NUREG-0825
Supplement No. 1

Integrated Plant Safety Assessment
Systematic Evaluation Program

Yankee Nuclear Power Station

Yankee Atomic Electric Company
Docket No. 50-29

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

October 1987

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ABSTRACT

The U.S. Nuclear Regulatory Commission (NRC) has prepared Supplement 1 to the final Integrated Plant Safety Assessment Report (IPSAR) (NUREG-0825), under the scope of the Systematic Evaluation Program (SEP), for Yankee Atomic Electric Company's Yankee Nuclear Power Station located in Rowe, Massachusetts. The SEP was initiated by the NRC to review the design of older operating nuclear power plants to reconfirm and document their safety. This report documents the review completed under the SEP for those issues that required refined engineering evaluations or the continuation of ongoing evaluations after the Final IPSAR for the Yankee plant was issued. The review has provided for (1) an assessment of the significance of differences between current technical positions on selected safety issues and those that existed when Yankee was licensed, (2) a basis for deciding how these differences should be resolved in an integrated plant review, and (3) a documented evaluation of plant safety.

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ACRONYMS AND INITIALISMS

CFR	*Code of Federal Regulations*
GDC	general design criterion(a)
IEEE	Institute of Electrical and Electronics Engineers
IPSAR	Integrated Plant Safety Assessment Report
ISI	inservice inspection
LOCA	loss-of-coolant accident
LPST	low-pressure surge tank
NRC	U.S. Nuclear Regulatory Commission
PRA	probabilistic risk assessment
RG	regulatory guide
SEP	Systematic Evaluation Program
SER	safety evaluation report
SRP	Standard Review Plan
TS	Technical Specification(s)
UHS	ultimate heat sink
YAEC	Yankee Atomic Electric Company

INTEGRATED PLANT SAFETY ASSESSMENT REPORT
SUPPLEMENT NO. 1
SYSTEMATIC EVALUATION PROGRAM
YANKEE NUCLEAR POWER STATION

1 INTRODUCTION

The Systematic Evaluation Program (SEP) was initiated by the U.S. Nuclear Regulatory Commission (NRC) to review the designs of older operating nuclear power plants to reconfirm and document their safety. The review provides (1) an assessment of the significance of differences between current technical positions on safety issues and those that existed when a particular plant was licensed, (2) a basis for deciding how these differences should be resolved in an integrated plant review, and (3) a documented evaluation of plant safety.

The results of the SEP review of Yankee were published in NUREG-0825, the Final Integrated Plant Safety Assessment Report (IPSAR), dated June 1983. The review compared the as-built plant design with current review criteria in 137 different areas defined as "topics." During the review, 48 topics were deleted from consideration in the SEP because a review was being conducted under other programs (unresolved safety issue or Three Mile Island Action Plan tasks), the topic was not applicable to Yankee, or the items to be reviewed under that topic did not exist at the site.

Of the original 137 topics, 89 were, therefore, reviewed for Yankee; of these, 51 met current criteria or were acceptable on another defined basis. From the review of the 38 remaining topics, certain aspects of plant design were found to differ from current criteria. The integrated assessment consisted of evaluating the safety significance and other factors of the identified differences from current design to arrive at decisions about whether modification was necessary from an overall plant safety viewpoint. To arrive at these decisions, engineering judgment was used as well as the results of a limited probabilistic risk assessment study.

In general, the staff's positions in the integrated assessment fell into one or more of the following categories: (1) equipment modification or addition, (2) procedure development or Technical Specification changes, (3) refined engineering analysis or continuation of ongoing evaluation, and (4) no modification necessary. Table 4.1 of the IPSAR summarizes the staff's integrated assessment positions and documents the licensee's agreement with those positions.

For those positions classified as either Category (1) or (2), the IPSAR lists the scheduled completion dates agreed upon by the staff and the licensee. Region I has verified the implementation of these positions or identified certain corrective actions required, as described in Section 4 of this report.

For those positions classified as Category (3), the licensee has provided the results of its evaluation or engineering analyses. The purpose of this supplement to the IPSAR is to provide the staff's evaluation of the Category (3) issues and to summarize the status of all actions to be implemented as a result of the SEP review. In those cases where analyses are continuing, the staff's evaluation identifies the analyses to be performed and the acceptance criteria that will be used to design the optimum plant modifications, if necessary. Any pre-implementation staff reviews required for these ongoing analyses, after this supplement has been issued, will be summarized in individual safety evaluation reports as the analyses are completed.

