Task Analysis Implementation Plan

Revision 2

Non-Proprietary

January 2018

REVISION HISTORY

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1	March 2017	vii (Abstract)	Editorial correction. Description for reference plant added. R_383-8458(108)
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		6 (3.1.1)	Description for performance shaping factor added. R_315-8091(54)
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		10 (3.6)	Description for HSI inventory established by TA added. R_315-8091(51)
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		16 (4.2.1)	Supplemental description for subtask added. R_315-8091(50)

Revision	Date	Page	Description
		16 (4.2.1)	Description that accident with concurrent CCF considered as plant condition added R_315-8091(51)
		17 (4.2.1)	Description that TIHA links to related documents in task narrative database added. R_315-8091(43)
		17 (4.2.1)	Description for special knowledge of staff modified. R_260-8283(39) R_260-8283(39R)
		17 (4.2.1)	Definition of time available clarified. R_315-8091(42)
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		18 (4.2.1)	Description for administrative task and critical function monitoring task modified. R_260-8283(40)
		18 (4.2.1)	Supplemental description for performance shaping factor added. R_315-8091(54)
		19 (4.2.1)	Description for time required added to task narrative database. R_260-8283(38)
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		20 (4.2.2.1)	Description for accuracy added to process monitoring database. R_260-8283(36)
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		22 (4.2.2.2)	Description that HED to be identified during accident with concurrent CCF condition, and correlation between HSI inventory and previous plant design added. R_315-8091(51)
		22 (4.2.2.2)	Description for backup HSI added. R_383-8458(110)
		24 (4.3)	Supplemental description for subtask time added. R_315-8091(50)
		24 (4.3)	Description for changes in staffing added. R_315-8091(55)
		25 (4.3.1.1)	Terminology changed. (plant analyst -> systems safety engineer) R_315-8091(42)
		26 (4.3.1.2.1)	Description for task initiation time modified. R_315-8091(44)
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		29 (4.3.1.2.3)	Description for minimizing bias of characterization time added. R_315-8091(46)
		30 (4.3.1.2.4)	Description for minimizing bias of administration time added. R_315-8091(47)
		30 (4.3.1.2.5)	Description for minimizing bias of critical function time added. R_315-8091(48)
		31 (4.3.2)	Description for minimizing bias of process delay time added. R_315-8091(49)
		31 (4.3.2)	Supplemental description for time margin added. R_315-8091(53)
		32 (4.3.3)	Description for independent review added. R_315-8091(48)
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2	January 2018	3, 4 (2) 4 (2)	Editorial correction for task analysis scope. 11E47-CR-17-J-220 Supplemental description for generic assumption added. R_553-9084(137)

ABSTRACT

This document provides the implementation Plan (IP) for the human factors engineering (HFE) task analysis (TA) program element (PE), which is one of 12 PEs in the Advanced Power Reactor 1400 (APR1400) HFE Program. This IP governs the technical activities conducted within the TA PE by defining the scope and methodology of the TA PE, including the output products generated and the qualifications of the personnel who generate the products.

The main purposes of the TA are to:

1. Define the APR1400 human systems interface (HSI) inventory of process indications, alarms and controls, that support the accomplishment of plant operations tasks for normal, abnormal and emergency conditions. The HSI inventory is implemented in other APR1400 HFE PEs through soft displays and controls, control panels, operating procedures, and training programs.

2. Establish the number and qualifications of operations personnel for individual plant operations task. Where deemed necessary, staffing for a specific task is based on a quantitative analysis of workload and time margin. While the TA examines staffing on a task-by-task basis, the HFE staffing and qualifications (S&Q) PE examines staffing in aggregate for all plant modes to assure a meaningful job and adequate workload.

3. Confirm the human performance (HP) assumptions for important human actions (IHAs) as defined in the HFE treatment of important human actions (TIHA) PE. The TIHA extracts these HP assumptions from the APR1400 probabilistic risk assessment (PRA), transient and accident analysis (TAA) and the defense-in-depth and diversity coping analysis (D3CA).

The TA is conducted for plant operations tasks conducted by licensed and non-licensed operators, which are identified in (1) APR1400 operating procedures that are available at the time the TA is conducted or (2) procedures from APR1400 predecessor plants, predecessor designs, or reference plants; the predecessors and references are identified in the APR1400 HFE Program Plan (HFEPP). This encompasses plant operations tasks for all modes, including shutdown and refueling. The TA is conducted by plant operations subject matter experts (SMEs) whose qualifications are defined in the HFEPP. SMEs use their experience to select additional tasks for TA implementation that are known to challenge plant operating crews.

