SYLVAN CAPITAL · MONTHLY INDUSTRY REPORT

Casting Off

Nuclear finally goes to sea — and the trade is at the approval desk and the enrichment plant, not the reactor core.

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A year ago, “nuclear-powered merchant ship” was a phrase you used to test whether someone had read past the headline. As of this month, three of the world’s largest classification societies have issued approvals-in-principle for reactor-propelled commercial vessels, the world’s largest container line is twelve months into a regulatory feasibility study, a Chinese state yard has shown a thorium-reactor box ship and a reactor-powered floating fuel factory at two consecutive trade shows, and the U.S. Department of Energy has produced the first fuel ever made for a fast molten-salt reactor and called it — in writing — the door to maritime deployment. The technical inputs on my desk this month are mostly old: a 2016 nonproliferation paper, a 2023 techno-economic review, a 2025 history of marine reactors, and two engineering chapters written in the *NS Savannah* era. They are old because the engineering question was settled decades ago. What changed in 2026 is the part the papers don’t price: regulation, insurance, and fuel supply. That is exactly where the money is.

THINGS WORTH NOTING FROM THIS MONTH

- **Maritime nuclear cleared its first regulatory gate at scale.** ABS approved a 16,000-TEU nuclear-electric container ship design with HD Hyundai; Lloyd's Register approved a molten-salt-reactor car carrier and a hybrid nuclear-diesel concept. Approval-in-Principle is now a cadence, not a one-off.
- **The economics argument is an opex argument, and a carbon price wins it.** A peer-reviewed model puts an on-board modular reactor at ~$1,126/voyage-hour versus ~$1,444/hour of marine fuel; a $50/ton CO_2 price adds ~$10,000/day to the fossil ship. An all-battery ship needs $0.5–0.75 bn of cells — a non-starter at deep-sea scale.
- **IMO is the catalyst.** The Net-Zero Framework (global fuel standard + GHG pricing) is now targeted for adoption in December 2026, applying to ships >5,000 GT that emit ~85% of shipping CO_2.
- **All new civilian marine reactors will be LEU/HALEU, not HEU.** That moves the value to the enrichment chokepoint. Centrus is the only U.S. HALEU producer at commercial scale.
- **China is building the integrated concept fastest.** A CSSC thorium-MSR 14,000-TEU ship (design phase 2026) and a Jiangnan reactor-powered floating hub that makes hydrogen/ammonia on site — reactor-as-fuel-factory, not just propulsion.
- **The reactor-chemistry "horse race" is unsettled — and that's the point.** PWR, lead-cooled fast, molten-salt and HTGR are all live. Underwrite licensability, not chemistry.
- **The real binding constraint is insurance.** Maersk's own fleet-technology lead says commercial insurability of floating reactors and nuclear ships — not reactor physics — is the unlock. No paper in the stack prices this.

1. Market trends I'm watching

The defining feature of June 2026 is that maritime nuclear stopped being a technology story and became a *permissions* story. The shipping industry moves roughly 80% of world trade by volume, is itself a sector worth more than US$400 billion, and enables over US$4 trillion of goods trade — while emitting about 3% of global CO_2 (Bhattacharyya et al., 2023). It is also one of the hardest sectors to abate: batteries don't have the energy density for deep-sea voyages, and green ammonia/methanol require an enormous new fuel-production build-out. Into that gap walks a heat source that is energy-dense, carbon-free, and — crucially — has fifty years of at-sea operating history in navies and icebreakers.

What makes 2026 different from every prior false dawn is that three things arrived at once. First, a regulatory forcing function: the IMO's Net-Zero Framework puts a price on marine carbon and a floor under marine fuel intensity. Second, a financeable engineering milestone: classification-society approvals-in-principle, which convert "interesting idea" into "design a yard can quote." Third, a generation of reactor designs (lead-cooled fast, molten-salt, HTGR) whose vendors claim inherent, walk-away safety — the property that, if it survives independent review, collapses the liability and crewing problem that sank civilian nuclear shipping the first time. The investor's job this month is to separate which of those three is actually de-risked (the first), which is genuinely advancing (the second), and which is still a claim (the third).

