ABB
ASEA BROWN BOVERI

September 24, 1993
LD-93-140

Docket No. 52-002

Attn: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: System 80+™ Information for Issue Closure

Dear Sirs:

Enclosed with this letter are five attachments on Human Factors Engineering verification and validation, including CESSAR-DC markups for the main control room procedures validation.

If you have any questions, please call me or Mr. Stan Ritterbusch at (203) 285-5206.

Very truly yours,

COMBUSTION ENGINEERING, INC.

S. E. Ritterbusch for

C. B. Brinkman
Acting Director
Nuclear Systems Licensing

CBB/ser
cc: J. Trotter (EPRI)
T. Wambach (NRC)
P. Lang (DOE)

010057

Combustion Engineering, Inc.
1000 Prospect Hill Road
Post Office Box 500
Windsor, Connecticut 06095-0500
Telephone (203) 688-1911
Fax (203) 285-9512
Telex 99297 COMBEN WSOR

D032

ATTACHMENT 1

Tables of NRC Comments and ABB Responses on V&V Plan from June 14, 1993 Resolution Meeting

V&V PLAN REVIEW (VERIFICATION)

Table 1: Criterion 2 - V&V Scope (4.2.1)

Table Ref #	Draft Tech Report Comment	ABB-CE Response
1-1	It is not clear that V&V will be directed toward environmental considerations such as lighting, noise, etc. in the MCR and at local control stations	Section 2.0, Scope will modified to include workspace environment.
1-2	The issue of the absence of a procedure element from the HFE program has already been identified. The scope of ABB-CE's V&V effort will remain open until the procedures issue is resolved.	Resolution is beyond the scope of V&V.

Table 2: Criterion 9 - Technical Basis in Current Literature (4.2.2)

Table Ref #	Draft Tech Report Comment	ABB-CE Response
2-1	Most of the documents listed are not specifically referenced nor is it clear how they were used.	ABB-CE will specifically list references and how they will be used.
2-2	The Verification Analysis Report did not indicate that anything other than NUREG-0700 was used for verification. This document does not contain adequate criteria for a CR such as Nuplex 80+. Clarify how industry documents will be used.	Verification suitability criteria will come from the HFE Standards, Guidelines, and Bases for System 80+ (HFESGB). The HFESGB criteria is based on design guidance applicable to advanced control rooms including NUREG-0700. See HFESGB for a reference list.

V&V PLAN REVIEW (VERIFICATION)

Table 3: Criterion 7 - Verify HF Issue Resolution (4.2.3)

Table Ref #	Draft Tech Report Comment	ABB-CE Response
3-1	Verification of HFE issues documented in the HFE Tracking System resolution is not addressed in the Plan.	The TOI database is a tool used in the design process to track HFE issues, it is not a design product that lends itself to verification. However, an activity will be added to Availability Verification, Suitability Verification, and Validation to review all applicable unresolved HFE TOI database issues. The purpose of these activities is to identify any issues that should be considered during V&V.

V&V PLAN REVIEW (VERIFICATION)

Table 4: Criterion 3 - HSI Task Support (Availability; 4.2.4)

Table Ref #	Draft Tech Report Comment	ABB-CE Response
4-1	It is unclear whether the availability analysis will be limited to EPG-based actions. PRA critical tasks, normal operating operations, and abnormal operations should be addressed as well.	Phase I Availability Analysis is performed on the following: - Federally mandated req. - PGICR from FTA, including some normal & abnormal operation tasks - Min. Inventory from PRA Phase II Availability Insp. is performed on all control station HSI, which includes the above and cognizant engineering organization requirements.
4-2	1. Under the Phase 1 purpose paragraph, should the last line read EPG and critical tasks?	Agreed, will be changed from EPG "or" critical tasks to "and".
4-3	2. The criteria for availability criteria for SPDS should include NUREG-1432. Additionally, 10 CFR 50.34 rqmt.s should include RG 1.97.	Agreed, NUREG-1342 and RG 1.97 will be referenced.
4-4	3. Availability analysis criteria number 4 states "System I&C Inventory" only. What is the criteria?	In this activity we verify that the System I&C Inventory is complete. The System I&C Inventory is specified by the system cognizant engineering organization. It has no criteria and will be removed.

