Perfect Nuclear Storm Waiting to Happen in Russia's Northwest Region

The large-scale nuclear disaster at Japan's Fukushima Daiichi Nuclear Power Plant has acted as a wakeup call for the international community, engendering deep reflection on the consequences of using nuclear energy. The maintenance and servicing of nuclear plants either currently in operation or under construction, and the dismantling of those already decommissioned or on their way to being shut down, are issues of heated debate, as are possible future nuclear projects.

ASSOC. PROF. RICHARD ROUSSEAU | MARCH 17, 2012

A crucial issue for European Union members, the United States, China and the whole world, is how to ensure appropriate maintenance practices and technology of Russia's nuclear waste disposal sites, particularly those in the north west of the country. It is predicted that an accident involving nuclear infrastructures in that region could easily be more devastating than that at Chernobyl in Ukraine in April 1986.

The North West Region, which includes the Murmansk and Archangelsk Oblasts (provinces), the Novaya Zemlya Territory (Okrug) and the White, Barents and Kara Seas, contains the largest concentration of fissile, radioactive and nuclear materials for either military or civilian application found anywhere on the planet.

- ***Civilian Nuclear Energy fleet***

Polyarny Zori, a city on the outermost western edge of the Murmansk Fjord, is the largest energy producing locality in the Murmansk Oblast. The city is home to the Kola Power Plant (NPP-1), whose 4 PWRs (pressurized water reactors) were built in two phases. Phase 1 went online in 1973-74, with two reactors of the VVER-440/230 type –Russia's first generation of PWR reactors using LEU (low-enriched uranium), with an enrichment level ranging from 2 to 4.95%. Phase 2 came

online in March 1981 and October 1984, with the commissioning of the No. 3 and No. 4 reactors of the improved VVER 440/213 type. Reactors of the previous VVER-440/230 type (phase 1) were designed to have an operational lifespan of 30 years and scheduled to be decommissioned in 2003 and 2004 by the Russian Nuclear Energy State Corporation (Rosatom). However, the Russian government, under a cloud of controversy, extended their operational lifespan for 10 years in 2003, despite the high number of accidents seen around that time. [1] During the first two weeks of February 2011, for instance, five out of Russia's 32 operational reactors had to be shut down for emergency repairs and at least a dozen leaks of contaminated material were recorded. [2]

These emergency repairs in the month of February, in only eleven days, are sad testimony to the fact that the Russian nuclear energy industry is in dire shape and simply unfit to be operated with any degree of reliability. As reactor equipment gets older its performance is reduced, making it prone to cause more and more incidents, especially given the apparently low standard of maintenance, which is not undertaken regularly anyway. Such a ticking time bomb not only creates additional expenditures and destabilizes supplies of energy but is a public health hazard waiting to happen. If repairs are hastily performed in order to bring power generation back on line, and the quality of this work is substandard as a result of this time pressure, more human errors and "glitches" are likely to occur – and with increased frequency. After each nuclear incident, the Russian nuclear authorities say that nothing of significance transpired. However, in its report on the Most Dangerous Reactors, released in 1995, the U.S. Department of Energy ranked the Kola Nuclear Power Plant as the most dangerous in Russia. [3]

The antiquated technology of the KPP-1 and rising domestic energy demand in the region have prompted the Kremlin to build a new atomic complex, the Kola Power Plant 2 (NPP-2), located eight kilometers from NPP-1. [4] The Ministry of Energy plans to install at NPP-2 four next-generation reactors (VVER-620), a cross between the VVER-440 and KLT-40 models. The VVER-620 reactors represent the cutting edge of Russian nuclear engineering. They are a new generation of nuclear reactors designed during a three-year joint project conducted by Russian Ministry of Atomic Energy and the German companies Siemens and Gesellschaft fur Reaktorsicherheit (Association for Plant and Reactor Safety). They operate as pressurized water reactors (PWR), using 90% enriched uranium-235 fuel derived from marine plants. Each of these medium-power reactors will produce approximately 700 MWe of energy. The KPP-2 should be operational by 2018\2019, which will allow for the shutdown of the two old reactors of the KPP-1 facility.

In addition to grave concerns over the old NPP-1, the Murmansk Oblast is also confronted with the menace of another potential nuclear accident of significant amplitude and enormous environmental cost: The icebreaker fleet stationed in the port of the city of Murmansk.

Russia possesses six nuclear-powered civil icebreakers (the "Yamal," "Russia," "Arktika," "Taimyr," "Vaigach" and "Sovetsky Soyuz") which are equipped to carry out a range of operations. [5] Russia's fleet comprises two types of icebreakers: Sea-going-class icebreakers, which can operate in high waves, and shallow draught icebreakers, which can enter rivers. A third type of icebreaker is basically a nuclear-powered container ship. In total, 14 PWR reactors of the KLT-40 type, loaded with HEU (90%), propel these icebreakers. The Murmansk Shipping Company (MSC) operated all these vessels until August 2008, when the fleet was handed over to the Nuclear Energy State Corporation (Rosatom). [6] The federal state-owned unitary enterprise Atomflot, based in Murmansk, has since been authorized to run the nuclear-powered vessels and deal with radioactive waste (RW), including its storage and processing.

Finally, Rosatom owns five service and storage vessels especially designed for dealing with radioactive waste (RW) and spent nuclear fuel (SNF), and stationed at the Atomflot base, only two kilometers from residential districts. The service ships “Imandra” and “Lotta” are used to store for six months – in dry, water-cooled containers – spent fuel from the Rosatom’s civil ice-breakers. Imandra and Lotta can store 1,530 (i.e. fuel from six reactors) and 4,080 (i.e. fuel from 12 reactors) fuel assemblies respectively.