Projet de modification des installations de stockage des déchets radioactifs et réfection de Gentilly-2

Greenpeace

Réponse au questionnement de la commission du BAPE à l'audition du mémoire présenté le 16 décembre dernier

Décembre 2004

December 22, 2004

On December 16, 2004, the BAPE asked for clarification of the statement, "...les reports de la mise hors service du réacteur entraînent des risques non négligeables au niveau de la sécurité, car la surveillance à distance de l'état des canaux de combustible ne peut être considérée comme fiable à 100%." (See: *La réfection de Gentilly 2*)

GREENPEACE RESPONSE:

Problems with fuel channels in CANDU reactors have historically been the single largest cause of outages at CANDU reactors. Retubing is the primary factor in performance problems and hence the cost effectiveness of all CANDU reactors. Retubing is also a fundamental safety issue.

The hundreds of fuel channels in the Gentilly-2 reactor core are prone to age-related problems due to the weight of the fuel bundles, as well as high temperature, high pressure, and radiation fields in the reactor cores. Fuel channels in CANDU reactors consist of an outer calandria tube, and an inner pressure tube. The inner pressure tube holds uranium fuel bundles, and heavy water coolant is pumped through at high pressure to draw off the heat released by the fission process. Pressure tube problems include 'creep' and 'sag', where the metal thins out over time and the tubes become wider and longer, bending under the strain. Various design changes were made in later stations to try to accommodate these problems, but eventual tube replacement ('retubing') is anticipated on a schedule dictated by the extent of the problem in each reactor.

When the pressure tubes sag they can come into contact with the outer 'calandria tube'. This increases the chance of pressure tube rupture caused by 'embrittlement', where the metal becomes brittle due to absorption of hydrogen. This 'metal hydriding' process happens faster where the sagging pressure tubes make contact with the cooler calandria tubes. The space or annulus between the calandria and pressure tubes is maintained by spacers or 'garter springs'. However, at Bruce reactors 3 and 4 (as well as at Pickering reactors 5 and 6), the garter springs are not locked into place and have to be periodically checked and moved back into position to keep the two tubes from touching.

AECL has argued that pressure tubes will always leak before rupturing, allowing time to shut the reactor down before a loss of coolant accident occurs -- an assumption they call 'leak before break'. However, contradicting this theory, there have been two catastrophic pressure tube ruptures in Ontario reactors.

After only 12 years of operation, Pickering reactor 2 was shut down in August 1983 following a rupture in one of its 390 pressure tubes. The massive meter-long rupture was due to embrittlement caused by hydrogen absorption in the tube alloy. Pickering Reactor 1 was shut down shortly after and reactors 3 and 4 eventually had to be shut down as well for retubing. The cost of retubing these four reactors took ten years and cost about $1 billion – more than the original construction cost of the reactors.
A second catastrophic pressure tube failure occurred in March 1986 at Bruce reactor 2.. Bruce

reactors 1 and 2 will likely require complete retubing if they are ever to be restarted.

Delay in the replacement of the CANDU fuel channels at Gentilly-2 increases the risk of catastrophic pressure tube and/or calandria tube failure since the various means of remotely assessing the integrity of the tubes cannot be guaranteed with 100% accuracy.

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