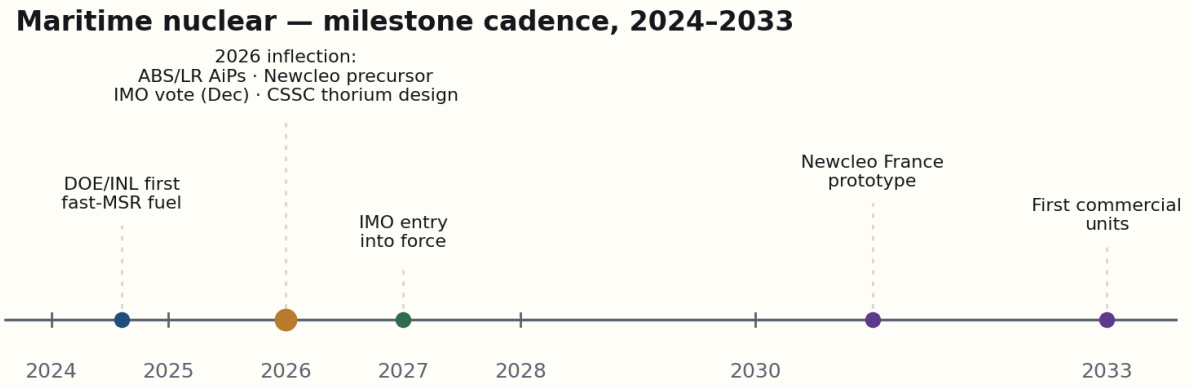

Figure 1. Indicative milestone cadence for maritime nuclear. 2026 is the inflection year: classification AiPs (ABS/HD Hyundai 16,000-TEU box ship; Lloyd's Register MSR car carrier and hybrid concept), Newcleo's Brasimone precursor, the targeted December IMO Net-Zero adoption vote, and the close of China's thorium-MSR ship design phase all land this year. Commercial reactor delivery (Newcleo roadmap) is 2033. Sources: ANS/WNN, CORE POWER/INL, NucNet, IMO. Markers are calendar-positioned, not to scale within years.

2. Maritime nuclear — the deep dive

2.1 The approval cadence is the signal

Approval-in-Principle is the maritime equivalent of an SMR offtake letter: it doesn't build anything, but it is the first time a regulator commits in writing that a design *could* comply. This month's cadence is the strongest evidence in the dataset. The American Bureau of Shipping and HD Hyundai signed a joint development project for a nuclear-electric propulsion system on a 16,000-TEU container ship, integrating an SMR delivering up to ~100 MW, with the propulsion concept shown at Gastech 2026. Lloyd's Register issued AiP to HD Hyundai Heavy Industries and HD KSOE for a large pure car & truck carrier using a molten-salt reactor, and separately to Australian designer Seatransport for a hybrid nuclear-diesel concept. Three societies — ABS, Lloyd's Register and DNV — are now actively reviewing nuclear propulsion designs. When the bottleneck stops being "can it work" and starts being "how many designs can the class societies process," you are watching a sector cross a threshold.

2.2 The vendor field — mostly private, deliberately diversified

The reactor vendors are where the technology risk lives, and they are almost all private. **CORE POWER** (UK) anchors the commercial maritime molten-salt thesis through the Molten Chloride Reactor Experiment (MCRE) — a public-private effort with Southern Company, TerraPower and the U.S. DOE, hosted at Idaho National Laboratory's LOTUS test bed. The first fuel-salt production batch was delivered at the end of September 2025, with four more through March 2026; in January 2026, INL produced the first fuel ever made for a fast molten-salt reactor experiment, explicitly framed as opening maritime deployment. **Newcleo** (UK/Italy/France) is pursuing a lead-cooled fast reactor; with Fincantieri and RINA it ran a maritime feasibility study and unveiled a full-scale mock-up of its TL-40 marine reactor, on a roadmap of an Italian precursor by end-2026, a French prototype by 2031, and commercial units from 2033. It closed an $85 m

round in March 2026 (over $755 m since 2021). **Seaborg** (Denmark) is building a barge-mounted compact molten-salt reactor, targeting type approval in 2026 and serial production from 2027.

