U.S. NUCLEAR REGULATORY COMMISSION
REGION I

DOCKET/REPORT NO.	50-309/93-20
LICENSE NO.	DPR-36
LICENSEE:	Maine Yankee Atomic Power Company
FACILITY NAME:	Maine Yankee Atomic Power Station
INSPECTION DATES:	Onsite inspection: August 30 - September 3, 1993 Review at Region I: October 18 - November 2, 1993

INSPECTOR: John A. Calvert (signature) 2/3/94
John Calvert, Reactor Engineer
Electrical Section, EB, DRS
Date

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Date

Area Inspected: This was an announced inspection to review the licensee's 10 CFR 50.59 modification process and documentation for the digital aspects of the diverse scram system part of the ATWS system, the wide range nuclear instrumentation system, and the steam generator water level control system.

Results: No violations or deviations were identified.

- Modification packages for ATWS, Wide Range Nuclear Instrumentation and Steam Generator Level were thorough, clear, detailed, and accurate. They showed proper concern for safety and excellent attention to detail.

- Digital hardware engineering at the system level was excellent for systems implemented as part of the integrated non-nuclear safety digital automation control system (INNSDACS).

- The formation of the Foxboro Intelligent Automation (I/A) cross-functional team was an appropriate way to increase organizational effectiveness and maintenance quality concerning plant digital systems.

- The inspector was not shown any report of an audit of the INNSDACS vendor to determine the extent of software verification and validation. Although this is not a requirement, an audit would serve to increase the confidence level of the control block code reliability.

DETAILS

1.0 PURPOSE AND SCOPE

The purpose of this inspection was to assess the safety and engineering aspects of plant modifications with special focus on the digital and software design. The inspection included review of documents, walkdowns, personnel interviews, and observations concerning the diverse scram system of the ATWS system, the wide range nuclear instrumentation system, and the steam generator water level control system. The inspection was conducted at the Maine Yankee Atomic Power Station, Wiscasset, Maine.

The inspector used a review methodology based on NRC inspection manual guidance concerning design changes and modifications. The digital segments were assessed for the quality of the following areas: system requirements; accuracy of analog-to-digital requirements translation; licensee understanding of digital vendor's hardware and software; hardware/software error management at the system and module level; human machine interface; software documentation accuracy and traceability; software configuration management; software verification and validation; operator and maintenance training. After the quality of the unique digital segments was determined, the entire modification was audited to determine degree of conformance to any NRC requirements and licensee's requirements. Finally, the licensee's safety evaluation was verified.

2.0 ATWS MODIFICATION (EDCR 89-57)

The inspector reviewed the implementation of the diverse scram system (DSS), which is the digital area of the anticipated transient without scram (ATWS) modification. The DSS implements the requirement of the 10 CFR 50.62 ATWS rule for diverse scram from the sensor output to interruption of power to the control rods. The inputs to the DSS are from the four Class 1E isolated pressurizer pressure signals used for the reactor protection system. A single microprocessor-based channel performs a 2-out-of-4 algorithm and outputs to an HFA relay. When a high pressurizer pressure of 64 psig above the RPS value occurs, the relay will be energized; then two separate contacts will deenergize the load contactors for the two control element drive MG sets. Suitable additional circuitry was added for shutdown testing and for adherence to the licensee's design requirement that no single failure will result in a spurious trip.

The diverse auxiliary feedwater actuation requirement of the ATWS rule was met by the existing redundant emergency feedwater (EFW) pump automatic start circuit.

The ATWS rule requirement for a diverse turbine trip (DTT) was met with the addition of Class 1E relays to the EFW initiation logic, performed as part of this modification. Either or both DTT relays will initiate a turbine trip by closing contacts in the turbine auto stop and emergency trip circuits.

The relays used for the DSS, DTT, and EFW outputs energize to actuate.

2.1 Requirements Translation

The inspector reviewed the translation of the DSS design basis into the design requirements for the digital system vendor. A specification (MYPS-55) was transmitted to the vendor that contained the general requirements for a Foxboro Intelligent Automation (I/A) digital system, the functional requirements for the DSS, and the particular design requirements for the power, grounding. The DSS functional requirements consisted of an overall concept description and a functional diagram. The inspector determined that the specification was adequate for conveying DSS functional requirements and design constraints to a systems house vendor that has the hardware and software design responsibility

2.2 Hardware

The DSS is one system in the intelligent non-nuclear safety digital automation control system (INNSDACS.) The INNSDACS uses Intelligent Automation (I/A) products from the Foxboro Company and is a modular, distributed data acquisition and control computer system. INNSDACS is the base system from which other non-nuclear control system upgrades can be added. The DSS portion of the system consists of analog to digital (A/D) modules, digital modules, power supply modules, and control processor (CP) modules.

