June 26, 2008

Mr. Ronnie L. Gardner
AREVA NP Inc.
3315 Old Forest Road
P.O. Box 10935
Lynchburg, VA 24506-0935

SUBJECT: SECOND REQUEST FOR ADDITIONAL INFORMATION REGARDING ANP-10279, "U.S. EPR HUMAN FACTORS ENGINEERING PROGRAM" (TAC NO. MD4252)

Dear Mr. Gardner:

By letter dated January 29, 2007 (ML070370196), AREVA NP (AREVA) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review Topical Report (TR) ANP-10279, Revision 0, "U.S. EPR Human Factors Engineering Program Topical Report," (Agencywide Documents Access and Management System Accession No:. ML070370197). The NRC staff then issued an initial request for additional information (RAI) by letter dated September 11, 2007 (ML072530009). You subsequently responded to these questions by your letter dated October 30, 2007 (ML073090055).

The NRC staff has determined that additional information is required to complete the review. The specific information requested is addressed in the enclosure to this letter. This request is slightly modified from the draft provided to your staff via electronic mail on May 30, 2008, (ML081780565) as discussed during a telephone conference on June 9, 2008. Question 21 has been amended to address the overlap of the various AREVA QA program documents. The gap in RAI numbering (39-44) has been removed, and original question 64 has been broken down into multiple questions. The last RAI is now number 69. Finally, minor typographical errors have been corrected.

All the applicable TR questions, including those that are considered closed, are provided in the enclosure.

If you have any questions regarding this matter, I may be reached at 301-415-3361.

Sincerely,

***/RA/***

Getachew Tesfaye, Senior Project Manager
EPR Projects Branch
Division of New Reactor Licensing
Office of New Reactors

Project 733

Enclosure:
Request for Additional Information

cc w/enc: See next page

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|---|---|---|---|---|---|
| NAME | MCanova | JMcLellan | GTesfaye | MJunge | JColacccino |
| DATE | 06 /26/08 | 06 /26/08 | 0626/08 | 06/26/08 | 06/26/08 |

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**SECOND REQUEST FOR ADDITIONAL INFORMATION RELATED TO:**

**ANP-10279**

**"U.S. EPR HUMAN FACTORS ENGINEERING PROGRAM TOPICAL REPORT," REVISION 0**

This request contains:

- the original RAIs sent to AREVA (# 1 to 12)
- the evaluation of AREVA's responses to these RAIs (Letter NRC 07-061) including follow-up RAIs as needed
- new RAIs developed following the complete review of the topical report (TR).

RAI-1 **Closed** - The use of the terminology human-machine interface (HMI) and human-system interface (HSI) throughout the report is confusing. The distinction between the two terms should be clarified. Response acceptable.

RAI-2 **Open** Clarify use of should General Comment: Use of a combination of verb tenses "should"/"should be" vs "will"/"will be," vs "are", etc., make it difficult to determine whether a commitment is made or not. For example, on p.2-3, "The acoustic environment and the mean noise level in the MCR should aid operator alertness…" versus "The lighting in the control rooms provide optimum working conditions…"

Evaluation: AREVA's response did not fully address the question. Not all instances of the "should" use were addressed in response. There are still several inappropriate uses, e.g., in 2.2, 2,2,1, 4.1.2, 4.1.3.4 and 4.1.4. There is also a "similar" in 4.1.4 that needs to be addressed. This is inappropriate in regulatory document. Please update the report and commitments to clarify those areas where should and similar are used.

**Follow-up RAI**: In RAI 2, the staff requested clarification of the use of a combination of verb tenses "should"/"should be" vs "will"/"will be," vs "are", etc. These make it difficult to determine whether a commitment is made or not. For example, on p.2-3, "The acoustic environment and the mean noise level in the MCR should aid operator alertness…" versus "The lighting in the control rooms provide optimum working conditions…" AREVA's response did not address all instances of the "should." There still appear to be several inappropriate uses, e g., in 2.2, 2.2,1, 4.1.2, 4.1.3.4 and 4.1.4. There is also a "similar" in 4.1.4 that needs to be addressed. This is inappropriate in regulatory document. Please update the report and commitments to clarify those areas where should and similar are used. This is follow-up RAI 2, Clarify ambiguous terminology.

