UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

YANKEE ROWE

EVALUATION OF CATEGORY "A" LESSONS LEARNED IMPLEMENTATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

DOCKET NO. 50-29

Introduction

By letters dated December 31, 1979 and April 9, 1980, Yankee Atomic Electric Company (the licensee) submitted documentation of the actions taken at Yankee Rowe (the plant) to implement the requirements resulting from TMI-2 Lessons Learned. To facilitate our review of the licensee's actions, members of the staff visited the plant on April 2, 1980.

Evaluation

Details of the NRC's Category "A" requirements and acceptance criteria are documented in NUREG-0578 and NRC letters dated September 13 and October 30, 1979. The number designation of each item is consistent with the identifications used in NUREG-0578.

2.1.1 Emergency Power Supplies

Pressurizer Heaters

The pressurizer heaters are fed from 480 volt buses. Two buses contain four groups of heaters each and the capacity is 37.5 kw per group. These heaters are shed upon a loss of offsite power. Following diesel start the pressurizer heater buses can be supplied from emergency power by closing circuit breakers in the control room. The licensee has stated that 37.5 kw of heaters is sufficient capacity to maintain subcooled natural circulation operation. This has been verified by operating experience and extrapolation of Westinghouse calculation results.

Procedures for the reconnection of the pressurizer heaters are in the control room. The time required to accomplish this action is adequate to support natural circulation operation.

PORVs and Block Valves

The motor operated block valve is connected to a 480V emergency bus. The pressurizer solenoid-operated relief valve is supplied by an emergency DC power supply.

Pressurizer Level Indicator

The pressurizer level indication instrument channels are supplied by a vital power source.

The licensee meets the requirements of Category "A" for Item 2.1.1.

2.1.2 Relief and Safety Valve Testing

The licensee has committed to participate with the NSSS Owners Group and the Electric Power Research Institute in the development of a solution to this concern. This satisfies the Category "A" requirements for this item.

2.1.3.a Direct Valve Position Indication

The licensee has installed an acoustic monitoring system supplied by Babcock and Wilcox (B&W). The B&W system consists of sensor channel transducers and preamplifiers located in containment and rack mounted monitoring equipment in the control room. The sensor channel detects the valve flow noise and converts it to an AC voltage signal by providing suitable amplification and filtering. The conditioned signal is then converted to a DC level which drives a visual display meter and actuates the alarm.

The licensee has one sensor on the PORV and one sensor on each of the two safety valves. All valve position indicators will be powered from one vital bus and will be indicated and alarmed in the control room.

The B&W acoustic monitoring system is being qualified to IEEE 323, 344 and 383. The licensee states qualification will be complete by the third quarter of 1981.

The licensee meets the Category "A" requirements for Item 2.1.3.a.

2.1.3.b Instrumentation of Inadequate Core Cooling

The Westinghouse Owners Group performed analyses as required by Section 2.1.9 of NUREG-0578 to study the effects of inadequate core cooling. Procedural guidelines to recognize inadequate core cooling entitled, "Instruction to Restore Core Cooling During a Small LOCA" were included in the anlayses. The guidelines provided the basis for procedural changes and operator training to recognize the existence of inadequate core cooling and restore core cooling based on existing instrumentation.

The licensee states that the Owners Group generic solution to a vessel level system is not feasible for Yankee Rowe. As an alternate approach, the licensee is attempting an analytical technique. The approach will utilize the change in count rate at the source range detectors as water level changes. In addition, the licensee has requested that Westinghouse propose alternate methods for Yankee Rowe. Additional details of the licensee's proposal will be provided by June 1, 1980.

Subcooling Meter

The licensee has installed a Combustion Engineering (CE) designed subcooled margin monitoring system to provide continuous digital display of temperature or pressure margin to saturation. Input temperatures are from four core exit thermocouples

located in different quadrants. Inputs are auctioneered for the hottest and the sensor range is 0-700°F. To upgrade the system the number of core exit thermocouple inputs will be increased to eight prior to restart. System pressure inputs to the monitor are provided from two sources. One input is a pressurizer pressure input, and one is a main coolant system pressure input. Both pressure ranges are 0-3000 psig.

