

CANDU 9 Moderator Temperature Predictions for Steady State and Accident Scenarios Using MODTURC-CLAS

W.M.Collins¹ and B.Wu²

ABSTRACT

The CANDU 9 inlet nozzle / outlet port configuration for moderator circulation was designed to optimize circulation within and subsequent heat removal from the moderator. In the CANDU 9 design, the inlet nozzles and outlet ports are both placed in the upper half of the vessel with the inlet nozzles pointing downwards. The ensuing upflow in the centre of the vessel caused by the collision of the inlet jets at the bottom of the vessel complements the natural upward buoyancy flow in the core caused by internal heat generation. This design results in an improved moderator temperature distribution which minimizes the difference between the maximum temperature occurring inside the vessel and the outlet temperature which can be achieved for a given heat load and total inlet flow rate with the maximum temperature for the design occurring at the top of the vessel. Both steady state and transient analyses have been performed for the CANDU 9 configuration using the MODTURC-CLAS computer code in conjunction with staff from ASC (Advanced Scientific Computing). The results indicate that the steady state solution is inherently stable with a relatively low bulk temperature. For accident analyses (large LOCA with loss of class IV power, and large LOCA with loss of emergency core cooling) subcooling results are expected to be well within acceptable margins.

¹ AECL - Sheridan Park

² Ontario Hydro