The CP performs the DSS algorithm, has self-checking diagnostics at power up, and has runtime diagnostics that include a watchdog timer. The CP detects single bit errors in its memory.

The A/D and digital modules connect to the CP through the field bus, which is a redundant fault tolerant bus that is not shared with modules from any other system. The data integrity on the bus is protected by detection of single/double/odd bit errors, and noise burst errors. The CP-to-module data communication protocol is the master/slave type, which is deterministic and closely controls bus traffic.

The CP connects to a redundant communication bus, the node bus, which is shared by CPs used for other systems, application processor (AP), two work station processors, and a printer control processor. The node bus is single-point-of-failure fault tolerant and provides data integrity protection. The protocol is the carrier sense multiple access type, with retransmission in the case of data packet collision. The node bus is not required for normal operation of the DSS, but is required for testing the algorithm at plant shutdown, because the work station serves as the human interface for test initiation and status data. Access to the work station is controlled by password.

The system has on-line error detection of the processors and data communications. Start-up diagnostics are performed. Each module has failure detection schemes and red/green lamps on the front of modules show status. A green lamp indicates that the module is functioning properly. A red lamp indicates a module failure.

The power supply modules are redundant and were type tested by the vendor to withstand voltage surges. All modules were designed to withstand a minimum of 3 Volts/meter of radio frequency interference (RFI) and the following electrical specifications:

a. electrostatic discharge per International Electrotechnical Commission (IEC) 801-2;
b. high frequency transient per IEC 801-4;
c. switching/indirect lighting per IEC 801-5;
d. surge withstand capability per ANSI/IEEE C37.90-1984 and ANSI/IEEE C62.41-1980.

The DSS is designed such that with a loss of source power, the DSS will fail as is. The normal source power to the DSS is from the non nuclear 125 Vdc battery system. Rebooting of the CP will be done by the AP after source power is restored.

2.3 Application Software

The DSS control block application software and real-time multi-tasking operating system (VRTX, which is compatible with UNIX system 5) were configured by Foxboro on an application processor (AP) hard disk with a backup copy put on a floppy disk. The software was downloaded to the CP from the AP through the node bus, which checks the data transfer for errors. The AP is not required for DSS normal operation after initial download to the control processors.

The software documentation included a software schematic and a data base of the software. The software schematic showed field connections, vendor I/O connections, and software control blocks that gave a graphical depiction of the continuous and sequential control functions implemented. The licensee's engineering reviewed the vendor software schematic. The data base showed the detailed parameters used in the software control blocks and also the sequence of block execution. The data base printout, in conjunction with the vendor detailed descriptions of the control blocks, is the functional equivalent of a source code listing. The actual source code is transparent because of the high level application software programming methodology employed by the vendor.

2.3.1 Verification and Validation (V&V)

The inspector reviewed the accuracy of the DSS algorithm using the DSS functional diagram, the vendor software schematic, the data base printout, and the vendor detailed descriptions of the control blocks. The data base printout of the DSS control blocks was a two step process because the data base for the 2/4 test state control block was not in the same data base location as the rest of the control blocks for the DSS algorithm. However, the Foxboro system software automatically makes the link between the two different locations before the DSS algorithm is downloaded to the DSS control processor. The inspector performed several thread audits using the various documents for the DSS algorithm and found no errors.

A Foxboro representative stated that the generic software control blocks were independently tested at the unit level, which included design verification and integration (validation). A factory acceptance test and installation test were conducted.

The DSS has a software-controlled test which can be invoked from the work station by an I&C technician using a password. The software access is limited to conduct of the test only. The inspector walked through the test procedure and the displays with an I&C technician authorized to conduct the test. The displays showed the status of the test steps, the actual test values, the setpoint, and the test result computed by the software. The procedure clearly delineates the sequence to be followed. The acceptance criteria shows the correct software output values for comparison with the display test results. The test covers all external switches and relays. The software controlled test is designed to be run during shutdown conditions. The pressure sensors are calibrated and tested on plant surveillance cycles.

