

## **KHNPDCDRAIsPEm Resource**

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**From:** Ciocco, Jeff  
**Sent:** Tuesday, April 26, 2016 10:25 AM  
**To:** apr1400rai@khnp.co.kr; KHNPDCDRAIsPEm Resource; Junggho Kim (jhokim082@gmail.com); Andy Jiyong Oh; Steven Mannon  
**Cc:** Harbuck, Craig; Dias, Antonio; Umana, Jessica; Williams, Donna; Akstulewicz, Frank  
**Subject:** APR1400 Design Certification Application RAI 470-8552 (16 - Technical Specifications)  
**Attachments:** APR1400 DC RAI 470 SPSB 8552.pdf

KHNP,

The attachment contains the subject request for additional information (RAI). This RAI was sent to you in draft form. Your licensing review schedule assumes technically correct and complete responses within 30 days of receipt of RAIs. However, KHNP requests, and we grant, the following RAI question response times. We may adjust the schedule accordingly.

30 16-136: 30 days  
60 16-137: 60 days  
30 16-138: 30 days

Please submit your RAI response to the NRC Document Control Desk.

Thank you,

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## REQUEST FOR ADDITIONAL INFORMATION 470-8552

Issue Date: 04/26/2016  
Application Title: APR1400 Design Certification Review – 52-046  
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.  
Docket No. 52-046  
Review Section: 16 - Technical Specifications  
Application Section: 16.3.3.1, 16.3.3.2, 16.3.3.4, 16.3.3.5, 16.3.3.6, 16.3.3.14

### QUESTIONS

16-136

This is a follow up question regarding KHNP response to Sub-question 16-113.8. This issue was discussed during the Feb 24 & 25, 2016, meeting:

The surveillance column Note for SR 3.3.14.1, Channel Check of BDAS channels, proposed revision is not consistent with the STS convention for Notes that actually modify the surveillance frequency, not the applicability of the surveillance. The Note should say: "Not required to be performed until 1 hour after neutron flux is within the startup range," which is what DCD Rev 0 says.

16-137

The response to RAI-Question 16-89 was lacking sufficient detail to resolve the questions asked.

1. The applicant is requested to submit a table that shows the following for each component, segment, and portion of the instrument loop from the process sensor through bistable logic, coincidence logic, initiation logic, actuation logic, the component interface module, or reactor trip logic to the reactor trip circuit breakers, or the actuated end device in the ESFAS circuits:

- component name or description
- name of test as depicted on DCD Figure 7.2-11
- name of test as stated in DCD 7.2.2.5
- corresponding generic TS Section 3.3 surveillance requirement as defined in generic TS Section 1.1 (CHANNEL CHECK; CHANNEL FUNCTIONAL TEST, CHANNEL CALIBRATION)

The NRC staff included a draft of the requested table in the agenda notes for the meeting between the NRC staff and Applicant staff on February 24 and 25, 2016. That table was based on information in the DCD and in the response to RAI-Question 16-89. The applicant may use that draft table as a guide in preparing the requested table; however, the staff does not consider the table to be fully accurate because the DCD descriptions are unclear.

2. Notice that DCD Figure 7.2-11 does not depict "CPCS Test" and "Manual Trip Test", which are described in DCD Section 7.2.2.5. The applicant is requested to revise DCD Tier 2 Section 7.2 so that Section 7.2.2.5 and Figure 7.2-11 are correctly aligned. In addition, consider adding

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a discussion in DCD Tier 2 Section 7.3 that describes the testing for the ESFAS instrumentation loops with the same level of detail as the requested revised description in DCD Tier 2 Section 7.2.2.5, and also a figure equivalent to Figure 7.2-11. Notice that Figure 7.2-11 depicts no tests for ESFAS related components after the input to the actuation logic in the group controller.

3. The last two sentences of the response to RAI-Question 16-89 said,

... the “Bistable Logic Test” and the “CPCS Test” of the RPS CHANNEL FUNCTIONAL TEST are performed in accordance with the Setpoint Control program (SCP). The remaining tests specified in the SCP such as Nominal Trip Setpoint, Allowable Value, As-Found Tolerance, and As-Left Tolerance are not directly related to setpoints.

The applicant is requested to explain what is meant by these statements. For example, the NTSP, AV, AFT, and ALT are not tests. Also, the ESFAS CHANNEL FUNCTIONAL TEST and the CHANNEL CALIBRATION are not mentioned.

4. The applicant is requested to explain what meaning the "OR" logical gate symbols on Figure 7.2-11 are intended to convey; especially with respect to depicting testing overlap.

