

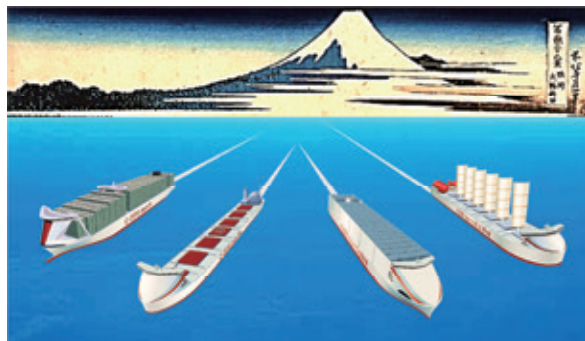
Zero-Emission Ships on the Horizon

As a shipping and shipbuilding nation, Japan aims to put “Zero-Emission Ships” (ships that emit no greenhouse gases) in commercial service for international shipping by 2028.

YANAGISAWA MIHO

JAPAN is an island country dependent on international trade, a maritime power that imports and exports a large volume of goods by ship. In April 2018, the International Maritime Organization* (IMO) adopted the “Initial IMO Strategy on Reduction of GHG Emissions from Ships,” which outlines reduction targets and measures to reduce greenhouse gases (GHG) in international shipping. The Strategy set the target of reducing total GHG emissions by at least 50 percent below 2008 levels by 2050, and phasing out GHG emissions as soon as possible within this century. In response to this, Japan set out to reduce GHG emissions from ships, launching the International Shipping GHG Zero Emissions Project in collaboration with industrial, academic and public sectors in August 2018, and formulating the “Roadmap to Zero Emission” in March 2020.

Within this context, Japan is aiming to introduce zero emission ships by 2028. A zero emission ship is a vessel that emits no GHGs during its operation.

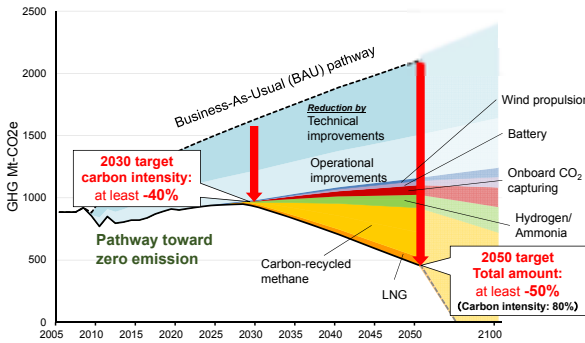


All image and figures: Courtesy of Ministry of Land, Infrastructure, Transport and Tourism

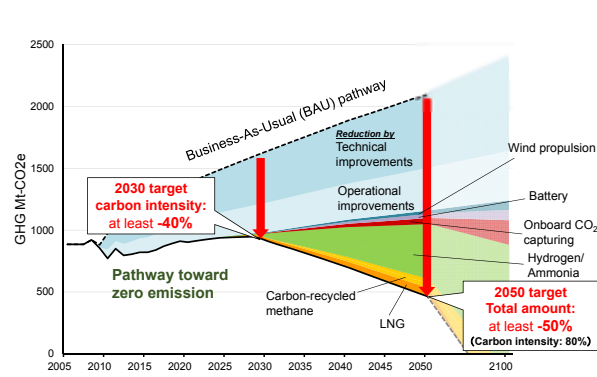
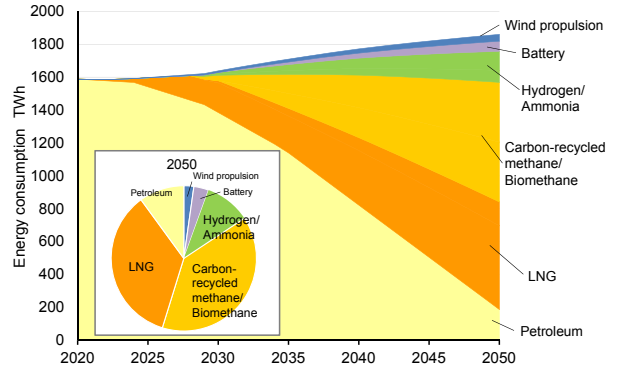
“Currently, there are no zero-emission ships in the world engaged in international trade. A number of countries are competing to be the first to achieve the delivery of the zero-emission ships.”

