

VERMONT YANKEE NUCLEAR POWER STATION INDIVIDUAL PLANT EXAMINATION
STAFF EVALUATION REPORT

9602200055 960209
PDR ADOCK 05000271
P PDR

I. INTRODUCTION

On December 21, 1993, the Vermont Yankee Nuclear Power Corporation (VYNPC) submitted the Vermont Yankee Nuclear Power Station (VYNPS) Individual Plant Examination (IPE) in response to Generic Letter (GL) 88-20 and associated supplements. On June 23, 1995, the staff sent questions to the licensee requesting additional information (RAI). The licensee responded in a letter dated October 27, 1995.

A "Step 1" review of the VYNP IPE submittal was performed and involved the efforts of Science & Engineering Associates, Inc., Scientech, Inc., and Concord Associates in the front-end, back-end, and human reliability analysis (HRA), respectively. The Step 1 review focused on whether the licensee's method was capable of identifying vulnerabilities. Therefore, the review considered (1) the completeness of the information and (2) the reasonableness of the results given the IPE design, operation, and history. A more detailed review, a "Step 2" review, was not performed for this IPE submittal. A summary of contractors' findings is provided below. Details of the contractors' findings are in the attached technical evaluation reports (Appendices A, B, and C) of this staff evaluation report (SER).

In accordance with GL 88-20, VYNPC proposed to resolve USI A-45, "Shutdown Decay Heat Removal Requirements." No other specific USIs or generic safety issues were proposed for resolution as part of the VYNPS IPE.

II. EVALUATION

VYNPS is a single unit General Electric BWR-4 with a Mark I containment. The VYNPS IPE has estimated a total core damage frequency (CDF) of $4.3E-6$ /reactor year from internal events. Analysis of internal flooding was deferred and will be included in the VYNPS Individual Plant External Events Examination submittal. Transients including loss of feedwater and main steam isolation valves (MSIV), loss of DC bus, and losses of all high pressure injection contribute 58%, loss of offsite power (LOSP) transients, including station blackout 20%, anticipated transients without scram (ATWS) 19%, and loss of coolant accidents (LOCAs) 3%. In regards to LOSP initiator, weather-related failures were not included which would slightly increase the CDF. The important system contributors to the estimated CDF that appear in the top sequences are: loss of reactor core isolation cooling system, loss of high pressure coolant injection system, and failure to depressurize the primary system. The licensee's Level 1 analysis appears to have examined the significant initiating events and dominant accident sequences.

The licensee performed a HRA to document and quantify potential failures in human-system interactions and to quantify human-initiated recovery of failure events. The licensee identified the following operator actions as important in the estimate of the CDF: failure to manually depressurize the primary system, failure to inhibit ADS during ATWS sequences, failure to prevent loss of feedwater due to feedwater isolation on high vessel level, failure to initiate suppression pool cooling, and failure to vent containment via the torus vent.

The licensee evaluated and quantified the results of the severe accident progression through the use of a containment event tree and considered

uncertainties in containment response through the use of sensitivity analyses. The licensee's back-end analysis appears to have considered important severe accident phenomena. Among the VYNP conditional containment failure probabilities: early containment failure is 48% with overpressure being the primary contributor, late containment failure is 24% with failure of containment venting being the primary contributor, and bypass is <1%. The containment remains intact 27% of the time. The licensee's response to containment performance improvement program recommendations is consistent with the intent of GL 88-20 and associated Supplement 3.

Some important plant-specific safety features identified at VYNPS are:

1. The Vernon hydroelectric station provides an alternate power supply to the VYNPS.
2. Installation of a hardened wetwell vent.
3. Ability to use diesel driven firewater for vessel injection.
4. Alternate cooling water source for diesel generator cooling and for residual heat removal service water (RHRSW) system.

The licensee used the NRC proposed criteria, namely, total plant CDF greater than $1E-04$ /reactor year and large release frequency greater than $1E-06$ /reactor year, to screen for plant-specific vulnerabilities. Based on these criteria, the licensee did not identify any vulnerabilities. No hardware modifications are proposed as a result of the IPE. Plant improvements, however, were identified and have been implemented prior to, and in conjunction with, the IPE analysis. These improvements include the replacement of the uninterrupted power supply for the injection valves of the low pressure coolant injection system, improvement of the safety relief valve and MSIV pneumatic components, replacement of instrument air compressors, and upgrade of RHRSW.

III. CONCLUSION

Based on the above findings, the staff notes that: (1) the licensee's IPE is complete with regard to the information requested by GL 88-20 (and associated guidance NUREG-1335), and (2) the IPE results are reasonable given the VYNPS design, operation, and history. As a result, the staff concludes that the licensee's IPE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities, and therefore, that the VYNPS IPE has met the intent of GL 88-20.

It should be noted, that the staff's review primarily focused on the licensee's ability to examine VYNPP for severe accident vulnerabilities. Although certain aspects of the IPE were explored in more detail than others, the review is not intended to validate the accuracy of the licensee's detailed findings (or quantification estimates) that stemmed from the examination. Therefore, this SER does not constitute NRC approval or endorsement of any IPE material for purposes other than those associated with meeting the intent of GL 88-20.