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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO GENERIC LETTER 83-28, ITEM 1.2 - POST-TRIP REVIEW

DATA AND INFORMATION CAPABILITY

DETROIT EDISON COMPANY

FERMI-2

DOCKET NO. 50-244

1.0 INTRODUCTION

On February 25, 1983, both of the scram circuit breakers at Unit 1 of the Salem Nuclear Power Plant failed to open upon an automatic reactor trip signal from the reactor protection system. This incident occurred during the plant start-up and the reactor was tripped manually by the operator about 30 seconds after the initiation of the automatic trip signal. The failure of the circuit breakers has been determined to be related to the sticking of the under voltage trip attachment. Prior to this incident, on February 22, 1983, at Unit 1 of the Salem Nuclear Power Plant, an automatic trip signal was generated based on steam generator low-low level during plant start-up. In this case, the reactor was tripped manually by the operator almost coincidentally with the automatic trip.

Following these incidents, on February 28, 1983, the NRC Executive Director for Operations (EDO) directed the staff to investigate and report on the generic implications of these occurrences at Unit 1 of the Salem Nuclear Power Plant. The results of the staff's inquiry into the generic implications of the Salem unit incidents are reported in NUREG-1000, "Generic Implications of the ATWS Event at the Salem Nuclear Power Plant." As a result of this investigation, the Commission (NRC) requested (by Generic Letter 83-28 dated July 8, 1983) all licensees of operating reactors, applicants for an operating license, and holders of construction permits to respond to certain generic concerns. These concerns are categorized into four areas: (1) Post-Trip Review; (2) Equipment Classification and Vendor Interface, (3) Post-Maintenance Testing; and (4) Reactor Trip System reliability Improvements. The licensee submitted a response to Generic Letter 83-28 on November 3, 1983.

This safety evaluation (SE) addresses only the licensee's response to Action Item 1.2. Post-Trip Review, Data and Information Capability.

2.0 PROPOSED CHANGES

The licensee's response to Generic Letter 83-28 was reviewed to ensure that the licensee has the capability to record, recall and display data and information which will permit diagnosing of the causes of unscheduled reactor shutdowns and for ascertaining the proper functioning of safety-related equipment.

3.0 REVIEW CRITERIA

The following review guidelines were developed after initial evaluation of the various utility responses to Item 1.2 of Generic Letter 83-28 and incorporate the best features of these submittals. As such, these review guidelines in effect represent a "good practices" approach to post-trip review. We have reviewed the licensee's response to Item 1.2 against these guidelines:

A. The equipment that provides the digital sequence of events (SOE) records and the analog time history records of an unscheduled shut down should provide a reliable source of the necessary information to be used in the post-trip review. Each plant variable, which is necessary to determine the cause and progression of the events following a plant trip, should be monitored by at least one recorder (such as a sequence-of-events recorder or a plant process computer) for digital parameters; and strip charts, a process computer or analog recorder for analog (time history) variables. Performance characteristics guidelines for sequence-of-events and time history recorders are as follows:

   Each sequence-of-events recorder should be capable of detecting and recording the sequence of events with a sufficient time discrimination capability to ensure that the time responses associated with each monitored safety-related system can be ascertained, and that a determination can be made as to whether the time response is within acceptable limits based on FSAR Accident Analyses. The recommended guidelines for the sequence of event time discrimination is approximately 100 milliseconds. If current sequence-of-event recorders do not have this time discrimination capability, the licensee should show that the current time discrimination capability is sufficient for an adequate reconstruction of the course of the reactor trip and post-trip events. As a minimum, this should include the ability to adequately reconstruct the transient and accident scenarios presented in the plant FSAR.

   Each analog time history data recorder should have a sample interval small enough so that the incident can be accurately reconstructed following a reactor trip. As a minimum, the licensee should be able to reconstruct the course of the transient and accident sequences evaluated in the accident analysis of the plant FSAR. The recommended guideline for the sample interval is ten seconds. If the time history equipment does not meet this guideline, the licensee should show that the time history capability is sufficient to accurately reconstruct the transient and the accident sequences presented in the FSAR. To support the post-trip analysis of the cause of the trip and the proper functioning of involved safety-related equipment, each analog time history data recorder should be capable of updating and retaining information from approximately five minutes prior to the trip until at least ten minutes after the trip.

   All equipment used to record sequence-of-events and time history information should be powered from a reliable and non-interruptible power source. The power source used need not be safety-related.

B. The sequence-of-events and time history recording equipment should monitor sufficient digital and analog parameters, respectively, to assure that the course of the reactor trip and post-trip events can be reconstructed. The parameters monitored should provide sufficient information to determine the root cause of the unscheduled shutdown, the progression of the reactor trip, and the response of the plant parameters and protection and safety systems to the unscheduled shutdowns. Specifically, all input parameters associated with reactor trips, safety injections and other safety-related systems as well as output parameters sufficient to record the proper functioning of these systems should be recorded for use in the post-trip review. The parameters deemed necessary, as a minimum, to perform a post-trip review that would determine if the plant remained within its safety limit design envelope are presented in Table 1. They were selected on the basis of staff engineering judgment following a complete evaluation of utility submittals. If the licensee's sequence-of-events and time history recorders do not monitor all of the parameters suggested in these tables, it should be shown that the existing set of monitored parameters are sufficient to establish that the plant remained within the design envelope for the accident conditions analyzed in the plant FSAR.