The subcooled margin monitor is designed to IEEE Standards 344-1975 and 323-1974. The monitor qualifies as a protection grade Class IE system. The licensee is currently verifying the qualification of the core exit thermocouples. The existing pressure sensor is qualified to IEEE 323-1971 and 344-1975. The installed pressure sensor is qualified to IEEE 323-1974 and 344-1975.

Saturation curves are available in the control room along with procedures to be used by the operator.

The licensee meets the Category "A" requirements for Item 2.1.3.b. Our Office of Inspection and Enforcement (IE) will verify that eight core exit thermocouples provide input to the monitor when the facility returns to operation.

2.1.4 Containment Isolation

The NRC requirements are that the licensee: (a) carefully reconsider their determination of which system should be considered essential or non-essential for safety; (b) modify systems as necessary to isolate all non-essential systems by automatic, diverse, safety-grade isolation signals; and (c) modify systems as necessary to assure that the resetting of the containment signals does not cause the inadvertent reopening of containment isolation valves.

The licensee's December 31, 1979 and April 9, 1980 submittals identified the essential and non-essential systems and provided the bases for the essential system classification. Non-essential systems are isolated on diverse signals consisting of a low reactor system pressure safety injection signal and a high containment pressure signal.

The design of the control system for automatic containment isolation valves prevents the reopening of the isolation valves while resetting the isolation signal. To prevent inadvertent reopening, each valve has "seal-in" relays which maintain the valve in the closed position following containment isolation reset. The reopening of the isolation valves require deliberate operator action. Isolation valves are reopened on a valve-by-valve basis. Group reopening of automatic isolation valves is precluded by the control system design.

Our conclusion is that the licensee's containment isolation design meets the NUREG-0578 Section 2.1.4 containment isolation requirements and is therefore acceptable.

2.1.6.a Dedicated Penetrations for External Recombiners or Post-Accident External Purge System

The NRC's position is that dedicated containment isolation systems should be used for the external recombiners or purge systems that meet redundancy and single failure requirements.

The licensee utilizes a hydrogen vent system for post accident hydrogen control. This system and its use for hydrogen control is described in their December 31, 1979 and April 9, 1980 submittals. The April 9, 1980 submittal includes a single failure analysis of the system for the containment integrity and the hydrogen control function. As discussed in the submittal, several purge system modifications are being considered to insure that the system meets the single failure. These modifications are to be completed by January 1, 1981.

Based on our review of the above information, we have concluded that the licensee's hydrogen control system meets the NUREG-0578 Section 2.1.5.a. requirements for dedicated penetrations and is therefore acceptable.

2.1.5.c Hydrogen Control Procedures

The NRC's position is that the procedures for use of the hydrogen control system be reviewed considering shielding requirements and personnel exposure limitations.

During the site visit we discussed the licensee's review of the hydrogen vent system operating procedures OP-2658, Rev. 6, and agreed that no modifications are required.

We have concluded that the licensee has met the NUREG-0578 requirements for review of the hydrogen control system procedures, Section 2.1.5.c.

2.1.6.a Systems Integrity

The licensee has provided a list of those systems which he has determined may contain radioactivity following an accident. These systems include the safety injection, shutdown cooling, charging and volume control, main coolant bleed, purification, liquid waste, H_2 vent, waste gas, vapor container recirculation, and main coolant sampling systems. He has also provided a description of the leak reduction program which include visual inspections to identify leakage and appropriate corrective actions.

The licensee has measured final system leak rates and reported the results.

The licensee has established a leak reduction program for systems which may contain activity following an accident which includes testing once per refueling cycle to ensure the potential for release is minimized.