2 TOPICS THAT REQUIRED REFINED ENGINEERING ANALYSIS OR CONTINUATION OF ONGOING EVALUATION

Table 2.1 of this report presents a list of all issues that were evaluated in the IPSAR. The licensee has submitted an evaluation of each of the items identified in the final IPSAR as requiring additional analysis. A summary of the staff's findings of these items is presented in Sections 2.1 through 2.10 below. Each section references the staff's Safety Evaluation Report, if applicable, which provides more detail regarding the basis for the staff's conclusions. Factors considered in reaching a staff conclusion for each item include the perceived safety significance of the difference from current licensing criteria and a qualitative assessment of the financial and radiation exposure costs to make a modification. The evaluation of these issues also considered any applicable risk perspectives, developed for the integrated assessment and described in the IPSAR, and related corrective actions proposed by the licensee as part of the integrated assessment or as a result of the subsequent evaluations.

2.1 Topics II-3.B, Flooding Potential and Protection Requirements; II-3.B.1, Capability of Operating Plants To Cope With Design-Basis Flooding Conditions (NUREG-0825, Section 4.1); and III-3.A, Effects of High Water Level on Structures (NUREG-0825, Section 4.6)

General Design Criterion (GDC) 2 in Title 10, Part 50 of the Code of Federal Regulations (10 CFR 50), as implemented by Standard Review Plan (SRP) Section 2.4.5 (NUREG-0800) and Regulatory Guide (RG) 1.59, requires that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as floods.

A failure of the Harriman Dam from the effects of probable maximum precipitation constitutes the only flooding threat to the site. The Federal Energy Regulatory Commission is responsible for the review of the integrity of this dam. The staff will receive the results of this review by the end of 1987 and will use that document to close out the NRC review of this concern.

2.2 Topic III-1, Classification of Structures, Components, and Systems (Seismic and Quality) (NUREG-0825, Section 4.4)

10 CFR 50 (GDC 1), as implemented by RG 1.26, requires that structures, systems, and components important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed.

In IPSAR Section 4.4, the staff concluded that the licensee should supply additional information to address the following areas:

(1) radiography
(2) fracture toughness
(3) valves
(4) pumps

(5) storage tanks
(6) piping
(7) codes and standards
(8) pressure vessels

The licensee proposed to evaluate the safety significance of the components and systems in question and show that they are adequately monitored by a formal inspection program or that the risk from failure is negligible. The results of the licensee's review were provided in a letter dated September 26, 1984. The staff, in its evaluation issued on August 25, 1986, concluded that these issues were satisfactorily resolved.

2.3 Topics III-2, Wind and Tornado Loadings (NUREG-0825, Section 4.5), and III-4.A, Tornado Missiles (NUREG-0825, Section 4.8)

10 CFR 50 (GDC 2), as implemented by SRP Sections 3.3.1 and 3.3.2 and RGs 1.76 and 1.117, requires that the plant be designed to withstand the effects of natural phenomena such as wind and tornados.

In IPSAR Sections 4.5 and 4.8, the staff stated that some structures and components important to safety would not withstand the 10^{-7}/year tornado that was recommended in the evaluation for SEP Topic II-2.A.

In the IPSAR, the licensee proposed a 10^{-5}/year tornado (median) of 110 mph as a more appropriate design basis and proposed to satisfy the following objectives to demonstrate adequate tornado protection, rather than to upgrade the plant to protect against the 10^{-7} tornado:

(1) Maintain integrity of the reactor coolant pressure boundary.
(2) Maintain integrity of the secondary system pressure boundary as a heat sink.
(3) Ensure capability for steam generator feedwater and primary system makeup.

The staff concluded that the general method was acceptable but that the following specific recommendations should be followed:

(1) Determine the capacity of systems, structures, and components required for reaching a hot shutdown condition at the 10^{-4}/year and 10^{-5}/year upper 95% confidence limit windspeeds.

(2) Determine the modifications needed to upgrade the plant to protect against both windspeeds.

(3) Estimate the costs of such modifications.

(4) Perform a cost-benefit evaluation to decide what modifications to make.

For tornado missiles, the staff's position in the IPSAR was that a steel rod and a utility pole should be considered in the licensee's analysis of the effects of winds and tornados.

The licensee submitted the cost-benefit evaluation for wind and tornados that stated that certain plant modifications should be implemented to improve plant capability to withstand such events. These include modifications to

(1) the block walls in the turbine building and primary auxiliary building
(2) the cable spreading room
(3) the main steam/feedwater piping and support structure
(4) the diesel generator building west wall

The staff, in its evaluation issued on May 13, 1987, concluded that with the implementation of the specified modifications, the risk from high wind/tornado events (including tornado-generated missiles) is acceptably low.

2.4 Topic III-5.A, Effects of Pipe Break on Structures, Components, and Systems Inside Containment (NUREG-0825, Section 4.9)

10 CFR 50 (GDC 4), as implemented by SRP Section 3.6.2, requires, in part, that structures, systems, and components important to safety be appropriately protected against dynamic effects such as pipe whip and discharging fluids.

