Verification of Applicability of High Bundle Flush for an Actual Steam Generator

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1 INTRODUCTION

Sludge in Steam Generator (SG) should be removed as completely as possible because it can lead both to a corrosive environment and thermal degradation. Conventionally, water jet cleaning or lancing is carried out to remove sludge deposited on the upper Tube Support Plates (TSPs) and the Top of the Tubesheet (TTS). These cleaning methods are usually effective but they require much time and the cleaning equipments are complex. On the other hand, a High Bundle Flush (HBF) can remove soft sludge from the upper part of the SG secondary side more quickly and using a more simple device.

2 RESULTS OF HBF APPLICATION

A HBF is intended to wash off soft sludge that has accumulated on the upper TSPs. This sludge is flushed down to the TTS by the action of a large volume of water (6 tons/minute) introduced at the SG steam separators. Temporarily installed high capacity pumps supply this water by taking a suction at the SG handholes. Sludge Lancing performed following the HBF removes the sludge that has been flushed down to the TTS.

Nuclear Engineering Ltd. carried out theoretical safety analyses of the HBF and we also conducted mock-up testing prior to the application of the HBF in an actual SG. These analyses and testing confirmed that the HBF had no adverse effects on any of the SG secondary side components (e.g. the HBF would not cause problems with the SG tubes such as deformation, fatigue, wear or corrosion).

A HBF was carried out for the “B” SG at Ohi unit 1 of Kansai Electric Power Co, Inc. (KEPCO). This was performed during the 17th refueling outage in January 2002. Sludge removed from the “B” SG where the HBF was performed was three or four times the amount removed from the other SGs where only Sludge Lancing was performed. In addition, visual inspections were conducted before and after the HBF. They confirmed that the HBF had no adverse effects on any of the SG secondary side components. Furthermore, the HBF required only 4 days. Hence it was confirmed that the HBF could be carried out with less or no impact on the critical path for even very short refueling outages.

3 CONCLUSIONS

The performance of the HBF system at Ohi unit 1 confirmed that a HBF could easily and safely remove much of sludge from the SG, even in a SG that has small sludge inventory. In the future, application of a HBF in other SGs with larger sludge inventories is expected to remove much greater volumes of sludge.