4. SUMMARY

The first phase of the ISP 41 follow-up exercise, reported in this document, examined the sensitivity of iodine code predictions to a wide range of conditions anticipated in containment, with the conclusion that the codes agree reasonably well regarding the qualitative effects of most parameters on iodine volatility. The codes show similar quantitative trends under some conditions. For example, all of the codes predict that iodine volatility will decrease with increasing temperature by about the same amount, and that the gaseous iodine fraction will be rather insensitive to initial iodide concentration.

The codes all predict the same overall effect of pH, Ag and organic impurity concentrations on iodine volatility; all predict large decreases in gaseous iodide with a decrease in pH, and in the presence of silver. Most of the codes also predict that an increase in organic impurity concentration will lead to an increase in iodine volatility. However, the sensitivity of the predicted iodine volatility to these parameters varies widely from code to code. For example, with a pH change from 9 to 5, IODE(NRIR) and IMPAIR predict that iodine volatility will increase by a factor of 500,, LIRIC and IMOD predict a 50-fold increase, and IODE(IPSN) and INSPECT predict a 5- to 10-fold increase.

One significant difference in the qualitative predictions of the iodine behaviour codes is the effect of dose rate on iodine volatility. Although the reason for this discrepancy between codes is not completely clear, it is suspected that it is due to the formulation of the organic iodide formation and depletion processes. The strong dependence of iodine volatility on dose rate in many codes may be due to the fact that these codes do not model radiolytic destruction of organic iodides in this model. The dose rate dependence of organic iodide formation also varies significantly from model to model.

Under certain conditions, the quantitative agreement between code predictions is poor. In general, the agreement between code predictions was the worst at high pH values, high temperature, high dose rate, and high iodide concentrations. Agreement between the codes was also poor when the effect of organic impurities in the aqueous phase was considered. It appears that part of the reason for the wide divergence in the codes regarding the gaseous iodine fraction is also due to the way in which organic iodide formation is modelled.