Why Shipyards May Be The Future of Fission

The nuclear sector needs to build lots of reactors quickly. Shipyards could be the way to make that happen.

Robert Bryce
Jan 20

This photo, shot in 2017 in Jounieh, Lebanon, shows a 200-megawatt powership owned by the Turkish firm, Karpowership. Photo credit: Tyson Culver and *Juice: How Electricity Explains The World.*

The biggest challenge facing the future of the global nuclear sector can be summed up in one word: scale.

There's no doubt that we are seeing a new paradigm for nuclear energy. The surging interest in the technology is due to many factors, including Russia's invasion of Ukraine, climate change, and the global energy crisis. And the announcements over the past few weeks -- from South Korea, Japan, Sweden, Indonesia, and Estonia, are indicative of this resurgence. But the main problem facing the global industry is that new reactors take far too long to build and deploy.

For proof of that, you need only look at two reactors being built at Southern Company's Plant Vogtle. Construction on the Unit 3 reactor began in 2009. That 1,100-megawatt reactor is expected to finally begin pumping juice into the grid in

April, roughly 14 years after construction began. Or consider Finland's Olkiluoto 3 nuclear reactor, which began construction in 2005. That project, which uses the European Pressurized Reactor, incurred numerous delays and finally began producing power in 2022, about 17 years after construction began. (That 1,600-megawatt reactor is still having problems.)

Put short, we just aren't building new reactors fast enough to make even a small dent in global greenhouse gas emissions, which continue to rise. Indeed, they rose by about 1% last year to a new record high of 36.6 gigatons.

That's why the recent announcement by Samsung Heavy Industries and Denmark's Seaborg Technologies about a new nuclear powership is a potential game changer. The companies announced they have completed designs for a nuclear power ship using compact molten salt reactors that could produce up to 800 megawatts of power. They also said they are aiming for commercialization by 2028.

Shipyards have the production capacity – including their own steel mills and armies of welders – to churn out reactor vessels at the scale needed to make a difference in the global electricity mix. Indeed, they have the ability to build powerships at rates that could transform the nuclear industry.ThorCon International an American startup company that wants to build nuclear powerships, claims that if it can get enough key components, including steam generators, it could be producing some*20,000 megawatts of new nuclear capacity per year* in Asian shipyards.

