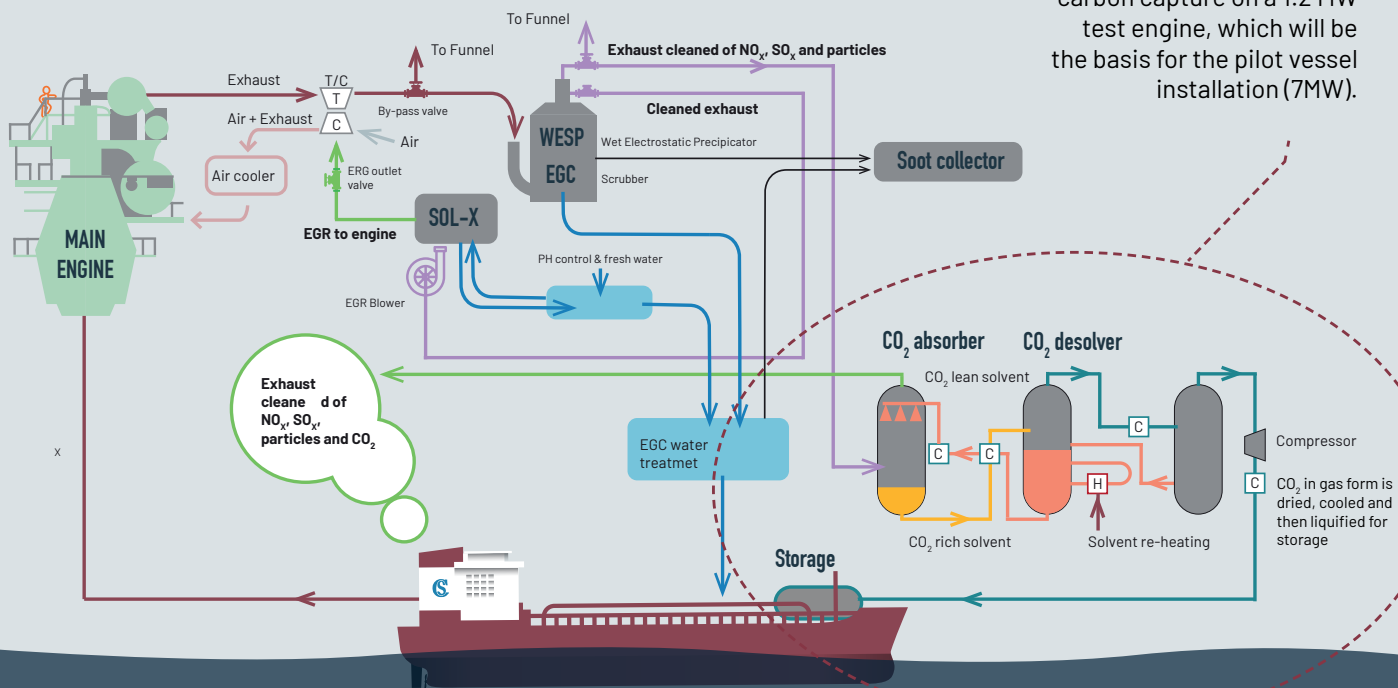


OCCS captures more than
70% of CO₂ emissions

A zero-emission setup for conventional propulsion

The way to comply with IMO's 2050 target without rejecting our foremost advantage

Total emissions control system



Solvang and Wärtsilä run carbon capture on a 1.2 MW test engine, which will be the basis for the pilot vessel installation (7MW).

From trash to treasure

Onboard carbon capture could make the climate effort affordable. The output CO₂ could turn out profits through multiple value chains.

In 2025, Solvang enters operational testing of carbon capture and storage onboard a 21,200 cbm gas carrier. Between 70 and 80 percent of the CO₂ can be captured to deck tanks as high-grade liquid.

The global OCCS technology pilot is a culmination of Solvang's ECO LPG carrier programme started in 2011. It comprises the exhaust gas cleaner (scrubber) from Wärtsilä, Solvang's low-pressure exhaust gas recirculation system, a WESP (wet electrostatic particulate filter), and water cleaning systems, as well as extensive energy efficiency measures on all systems and procedures. The outcome is a Tier III zero-emission gas carrier compliant with IMO's 2050 zero-emission target.

Seven newbuildings ready for OCCS

Solvang has ordered seven Panamax VLGC newbuilds ready for zero-emission operation following the OCCS pilot. Built for single-fuel operation with all exhaust cleaning technology, the vessels will keep their competitive advantage: The cheap, reliable and efficient energy source, sparing costly e-fuels for other sectors and saving costs for our clients.