The requested information is needed to enable the NRC staff to determine whether or not surveillances for RPS and ESFAS instrumentation functions satisfy 10 CFR 50.36 requirements.

16-138

The response to RAI-Question 16-95 proposed to use the phrase “daily power calibration” in place of the various phrases listed in the Bases for SR 3.3.1.4 and also in SR 3.3.1.4 itself. However, since the response did not state what is meant by the phrase “daily power calibration” the proposed changes did not provide the needed clarity and consistency. The applicant is requested to revise SR 3.1.1.4 and associated Bases to be consistent with the following markup:

SR 3.3.1.4

-----NOTES-----

2. The daily **power** calibration may be suspended during PHYSICS TESTS, provided calibration is performed upon reaching each major test power plateau and prior to proceeding to next major test power plateau.

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Perform **the daily power calibration** ~~calorimetric calculation~~ **by calculating core THERMAL POWER from the daily secondary heat balance measurement (a calorimetric)** and adjusting the linear power, CPC  $\Delta T$  **power**, and CPC neutron flux

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power **channels** to agree with ~~calorimetric calculation~~ **the calculated THERMAL POWER** if any ~~of the linear power, CPC  $\Delta T$ , and CPC neutron flux power is less than calorimetric calculation by~~ **channel indicates** more than 0.5% RTP less than **the calculated THERMAL POWER**.

### SR 3.3.1.4

**The daily power calibration is the calculation of the core THERMAL POWER by performing a secondary heat balance measurement (a calorimetric) and adjusting the linear power, CPC  $\Delta T$  power, and CPC neutron flux power channels to agree with the calculated THERMAL POWER if any channel indicates more than 0.5% RTP below the calculated THERMAL POWER.** A daily ~~heat balance power~~ calibration is performed when THERMAL POWER is greater than or equal to 15% RTP. The linear power level signal and the CPC addressable constant multipliers are adjusted **in each channel** to make **the linear power level signal and CPC-calculated signals for CPC  $\Delta T$  power and CPC neutron flux nuclear power calculations** agree with the **calculated THERMAL POWER (calorimetric) calculation** if the signal from any channel of linear power, CPC  $\Delta T$  power, and CPC neutron flux power is more than 0.5% RTP less than the **calculated THERMAL POWER** ~~the absolute difference is greater than or equal to 0.5%~~. The value of 0.5% RTP is adequate because this value is assumed in the safety analysis. These checks (and if necessary, the adjustment of the linear power level signal and CPC addressable constant coefficients) are adequate to ensure that the accuracy of these ~~CPC calculations~~ **CPC-calculated signals** is maintained within the analyzed error margins. ~~The power level~~ **Core THERMAL POWER** must be greater than 15% RTP to obtain accurate **secondary heat balance measurement (calorimetric)** data. At lower power levels, the accuracy of calorimetric data is ~~questionable~~ **inadequate**.

The Frequency of 24 hours is based on plant operating experience and takes into account indications and alarms located in the MCR to detect deviations in channel outputs. The Frequency is modified by Note 1 indicating this Surveillance need only be performed within 12 hours after reaching 15% RTP. The 12 hours after reaching 15% RTP is required for plant stabilization, data taking, and flow verification. The secondary calorimetric **calculated THERMAL POWER** is inaccurate at lower power levels. A second note in the SR indicates the SR may be suspended during PHYSICS TESTS.

The conditional suspension of the daily ~~calibrations~~ **power calibration** under strict administrative control is necessary to allow special testing to occur.

### SR 3.3.1.5

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The RCS flow rate indicated by each CPC is verified to be less than or equal to the RCS total flow rate every 31 days. The Note indicates the Surveillance is performed within 12 hours after THERMAL POWER is greater than or equal to 80% RTP. This check (and if necessary, the adjustment of the CPC addressable flow constant coefficients) ensures that the DNBR setpoint is conservatively adjusted with respect to actual flow indications as determined by a ~~calorimetric calculation~~ **daily power calibration**. Operating experience has shown the specified Frequency is adequate, as instrument drift is minimal, and changes in actual flow rate are minimal over core life.

### SR 3.3.1.8

... The detectors are excluded from CHANNEL CALIBRATION because they are passive devices, with minimal drift, and because of the difficulty of simulating a meaningful signal. Slow changes in detector sensitivity are compensated by performing the daily ~~CALORIMETRIC CALIBRATION~~ **power calibration** (SR 3.3.1.4) and the monthly linear **power** subchannel gain check (SR 3.3.1.6). In addition, the associated MCR indications are monitored by the operators.



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