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.: **43-7887**

SRP Section: **7.1 - Instrumentation and Controls**

Application Section: **7.1.2.3**

Date of RAI Issue: **06/22/2015**

Question No. 07.01-25

Provide adequate design information and accompanying analysis to demonstrate predictable and repeatable operation of the CPCS central processing unit (CPU) when processor loading exceeds 70 percent. Provide the basis and analysis for the 70 percent CPU loading criteria and describe how the particular tests and analyses proposed in the application will be conducted to verify predictable and repeatable behavior. Include an inspection, tests, analyses, and acceptance criteria (ITAAC) item to include the necessary analysis and test to ensure predictable and repeatable operation of the CPCS system once software development has been completed and for support of future software maintenance.

10 CFR 50.55a(h)(3) requires compliance with IEEE Std. 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," and the correction sheet dated January 30, 1995. Clause 5.5 of IEEE Std. 603-1991 requires the safety systems shall be designed to accomplish their safety functions under the full range of applicable conditions enumerated in the design basis. Clause 5.15, "Reliability," requires, in part, that for those systems for which either quantitative or qualitative reliability goals have been established, appropriate analysis of the design shall be performed in order to confirm that such goals have been achieved. 10 CFR 52.47(b)(1), requires that a design certification application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations.

Technical Report APR1400-A-J-NR-14004-P, Rev. 0, "Common Q Platform Supplemental Information in Support of the APR1400 Design Certification," states, in part, that the maximum load of the Common Q platform CPU (AC160) to be used for the APR1400 CPCS system needs to be raised to 75 percent, which exceeds the 70 percent CPU load limit as specified in the Common Q Topical Report, WCAP- 16097-P-A, Rev. 3. In addition, many restrictions for configuration and programming have been proposed in the above technical

report APR1400-A-J-NR-14004-P, so the task processing and communication in the CPCS could be deterministic. Particular tests are proposed to be conducted to ensure that the CPCS system will behave in a predictable and repeatable manner. However, the above Common Q Topical Report specifies that the maximum CPU load must not exceed a value of 70 percent to ensure the deterministic communication. Describe how the CPCS system will be able to reliably perform all scheduled CPU tasks when the CPU load exceeds 70 percent. The description should include the basis for the CPU loading criteria, analysis, and/or outline the analysis to be performed that demonstrates reliable performance for CPU loading once the software is completed. Also, describe how the proposed tests will be conducted to verify the deterministic communication and include an ITAAC to ensure that the necessary analysis and tests will be conducted to ensure the CPCS CPU tasks behave in a predictable and repeatable manner.

Response

The response is provided as the attachment.

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.

Westinghouse

Appendix A

Westinghouse provides the following input to KHNP and KEPCO E&C to assist in the preparation of the response to RAI 43-7887, Question 07-01-25.

Per the ABB users guide(reference 1, section 3.2.2.1)the maximum load for an AC160 Controller shall not exceed 70%.There are applications in which this 70% limit is not sufficient, and a 75% load is required to execute the application. The CPC design is one of these applications. [

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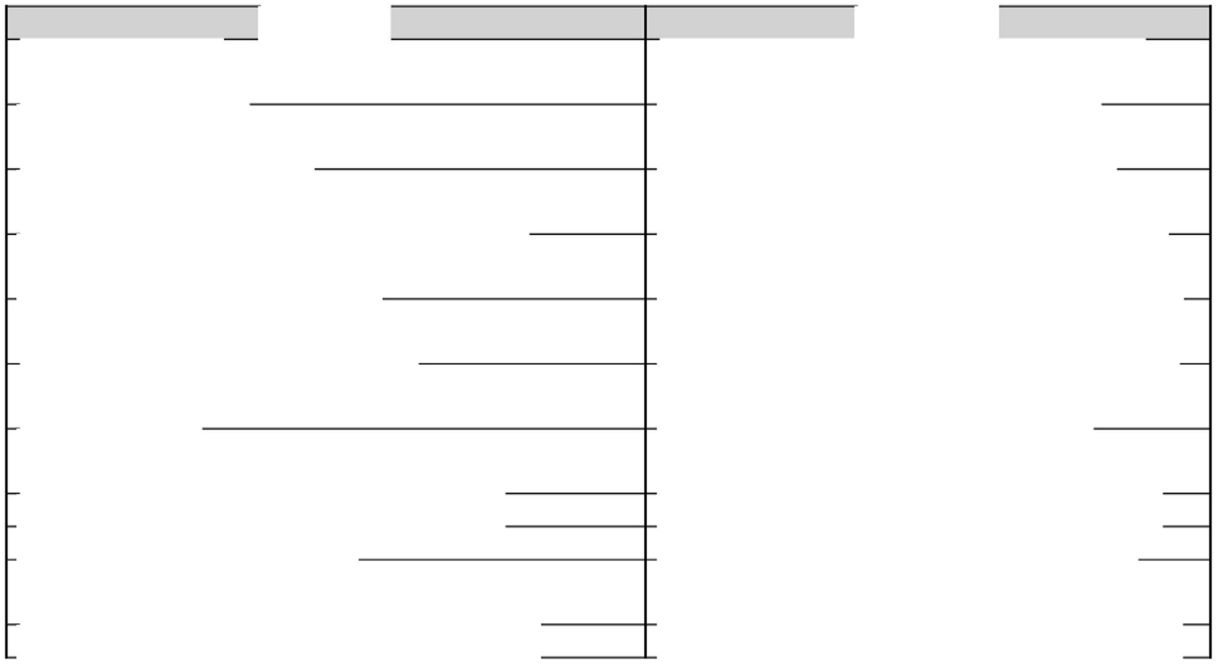

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*Note: These items will need verified upon final CPC design.

The load on a CPCS processor module will be verified to not exceed 75%. This is done via the PC Element SYSL. SYSL was qualified for use as part of the original AC160 software. SYSL allows the user to monitor the load on the system. Figure 1 describes the SYSL PC Element. Further information on the SYSL usage is described in the PC Element Reference Manual (Reference 6).

Testing must conform to the guidelines specified [
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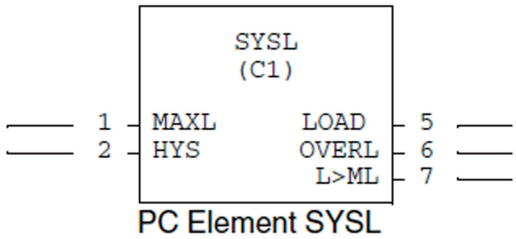

Figure 1 SYSL PC Element

References:
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