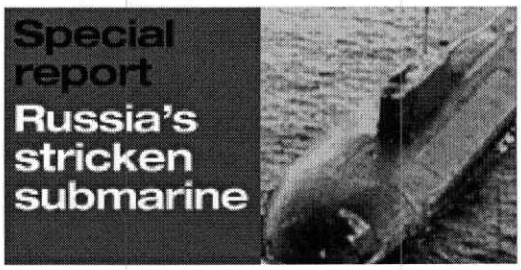

Reactors may not be shut down

Vessel harbours powerful threat to environment

Special report: Russia's stricken submarine

Paul Brown, environment correspondent
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There is around 1.2 tonnes of enriched uranium in the twin reactors which powered the submarine Kursk, which is a modern Oscar II class.

Constant monitoring by the Norwegians has found no evidence of a radioactive leak, however, despite the two explosions reported, which must have ruptured the hull. But the massive damage to the bow revealed by five hours of Russian video and the news that the submarine was crippled in a flash increased fears last night that the crew had no time to shut down the reactors.

Kursk has two hulls, which are designed to withstand an impact from an average torpedo. If it was sunk by an explosion in the torpedo compartment then it was probably a very big explosion.

The power output is given as 190 megawatts for each reactor, about the same as one of Britain's older nuclear power stations and a third of the power of Sizewell C in Suffolk, the newest commercial pressurised water reactor.

This is a lot larger than the British Trafalgar class hunter killer submarines which have a single reactor of around 70 megawatts. The Russian submarine is twice as wide at 18 metres, with a similar draft of three metres, and clearly needs much bigger engines to power it through

they fear that their sons are dead

Scientists fear nuclear meltdown on seabed

Fresh rescue bid fails to reach submarine crew

British rescue team heads for sunken submarine

Stranded sub: Russians accept British offer of help

Leader: Russia too proud to accept help over submarine accident

Comment: Putin's stock may sink with the fleet

Russia launches mission to save sub

Iron coffin

How Russians plunged to disaster

Perilous history of Soviet nuclear fleet

Russian submarine crew faces dreadful fate

Time running out for sailors trapped in sub

much bigger engines to power it through the water.

The fuel core in a Trafalgar class submarine may contain around 220kg of uranium. Each reactor on Kursk is likely to contain around 600kg of uranium, so there will be around 1.2 tonnes on the submarine. Uranium 235 has a half life of 710m years.

When a submarine reactor is shut down a significant amount of heat is still produced by radioactive decay. For this reason there normally has to be a supply of electricity to power the cooling pumps, but these reactors are designed to cool by convection, without the need for power. According to Igor Kudrik, a nuclear researcher at the Norwegian group Bellona, if this system has been disrupted there is a danger of a reactor cracking in the heat, allowing sea water to surge in. This would produce a plume of radioactive water on the current.

A meltdown of the core was less likely. But this heat decay will remain a potential problem for several weeks.

Over a longer period the metalwork which contains the radioactive material will decay, allowing it to be released into the sea.