In IPSAR Section 4.9, the staff identified four areas requiring further evaluation. These areas were related to

(1) clarification of assumptions used in the jet impingement and pipe whip evaluations

(2) thrust forces on steam generator

(3) blister 12E (electrical penetration)

(4) loop compartment walls

Each of these issues was resolved as discussed in the following sections.

Jet Impingement and Pipe Whip Evaluations

In a letter dated September 27, 1984, the licensee stated that two areas would require further assessment on the basis of its reevaluation of the effects of jet impingement.

The first area was the effect of a break in the 5-inch crossover piping. Such a break could have unacceptable consequences. Therefore, the licensee performed a leak-before-break analysis to demonstrate that a rupture would not occur. This analysis was provided in a letter dated October 1, 1986. The staff, in its evaluation issued on July 16, 1987, concluded that the licensee's analyses were acceptable contingent on the licensee's commitments to (1) modify the procedure for visual inspection of 5-inch crossover piping for potential inservice pipe degradation, (2) perform augmented inspection of eight main steam piping welds, and (3) modify steam generator blowdown piping supports for jet impingement loads.

The second area was a break of steam generator blowdown piping where the four lines enter the containment. The licensee has committed to include jet impingement loads in the seismic reanalysis of this piping, so that the piping line would not fail as a result of the effects of a break in an adjacent line. The staff finds this commitment acceptable.

Thrust Forces on Steam Generator

The licensee analyzed the effects of a rupture of a main steam line at the nozzle on the steam generator in a submittal dated March 26, 1984. The staff found that the structural integrity of the generator was acceptable. In a letter dated March 16, 1986, the staff raised a question concerning a horizontal break at the main steam outlet. In its October 1, 1986 submittal, the licensee stated that the steam generator could not withstand the loading and proposed an augmented inservice inspection (ISI) program for these welds. By letter dated July 16, 1987, the staff concluded that this resolution was acceptable.

Blister 12E (Electrical Penetration)

To resolve the concern regarding the effects of jet impingement on electrical penetration blister 12E, the licensee proposed an augmented ISI program for the welds. By letter dated May 3, 1984, the staff concluded that this resolution was acceptable.

Loop Compartment Walls

The effects of pipe breaks in large reactor coolant system piping are covered by the analyses in WCAP-9558, which provides the technical basis for not postulating double-ended pipe breaks in this piping. As discussed in the letter dated May 3, 1984, the staff finds this analysis acceptable to resolve this concern.

2.5 Topic III-6, Seismic Design Considerations (NUREG-0825, Section 4.11)

10 CFR 50 (GDC 2) and 10 CFR 100, Appendix A, as implemented by SRP Sections 2.5, 3.7, 3.8, 3.9, and 3.10 and SEP review criteria (NUREG/CR-0098), require that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as earthquakes.

In the IPSAR, the staff stated that the licensee's analyses of piping and major mechanical equipment were not complete. There also were some open issues pertaining to structures.

By letter dated July 16, 1987, the staff issued its safety evaluation of the seismic reevaluation program for Yankee. The licensee has made specific commitments for plant modifications and further analyses as a result of this review. The staff finds these commitments acceptable.

2.6 Topic III-7.B, Design Codes, Design Criteria, Load Combinations, and Reactor Cavity Design Criteria (NUREG-0825, Section 4.12)

10 CFR 50 (GDC 1, 2, and 4), as implemented by SRP Section 3.8, requires that structures, systems, and components be designed for the loadings they may experience and that they conform to applicable codes and standards.

In a letter dated July 16, 1987, the staff requested that the licensee reanalyze the column to vapor container shell connections; therefore, this remains an open item. The licensee agreed to redeck the heating boiler room roof and the lower roof of the primary auxiliary building to resolve a concern about snow loads.

As discussed in IPSAR Section 4.12, the licensee proposed to perform, on a sampling basis, an evaluation of the code, load, and load combination issues delineated by the staff in order to assess the adequacy of as-built structures at Yankee. By letter dated December 4, 1986, the licensee supplied the results of its review. In addition, the staff requested information regarding the effects of snow loading on plant structures. The licensee responded in a letter dated September 8, 1986. The staff's review of both issues is documented in a letter dated July 16, 1987, which found the licensee's analyses acceptable.

2.7 Topic VI-1, Organic Materials and Postaccident Chemistry (NUREG-0825, Section 4.21)

2.7.1 Sump Water Chemistry

10 CFR 50 (GDC 14) requires that the reactor coolant pressure boundary be designed so that it has a low probability of abnormal degradation or rapidly propagating failure.

A low pH value increases the potential for stress-corrosion cracking of piping systems. Following an accident, the pH of the sump water would be low because of the presence of boric acid and hydrochloric acid (formed by radiolysis).

