CONTROL ROOM HABITABILITY

TAC No. MC0021

Final Update: 04/07/09
Lead NRR Division:
DSS Supporting Division:
DORL
CTL: N/A
GSI No.: N/A

MILESTONE	DATE (T/C)
Staff review of NEI 99-03 and redline and strikeout version provided to NEI Control Room Habitability task force	04/17/01 (C)
Staff will prepare Generic Letter and develop draft Regulatory Guides on Control Room Habitability at Nuclear Power Reactors (DG-1114), Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors (DG-1115), Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light Water Nuclear Power Reactors (DG-1113), and Atmospheric Relative Concentrations for Control Room Radiological Habitability Assessments at Nuclear Power Plants (DG-1111)	07/01/01 (C)
Office review of draft Regulatory Guides DG-1111 and DG-1113	12 /31/01 (C)
Office review of draft Regulatory Guides DG-1114 and DG-1115 and draft Generic Letter	03/01/02 (C)
Brief CRGR on draft Regulatory Guides DG-1111 and DG-1113	12/31/01 (C)
Brief CRGR on draft Regulatory Guides DG-1114 and DG-1115 and draft Generic Letter draft	GENERIC LETTER: 04/29/02 (C) DG-1114, DG-1115: 03/11/02 (C)
Issue draft Regulatory Guides DG-1111, DG-1113, DG-1114, and DG-1115 and draft Generic Letter for public comment draft	GENERIC LETTER: 05/09/02 (C) DG-1111: 12/31/01 (C) DG-1113: 01/31/02 (C) DG-1114: 03/28/02 (C) DG-1115: 03/28/02 (C)
Public meeting on draft Regulatory Guides DG-1111, DG-1113, DG-1114, and DG-1115 and draft Generic Letter	RI: 07/11/02 (C) RII: 07/16/02 (C) RIII: 08/06/02 (C) RIV: 07/18/02 (C)
Resolve public comments on draft Regulatory Guides DG-1111, DG-1113, DG-1114, and DG-1115	12/30/03*
Office review and concurrence of final Regulatory Guides and Generic Letter	DG-1111, DG-1113: 01/31/03 (C) DG1114, DG-1115, and GENERIC LETTER 2003-01: 03/24/03 (C)
Brief ACRS on final Regulatory Guides and Generic Letter	04/10/03 (C)

MILESTONE	DATE (T/C)
Brief CRGR on final Regulatory Guides and Generic Letter	04/22/03 (C)
Commission Information Paper on Generic Letter	06/03 (C)
Issue final Regulatory Guides and Generic Letter	06/03 (C)
Review 60 days responses to Generic Letter	12/30/03 (C)

Develop replacement technical specification for Attachment B to Regulatory Guide 1.196	1/24/05 (C)*
Develop response to TSTF letter of 3/8/04	1/24/05 (C)
Transmit staff proposal for revision to TSTF-448	1/24/05 (C)
Provide final NRC position on TSTF 448 Rev 2 in a letter to TSTF working group. Conduct public meeting April 2006. Update STS May 2006.	12/28/05 (C) & 3/10/06 (C) 04/20/06 (C) Meeting 05/12/06 (C) STS
Complete review of Generic Letter response and to determine if additional action is warranted	12/17/2007 (C) Closeout Of Multi-plant Action MPA-L301 GENERIC LETTER (GL) 2003-01 Package ML073460498

Description: In its review of license amendment submittals over the past several years, the staff has identified numerous problems associated with the assessment of control room habitability. These problems have included the overall integrity of the control room envelope and the manner in which licensees have demonstrated the ability of their control room designs to meet GDC-19. Licensees have failed to:

1. Assess the impact of proposed changes to plant design, operation, and performance on control room habitability,
2. Identify the limiting accident,
3. Appropriately credit the performance of control room isolation and emergency ventilation systems in a manner consistent with system design and operation, and
4. Substantiate assumptions regarding control room unfiltered inleakage.

In response to Item 4 above, several utilities performed testing of their control room envelope (CRE) to determine unfiltered inleakage using methods from ASTM E741-93, "Standard Test Methods for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution." As of May 2003, about 30 percent of the operating plants' control rooms had been tested. At that time, all of the control rooms except one measured unfiltered inleakage which exceeded the design basis analysis assumptions. In several cases, the measured inleakage exceeded the design basis value by over an order of magnitude. In most of the cases to date, licensees have been able to ultimately demonstrate compliance to GDC-19 through corrective action and retesting or by re-analysis. The nearly 100 percent failure rate of such a large fraction of the operating plant control rooms created a large uncertainty in the ability of the remaining untested facilities to meet control room habitability requirements. These control room habitability issues adversely affected the timely review of many license amendment requests. Licensee and staff expended significant resources to resolve differences regarding licensing and design basis issues and weaknesses in analysis assumptions, inputs and methods. While the capability of untested control rooms to meet their design basis was in question, the staff has reasonable assurance that continued operation was safe since compensatory measures; e.g., use of self-contained breathing apparatus and potassium iodide were established by licensees.

Background: General Design Criterion (GDC-19), "Control Room," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, establishes criteria for a control room. It requires that a control room be provided which allows operators to take actions under normal conditions to operate the reactor safely and to maintain the reactor in a safe condition under accident conditions. GDC-19 also requires that equipment be provided at locations outside the control room with the design capability for hot shutdown of the reactor, including the necessary instrumentation and controls that both maintain the reactor in a safe condition during hot shutdown and possess the capability for the cold shutdown of the reactor through the use of suitable procedures. GDC-19 also requires that adequate radiation protection be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures more than 5 rem whole body, or its equivalent to any part of the body, for the duration of the accident. Applicants to build or license a new plant under Part 50 after January 10, 1997, applicants for design certification under Part 52 after January 10, 1997, applicants to

build a new plant under Part 52 who don't reference a standard design certification, or current licensees who want to use an alternative source term as allowed by 50.67, are required by GDC-19 to use as the control room dose criterion 0.05 Sv (5 rem) total effective dose equivalent (TEDE). In March 1998, the staff briefed the Office of Nuclear Reactor Regulation Executive Team (ET) on its concerns related to the infiltration testing results and other aspects of control room habitability. The ET directed the staff to work with the Nuclear Energy Institute (NEI) to resolve the issues. Pursuant to this direction, the staff co-hosted, with NEI and the Nuclear Heating Ventilation and Air Conditioning Users Group (NHUG), a workshop on control room habitability in July 1998. Following that workshop, NEI agreed to form a task force to address control room habitability. In August 1999, NEI submitted for staff review and comment a draft of a proposed NEI document intended to address this issue. This document, NEI 99-03, entitled, "Control Room Habitability Assessment Guidance," did not adequately address the staff's concerns. In response to the staff concerns, NEI agreed in December 1999 to restructure NEI 99-03. During the period January through June 2000, the NEI task force met with the NRC staff in a series of public meetings to resolve outstanding issues and to discuss the content of NEI 99-03. A revision to NEI 99-03 revision was sent to the staff on October 13, 2000. The staff reviewed the October 13, 2000, revision and determined that, while there was much agreement on positions taken in the document, areas remained where the staff and industry were in disagreement. The staff determined, and NEI agreed, that the staff should reflect its position in formal regulatory guidance with outstanding issues resolved through the public comment process.

In June 2001, NEI issued Revision 0 of NEI 99-03, "Control Room Habitability Assessment Guidance." This version was substantially the same as the October 13, 2000, draft reviewed by the NRC staff. The NRC staff pursued a solution to the control room habitability issues with the NEI task force. The staff indicated its willingness to incorporate up-to-date information into its assessment of radiological analyses, consider possible changes in the radiological dose acceptance criteria and possible reductions in the conservatisms in control room habitability analyses.

NEI did not commit to making this industry initiative binding on individual utilities. The staff believed that a voluntary approach would not adequately resolve its concerns and that some generic approach would be needed. A Generic Letter would request licensees to take action to evaluate, in light of the ASTM E741 testing results to date, how licensees meet the requirements of GDC-19 with respect to unfiltered inleakage to their control room envelopes.

During staff interactions with the NEI issue task force, many issues were discussed. The staff believed that additional regulatory guidance was necessary in order that control room habitability issues were addressed in a complete and thorough manner. In addition, it was the staff's opinion that the regulatory information associated with control room habitability needed to be updated to reflect current knowledge. In meetings with the NEI Task Force on Control Room Habitability, changes to design basis accident radiological analysis assumptions were discussed. For those facilities whose licensing basis is based upon the TID-14844 source term, the staff and industry believed that it was necessary to consolidate existing information and to reflect current knowledge into one regulatory guide. For those licensees that implement an alternative source term as allowed by 10 CFR 50.67, Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," provided guidance for performing control room radiological analyses. These regulatory guides provided the industry and public more realistic assumptions for performing radiological analyses.

The staff also believed that creating regulatory guidance on meteorology for control room habitability assessments was necessary and appropriate. It had been almost 20 years since the staff updated its information on control room habitability. Various staff and industry studies had been conducted in those 20 years. These studies had identified issues which were addressed to only a limited extent in the previous guidance on control room habitability. A regulatory guide on control room habitability would assist licensees in their determination of the present state of the integrity of their control room envelope. Along with the control room habitability regulatory guide, an additional regulatory guide on control room envelope integrity testing would provide guidance to the industry on how plants may determine control room envelope integrity and continually demonstrate that integrity. Such regulatory guidance would utilize the information obtained from the testing that had already been conducted on 30 percent of the

control room envelopes. Therefore, control room habitability would be addressed through a Generic Letter and new Regulatory Guides on:

1. Control room habitability,
2. Control room envelope integrity testing,
3. Meteorology for control room habitability assessments, and
4. Design basis accident radiological analyses.

Additionally, to support licensees that begin testing the integrity of the control room envelope by measuring unfiltered inleakage, the staff proposed to the Technical Specifications Task Force (TSTF) changes to standard technical specifications on control room emergency ventilation systems. The staff discussed these changes with the NEI control room habitability task force. The staff considered resolution of this issue supportive of the NRR pillars of maintaining safety, increasing public confidence (both by restoring control room integrity to the level assumed in the facility's licensing basis), increasing effectiveness and efficiency of key NRC processes (via a generic approach to resolution rather than the current plant-by-plant approach), and reducing unnecessary regulatory burden and increasing realism (due to possible relaxation in certain analysis assumptions and acceptance criteria, based on current information).

Four draft regulatory guides, numbered DG-1111, DG-1113, DG-1114 and DG-1115, were issued for public comment. Proposed Generic Letter 2002- XX, "Control Room Envelope Habitability," (ADAMS accession number ML021430317) was published on May 9, 2002, at 67 FR 31385. The staff completed review and disposition of comments received during the public comment period and completed making necessary revisions to the draft guides and generic letter. Regulatory Guide 1.194, Atmospheric Relative Concentrations for Control Room Radiological Habitability Assessments at Nuclear Power Plants, formerly DG-1111 was issued in June 2003. Regulatory Guide 1.195, Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light-Water Nuclear Power Reactors, formerly DG-1113, Regulatory Guide 1.196, Control Room Habitability at Light-Water Nuclear Power Plants, formerly DG-1114; and Regulatory Guide 1.197, Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors, formerly DG-115, were issued in May 2003. Generic Letter 2003-01 was issued on June 12, 2003. The staff's proposed changes to technical specifications for control room emergency ventilation systems were included in Appendix B of Regulatory Guide 1.196.

During the finalization of the Regulatory Guides and the Generic Letter, NEI provided Revision 1 to NEI 99-03, "Control Room Habitability Assessment Guidance," March 11, 2003. The Generic Letter and Regulatory Guides referred to Revision 0 of NEI 99-03. Staff assessed the impact of Revision 1 and determined that revisions to the Generic Letter and Regulatory Guides were not necessary.
On December 30, 2002, NEI provided the Industry/ TSTF Standard Technical Specification Change Traveler TSTF-448, "Control Room Habitability," to the NRC for consideration. On July 1, 2003, the staff transmitted to NEI comments on Rev. 0 of TSTF-448. The staff held a meeting with the TSTF/NEI on July 11, 2003, to discuss its comments on Rev. 0. On August 19, 2003, Technical Specifications Task Force (TSTF) transmitted to the staff Rev. 1 to TSTF-448. On December 16, 2003, the staff provided comments and a request for additional information on Rev. 1. In a March 8, 2004, letter, the TSTF responded to the staff 's comments. In that letter the TSTF also identified what they considered to be beneficial revisions to TSTF-448. The TSTF indicated that if the staff agreed with these proposed revisions a formal revision to TSTF-448 would be provided.

Originating Document: None.

Regulatory Assessment: The staff believes that the potential deficiencies in the control room habitability designs, operations, and analyses represent safety issues that warrant resolution. It is important to recognize that the objective of control room habitability requirements, such as those in GDC-19, is not to minimize operator exposure for the purposes of ALARA (which is controlled under 10 CFR Part 20), but to provide a habitable environment in which to take action to operate the reactor safely under normal conditions and to maintain it in a safe condition under accident conditions. The dose criterion of 5 rem whole body was selected as it was believed that operations personnel would not be distracted from

necessary plant operations and would not unnecessarily evacuate the controls area due to concerns for their personal safety. Protection against smoke and other toxic gases is also necessary since these hazards could cause, in some cases, immediate physical impairment or incapacitation of control room operators. While toxic gases are considered in control room habitability analyses in accordance with the guidance in Regulatory Guide 1.78, the potentially toxic byproducts of fires and their impacts on control room habitability were not considered a problem in the past because of the presumed integrity of the control room envelope. In the past, a fire outside the control room was considered to have no impact upon the operators because smoke and toxic fire gases were never presumed to enter the control room envelope. If a fire occurred in the control room, the operators had the remote shutdown areas for controlling the reactor. Testing of the control room envelope's integrity has demonstrated that the perceived integrity does not exist. Consequently, some portions of the smoke issue may be covered under this action plan while other aspects may not. The staff considered the risk impacts of control room habitability and made a preliminary determination that control room habitability has not been addressed in current PRAs because:

1. It has been assumed that the design basis was being met, and
2. Quantification of the risk associated with failure to meet the design basis for control room habitability is not addressed by current metrics, methods, and risk experience data.

Current Status:

On December 17, 2007, the NRC issued a memo (Accession No. ML072670328) that closed out Multi-Plant Action L301 GL 2003-01 "Control Room Habitability." All plant specific licensing activities associated with GL 2003-01 were closed, as well as, this action plan.

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