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STOLZ,J.F. Operating Reactors Branch 4

SUBJECT: Forwards addl info requested in 850604 ltr re review of SAR for SPDS.

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July 19, 1985

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. John F. Stolz, Chief
Operating Reactors Branch No. 4

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

Dear Sir:

By letter dated June 4, 1985, the NRC transmitted their review and approval of Duke Power Company's Safety Analysis Report for the Safety Parameter Display System (SPDS). However, as a result of the review, additional information was requested by the NRC. Attached please find the information requested.

Very truly yours,

H. B. Tucker /lbl

Hal B. Tucker

SGG:slb

Attachment

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Duke Power Company

Oconee Nuclear Station

Response to NRC Request For Additional
Information Regarding The Safety Parameter
Display System (SPDS)

July 19, 1985

Question 1:

The following variables are not proposed for the Oconee SPDS:

(a) RCS Level
(b) Hot Leg Temperature
(c) Cold Leg Temperature

Duke Power Company should respond by either (1) adding these variables to the Oconee SPDS, or (2) providing alternate added variables along with justification that these alternates accomplish the same safety function for all scenarios, or (3) providing justification that variables currently on the Oconee SPDS do in fact accomplish the same safety functions for all scenarios.

Response:

(a) RCS Level
Reactor Coolant System (RCS) level measuring instrumentation is currently scheduled for installation at Oconee as part of the Inadequate Core Cooling Monitoring System. A description of this system and the proposed implementation dates are discussed in the Duke Power submittal of the Final Design Description of the Inadequate Core Cooling Monitoring System for Oconee dated July 1, 1985. At the time of implementation, this instrumentation will be included in the SPDS logic to enhance the Inadequate Core Cooling and RCS Critical Safety Functions (CSF). The RCS level indications will not be displayed on the SPDS since a separate display with this information will be installed on the control boards as part of the ICC Monitoring System.

(b & c) Hot and Cold Leg Temperatures
Hot leg temperatures are used in the SPDS to calculate the subcooled margin of both hot legs. This information is used in the Inadequate Core Cooling CSF to indicate saturated RCS conditions. Cold leg temperature is used in the RCS Integrity CSF to monitor the RCS cool-down rate and minimum temperature and alert the operator to the potential for pressurized thermal shock. The SPDS is also designed to alert the operator to RCS pressure/temperature (P/T) conditions which are approaching the NDT limit. This determination is also based on RCS cold leg temperature.

RCS hot leg and cold leg temperatures are not used explicitly in the SPDS to determine if natural circulation has been established following the trip of all reactor coolant pumps. Instead, a RCS P/T color graphic display has been included as part of the Operator Aid Computer (OAC)

upgrade to assist the operator in identifying transient as well as typical plant response. Included in the P/T displays are hot leg, cold leg and core exit temperatures as well as steam generator level and pressure. From this display, the operator can readily monitor natural circulation. The information provided by the P/T displays is redundant to the normal control room instrumentation available to the operator.

- Question 2:

Identify the variable(s) used to monitor the system status parameters represented on the SPDS, e.g., "Low Pressure Injection System".

Response:

The SPDS is designed to monitor the status of several plant systems to ensure that they are performing both their normal and emergency functions. The SPDS logic uses this information to warn the operator of degraded system performance or system failure through the appropriate CSF alarm. The specific systems monitored by the SPDS are listed below.

- Low Pressure Injection System (LPIS) - normal and emergency functions
- High Pressure Injection System (HPIS) - normal and emergency functions
- Main Feedwater System (MFW) - normal function
- Emergency Feedwater System (EFW) - normal function
- Condensate System (CS) - normal function
- Condenser Circulating Water (CCW) - normal and emergency functions
- Low Pressure Service Water (LPSW) - normal and emergency functions
- Reactor Building Isolation System (RBIS) - emergency function
- Reactor Building Cooling System (RBCS) - emergency function
- Reactor Building Spray System (RBSS) - emergency function