In IPSAR Section 4.21.1, the licensee agreed to provide a means for controlling the pH of sump water following a loss-of-coolant accident. The licensee installed trisodium phosphate baskets in the sump during the 1985 refueling outage. As discussed in a staff evaluation dated November 19, 1984, the staff finds this resolution acceptable.

2.8 Topic VI-4, Containment Isolation System (NUREG-0825, Section 4.22)

10 CFR 50 (GDC 54, 55, 56, and 57), as implemented by SRP Section 6.2.4 and RGs 1.11 and 1.141, requires isolation provisions for the lines penetrating primary containment to maintain an essentially leaktight barrier against the uncontrolled release of radioactivity to the environment.

In the IPSAR, the staff noted several areas that required further evaluation. The licensee provided a response to the concerns by letter dated March 16, 1983.

There are some penetrations that do not contain redundant isolation barriers. The staff evaluated the risk reduction that would result if additional valving was installed. In an August 28, 1986 evaluation, the staff concluded that only a minimal reduction in risk would occur and, therefore, the modifications were not required.

2.9 Topic VIII-3.B, DC Power System Bus Voltage Monitoring and Annunciation (NUREG-0825, Section 4.28)

2.9.1 Battery Current/Discharge and Fuse Open Alarm

In IPSAR Section 4.28.1, the staff recommended that an ammeter be installed to indicate battery current for charge/discharge. However, the licensee subsequently performed a test that demonstrated that installation of an ammeter would not be effective in detecting high resistance connections. As an alternative, the licensee has in place test and surveillance procedures for plant batteries to check for loose connections and for buildup of corrosion. Therefore, by letter dated September 19, 1985, the staff concluded that this issue was resolved.

2.10 Topic VIII-4, Electrical Penetrations of Reactor Containment (NUREG-0825, Section 4.29)

10 CFR 50 (GDC 50), as implemented by RG 1.63 and Institute of Electrical and Electronics Engineers (IEEE) Std. 317-1972, requires that penetrations be designed so that the containment structure can accommodate, without exceeding the design leakage rate, the calculated pressure, temperature, and other environmental conditions resulting from any loss-of-coolant accident (LOCA).

2.10.1 Low-Voltage Penetrations

In IPSAR Section 4.29.2, the staff noted that some low-voltage electrical penetrations served components inside the containment for which qualification for the LOCA environment had not been established. These were identified as category B penetrations. Current criteria would require a backup to the primary protection device. In the IPSAR, the staff concluded that modifying the penetrations to add backup protection would result in only a small improvement in risk. Therefore, the staff concluded that modification was not necessary provided the licensee determined that the existing circuit protection met or exceeded that assumed in the staff's risk assessment.

In Appendix D to the IPSAR, the staff evaluated the risk significance of the category B penetrations. In the assessment, it was assumed that a penetration fault occurs if an electrical fault (circuit overload) exists and the breaker fails to isolate the circuit. The breaker fault is assumed to be an independent failure; thus, the fault clearing time of the primary protection device must be shorter than the time to reach design temperature of the penetration.

By letter dated January 4, 1984, the licensee described the protection for the category B penetrations. Since they all had primary protection devices consistent with the probabilistic risk assessment assumptions, the staff concluded that this issue was resolved in an evaluation issued on September 19, 1985.

Table 2.1 Summary of evaluations in the IPSAR and this supplement

SEP topic no.	IPSAR section no.	Title	IPSAR requirements	Supplement section no.	Supplement requirements
II-3.B, II-3.B.1, II-3.C	4.1.1	Design-Basis Groundwater Level	None	--	--
	4.1.2	Probable Maximum Precipitation	*	2.1	None
	4.1.3	Probable Maximum Flood	*	2.1	None
	4.1.4	Local Site Flooding	*	2.1	None
	4.1.5	Roof Flooding	Install improved roof drainage.	4.1.1	Complete; see Inspection Report 83-15.
	4.1.6	Dam-Failure-Induced Floods	*	2.1	None
	4.1.7	Ultimate Heat Sink	None	--	--
	4.1.8	Emergency Procedures and Technical Specifications	*	--	--
II-4.E	4.2	Dam Integrity	See IPSAR Section 4.1.	--	--
II-4.F	4.3.1	Liquefaction Potential	None	--	--

*Further analyses of probable maximum precipitation, probable maximum flood, and dam integrity are being conducted for the NRC.