Our October 30, 1979 clarification letter requested the licensee to include a review of potential release paths due to design and operator deficiencies as discussed in the October 17, 1979 letter regarding North Anna. The licensee has analyzed their plant with regard to the North Anna Incident and found that corrective action is not necessary.

Based on the above information, we conclude that the licensee has met the Category A requirements for this item.

2.1.6.b Plant Shielding Review

The licensee has performed a preliminary shielding review for the Yankee Rowe plant. This review indicates that with the source term as specified in the October 30, 1979 Denton letter, the major source of radiation will be the vapor container vessel. The analysis results demonstrate that most onsite buildings would be uninhabitable for several days following an accident. The calculations show that a concrete shield around the containment vessel would be required to reduce the radiation levels to an acceptable level in the early stages of the accident.

The licensee has identified those areas in the plant where access may be required shortly after an accident. The licensee has initiated design changes to provide for safe operation of some of the identified systems.

Due to the problems identified in the shielding review the licensee has proposed that further actions (such as containment enclosure) or performing a more realistic analysis be deferred to the SEP review. The licensee is performing a review of environmental qualification of equipment as part of SEP. This review is currently scheduled to be completed by June 1980 and the licensee has committed to submit the results to the NRC and include all equipment as required by NUREG-0578.

Based on the above considerations, we conclude that the licensee has met the Category "A" requirements for this item.

2.1.7.b Auxiliary Feedwater Flow Indication

The auxiliary feedwater (AFW) flow indicators will be powered from a vital bus. Backup capabilities will come from three steam generator level channels. Present equipment is "control grade" and the accuracy of the feedwater flow is plus or minus five percent.

The licensee meets the Category "A" requirements for Item 2.1.7.b.

2.1.8.a Post-Accident Sampling

The licensee has performed a design review of the plant sampling capability for primary coolant and containment air samples assuming a source as specified in NUREG-0578.

The licensee has implemented interim procedures for obtaining and analyzing reactor coolant and containment atmosphere samples with the existing equipment. The procedures include provisions for keeping occupational exposures as low as reasonably achievable.

The licensee has not provided a conceptual design for reactor coolant and containment atmosphere monitoring in order to meet the Category "B" requirements for this item. However, the licensee has committed to submit the proposed design by May 1, 1980 which will allow sufficient time for NRC review prior to implementation.

Based on the above information, we conclude that the licensee has met the Category "A" requirements for this item.

2.1.8.b High Range Radiation Monitors

The licensee has implemented interim procedures and installed equipment for the quantification of noble gas effluents released from the primary vent stack if the existing instrumentation goes offscale. The licensee has not yet implemented the procedures for obtaining noble gas release rates from the steam dump and safety valves. However, the equipment is available and the procedures have been written. He has committed to implement these procedures prior to plant startup. IE will assure that the procedures are in place. The licensee has identified these as the final release points which include all other individual sources.

The noble gas release rates from the stack will be determined using detector installed on the vent stack sampling line with a local readout. Detector readings can be converted to exhaust concentrations as specified using the existing procedures. The steam release rates will be determined using a portable detector which will be transported to a preselected location on the steam line. Release rates will be determined by converting from the radiation readings to exhaust concentrations. The licensee has also provided a description of the interim system/method to be used to determine radioiodine and particulate effluents.

Based on the above information, we conclude that the licensee has met the Category "A" requirements for this item.

2.1.8.c Improved Iodine Instrumentation

The licensee has designated a portable air sampler to fulfill this function. The sampling medium is a standard charcoal cartridge. The procedures call for analyzing the cartridge with a standard probe. If high radioactivity levels are detected, the cartridge will be purged with clean air to remove noble gases and recounted. If radioactivity is still detected, the cartridge can be counted on a portable dual channel analyzer which will be available near the control room.

The licensee has designated one system to monitor the control room and Technical Support Center (TSC) since both the control room and TSC are serviced by the same ventilation system. The licensee has incorporated procedures for instrument operation and personnel actions in the control room and TSC. Based on the above information, we conclude that the licensee meets the requirements of this item.