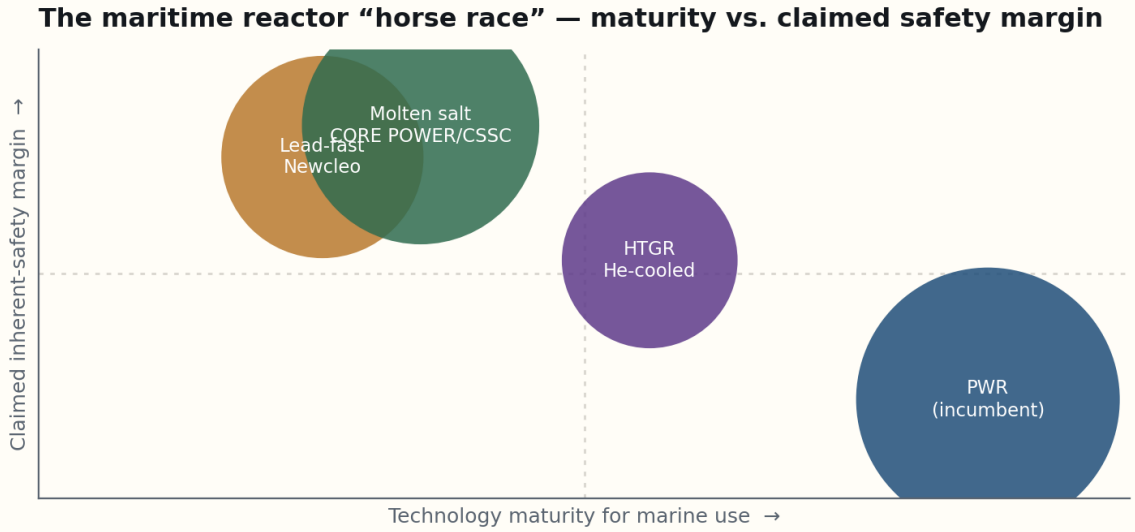

Figure 2. Qualitative positioning of marine reactor types. The pressurized water reactor is the conservative, operating incumbent (Holbert 2025; Strong & Nash; *NSP* Ch.7 frames selection as a “horse race” with no guaranteed winner). Gen-IV entrants — lead-cooled fast (Newcleo), molten-salt (CORE POWER/TerraPower, Seaborg, CSSC), HTGR (the 2×50 MWe helium concept in Bhattacharyya 2023) — claim higher inherent-safety margins but are less mature for marine use. Axes are illustrative.

3. The economics — it’s an opex argument, and carbon decides it

The most useful document in this month’s stack is the Bhattacharyya techno-economic review, because it puts numbers on the comparison that actually matters to a shipowner: cost per voyage-hour. The modelled on-board configuration is two 50 MWe modular helium-cooled reactors at a levelized cost of $0.04–0.10/kWh(e) and an overnight capital cost of $5,000–8,000/kW(e). On that basis the reactor pathway runs about $1,126 per voyage-hour. The fossil incumbent, at marine fuel near $550/ton, burns roughly $34,650/day — about $1,444/hour. The two are already in the same neighbourhood before any carbon policy. Apply a modest $50/ton CO_2 price and the fossil ship picks up roughly $10,000/day in extra operating cost, and the comparison tips decisively toward the reactor.

The “just use batteries” objection dies on the same page: an all-battery deep-sea ship would need $500–750 million of cells (at $200–300/kWh) for a single vessel. That is not an energy transition; it is a way to convert a ship into a battery that occasionally carries cargo. The honest read is that for deep-sea, high-utilisation trades, the credible zero-carbon options are nuclear-direct propulsion or nuclear-derived synthetic fuels (hydrogen, ammonia, methanol) — and the same reactor fleet underwrites both.