RAI-3 **Closed**- P 4-5, Section 4.2.3: "Single purpose, fixed-location, continuously available controls and related displays should remain available via the SICS." Does this mean they always will be available or that they might be available or unavailable? Response acceptable

RAI-4 **Closed** - P. 5-3, Figure 5.2-1: Please describe (compare and contrast) the individual functions of Human Factors Design, HSI Design, Control Rooms Design, and Automation Systems Design. Response acceptable.

RAI-5 **Closed** - P. 5-12, Section 5.4.2.1.2: "As the design evolves, the structure of the HFE and Control Room Design Team may change; however, the functions required of the team do not transfer to any other organization." If this were to occur, could the team's authority for exercising its responsibility for the HFE program change, essentially diminish? What are the controls in place to prevent this from occurring? Response acceptable.

RAI-6 **Closed**- P. 5-22, Section 5.4.3.1: Why are personnel interviews limited to utility personnel? Response acceptable.

RAI-7 **Open -**P. 5-27, Section 5.4.4: "For the U.S. EPR, the process for defining and allocating plant functions is not relevant to the HSI design as the HSI design has evolved to a high level of detail. Implementation of a process of FRA and FA would be equivalent to reverse engineering for the sake of creating documentation." Please explain the rationale for these statements.

Also, this section continues by saying, "…AREVA NP will extract… a list of functions that have been automated for the OL3 plant. AREVA NP will then compare that list of functions to the list derived for the U.S. EPR from system and function activities and capture the differences. The completed FA would then consist of those functions which are allocated identically for OL3 and the U.S. EPR and a list of gaps." Was an FRA and FA completed for OL3? What is meant by "…the list derived for the U.S. EPR from system and function activities"…i.e., what are the U.S. EPR system and function activities?

**Evaluation:** AREVA's response did not fully clarify the staff's concern.

**Follow-up RAI**:

To clarify AREVA's use of OL3 design analyses for functional requirements analysis and function allocation, the staff submitted RAI 7. AREVA's response described the process for FRA and FA used by the OL3 designers. The staff does not find this response fully acceptable.

It is acceptable to use experience with predecessor plants as a basis for functional requirements analysis and function allocation, when little change is expected in the design and operation of the plant design being reviewed. However, since the OL3 is not an operating plant, the existing design cannot be justified on the basis of operating experience. Therefore, the acceptability of this approach rests on analyses performed in support of the design of the predecessor plant (OL3). Since these have not been reviewed by the staff, they should be submitted or made available to the NRC for review as part design certification. To follow up on the original RAI, please describe how functional safety requirements and functional allocation per

NUREG-0711, Section 4 will be addressed. Sections 5.2 and 5.3, 5.4.4 and Table A-2 of the TR seem to indicate that this will not be produced for the US EPR since it was done for OL3. The OL3 design has not been reviewed and approved by the staff and there is no operating experience with either OL3 or any other EPR plant. The actual results of the FR and FA analyses for OL3 may very well be acceptable, but will need to be submitted and reviewed if AREVA proposes to use them. AREVA should provide this information.

RAI-8 **Open -**P. 5-29, Section 5.4.5: "The operating procedures for the U.S. EPR are based on the work developing procedures for the OL3 EPR and other precursor plants. The completed operating procedures constitute an analysis of the tasks that operators should perform to safely operate the plant. The operating procedures should satisfy the required safety objectives to be considered completed. The completed plant procedures are subjected to a separate verification process to evaluate their technical effectiveness. For the U.S. EPR, the task analysis (TA) will consist of verification (see Section 5.4.11) that controls and displays are available and are organized to be compatible with the intended operations, including safety objectives as a subset, as defined in the procedures."

It appears that AREVA NP will use OL3 operating procedures as the basis for determining operator tasks for the U.S. EPR. However, it is the output from task analysis that is used as an input to developing procedures. Also Section 5.4.9 states, "…AREVA NP will produce operational guidelines for the development of plant-specific normal operating, abnormal operating, alarm response, and EOPs..." From this statement, it appears that AREVA NP will develop U.S. EPR-specific "generic guidelines." Please explain how these guidelines will be used to determine operator tasks. Also, how will AREVA NP account for any operator tasks that are not contained in procedures? Has a task analysis been completed for OL3? Has/will AREVA NP use the OL3 task analysis to determine operator tasks required for the U.S. EPR?

