20th Annual Conference of the Canadian Nuclear Society
Montreal, Quebec, Canada / May 30 - June 2, 1999

CANFLEX Demonstration Irradiation at Point Lepreau: Background and Observations

by:

R. A. Gibb, R. W. Sancton
P. J. Reid (ALARA Research, Inc.)
J. Bullerwell (Centre for Nuclear Energy Research)

The Point Lepreau Generating Station (PLGS) is considering changing fuel type from the current, 37-element design to the 43-element CANFLEX design. As part of the preparation for this potential conversion, the station is performing a Demonstration Irradiation of 24 CANFLEX fuel bundles. Conversion to this new fuel type is being considered as part of PLGS' strategy to combat the effect of plant ageing. "Plant ageing" is used to denote a variety of phenomena, such as pressure tube creep and boiler tube fouling, which have the effect of reducing operating margins, particularly on the Regional Overpower Trip system. Since channels containing CANFLEX fuel have enhanced Critical Channel Powers when compared to channels containing 37-element fuel, conversion to CANFLEX could be used to regain operating margins which would otherwise be lost.

The CANFLEX bundle is the latest design in the evolution of CANDU fuel. Its 43-element fuel-bundle assembly and its patented critical-heat-flux enhancement buttons offer higher operating and safety margins, while maintaining full compatibility with operating CANDU reactors. The greater element subdivision and the use of two element diameters lower the peak linear element rating of a CANFLEX bundle compared to the standard 37-element CANDU bundle at the same bundle power. The higher operating and safety margins also offer the potential of reactor power up-rating, which would further increase the economic competitiveness of the CANDU reactor.

CANFLEX development was begun in 1986 by AECL. In 1991, the development effort became a joint effort by Atomic Energy of Canada Ltd. (AECL) and Korea Atomic Research Institute. It has undergone extensive design analysis, performance and qualification testing, as well as an independent review within the Canadian nuclear industry. The design phase is now complete and field commissioning has commenced. The first step of field commissioning is the demonstration irradiation at PLGS. The demonstration irradiation will establish fuel handling and irradiation experience of the CANFLEX bundle in a power reactor, and will confirm the production processes of fuel fabrication for this new bundle design. Upon successful completion of the demonstration irradiation, the CANFLEX bundle should be a product which is ready for full-scale use in existing and future CANDU reactors.

This paper discusses the planning and approval process for irradiating this new fuel type in a demonstration irradiation at PLGS. It also provides the information gathered as part of the demonstration irradiation. PLGS is gathering data on bundle powers, channel flows, flux detector responses and various other process parameters which could be affected by the presence of CANFLEX fuel. In addition, the CANFLEX fuel bundles are being visually inspected in the fuel bays at PLGS on discharge to increase the information available regarding their real-world in-reactor performance. Finally, a selected number of fuel bundles will be shipped to AECL's Chalk River Laboratories for detailed destructive PIE. The paper will present data gathered up to the time of submission and will outline the plans for future data gathering.