

N210. Replacing Steam Generators at Millstone 2

The steam generators at Millstone 2 have suffered from severe pitting and cracking problems. After more than 15 years of operation, Northeast Utilities (NU) has had to plug or install sleeves in more than 7,400 of the 17,000 tubes in the two steam generators.

As improvements in materials, water chemistry, and operation have occurred, NU expects to obtain many benefits from replacing the old steam generators, including higher plant efficiency and output and fewer and shorter outages. New units should also decrease the level of maintenance and inspections needed. The company expects a reduction in exposure of personnel by some 100 person-rem per outage.

A scale model of the containment building was constructed to determine the best scheme for replacement. It became clear that replacing the steam generator subassemblies, rather than entire steam generators, was preferable.

This would eliminate the need to remove the concrete around the equipment access hatch -- the steam drums are over 20 feet in diameter and would not fit through the 19-foot diameter hatch. The subassemblies include the tube bundle with tubesheet and the entire pressure boundary below the shell cone. Although the steam drums would not be replaced, they would be overhauled.

In 1987, engineers traced the cause of a serious leak in a steam generator to a new problem -- outside-diameter circumferential cracking. Believing that this could spread to other tubes, NU decided to purchase spare subassemblies from Babcock & Wilcox Canada. The specifications for the new subassemblies address all known problems, for example corrosion of the tube supports and accumulation of sludge, and potential problems such as primary side tube cracking. Key improvements include:

- Changing to thermally treated Inconel 690 tubing with stainless steel supports to maximize reliability.
- Adding enlarged/repositioned primary head manways; redesigned nozzle dams, and polish cladding, to reduce radiation exposure during maintenance.
- Using high-performance steam separation equipment.
- Redesigning the feedwater nozzle and piping.

In addition, the new steam generators will have wide-range water level indication and will include modifications to the wet layup and blowdown systems to aid chemistry control.

Taken from, "Replacement Project Underway at Millstone 2," Nuclear Engineering International, September 1992, p. 26.