So says Saito Hideaki, the first Asian chair of the IMO’s Maritime Environment Protection Committee and currently Deputy Director-General for Engineering Affairs of the Maritime Bureau, Ministry of Land, Infrastructure, Transport and Tourism. Commenting on the targets set in the IMO Strategy, Saito goes on, “The development of zero-emission ships is considered essential to achieve those targets. This is because the life of a ship is around thirty years. For example, a ship launched in 2025 will be in service until 2055. Unless the shipping industry makes a shift to zero-emission ships at an early stage, we will not be able to meet the GHG emissions targets,” he says.

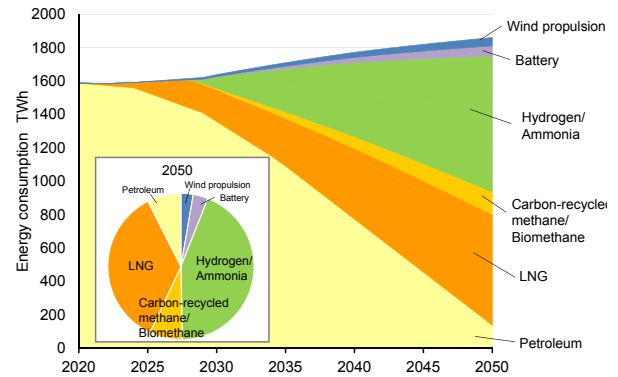
Japan envisages four types of zero-emission ships: hydrogen-fueled ships, ammonia-fueled ships, ships equipped with onboard CO₂ capture systems and super-efficient LNG-fueled wind-propelled vessels. The technologies required for these ships are now under research and development. Hydrogen fuel is also being considered for use in automobiles due to its zero CO₂ emissions and high energy efficiency. Ships fueled by ammonia, like those fueled by hydrogen, are clean energy ships that do not emit CO₂ during combustion. Ships equipped with onboard CO₂ capture systems apply the technology that has already been put to practical use on land to recover CO₂ from exhaust gases. The installation of CO₂ recovery devices on ships will make it possible to achieve zero CO₂ emissions irrespective of the fuel used. The key, however, will be how efficiently the CO₂ can be recaptured on ships. Super-efficient LNG-fueled wind-propelled vessels use LNG fuel instead of the heavy oil for ships that is mainly used



Emission pathway I “a fuel shift from LNG to carbon-recycled methane”



Emission pathway II “the expansion of hydrogen and/or ammonia fuels”



at present, and can be built by combining existing technologies such as wind propulsion to reduce CO₂ emissions. Furthermore, in the future Japan also aims to achieve zero emissions by introducing carbon recycled synthetic fuels produced from CO₂ captured and recovered as a resource.

A key point for future technological development lies in the making of new engines to power large ships such as huge container ships, bulk carriers and tankers that can either reduce GHGs or achieve zero emissions.

“We have to build an engine that no one in the world has ever made before, so the technological development required is immense. In terms of the Roadmap, there are many things we cannot envisage at this point in time, such as the emission pathway as well as the energy supply mix that will be taken

to reduce GHGs in the future. However, the Japanese government intends to develop measures such as a mechanism to support business stakeholders committed to embarkment of zero emission ships, and my hope is that such businesses will use their advanced technological capabilities to realize zero-emission ships made in Japan sailing the world’s oceans in the future,” says Saito.

Surrounded by the sea on all sides, Japan’s territorial waters and EEZ (Exclusive Economic Zone) extend over an area of some 4.5 million square kilometers. As the world’s sixth-largest maritime nation, Japan is actively promoting and contributing to phasing out GHGs in international shipping. ⁷

* A specialized agency of the United Nations established in 1958 to address maritime issues such as maritime safety and protection of the marine environment.