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REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

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CONTROL ROOM HABITABILITY AT LIGHT-WATER NUCLEAR POWER REACTORS

A. INTRODUCTION

This guide provides guidance and criteria acceptable to the Nuclear Regulatory Commission (NRC) staff for implementing the NRC's regulations in Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," regarding control room habitability (CRH). The guide outlines a process that licensees may apply to control rooms that are modified, are newly designed, or must have their conformance to the regulations reconfirmed. In Appendix A to 10 CFR Part 50, General Design Criteria (GDC) 1, 3, 4, 5, and 19 apply to control room habitability. A summary of these GDCs follows.

GDC 1, "Quality Standards and Records," requires that structures, systems, and components (SSCs) important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions performed.

GDC 3, "Fire Protection," requires SSCs important to safety be designed and located to minimize the effects of fires and explosions.

GDC 4, "Environmental and Dynamic Effects Design Bases," requires SSCs important to safety to be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents (LOCAs).

GDC 5, "Sharing of Structures, Systems, and Components," requires that SSCs important to safety not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, the orderly shutdown and cooldown of the remaining units.

GDC 19, "Control Room," requires that a control room be provided from which actions can be taken to operate the nuclear reactor safely under normal conditions and to maintain the reactor in a safe condition under accident conditions, including a LOCA. Adequate radiation protection is to be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of specified values.

The information collections contained in this regulatory guide are covered by the requirements of 10 CFR Part 50, which were approved by the Office of Management and Budget (OMB), approval number 3150-0011. The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.

B. DISCUSSION

A licensee may use this guide for assessing CRH following changes to control room habitability systems (CRHSs) or the sources that would lead to consequences to the operator. Examples of changes that may impact the existing CRH assessments and may result in a re-analysis of the licensee's CRH are:

- Changes in procedures, operation, performance,[1] alignment, or function of the CRHSs,
- New hazardous chemicals or radioactive sources introduced onsite or in the vicinity of the plant,
- Increases in hazardous chemical or radioactive source quantities, concentrations, locations, or shipments.

The primary design function of CRHSs is to provide a safe environment in which the operator can keep the nuclear reactor and auxiliary systems under control during normal operations and can safely shut down these systems during abnormal situations to protect the health and safety of the public and plant workers. If the control room is not habitable or the response of the operator is impaired during an accident, there could be increased consequences to public health and safety. It is important for the operators to be confident of their safety in the control room to minimize errors of omission and commission. The Regulatory Positions below provide methods acceptable to the NRC staff for ensuring that the public and the control room operators are protected.

[1] An example of a changed performance parameter that may require re-analysis is an increase in control room envelope (CRE) inleakage beyond that assumed in previous CRH assessments.

When possible, this guide has incorporated guidance contained in NEI 99-03, "Control Room Habitability Assessment Guidance" (Ref. 1). The staff has reviewed this document and has concluded that portions of this document can serve as a valuable resource on CRH. Only the sections of NEI 99-03 that are specifically stated in the Regulatory Position should be considered to be endorsed by the NRC staff. The staff's endorsement of these sections should not be considered an endorsement of the remainder of NEI 99-03 nor any other document referenced in NEI 99-03. A summary of the staff's endorsement is provided in Appendix A.

Definitions of key terms used within the context of this regulatory guide are given below. However, in most cases a facility's licensing basis[2] and associated documents will define the term for a particular facility.

Control Room: The plant area, defined in the facility licensing basis, in which actions can be taken to operate the plant safely under normal conditions and to maintain the reactor in a safe condition during accident situations. It encompasses the instrumentation and controls necessary for a safe shutdown of the plant and typically includes the critical document reference file, computer room (if used as an integral part of the emergency response plan), shift supervisor's office, operator wash room and kitchen, and other critical areas to which frequent personnel access or continuous occupancy may be necessary in the event of an accident.

Control Room Envelope (CRE): The plant area, defined in the facility licensing basis, that in the event of an emergency, can be isolated from the plant areas and the environment external to the CRE. This area is served by an emergency ventilation system, with the intent of maintaining the habitability of the control room. This area encompasses the control room, and may encompass other non-critical areas to which frequent personnel access or continuous occupancy is not necessary in the event of an accident.

Control Room Habitability Systems (CRHSs): The systems, defined in the facility licensing basis, that typically provide the functions of shielding, isolation, pressurization, heating, ventilation, air conditioning and filtration, monitoring, and sustenance and sanitation necessary to ensure that operators can remain in the control room, take actions to operate the plant under normal conditions, and maintain it in a safe condition during accident situations. The CRHSs include the CRE.

C. REGULATORY POSITION

1. AN OVERVIEW OF THE PROCESS OF DEMONSTRATING AND MAINTAINING CRH

In demonstrating that a facility's control room conforms to the GDCs, the following CRH aspects are typically assessed.

[2] As used in this guide, the licensing basis is the documentation that describes how the plant meets applicable regulations. Design bases are defined in 10 CFR 50.2. Regulatory Guide 1.186, "Guidance and Examples for Identifying 10 CFR 50.2 Design Bases" (Ref. 2), provides additional guidance. The design bases are a subset of the licensing bases. Thus, licensing bases will be used in this guide to refer to both.

- Radiological doses
- Protection from the effects of hazardous materials
- Control of the reactor from either the control room or the alternate shutdown panel.

The process of demonstrating the above three aspects includes the following actions:

1. Identification of the licensing bases for the (a) CRHSs, (b) areas adjacent to the CRE, and (c) ventilation systems that serve or traverse the CRE and those located in areas adjacent to the CRE.