**Evaluation:** AREVA's response did not fully clarify the staff's concern.

**Follow-up RAI**:

In the original RAIs, the staff requested clarification of AREVA's TA plans in RAI 8. AREVA's response did not completely address the staff's request. Table A-2 notes that a TA will not be produced for EPR based on completed operating procedures for OL3. The OL3 design has not been reviewed and approved by the staff and there is no operating experience with either OL3 or any other EPR plant. AREVA should describe how task analysis per NUREG-0711, Section 5, will be addressed.

RAI-9 **Closed** - From a human factors engineering standpoint, how similar is the OL3 HSI design to the AREVA NP HSI design? What are the major HSI design differences? Response acceptable.

RAI-10 **Closed** - Please explain how the concept of "Minimum Inventory" of alarms, controls, and displays, needed to bring the plant to safe shutdown conditions in the event

of a loss of all primary instrumentation is addressed by the U.S. EPR design. The response is partial and defers addressing the minimum inventory to the DCD/FSAR. This RAI is closed for the ANP-10279 Report and will be reviewed as part of the staff's review of the AREVA DCD/FSAR.

RAI-11 **Open -** Appendix A, Table A-2, p. A-4: Will the Implementation Plan(s) for HSI be included as part of the DCD/FSAR for the U.S. EPR?

**Evaluation:** AREVA's response did not fully clarify the staff's concern.

**Follow-up RAI**:

In RAI 11 the staff asked if the Implementation Plan(s) for HSI identified in Appendix A Table A-2 p. A-4 will be included as part of the DCD/FSAR for the U.S. EPR. AREVA's response did not fully address the request. Table A-2 indicates that several of the implementation plans will be complete in CY07. The FSAR mentions implementation plans for several of the HFE elements, but does not directly cite the title or date of the implementation plan and the references at the end of each FSAR subsection do not include the implementation plans. In past completed design certifications the implementation plans have been designated as Tier 2*. Please indicate which of the plans have been completed and when they will be submitted to the staff for review (as described in RG 1.206, Section C.I.18).

RAI-12 **Closed** - Appendix A, Table A-2: Under the heading, "Output Results," and "Schedule," what is meant by "Detailed Design?" When in the overall Human Factors Engineering (HFE) design process, will the "output results" be completed for each HFE Program Element? How will the products for each element be available to the staff for review and approval? The response is partially acceptable. There are other issues in Appendix A, but these are addressed in other RAIs, therefore this RAI is closed.

RAI-13 **New** The abstract and Section 2.1 note that the goal of the HFE program is to provide reasonable assurance that operators can access the required information and controls to enable safe and efficient control and monitoring for plant processes and equipment. This goal does not address nearly the scope and depth expected of an HFE program as referenced in 10CFR50.34(f)(C)(iii) and as described in NUREG-0711. Please clarify the goals of the HFE program.

RAI-14 **New** Section 2.1 identified general principles that address time requirements, situation assessment, and error tolerance. Workload is discussed as a consideration in other sections of the report, in the context of staffing, automation, and HSI design. What is not addressed is personnel vigilance. Please provide information related to the treatment of personnel vigilance in the EPR HFE program.

RAI-15 **New** Assumptions and constraints are not explicitly addressed in the report. However, the report does identify specific analyses and design features that will not be addressed in the U.S. EPR because they were conducted and identified in the OL3 development effort. Thus, they are inputs to the U.S. EPR design effort. The staff has

specific questions regarding some of these analyses/design features that are identified in other RAIs. However, since assumptions and constraints are not explicitly identified, please identify any other assumptions and constraints that may not be captured by the analyses and design features derived from the OL3 effort and identified in the report.

RAI-16 **New** Applicable facilities are discussed in Section 2.1.2. The report indicates that the HFE program will be applied to "HSIs, procedures, and training associated with monitoring and control I&C functions." These functions will include those ranging from normal to accident conditions. Not specifically included in the scope are non-I&C systems that can include manual valves and specific LCSs (note that the abstract omits LCSs from those areas to which the HFE program applies). Instead, the report indicates that the design of these systems "should" follow the guidance developed by the team: "HSIs associated with non-I&C systems (e.g., manual valve operators and other LCSs) should follow guidelines established by the HFE and Control Room Design Team." Section 18.1.1.4 of the FSAR, Applicable Human System Interfaces, Procedures, and Training, states "HSIs associated with non-I&C systems (e.g., manual valve operators and other LCSs) follow guidelines established by the HFE and Control Room Design team."