The TA may be conducted before or after instrumentation and control (I&C) design requirements have been established by the mechanical and I&C system designers for a specific plant system. If the TA is conducted before the I&C design, then the TA establishes HSI inventory requirements for the plant system design. If the TA is conducted after the I&C design has been developed for a specific plant system, then the TA confirms that the I&C design is acceptable to support the HSI inventory; if it is not, human engineering discrepancies (HEDs) are generated as the conclusion of the TA PE. For all plant systems, the piping and instrumentation diagrams are the starting point for creating HSI indication and control designs during the APR1400 human-system interface design (HD) HFE PE. Any discrepancies between these HSI designs and the HSI inventory defined by the TA are identified during the HFE verification and validation (V&V) PE. The HFE PP describes the HED resolution process.

The TA is a one-time non-recurring HFE PE whose closure is marked by issuance of the TA results summary report (ReSR). However, the analyses conducted within the TA are iterative in that HEDs generated by other HFE PEs are evaluated for any potential changes needed in those analyses. Similarly, APR1400 plant design changes are evaluated for their impact to the output of all HFE PEs, including the output of the TA PE, and HEDs are generated as needed. Therefore, any analysis changes that may be needed after completing the TA ReSR are managed through the HED resolution process. HEDs that affect TA outputs are resolved prior to completing the HD, which establishes the APR1400 HSI design for V&V.

After completion of the V&V, site specific changes, including any required TA output changes, are managed within the design implementation (DI) HFE PE, which is a recurring PE for each plant. The DI also ensures that all HEDs are closed.

Section 1 of this document defines the TA purpose, Section 2 establishes the scope, Section 3 provides a methodology overview, Section 4 provides the details of the implementation plan, including the format and content of each TA output product, Section 5 establishes the qualification requirements for the TA implementation team, and Section 6 defines the required content of the TA ReSR, which demonstrates that the TA was conducted in accordance with this IP. Appendix A demonstrates conformance of this IP to the NUREG-0711 review criteria for the TA.

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ACRONYMS AND ABBREVIATIONS

AOP	abnormal operating procedure
APR1400	Advanced Power Reactor 1400
BTA	basic task analysis
CBP	computer based procedure
CCF	common cause failure
COL	combined license
CTL	challenge task list
D3CA	diversity and defense-in-depth coping analysis
DCD	Design Control Document
DI	design implementation
EOF	emergency operation facility
EOG	emergency operating guideline
EOP	emergency operating procedure
ESCM	engineered safety feature control module
FA	function allocation
FRA	functional requirements analysis
GOP	general operating procedure
HA	human action
HD	human-system interface design
HED	human engineering discrepancy
HFE	human factors engineering
HFEPP	human factors engineering program plan
HP	human performance
HSI	human-system interface
I&C	instrumentation and control
IFPD	information flat panel display
IHA	important human action
IP	implementation plan
KEPCO	Korea Electric Power Corporation
KHNP	Korea Hydro & Nuclear Power Co., Ltd.
LCS	local control station
MCR	main control room
NLO	non-licensed operator
OER	operating experience review

PE	program element
PP	program plan
PRA	probabilistic risk assessment
PSF	performance-shaping factor
RCS	reactor coolant system
ReSR	results summary report
RO	reactor operator
RSR	remote shutdown room
S&Q	staffing and qualifications
SDCV	spatially dedicated continuously visible
SME	subject matter expert
SRO	senior reactor operator
SST	standard subtask time
TA	task analysis
TAA	transient and accident analysis
TIHA	treatment of important human actions
TmAv	time available
TmEn	time engaged
TS	trade secret
TSC	technical support center
TTA	task timing analysis
V&V	verification and validation

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1. PURPOSE

This document provides the implementation plan (IP) for the human factors engineering (HFE) task analysis (TA) program element (PE), which is one of 12 PEs within the Advanced Power Reactor 1400 (APR1400) HFE Program. This IP governs the technical activities conducted within the TA PE by defining the scope and methodology of the TA PE, including the output products generated and the qualifications of the personnel who generate the products.