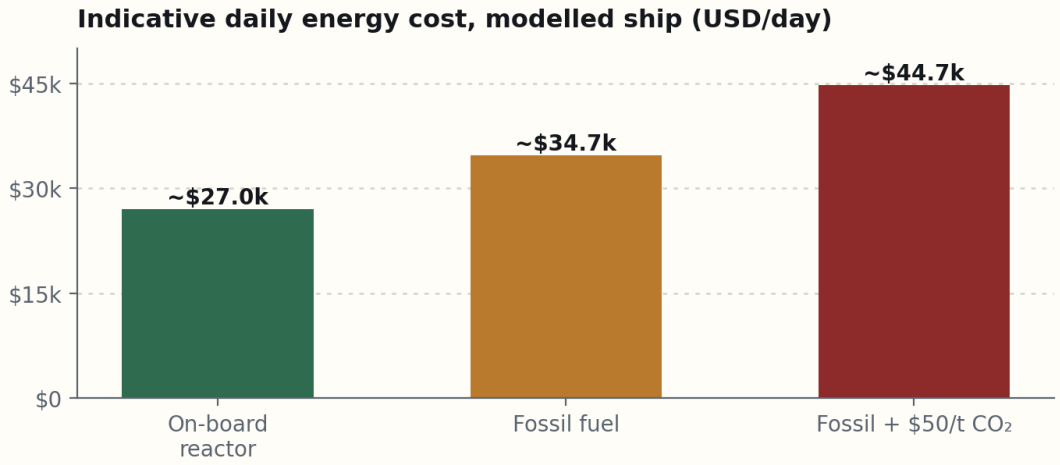

Figure 3. Indicative daily energy cost for the modelled vessel. Reactor: ~$1,126/voyage-hour ≈ $27.0k/day. Fossil: ~$1,444/hour ≈ $34.7k/day at ~$550/ton fuel. A $50/ton CO_2 price adds ~$10.0k/day, taking the fossil ship to ~$44.7k/day. Figures derived from Bhattacharyya, El-Emam & Khalid (2023). Illustrative of the model's relationships, not a forecast for any specific ship.

4. The fuel & enrichment chokepoint — where the public-market purity is

Here is the read-through the engineering papers make possible. The 2016 NTI paper establishes that naval propulsion is the largest remaining non-weapons use of highly enriched uranium: the U.S. and U.K. navies run weapons-grade enrichment (~93%+ U-235), while France and China use far lower enrichment. The proliferation concern — the "naval loophole" that exempts naval fuel from IAEA safeguards — is precisely why every *new civilian* maritime reactor program is being designed around low-enriched uranium (under 20%) and, in practice, HALEU. A congressional amendment now directs the U.S. to assess LEU viability for naval propulsion including SSN-AUKUS-suitable reactors, though the Navy continues to argue LEU offers "no military benefit." That defense conversion is slow, multi-decade option value. The commercial signal is cleaner: civilian marine reactors create HALEU demand, and HALEU has one U.S. commercial producer.

That producer is **Centrus Energy** (NYSE: LEU), the only U.S. company enriching HALEU at commercial scale, with FY2025 revenue near $448.7 million, a backlog of roughly $3.8 billion extending to 2040, and a ~$900 million DOE HALEU production task order. Whether the first reactor to sea is lead-cooled, molten-salt or HTGR, it will need enriched fuel — and in the Western supply chain the toll booth on that fuel is narrow. This is the rare maritime-nuclear exposure you can express in a public, liquid name today.

5. China's integrated play

China is not waiting for a classification cadence; it is building the whole stack. At Posidonia 2026, Jiangnan Shipyard (a CSSC yard) unveiled a nuclear-powered floating logistics hub cored on a molten-salt reactor and supplemented by solar and wind — designed to produce hydrogen, ammonia and synthetic green fuels on site for terminal operations and support vessels. Separately, CSSC is developing a 14,000-TEU container ship

powered by a thorium molten-salt reactor, with the design phase targeted for completion in 2026 and construction possibly beginning late this decade. The land-based science is advancing in parallel: China's thorium-MSR program has demonstrated thorium-to-uranium fuel conversion in a molten-salt system. The strategic point for a Western allocator is that China is treating the marine reactor as energy infrastructure — a floating fuel factory — rather than merely a propulsion unit, which is a more defensible and more scalable concept than a single nuclear hull.