"Deep sea shipping needs to join the world's climate protection efforts, but the OPEX for alternative fuels makes the change very costly. Instead, we think it is possible to join at a fraction of the price with OCCS," states Mr. Tor Øyvind Ask, Fleet Director at Solvang.

// *Deep sea shipping needs to join the world's climate efforts. We think it is possible to join at a fraction of the price with OCCS.*

Tor Øyvind Ask
Fleet Director at Solvang







From the past to the future:

Solvang's ECO timeline

2011

"Make our Blue Logo Green" programme. Places orders for 2 VLGCs with full-scale exhaust cleaning systems.

2013

Delivery of the world's first ECO LPG Carrier.

2015

Delivery of 3 newbuild ECO LGC gas carriers, retrofits EGC + scrubber + LP EGR (NOx/SOx control) on an ethylene carrier.

2017

Delivery of 2 ECO Panamax VLGC newbuilds.

2019

4 ECO Ethylene and 1 ECO Panamax VLGC newbuilds.
Retrofitting 4 vessels with scrubbers.

2021

Launches carbon capture project with Wärtsilä.

2023

Orders 7 VLGCs, OCCS-ready, installs Mewis ducts, Eco bulbs, propeller and drivetrain optimization. Awarded MNOK 78 for an OCCS pilot project.

2024/2025

Installing and running the world's first full-scale OCCS system onboard the pilot vessel.

Opening a highway to IMO's 2050 goal

While alternative fuels multiply fuel costs, we want to prove that onboard carbon capture comes at a much lower price, opening a wide path for deep sea shipping to comply with IMO's 2050 zero-emission goal.

The onboard carbon capture pilot marks a new way of fulfilling IMO's revised greenhouse gas strategy, which demands 30 percent greenhouse gas reductions (CO₂, CH₄ ++) by 2030, 80 percent reduction by 2040, and zero-emission by 2050. According to IMO, emissions must be considered in a well-to-wake perspective, making it harder to shuffle around carbon outlets from one energy source to another (See figure on next page) Until now, the only prospect for compliance has been to replace hydrocarbons with costly biofuels and/or e-fuels made from renewable energy sources, added in the fuel mix.

"The shipping industry faces an almost impossible cost

increase from alternative fuel options. With the onboard carbon capture, we have found a way to reduce the massive increase in future fuel costs to a mere fraction", states Mr. Tor Øyvind Ask, Fleet Director at Solvang.

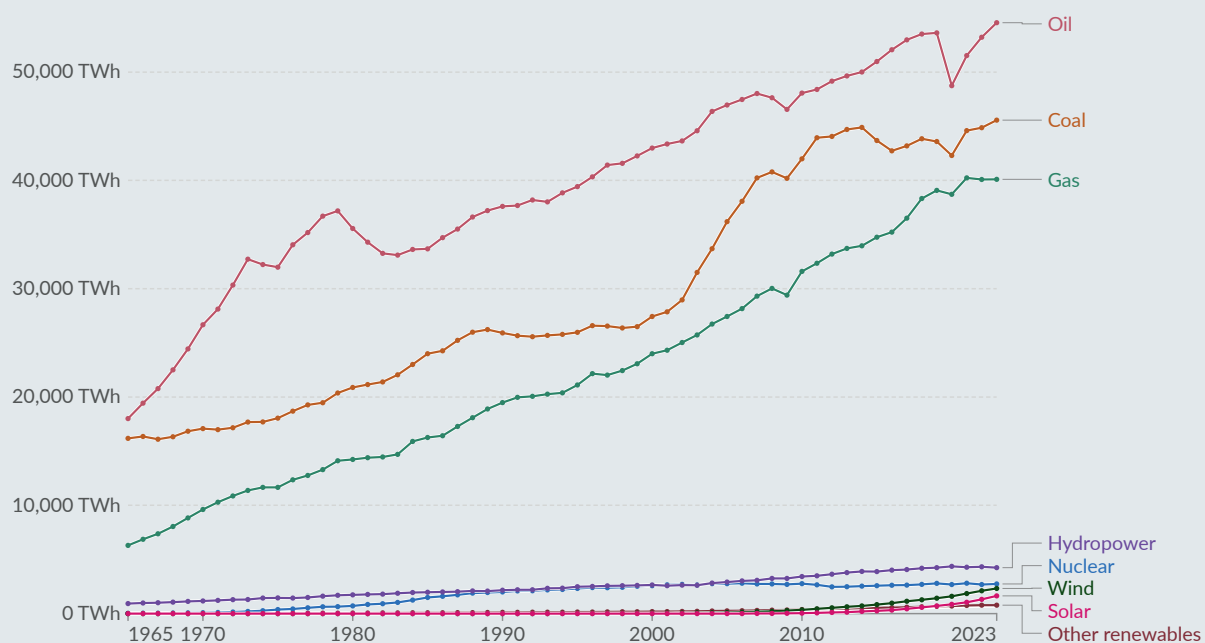
Buying time for climate action

The onboard capture of CO₂ from combustion engine exhaust is poised to play a key role in the world's energy mix (see chart below). It allows for an environmental-friendly continued use of cheap, fossil energy sources, buying the world time to discover sustainable low-carbon energy resources.