C. The information gathered by the sequence-of-events and time history recorders should be stored in a manner that will allow for data retrieval and analysis. The data may be retained in either hardcopy, (e.g., computer printout, strip chart record), or in an accessible memory (e.g., magnetic disc or tape). This information should be presented in a readable and meaningful format, taking into consideration good human factors practices such as those outlined in NUREG-0700.

D. Retention of data from all unscheduled shutdowns provides a valuable reference source for the determination of the acceptability of the plant vital parameters and equipment response to subsequent unscheduled shutdowns. Information gathered during the post-trip review is to be retained for the life of the plant for post-trip review comparison of subsequent events.

4.0 EVALUATION AND DISCUSSION

By letter dated November 3, 1983, the Detroit Edison Company provided information regarding its post-trip review program data and information capabilities for the Fermi-2 nuclear plant. We have evaluated the licensee's submittal against the review guidelines described in Section 3.0. Licensee's deviations from the guidelines of Section 3.0 were reviewed with the licensee by telephone on August 19, 1991. A brief description of the licensee's response and the staff's evaluation of the responses against each of the review guidelines are provided below:

A. The licensee has described the performance characteristics of the equipment used to record the sequence-of-events and time history data needed for post-trip review. Based on our review, we find that the sequence-of-events and time history recorder characteristics conform to the guidelines described above and are acceptable.

Information supplied in the licensee's original submittal of November 3, 1983, indicated that the SOE recorder met the guidelines noted above but that the analog time history data recorder did not. Subsequently, the licensee installed a Safety Parameter Display System (SPDS). The data sampling and retention characteristics of the SPDS exceed the guidelines for time history data noted above.

B. The licensee has established and identified [illegible] parameters to be monitored and recorded for post-trip review. Based on our review, we find that the parameters selected by the licensee include most of those identified in Table 1. The licensee does not record all of the parameters recommended in Section 3.0B; however, alternate parameters may be used to implicitly determine the recommended parameter. Further, as noted below, both the SOE recorder and the SPDS record parameters over and above those noted in the licensee's original response.

We find that containment isolation is not recorded directly but is indirectly available by consulting individual actuation signals. Turbine bypass valve position is available directly from General Electric Transient Analysis Recorder System (GETARS) or can be inferred by consulting reactor pressure. The SOE recorder now monitors turbine trip, AC/DC system status (high and low voltage alarms) and emergency diesel generator (EDG) status. Safety injection flow, containment drywell radiation, and steam flow are monitored by the SPDS. Steam flow is also recorded as an analog signal on the plant process computer. Suppression pool temperature is monitored by the SPDS with a high temperature alarm logged on the SOE recorder. Recirculation flow is monitored on the SPDS with pump trip and runback recorded on the SOE recorder. Condenser vacuum is monitored on the SPDS and the low vacuum alarm is logged on the SOE recorder.

In summary, most of the desirable plant parameters needed for post-trip review are now recorded by the licensee. Alternative data sources for those parameters not directly recorded are available for the post-trip review. Consequently, we find that the licensee's selection of parameters meets the intent of the guidelines described in Section 3.0B and is, therefore, acceptable.

C. The licensee has described the means for storage and retrieval of the information gathered by the sequence-of-events, time history and analog data base recorders, and for the presentation of this information for post-trip review and analysis. Based on our review, we find that this information is being presented in a readable and meaningful format, and that storage, retrieval and presentation conform to the guideline of Section 3.0C.

D. The licensee has described the retention capability of the data gathered by the plant computer and the time history records. Based on our review, we find that the program for the retention of data conforms to the guidelines of Section 3.0D.

5.0 CONCLUSION

Based on the foregoing discussion, the staff concludes that the licensee's post-trip review data and information capabilities for the Fermi-2 nuclear plant are acceptable for Item 1.2 of Generic Letter 83-28.

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TABLE 1

BWR PARAMETER LIST

SOE Recorder	Time History Recorder	Parameter / Signal
x		Reactor Trip
x		Safety Injection
x		Containment Isolation
x		Turbine Trip
x		Control Rod Position
(1) x	x	Neutron Flux, Power
(1) x		Main Steam Radiation
(2)		Containment (Drywell) Radiation
(1) x	x	Drywell Pressure (Containment)
(2)		Suppression Pool Temperature
(1) x	x	Primary System Pressure
(1) x	x	Primary System Level
x		MSIV Position
(1) x		Turbine Stop Valve Position
x		Turbine Bypass Valve Position
	x	Feedwater Flow
	x	Steam Flow
(3)		Recirculation; Flow, Pump Status
(1) x		Scram Discharge Level
(1) x		Condenser Vacuum
x		AC and DC System Status (Bus Voltage)
(3)(4)		Safety Injection; Flow, Pump/Valve Status
x		Diesel Generator Status (Start/Stop, On/Off)

(1) Trip parameters
(2) Parameter may be monitored by either an SOE or time history recorder.
(3) Acceptable recorder options are:
    (a) system flow recorded on an SOE recorder,
    (b) system flow recorded on a time history recorder, or
    (c) equipment status recorded on an SOE recorder.
(4) Includes recording of parameters for all applicable systems from the following: HPCI, LPCI, LPCS, IC, RCIC.