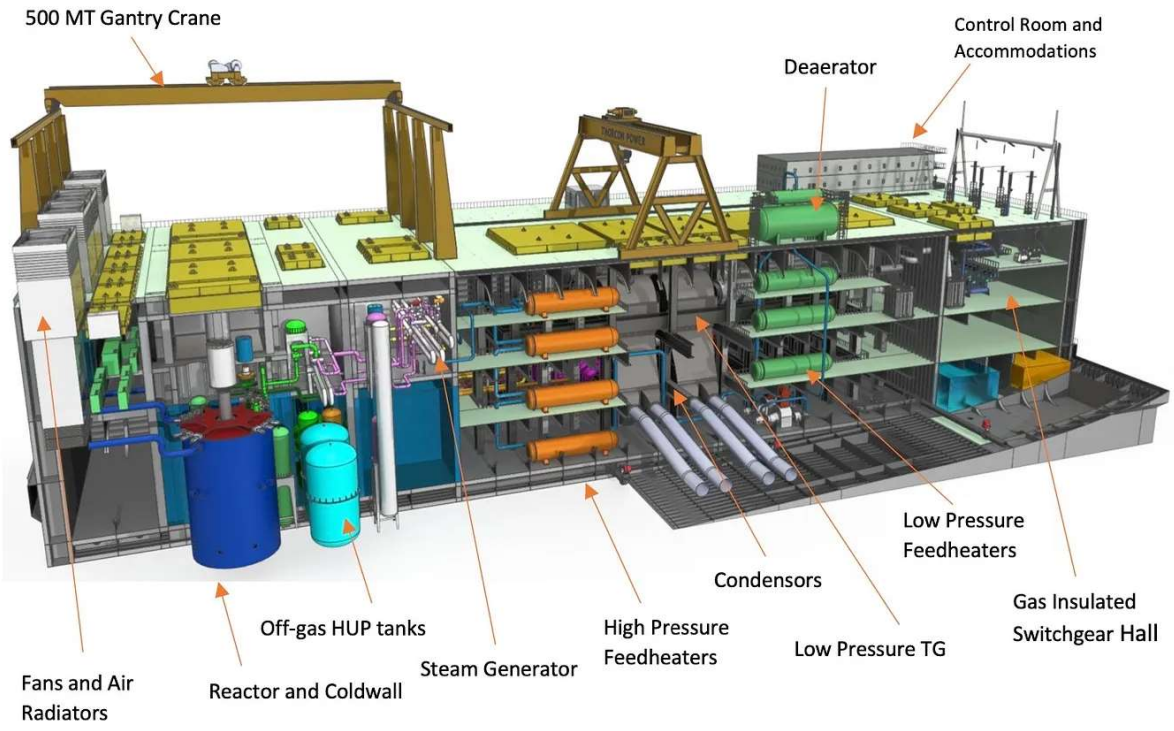

Figure 3-3: Plant cutaway from port side.

An illustration of ThorCon International's powership .

In a phone interview this week, Robert Hargraves, a co-founder of ThorCon, told me that "shipyards are the obvious way to go forward with nuclear because they can produce reactors at the scale that we need to make a dent in the global energy mix on a timeline that could really make a difference." (Hargraves came on the Power Hungry Podcast back in 2021).

Estimates vary, but as much as three-quarters of the people on the planet now live within 50 kilometers of the ocean. If shipyards could begin churning out these ships at scale, they could be deployed to electricity-starved nations throughout Asia and Africa. They could be towed to those locations, anchored in a convenient spot in the harbor, and plugged into existing power grids.

In 2017, I saw power ships in action in Lebanon, a country that has been plagued by electricity shortages for years. We shot a segment for our documentary, *Juice: How Electricity Explains the World,* (check it out, it's now available free on YouTube), in Jounieh, a small port town north of Beirut, where the Turkish firm, Karpowership, was operating a vessel that was providing about 200 megawatts of generation capacity to the Lebanese grid. But that powership, and another one that was docked south of Beirut, burned heavy fuel oil and were extremely polluting. Karpowership is

one of the world's largest powership operators and has deployed its vessels in numerous countries, including Ghana, Indonesia, and Iraq.

To be clear, nuclear powerships are not a new idea. In 1968, the US military deployed the MH-1A Sturgis Nuclear Barge in Panama. It was docked in Gatun Lake and provided about 10 megawatts of power to the Canal Zone until it was unplugged in 1976. In 2019, Rosatom deployed a nuclear powership in the Siberian city of Pevek. That vessel, the Akademic Lomonosov, has an electric power capacity of 70 megawatts. It uses two KLT-40 reactors which is what Russia uses on its nuclear-powered icebreakers. Rosatom is also reportedly planning to develop more nuclear powerships.

The MH-1A Sturgis Nuclear Barge in Panama. Photo credit: U.S. Army Corps of Engineers.

But Rosatom, Samsung, and ThorCon aren't the only ones who are seeing the potential of powerships. In 2020, Kirsty Gogan and Eric Ingersoll, the co-founders of the non-profit groupTerraPraxis, issued a report that charted a commercialization pathway that would utilize the world's biggest ship-building countries, Japan, South Korea, and China, to fabricate dozens of nuclear reactors and the ships that would hold them.

Last month, Gogan, Ingersoll, and Rauli Partinen expanded on the potential of shipyard-based fabrication in an article published by the Breakthrough Institute. They wrote, "Marine nuclear, after all, is really nothing new. Hundreds of small marine reactors have been built and operated in the last 70 years, albeit mainly for military vessels. No doubt there are issues to be resolved in licensing, operating, and proving the safety case for commercial plants. And for international commercial applications, global maritime regulation and trade regimes would need to get up to speed. But, at least according to the 2022 IAEA book on Nuclear Law, the legal infrastructure is at least in place for pilot projects. And these pilot projects themselves would have a substantial technical history of maritime nuclear to start from."

They are right. Many issues have to be resolved before nuclear powerships can be scaled up, including regulatory matters. But the nuclear sector badly needs momentum. It needs to build lots of reactors, quickly. Shipyards appear to be one of the best ways to make that happen.