2.4 Cross-Functional Team Report

An incident concerning the ATWS DSS system, in which an I&C technician unknowingly disabled the system, prompted the formation of a cross-functional team to review the use of digital control system technology at Maine Yankee. The inspector reviewed the licensee self-assessment document entitled, "Foxboro I/A Cross-Functional Report," dated August 26, 1993 (file GDW-93-52), that provided approved action items concerning the INNSDACS system. These action items cover the areas of organization, procedures, operation, training, access, and display standards. The inspector noted that the report covered those areas which tend to increase organizational effectiveness and maintenance quality concerning plant digital systems.

2.5 Conclusions

The inspector audited the licensee DSS design modification documents and concluded the following:

a. the non-nuclear safety 125 Vdc battery source in conjunction with the normally deenergized output function is adequate to prevent interruption of the DSS function;

b. the fieldbus for a particular control processor is unique and not shared with another control processor;

c. the node bus and fieldbus have adequate data integrity checks;

d. the Foxboro equipment is designed to withstand the upper limit of the radio frequency field strengths generally found in control rooms;

e. the Foxboro equipment has adequate methods to detect internal errors and display the pass/fail status of the equipment; and

f. the accuracy of the DSS application is adequate along with the method of periodic testing.

The inspector determined that the DSS implementation complies with the ATWS rule and supports the conclusions of the licensee's safety evaluation.

3.0 WIDE RANGE NUCLEAR INSTRUMENTATION MODIFICATION (EDCR 92-41-1)

The licensee's reason for the wide range nuclear instrumentation modification was to resolve recurring operational, maintenance, and spare parts problems with the previous four channel system that had resulted in three different hardware arrangements. This modification achieved a uniformity of hardware for the detectors, penetrations, and wide range processors.

The fission chamber detectors and containment cable assemblies for channels B and C were replaced with the same type from Gamma-Metrics as exists for channels A and D. The containment penetrations for channels B, C, and D were replaced with the same type from Conax as exists for channel A and other electrical penetrations installed in the plant.

The amplifiers and amplifier cable assemblies for all channels were replaced with new types from Gamma-Metrics. A new three-way isolator assembly between the channel A amplifier and the drawer provides the signals to the Appendix R alternate shutdown processor. The wide range signal processing drawers housed in the reactor protection system cabinets were replaced with new types from Gamma-Metrics.

Post-accident source range capability is provided by channels A and D. Station blackout display of source range is provided by LCD and digital meters on the wide range drawers mounted in the main control room RPS cabinets.

The licensee classified the wide range instrumentation as Class 1E from the detectors through the signal processor drawers housed in the RPS cabinets. The signals that exit from the drawers are isolated from the Class 1E signals within the drawers. The INNSDACSS inputs from the wide range system are isolated from Class 1E signals.

3.1 Detectors and Penetrations

The detector assembly contains three fission chambers, only two of which are needed to achieve a minimum source range thermal neutron sensitivity of 4 cps/nv. The detector assembly, integral cable, junction box and in-containment cable were qualified to operate in the normal, accident, post-accident, and seismic environments per IEEE 323-1983, and IEEE 344-1987. The detector cables are triax, which provide excellent EMI shielding properties along with the single point ground used for the system. The inspector sampled and audited the detector specifications, vendor qualification report, and licensee qualification document reviews and concluded that licensee evaluations regarding qualification were supported by the documentation.

The penetration assemblies were purchased with the same specification requirements as electrical penetrations previously installed in the 1990 refueling outage. The installed location of the penetrations is above submergence level. The inspector sampled and audited the penetration specifications, vendor qualification report, and licensee qualification document reviews and concluded that licensee evaluations regarding qualification were supported by the documentation.

3.2 Amplifiers and Signal Processors

The amplifiers provide high voltage for the detector, plus amplification, pulse shaping, and discrimination for the detector signals. The amplifiers are housed in a steel enclosure and are mounted directly on the concrete walls of the physically separated outboard containment penetration rooms. The amplifier outputs are transmitted over twisted shielded pair cable to the control room.

The signal processing drawers provide conventional counting and root-mean-square techniques to cover 0.25 to 2×10^{10} nv, which corresponds to a range of approximately 10^{-10} to 200% reactor power. With the detectors, the system provides a 4 decade overlap between source and wide range, and greater than a 2 decade overlap between wide range and power range. The source range and wide range parameters are displayed on the front of the drawer on a liquid crystal display (LCD) bargraph and a digital display for log level and rate. Bistable trip set points are displayed on LCD bargraph displays also.