Table Ref #	Draft Tech Report Comment	ABB-CE Response
4-5	4. The development of the availability checklist and the specification of what is unnecessary needs to be clarified.	The availability checklist includes all required I&C, both HFE requirements verified in Phase I (see response 10-1) and the cognizant engineering organization requirements. I&C not on the list is unnecessary.

V&V PLAN REVIEW (VERIFICATION)

Table 5: Criterion 3 - HFE Task Support (Suitability; 4.2.5)

Table Ref #	Draft Tech Report Comment	ABB-CE Response
5-1	1. Clarification of the methodology by which top-down analysis is accomplished is needed.	The top-down approach compares elemental tasks with the design. The methodology considers the overall system design, and integration of the parts of the HSI into a coherent and easily used whole. It is a knowledge based review (performed by a HF expert) that identifies deficiencies that may be missed during the rule-based evaluation (bottom-up approach).
5-2	2. The Verification Analysis Report indicated that only NUREG-0700 was used. This is not a comprehensive document. It does not apply to local control stations.	The HFE Standards, Guidelines, and Bases document will be used as the criteria for the suitability verification analysis. It addresses all HSI criteria including criteria related to soft displays, and local control stations (See response 2-2).
5-3	3. Will all elements in the HSI (e.g. every display) be reviewed or will a sampling process be used?	All elements of the HSI will be reviewed. Suitability verification will concentrate on added (i.e., previously unanalyzed) and unique applications of HSI features and characteristics.

5-4	4. How will discrepancies from guidance checklists be resolved? Verification should address potential concerns and trade-offs should be justified by the designer.	The ABB-CE document review and comment process and document distribution process ensure that the results of the HFE V&V activities are received, reviewed, and commented on. The HFE V&V management structure ensures that all comments are resolved (see Plan sections 5.4 and 8.1). Suitability verification is performed by HF and operations experts with expertise in Nuplex 80+. These experts will be able to verify and justify if the trade-offs are acceptable; if not, the discrepancies will be documented and resolved using ABB-CEs review process.

V&V PLAN REVIEW (VALIDATION)

Table 6: Criterion 4 - Dynamic Performance Evaluation

Table Ref #	Draft Tech Report Comment	ABB-CE Response
6-1	- Clarify differences in approach within SSAR, HFPP, & Val Plan.	- Val Plan describes final activities; others are for refinement, not acceptance, of design. Consistency will be verified in cited references.
6-2	- Test bed requirements for Val need to be clarified.	- HFPP, SSAR, and Val Plan shall conform with ITAAC statements.
6-3	- Section 6.3.1 makes reference to EPGs (expand scope).	- Citation will be changed to be consistent with broader scope of Val Plan.

Table 7: Criterion 5 - Range of Conditions Evaluated

Table Ref #	Draft Tech Report Comment	ABB-CE Response
7-1	- Seems to be incomplete treatment of functional recovery guidelines.	- FRGs addressed by TA as leftover task req.s after ORGs are partialed out; gives total task coverage.
7-2	- AOP scenarios should include loss of RCP seal cooling & injection, RCP seal failures, & stuck open PZR Relief valve.	- Agreed.
7-3	- Include selected inst. failures & loss of IPSO in HSI and I&C failure scenarios combined with emergency ops & events.	- Redundancy prevents loss of info or control capability by a credible single failure. Loss of DPS bounds loss of selected instruments. Loss of IPSO will lead to transfer of function to CRT --> no impact.
7-4	- Ensure that all PRA critical tasks addressed by defined scenarios (also Criterion 8).	- Agreed.
7-5	- System should be validated for tolerance to human error; include planned errors in scenarios.	- All errors identified will be eval'd for impact, but without metrics, baseline data, etc. error tolerance is poor object of analysis; - Tolerance to single equipment failures envelopes single human error results; - Sys80+ tolerance increased from acceptable Sys80 design with expanded capacities & redundancies.

V&V PLAN REVIEW (VALIDATION)

Table 8: Criterion 6 - Performance Measures

Table Ref #	Draft Tech Report Comment	ABB-CE Response
8-1	- Performance measures should... test achievement of objectives, design goals, & performance reqs, including: - system safety - crew primary tasks - crew errors - sit'n awareness - workload - comm.s & coord.s - physical mvmt & interaction - anthropometry	- 2 basic approaches to data will be used: 1) Auto event data logging, to assess overall system performance, crew primary task performance, workload levels, movement, and errors; and 2) subjective evaluation, to assess crew movement, positioning, coordination, communication, workload, situational awareness, and errors. - Anthropometry is suitability issue, but observed concerns will be addressed. - Data analysis approach to be added to Val Plan.

