

# NRC DIGITAL I&C PROJECT PLAN

## **Task Working Group # 4: Highly-Integrated Control Rooms: Communications Issues (HICRc)**

### **1 PLAN OBJECTIVES**

*(generic)*

### **2 DESCRIPTION**

*(detail input for this issue only)*

This Task Working Group (TWG) will address Highly-Integrated Control Room (HICR) design issues, focusing, in particular, upon communications involving digital equipment in nuclear safety service and needed to support the specification and design of simulators for new plants or the design and implementation of digital retrofits at existing plants. Specifically, this TWG will address all communications and influences which involve any safety channel<sup>1</sup> and anything outside the electrical division of which that safety channel is a member. In this context, “communication” means any transmittal or reception of data, information, or commands, and “influence” means to affect the operation of a safety channel in any way (including both effects involving safety functions and effects involving functions not related to safety). For example, the following will be addressed:

1. communication among redundant electrical divisions
2. communication between any safety channel and anything external to that channel’s electrical division
3. control of safety equipment from a workstation in a different electrical safety division
4. control of safety equipment from a nonsafety workstation
5. commingling of safety and nonsafety controls or indications on a single workstation
6. connection and operation of programming, maintenance, and test equipment

The following are explicitly excluded from the scope of this task:

7. communication within a single safety division, even if physically dispersed
8. communication which do not involve a safety channel
9. cyber-security
10. Diversity and Defense-in-Depth (D3) considerations
11. Human Factors (HF) considerations

Cyber-security, D3, and HF considerations are all closely related to the general concept of cross-divisional interactions, and coordination with the associated Task Working Groups will be necessary. However, those concepts are related more to the application of cross-divisional

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<sup>1</sup> The terms “channel” and “division” are used herein in accordance with the definitions of those terms in IEEE 603-1991.

interactions than to the means of implementation of such interactions. The HICRc TWG will address the means of implementation, rather than the manner in which the provisions for such interactions are used. The objective of anticipated interactions with other TWG is to ensure that HICRc TWG activities are consistent with, and supportive of, the solutions that the other TWG will provide.

Except as specifically addressed in the resolution of the issues identified above, physical separation and electrical isolation requirements for digital equipment are the same as for non-digital equipment. Physical separation and electrical isolation will not be addressed separately in this task. Similarly, seismic and environmental qualification requirements are not included in this task.

### **3**            **PROJECT PLAN**

*(detail input for this issue only)*

#### **3.1**           **Problem Statement**

There are clear potential advantages to the implementation of some types of cross-divisional influences, but the abandonment of established independence criteria would be difficult to justify and could require modification of regulations. The objective of this task is to evaluate cross-divisional interactions and to establish specific design and licensing criteria by which beneficial interactions may be accomplished.

The following specific problem areas are noted:

- Industry Standards (e.g. IEEE 7-4.3.2) do not provide sufficient guidance regarding communication independence for digital systems.
- NRC Regulatory guidance (e.g. RG 1.152) does not explicitly address inter-divisional communications.
- The protection system division separation and isolation requirements in existing regulations (10CFR50.55a(h), which incorporates IEEE603-1991 among other things) do not define for digital systems “the degree [of independence] necessary to retain the capability to accomplish the safety function during and following any design basis event requiring that safety function.”
- SRP Chapter 7 includes conflicting guidance regarding communication independence.

#### **3.2**           **Goals & Criteria for Success**

The goal of this TWG is to:

12. Establish criteria permitting a safety channel to accept information and commands from sources outside its electrical safety division while retaining separation, isolation, and functional independence in accordance with existing requirements.
13. Develop a document describing the design and licensing guidance needed to implement the criteria developed in goal #1.

14. Produce recommendations for alteration of existing regulations if necessary. Include consideration of timing issues relative to anticipated licensing submittals vs time required to accomplish the recommended rulemaking.
15. Produce recommendations for alteration of existing regulatory guidance, if appropriate, for clarification of particular provisions applicable to digital systems.
16. Prepare one or more Regulatory Information Summaries (RIS) (or other vehicle as designated by the Digital I&C Steering Committee) to disseminate and facilitate the implementation of the TWG recommendations.
17. Make recommendations for modification of industry standards as needed.

The TWG will consider the possibility that the needs of new and existing facilities are different, and will include accommodation of such differences in the final documentation if necessary. It is initially anticipated that there will be no difference in the guidance for new and existing facilities.

Final guidance relating to control room design is needed to support final specification and design of the simulators for new plants. It is anticipated that the first simulators will need to be ordered in mid-2009, and that about 18 months will be required between the time the guidance is issued and the first simulators are ordered. The guidance is therefore needed by early 2008. To allow for a reasonable amount of schedule float, the TWG anticipates completing its work by mid-2007.