The TA is performed primarily to:

1. Define the human-system interface (HSI) inventory of process indications, alarms, controls, and communications, and the characteristics of that inventory the support the accomplishment of plant operations tasks for normal, abnormal, emergency conditions. The HSI inventory is implemented during the HFE human-system interface design (HD) PE through soft displays and controls, control consoles and computerized operating procedures. A human engineering discrepancy (HED) is generated if the TA concludes that the required HSI inventory is not supported by the instrumentation and controls (I&C) and communications documented in the plant design at the time the TA is conducted. Where the plant design documentation is not sufficiently detailed, the HSI inventory defined by the TA establishes the minimum I&C and communications requirements for the plant design.

2. Establish the number and qualifications of operations personnel for each plant operations task, including quantitative analyses of workload and time margin where deemed necessary by defined criteria. The TA establishes staffing on a task-by-task basis, whereas, the staffing and qualifications (S&Q) PE examines staffing through the combination of multiple tasks, since they are aggregated during various plant evolutions. An HED is generated if the TA concludes that a task cannot be supported by the staffing available at the plant location designated to perform the task. Minimum and maximum staffing for certain locations are according to the design constraints defined in the human factors engineering program plan (HFEPP) (Reference 1).

3. Confirm the human performance (HP) assumptions for important human actions (IHAs) as defined in the treatment of important human actions (TIHAs) PE. The TIHA extracts these HP assumptions from the APR1400 probabilistic risk assessment (PRA), the transient and accident analysis (TAA), and the diversity and defense-in-depth coping analysis (D3CA). HP assumptions include HFE characteristics such as personnel availability, HSI locations, environmental and stress conditions, and time available (TmAv), to reach the final assumption that operators can reliably perform the action. An HED is generated if the TA concludes that an IHA cannot be performed.

The TA is also performed to:

4. Confirm that issues identified in the HFE operating experience review (OER) PE that are assumed to be resolved through tasks assigned to plant operators, are resolved with no outstanding issues. An HED is generated if the TA concludes that a task cannot be performed.

5. Define the manual control tasks, the resulting HSI inventory and staffing for the control actions allocated to humans in the HFE functional requirements analysis and function allocation (FRA/FA) PE. An HED is generated if the TA concludes that a human control action allocation cannot be supported.

6. Define the supervising and backup control tasks, the resulting HSI inventory and staffing for the control actions allocated to machine in the FRA/FA. An HED is generated if the TA concludes that a machine control action allocation cannot be supported.

7. Resolve any HEDs generated during the FRA/FA for allocations that are not consistent with the plant design.

8. Define the HSI inventory and staffing for similar tasks that have been known to challenge operating crews at predecessor plants.

In summary, the TA establishes the HSI inventory requirements and staffing needed for a crew to perform each task necessary to operate the APR1400 during normal, abnormal and emergency conditions.

As demonstrated in Appendix A, this IP conforms to the review criteria of NUREG-0711, “Human Factors Engineering Program Review Model,” Rev. 3, Section 5 (Reference 2). Section 5 of this TA IP defines the subject matter experts (SMEs) required to conduct the task analyses and the independent review; the HFEPP defines the qualifications of the SMEs. This document also defines the required content of the TA results summary report (ReSR), which demonstrates that the TA was conducted in accordance with this IP.

2. SCOPE

The scope of TA includes:

- All IHAs as determined by probabilistic and deterministic means

- Tasks that were not identified as “IHAs” but have negative consequences if performed incorrectly

- Tasks that are new compared to those in predecessor plants, such as ones related to new systems or procedures

- Tasks that, while not new, are performed significantly differently from predecessor plants

- Tasks related to monitoring of automated systems that are important to plant safety, and the use of automated support aids for personnel, such as computer based procedures

- Tasks related to identifying the failure or degradation of automation, and implementing backup responses

- Tasks anticipated to impose high demands on personnel, e.g., little time or high workload (such as administrative tasks that contribute to work load and challenge ability to monitor the plant)

- Tasks important to plant safety that are undertaken during maintenance, tests, inspections, and surveillances

- Tasks with potential concerns for personnel safety (such as maintenance tasks performed in the containment)

The TA scope additionally includes tasks performed by senior reactor operators (SROs), reactor operators (ROs) and non-licensed operators (NLOs) in the main control room (MCR), remote shutdown room (RSR), technical support center (TSC), emergency operation facility (EOF), and local control stations (LCSs), as follows:

1. Tasks directed by normal, abnormal, emergency, and alarm response procedures from APR1400 or procedures from predecessor plants, predecessor designs, or reference plants, during all modes of operation, shutdown, and refueling. Abnormal procedures include the following degraded I&C and HSI conditions:

    a. Continued stable operation with loss of all non-safety HSI

    b. Accident mitigation and safe shutdown with only safety HSI

    c. Accident mitigation and plant stabilization with concurrent common cause failure (CCF) in digital I&C systems (as defined by the D3CA)

    d. Safe shutdown from the RSR

    While the procedures from predecessor plants, predecessor designs, and reference plants are expected to have a high level of applicability to the APR1400, SMEs utilize these procedures in conjunction with APR1400 system design and analysis documentation (e.g., APR1400 Chapter 15 safety analysis and D3CA) to ensure the tasks applicable to APR1400 are correctly and completely identified, and that non-applicable tasks are excluded. Procedures from predecessor plants, predecessor designs, and reference plants which are used by SMEs are to be translated

to English before use. The tasks identified for degraded I&C and HSI conditions include compensatory actions and the transition to back-up systems.

2. Tasks required for manual control for the control actions with human allocations from the FRA/FA PE.

3. Tasks required for supervising and backing up automation for the control actions with machine allocations from the FRA/FA PE.

4. Tasks associated with issues identified in the OER PE that are assumed to be resolved by actions assigned to plant operators.

5. Tasks performed from the TSC and LCS that directly support operations, abnormal event, or accident mitigation. The TA encompasses communication with operators in the MCR or RSR.

6. The TA for the EOF is limited to defining the plant safety information requirements (i.e., safety parameter display system) and communication with operators in the MCR or RSR.

The tasks identified in the TA scope defined above originate from other HFE PEs or plant procedures. The tasks include tasks executed with both paper and computer-based procedures. SME judgment is therefore not required in the task selection. The following areas are evaluated by SMEs using their plant operations and simulator training experience to identify and select additional tasks that have challenged predecessor plant operating crews:

1. Surveillance, test, inspection and maintenance, with special focus on tasks that pose potential threats to personnel safety and plant safety.

2. Operational tasks that are precursors to plant transients that are not procedure based and are not IHAs. These tasks include unusual failure modes that may not have alarm response procedures, such as a spurious opening of a pressurizer spray valve and a spurious control rod withdrawal, or situations in which the operators had to revert to skill-based manual operation (e.g., low power steam generator level control).

3. Beyond design basis conditions such as station blackout and severe accident.

4. Tasks associated with the APR1400 fire safe shutdown analysis.

In addition, SMEs use their judgment and experience to identify and select tasks they believe challenge plant operations crews, based on new or unique features of the APR1400 plant design, with consideration of both workload and complexity. These tasks include tasks that are performed significantly differently from predecessor plants and tasks that use new automated support aids such as computer-based procedures.

The additional tasks selected by SMEs are those that are not already encompassed by previous HFE PEs and operating procedures.

The TA is based on generic assumptions that are made to establish a plant design that is reflected in the initial APR1400 HSI design. As site specific information is known, the generic assumptions are modified. When the COL applicant performs the HFE activities, the site specific information such as the switchyard and ultimate heat sink is applied to develop the APR1400 HSI design at the site, and the TA is updated accordingly. The updated information is ultimately reflected in the complete APR1400 HSI design for verification and validation (V&V). The design implementation (DI) PE confirms the as-built design with the application of the site specific information.

3. METHODOLOGY OVERVIEW

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Figure 3-1 Task Analysis Process