6. The radioisotope supply chain — a small, non-obvious picks-and-shovels angle

One of this month's inputs surveys the radioluminescent ("radioactive paint") supply chain, and it is worth separating cleanly from reactor fuel because the two get conflated. Self-luminous markers at sea — compass cards, clinometers, life-raft and life-jacket locator markers, and self-powered exit/escape signage — have moved entirely from brushable radium and promethium paint to sealed Gaseous Tritium Light Sources (GTLS). The tube-fillers are a tiny licensed group: mb-microtec (Switzerland, "trigalight"), Betalight (Netherlands/UK, supplying over 600 NATO stock numbers), and exit-sign makers SRB Technologies and Shield Source in Ontario. There is no commercial "radioactive anti-fouling paint"; on a nuclear ship, the radioactivity is in the fuel and activated components, not a coating.

The investable insight is the chokepoint behind the chokepoint: tritium. Essentially all civilian commercial tritium is a byproduct of Canada's CANDU heavy-water reactors, with the bulk of a roughly 25 kg global civilian stockpile held at Darlington by Ontario Power Generation and annual production of only ~2 kg, slowly decaying. The U.S. produces ~2 kg/yr at Watts Bar, reserved for defense. Compounding this, the West has had no lithium-6 enrichment line since the COLEX process closed in 1963, and lithium-6 is the feedstock for both tritium breeding and future fusion fuel. This is not a 2026 trade, but it is a structural scarcity story the fusion narrative will eventually reprice — worth a watch slot.

7. Regulation & insurance — the constraint the papers don't price

If there is one thing the academic stack systematically under-weights, it is that this is a permissions-and-liability problem before it is an engineering one. The IMO's Net-Zero Framework — a global marine fuel standard plus a GHG emissions-pricing mechanism — was approved at MEPC 83 in April 2025, adjourned for a year that October, and is now targeted for adoption at the December 2026 MEPC, with implementation guidelines progressed at MEPC 84 in spring 2026 and entry into force expected in 2027. It applies to ships over 5,000 gross tons, which emit about 85% of international shipping's CO_2. That vote is the single largest swing factor for the entire thesis.

Maersk's participation is the tell on the second constraint. The line joined a Lloyd's Register / CORE POWER feasibility study on nuclear-propelled European feeder shipping, and a follow-on Lloyd's Register / Port of Rotterdam / CORE POWER / Maersk desktop study found that existing port safety and risk frameworks could be a credible starting point for assessing nuclear-ship port calls. But Maersk's head of fleet technology has been explicit that the binding constraint is the standards framework for *commercial insurability* of floating nuclear plants and nuclear ships operating in ports and nearshore waters. Reactors that can't be insured can't be financed, and ships that can't call at ports can't trade. The real moat in this sector belongs to whoever writes — and underwrites — those frameworks.

8. Oil & macro — risk premium deflating, still conditional

Carrying forward last month's crude thread: Brent traded near $84.62/bbl on 15 June 2026, well off the Q2 spike driven by the Strait-of-Hormuz risk premium, as the Middle East peace framework held. The EIA's spring outlook had Brent averaging ~$106 in Q2 falling toward ~$89 in Q4; Goldman's 2026 base case sits near $85 (with upside above $120 if Hormuz stays constrained), while JPMorgan holds a ~$60 baseline. The binary we flagged in May is intact but deflating: framework holds and crude drifts toward the mid-$80s; framework breaks and oil reprices sharply higher. For the maritime-nuclear thesis this matters at the margin — higher and more volatile fuel prices strengthen the case for reactor and synthetic-fuel propulsion, while a benign oil tape lengthens the runway the incumbents enjoy.

9. Investment recommendations — short, blunt, profitable

LONG

Enrichment / HALEU — the cleanest public expression: Centrus Energy (LEU). Only U.S. commercial HALEU producer; ~$3.8 B backlog to 2040 and DOE task orders. Every Western marine reactor, regardless of chemistry, needs enriched fuel. This is the toll booth.

LONG

Shipbuilders — own the integrators: HD Hyundai (329180.KS) and Fincantieri (FCT.MI). HD Hyundai holds AiPs from both ABS (16,000-TEU box ship) and Lloyd's Register (MSR car carrier); Fincantieri is Newcleo's marine partner. The yard that integrates the reactor captures the recurring value.