It is noted that support of simulator procurement requires only that the conceptual design of the control room be completed. It does not require that the details of the internal workings of the operator interfaces be fully developed. The efforts of this TWG will influence the nature and layout of the control room in that requirements relating to the disposition and application of operator interface workstations could be affected, but those influences will be limited to whether various operator-interface design provisions will or will not be considered acceptable (for example, whether or under what design constraints it might be acceptable for a single control station to include both safety and nonsafety functions). The efforts of other TWG will have greater influence upon control room design and layout, such as the TWG working on Diversity and Defense-in-Depth (D3) requirements, and the TWG working on details of Human-Machine Interfaces (HMI) from a Human Factors (HF) standpoint.

The HICRc TWG will focus on issues related to the technical aspects of communications. It will not specifically address the application of such communications provisions in regard to D3 or HF considerations, and will not specifically address cyber-security concerns. HICRc TWG will interact with the TWG that are addressing those issues.

In the near term (defined as in support of simulator procurement for the first of the anticipated new plants), the TWG will produce guidelines describing appropriate design provisions and limitations. These guidelines will include a statement of the fundamental requirements and specific regulatory criteria that must be observed. The HICRc TWG will also provide recommendations for revisions to RG1.152, IEEE 7-4.3.2, applicable Standard Review plan sections, and other regulatory guidance and industry standards as deemed necessary. These recommendations will be considered “long-term” and will be addressed by the NRC independently of the TWG and probably at a time following the disbandment of the TWG.

The TWG will give due consideration to the burdens that might be imposed upon both applicants and NRC staff as a result of specific guidance. For example, acceptance of a certain provision might require detailed staff review in an area not presently subject to such review. This would impose a burden upon an applicant in that additional materials must be assembled for inclusion in the application package, some of which may be proprietary and thus require the

development of a redacted version as well as the full version, and upon the NRC in the actual review of the subject details. The cost of such a provision in terms of resources, review effort, and review time extension should be considered in relation to the potential benefits of such an approach relative to an approach that is simpler from regulatory point of view.

In addition, it is anticipated that the TWG will make all reasonable efforts to provide guidance that will not involve significant changes in NRC policy and will not require rulemaking. It is anticipated that industry objectives can be met within the existing regulations.

### **3.3 Critical Path and Steps to Success**

In order to accomplish its mission, the HICRc TWG will need to have timely access to detailed information concerning each proposed reactor design. The TWG will make every reasonable effort to obtain specific design information needed to support its work, however, if extended correspondence with reactor vendors is required in an effort to obtain the needed information, or if information availability is restricted by intellectual property rights issues or other issues, the TWG may decide to suspend consideration of design details related to the associated supplier or may decide to recommend other compensatory action to the NRC Digital I&C Steering Committee. In such a case, the TWG would proceed on the basis of generic considerations. The NRC Digital I&C Steering Committee should be advised promptly if such a situation occurs.

The primary efforts of the TWG will include the following:

1. Develop a statement describing the existing regulatory requirements and regulatory guidance associated with cross-divisional interactions, without consideration of specific proposed designs. This statement will establish the recommended boundaries for the ultimate products of the HICRc TWG.
2. Develop a detailed and prioritized listing of the types of interactions to be considered by the TWG. The TWG will address the associated design and licensing issues in accordance with this prioritization. To support the development and prioritization of this listing, the industry members will advise the TWG as a whole as to their best estimate of the types of cross-channel interactions that have actually been proposed or planned, with indication of the level of interest in the use of each type. The industry members may obtain this information through informal polling of selected vendors and facilities, or by whatever means they determine to be appropriate. Consideration should include new plants, existing plants, and fuel cycle facilities. The objective of this advice is to ensure that the TWG addresses the types of interactions that are of greatest interest to industry. For example, perhaps many system designers plan to use scratchpad-based data exchange and some but very few plan to use ethernet-based direct communication between safety processors: then the TWG would address the more widespread practice first and the less widespread practice later. If it determines that some type of interaction is planned for use by only a very few suppliers but that that type of interaction is highly desirable or problematical, the TWG may choose to address that issue early in order to get the word out that that type of interaction may be easy or difficult to license.<sup>2</sup> The industry member advice should consider such issues as, for example:

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<sup>2</sup> This prioritization will not preclude or affect NRC consideration of interactions proposed in license requests that have already been submitted or that are submitted in the future. License requests that fall outside the recommendations of the TWG or that are contrary to them will be considered by the NRC on a case-by-case basis.