The list of parameters used to monitor each of these systems is quite extensive (approximately 180). The detailed identification of each parameter and how it is monitored is not practical. However, the approach that is used to determine the status of each system is as follows:

Each of the systems listed above are designed to operate in certain configurations or alignments depending upon its normal or engineered safeguards (ES) mode. Based upon plant operating experience and system testing, the specific performance characteristics of each system are known. Thus the SPDS logic is designed to take advantage of this information and generate a CSF alarm if a particular system is required to be in service but the expected performance is not observed. This is accomplished, for example, by monitoring the number of pumps in operation, key valve positions, RCS pressure, temperature, and power, which are then compared to the expected valve alignments and expected system performance. When an ES channel has been actuated, the logic will monitor the same parameters to verify the expected ES performance and ensure that ES initiated valve repositioning has occurred and the resulting system flowrates are as expected.

- Question 3:

Discuss how radiation in the secondary system (steam generators and steam lines) is monitored on the SPDS when the steam generators and/or their steam lines are isolated.

Response:

Secondary system radiation monitors are currently installed on both steam lines (RIA-16, 17) and on the condensor steam jet air ejector (CSAE) exhaust (RIA-40). These monitors are physically located at the main steam line penetration of the turbine building and the CSAE exhaust piping which leads to the unit vent. The alarms are used in the SPDS logic to identify a steam generator tube rupture (SGTR) which indicates a breach in RCS integrity.

If a sizable SGTR occurs while the unit is at power operation, the RIAs will promptly respond and generate an alarm of the RCS Integrity CSF. However, if a SGTR occurs after a steam generator has been isolated due to a secondary piping break, indications of the break may be limited to the primary system response and an unexpected increase in steam generator level. The RIAs may be unable to detect an increase in secondary radiation unless the isolated generator is being steamed. The operator training program includes training on the diagnosis of a SGTR including the expected indications following steam generator isolation.

- Question 4:

It is not clear that the methods used for data validation are comprehensive in terms of validation of all SPDS inputs or in terms of validation over all emergency conditions. Please commit to physical and/or analytical validation for all SPDS inputs.

Response:

The Oconee SPDS design provides several checks on input signal validity. All Operator Aid Computer (OAC) analog inputs are continuously monitored for over and under range conditions, scan lockout, and out of service status. Input power fuses for all digital inputs are also monitored. Ths SPDS logic is designed such that any failed input as monitored above is considered by the SPDS logic and "invalid input"/"indeterminate" status is displayed to the operator. These input validity checks apply to all OAC inputs; and, as such, apply to all SPDS inputs and are applicable over all emergency conditions.

In addition, the logic which drives the SPDS display utilizes redundant inputs on critical parameters where currently available, e.g. RCS Pressure, Containment Pressure, etc. Additional safety instrumentation (RCS Pressure, Pressurizer Level, High Pressure Injection Flow, Low Pressure Injection Flow, etc.) will be added at Oconee as outlined in Duke Power's "Response to Supplement 1 to NUREG-0737" for Oconee Nuclear Station. These new instruments will also provide isolated inputs to the OAC. Duke Power plans to modify the SPDS to utilize these additional redundant signals (in the same manner as previously described) in the SPDS logic as these signals become available, thus providing additional physical reduncancy in the SPDS.

Duke Power is currently working closely with other utilities on a Utility Advisory Group formed to provide project direction to EPRI Research Project RP-2292-1, "Validation and Integration of Critical PWR Signals". The purpose of the project is to develop a methodology and a system of computer software for on-line validation of signals for use in nuclear power plants. The project scope is specifically aimed at validation methodologies using physical and/or analytical redundancy. An important goal of the project is a high degree of utlity involvement to insure that the project will satisfy the needs of the utilities. The project Final Report is expected to be complete by the second quarter of 1987. Duke Power is hopeful that the project will produce practical signal validation techniques that potentially can be retrofitted into our SPDS design. Duke Power intends to closely review the results of this EPRI project and to evaluate implementation of resulting physical and/or analytical redundancy software on the Oconee SPDS.