Table 2.1 (Continued)

SEP topic no.	IPSAR section no.	Title	IPSAR requirements	Supplement section no.	Supplement requirements
II-4.F	4.3.2	Spent Fuel Pool Building	None	--	--
III-1	4.4	Classification of Structures, Components, and Systems (Seismic and Quality)	Evaluate safety significance of components involved, show that they are covered by in-service inspection (ISI) program or are of no risk consequence, or establish current design safety margin.	2.2	None
III-2	4.5	Wind and Tornado Loadings	Evaluate structural adequacy to NRC-recommended wind/tornado windspeed.	2.3	Implement identified structural modifications.
III-3.A	4.6.1	Local Flooding	See IPSAR Section 4.1.	--	--
	4.6.2	Probable Maximum Flood and Dam Failure	See IPSAR Section 4.1.	--	--
III-3.C	4.7.1	Inspection Program for Harriman and Sherman Dams	Retain copy of Federal Energy Regulatory Commission inspection reports.	4.2.1	Complete; see Inspection Report 83-15.
	4.7.2	Inspection Program for YAEC Water-Control Structures	Develop and implement formal inspection program for YAEC water-control structures.	4.2.2	Complete; see Inspection Report 84-20.
III-4.A	4.8	Tornado Missiles	Evaluate protection against NRC-recommended windspeed and missiles.	2.3	Implement identified structural modifications.

Table 2.1 (Continued)

SEP topic no.	IPSAR section no.	Title	IPSAR requirements	Supplement section no.	Supplement requirements
III-5.A	4.9	Effects of Pipe Break on Structures, Components, and Systems Inside Containment	Evaluate specified locations for the effects of dynamic pipe breaks.	2.4	Implement augmented ISI program for main steam line welds inside containment.
III-5.B	4.10.1	Main Steam Line Break	Modify ISI program to include welds on outlet side of the four steam line nonreturn valves.	4.3.1	Complete; see Inspection Report 84-01.
	4.10.2	Jet Impingement on Switchgear Room Wall	Install jet impingement shield plate.	4.3.2	Complete; see Inspection Report 85-04.
III-6	4.11.1	Structures	Evaluate structural areas found to be overstressed.	2.5	Implement block wall modifications.
	4.11.2	Piping Systems	Complete analysis of piping systems and supports.	2.5	Implement support modifications.
	4.11.3	Major Mechanical Equipment and Supports	Complete analysis of structural integrity of major mechanical components.	2.5	Analysis will be complete by end of 1987.
	4.11.4	Electrical and Other Mechanical Components (Including Supports)	Perform analysis on a sample basis from each category of safety-related equipment.	2.5	See Generic Letter 87-02.
III-7.B	4.12	Design Codes, Design Criteria, Load Combinations, and Reactor Cavity Design Criteria	Code changes affecting specific types of structural elements have been identified by YAEC. The staff is currently evaluating that information.	2.6	Reanalyze column to vapor container shell connections. Redeck two roofs for snow loads.

Table 2.1 (Continued)

SEP topic no.	IPSAR section no.	Title	IPSAR requirements	Supplement section no.	Supplement requirements
III-8.A	4.13	Loose-Parts Monitoring and Core Barrel Vibration Monitoring	None	--	--
III-10.A	4.14.1	Bypass of Thermal-Overload Devices	Implement second recommendation of RG 1.106, except only require one-time test for setpoint.	4.4.1	Perform setpoint test for eight valves; see Inspection Report 85-11.
	4.14.2	Valve Reliability	None	--	--
IV-2	4.15	Reactivity Control Systems, Including Functional Design and Protection Against Single Failure	None	--	--
V-5	4.16.1	Other Systems Available at Yankee for Leak Detection	None	--	--
	4.16.2	System Sensitivity	None	--	--
	4.16.3	Leakage-Detection Capability Following a Safe Shutdown Earthquake	None	--	--
	4.16.4	Intersystem Leakage	None	--	--

Table 2.1 (Continued)

SEP topic no.	IPSAR section no.	Title	IPSAR requirements	Supplement section no.	Supplement requirements
V-5	4.16.5	Leakage Detection Required by Topic III.5.A Analysis	Dependent on results of continuing analysis	2.4	None
	4.16.6	PRA Safety Significance of Leakage-Detection Systems	None	--	--
	4.16.7	Staff Recommendations	None	--	--
V-6	4.17	Reactor Vessel Integrity	None	--	--
V-10.A	4.18	Residual Heat Removal System Heat Exchanger Tube Failures	None	--	--
V-10.B, V-11.B, VII-3	4.19.1	Auxiliary Feedwater System	None	--	--
	4.19.2	Shutdown Cooling System	None	--	--
	4.19.3	Control Air System	None	--	--
	4.19.4	Operator Action To Achieve Cold Shutdown	Provide procedures for post-incident cooling.	--	--
	4.19.5	Shutdown Cooling System Over-Pressurization	Install pressure interlock.	4.5.1	Complete; see Inspection Report 84-20.