V&V PLAN REVIEW (VALIDATION)

Table 9: Residual Methodology Requirements

Eval Item#	Draft Tech Report Comment	ABB-CE Response
9-1	- Methodology lacks detail.	- Plan details are added as necessary. Generating elaborate plans far in advance of effort is ill-advised; at present, requirements (such as provided) are appropriate and sufficient.
9-2 & 9-3	- Use of "walk-through" methodology not sufficient for real-time data collection.	- Agreed. Revision to draft Plan will properly deemphasize role of walk-through techniques in overall Validation.
9-4 & 9-5	- Clarify number, experience, and organizational membership of "expert" participants.	- No requirements or criteria specified on participants that delimit acceptability of test plans. Detailed description of participants is otherwise not presently necessary.
9-6	- How will mock-up simulation differ from actual design?	- Requirements are not based on difference, but on similarity. Facility will meet ANSI 3.5 fidelity requirements.
9-7	- What type of data analysis is planned?	- See Performance Measures response in Ref 8-1.

9-8	On 6.3.5 Val Criteria: - a, b, & c. Errors	- Errors will be examined (see Performance Measures response in Ref 8-1) for all tasks. - 1a (availability) criterion is sufficient; omission & commision are meaningful distinctions, but N/A to criteria; to be revised in Val Plan appropriately.
	- d. Include criterion for procedure laydown space.	- Laydown space is a suitability issue; but observed concerns will be addressed.
	- e. Basis for 15 minute recognition criterion in 6.c?	- Criterion was arbitrary & will be removed; concern for prompt response will be addressed through event logging & subjective evaluation.
	- f. Additional criteria may be needed...	- Specific criteria can be added, where necessary.

Table 10: Task Analysis Issues

Table Ref #	Draft Tech Report Comment	ABB-CE Response
10-1	- Address interference of I&C maintenance (M) activities w/MCR ops.	- Basic M-tasks (e.g., panel component replacements, component control tagout) shall be demo'd for normal ops. - Loss of I&C components N/A; enveloped by loss of I&C system scenarios. - Basic M-tasks not performed in accident scenarios, since 1) M-tasks would be deferred, and 2) Dual failures are Beyond DBEs.
10-2	- Evaluate work order & tagout interaction w/MCR ops.	- Agreed. Impact of basic M-tasks as described in Ref 10-1 shall be evaluated.
10-3	- Consider adjunct issues (e.g., lighting, laydown space) associated with use of printed matter in MCR.	- These are primarily suitability issues; but observed concerns will be addressed.
10-4	- Operator awareness of the status of out-of-service equipment should be evaluated.	- Agreed. Scenarios can incorporate exemplar OOS equipment; results will be evaluated using methods of Ref 8-1.

V&V PLAN REVIEW (VALIDATION)

Table 11: HSI Design

Table Ref #	Draft Tech Report Comment	ABB-CE Response
11-1	- DPS & DIAS alarm implementations should be evaluated under high alarm conditions.	- Agreed.

ATTACHMENT 2

Justifications of ABB Positions
Requested for Closure of V&V

V&V REVIEW ISSUE 1.1

NRC Comment: It is not clear that V&V will be directed toward environmental considerations such as lighting, noise, etc. in the MCR and at local control stations.

ABB Response: The V&V scope has been modified in the V&V Plan (Sections 2.0 and 6.2.2) to make explicit the verification of the suitability of workspace environments using the HFE Standards, Guidelines, and Bases for System 80+. In addition, the Nuplex 80+ design specifically addresses noise reduction by the following methods:

- Removal of most maintenance and testing activities from the MCR
- Reduction in conversational noise levels in controlling workspace via controlled access
- Use of quiet fans and elimination of panel fans
- Removal of printers from controlling workspace

Validation exercises will evaluate if alarms are distracting when many may be present (e.g. during accidents).

V&V REVIEW ISSUE 1.2

NRC Comment: The issue of the absence of a procedure element from the HFE program has already been identified. The scope of ABB-CE's V&V effort will remain open until the procedures issue is resolved.

ABB Response: The procedures issue requires resolution at higher levels than the V&V Plan, including those of 10 CFR 50.34(f)(2)(ii), NPOC Building Block 7, and ITAAC. However, the use of design validation scenarios and results as performance benchmarks for subsequent procedure validation has been incorporated in Section 6.3.4.4 of the V&V Plan.

