

Nuclear Shipping

Discussion on the possibility of nuclear energy to power commercial ships are liable to knee-jerk reactions, especially in regards to safety. However the discussion on nuclear shipping has been ongoing for over the past 50 years, and in recent years nuclear shipping has been proposed as a 'clean energy' that can help the shipping industry lower the 870 metric tonnes of carbon dioxide emissions it emits into the earth's atmosphere every year, or 2.7% of total global carbon emissions.

A Clean Energy ?

In more recent years the increasing limitations on Sulphur Oxide emissions from ships has put the global maritime industry on a search for economical ways to meet current and future environmental regulations. Environmentally nuclear power is considered to produce 'clean energy' with few emissions. While radioactive waste is produced in the reactor of a nuclear ship, they are contained within the reactor and are not released into the atmosphere. The fact that nuclear shipping emits no emissions into the environment means that it meets all current and all likely future environmental emission regulations, an area of great concern for the shipping industry. Furthermore because it does not produce soot, it is an environmentally conscious way to ship possible trans-arctic expeditions. Soot can have a lasting effect on the ice, increasing the heat retention and leading to greater melting of already threatened arctic icecaps.

Application

Apart from land based nuclear power stations, nuclear power is used in a number of naval ships and submarines and also on some ice-breakers, where it is seeing its greatest contribution to commercial shipping.

"Nuclear propulsion has proven technically and economically essential in the Russian Arctic where operating conditions are beyond the capability of conventional icebreakers. The power levels required for breaking ice up to 3 metres thick, coupled with refuelling difficulties for other types of vessels, are significant factors. The nuclear fleet, with six nuclear icebreakers and a nuclear freighter, has increased Arctic navigation from 2 to 10 months per year, and in the Western Arctic, to year-round" (Hore-Lacy, 2010).

Nuclear power is particularly suitable for vessels which need to be at sea for long periods without refuelling, or for powerful submarine propulsion.



The N.S Savannah : This demonstration freighter operated between 1961 and 1971

Nuclear Shipping

Fuel Cost

For modern shippers the greatest benefit nuclear power has to offer them is the low cost of fuel in comparison to the cost of bunker fuel or liquefied natural gas. With the ever increasing price of oil the price comparison will only become more disproportionate.

Furthermore, ships to save fuel and produce fewer emissions often reduce their speeds when crossing oceans (20 percent reduction would decrease consumption by 36 to 39 percent (International Council for Clean Transportation, 2011). Due to the price of the fuel shipping lines can achieve top speeds much cheaper using nuclear energy.

Modern Developments

Some 140 vessels are powered by more than 180 small nuclear reactors and more than 12,000 reactor years of marine operation has been accumulated. Most are submarines, but they range from icebreakers to aircraft carriers. However despite over 50 years of research and development into nuclear shipping there is still no commercial cargo vessel operating throughout the world today.

In December 2009 the head of the large Chinese shipping company Cosco suggested that container ships should be powered by nuclear reactors in order to reduce greenhouse gas emissions from shipping. He said that Cosco was in talks with China's nuclear authority to develop nuclear powered freight vessels. However, in 2011 Cosco aborted the study after three years, following the Fukushima accident.

In 2010 Babcock International's marine division completed a study on developing a nuclear-powered LNG tanker (which requires considerable auxiliary power as well as propulsion). The study indicated that particular routes and cargoes lent themselves well to the nuclear propulsion option, and that technological advances in reactor design and manufacture had made the option more appealing.

Nuclear power seems most immediately promising for the following:

- Large bulk carriers that go back and forth constantly on few routes between dedicated ports – eg China to South America and NW Australia. They could be powered by a reactor delivering 100 MW thrust.
- Cruise liners, which have power demand curves like a small town. A 70 MWe unit could give base-load and charge batteries, with a smaller diesel unit supplying the peaks.
- Nuclear tugs, to take conventional ships across oceans
- Some kinds of bulk shipping, where speed is essential.

In future, constraints on fossil fuel use in transport may bring marine nuclear propulsion into more widespread use. So far, fears about safety have caused political restriction on port access limiting any potential development or rollout of commercial nuclear ships.