Loop testing from the amplifier through the drawer electronics is accomplished from the drawer front panel. Momentary pushbuttons in a 3 X 5 matrix and a potentiometer are mounted on the front panel for test, calibration, status and control purposes. The pushbuttons are enabled by depressing the single "channel in test" pushbutton, which minimizes inadvertent operator action from causing a test condition. An alarm window illuminates on test condition, along with a LED on a separate pushbutton that shows the test condition locally. Some of the pushbuttons have integral LEDs which indicate the status of the associated circuits.

The inspector audited the specifications, qualification reports, and modification package concerning the amplifiers and signal processor drawers. The inspector noted that because the correspondence of data between the qualified part numbers in the vendor's test reports and the installed part numbers was not clear, the qualification by analysis was complex. The inspector sampled the data taken for the environmental extremes and seismic tests and noted that the vendor qualification evaluations for these particular tests were supported by the data.

3.3 Appendix R Isolator

The inspector reviewed the qualification report for the three-way isolator that is used to isolate the channel A amplifier signals from the alternate shutdown panel wide range signal processor and the control room wide range signal processor. The inspector noticed that the isolator referred to in the test report contained a fiber optic channel that failed the radiation test. The installed isolator did not contain a fiber optic cable. Furthermore, the test report did not explain if there were any differences between the qualified assembly and the installed three-way isolator.

The inspector asked the licensee's cognizant engineer how the installed isolator was accepted as qualified. The engineer stated that the report was reviewed and that the subject discrepancy was discovered and resolved with the vendor, but apparently the resolution did not get documented in the file. During the inspection, the engineer obtained a letter from the vendor stating that the qualified isolator was tested to prove that the input and the two identical output channels (before the fiber optics cable and driver) were electrically isolated from each other; that the removal of the fiber optics printed circuit assembly and the fiber optic cables does not compromise any of the environmental or seismic results. The vendor, therefore, based the qualification of the installed isolator on the analysis of previously qualified equipment. This method of qualification by analysis is permitted under IEEE 323. The inspector had no further questions concerning the qualification of the three-way isolator.

3.4 Human Machine Interface (HMI) and INNSDACS Interface

The wide range recorder, formerly mounted on the main control board, was replaced with a CRT touch screen display driven from the INNSDAC system. The operational and transient recording function of the recorder, which was used to satisfy the record retention Technical Specification 5.10.2f, was replaced by electronic data recording by the INNSDAC system. The INNSDACS system archives the data for 1 month, then will notify the operator to back up the data base. Floppy disks may be used and a streaming tape will be added later to the INNSDACS for the back-up. A daily hard copy summary log will be used until a QA program for storing the magnetic media is implemented.

The CRT touchscreen display provides inverse countrate (1/M) trending at startup and shutdown, and during normal operations, source and/or wide range data trending for any 2 of the 4 channels. The menu selection and a reference location must be selected on the touchscreen to cause the system to respond; this prevents inadvertent functions from being selected. If a reactor trip occurs, channels A and D are automatically selected for fast speed display. The CRT swivel base and associated custom display selection keypad are mounted to the main control board to restrict any seismic motion.

The INNSDAC system, with a manual override, provides the automatic alarm to evacuate containment and warn operators of a potential inadvertent criticality.

Equipment was added to the INNSDACS system to provide for data acquisition, display generation, data storage, and hardcopy generation. The data acquisition is a stand-alone function connected in a modular fashion using a redundant bus similar to the DSS part of ATWS described in Section 2.2 above. The CP for the wide range function is connected to the redundant node bus for data communications to a work station processor that drives the CRT.

3.5 Walkdown

The inspector walked down containment penetration rooms where the penetrations and amplifiers are mounted. The penetrations were connected to the existing leak test system for periodic testing. Cable and conduit routing was neat and allowed room for maintenance. The inspector observed paper tags were used to identify cables in the penetration rooms and asked if the paper tags were accounted for in combustible loading. During the inspection, the licensee's fire protection engineer stated that the loading due to the paper tags represented from 0.17% to 0.37% of all combustible loads in the penetration areas and does not impact any conclusions in the fire hazards survey. The inspector had no further questions in the combustible area.

The inspector walked down the wide range drawers mounted in the RPS cabinet in the main control room and verified that the keypad could be randomly touched without causing any upset to the equipment. The temporary channels were installed to comply with the Technical Specifications paragraph 3.13 for source range indication while shutdown during the replacement of the wide range drawers.

3.6 Conclusions

The design, qualification and installation of the wide range instrumentation is consistent with the requirements the licensee placed on the system.

