Beazley Logo

Artículo

Clean marine: How aqua-innovators can ride the energy wave

Sundeep Khera

Our Risk & Resilience report “ Spotlight on Energy Transformation 2026” looks at the opportunities, risks and new approaches needed for the new energy era. Read on for Sundeep’s insights into shipping’s energy transition and rising nuclear momentum.

The entire global maritime sector faces an urgent deadline to wipe out all greenhouse gas (GHG) emissions by mid-century. The International Maritime Organization adopted a 2023 strategy for member states to reduce greenhouse gases[1], and is on the path to establish a legally binding, enforceable framework for net-zero goals[2]. The pressure is high and the race is on to replace conventional fuels with viable, scalable zero-carbon alternatives.

But the road to clean marine is not simply a response to regulation. It is shaping up to be an opportunity for market players to build new models for energy, transport and growth; across fuels, infrastructure and energy supply.

Alternative maritime fuels: High hopes, uncertain slopes

Alternative fuels are advancing, but each comes with trade-offs in cost, scalability or emissions. Methanol and other biofuels – though emitting practically zero sulphur oxides – face concerns around demand, supply, quality, cost[3] and environmental concerns[4]. Similarly, while ammonia fuel holds no carbon molecules, it comes with extreme toxicity risks to humans and nature[5]. Blended fuels (e.g. agricultural and traditional) degrade over time and can block fuel flows[6]. And while liquefied natural gas (LNG) may produce lower air pollutants and CO_2 emissions, its high-methane composition means it could contribute to climate

warming at a significant pace[7].

Floating nuclear reactors: A sea of opportunity

Given the mixed benefits of current fuels, the pursuit of dependable alternative energy pushes on. Commercial floating nuclear power plants (FNPPs) deliver a practical energy solution, generating stable, low-emission baseload electricity. Nuclear power is gaining attention as a clean, stable solution that enables long-range operations without refuelling.

While the British Royal Navy[8] and Russian Arctic icebreakers[9] have proven the success of nuclear fuel, commercial ships still face high insurance costs, port limits, and safety worries. However, the IMO is updating its regulations around nuclear to integrate newer, advanced nuclear technologies that could play a significant role in reducing GHG emissions in shipping[10].

Once scaled, FNPPs can help to fulfil the skyrocketing power demands of offshore data centres, port and ship electrification, remote communities, islands, and coastal desalination hubs.

The big advantages creating big nuclear appetites

The advantages are plenty with users able to evade oil price and supply volatilities. Their modular nature means less reliance on fragile supply chains and faster deployment than traditional, monumental power plants. And they're being designed for resilience in the face of hostile maritime conditions[11] and natural disasters[12], also targeting longer refuelling intervals of up to 12 years[13]. Meanwhile, any accidents trigger autonomous defence systems to contain them[14].

The appetite and momentum around FNPPs is clear. One is already active in Russia[15] supplying over 60% of the electricity across isolated Arctic towns[16] and supporting large-scale extraction projects[17]. Wider governments and private companies worldwide are collaborating to drive development[18], with many set to debut within the decade[19]. FNPP developer Core Power is actively lobbying governments worldwide, aiming to forge dedicated nuclear corridors to launch operations, and collaborating with the International Atomic Energy Agency (IAEA) to develop global frameworks[20].

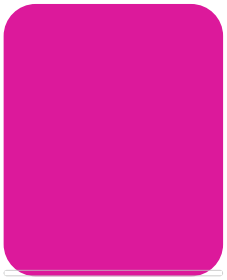
This creates new opportunities for: ports to secure long-term, stable energy supply; lower operating cost in regions with expensive energy; energy-intensive industries to expand in constrained locations. But the risks here span geopolitics and bureaucracy including:

- **Regulatory uncertainty:** around maritime nuclear use[21],
- **Geopolitical exposure:** including conflict, piracy and restricted port access[22],
- **Political risks:** such as confiscation or nationalisation of floating assets[23].

Insurance supports adoption and investment

Insurance is critical to clean marine progress, but new fuels bring risks traditional policies do not fully cover. Nuclear projects for example are typically excluded[24], necessitating new frameworks and collaboration across industries. Insurers are building rapid insights into emerging clean marine risks, and those who engage can access that expertise, manage risks early on, structure appropriate cover, secure investment, and move ahead with confidence.

The transition will not be uniform. Progress will vary by region, fuel and technology. However, organisations that act early, invest in capability and manage risk in parallel with innovation are best positioned to reap the benefits.



Sundeep Khera

Head of Marine

1. https://www.imo.org/en/ourwork/environment/pages/2023-imo-strategy-on-reduction-of-ghg-emissions-from-ships.aspx
2. https://www.imo.org/en/mediacentre/pressbriefings/pages/imo-approves-netzero-regulations.aspx
3. https://www.transportenvironment.org/topics/ships/lng
4. https://www.mdpi.com/2305-6290/9/2/71
5. https://www.mdpi.com/2305-6290/9/2/71
6. https://www.bellperformance.com/blog/bid/58315/ethanol-blended-gasoline-and-its-effects-on-farm-equipment
7. https://www.transportenvironment.org/topics/ships/lng
8. https://www.navylookout.com/the-evolution-of-uk-nuclear-submarine-reactors-and-rolls-royces-central-role/
9. https://gcaptain.com/russia-deploys-all-eight-nuclear-icebreakers-for-first-time-to-keep-arctic-export-routes-open/
10. https://shipandbunker.com/news/world/209074-imo-to-discuss-updating-safety-rules-for-nuclear-ships
11. https://world-nuclear.org/our-association/publications/working-group-reports/facilitating-global-deployment-of-floating-nuclear-power-plants
12. https://world-nuclear.org/our-association/publications/working-group-reports/facilitating-global-deployment-of-floating-nuclear-power-plants
13. https://world-nuclear.org/information-library/non-power-nuclear-applications/transport/nuclear-powered-ships
14. https://wikis.mit.edu/confluence/display/FLOATINGREACTOR/Reactor+Safety
15. https://www.fnpp.info/
16. https://rosatomnewsletter.com/2025/02/28/small-but-necessary/
17. https://fnpp.info/latest-news/world%E2%80%99s-only-operational-fnpp-generates-978-million-kwh-of-electricity-in-five-years
18. https://www.iaea.org/events/fnpp-2023
19. https://world-nuclear-news.org/articles/core-power-plans-mass-production-of-floating-nuclear-power-plants

20. https://www.linkedin.com/posts/corepower-energy_maritimenuclear-fnpp-safesecuretransport-activity-7447561419308601344-MbTW/

21. https://maritime-executive.com/editorials/regulatory-and-liability-challenges-to-unlocking-nuclear-power-for-maritime

22. https://bellona.org/news/nuclear-issues/nuclear-russia/2005-07-floating-nuclear-power-plants-easy-prey-for-terrorists

23. https://doaj.org/article/40632e3e44994950a04a48cad7dd88cd

24. https://assets.lloyds.com/media/85894039-62f0-4ca6-a508-33a31614acc2/LLOYDS-Greener-energy-time-capsule-final.pdf

Home

©Beazley Group | LLOYD's Underwriters