2.2.1.a Shift Supervisor (SS) Responsibilities

The NRC requirement for this item is to revise, as necessary, the responsibilities of the SS such that he can provide command oversight of operations and perform management review of ongoing operations that are important to safety.

The licensee has issued management directive MDC 79-6 and revised their plant Procedures AP-2001, Rev. 9 "Responsibilities and Authority of Operating Department Personnel" in response to the staff's requirements.

During the staff's site visit we verified that the licensee's management directives and administrative procedures adequate addressed this position.

We conclude that the licensee has satisfied the requirements of NUREG-0578, Item 2.2.1.a, for the delineation of SS responsibilities.

2.2.1.b Shift Technical Advisor

The NRC requirement is for the licensee to provide an on-shift technical advisor (STA) to the SS to serve the functions of accident assessment and operating experience assessment. As a supplement to the operating staff, the STA must be available to the control room to assist in diagnosing an off-normal event.

The licensee has implemented a program to provide an onsite STA to provide the shift operating crew with an independent accident assessment capability.

A group of six degreed personnel fulfill both the required accident assessment and the operating experience assessment functions of the STA. During the site visit we discussed the STA program with the licensee and determined that a satisfactory STA program is in operation. We find that their STA program is in agreement with the staff's requirements described in Section 2.2.1.c of NUREG-0578 and is therefore acceptable.

2.2.1.c Shift and Relief Turnover Procedures

The NRC requirement is for the licensee to assure that procedures are adequate to provide guidance for a complete and systematic turnover between the off-going and on-coming shift to assure that critical plant parameters are within limits and that the availability and alignment of safety systems are made known to the oncoming shift.

During the site visit our check of the revised procedures "Operations Department Personnel Shift Relief" AP-2002, Rev. 9, "Operations Department Surveillance Schedule" AP-2003, Rev. 14, the shift turnover logs and checklist confirmed that the licensee has addressed this position.

We conclude that the licensee has satisfied the requirements of NUREG-0578, Item 2.2.1.c related to the shift turnover procedures. Adequacy of the checklists and logs will be performed by IE and will be documented by appropriate Inspection Reports.

2.2.2.a Control Room Access

The NRC requirement is for the licensee to make provisions for limiting access to the control room to necessary personnel.

During our site visit our check of the licensee's procedures "Control Room Access During Accident and Operating Transients" confirmed that the licensee has addressed this position.

Based on our review of these procedures, we find that the licensee has satisfactorily implemented the NUREG-0578, Section 2.2.2.a requirements related to control room access.

2.2.2.b Technical Support Center (TSC)

A TSC has been established adjacent to the control room and meets the same habitability criteria. The TSC is equipped with appropriate plant data and operating procedures. Operating parameters can be displayed on a TV screen from a camera located in the control room. The TV camera is controlled from the TSC and the licensee has done a detailed survey to assure control room instruments are reacable. Prior to restart the licensee will have one channel of the Gaitronics dedicated for communication with the control room as well as a dedicated communication capability with the ECC. A dedicated phone to the NRC is in place. The licensee has, as part of the Emergency Plan, established procedures for actuating and staffing the TSC. The licensee has submitted plans to upgrade the TSC to meet the Category "B" requirements.

NRC's IE will verify the existence of dedicated communications between the TSC and control room and TSC and ECC by the time the facility returns to operation. We conclude the licensee's actions meet the Category "A" requirements of this item.

2.2.2.c On-site Operational Support Center (OSC)

The licensee has established an OSC located in the Boiler Feed Pump Room. Communications exist between the OSC and the control room and the OSC is described and activated per the emergency plan. The licensee's actions meet the requirements for this item.

NRR Reactor Coolant System Venting

The licensee has proposed a design for venting of the reactor coolant system in fulfillment of the Category "A" requirements.

Conclusion Based on the above, subject to IE verification as noted, we find that implementation of the Category "A" Lessons Learned requirements at Yankee Rowe is acceptable.

Dated: