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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.: 383-8458

SRP Section: 18 – Human Factors Engineering

Application Section:

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### **Question No. 18-105**

NUREG-0711, Criterion 8.4.4.2(15), "Computer-Based Procedure Platform," states that the applicant's computer-based procedures should be consistent with the design review guidance in DI&C-ISG-5, "Highly-Integrated Control Rooms - Human Factors issues (HICR - HF)," Section 1 (NRC, 2008).

The staff reviewed APR1400-E-I-NR-14011-P, Rev. 0, "Basic Human-System Interface (HSI)," TeR, Section 4.8, "Computer-based Procedures," the HD IP, 4.2.6, "Computer-Based Procedures," and DCD Tier 2, Section 7.7.1.4(d)(6), "Computer-based procedure system," and found that the design of the computer-based procedures is consistent with the guidance in DI&CISG-5, Section 1, except for the following review criteria: #3, #4, #7, #15, #16, #17, #19, #22, and #24.

Please describe how the computer-based procedures are consistent with these review criteria, or describe why these were not addressed.

**Response**

The computer-based procedure system are consistent with DI&C ISG-5 Section 1 review criteria as described on the below table.

<b>Review criteria No.</b>	<b>Criteria</b>	<b>Response</b>
#3	The computer-based procedure system should always present the most recently approved and issued version of a procedure.	<p>Procedure revision including CP (Computerized Procedure) is strictly controlled by PGP (Procedure Generation Package).</p> <p>Revised procedure is reviewed and approved according to PGP, and saved in the master repository (ERP).</p> <p>CBP manager copies the revised and approved CP into CBP server, and prints out a backup hardcopy of the CP.</p> <p>When operator opens CPs in procedure open dialog, metadata such as revision number, procedure types, and revision date are displayed.</p>
#4	<p>Measures should be taken to ensure that the computer-based procedure system will display the selected procedure.</p> <p>Measures should be taken to inform the operator, if the selected procedure is not or cannot be displayed.</p>	<p>There are three methods to open a CP.</p> <ol style="list-style-type: none"> <li>1. From procedure open dialog (Manual)</li> <li>2. From other CP entrance condition (Auto)</li> <li>3. From alarm list (Manual)</li> </ol> <p>When operator selects a CP to open, CBP asks operator to confirm the CP (Method 1).</p> <p>When reactor trips occur, CBP asks operator to confirm that SPTA procedure is ready to open (Method 2).</p> <p>When operator clicks any alarm from a display, a popup window for the alarm response procedure is shown.</p> <p>When procedure is opened in CBP, procedure title becomes the window title. Operators can easily notice the selected (focused) procedure.</p>
#7	Measures should be taken to ensure that plant data that is displayed in a computer-based procedure system is correct. The operator should be informed when the plant data presented has not been or cannot be validated or is invalid.	<p>Device symbols and parameters are included in both CBP and IPS. Those symbol and parameter IDs are identical with both CBP and IPS.</p> <p>Any invalid data (e.g., out of range) in the CP are displayed as yellow color with asterisk ("*") letters. Therefore, invalid data can be easily distinguished.</p>

#15	A computer-based procedure system should contain a concise set of soft controls whose meaning should be obvious to the user. Soft controls have a single, unambiguous control function. A control function can be defined as comprising one or many control actions.	CBP is integrated with the control and monitoring system. But CBP does not send control commands to the actuator directly. CBP only links IFPD. The IFPD or ESCM is a place where sends a control command. When a device symbol in CP is clicked, the system mimic page with soft control template for the device appears at adjacent IFPD. If the device is safety related, a control template is displayed in the ESCM, which is located below the IFPD. CBP only provides link for the required control. These control selection links reduce the operators' secondary tasks. Soft control templates in the IFPD and ESCM have the same shape and same control convention ((i.e., unambiguous).
#16	Soft controls should provide needed feedback to the user regarding the state of the control.	Because CBP makes use of IFPD and ESCM for control, the first feedback of control appears in IFPD and ESCM. The device symbol in CBP also changes according to the feedback.
#17	The control of plant equipment by an operator should take at least two discrete actions.	Control behavior takes three actions. <ol style="list-style-type: none"> <li>1. Click a device symbol in CBP</li> <li>2. IFPD displays related system mimic page with soft control template for the device</li> <li>3. Operator select control command through the soft control template</li> </ol>
#19	A computer-based procedure system should provide a simple method to allow the operator to recover from an error of commission.	Commission error may occur during procedure execution. CBP provides recovery means for the error. For example; When operator evaluates a CP instruction incorrectly, CBP informs the operator of an evaluation error using embedded logic to the instruction. When a shift supervisor (SS) leads an incorrect step in a CP, other operators can notice that a SS directs an incorrect step. This is because all operators share the same procedure and step with the SS.
#22	The computer-based procedure system should not change the approved procedure.	CBP consists of Editor, CP, and Executor. Editor is a tool to write CP. Executor is a tool to execute CP, which is written by Editor. Executor does not have the capability to change a CP.

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#24	The computer-based procedure should provide a means to access relevant meta-data (e.g., author, plant name, Unit, procedure type, etc.). However, the meta-data does not need to be presented to the operator.	When an operator opens a CP from procedure open dialog, metadata such as revision number, procedure types, and revision date are displayed.  Once the procedure is opened, the procedure title, steps, and instructions are displayed rather than the meta-data.
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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**

Technical report APR1400-E-I-NR-14011-P/NP, Rev.0, "Basic Human-System Interface," Section 4.8, will be revised, as indicated in the attachment associated with this response.

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**4.8.3 Multiple Procedures Execution**

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**4.8.4 Procedure Initiation**

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**4.8.5 Place Keeping of Procedure Execution**

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**4.8.6 Management of Continuous Action Steps**

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**4.8.10.1 Consistency**

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**4.8.10.2 Task Usability**

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**4.8.10.3 Man-in-the-Loop**

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**4.8.10.4 Predictive Displays and Computer Decision Aids**

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**4.9 Safety Parameter Display System**

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