Primary direct energy consumption by source, World

Energy consumption is measured in terawatt-hours¹, in terms of direct primary energy². This means that fossil fuels include the energy lost due to inefficiencies in energy production.

Our World
in Data



Data source: Energy Institute - Statistical Review of World Energy (2024)

OurWorldInData.org/energy | CC BY

Note: Includes only commercially-traded fuels (coal, oil, gas), nuclear, and modern renewables. It does not include traditional biomass.

Liquid CO₂: A new valuable business

Solvang has made the first steps and we challenge the land based industries to create new possibilities with the valuable liquid CO₂:

Synthetic fuels

F.i. Fischer-Tropsch synthesis with renewable hydrogen to create sustainable alternatives to fossil fuels

Enhanced oil recovery (EOR)

Oil field injection into geological formations

Industrial applications

Medical/pharmaceutical use, food/beverage, storage

Construction materials

Conversion into carbonate for concrete and sement

The workshop industry

CO₂ as welding gas

Mineralization

Conversion to stable mineral carbonates for permanent storage or processing into commercial products

Algae production

Use for algae cultivation for a bio-based economy

Plastics and polymers

Replacement of fossil fuel-based components

Agriculture

Greenhouse enrichment to promote plant growth

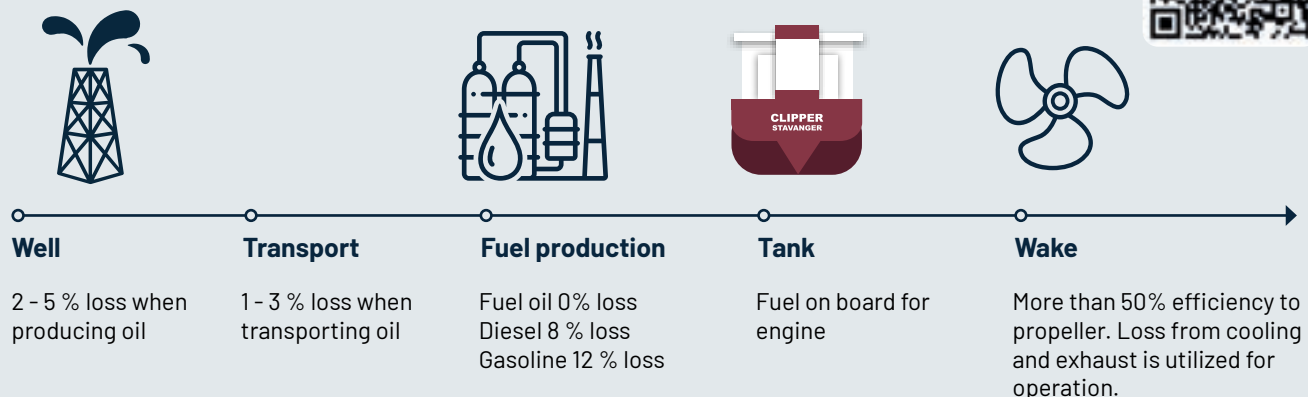
Fire extinguishing

Used for cooling or suffocating fire extinguishing

What is the well-to-wake perspective?

The holistic well-to-wake (WTW) approach encompasses the life cycle of fuel from extraction, throughout to generation of cargo transport. Solvang has adopted this approach. Provided that renewable energy is available, it should be deployed where the climate effect is highest.

Scan to read the article
"THE WELL-TO-WAKE REALITY"





www.solvangship.no

Norway

SOLVANG STAVANGER

Strandkaien 36

PO Boks 90

N-4001 Stavanger

Tel: +47 51 84 84 00

SOLVANG OSLO

Haakon VII's gate 6

PO Box 1737

N-0121 Oslo

Tel: +47 22 47 19 50

Philippines

SOLVANG PHILIPPINES

OSM Thome building

3rd Floor, 479 Pedro Gil St.

Ermita Manila 1000

Republic of The Philippines

Tel.: +63 2 8831 6520