Table 2.1 (Continued)

SEP topic no.	IPSAR section no.	Title	IPSAR requirements	Supplement section no.	Supplement requirements
V-10.B, V-11.B, VII-3	4.19.6	Pressure Control and Relief System	None	--	--
V-II.A, V-II.B	4.20	Requirements for Isolation of High- and Low-Pressure Systems; Residual Heat Removal System Interlock Requirements (Electrical)	See IPSAR Section 4.19.5.	--	--
VI-1	4.21.1	Sump Water Chemistry	Provide means to adjust sump water pH.	2.7.1	Complete
	4.21.2	Surface Coatings Inspection Program	Develop and implement inspection program for surface coatings.	4.6.1	Complete; see Inspection Report 85-11.
VI-4	4.22.1	Valve Redundancy	Complete analysis of adequacy of valve redundancy in identified penetrations.	2.8	Complete
	4.22.2	Simple Check Valves Outside Containment	None	--	--
	4.22.3	Blind Flanges	Indicate if these penetrations are tested in accordance with regulations.	2.8	Complete

Table 2.1 (Continued)

SEP topic no.	IPSAR section no.	Title	IPSAR requirements	Supplement section no.	Supplement requirements
VI-4	4.22.4	Local Manual Valves	Complete analysis of identified penetrations isolated by local manual valves.	2.8	None
	4.22.5	Location of Isolation Valves	None	--	--
	4.22.6	Low-Pressure Surge Tank (LPST)	Make proposed modifications to LPST.	4.7.1	Complete; see Inspection Report 84-20.
	4.22.7	Main Steam Piping	Complete analysis of these penetrations.	2.8	Completed by Amendment 86
	4.22.8	Main Feedwater Piping	Complete analysis of these penetrations.	2.8	Completed by Amendment 86
	4.22.9	Containment Leg Expansion Joints	None	--	--
	4.22.10	Spare Penetrations and Hatches	Confirm that penetrations 66, 67, and 68 are tested in accordance with regulations.	2.8	Complete
	4.22.11	Test, Vent, and Drain Lines	Complete analysis of these penetrations.	2.8	Lock closed one valve in each line.
VI-7.A.3	4.23	Emergency Core Cooling System Actuation System	Include automatic valve in testing program.	3.1	Completed by Amendment 83

Table 2.1 (Continued)

SEP topic no.	IPSAR section no.	Title	IPSAR requirements	Supplement section no.	Supplement requirements
VI-10.A	4.24	Testing of Reactor Trip System and Engineered Safety Features, Including Response-Time Testing	Include response-time testing program in Technical Specifications.	3.2	Completed by Amendment 83
VII-1.A	4.25	Isolation of Reactor Protection System From Non-Safety Systems, Including Qualification of Isolation Devices	None	--	--
VII-3	4.26	Systems Required for Safe Shutdown (Instrumentation)	None	--	--
VIII-1.A	4.27	Potential Equipment Failures Associated With Degraded Grid Voltage	Develop procedures for diesel generator load sheddings.	4.8	Complete
VIII-3.B	4.28.1	Battery Current Charge/Discharge and Fuse Open Alarm	Install ammeter to indicate battery current charge/discharge or provide technical justification for not installing.	2.9.1	None
	4.28.2	Battery Charger Output Current	None	--	--
	4.28.3	DC Bus Voltage	None	--	--

Table 2.1 (Continued)

SEP topic no.	IPSAR section no.	Title	IPSAR requirements	Supplement section no.	Supplement requirements
VIII-3.B	4.28.4	DC Bus Ground Alarm	None	--	--
VIII-4	4.29.1	Medium-Voltage Penetrations	None	--	--
	4.29.2	Low-Voltage Penetrations	Identify all Category B penetrations and the protection for each, and analyze adequacy of each.	2.10.1	None
IX-3	4.30.1	Component Cooling Water System	None	--	--
	4.30.2	Service Water System Flow	None	--	--
IX-5	4.31.1	Failure of Exhaust Fan RF-11	None	--	--
	4.31.2	Upper Level Primary Auxiliary Building Vent Louvers	None	--	--
	4.31.3	Diesel Generator Building Ventilation System	Modify steam to eliminate potential for a single active failure.	4.9.1	Complete; see Inspection Report 84-20.
	4.31.4	Battery Room Ventilation System	Develop procedures for loss of ventilation.	--	--
XV-2	4.32	Spectrum of Steam System Piping Failures Inside and Outside Containment	None	--	--

Table 2.1 (Continued)

SEP topic no.	IPSAR section no.	Title	IPSAR requirements	Supplement section no.	Supplement requirements
XV-4	4.33	Loss of Nonemergency AC Power to the Station Auxiliaries	None	--	--
XV-7	4.34.1	Simultaneous Pump Coastdown	None	--	--
	4.34.2	Fuel Damage Predictions	None	--	--
XV-19	4.35	Loss-of-Coolant Accidents Resulting From Spectrum of Postulated Piping Breaks Within the Reactor Coolant Pressure Boundary	Modify specifications for engineered safety features leakage.	3.3	Completed by Amendment 90

3 IPSAR TOPICS RESOLVED BY CHANGES TO PLANT TECHNICAL SPECIFICATIONS

During the integrated assessment for Yankee, a number of issues were resolved by commitments from the licensee to perform evaluations in order to determine whether modifications to plant Technical Specifications were warranted.

