

FLOATING NUCLEAR BARGES

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9/16/2019

1. INTRODUCTION



Figure 1. Floating nuclear barge Akademik Lomonosov [1].

As Russia is forced to push further north into the Arctic in the search for oil and gas, it needs electricity in far-flung locations. To meet electricity needs in developing the oil resources in remote Arctic regions and eastern Siberia, Russia's Rosatom built a floating nuclear power station at Saint Petersburg: the Akademik Lomonosov [1].

Rosatom is setting a trend for medium-capacity mobile nuclear facilities. The 144-by-30-metre or 472-by-98-foot barge holds two reactors with two 35 MWth nuclear reactors, similar to those used to power nuclear icebreakers.

From Murmansk where it was fueled, it is towed in to the port of Pevek in the autonomous Chukotka region in Russia's extreme northeast. The barge can produce enough electricity to power a town of 200,000 residents, far more than the 5,000 live in Russia's northernmost town.

Low-capacity, mobile power plants can be used in the Russian Arctic where large amounts of electricity are not needed and the construction of conventional power stations would be complicated and costly. The alternatives are coal, gas and diesel. But diesel is very costly, while the gas needs to be delivered as Liquefied Natural Gas (LNG). Such units would supply electricity and heat to the most remote regions, supporting also growth and sustainable development. Such floating reactors can save 50,000 tonnes of carbon dioxide emissions per year.

The Akademik Lomonosov is meant to replace an ageing nuclear reactor and a coal-fired power plant which are both located in Chukotka. The plant meets the same safety rules as nuclear icebreakers and submarines.

Rosatom hopes to build more such barges and to find Asian clients in need of power in remote regions, giving the examples of Indonesia and Philippines. China is also building a floating nuclear power plant.



Figure 2. Floating nuclear barge Akademik Lomonosov control room.



Figure 3. Floating nuclear barge Akademik Lomonosov engine room.

DEPLOYMENT

Russia launched a pioneering floating nuclear power station, which will sail 5,000km (3,000 miles) from the Arctic port of Murmansk to Chukotka in the far-east. The nuclear agency

Rosenergoatom says the Akademik Lomonosov's mobility will boost the power supply to remote areas.

One of its targets is to power the Chaun-Bilibin mining complex in Chukotka, which includes gold mines. The floating power station's spent fuel will be stored on board. Others of similar design will follow to serve remote areas.

The Akademik Lomonosov is also destined to supply electricity to offshore oil rigs in Russia's Arctic. Another idea is to hook it up to a desalination plant, to produce fresh water, and in future island states could benefit from such power stations.

The Northern Sea Route connecting European Russia with far eastern ports is becoming navigable for longer periods because global warming is reducing pack ice. Three tugs will tow the facility to Pevek, where it is expected to dock in late September 2019. In good weather conditions it will sail at 4-5 knots (7-9km/h).

The Lomonosov was built in St Petersburg and has two nuclear reactors of the type used in Russian icebreakers. They are KLT-40S reactors with a combined capacity of 80 Megawatts(th), and are reported to be tsunami-proof.

Russia's Vesti news program says the facility will have enough power to illuminate and heat a town of about 100,000 inhabitants. The crew on board is expected to be about 70-strong. It is 140m (459ft) long, 30m (98ft) wide and is expected to operate for 40 years.

DISCUSSION

In the period 1968-1976 the USA Army used a floating nuclear power plant at the Panama Canal, for canal operations, called the MH-1A Sturgis. It was a converted World War II cargo ship, and was later decommissioned.

The Akademik Lomonosov uses two KLT-40S reactors derived from a time-tested design used for Russia's nuclear-propelled icebreakers. They have relatively low output, generating 35MWth of thermal power each, that can supply a city with 100,000 residents.

The second floating nuclear power station will use a different type of reactor, RITM-200M, which produces more power and requires less space, which means the ship carrying them can be made smaller and thus easier to tow and dock without compromising safety.

REFERENCE

1. Andrea Palasciano, "World's first floating nuclear barge to power Russia's Arctic Oil Drive," Digital Journal, May 19, 2018.