These discussions raise two potential concerns: First, the wording does not suggest a requirement for including them in the HFE program. Further, using a "should" statement, suggests some uncertainty in how they will be addressed in the HFE program. It is the staff's belief that any HSI should be addressed in the HFE program. Second, if HSIs (like manual valves) are not included within the scope of the program, it seems unlikely they will be addressed in the HFE program. Thus, guidance will be unavailable for the design of these HSIs. Please clarify the relationship between the HFE program and non-I&C HSIs.

RAI-17 **New** The categories of plant personnel whose functions and tasks will be addressed by the HFE program are not discussed in the TR. Please provide this information.

RAI-18 **New** HFE team responsibility is addressed in Section 5.4.2.1.1 of the plan. The responsibilities listed include most of the items listed in the staff's criterion except the development of all HFE plans and procedures and the scheduling of activities and milestones. Please clarify the HFE teams responsibilities with respect to development of all HFE plans and procedures and the scheduling of activities and milestones.

RAI-19 **New** The composition of the team is described in Section 5.4.2.1.3. The technical disciplines listed generally meet the staff's criterion. Clarification is needed as to why Safety Engineering is not included on the team.

RAI-20 **New** HFE team staffing is not specifically addressed in the TR. Please provide information on HFE team staffing, including job descriptions and assignments of team personnel to HFE activities.

RAI-21 **New** Section 5.1 indicates that the HFE program falls under the general management processes provided in "AREVA NP Inc. Quality Assurance Plan (QAP) for Design and Deployment of the U.S. Evolutionary Power Reactor." Section 5.2 describes the HFE design control processes. Section 5.1 describes the general process and configuration management used to prepare design documentation. Design reviews are

performed by independent individuals to ensure completeness and technical quality of the work. The process includes a variety of verification methodologies including design review boards and design verification testing. While an overview of these processes is presented, additional detail as to how the processes are managed is needed and may be in the QAPs. Please provide a copy of the appropriate document for staff review. ADAMS Document No. ML070650256, ANP-10266, Revision 1, "AREVA NP Inc. Quality Assurance Plan (QAP) for Design Certification of the U.S. EPR Topical Report." Specifically describes the Quality Assurance Plan applicable to the Design Certification of the U.S. EPR. However, the scope of this design certification document does not include fabrication, erection, installation or operations. Please discuss any overlaps that may exist between ANP-10266 and the AREVA NP QAM throughout the HFE Program lifecycle.

RAI-22 **New** Section 5.1 states that the HFE program is conducted using the guidance provided in AREVA's QAP. This document is requested for review in RAI 21. Please identify any other process management descriptions to support the staff's review.

RAI-23 **New** Section 5.4.2.1.2 states that the Program Manager for HFE is responsible for integration of the HSI with the overall plant design, but the report does not specify what that integration involves. Please identify the inputs from other plant design activities to the HFE program and the outputs from the HFE program to other plant design activities.

RAI-24 **New** Section 5 identifies the classes of documents governed by the QAP including: plant technical requirements, system design requirements, system descriptions, design drawings, design analyses, computer program documentation, and specifications and procedures. Section 5.3 discusses HFE documentation, including plant technical requirements, system design requirements, system descriptions, and specifications. However, no mention is given to design drawings, design analyses, and computer program documentation. These three areas are also not specifically mentioned in FSAR Section 18.1.3.2. Please clarify whether HFE documentation will be developed for these types of design documentation.

RAI-25 **New** With respect to plant technical requirements, Section 5.3.2 indicates that "The Olkiluoto 3 (OL3) EPR reference design provides the starting point for development of design inputs for the U.S. EPR." Please identify specifically in what ways the OL3 plant provides the starting point for the U.S. EPR and what documentation is available for review of the basis for these starting points. The FSAR, Section 18.3.2, mentions an FRA (Functional Requirements Analysis) report that may provide useful information for the review. Please provide.

RAI-26 **New** With respect to system design requirements, Section 5.3.2 indicates that "For the U.S. EPR HFE program, SDRDs are produced for the control rooms (i.e., MCR, TSC,RSS, and I&CSC) and the HSIs (i.e., PICS and SICS)." Are system descriptions for the EOF and LCSs to be developed as part of the HFE program? Please explain.