The inspector concluded that the modification design documentation and direct observations of the installed equipment verified the positions stated in the licensee's safety evaluation.

4.0 STEAM GENERATOR WATER LEVEL CONTROL (EDCR 89-30)

The steam generator water level control modification replaced the functions of the three-loop analog control system with a three-loop system using digital smart transmitters and a fault-tolerant distributed digital control system implemented with the INNSDACS equipment. Only the output control valves, along with their associated electronic drivers and wiring, are subject to single failures that affect process control.

4.1 Analog-to-Digital Requirements Translation

The inspector noted that the functional requirements and parameters for the digital control system were the same as the original analog system. The inspector reviewed the design and performance requirements that were formalized in the design input document, and a system procurement specification for Foxboro. The inspector examined the Foxboro diagram that depicted the control block symbology, data flow and control flow for the digital system. The diagram is the as-built document for the Foxboro system. The parameters and details of the programming are in the system data base. The inspector determined that from the system function level, the translation accuracy is adequate.

The control block programming tools allow the system engineer to understand the software programming at a system level, and allow for a common ground of interpretation between the vendor and the licensee. This enhances the accuracy of translation from the system requirements to the software.

However, the control block programming technique, while a benefit in requirements accuracy, places a premium on the quality of the underlying software. This is because the underlying microprocessor considerations of processor utilization, timing margins, memory margins, and the extent of error processing are not readily available to a reviewer for verification. The determination of the accuracy and reliability of the software then shifts to an examination of the vendor's software verification and validation. The inspector was not shown any audit report of the INNSDACS vendor to determine the extent of software verification and validation. Although this is not a requirement, it would serve to increase the confidence level of the control block code reliability. The inspector audited the translation of requirements at the functional diagram level, and not at the actual software level.

4.2 Digital Transmitters

Each loop uses redundant intelligent sensors for feedwater flow, main steam line flow, main steam line steam pressure, and steam generator water level. The loops operate with a preferred (X) digital transmitter, then if X input fails, a switch is made to the hot standby (Y) analog transmitter. The analog intelligent transmitter is really a digital transmitter with an output digital-to-analog converter.

These intelligent sensors have low drift characteristics and have protection against voltage surges and radiated electromagnetic interference. The licensee changed the calibration frequency of the transmitters used in the plant calorimetrics program from 6 months to 18 months based on the lower calculated uncertainties using the intelligent transmitters. The inspector checked the calculation of the new uncertainties and found them in consonance with the vendor specifications.

The intelligent transmitters are designed with the option of problem diagnosis using hand-held terminals connected to the output loop. The connection does not disturb the output signal of the transmitter. The inspector noted that the remote diagnostic capability is an enhancement to maintainability for those intelligent transmitters mounted in the containment.

The steam generator water level intelligent transmitters are mounted in the containment. They do not need to be harsh environment qualified, but they do have to meet the radiation required for service. The licensee's engineering determined that the radiation testing done on Rosemount transmitters would allow 7.6 years service in the installed radiation environment. The Foxboro transmitters were projected at 30 year service life. The licensee has preliminarily decided to replace both types of in-containment transmitters every 7.5 years. This may change if an EPRI program concerning radiation hardening of smart electronics is used to qualify vendor hardware.

4.3 **INNSDACS Equipment**

Each loop of the steam generator water level control system, as implemented with INNSDACS equipment, is dual redundant. The equipment for each loop is independent of the other loops. The X and Y inputs are distributed to redundant modules. However, modules that provide an analog output to indicators are not redundant. The bus connecting the modules to the control processor (CP) is redundant. The CPs are redundant and operate as a fault-tolerant pair. The CP connects to the redundant node bus. The node bus is not required for normal operation of the loops.

The system has redundant power sources: non-safety inverter 120 Vac and safety-related 125 Vdc. Redundant power modules are provided for each source, such that loss of a single source or power module will not result in loss of power to the system. The proper design measures were taken concerning separation. Appropriate fusing and/or Class 1E breakers located in the Class 1E distribution panels provide fault isolation. Electrical isolation to prevent backfeeding with surge suppression is provided by transformer networks and blocking diodes within the power supply modules. The inspector concluded that suitable design measures were taken to avoid common mode failure that could affect any safety bus from non-safety equipment.

Normal operation of the control system will be interrupted following a turbine trip, which will set the main feedwater control valves to fully closed and the bypass valves to 32% open. The logic is two-out-of-three, so that a single failure will not cause interruption and will provide a measure of protection against spurious interruptions. The time response for this turbine trip interlock was increased by 2.5 seconds, compared to the previous analog implementation. The additional was due to the basic processor cycle time being set at 0.5 second and interprocessor communications delays. The licensee analyzed the effects of this additional time delay on the safety evaluation and equipment qualification environments and concluded that there would be no effect.

