

## Evaluation of Maximum Allowable Temperature inside Basket of Dry Storage Module for CANDU Spent Fuel

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### Abstract

This study provides a maximum allowable fuel temperature through a preliminary evaluation of the  $UO_2$  weight gain that may occur on a failed (breached sheathing) element of a fuel bundle. Intact bundles would not be affected as the  $UO_2$  would not be in contact with the air for the fuel storage basket. The analysis is made for the MACSTOR/KN-400 to be operated in Wolsong ambient air temperature conditions. The design basis fuel is a 6-year cooled fuel bundle that, on average has reached a burnup of 7,800 MWd/MTU. The fuel bundle considered for analysis is assumed to have a high burnup of 12,000 MWd/MTU and be located in a hot basket. The MACSTOR/KN-400 has the same air circuit as the MACSTOR and the air circuit will require a slightly higher temperature difference to exit the increased heat load. The maximum temperature of a high burnup bundle stored in the new MACSTOR/KN-400 is expected to be about  $9^\circ\text{C}$  higher than the fuel temperature of the MACSTOR at an equivalent constant ambient temperature. This temperature increase will in turn increase the  $UO_2$  weight gain from 0.06% (MACSTOR for Wolsong conditions) to an estimated 0.13% weight gain for the MACSTOR/KN-400. Compared to an acceptable  $UO_2$  weight gain of 0.6%, we are thus expecting to maintain a very acceptable safety factor of 4 to 5 for the new module against unacceptable stresses in the fuel sheathing. For the  $UO_2$  weight gain, the maximum allowable fuel temperature was shown by  $164^\circ\text{C}$ .