This section describes the actions taken regarding resolution of IPSAR issues involving Technical Specification changes.

3.1 Topic VI-7.A.3, Emergency Core Cooling System Actuation System (NUREG-0825, Section 4.23)

In IPSAR Section 4.23, the staff noted that the Yankee Technical Specifications (TS) allow the exclusion of testing automatic valves in the flow path of the emergency core cooling system. Therefore, the staff recommended that the phrase "Excluding Automatic" be deleted from the TS. This change was submitted by the licensee by letter dated January 23, 1984 and approved in Amendment 83 to the license on July 1, 1985.

3.2 Topic VI-10.A, Testing of Reactor Trip System and Engineered Safety Features, Including Response-Time Testing (NUREG-0825, Section 4.24)

In IPSAR Section 4.24, the staff discussed response-time testing of reactor protection and engineered safeguard features. The staff recommended that testing of response times of important components now addressed by plant procedures be included in the TS. By letter dated January 23, 1984, a TS change request was submitted by the licensee. In Amendment 83 to the license, issued on July 1, 1985, response-time testing of diesel generator starting was approved.

3.3 Topic XV-19, Loss-of-Coolant Accidents Resulting From Spectrum of Postulated Piping Breaks Within the Reactor Coolant Pressure Boundary (NUREG-0825, Section 4.35)

In IPSAR Section 4.35, the staff identified a concern that calculated doses following a LOCA might exceed 10 CFR 100 guidelines. The postulated 1-gpm leakage of recirculated core cooling water outside the containment was a major factor. Therefore, the staff concluded that the licensee should limit the leakage by TS so that doses following a LOCA would satisfy the guidelines. By letter dated May 7, 1985, the licensee submitted a proposed TS change to include a leakage limit of 50 gallons per day for the recirculation system. The proposed TS limits were approved in Amendment 90 to the license, dated December 16, 1985.

4 IPSAR TOPIC RESOLUTIONS CONFIRMED BY NRC REGION I OFFICE

During the integrated assessment for Yankee, a number of issues were resolved by commitments made by the licensee for specific plant modifications or procedural changes. After the IPSAR for Yankee was issued, the Region I office was asked through Task Interface Agreement 83 to verify that plant modifications had been implemented and to review changes to plant operating procedures made by the licensee. Table 4.1 provides a list of IPSAR actions for which confirmation by the Region I office was requested.

Region I personnel conducted onsite inspections for each item identified in Table 4.1. The inspections consisted of examinations of installed equipment as well as a review of supporting procedures and other documentation. The Region I office concluded that the licensee had met the commitments documented in the IPSAR for the items in Table 4.1. Inspection findings with the results of the review are documented in inspection reports as noted in the following sections.

4.1 Topics II-3.B, Flooding Potential and Protection Requirements; II-3.B.1, Capability of Operating Plants To Cope With Design-Basis Flooding Conditions; and II-3.C, Safety-Related Water Supply (Ultimate Heat Sink (UHS)) (NUREG-0825, Section 4.1)

4.1.1 Roof Flooding

As discussed in IPSAR Section 4.1.5, the licensee installed scuppers on the turbine building roof. (Inspection Report 83-15)

4.2 Topic III-3.C, Inservice Inspection of Water-Control Structures (NUREG-0825, Section 4.7)

4.2.1 Inspection Program for Harriman and Sherman Dams

As discussed in IPSAR Section 4.7.1, the licensee is retaining copies of Federal Energy Regulatory Commission inspection reports on the Sherman and Harriman Dams. (Inspection Report 83-15)

4.2.2 Inspection Program for YAEC Water-Control Structures

As discussed in IPSAR Section 4.7.2, the licensee has implemented a formal inspection program for water-control structures. (Inspection Report 84-20)

4.3 Topic III-5.B, Pipe Break Outside Containment (NUREG-0825, Section 4.10)

4.3.1 Main Steam Line Break

As discussed in IPSAR Section 4.10.1, the licensee has modified the inservice inspection program to include augmented inspection of welds on the steam lines. These welds were examined by ultrasonic and magnetic particle techniques. (Inspection Report 84-01)

4.3.2 Jet Impingement on Switchgear Room Wall

As discussed in IPSAR Section 4.10.2, the licensee committed to install a shield plate on the switchgear room wall to protect equipment from the adverse effects of a pipe break. Installation is complete. (Inspection Report 85-04)

4.4 Topic III-10.A, Thermal-Overload Protection for Motors of Motor-Operated Valves (NUREG-0825, Section 4.14)

4.4.1 Bypass of Thermal-Overload Devices

As discussed in IPSAR Section 4.14.1, the licensee performed a one-time test of the thermal-overload setpoints for motor-operated valves to determine whether the setpoints were adequate.