- sharing a control station associated with one safety division by other safety or non-safety divisions
  - provision of hard controls and indicators (physical switches, indicating lights, analog indicators, etc.) on computer-based control consoles or on panels dedicated to the support of manual actuations
  - use of, and licensing credit taken for, manual actuation systems
  - intended flow of data and commands into and out of each safety division from external sources
  - commingling of safety and non-safety functions or processes in a single processor or software package, and commingling of safety functions from different divisions
3. Develop licensing guidance and associated bases for each specific type of interaction that is included in the TWG scope of consideration.
  4. Develop one or more RIS (or other vehicle as directed by the NRC Digital I&C Steering Committee) to document the regulatory and design guidance developed by the TWG. This RIS is to include specific acceptance criteria for types of interactions found to be acceptable, and is also to include descriptions of types of interactions found to be unacceptable.

DRAFT

## 4 REFERENCES

*(detail input for this issue only)*

1. NEI whitepaper
  - comments by Invensys
  - comments by MikeW
  - comments by Gary Johnson (via HL Dec11)
2. RG 1.152
3. SRP7.1-D
  - latest draft
  - comments by NEI (Feb7)
  - comments by Wes Bowers
  - also consider associated SRP sections
4. IEEE 7-4.3.2
  - draft from late January IEEE meeting
5. IEEE 603
6. Dec12 meeting
  - NRC slides
  - NEI slides
  - action items list
7. Feb2 meeting (HICRc portion only)
  - NRC slides
  - NEI slides
  - action items list

## 5 TASK WORKING GROUP (TWG) MEMBERSHIP

*(detail input for this issue only)*

### NRC representatives:

William Kemper	(RES, TWG manager)
Paul Rebstock	(RES, TWG technical lead)
Gush Singh	(NRR)
Royce Beacom	(NRO)
Will Smith	(NMSS)

### Industry representatives:

Wes Bowers	(Exelon)
Ron Jarrett	(TVA)
Kimberly Keithline	(NEI)

## **6**            **RESPONSIBILITIES AND MILESTONES**

*(detail input for this issue only)*

### **6.1**            **NRC Representatives**

The NRC representatives are responsible for the development of this Project Plan.

The NRC representatives will draft all TWG deliverables except as explicitly agreed by the TWG as a whole.

### **6.2**            **Industry Representatives**

The industry representatives are responsible for advising the NRC as to:

- whether the scope of this TWG and the activities described in the draft Project Plan address all of the industry concerns relating to safety system communications that must be addressed to support ordering new plant simulators by mid 2009
- whether the deliverables described in the draft Project Plan will support an efficient regulatory process
- whether the schedule expressed in the draft Project Plan and the industry schedules for associated activities are compatible with one another

In addition, it is the responsibility of the industry representatives to interact as necessary with reactor vendors and others to obtain design information needed to support the work of the TWG as described herein

The industry representatives are invited to provide comment and discussion concerning the items within the purview of this TWG, and to offer comments and other input on all TWG deliverables, in the interest of ensuring that industry's needs are appropriately addressed.

### 6.3 Milestones, Assignments, and Deliverables

Milestones and Deliverables	deliverable	Due Date (2007 or as-noted)	Est / Actual	Lead	Support
<b>Near-Term</b>					
initial TWG meeting		Feb 23	A	NRC	NEI
statement of fundamental restrictions & requirements - draft	✓	March 8	F	NRC	NEI
statement of fundamental restrictions & requirements - final	✓	March 15			
submit final draft of HICRc Project Plan for integration into DI&C plan	✓	March 9	F	NRC	NEI
DI&C-SC endorsement of HICRc Project Plan			F		
identify communication design concepts		March 6	F	NEI	NRC
final prioritization	✓	March 8	F	NRC	NEI
NRC RES Project results available (not final report)		June 1	F	NRC	n/a
regulatory & design requirements with basis for each type of interaction	✓	June 1	F	NRC	NEI
guidance outline & acceptance criteria	✓	June 15	F	NRC	NEI
industry review & comment	✓	June 22		NEI	n/a
initial draft of guidance document (RIS)	✓	June 29	F	NRC	NEI
final draft of guidance document submitted for issue process		July 31	F	NRC	NEI
DI&C-SC endorses guidance document (RIS)		Sept 14	F	NRC	NEI
issue guidance document (RIS)	✓	Sept 28 (tentative projection)	F	NRC	NEI
<b>Long-Term</b>					
work with IEEE on modifications to 7-4.3.2 – anticipate issue by:		2Q08		NEI	n/a
revise RG 1.152		2Q09		NRC	n/a
revise SRP		3Q09		NRC	n/a