V&V REVIEW ISSUE 2.1

NRC Comment: Most of the documents listed are not specifically referenced nor is it clear how they were used.

ABB Response: References listed in Section 3 of the V&V Plan are specifically cited in the text of the Plan. The following documents (cited by the NRC Program Review Model) were not needed as other references were sufficiently comprehensive:

1. AR 602-1, Human factors engineering program. DOD: 1983.
2. TOP 1-2-610, Test operating procedure - Parts 1 & 2. DOD: 1990.
3. DODI 5000.2, Defense acquisition management policies and procedures. DOD: 1991.
4. EPRI NP-3701, Computer Generated Display System Guidelines (Vol 1 and 2), EPRI: 1984.

V&V REVIEW ISSUE 2.2

NRC Comment: The Verification Analysis Report did not indicate that anything other than NUREG-0700 was used for verification. This document does not contain adequate criteria for [advanced control rooms] such as Nuplex 80+. Clarify how industry documents will be used.

ABB Response: NUREG-0700 was, at the time, appropriate for the initial verification analysis, since: 1) 0700 is the source reference for the suitability verification concept, 2) the System 80+ verification methodology had not yet been established, 3) the NRC had not yet issued "advanced" control room design guidance, and 4) the 0700 guidelines served as a complementary approach to a more integrated top down analysis by HFE Specialists.

Comprehensive criteria for suitability verification are contained in the HFE Standards, Guidelines, and Bases for System 80+ (HFESGB). The HFESGB criteria are based on a comprehensive survey of industry design guidance applicable to advanced control rooms (this includes NUREG-0700; see the Bases Section for references). The V&V Plan has been modified (Sections 6.2.4 and 6.2.5) to cite the HFESGB as the basis for suitability verification.

V&V REVIEW ISSUE 3.1

NRC Comment: Verification of the resolution of HFE issues entered in the TOI system is not addressed in the V&V Plan.

ABB Response: The TOI database is not a design product, but rather a tool of the design process used to track HFE design product issues to closure. The V&V Plan is thus not the appropriate level of authority from which to manage the TOI database itself. To ensure coverage of open issues in V&V processes, TOI database review activities have been added to the V&V Plan requirements for Availability (Section 6.1.4), Suitability (Section 6.2.2), and Validation (Section 6.3.4.1). The HFPP will address TOI closure and transfer to the COL Applicant.

V&V REVIEW ISSUE 4.1

NRC Comment: It is unclear whether the availability analysis will be limited to EPG-based actions. PRA Critical Tasks, normal operations, and abnormal operations should be addressed as well.

ABB Response: Agreed. Availability Analysis incorporates the following:

- Federally mandated requirements
- PGICRs from FTA (which includes Critical Tasks, and normal and abnormal operations, as well as EPGs)
- Minimum EPG Inventory
- System I&C Inventories
- TOI Database issues

The V&V Plan (Section 6.1.4.1) describes how the System I&C Inventory is revised and completed.

V&V REVIEW ISSUE 4.2

NRC Comment: Under the Phase 1 purpose paragraph, should the last line read "EPG and Critical Tasks"?

ABB Response: Yes; it has been revised as suggested.

V&V REVIEW ISSUE 4.3

NRC Comment: The availability criteria for SPDS should include NUREG-1342. Additionally, [PAMI] requirements should include Reg Guide 1.97.

ABB Response: Agreed; NUREG-1342 and Reg Guide 1.97 have been referenced in Section 6.1.5.1 Items a and l.

V&V REVIEW ISSUE 4.4

NRC Comment: Availability analysis criteria number 4 states "System I&C Inventory" only. What is the criterion?

ABB Response: In this activity we are verifying that the System I&C Inventory entries are necessary and sufficient. The System I&C Inventory is specified by the system cognizant engineering organization. The criterion for any item's entry is for it to have a basis. The V&V Plan has been modified to include this criterion.

V&V REVIEW ISSUE 4.5

NRC Comment: The development of the availability checklist and the specification of what is unnecessary needs to be clarified.