RAI-27 **New** The contribution of subcontractors is not discussed in the report. Please identify what aspects of the HFE program will be performed by subcontractors, how HFE requirement are communicated to subcontractors, and how their compliance with HFE requirements is verified.

RAI-28 **New** Section 5.5 describes the HFE issues tracking system. This section states that the AREVA NP corrective action program is used as a database to track issues and that it is accomplished within the framework of the QAP. Applications of the issues tracking system are contained else where. Section 5.4.3 references an "HFE Issues Tracking System" with respect to the management of OER findings and it is referenced in Section 5.4.12.1 with respect to Final Plant HFE Design Verification. No specific details of how the tracking system functions are provided. Section 5.3.1 of the Plan does state that the HFE Program Plan to be provided in the DCD/FSAR will include descriptions of the HFE issues tracking. Please provide a description of the HFE Issues Tracking System's availability, methodology, means of issue documentation, and assignment of responsibility.

RAI-29 **New** Section 7 provides a list of documents that will support the development of the U.S. EPR HFE program. The list includes appropriate NRC documents, the AREVA QA plan, and a small selection of industry documents. Please clarify if the list provided in Section 7 is complete.

RAI-30 **New** Section 6 of the report discusses simulator design activities. This discussion pertains to a full-scope simulator suitable for operator training. Will any other simulation or other tools be available for use to support the HFE design team during the design process?

RAI-31 **New** OER is discussed in Section 5.4.3 of the TR and Section 18.2 of the FSAR. Information on the overall process, sources of information reviewed, screening for issues, and issue documentation is provided. Table A-2 indicates that the OER implementation plan is complete and will be summarized in the DCD/FSAR. That does not appear to be the case. It is not clear what the current status of the OER is and whether any OER items have been incorporated into the issues tracking system. Section 5.4.3 mentions PWR and PWR predecessor systems. Please identify and discuss the EPR predecessor plants in the context of NUREG-0711 Section 3.4.1 (1). In addition, please clarify the current status of the OER and indicate when the results will be available for review.

RAI-32 **New** Task analysis is discussed in Section 5.4.5 of the report. Like functional requirements analysis and function allocation, AREVA plans to use the OL3 information in lieu of conducting analyses for the U.S. EPR. As noted earlier, it is acceptable to use experience with predecessor plants as a basis for task analysis, when little change is expected in the design and operation of the plant design being reviewed. However, since the OL3 is not an operating plant, the existing design cannot be justified on the basis of operating experience. Therefore, the acceptability of this approach rests on analyses performed in support of the design of the predecessor plant (OL3). AREVA further states that "For the U.S. EPR, the TA will consist of verification (see Section 5.4.11) that controls and displays are available and are organized to be compatible with the intended operations, including safety objectives as a subset, as defined in the procedures." Such an activity is not task analysis, it is task support verification. Additional information is needed before this approach can be found acceptable. Please identify; what methodology was used to perform task analyses consistent with the scope identified, where the staff can review the results of the OL3 task analyses, and how the task analysis results was used to develop the procedures for OL3.

RAI-33 **New** Table A-2 indicates that the implementation plan is complete and that the internal assumptions are documented and will be summarized in the DCD/FSAR. In Section 5.4.6, no mention is made of an implementation plan. Section 18.5 of the FSAR provides a discussion of staffing analyses, but not reference is made to a staffing implementation plan. Please clarify the status of the implementation plan and whether the plan will be submitted to the NRC, or where the staff can review the implementation plan.

RAI-34 **New** Table A-2 indicates that the output results will be available in Detailed Design. However, the table explanation states that the results "Consists of justification (within V&V output) that operating staff numbers are able to cope in all situations." While this is an appropriate validation, it does not address the documentation of the output of analyses conducted in accordance with a Staffing and Qualifications Implementation Plan. Please indicate how the results of their Staffing and Qualifications analyses will be documented.

RAI-35 **New** Section 5.4.6 states "The initial MCR staffing level is established based on experience with previous four loop PWR plants and takes into account the increased levels of automation and the minimum number of operators required by 10 CFR 50.54(m)." Please identify how the increased automation is accounted for in the U.S. EPR design.

