



To Sea, To Sea... with Floating Nuclear Power Plants



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There is a buzz in the air about floating nuclear power plants (FNPPs). The idea and the technology are not new, with the US having deployed such a plant to power the Panama Canal Zone from 1968-1975. Russians too have toyed with the idea of modifying reactors of their nuclear-powered ice-breakers to provide electricity to remote regions in North and Far East. Construction of first such ship housing two reactors of 35MWe each started in 2006.

Contemporary spotlight on FNPPs, however, has been brought by recent reports on China's rapidly evolving efforts in this direction. Though China is still some distance from operationalising any such plant, speculation is rife on where and for what purpose these plants would be utilized. This, then, is a good time to reflect on FNPPs – the kinds of opportunities they spell, and the challenges they pose.

A floating nuclear power plant is a reactor at sea stationed on a ship designed for the purpose. It is meant to provide electricity, heat and even desalination, particularly to far flung areas. Since getting electricity to remote places is cumbersome across long transmission lines and the transportation of diesel is both expensive and inadequate –besides being environmentally unfriendly –FNPPs are seen as one way of overcoming these issues. Supporters of FNPPs see them as beneficial for nations that are deficient in electricity sources, are environmentally conscious, but which do not have the capability to invest in elaborate and complex wherewithal and infrastructure necessary to set up nuclear plants of their own.

While this looks attractive, the challenges facing this technology are many, traversing the three dimensions of nuclear safety, security and safeguards. In terms of nuclear safety, in addition to the

risks faced by land-based reactors, one would need to include exceptional possibilities such as capsizing of or collision of ships. Given that some of the regions that might host these plants could be busy shipping zones or prone to serious typhoons/sea storms, it could create problems for safe reactor operations. Also maintenance, which is key to safe operations, will pose difficulties of its own in remote locations.

From the perspective of nuclear security, these plants would be more exposed to risks of hijack or high sea piracy, especially when in transit. It is still unclear whether they will be built with double containment, lack of which could make them vulnerable to air borne attacks. Also, with no real physical perimeter fencing, FNPPs could face the threat of other intrusion scenarios or sabotage. Such security risks would impinge on nuclear safety too and it is yet unclear that in case of an accident, or in case of terrorists/pirates seizing floating reactors, who would bear liability – the supplier nation or the host, user nation?

Meanwhile, from the point of view of safeguards, FNPPs will pose another set of challenges. Until now, such plants have been envisaged by countries for national use across their own far flung territories. This implies a unity of the supplier, host and regulator country and thus nothing changes as far as the liability requirements are concerned. However, this picture alters significantly when export of such reactors is contemplated and the supplier and host are different entities. In such a case, who would have the licensing and regulatory authority on plant design and operations? These questions are yet to be answered. No special regulations are in place today for building and transporting FNPPs. If regulatory bodies were to step in later, after the plants have been constructed, and then impose stringent new rules, it would have cost implications that are most likely to be resented by the nuclear industry. Therefore, as this activity evolves, it would be a good idea to build safety, security and safeguards at the design stage itself.

A brief look at the Chinese activity on FNPPs now. The Chinese government gave approval for construction of floating nuclear power plants – 20 of them – in 2015. The first plant is currently under construction and due to become operational in 2020. While the first plant is envisaged for deployment in Hainan island, future FNPPs are likely to be used to provide electricity to the islands claimed by China in the South of China Sea besides to other newly created artificial islands and other offshore gas exploration platforms in the region. This will bring in territorial sensibilities, as well as raise environmental concerns, unless liability issues are suitably handled. China is also looking at export of these plants to countries, especially in South East Asia, that are keen on nuclear power but have been

hesitant to build their own nuclear power plants and the attendant infrastructure. In fact, FNPP exports have been highlighted as a lucrative potential market besides offering opportunities for the revival of nuclear and ship-building industries.

In theory, the idea of FNPPs looks attractive, but the challenges are just about beginning to be recognized. Whether the initiative will sustain and blossom is yet to be seen. The only thing that can be said with certainty at this time is that the future of this technology will be intertwined with the overall future of nuclear power itself. If public confidence in nuclear energy sustains and the FNPPs turn out to be financially viable, then the activity in the sector will pick up for sure. India must watch this space carefully.

(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies [CAPS])

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