ABB Response: The availability analysis determines what is necessary based on Federal regulations, FTA results (including PRA Critical Tasks), requirements from system designers, and TOI issues. Based on these results, the availability checklist provides a tool for verification of the as-built design by inspection (see Issues 4.1 and 4.4). The analytic and review process for the final System I&C inventories ensure that resulting checklists are sufficient to verify the as-built design. Unnecessary items are specified by exclusion; i.e., instrumentation for which the availability analysis fails to produce a basis for inclusion will be removed from the list, pending operational review. Section 8.1 of the V&V Plan commits to perform an operational review for any item identified as unnecessary, to confirm that the information/ control has no operational significance.

V&V REVIEW ISSUE 5.1

NRC Comment: Clarification of the methodology by which top-down analysis is accomplished is needed.

ABB Response: The is a knowledge-based review (performed by a HF expert familiar with the Nuplex 80+ HSI design) that identifies deficiencies that may be missed during the rule-based evaluation (bottom-up approach). The top-down approach compares the design elements of the HSI with the expected demands of actual use in component tasks. The methodology considers the overall system design, and integration of the parts of the HSI into a coherent and easily used whole.

V&V REVIEW ISSUE 5.2

NRC Comment: The Verification Analysis Report indicated that only NUREG-0700 was used. This is not a comprehensive document. It does not apply to local control stations.

ABB Response: The HFE Standards, Guidelines, and Bases document will be used as the criteria for the suitability verification analysis (see Response to Issue 2.2). It addresses all HSI criteria including those for soft displays, and local control stations.

V&V REVIEW ISSUE 5.3

NRC Comment: Will all elements in the HSI (e.g. every display) be reviewed or will a sampling process be used?

ABB Response: All elements of the HSI will be reviewed, rather than a sampling process. The nature of the top-down analytic approach implies that suitability analysis will concentrate on new and unique applications of HSI features and characteristics, while standard features will be more familiar to and readily accepted by the analyst. The V&V Plan has been modified to specify that all HSI elements will be reviewed (Section 6.2.4.1).

V&V REVIEW ISSUE 5.4

NRC Comment: How will discrepancies from guidance checklists be resolved? Verification should identify potential

concerns; subsequent trade-offs and resolutions should be justified.

ABB Response: Checklists are Verification Inspection items. These are under the scope of ITAAC, and thus may or may not be performed by ABB-CE. In either case, a discrepent finding is only a potential concern until examined by the applicable review process and resolved by the responsible management structure. The resolution's documentation should justify any tradeoffs made. The ABB-CE document review and comment process and document distribution process ensure that the results of the HFE V&V activities are received, reviewed, and commented on; discrepancies identified during HFE V&V are not unique in this regard. The HFE V&V management structure and TOI mechanism ensures that all comments are resolved (see Plan sections 5.4 and 8.1). Resolutions will generally be sought starting from the lowest level in the management structure at which they can be obtained (e.g., suitability discrepencies will start at the HF specialist/operations expert-level.) If these experts and their immediate supervisors cannot resolve the issues and tradeoffs, the discrepancies will be raised to a higher level of management attention, until resolution is achieved.

V&V REVIEW ISSUE 6.1

NRC Comment: Clarify the apparent differences in approach cited in the SSAR, HFPP, and V&V Plan regarding phased validation.

ABB Response: The V&V Plan describes final acceptance testing activities. The other documents refer to related activities that are for interim refinement, rather than final acceptance testing, of the design. Consistency among these descriptions will be verified in the cited references.

V&V REVIEW ISSUE 6.2

NRC Comment: Clarify the apparent differences in approach cited in the SSAR, HFPP, and V&V Plan regarding test bed requirements for validation.

ABB Response: General test bed requirements for validation are stated in the MCR and RSR ITAAC. Similar requirements in the SSAR, the HFPP, and the V&V Plan have been worded consistently, as follows:

> "... a fullsize dynamic mockup of the (MCR, RSR) consoles that simulates plant operational responses..."

Test bed requirements for local control stations, where needed, will be established on a case-by-case basis.

V&V REVIEW ISSUE 6.3

NRC Comment: Section 6.3.1 of the V&V Plan makes reference only to EPGs; other operational sequences are within scope.

ABB Response: Agreed. The reference to EPGs in Section 6.3.1 ("Purpose") was incomplete when compared to the Plan details that followed in the rest of 6.3. Section 6.3.1 and 6.3.2 have been revised to commit to exercise the broader scope of operational sequences required for the validation plan per Section 6.3.4.2.