LONG

Reactor vendors (private sleeve, small sizing): CORE POWER (maritime MSR via MCRE with TerraPower/Southern/DOE), Newcleo (lead-cooled, $755 M raised, 2026 precursor), Seaborg (barge MSR, type approval 2026). Build a diversified, milestone-gated pre-IPO basket — not a single-chemistry bet.

WATCH / OPTION-VALUE

SMR / advanced-reactor public names: NuScale (SMR, only NRC-certified design), Oklo (OKLO). Both pre-revenue and loss-making; size as options. Catalyst is the first commercial unit and the first marine-relevant deployment.

PAIR

Long the chokepoints / short the hulls-only hype: the value accrues to fuel (Centrus), classification/insurance, and integrating yards — not to single-ship "nuclear vessel" press releases. Pair long the chokepoint basket against any narrative-only single-asset nuclear-ship promoter.

WATCH

Tritium / lithium-6 strategic supply: CANDU/heavy-water-linked tritium custody (Ontario Power Generation / Darlington) and accelerator-driven tritium concepts (Los Alamos). Long-dated scarcity story the fusion narrative will reprice. Not a 2026 trade.

UNDERWEIGHT / AVOID

Defense LEU-naval-fuel "conversion" plays as near-term trades. The U.S. Navy LEU program is a ~15-year, ~$1 B effort the Navy itself resists. Real, but multi-decade. Don't pay 2026 prices for a 2040s catalyst.

UNDERWEIGHT / AVOID

Any maritime-nuclear program without an insurability and class-approval pathway. Reactors that can't be insured can't be financed. Expect a long tail of concept-only ventures to stall on liability, not physics.

10. Risk factors and what would change my mind

The single largest swing factor is the **IMO Net-Zero adoption vote** targeted for December 2026. A failure to adopt, or a materially watered-down carbon-pricing mechanism, would remove the opex forcing function that the entire economics case rests on (§3) and push the timeline out years. Conversely, a clean adoption is the catalyst.

Secondary risks: (i) **Insurability** — if the commercial insurance and port-call frameworks Maersk flags don't materialise, financeable orders don't follow regardless of AiPs; (ii) **Safety-case validation** — Gen-IV "walk-away safe" claims are largely vendor-disclosed and need independent regulatory confirmation; Holbert's account of the 1965 *Lenin* loss-of-coolant accident is a reminder that marine reactor risk is real and was once badly handled; (iii) **Chemistry mortality** — the "horse race" framing means several Gen-IV designs will not finish; a concentrated single-chemistry bet can go to zero even as the sector wins; (iv) **HALEU supply policy** — Centrus's value rests partly on DOE task orders and the domestic-enrichment policy stance, which is political; (v) **Benign oil** — a sustained low, stable crude tape lengthens the incumbents' runway; (vi) **Geopolitics of dual-use fuel** — HALEU and lithium-6 are dual-use chokepoints whose availability can be constrained by export controls as easily as by capacity.

> *"Buy the toll booth, not the ship. The hulls will get the headlines, but the durable value in maritime nuclear sits where the fuel is enriched, where the design is approved, and where the reactor is insured. The reactor going to sea is the easy part — fifty years of submarines proved that. The hard part is the paperwork, and the paperwork is where the moat is."*

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Disclosure. This report reflects the author's professional judgement based on publicly available information and the technical documents in the June 2026 report folder. Figures cited from peer-reviewed literature (Holbert 2025; Bhattacharyya, El-Emam & Khalid 2023; Strong & Nash; the *Nuclear Ship Propulsion* chapters), the NTI naval HEU/LEU paper (2016), the radioluminescent supply-chain survey, and current reporting from the IMO, classification societies (ABS, Lloyd's Register), company announcements and financial-data providers. Economic relationships in Figure 3 are derived from the Bhattacharyya model and are illustrative, not forecasts for any specific vessel; Figures 1 and 2 are qualitative positioning aids. Tickers and valuations are indicative and may have changed; refer to live data before transacting. This is research commentary, not investment advice. Past performance does not predict future results. Full primary-source list in the companion files Analyst_Notes_June2026.md and Analyst_Notes_June2026_PartII_Market.md.

Primary sources for this monthly note (selected):

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