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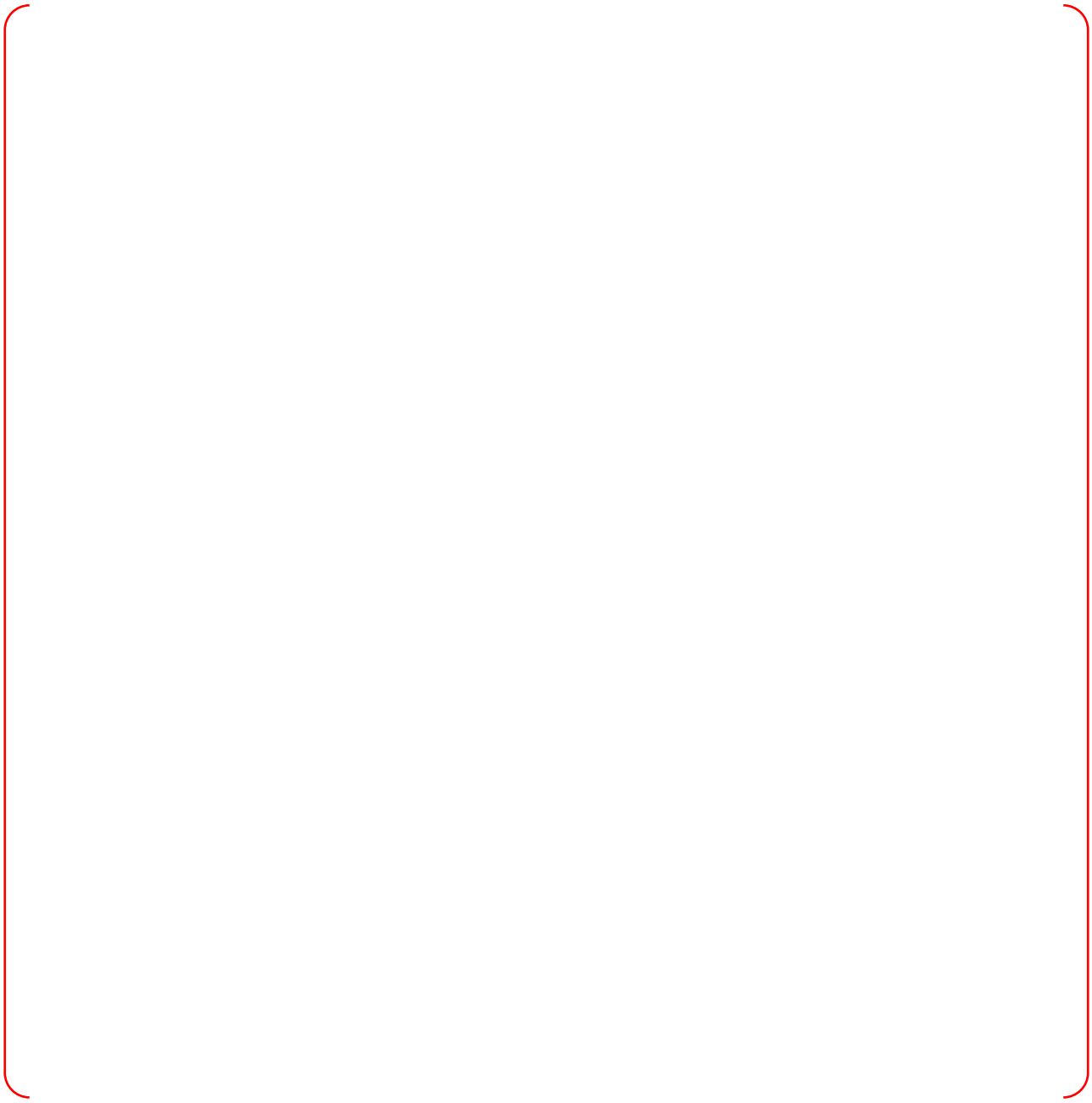

4.3.2. Time Margin

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4.3.3. Independent Review

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5. IMPLEMENTATION TEAM

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Table 5-1 TA Implementation Summary

6. RESULTS SUMMARY REPORT

The results of the TA are documented in the ReSR, either directly or through reference to the TA database. This report demonstrates that the analysis of tasks for the plant operating crew was conducted in accordance with this IP.

The TA data are created and stored within a database to allow the information to be modified and updated. Existing portions of the analysis are updated to reflect any changes to the plant design to ensure internal consistency between the TA database and the APR1400 design. The TA database incorporates all event sequences and the related results from the analysis of the sequences.

In addition to referencing the TA database, the TA ReSR includes the following:

1. The TA results overview, which describes the principal findings of the HFE PE, including confirmation of IHAs and an overview of any HEDs

2. Each TA team member's name, SME position filled, and the types of TA outputs generated by the team member (the outputs generated or reviewed by each member are documented in the TA database)

3. A summary tabular listing of all tasks for which a TTA was conducted, including the workload and time margin results

4. A detailed description of any resulting HEDs including conflicts between TA results and the results of previous HFE PEs or the APR1400 plant design, and HEDs that identify excessive workload or inadequate time margin

5. A conclusion that TA:

    a. Has been conducted in accordance with the TA IP

    b. Demonstrates that the tasks conducted by plant operators have been analyzed to establish HSI inventory requirements

    c. Confirms that all analyzed tasks can be conducted with acceptable workload and time margin within the staffing design constraints (except as may be noted by HEDs)

The TA is a one-time, nonrecurring HFE PE whose closure is marked by issuance of the TA ReSR. However, task analyses conducted within the TA are iterative in that HEDs generated by other HFE PEs are evaluated for any potential changes needed in those task analyses. Similarly, plant design changes are evaluated for their impact to the output of all HFE PEs, including the output of the TA; HEDs are generated as needed. Therefore, any task analysis changes that may be needed after completing the TA ReSR are managed through the HED resolution process. HEDs that affect TA outputs are resolved prior to completing the HD, which establishes the APR1400 HSI design for the V&V.