RAI-36 **New** Section 5.4.6 states that "The functions of licensed operators for the OL3 EPR are expected to be slightly different than is typical for U.S. utilities today." Please identify how the functions are different and what the implications are for task analysis, HSI design, procedures, and training.

RAI-37 **New** Section 5.4.6 does not address operator qualifications or how the applicable guidance in NUREG-0800 Section 13.1 is addressed. Please identify how operator qualifications and the applicable guidance in NUREG-0800 Section 13.1 are addressed in the U.S. EPR design.

RAI-38 **New** Section 4.1, Staffing, indicates that the responsibilities of the shift supervisor are described in ACAD 97-004. Please clarify the author or organization responsible for this document and provide a copy of this document to support the staff's staffing review.

RAI-39 **New** Clarify displays available to the SS. Section 4.1.1 describes how the shift supervisors monitor plant activities and note they may use the auxiliary workstation in the MCR if not in use. Explain why the SS does not have a dedicated workstation available for their use in monitoring the plant and maintaining their overall situation awareness.

RAI-40 **New** HRA is discussed in Section 5.4.7 of the TR. It mentions that risk-important human actions (R-I HAs) will be determined but does not address a method or acceptance criteria. Further this section notes that the R-I HAs will be addressed in various HFE activities. Missing from the list of activities is function allocation. Please add this. Section 18.6 of the FSAR discusses the HRA /HFE integration process and refers to Chapter 19 of the FSAR, but does not mention an HRA/HFE implementation. Is there such a plan and can it be provided to NRC for review?

RAI-41 **New** HSI design is discussed in Section 5.4.8 of the report. The description of aspects of the design in Section 2.2, such as the alarm system (Section 2.2.8), consists of high-level characteristics that an alarm system should have. The descriptions of the standard features, such as the Plant Overview Panel (Section 3.2.2), have a similar level of description. What is the relationship between the design goals and bases listed in Section 2.2 and the CR and HSI standard features presented in Section 3?

RAI-42 **New** Procedure development is discussed in Section 5.4.9 of the report. The section discusses procedure development but does not include maintenance and test procedures. FSAR, Section 18.8.1, Objectives and Scope (of Procedure Development), includes maintenance procedures but not test procedures. Please add test procedures and make these consistent.

RAI-43 **New** Table A-2 indicates that the implementation plan has been completed and will be in the DCD/FSAR. The table also indicates that the output results are related to the task analysis use of procedures. However, the output of the procedure development plan should be a writer's guide and plant procedures. Please clarify the output of the procedure development activity.

RAI-44 **New** Section 4.3.2 discusses the preparation of EPGs and emergency procedures. EPGs are not mentioned in Table A-2. Please provide a schedule for developing and submitting the EPGs.

RAI-45 **New** FSAR Section 18.9.1, Objectives and Scope (of Training Program Development), mentions an implementation plan for the training program, but it is not specifically listed in the references. Please provide this plan for NRC review.

RAI-46 **New** Table A-2 indicates that the implementation plan has been completed and will be in the DCD/FSAR as a COL applicant responsibility. Please clarify its role in training program development and what information will be provided to the COL applicant as the designer's input to training.

RAI-47 **New** Clarify Table A-2 refers to the Simulator Design Activities for the output results. However, these activities (discussed in Section 6 of the report) refer to simulator development. Please clarify what aspects of the training program it will develop, beyond a training simulator.

RAI-48 **New** HF V&V is discussed in Section 5.4.11 of the report. It states "HSI task support verification evaluates that the HSI supports personnel task requirements as defined by task analyses." However, according to the plan, task analysis is not being conducted for the U.S. EPR. If there is not task analysis, how can task support verification be possible? As noted earlier in the task analysis evaluation, AREVA indicated that "For the U.S. EPR, the TA will consist of verification (see Section 5.4.11) that controls and displays are available and are organized to be compatible with the intended operations, including safety objectives as a subset, as defined in the procedures." Such an activity is task support verification assuming the procedures were sufficiently comprehensive and detailed, but this approach is not mentioned in the V&V section. Please clarify how task support verification will be performed in the absence of task analysis criteria.

RAI-49 **New** Figure 3.1-1 shows an “integrated operations area.” What is the purpose of this area?

RAI-50 **New** 3.1.4 describes the instrumentation and control service center (I&CSC). Does the architecture of the I&CSC provide the opportunity to control plant equipment during operations by unlicensed personnel? If not, please describe the aspects of this control room that prevent such actions.