V&V REVIEW ISSUE 7.1

NRC Comment: The treatment of the EPG Functional Recovery Guidelines (FRGs) by the planned V&V activities seems incomplete.

ABB Response: FRGs comprise a more complete but less efficient procedure to deal with a wide range of emergency operating scenarios, regardless of cause. It is thus not surprising that most of the individual FRG tasks can be found elsewhere in the more specific Optimal Recovery Guidelines (ORGs). To minimize redundant data and analytic effort, the FRGs were addressed in the FTA as the task requirements remaining after those for the Optimal Recovery Guidelines were partialed out. These "remainder tasks" were then added to the FTA database, for incorporation in Availability Analysis. For Validation, ATWS and ESDE scenarios will be used to exercise the FRGs (Section 6.3.4.2).

V&V REVIEW ISSUE 7.2

NRC Comment: AOP scenarios should include loss of RCP seal cooling and injection, RCP seal failures, and a stuck open PZR relief valve.

ABB Response: Agreed. These scenarios have been added to the list of AOPs in Section 6.3.4.2 of the V&V Plan.

V&V REVIEW ISSUE 7.3

NRC Comment: Include in the HSI and I&C failure scenarios 1) selected instrument failures, and 2) loss of IPSO combined with emergency events and operations.

ABB Response: In general, concerns for the effects of equipment failure are valid. However, the failures that were proposed are not representative of any limiting event, nor are they an expected source of complex operating interactions.

The failures represent Availability- rather than Validation-related issues. Regarding Availability, Nuplex 80+ has a redundant and diverse architecture to prevent loss of critical function-level information or control capability from a credible single failure. Furthermore, the loss of any individual instrument or indication is bounded by the ability to operate entirely without the DPS (which is unlikely to be necessary due to its high reliability.) Loss of the IPSO would lead to the transfer of the SPDS function to a CRT, similar to their acceptable implementation in existing plants.

Although ABB elects not to incorporate the proposed failures at this time, a commitment has been made in Appendix B of the V&V Plan to consider their incorporation at the time of detailed scenario development. Also, one beyond-design-basis I&C failure scenario has been added to 6.3.4.2. This is for common mode I&C failure during a LOCA, incorporating a loss of DIAS-N, ESF-CCS, and PPS.

V&V REVIEW ISSUE 7.4

NRC Comment: Ensure that all PRA critical tasks are addressed by defined scenarios and evaluation (see also Criterion 8).

ABB Response: Agreed. Statements clarifying this intent have been added to the V&V Plan (Section 6.3.5) to ensure that this will be treated when detailed operating sequences are developed.

V&V REVIEW ISSUE 7.5

NRC Comment: The system should be validated for tolerance to human error; include planned errors in scenarios.

ABB Response: All errors identified will be evaluated for their causes and consequences (Section 6.3.4.1 and 6.3.4.3). In addition, errors identified in critical task execution (see Issue 7.4) shall be subject to added scrutiny. However, without metrics or baseline data, error tolerance per se is an intractable object of evaluation. On the other hand, the tolerance of System 80+ to single equipment failures has similar implications for the consequences of single human errors as well. Also, System 80+ margins have been increased over the acceptable System 80 design with expanded system capacities & redundancies. Thus, System 80+ is considered, a priori, to have generally improved tolerance to human error.

V&V REVIEW ISSUE 8.1

NRC Comment: Performance measures should ... test achievement of objectives, design goals, and performance requirements, including:
- system safety
- crew primary tasks
- crew errors
- situation awareness
- workload
- communications and coordination
- physical movement and interaction
- anthropometry

ABB Response: Two basic approaches to data will be used:
1) Auto event data logging, to assess overall system performance, crew primary task performance,

workload levels, movement, and errors; and 2) subjective evaluation, to assess crew movement, positioning, coordination, communication, workload, situational awareness, and errors. Anthropometry is suitability issue, but observed concerns will be addressed. These approaches to data analysis have been added to Section 6.3.4.3 of the V&V Plan. Additional details will be added prior to implementation (see Issue 9.1)

V&V REVIEW ISSUE 9.1

NRC Comment: Methodology lacks detail.

ABB Response: Generating detailed plans far in advance of a complex effort is ill-advised, as flexibility remains necessary for successful implementation. At present, requirements (as provided) are appropriate and sufficient for the purposes of a plan. Further details will be added as required by the needs of the project, which will culminate in an implementation plan for the validation. An appendix to the V&V plan lists areas to be detailed for implementation. The implementation plan should be reviewed by the NRC prior to its implementation (i.e., prior to the conduct of final validation).