After completion of the V&V, site-specific changes, including any required TA output changes, are managed within the DI, which is a recurring PE for each plant. The DI also ensures that all HEDs are closed.

7. REFERENCES

1. APR1400-E-I-NR-14001-P, “Human Factors Engineering Program Plan,” Rev.2, KHNP, January 2018.

2. NUREG-0711, “Human Factors Engineering Program Review Model,” Rev. 3, U.S. Nuclear Regulatory Commission, November 2012.

3. NUREG-1122, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors," Rev. 2, Supp. 1, U.S. Nuclear Regulatory Commission, October 2007.

4. APR1400-E-I-NR-14011-P, “APR1400 Basic Human-System Interface,” Rev.2, KHNP, January 2018.

8. DEFINITIONS

The terms in this section are used in this report and are defined to clarify their use.

Control action – Lowest decomposition of a success path within the FRA. Control actions are allocated to humans or machines in the FA.

Diagnosis – Examination and evaluation of data from the HSI to determine either the condition of the plant or the cause of the condition.

Human action – Manual response by a member of the plant operations crew.

Human-system interface – Alarms, indications, controls, and procedures used by the plant operations crew to monitor the plant, supervise automation, and execute HAs.

Local control station – HSI control device that is not located in the MCR or RSR. Local control stations include single-function panels (e.g., controls for a single breaker or valve) as well as multifunction panels (e.g., controls for a group of plant components).

Performance-shaping factor – Factor that influences human error probability, such as availability of procedural guidance or TmAv to perform an action.

Subject matter expert – Expert in a particular area or topic. SME minimum qualifications and typical contributions are defined in the HFEPP (Reference 1).

Task – Collection of activities with a common purpose, often occurring in temporal proximity, with identifiable start and end points. Control actions are defined and allocated to humans or machines in the FRA/FA PE. HAs are decomposed into tasks, which are analyzed in the TA PE.

Time available – Time period from the presentation of a cue for human action or equipment response to the time of adverse consequences if no action is taken.

Time required – Time it takes an operator to complete the action that prevents adverse consequences.

APPENDIX A - NUREG-0711, REV. 3, REVIEW CRITERIA CONFORMANCE TABLE

NUREG-0711, Rev. 3, Review Criteria	IP Section and Paragraph
5.4 Review Criteria (1) The scope of the applicant's task analysis should include: • All important HAs as determined by probabilistic and deterministic means (see Section 7, Treatment of Important Human Actions, of this report)	2, paragraph 1, item 1
• The applicant should select tasks for analysis that represent the full range of plant operating modes, including startup, normal operations, low-power and shutdown conditions, transient conditions, abnormal conditions, emergency conditions, and severe accident conditions. The chosen tasks should cover:	2, paragraph 1, item 2
- tasks that were not identified as "important HAs" but have negative consequences if performed incorrectly	2, paragraph 1, item 2
- tasks that are new compared to those in predecessor plants, such as ones related to new systems or procedures	2, paragraph 3
- tasks that, while not new, are performed significantly differently from predecessor plants	2, paragraph 3
- tasks related to monitoring of automated systems that are important to plant safety, and the use of automated support aids for personnel, such as computer based procedures	2, paragraph 1, item 4; paragraph 3
- tasks anticipated to impose high demands on personnel, e.g., little time or high workload (such as administrative tasks that contribute to work load and challenge ability to monitor the plant)	2, paragraph 1 (encompassed by all tasks), paragraph 3
- tasks important to plant safety that are undertaken during maintenance, tests, inspections, and surveillances	2, paragraph 2, item 1
- tasks with potential concerns for personnel safety (such as maintenance tasks performed in the containment)	2, paragraph 2, item 1
(2) The applicant should describe the screening methodology used to select the tasks for analysis, based on criteria specifically established to determine whether analyzing a particular task is necessary.	3.3 4.1.1 4.1.2 4.1.3
(3) The applicant should begin task analysis with detailed narratives of what personnel have to do. The analysis should be sufficiently detailed to define the alarms, information, controls, and task support needed to accomplish the task.	3.1.1 4.2.1