RAI-51 **New** The I&CSC contains consoles for specialized systems (e.g., loose parts, leakage monitoring and core monitoring systems). Why are these separate and not a part of the overall computer-based screen display system?

RAI-52 **New** Section 4.3.3 discusses the loss of the main control room (MCR), and states “Recovery operations should not be attempted from the RSS, considering the possibility of later emergency situations after the MCR is abandoned.” Please explain why this is so.

RAI-53 **New** Section 2.2.8 states that “Alarm signals are based on information that indicates the true cause of the reported event.” What is meant by this statement?

RAI-54 **New** Section 2.2.8 states that “Alarms are integrated with the HSI….” Please explain how they will be integrated?

RAI-55 **New** Section 2.2.8 states that “Alarm signals include logic so that only operationally relevant conditions are alarmed (e.g., the alarm logic for "low discharge pressure" downstream of a pump will produce an alarm only if the pump is supposed to be running).” Are any other types of alarm logic employed?

RAI-56 **New** Section 4.2.4 states that “The I&C systems include integral self-testing features. Operators have no responsibility with regard to these self-testing features other than monitoring and responding to alarms when the self-testing indicates problems.” Are all such alarms handled by operators rather than I&C maintenance personnel?

RAI-57 **New** Section 3.2.1 describes the process information and control system (PICS) and notes that it provides alarm sheets. Are these alarm response procedures that will meet the guidelines of NUREG-0700 Section 4.5?

RAI-58 **New** Section 3.2.1 states that “The control functions on the PICS are divided into hierarchies, and operator workstations should be logged in with responsibilities for selected hierarchies.” Please clarify this statement. Section 3.2.1 further states that “With the exception of the PICS workstation in the RSS, plant control functions are disabled outside the MCR.” However, Section 3.1.4 states that equipment control can be accomplished from the ICIS. Please clarify how equipment control is managed.

RAI-59 **New** Section 4.3.1.1 indicates that one of the criteria for determining that the PICS is available is that “Data communication with the automation level is working satisfactorily.” What is meant by automation level in this criterion?

RAI-60 **New** Section 4.3.1.1 describes the criteria for determining that the PICS is available. If one of these criteria are not met, is the PICS declared unavailable?

RAI-61 **NEW** In new modern digital control rooms, the loss of the primary display and control system is a potential significant event that merits careful design consideration. Section 4.3.1.1 is titled, Loss of PICS, but does not address this event. Please address.

RAI-62 **NEW** Section 4.3.1.2 addresses loss of I&C other than or in addition to the PICS. It states that "When the PICS is unavailable, the operator performs operations from the SICS including the QDS. Depending on plant conditions and the availability of systems, the operators may use the SICS and QDS to maintain steady state operations or commence shutdown to a safe state via conventional SICS controls. The operating manual should identify actions that are required for dealing with the loss of computerized I&C systems and measures that establish the priority of the actions implemented with the remaining conventional systems." Please describe the operating manual. Are the procedures for managing this transition and establishing the priority of actions available for staff review?

RAI-63 **New** The SICS contains "single-purpose" HSIs (p. 4-5). Please clarify the meaning of single purpose.

RAI-64 **New** The SICS contains HSIs for monitoring design basis accidents (p. 4-5). How are risk significant failures that are beyond design basis handled?

RAI-65 **New** Section 2.2.9 indicates that most operating procedures will be implemented as computer-based procedures. Several requirements are described, but little is said about the functionality of the procedures, e.g., will procedures step logic be automatically assessed? Will operators have control over the level of detail presented? Will the procedures monitor steps of continuous applicability? Will the procedures monitor operator action? Please provide a more complete description of the computerized procedures system's functionality

RAI-66 **New** Sections 2.2.9 and 4.3.1.3 indicate that paper backup of computer procedures will be available. Upon loss of the computerized procedures in the middle of a complex event, is any support provided for operators to determine their location in the paper procedure? How has the effectiveness of this transition during complex procedure operations been demonstrated or validated?

RAI-67 **New** Please indicate how the HSI design meets the staff's criteria for SPDS.

RAI-68 **New** Please clarify the role of TR ANP-10279 and the FSAR in the U.S. EPR design certification application.

RAI-69 **New** What aspects of the U.S. EPR's HFE program will be COL items?