

FUTURE MARINE FUELS

PATHWAYS TO DECARBONIZATION

IMO has developed the ambitious target of a minimum **50% reduction** in greenhouse gas (GHG) emissions **by 2050**.








Shipowners have **alternative fuel options** to help them meet IMO's ambitions, each with its own advantages and challenges.

 Advantages




 Challenges

CARBON FUELS





Liquefied Natural Gas (LNG)

-  Established infrastructure
-  Long-term solution
-  Global fuel availability
-  Safe to handle
-  Increased CAPEX
-  Clean fuel, rapidly developing infrastructure
-  Methane slip

Liquefied Petroleum Gas (LPG)





-  Global fuel availability
-  Safe to handle
-  CO₂ emissions

Methanol / Ethanol





-  Increased CAPEX
-  High fuel cost
-  Easy-to-handle, well developed terminal network
-  Refueling challenges, flammable

CARBON NEUTRAL

Biofuels / Biomethane






-  Safe to handle
-  High fuel cost
-  Increasingly used as marine fuel, can be used as drop-in fuel
-  Sustainable scaling up needed

Synthetic methane / SNG






-  Safe to handle
-  High fuel cost
-  Easily adapted to LNG infrastructure, can be used as drop-in fuel
-  Large-scale production challenges, requires renewable energy source

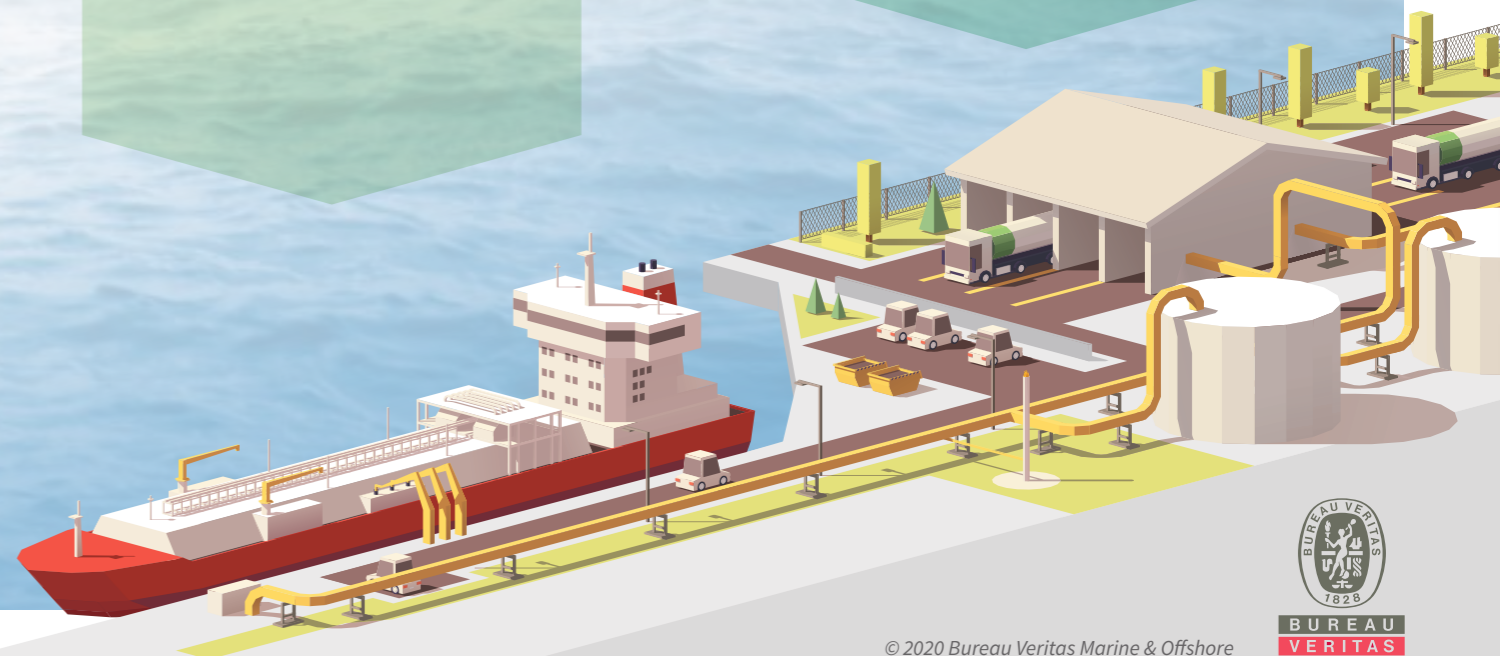
ZERO CARBON

Hydrogen

-  Long-term solution
-  Increased CAPEX
-  High fuel cost
-  Low energy density per volume and favorable specific density by mass
-  Storage challenges, flammable

Ammonia

-  Long-term solution
-  Increased CAPEX
-  High fuel cost
-  Solution for internal combustion engines and fuel cells
-  Limited bunkering, toxic effects on human health



BUREAU VERITAS