NUREG-0711, Rev. 3, Review Criteria	IP Section and Paragraph
The detailed task descriptions should address (as applicable to the task) the topics listed in Table 5-1. Alerts Information Decision-making Response Teamwork and Communications Workload Task Support Workplace Factors Situational and Performance Shaping Factors Hazard Identification	4.2.1, paragraph 3 items 1 to 28 4.2.2
(4) The applicant should identify the relationships among tasks. *Additional Information*: For example, some tasks can be carried out in any order or in parallel, some tasks have to be performed in a linear sequence, while for others the relationship is conditional (if such a condition exists, perform task A). Some tasks may involve coordinated actions among crew members or control room crew members and local personnel.	4.2.1, paragraph 3 items 12 and 20
(5) The applicant should estimate the time required to perform each task.	4.2.3, item 6 4.3
(6) The applicant should identify the number of people required to perform each task.	4.2.1, paragraph 3 Item 18 4.2.3, item 7
(7) The applicant should identify the knowledge and abilities required to perform each task.	4.2.1, paragraph 3 Item 18 4.2.3, item 7
(8) The applicant's task analysis should be iterative, and updated as the design is better defined.	6, paragraph 4
(9) Applicants should provide an analyses of the feasibility and reliability for important HAs that address the following: • The analysis establishes the time available using an analysis method and acceptance criteria consistent with the regulatory guidance associated with the actions. The basis for the time available is documented. *Additional information:* The time available to perform the actions should be based on analysis of the plant response to the anticipated operational occurrence or accident. This analysis should reflect the guidance associated with the event.	4.2.1, paragraph 3 items 6 and 17 4.2.3, item 1 (plant analysis references for IHAs are in TIHA ReSR)
• The analysis of the time required is based on a documented sequence of operator actions (based on task analysis, vendor-provided generic technical guidelines for emergency operating procedure development, or plant-specific EOPs, depending on the maturity of the design).	4.2.1, paragraph 3 item 12 and 17 4.2.3, item 4 4.3.1.2.1 4.3.1.2.2 4.3.2

NUREG-0711, Rev. 3, Review Criteria	IP Section and Paragraph
• Techniques to minimize bias are used when estimates of time required are derived using methods that are dependent on expert judgment. Uncertainties in the analysis of time required are identified and assessed.	3.4 4.3.3
• The sequence of actions uses only alarms, controls, and displays that would be available and operable during the assumed scenario(s).	4.3, paragraph 1, last sentence
• The estimated time for operators to complete the credited action is sufficient to allow successful execution of applicable steps in the EOPs. *Additional Information:* Acceptable methods for deriving analysis time estimates for individual task components include, but are not limited to: - Operator interviews and surveys - Operating experience reviews - Software models of human behavior, such as task network modeling - Use of control/display mockups - Expert panel elicitation (e. g., Kolaczkowski et al., 2007)	4.3.1.2.2, paragraphs 3 and 4
• Staffing for analysis is justified, and if credited manual actions require additional operators beyond the assumed staffing, the justification for timely availability of the additional staffing is provided and the estimate of time required includes any time needed for calling in additional personnel.	4.3.1.2.2, paragraph 2, item 7
• The analysis of the action sequence is conducted at a level of detail sufficient to identify individual task components, including cognitive elements such as diagnosis and selection of appropriate response. *Additional information:* The documented sequence of operator actions should be analyzed at a level of detail necessary to identify critical elements of the actions and performance shaping factors (e.g., workload, time pressure) that affect time required and likelihood of successful completion of the action sequence. The applicant should establish time estimates for individual task components (e.g., acknowledging an alarm, selecting a procedure, verifying that a valve is open, starting a pump) and the basis for the estimates, through a method applicable to the HSI characteristics of digital computer-based I&C.	4.3.1.2.2, paragraph 2, items 5 and 6 4.3.1.2.3 4.3.1.2.4 4.3.1.2.5
• The analysis identifies a time margin to be added to the time required and the basis for the adequacy of the margin.	4.3.2
(10) Additional Considerations for Reviewing the HFE Aspects of Plant Modifications	Not applicable