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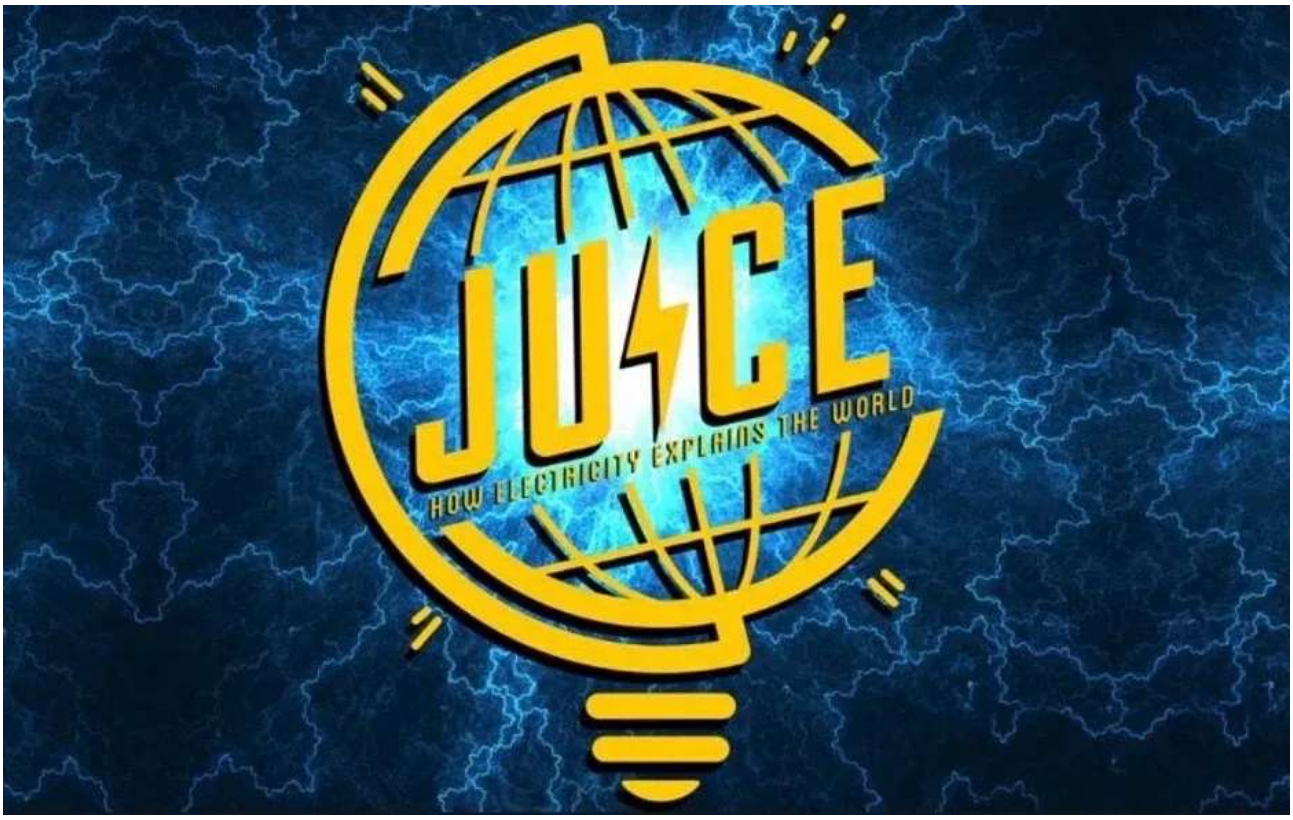

5 Comments

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Art Smith Jan 21

Good information. What about using the SMR (Small Modular Reactor) on a ship? Is this a benefit for cost, flexibility?

I just learned of Mr. Robert Bryce from Financial Sense podcast. Thank you for the input.

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Joe Donahue Jan 21

Good article, and having been involved in the industry for 40-plus years, the concept is sound. Westinghouse and Newport News Shipyard had a joint venture called Offshore Power Systems in 1970 and were going to build plants in Jacksonville, Fla., floating reactors in the US to be regulated by the NRC. Many of the current advanced designs are years away from regulatory approval in the US. The participants canceled the overall project due to opposition, cost, no approved design, TMI accident fallout, and thus no firm contracts. Once the designs in the US are approved, and the designs take into account flooding, capsizing, large waves, and servers weather impacts near a coast, the concepts can move forward. Also, not every shipyard can support nuclear-grade quality

assurance and construction of the nuclear side of the plant.

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