As discussed in Inspection Report 84-20, the valves that were tested were determined to be acceptable; however, eight other valves listed in Technical Specification Section 4.5.2 were not tested. By letter dated April 24, 1985, the licensee noted that these valves were part of other plant modifications and the overloads were functionally tested as part of their installation. During the following refueling outage, the thermal overload setpoints for these eight valves were tested to close out this issue. (Inspection Report 85-11)

4.5 Topics V-10.B, Residual Heat Removal System Reliability; V-II.B, Residual Heat Removal System Interlock Requirements (Systems); and VII-3, Systems Required for Safe Shutdown (Systems) (NUREG-0825, Section 4.19)

4.5.1 Shutdown Cooling System Overpressurization

As discussed in IPSAR Section 4.19.5, the licensee has installed an interlock on one valve on both the inlet and outlet of the shutdown cooling system. The licensee also has completed operations and surveillance test changes reflecting this modification. (Inspection Report 84-20)

4.6 Topic VI-1, Organic Materials and Postaccident Chemistry (NUREG-0825, Section 4.21)

4.6.1 Surface Coatings Inspection Program

As discussed in IPSAR Section 4.21.2, in a letter dated April 24, 1985, the licensee described its inspection program for containment coatings that has been implemented at the plant. (Inspection Report 85-11)

4.7 Topic VI-4, Containment Isolation System (NUREG-0825, Section 4.22)

4.7.1 Low-Pressure Surge Tank (LPST)

As discussed in IPSAR Section 4.22.6, the licensee completed the modifications to remove the low-pressure surge tank as an extension of the containment in 1984. (Inspection Report 84-20)

4.8 Topic VIII-1.A, Potential Equipment Failures Associated With Degraded Grid Voltage (NUREG-0825, Section 4.27)

As part of the resolution of the degraded grid voltage multiplant issue, the licensee committed to develop procedures for diesel generator load shedding. In a letter dated March 11, 1985, the staff concluded that the procedures provide the necessary protection of the Class 1E electrical system from a degraded grid voltage condition (when there is no loss-of-coolant accident).

4.9 Topic IX-5, Ventilation Systems (NUREG-0825, Section 4.31)

4.9.1 Diesel Generator Building Ventilation System

As discussed in IPSAR Section 4.31.3, the licensee modified the ventilation system for the diesel generator building to eliminate single-failure vulnerabilities. The modifications were completed during the 1984 refueling outage. (Inspection Report 84-20)

Table 4.1 Items for confirmation by NRC Region I office

Item no.	Description	IPSAR section
(1)	Install improved roof drainage.	4.1.5
(2)	Retain copies of Federal Energy Regulatory Commission inspection reports.	4.7.1
(3)	Develop and implement formal inspection program for water-control structures.	4.7.2
(4)	Include welds of main steam line at non-return valves in inservice inspection program.	4.10.1
(5)	Install jet impingement shield plate.	4.10.2
(6)	Perform one-time test of thermal-overload setpoints.	4.14.1
(7)	Install pressure interlock on shutdown cooling system valves.	4.19.5
(8)	Develop and implement program for inspection of containment coatings.	4.21.2
(9)	Make low-pressure surge tank modifications.	4.22.6
(10)	Develop procedures for diesel generator load shedding (degraded voltage).	4.27
(11)	Modify diesel generator building ventilation system.	4.31.3

APPENDIX

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The U. S. Nuclear Regulatory Commission (NRC) has prepared Supplement 1 to the final Integrated Plant Safety Assessment Report (IPSAR) (NUREG-0825), under the scope of the Systematic Evaluation Program (SEP), for Yankee Atomic Electric Company's Yankee Nuclear Power Station located in Rowe, Massachusetts. The SEP was initiated by the NRC to review the design of older operating nuclear power plants to reconfirm and document their safety. This report documents the review completed under the SEP for those issues that required refined engineering evaluations or the continuation of ongoing evaluations after the Final IPSAR for the Yankee plant was issued. The review has provided for (1) an assessment of the significance of differences between current technical positions on selected safety issues and those that existed when Yankee was licensed, (2) a basis for deciding how these differences should be resolved in an integrated plant review, and (3) a documented evaluation of plant safety.

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YANKEE NUCLEAR POWER STATION

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