Nuclear Energy Co., Florida Power & Light Co. (Maine Yankee, Fort Calhoun Unit 1, Calvert Cliffs Units 1 and 2, Millstone Unit 2, and St. Lucie Unit 1). Docket Nos. 50–309, 50–285, 50–317, 50–318, 50–336, and 50– 335. License Nos. DPR–36, DPR–40, DPR–53, DPR–69, DPR–65, DPR–67.

I. Introduction

On May 2, 1995, Mr. John F. Doherty, J.D. (Petitioner), filed a Petition with the U.S. Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 2.206. The Petitioner requested that the following six pressurized-water reactors be immediately shut down: Maine Yankee, Fort Calhoun Unit 1, Calvert Cliffs Units 1 and 2, Millstone Unit 2, and St. Lucie Unit 1. In addition, the Petitioner requested that steam generator tubes be inspected immediately at those plants. The Petitioner stated that an inspection by the license in April 1995 of the Maine Yankee plant using the newly developed Point Plus system revealed that the steam generator tubes are on the verge of rupture, threatening the release of radioactive liquid and gaseous material into the environment and consequent harm to human health and safety. Because the other plants the Petitioner identified were built by the same manufacturer (Combustion Engineering) and are of similar operating age, the Petitioner asked that they, along with the Maine Yankee, be immediately shut down and that all steam generator tubes be immediately inspected using the Point Plus Probe system.

On June 28, 1995, I informed the Petitioner that the Petition had been referred to my office for preparation of a Director's Decision. I further informed the Petitioner that his request for immediate shutdown and inspection was denied because continued operation of these units until their next scheduled outage posed no undue risk to public health and safety. I also informed the Petitioner that the NRC would take appropriate action within a reasonable time.

II. Discussion

The Petitioner requested that six CEdesigned plants be shut down and their steam generator tubes inspected with the Plus Point inspection probe. The request appears to be based on concerns that without inspections using the Plus Point probe, the steam generators in these plants may be susceptible to one or more steam generator tube ruptures (SGTRs). However, the results of examinations of tubes removed from the Maine Yankee steam generators and in situ pressure tests of the most severely degraded tubes in the Maine Yankee steam generators have demonstrated that the tubes, although severely degraded, still had a significant margin before failure even under postulated accident conditions. Furthermore, the NRC has taken actions to ensure that other plants have performed appropriate steam generator tube inspections to assure tube integrity. These important actions are discussed below in greater detail.

The NRC applies a defense-in-depth approach toward protecting public health and safety from the potential consequences of events involving the rupture of steam generator tubes. Steam generator tube degradation is managed through a combination of several different elements, including inservice inspection, tube repair criteria, primaryto-secondary leak rate monitoring, water chemistry, and analyses to ensure safety objectives are met.

The primary means for assessing steam generator tube degradation is through inservice inspections. Plant technical specifications require a periodic inspection of the steam generator tubes. Any tubes with identified degradation in excess of the repair criteria are repaired or removed from service. In order to assess the condition of steam generator tubing, the industry primarily relies on eddy current inspection techniques, which includes the motorized rotating pancake coil (MRPC) test. Circumferential cracking in steam generator tubing has been identified at expansion transitions, small radius U-bends, dented tube support plate intersections, and sleeved joints. Based on the utilities' responses to GL 95-03, the inservice CE steam generators (i.e., not including retired CE steam generators) have been inspected in these areas with techniques capable of detecting circumferential cracking and, to date, such cracking was found only at the expansion transitions.

Experience to date, including experience at the Maine Yankee plant, shows that the standard MRPC probe is a reliable means for detecting structurally significant cracking in steam generator tubes. The use of an MRPC probe in conjunction with adequate inspection procedures is a reliable means for detecting circumferential cracking in steam generator tubes. As discussed above, metallographic examinations of removed tubing and in situ pressure testing of degraded tubes continue to support the staff's conclusion that properly conducted MRPC inspections can identify circumferential cracking before the cracking exceeds the structural limits.

In addition to requiring periodic steam generator tube inspections, the

NRC requires an operational leak rate limit to provide reasonable assurance that should a primary-to-secondary leak be experienced during service, it will be detected and the plant will be shut down in a timely manner before rupture occurs and with no undue risk to public health or safety. Requiring operation within these limits decreases the possibility that steam generators may be vulnerable to tube ruptures during postulated accidents such as a main steamline break or a loss-of-coolant accident.

Inspection findings at Maine Yankee in 1994 revealed indications of large circumferential cracks that had been missed in previous inspections because of inadequacies in MRPC test and analysis procedures. The test and analysis procedures were upgraded accordingly. However, subsequent inspections at Maine Yankee performed with the MRPC in early 1995 revealed circumferential indications that were more numerous and larger than expected based on the short operating interval since the previous inspection. The 100-percent MRPC inspection of the expansion transitions were supplemented by inspections with the recently developed Plus Point probe and a specially wound high-frequency MRPC coil. These latter probes offer improved sensitivity to inner-diameterinitiated circumferential cracks of the type present at the Maine Yankee expansion transitions and identified substantial numbers of relatively small circumferential cracks not detected with the conventional MRPC.

Three tubes were removed from these steam generators in early 1995. Before the tubes were removed, they were tested by ultrasonic, visual (fluorescent penetrant dye), and eddy current techniques to confirm the nature of the indications. Eddy current methods included examination with a standard rotating pancake coil, a Plus Point coil, and a high-frequency pancake coil. The indications were sized with various techniques and the tubes were then destructively examined so that the actual size of the indications could be determined. The results of the destructive examinations are provided in NRC Information Notice 95-40, "Supplemental Information Pertaining to Generic Letter 95–03, 'Circumferential Cracking of Steam Generator Tubes.' " The destructive examination results and data obtained with a high-frequency pancake coil suggest that many of the indications may not have been as structurally significant as the standard pancake coil appeared to indicate.