V&V REVIEW ISSUE 9.2 and 9.3

NRC Comment: The use of "walk-through" methodology is not sufficient for real-time data collection.

ABB Response: Agreed. The revision of the draft V&V Plan has properly deemphasized the role of walk-through techniques in overall Validation activities (Section 6.3.4.1).

V&V REVIEW ISSUE 9.4 and 9.5

NRC Comment: Clarify the number, experience, and organizational membership of "expert" participants.

ABB Response: There are no external (e.g., federal) requirements or criteria specified on test participants that delimit the acceptability of the test plans. Thus, the detailed description of those participants is not presently necessary. However,

it is understood that this is an issue of substantive importance, that some diversity of participants is desirable, and that there should be independence of the validation team from the design team. These issues are captured in the implementation appendix to the V&V Plan.

V&V REVIEW ISSUE 9.6

NRC Comment: How will mock-up simulation differ from actual design?

ABB Response: Simulation requirements are not based on difference, but on similarity. The facilities will meet ANSI 3.5 fidelity requirements.

V&V REVIEW ISSUE 9.7

NRC Comment: What type of data analysis is planned?

ABB Response: See Performance Measures response (Issue 8.1).

V&V REVIEW ISSUE 9.8

NRC Comment: On 6.3.5 Val Criteria:

a, b, & c - More treatment of errors needed...
d - Include criterion for procedure laydown space.
e - Basis for 15 minute criterion in 6.c?
f - Additional criteria may be needed...

ABB Response: a, b, & c - Errors will be examined (see Performance Measures response in Issue 8.1) for all tasks. The (availability) criterion in 1a is sufficient; while omission & commision are meaningful distinctions, they are not applicable to criteria. This has been revised in the V&V Plan appropriately.

d - Laydown space is considered more a suitability than a validation issue; but observed concerns will be addressed.

e - The 15 minute recognition criterion was arbitrary and will be removed from 6c. The concern for prompt response will be addressed through event logging & subjective evaluation.

f - Specific criteria can be added, if it becomes necessary (e.g., as additional implementation details are specified), but the existing assumptions and criteria are sufficient at present for the planned V&V activities.

V&V REVIEW ISSUE 10.1

NRC Comment: Address interference of I&C maintenance activities with MCR operations.

ABB Response: Basic maintenance tasks (e.g., panel component replacements, component control tagout) shall be demonstrated for normal operations, and have been added to Section 6.3.4.2 of the V&V Plan. However, loss of I&C components is not limiting, since it is enveloped by global loss of I&C system scenarios (see Issue 7.3). In addition, basic maintenance tasks will not be performed during accident scenarios, since for System 80+ such tasks can and would be deferred.

V&V REVIEW ISSUE 10.2

NRC Comment: Evaluate work order & tagout interaction w/MCR ops.

ABB Response: Agreed. Impact of basic maintenance tasks (as described in Issue 10.1) shall be evaluated.

V&V REVIEW ISSUE 10.3

NRC Comment: Consider adjunct issues (e.g., lighting, laydown space) associated with use of printed matter in MCR.

ABB Response: These are primarily suitability issues; but observed concerns will be addressed.

V&V REVIEW ISSUE 10.4

NRC Comment: Operator awareness of the status of out-of-service equipment should be evaluated.

ABB Response: Agreed. Scenarios can incorporate exemplar out-of-service equipment; results will be evaluated

using methods of Issue 8.1. The validation of such indication's effectiveness has been added to the V&V Plan appendix as a detail of scenario implementation.

V&V REVIEW ISSUE 11.1

NRC Comment: DPS and DIAS alarm implementations should be evaluated under high alarm conditions.

ABB Response: Agreed. The validation of such indication's effectiveness has been added to the V&V Plan appendix as a detail of scenario implementation.

V&V REVIEW ISSUE 12.1

NRC Comment: Clarify how Availability can be performed after Suitability. Would modifications to the HSI following Availability analysis then be subject to Suitability analysis?

ABB Response: Availability can be staggered with Suitability as portions of the design are completed. However, the eventual design implementation of each entry in the Systems I&C Inventory will be verified to be suitable.

ATTACHMENT 3:

Human Factors V&V Plan