2. Determinations of whether the design, configuration, and operation of the systems and areas identified in action 1 are consistent with the licensing bases.

3. Determination of the performance characteristics for operating modes associated with radiological and hazardous chemical accidents.

4. Calculation of the radiological dose consequences to control room operators.

5. Evaluation of the habitability of the control room during a postulated hazardous chemical release.

6. Assessment of whether a radiological, hazardous chemical, or smoke challenge could result in the inability of the control room operators to control the reactor from either the control room or, in the event of smoke, from the alternate shutdown panel.

7. Maintenance and monitoring of the CRHSs.

2. DEMONSTRATING AND MAINTAINING CRH

Regulatory Positions 2.1 through 2.7 provide guidance on the process of demonstrating and maintaining CRH.

2.1 Identification of the Licensing Bases for the CRHSs

2.1.1 Identification of the Control Room and the CRE

Confirmation of a facility's ability to meet CRH requirements begins with the identification of the control room and the CRE. A description of the control room and CRE may be contained in a number of plant documents. These documents might include the Updated Final Safety Analysis Report (UFSAR), the original Final Safety Analysis Report (FSAR), the Safety Evaluation for the Operating License (OL), system descriptions, plant drawings, operating procedures, plant amendment requests, NRC safety evaluations, Three Mile Island (TMI) Action Item III.D.3.4 submittals, and responses to staff questions at the construction permit and OL stages.

2.1.2 Determination of the Licensing Bases

In demonstrating the habitability of a facility's control room, it is essential that the licensee know the facility's licensing bases for their CRHSs. The sources of the licensing bases of the CRHSs should be identified. Licensees should consider the documents identified in Section 4.3 of NEI 99-03 (Ref. 1) as potential sources that define the licensing bases for their CRHSs. Focusing on the events that may have established or changed these bases may help narrow this search.

Over the facility's lifetime the licensing bases change. The staff may have reviewed and approved the licensing bases of facilities licensed before the issuance of this guide. The original licensing bases may have been submitted as part of the construction permit application. Licensees may have modified them in response to NRC questions. In addition, the licensing bases were part of the application for the OL (FSAR). Depending on the plant vintage, licensees may have modified their licensing bases in response to TMI Action Item III.D.3.4. Amendments to the OL may have resulted in changes to the licensing bases of the CRHSs. Licensees should review the applicable plant changes to their licensing bases to determine the current bases.

A group of reactors received their construction permits or OLs before the GDCs were promulgated. During this time, proposed GDCs (sometimes called "Principal Design Criteria") were published in the *Federal Register* for comment. These proposed GDCs addressed CRH. Although facilities may have been licensed before the promulgation of the GDCs, licensees may have committed to the form of the GDCs as they existed at the time of licensing. A review of the record associated with the construction permit and OL proceedings should confirm whether licensees made such a commitment. Therefore, licensees that received their construction permits or OLs before the GDCs were promulgated should review their commitments to the draft form of the GDC to understand their CRH licensing bases.

For facilities licensed following the issuance of this regulatory guide, the sources for the description of the licensing bases will be the documents filed in support of the licensing application (under 10 CFR Parts 50 and 52).

2.2 Determination of Whether the CRHSs Are Consistent with the Licensing Bases

2.2.1 Comparison of System Design, Configuration, and Operation with the Licensing Bases

Licensees should compare the design, configuration, and operation of their CRHSs and the systems that are in adjacent areas and could interact with the CRE to their licensing bases to ensure consistency. The review of the configuration of the CRHSs should include the construction and the alignment of the systems and structures that make up the CRHSs. For new reactors and existing CRHSs undergoing redesign, this comparison should be made upon completion of construction. Section 5 of NEI 99-03 (Ref. 1) provides a method of comparing the plant's configuration and operation of ventilation systems with the licensing bases that is acceptable to the NRC staff with one clarification. Licensees should also establish the performance characteristics discussed in Regulatory Position 2.3.1 to ensure consistency between the operation of the control room ventilation systems and the licensing bases. Licensees should employ methods similar to those provided in Section 5 of NEI 99-03 when they perform these comparisons for other CRHSs.

2.2.2 Interactions Between the CRHSs and Adjacent Areas

The conditions that exist in the areas adjacent to the CRE influence the performance of the CRHSs. Although these systems might not be expected to operate during an emergency, during a loss of offsite power (LOOP), or with a single failure, inleakage may be increased if they do operate. Potential interactions between the CRHSs and adjacent areas that may increase the transfer of contaminants into the CRE should be identified. These interactions may be caused by ventilation systems that supply or exhaust air from areas adjacent to the CRE, are located in areas adjacent to the CRE, or have ductwork that traverses the CRE or areas adjacent to the CRE.

2.3 Determination of Performance Characteristics

2.3.1 Performance of CRHSs

The licensee should determine the performance characteristics of the CRE, its ventilation systems, and systems that serve or traverse areas within or located adjacent to the CRE. These parameters include but are not limited to differential pressures, system flow measurements (i.e., makeup and recirculation flow rates), duct static pressures, and filter differential pressures. Performance characteristics are needed to:

- Establish the operating parameters for incorporation into the licensing bases (for new reactors or those that have modified their CRE or associated ventilation systems),
- Determine the impact on systems caused by changes in the operation, design, alignment, or procedures,
- Define the limiting condition for the applicable design basis events,
- Determine new limiting conditions or perform new analyses.

Technical specifications require licensees to periodically perform measurements of several parameters important to maintaining CRH. These parameters may include system flow rates, carbon filter efficiencies, actuation signals, and CRE integrity tests. Engineered-safety-feature atmospheric clean up systems in light-water-cooled nuclear power plants should be tested and evaluated per Regulatory Guide 1.52, “Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants” (Ref. 3).

In CRE integrity tests performed from 1991-2001 by approximately 30 percent of the licensed facilities, all but one facility have measured greater inleakage than that assumed in the design analyses. In some cases, the measured inleakage exceeded the amount assumed in the design analyses by several orders of magnitude. Regulatory Guide 1.197, “Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors” (Ref. 4), provides guidance on this issue and an approach acceptable to the NRC staff to determine CRE integrity. As discussed in Regulatory Position 2.2.2, systems outside the CRE may impact CRE integrity. Testing may also be needed to understand the influence of these systems on CRH. Consistent with Regulatory Position 2.2.1, licensees should ensure that their assumed control room inleakage input value used in any accident calculations or evaluations (Regulatory Positions 2.4 and 2.5) are validated by the test methods provided in Regulatory Guide 1.197.

2.3.2 Identification of the Limiting Condition

The limiting condition for CRH is the configuration that results in the maximum consequences to the control room operators. Sometimes the limiting condition will arise from the configuration that produces the greatest inleakage and sometimes it will not. The latter situation can occur because the configuration that results in the largest inleakage may have mitigative features that result in smaller consequences to the control room operators. As an example, CRE inleakage may be greatest for a radiological accident that does not have a LOOP. However, the absence of a LOOP could provide mitigative features that reduce the overall consequences to the control room operators.

In determining the limiting condition for potential radiological accidents, it should not be presumed that the LOCA is the limiting accident because it has the largest initial source of activity. Other accidents, e.g., fuel handling accidents, may produce larger control room operator doses because the manner in which the CRHSs respond may provide less protection to the operators. Therefore, licensees should perform an analysis of the consequences of each applicable radiological accident as discussed in Regulatory Position 2.4 to ensure that they have identified the limiting accident.

Unless a facility relies on a common control room isolation process for all types of radiological accidents, the limiting accident may not be obvious. There are several reasons for this:

- The inleakage characteristics of the envelope may vary with the CRHS's response to an accident.
- The mitigative equipment used to reduce the radioactivity released to the environment may vary with the accident.
- The location of the release points for the various accidents relative to the control room intakes may result in less favorable atmospheric dispersion and higher magnitude intake concentrations.

Licensees should factor all the potential differences in accidents and the CRHS's performance in order to determine the limiting condition.

A few plants are within the exposure range for an accidental release from a nearby nuclear plant or have separate control rooms for multiple units on the same site. An accident in an adjacent unit should not prevent the safe shutdown of an operating unit. Regulatory Position 2.6, "Reactor Control," describes criteria used for determining a safe shutdown of the reactor. The release point, atmospheric dispersion, and postulated source term from the adjacent unit should be reviewed to assess the impact on the operating unit's control room.

For hazardous chemicals, a logic process similar to that employed for radiological accidents should be used to determine the limiting condition.

2.4 Radiological Consequences

Licensees should calculate control room operator doses for the methodology and accidents identified in Regulatory Guide 1.195 (Ref. 5) or Regulatory Guide 1.183 (Ref. 6). For CREs under construction, the control room operators' doses should be based on expected CRHS performance values. When the envelope and associated ventilation systems are operational, the inleakage value should be determined using Regulatory Guide 1.197 (Ref. 4).

2.5 Hazardous Chemicals

Licensees should perform an evaluation of the impact of hazardous chemicals on control room operators using the methodology of Regulatory Guide 1.78, "Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release" (Ref. 7). Regulatory Guide 1.78 encourages licensees to conduct periodic surveys of stationary and mobile sources of hazardous chemicals in the vicinity of their plant sites. The periodicity should be based on the number, size, and type of industrial and transportation activities in the vicinity of the plant and regional and local changes in uses of land. The staff recommends conducting a survey of the location, types, and quantities of the mobile and stationary hazardous chemical sources at least once every 3 years, or more frequently as applicable. The staff also recommends annual performance of an onsite survey of hazardous chemical sources.

For CREs under construction, the hazardous chemical analysis should be based on the expected performance values. When the envelope and associated ventilation systems are operational, the calculation should be based on an inleakage value determined according to Regulatory Guide 1.197 (Ref. 4).

2.6 Reactor Control

This Regulatory Position provides guidance for assessing whether a radiological, hazardous chemical, or smoke challenge could result in the inability of the control room operators to control the reactor from the control room, or in the event of a smoke challenge, from the control room or the alternate shutdown panel. This Regulatory Position does not address the performance of the reactor controls and instrumentation systems that are affected by environmental conditions caused by a radiological, hazardous chemical, or smoke event, nor does it address human engineering (i.e., temperature, vibration, sound, or lighting).

Demonstrating the facility's ability to maintain a habitable control room includes ensuring that an accident arising from a radiological event, hazardous chemicals, or a smoke challenge will not prevent the control room operators from controlling the reactor. Facilities should demonstrate that they meet the reactor control aspects of their licensing bases (typically GDC-19). The specific acceptance criteria for radiological events are summarized in Regulatory Position 4.5 of Regulatory Guide 1.195 (Ref. 5) for plants employing TID-14844 source term methodology and Regulatory Position 4.4 of Regulatory Guide 1.183 (Ref. 6) for plants employing alternative source term methodology. The specific acceptance criterion for chemical events is given in Regulatory Position 3.1 of Regulatory Guide 1.78 (Ref. 7).

Smoke may be a CRH concern if there is significant inleakage from outside the envelope or if a fire develops in the control room. In these situations, smoke could challenge the ability of the operator to shut down the reactor from within the control room or remotely. No regulatory limit exists on the amount of smoke allowed in the control room. Therefore, the plant's ability to manage smoke infiltration is assessed qualitatively. Licensees should perform a qualitative assessment to ensure that the plant can be safely shut down from either the control room or the alternate shutdown panel during an internal or external smoke event. The staff endorses Appendix E of NEI 99-03 (Ref. 1) as an acceptable method for performing this qualitative assessment with the following exceptions. The second sentence of Section 1 should read, "The guidance ensures that the operator maintains an ability to safely shut down the plant during a smoke event originating inside or outside the control room. Replace the words "fire/smoke event" in the first sentence of Section 2 with "smoke event originating from either inside or outside the control room." The title of Section 3 should be "Contingency Logic Evaluation," and the third bullet should be deleted. The last bullet in Section 3 should be the last bullet in Section 2.

2.7 Maintaining and Monitoring CRHSs

CRH is maintained and monitored during the operating life of the plant by a CRHS program. A CRHS program includes periodic evaluations, maintenance, configuration control, and training. This Regulatory Position covers CRHS programs, and it provides methods to mitigate degraded and nonconforming conditions when the plant does not meet the specific acceptance criteria given in Regulatory Position 2.6 or is outside its licensing basis. The following methods of maintaining and monitoring CRHSs should be used.

2.7.1 Periodic Evaluations and Maintenance

Periodic evaluations of CRH demonstrate that the CRHSs meet their functional criteria. These evaluations include periodic assessments and tests.

Periodic assessments of the CRHS's material condition, configuration controls, safety analyses, and operating and maintenance procedures should be performed. CRHS programs should assess the system and material conditions as described in Section 9.3.1, "System Material Condition," of NEI 99-03 (Ref. 1).

Licensees should perform testing to ensure they maintain CRH. Routine performance measurements are described in Regulatory Position 2.3.1. The complexity of testing following modifications should depend on the effect of the modification on CRH. Regulatory Guide 1.197 (Ref. 4) provides a testing method for verification of CRE integrity. A frequency for CRE integrity testing is provided in Regulatory Guide 1.197. Regulatory Position 2.5 above provides a method and a suggested frequency for evaluating the impact of hazardous chemicals on control room operators.

Changes to the standard technical specifications that are acceptable to the NRC staff and incorporate the above aspects of CRE integrity testing and periodic assessments are contained in Appendix B to this guide. Appendix B provides changes to the Westinghouse Standard Technical Specification (STS) 3.7.10 (Ref. 8), "Control Room Emergency Filtration System (CREFS)," and its associated bases, and adds a new administrative technical specification 5.5.1.8, "Control Room Integrity Program." Similar changes to Babcox and Wilcox (B&W) STS 3.7.10 (Ref. 9), Combustion Engineering (CE) STS 3.7.11 (Ref. 10), General Electric (GE) Boiling Water Reactor (BWR) 4 STS 3.7.4 (Ref. 11), and GE BWR 6 STS 3.7.3 (Ref. 12) and their associated bases would be acceptable to the staff.

Prior to the issuance of this regulatory guide, the Technical Specification Task Force (TSTF) initiated a change to the standard technical specifications for control room ventilation systems. The staff is currently reviewing TSTF-448, "Control Room Habitability" (Ref. 13). When approved, TSTF-448 will provide an acceptable alternative to the technical specification changes proposed in Appendix B.

A maintenance program should be established for the CRHSs. Table H-1 of NEI 99-03 (Ref. 1) should be used to identify systems and components to be included in a maintenance program. Guidance on air filtration and adsorption units of post-accident engineered-safety-feature atmosphere cleanup and normal atmospheric cleanup system maintenance is provided in Regulatory Position 5 of Regulatory Guides 1.52 (Ref. 3) and 1.140, "Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants" (Ref. 14), respectively. ASHRAE Guideline 1-1996 (Ref. 15) may be used to establish a maintenance program for systems that handle hazardous chemical and smoke challenges.

2.7.2 Configuration Control and Training

Configuration control and training are effective tools that can minimize the impact that changes to CRHSs can have on CRH. Section 9.4 of NEI 99-03 (Ref. 1) provides configuration controls that include CRE boundary and breach control, procedure control, toxic gas control, design change, and safety analysis controls.

The staff endorses the controls discussed in Sections 9.4.1 through 9.4.5 of NEI 99-03 (Ref. 1) with two exceptions. The staff does not endorse Appendix K, "Control Room Envelope Boundary Control Program," referenced in Section 9.4.1, "CRE Boundary/Breach Control." Instead of endorsing the method of equating a breach size to an inleakage flow rate, the staff endorses the method of breach control contained in the STSs (Ref. 8, 9, 10, 11, 12), which allows the control room boundary to be opened intermittently under administrative controls. For entry and exit through doors, the administrative control of the opening is performed by the persons entering or exiting the area. For other openings, these controls consist of stationing a dedicated individual at the opening who is in continuous communication with the control room. This individual will have a method to rapidly close the opening when a need for control room isolation is indicated. Regulatory Guides 1.183 or 1.195 should be used instead of Appendix C (referenced in Section 9.4.5); Regulatory Guide 1.194 should be used instead of Appendix D (referenced in Section 9.4.5); Regulatory Guide 1.78 should be used instead of Appendix G (referenced in Section 9.4.5) (Refs. 6, 5, 16, and 7).

Furthermore, the staff endorses Section 9.5, “Training,” of NEI 99-03 with one exception. Section 9.5 recommends training using NEI 99-03. Instead, the NRC staff endorses training using only the sections of NEI 99-03 that the staff has endorsed.

2.7.3 Degraded and Nonconforming Conditions

Methods available to address short term degraded or nonconforming conditions are provided in Section 8.4, “Methods Available to Address Degraded or Nonconforming Conditions” of NEI 99-03 (Ref. 1). Section 8.4 includes guidance on compensatory measures such as self-contained breathing apparatus (SCBA) and potassium iodide (KI) tablets. These methods are acceptable with the following exceptions. Appendices C and D are not endorsed; instead, Regulatory Guides 1.194, “Atmospheric Relative Concentrations for Control Room Radiological Habitability Assessments at Nuclear Power Plants” (Ref. 16), and 1.195 (Ref. 5), or Regulatory Guide 1.183 (Ref. 6) should be used. The staff endorses the use of the guidance in Appendix F of NEI 99-03 while corrective actions are being taken to resolve CRHSs that do not meet their licensing bases, subject to the following:

- Section 2.2 of Appendix F addresses the training and qualification of control room operators for SCBA. If SCBA units will be used as an interim compensatory measure for greater than 90 days while the plant is in Operating Condition or Mode 1, simulator crew training accident scenarios in which operators wear SCBAs should be performed. These scenarios should last about 2 hours and include a simulated watch turnover.

- Section 2.6 of Appendix F addresses the availability of adequate methods to refill depleted SCBA cylinders. The impact of a LOOP or airborne contamination at the refill compressor stations should be considered.

- Section 2 of Appendix F addresses additional guidance for evaluating the habitability of a control room during a chemical release. Replace the sentence beginning with “Additional guidance” with “Additional guidance is provided in Regulatory Guide 1.78, “Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release” (Ref. 7).

- Section 2.5 and 2.6 of Appendix F should be replaced with the following to correct an editorial error: “2.5 Persons Using Tight Fitting (Facepiece) Respirators Should Not Have Any Facial Hair That Interferes With the Sealing Surfaces of the Respirator. The required minimum staffing of control room operators qualified in SCBA use should be clean shaven. 2.6 Adequate Method(s) to Refill SCBA Air Cylinders Should Be Available.”

Some licensees were allowed to leave TMI Action Item III.D.3.4 actions open until the alternative source term rulemaking and regulatory guidance were published. These actions were completed with the issuance of 10 CFR 50.67 and Regulatory Guide 1.183 (Ref. 6). The Regulatory Positions in this regulatory guide on control room habitability provide methods acceptable to the NRC staff for closing open TMI Action Item III.D.3.4 actions.

D. IMPLEMENTATION

This section provides information to applicants and licensees regarding the NRC staff's plans for using this regulatory guide.

Except when an applicant or licensee proposes an acceptable alternative method for complying with specified portions of the NRC's regulations, the methods described in this guide will be used by the NRC staff in the evaluation of CRH for nuclear power plants for which the construction permit or license application is docketed after the issue date of this guide and plants for which the licensees voluntarily commit to the provisions of this guide.

REFERENCES

1. Nuclear Energy Institute, “Control Room Habitability Assessment Guidance,” NEI 99-03, Revision 0, June 2001.[1]

2. USNRC, “Guidance and Examples for Identifying 10 CFR 50.2 Design Bases,” Regulatory Guide 1.186, December 2000.[2]

3. USNRC, “Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants,” Regulatory Guide 1.52, Revision 3, USNRC, June 2001.[2]

4. USNRC, “Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors,” Regulatory Guide 1.197, May 2003.[2]

5. USNRC, “Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light-Water Nuclear Power Reactors,” Regulatory Guide 1.195, May 2003.[2]

6. USNRC, “Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors,” Regulatory Guide 1.183, July 2000.[2]

7. USNRC, “Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release,” Regulatory Guide 1.78, Revision 1, December 2001.[2]

8. USNRC, “Standard Technical Specifications Westinghouse Plants: Specifications,” NUREG-1431, Volume 1, Revision 2, June 2001.[3] (ADAMS Accession Number ML011840223)

9. USNRC, “Standard Technical Specifications Babcock and Wilcox Plants,” NUREG-1430, Volume 1, Revision 2, June 2001.[3] (ADAMS Accession Number ML011770186)

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[1] Copies are available for inspection or copying for a fee from the NRC Public Document Room at 11555 Rockville Pike (first floor), Rockville, MD; the PDR’s mailing address is USNRC PDR, Washington, DC 20555; telephone (301)415-4737 or 1-(800)397-4209; fax (301)415-3548; e-mail <PDR@NRC.GOV>.

[2] Requests for single copies of draft or active regulatory guides (which may be reproduced) or for placement on an automatic distribution list for single copies of future draft guides in specific divisions should be made in writing to the U.S. Nuclear Regulatory Commission, Washington, DC 20555, Attention: Reproduction and Distribution Services Section, or by fax to (301)415-2289; email <DISTRIBUTION@NRC.GOV>. Copies are available for inspection or copying for a fee from the NRC Public Document Room at 11555 Rockville Pike (first floor), Rockville, MD; the PDR’s mailing address is USNRC PDR, Washington, DC 20555; telephone (301)415-4737 or 1-(800)397-4209; fax (301)415-3548; e-mail <PDR@NRC.GOV>.

[3] Available through NRC’s web site, <www.nrc.gov> , in the Electronic Reading Room through ADAMS (using the accession number) and online at <www.nrc.gov/reactors/operating/licensing/techspecs.html> .

10. USNRC, “Standard Technical Specifications Combustion Engineering Plants,” NUREG-1432, Volume 1, Revision 2, June 2001.[3] (ADAMS Accession Number ML011930335)

11. USNRC, “Standard Technical Specifications General Electric Plants, BWR/4,” NUREG-1433, Volume 1, Revision 2, June 2001.[3] (ADAMS Accession Number ML011780639)

12. USNRC, “Standard Technical Specifications General Electric Plants, BWR/6,” NUREG-1434, Volume 1, Revision 2, June 2001.[3] (ADAMS Accession Number ML011780537)

13. TSTF-448, “Control Room Habitability,” Draft, December 18, 2002.[3] (ADAMS Accession Number ML030080399).

14. USNRC, “Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants,” Regulatory Guide 1.140, Revision 2, USNRC, June 2001.[2]

15. American Society of Heating, Refrigeration and Air Conditioning Engineers, “The HVAC Commissioning Process,” ASHRAE Guideline 1-1996, June 1996.

16. USNRC, “Atmospheric Relative Concentrations for Control Room Radiological Habitability Assessments at Nuclear Power Plants,” Regulatory Guide 1.194, May 2003.[2]

Appendix A

REGULATORY GUIDE ENDORSEMENT OF NEI 99-03, REV. 0, JUNE 2001, BY SECTION

NEI 99-03 Section Number	NEI 99-03 Section Title	Endorsement Status	Regulatory Guide Section	Exceptions/Remarks
1	Introduction	Not addressed	N/A	N/A
1.1	Purpose And Scope	Not addressed	N/A	N/A
1.2	History	Not addressed	N/A	N/A
1.3	Document Organization	Not addressed	N/A	N/A
2	Regulatory Requirements And Guidance	Not addressed	N/A	N/A
2.1	Purpose And Scope	Not addressed	N/A	N/A
2.2	Regulatory Requirement - General Design Criterion 19	Not addressed	N/A	N/A
2.3	Regulatory Guidance	Not addressed	N/A	N/A
2.3.1	Regulatory Guides	Not addressed	N/A	N/A
2.3.2	NUREGs	Not addressed	N/A	N/A
2.3.3	Information Notices	Not addressed	N/A	N/A
2.4	Generic Issues	Not addressed	N/A	N/A
3	Industry Issues Associated With Control Room Habitability	Not addressed	N/A	N/A

3.1	Purpose And Scope	Not addressed	N/A	N/A
3.2	Licensing Basis Different From As-built Plant	Not addressed	N/A	N/A
3.3	Analyses Different From As-built or As-operated Plant	Not addressed	N/A	N/A
3.4	DBA Analyzed Not Most Limiting	Not addressed	N/A	N/A
3.4.1	Adjacent Unit Accident (A Special Case)	Not addressed	N/A	N/A
3.5	Smoke Infiltration	Not addressed	N/A	N/A
3.6	Toxic Gas Evaluation	Not addressed	N/A	N/A
3.7	Control Room Air In-leakage Greater Than Assumed	Not addressed	N/A	N/A
3.7.1	Radiological Considerations	Not addressed	N/A	N/A
3.7.2	Toxic Gas Considerations	Not addressed	N/A	N/A
4	Determining CRH Licensing Basis	Not addressed	N/A	N/A
4.1	Purpose And Scope	Not addressed	N/A	N/A
4.2	Understanding The Concept of Licensing Basis	Not addressed	N/A	N/A
4.2.1	Design Basis	Not addressed	N/A	N/A
4.2.2	Supporting Design Information	Not addressed	N/A	N/A
4.2.3	Licensing Basis	Not addressed	N/A	N/A

4.3	Licensing Basis Sources	Full endorsement	Regulatory Guide 1.196, Regulatory Position (RP) 2.1.2	N/A
4.4	Performing the Licensing Basis Review	Not addressed	N/A	N/A
4.5	Assembling the CRH Analysis	Not addressed	N/A	N/A
4.6	Documentation of the Existing Plant CRH Licensing and Design Basis	Not addressed	N/A	N/A
5	Comparing Existing Plant Configuration and Operations with Licensing Bases for CRH	Full endorsement	RG 1.196, RP 2.2.1	This section provides a method of comparing the plant's configuration and operation of ventilation systems with the licensing bases that is acceptable to the NRC staff with one clarification. Licensees should also establish the performance characteristics discussed in Regulatory Position 2.3.1 to ensure consistency between the operation of the control room ventilation systems and the licensing bases.
5.1	Purpose and Scope	Full endorsement	RG 1.196, RP 2.2.1	N/A

5.2	Review the As-Built Control Room Envelope and Control Room Ventilation Systems	Full endorsement	RG 1.196, RP 2.2.1	N/A
5.3	Review the Normal and Emergency Operating Procedures Affecting the Control Room Ventilation Systems	Full endorsement	RG 1.196, RP 2.2.1	N/A
5.4	Review the Testing Procedures Affecting Control Room Ventilation Systems and the Associated Envelope	Full endorsement	RG 1.196, RP 2.2.1	N/A
5.5	Review the Maintenance Practices and Procedures for Effect on CRH Requirements	Full endorsement	RG 1.196, RP 2.2.1	N/A
5.6	Review the Plant Modification Procedures for Consideration of the CRH Requirements	Full endorsement	RG 1.196, RP 2.2.1	N/A
5.7	Review the CRH Analyses	Full endorsement	RG 1.196, RP 2.2.1	N/A
5.8	Identified Inconsistencies	Full endorsement	RG 1.196, RP 2.2.1	N/A
6	Assessing Industry Issue Applicability	Not addressed	N/A	N/A
6.1	Purpose and Scope	Not addressed	N/A	N/A
6.2	Limiting DBA	Not addressed	N/A	N/A
6.2.1	Recommended Actions to Evaluate Limiting DBA	Not addressed	N/A	N/A