4.4 Human Machine Interface (HMI)

The operator interfaces of the new system are in the same location as the replaced hardware. The main and bypass valve analog controllers were replaced with digital controller display stations that have different features. Training was conducted on the simulator to ensure that operators would be familiar with the new features.

A CRT display was added to the main control board to provide the operator with alarm messages, diagnostic status, process graphics, and selected I/O point values. The CRT station cannot be used for control of the system; only the digital control stations on the main control board can be used for control of a loop. Access is controlled by passwords for display environments other than for the operators.

The programmed failure mode of the system upon detection of fatal errors is "as is." Along with annunciation of failures, this helps the operator intervention to be more effective. Each control loop in the system is designed to allow the operator to take control from the automatic system at any time, using equipment that uses non-software-driven devices, as long as power is available, and the necessary final output electronics are available.

4.5 Conclusions

The use of the control block tool kit for programming minimized the chance for functional errors. The system engineers showed excellent grasp of the tool kit and its application to the steam generator water level control system.

The hot standby dual redundant computer system configuration provides protection against random hardware failures. The dual fault tolerant control processors provide appropriate protection for computer lock-up failure modes, and random processing errors.

The system engineers interacted with the operation staff as evidenced by the attention paid to operator considerations in the operator interface section of the modification package.

The use of only one safety-related power source with a non-safety inverter reduced the potential common mode effect. The design of the requisite isolation devices and fusing is adequate to reduce the potential of interaction with safety-related equipment.

The intent of the design was to provide control of the process for a large set of single failures. This is an appropriate action to reduce the probability that safety systems will be challenged for the loss of feedwater flow incident and excess load incident.

The inspector audited the design aspects of the specifications, drawings and other documents in the modification package to determine correspondence with the licensee's safety evaluation. The inspector determined that the design sufficiently supports the conclusions of the licensee's safety evaluation.

5.0 UNRESOLVED ITEMS

Unresolved items are matters about which additional information is necessary to determine whether they are acceptable, a deviation, or a violation. There are no unresolved items as a result of this inspection.

6.0 EXIT MEETING

The inspectors met with the licensee's personnel denoted in Attachment 1 of this report at the conclusion of the inspection period on September 3, 1993. At that time, the scope of the inspection and inspection results were summarized. An additional exit was conducted by telephone with the licensee's personnel on November 2, 1993, to summarize the results of responses to questions concerning ATWS DSS application programming and wide range monitor qualification.

ATTACHMENT 1

Persons Contacted

Maine Yankee Atomic Power Company

*	R. Bickford	Manager, Maintenance
**	R. Blackmore	Manager, Maine Yankee Nuclear Plant
	D. Bourgoin	Design Engineer, I&C
**	J. DeBartolo	Supervisor, Engineering Support Group
	P. Feist	Technician, I&C
	W. Frewin	Engineer, Electrical
*	J. Frothingham	Manager, Quality Programs
**	T. Gifford	Assistant Manager, Corporate Engineering Department
*	J. Gray	Section Head, Computer Group
	B. Griffin	Technician, I&C
	R. Hayward	Supervisor, Quality Assurance
*	J. Hebert	Manager, Licensing & Engineering Support
	S. Hill	Senior Instructor, Training
	R. Jordan	Senior Engineer, Licensing
	D. Kulp	Supervisor, Engineering, Yankee Nuclear Services Division
**	G. Leitch	Vice President, Operations
	J. Lewis	Engineer, Integrated Management Services Inc. MA
	L. Luzano	Design Engineer, I&C
	R. McGrath	Software Engineer, Simulator
	D. Mitchell	Engineer, Instrumentation & Controls Services Inc., MI
**	R. Nelson	Manager, Corporate Engineering
	A. Shean	Manager, Training
	H. Swartz, Jr.	Section Head, Speciality Training
**	G. Whittier	Vice President, Licensing & Engineering Support

State of Maine

*	P. Dostie	Nuclear Safety Inspector

Nuclear Regulatory Commission

*	W. Olsen	Resident Inspector, Maine Yankee
	J. Yerokun	Senior Resident Inspector, Maine Yankee

* denotes attendance at the exit meeting on 9/3/93

** denotes attendance at telephone re-exit on 11/2/9