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## 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.: 223-8204  
SRP Section: 11.05 – Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems  
Application Section: 11.5  
Date of RAI Issue: 09/23/2015

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### **Question No. 11.05-4**

Section 11.5.2.2.h identifies the Main Control Room air intake monitors (RE-071A, 072B, 073B, and 074B) are safety related.

1. The conformance to applicable requirements of IEEE Std. 603-1991 is required by 10 CFR Part 50.55a(h)(3) which should be stipulated for these Monitors and any other portions of this system which are safety related.
2. The Final Safety Analysis Report should discuss how such equipment meets the requirements outlined in IEEE Std. 603-1991.

Please address this item and provide a markup for the proposed DCD changes.

### **Response**

These four monitors are quadruple redundant instruments. The design and qualification is provided in Table 11.5-1, page 2 in summary form. Details of the compliance to IEEE Std. 603-1991 are as follows:

- Single-failure criterion

The monitors are designed and configured to be quadruple redundant (dual redundancy twice) to meet the single-failure criterion. The reason for this unique arrangement is to accommodate the divisionalized air intake before merging into a common plenum which can be separated when needed. This configuration allows independence of the redundant sensing instrumentation channels and precludes either a detectable or non-detectable failure impairing proper functioning of its intended safety function.

- Completion of protective action

The four redundant radiation monitor signals are brought into the balance of plant - engineered safety features actuation system (BOP-ESFAS) coincidence logic, where the one-out-of-two logic is run twice downstream to a high radiation bistable trip circuit for each signal. The output of the coincidence logic is the BOP-ESFAS control room emergency ventilation actuation signal (CREVAS). For each redundant actuation division of HVAC equipment, the actuated equipment is grouped in two; one that cannot be manually overridden until the protective action is completed, when the radiation level subsides and falls below a preset level. The other group includes equipment that could be manually overridden depending upon the plant condition. The latter group includes equipment such as air intake supply dampers which the operator can select the intake air path that shows an acceptable radiation level. This is possible since the two air intakes are located on the far end of the auxiliary building separated by the building structure.

- Quality

Table 11.5-1 (page 2) shows these monitors to be safety class 3 per ANSI/ANS 51.1, seismic category I, quality class Q, and electrical class 1E, which means these instruments including all associated appurtenances are designed, manufactured, inspected, installed, tested, operated, and manufactured in accordance with ASME NQA-1-2008, QA program. The instrumentation portion that performs safety related protective functions do not have embedded software or firmware. Therefore, the application guidance provided in IEEE Std. 7-4.3.2-2003 is not applicable.

- Equipment qualification

As discussed above, these four instrumentation loops including sensors and associated appurtenances are seismically qualified in accordance with IEEE Std. 344-2004 and environmentally qualified per IEEE Std. 323-2003. IEEE Std. 7-4.3.2-2003 is not applicable.

- System integrity

These four instruments, associated devices, and components are designed to perform their intended safety function of protecting the main control room operators from high radiation under accident conditions expected during design basis accidents, such as LOCA or a fuel handling accident. IEEE Std. 7-4.3.2-2003 is not applicable.

- Independence

The redundant safety related instrumentation loops are spatially and physically separated and are electrically isolated between the redundant loops when and where cross-connects are needed (i.e., coincident logics) using a qualified isolating medium. The interconnections between the safety portions and the non-safety SSC are electrically isolated using qualified isolation medium. Locations of these instrumentation loops are carefully determined and analyzed to ensure that functional degradation of these loops would not occur due to physical proximity or functional interaction. This is in accordance with IEEE Std. 384-1992, Regulatory Guide 1.120, Regulatory Guide 1.189, ISA S69.0, and Regulatory Guide 1.151. The effect of a single failure of a non-safety SSC affecting or downgrading the safety function of the safety MCR intake

radiation instrumentation loops is precluded and prevented based on basic features in the design, manufacturing, inspection, installation, and testing discussed above in detail.

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**Impact on DCD**

There is no impact on the DCD.

**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.