6.2.2	Adjacent Unit Accidents	Not addressed	N/A	N/A
6.3	Smoke Infiltration	Not endorsed	N/A	N/A
6.3.1	Recommended Licensee Action to Address Smoke Infiltration	Not endorsed	N/A	N/A
6.4	Toxic Gas Evaluation	Not addressed	N/A	N/A
6.4.1	Recommended Licensee Action to Address Toxic Gas Evaluation	Not Addressed	N/A	N/A
7	Measuring Air In-leakage (Baseline Test	Not addressed	N/A	N/A
7.1	Purpose and Scope	Not addressed	N/A	N/A
7.2	Preparation for Testing	Not addressed	N/A	N/A
7.3	Test Performance	Not addressed	N/A	N/A
7.4	Resolution of Identified Issues	Not addressed	N/A	N/A
8	Dispositioning and Managing Discrepancies	Not addressed	N/A	N/A
8.1	Purpose and Scope	Not addressed	N/A	N/A
8.2	Generic Letter 91-18	Not addressed	N/A	N/A
8.3	Determining Operability and Reportabilty	Not addressed	N/A	N/A

8.4	Methods Available to Address Degraded or Nonconforming Conditions	Partial endorsement	RG 1.196, RP 2.7.3	Appendices C and D are not endorsed. Appendix F exceptions related to: • Training and qualification of control room operators for SCBA • Availability of adequate methods to refill SCBA • Two typographical errors as described in the text of this guide.
8.4.1	Compensatory Measures	Partial endorsement	RG 1.196, RP 2.7.3	N/A
8.4.2	Dose Analysis Revision Option	Partial endorsement	RG 1.196, RP 2.7.3	N/A
8.4.3	Repairing or Modifying the Plant	Partial endorsement	RG 1.196, RP 2.7.3	N/A
8.4.4	Technical Specification Changes	Partial endorsement	RG 1.196, RP 2.7.3	N/A
9	Long-term CRH Integrity Program	Not addressed	N/A	N/A
9.1	Purpose and Scope	Not addressed	N/A	N/A
9.2	CRH Integrity Program	Not addressed	N/A	N/A
9.3	Periodic Evaluations	Not addressed	N/A	N/A
9.3.1	System Material Condition	Full endorsement	RG 1.196, RP 2.7.1	N/A

9.3.2	Post-maintenance Activities	Not addressed	N/A	N/A
9.3.3	In-leakage Assessments	Not addressed	N/A	N/A
9.3.3.1	Assessment Scope	Not addressed	N/A	N/A
9.3.3.2	Assessment Frequency	Not addressed	N/A	N/A
9.3.3.3	Determine Need to Test	Not addressed	N/A	N/A
9.3.4	Toxic Gas Evaluation	Not addressed	N/A	N/A
9.4	Configuration Control	Partial Endorsement	RG 1.196, RP 2.7.2	The NRC staff references the configuration controls in Section 9.4. These include CRE boundary and breach control, procedure control, toxic gas control, design change, and safety analysis controls.
9.4.1	CRE Boundary / Breach Control	Partial endorsement	RG 1.196, RP 2.7.2	The NRC staff does not endorse Appendix K.
9.4.2	Procedure Control	Full endorsement	RG 1.196, RP 2.7.2	N/A
9.4.3	Toxic Chemical Control	Full endorsement	RG 1.196, RP 2.7.2	N/A
9.4.4	Design Change Control	Full endorsement	RG 1.196, RP 2.7.2	N/A

9.4.5	Safety Analyses Control	Partial endorsement	RG 1.196, RP 2.7.2	Rather than endorse Appendices C, D, and G referenced in Section 9.4.5, Regulatory Guides 1.183, 1.194, 1.195, and 1.78 should be used to provide analysis assumptions used in safety analyses.
9.5	Training	Partial endorsement	RG 1.196, RP 2.7.2	The NRC staff endorses training using only the sections of NEI 99-03 that the staff has endorsed.
9.6	Testing	Not addressed	N/A	N/A
10	References	Not addressed	N/A	N/A
Appendix A	Licensing Basis History	Not addressed	N/A	N/A
Appendix B	Control Room Habitability Regulatory Information	Not addressed	N/A	N/A
Appendix C	CRH Dose Analysis: Regulatory Enhancements	Not endorsed	RG 1.196, RP 2.7.3	Regulatory Guide 1.195 should be used.
Appendix D	Atmospheric Dispersion	Not endorsed	RG 1.196, RP 2.7.3	Regulatory Guide 1.194 should be used.

Appendix E	Smoke Infiltration Impact on Safe Shutdown	Partial endorsement	RG 1.196, RP 2.6	The NRC staff endorses Appendix E as an acceptable method for performing this qualitative assessment with exceptions stated in Regulatory Position 2.6. However, the reference to Section 6 is not endorsed. Remove the words "as described in Section 6" in the first sentence.
Appendix F	Compensatory Measures Allowable on an Interim Basis	Partial endorsement	RG 1.196, RP 2.7.3	Appendix F exceptions relate to: • Training and qualification of control room operators for SCBA • The impact of a loss of offsite power or airborne contamination at the refill compressor stations. • Two typographical errors as described in the text of this guide.
Appendix G	Toxic Gas Assessments	Not Addressed	N/A	Regulatory Guide 1.78 should be used.
Appendix H	System Assessment	Partial endorsement	RG 1.196, RP 2.7.1	The NRC staff endorses Table H-1 as guidance for developing a maintenance program.

