
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 400-8425
SRP Section: 18 – Human Factors Engineering
Application Section:
Date of RAI Issue: 02/04/2016

Question No. 18-117

Regulations in 10CFR 50.34(f)(2)(iv) describe requirements for a safety parameter display system (SPDS). NUREG-0711, Criterion 8.4.4.2(1), describes an acceptable method for complying with the regulation, and states that the applicant should verify that the SPDS HSIs conform to the acceptable HFE practices using NUREG-0700, Section 5, "Safety Function and Parameter Monitoring System.

Guideline 5.3-2 and Guideline 5.3-3 discuss data reliability and display of data reliability. Describe how the plant data that is an input to the SPDS meets the guidelines. If this information has been submitted with the application (e.g., in DCD Tier 2, Chapter 7), then indicate which section discusses how these guidelines are applied to the SPDS HSI resources. Revise the submittal as necessary.

Response

The safety parameter display and evaluation system + (SPADES+) is implemented in the information processing system (IPS).

The three types of inputs are processed in the IPS for the display of SPADES+ as follows:

- Direct instrument inputs are direct instrument measurements with only engineering unit conversion and alarm checking processed by IPS.
- Composed point inputs are either the best estimate, average rate, maximum or minimum of several analog inputs, or a logical combination of several analog (or digital) states.
- Calculated variable inputs are variables calculated by a specified algorithm using any of the three input types.

The quality of composed points and calculated variables is determined from the quality of their direct instrument inputs.

All inputs to IPS have an indication of the quality of their value for data reliability. The quality is specified as follows:

- a. Good Scan is on and point is in range
- b. Fair Operator entered value
- c. Poor Generated from certain algorithms if some input were bad and some input were good
- d. Bad Scan is off (with no operator entered value) or sensor has failed, out of engineering range

APR1400 DCD Tier2, Subsection 7.7.1.4 will be revised as indicated in the attachment associated with this response.

Impact on DCD

APR1400 DCD Tier2, Subsection 7.7.1.4 will be revised as indicated in the Attachment associated with this response.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

APR1400 DCD TIER 2

- 3) Provides detailed plant process data to the operating staff via IPS displays and the LDP.
- 4) Provides data archive and retrieval functions.
- 5) Provides safety parameter displays to assist the operating staff during abnormal or accident conditions and provides this data to the staff in the MCR, RSR, TSC and EOF.
- 6) Processes for alarm signals and alarm controls including cross check with the QIAS-N alarms.
- 7) Generates log reports.
- 8) Supports the operating staff's control actions including selection of control objects.
- 9) Performs on-line diagnostics for continuous self-health monitoring.
- 10) Performs signal validation on input signals.
- 11) Determines a representative value for a given parameter being sensed by multiple sensors.
- 12) Accommodates a failure of any single hardware element so that no single failure within the IPS can disable any of the aforementioned functions; hardware redundancy coupled with continuous on-line diagnostics provides high availability.

The advanced alarm processing described in Section 18.7 is built into the IPS to minimize the number of alarms (via alarm grouping and prioritization) and generation of spurious alarms (nuisance alarms). Alarm priority categories are established to inform the operating staff of the relative importance of any alarm.

The IPS is designed with sufficient alarm buffer so that no alarm is "lost" during a high influx of alarms.

b. IPS configuration

Insert "A" on the next page.

"A"

13) Indicates the quality of the input values. The Quality is specified as follows:

- a) Good Scan is on and point is in range
- b) Fair Operator entered value
- c) Poor Generated from certain algorithms if some input were bad and some input were good
- d) Bad Scan is off (with no operator entered value) or sensor has failed, out of engineering range