Appendix I	Testing Program	Not Addressed	N/A	N/A
Appendix J	Control Room Envelope Sealing Program	Not addressed	N/A	N/A
Appendix K	Control Room Envelope Boundary Control Program	Not endorsed	RG 1.196, RP 2.7.2	The staff does not endorse Appendix K. Instead of endorsing the method of equating a breach size to an inleakage flow rate, the staff endorses the method of breach control contained in the STSs (NUREG-1431, NUREG 1430, NUREG-1432, NUREG-1433, and NUREG-1434) (Ref. 8-12), which allows the control room boundary to be opened intermittently under administrative controls.
Appendix L	Glossary of Terms	Not addressed	N/A	N/A

Appendix B

Acceptable Technical Specification and Bases Revisions For Westinghouse Plants

Revisions to Revision 2 of NUREG-1431

June 2001
(Manuscript completed April 30, 2001)

3.7 PLANT SYSTEMS

3.7.10 Control Room Emergency Filtration System (CREFS)

LCO 3.7.10 Two CREFS trains shall be OPERABLE.

- NOTE -

The control room boundary may be opened intermittently under administrative control.

MODES 1, 2, 3, 4, [5, and 6],
During movement of [recently] irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One CREFS train inoperable.	A.1 Restore CREFS train to OPERABLE status.	7 days
2) Two CREFS trains inoperable due to inoperable control room boundary in MODE 1, 2, 3, or 4 other than C not met.	B.1 Restore control room boundary to OPERABLE status.	24 hours
C. Surveillance Requirement 3.7.10.5 not met.	C.1 Initiate compensatory measures. <u>AND</u> C.2 Restore inleakage to ≤ acceptable inleakage as established in Specification 5.5.18.	Immediately 14 days

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action C.2 and associated Completion Time not met.	D.1 Issue a report in accordance with Specification 5.6.10.	90 days
~~C~~E. Required Action and associated Completion Time of Condition A or B not met in MODE 1, 2, 3, or 4.	~~C~~E.1 Be in MODE 3. <u>AND</u> ~~C~~E.2 Be in MODE 5.	6 hours 36 hours
~~D~~F. Required Action and associated Completion Time of Condition A not met [in MODE 5 or 6, or] during movement of [recently] irradiated fuel assemblies.	~~D~~F.1 ----------------------------- **- NOTE -** **[** Place in toxic gas protection mode if automatic transfer to toxic gas protection mode is inoperable. **]** ----------------------------- Place OPERABLE CREFS train in emergency mode. <u>OR</u> ~~D~~F.2 Suspend movement of [recently] irradiated fuel assemblies.	 Immediately Immediately
~~E~~G. Two CREFS trains inoperable [in MODE 5 or 6, or] during movement of [recently] irradiated fuel assemblies for reasons other than Condition C.	~~E~~G.1 Suspend movement of [recently] irradiated fuel assemblies.	Immediately

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~F~~H. Two CREFS trains inoperable in MODE 1, 2, 3, or 4 for reasons other than Condition B or C.	~~F~~H.1 Enter LCO 3.0.3	Immediately

~~SURVEILLANCE REQUIREMENTS~~

SURVEILLANCE		FREQUENCY
SR 3.7.10.1	Operate each CREFS train for [≥ 10 continuous hours with the heaters operating or (for systems without heaters) ≥ 15 minutes].	31 days
SR 3.7.10.2	Perform required CREFS filter testing in accordance with the [Ventilation Filter Testing Program (VFTP)].	In accordance with [VFTP]
SR 3.7.10.3	Verify each CREFS train actuates on an actual or simulated actuation signal.	[18] months
SR 3.7.10.4	Verify one CREFS train can maintain a positive pressure of ≥ [0.125] inches water gauge, relative to the adjacent [turbine building] during the pressurization mode of operation at a makeup flow rate of ≤ [3000] cfm.	[18] months on a STAGGERED TEST BASIS
SR 3.7.10.5	Verify control room measured inleakage is ≤ acceptable inleakage established in accordance with Specification 5.5.18.	In Accordance with Control Room Integrity Program

5.5 Programs and Manuals

5.5.16 Containment Leakage Rate Testing Program (continued)

e. The provisions of SR 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

f. Nothing in these Technical Specifications shall be construed to modify the testing Frequencies required by 10 CFR 50, Appendix J.

5.5.17 Battery Monitoring and Maintenance Program

This Program provides for battery restoration and maintenance, based on [the recommendations of IEEE Standard 450-1995, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," or of the battery manufacturer] including the following:

a. Actions to restore battery cells with float voltage < [2.13] V, and

b. Actions to equalize and test battery cells that had been discovered with electrolyte level below the minimum established design limit.

c. Nothing in these Technical Specifications shall be construed to modify the testing Frequencies required by 10 CFR 50, Appendix J.

5.5.18 Control Room Integrity Program

A Control Room Integrity Program shall be established and implemented to ensure that the criterion described in 10 CFR 50, Appendix A, General Design Criteria 19 is maintained. The program will provide controls to maintain main control room envelope integrity and shall include:

a. Establishing acceptable amounts of radioactive and hazardous chemical inleakage for the main control room.;

b. Maintaining configuration control and managing breaches of the main control room envelope to ensure that values for in-leakage remain below the established acceptable values;

c. Testing for main control room inleakage in accordance with and at the frequencies specified in Regulatory Guide 1.197;

5.5 Programs and Manuals

d. Providing preventive maintenance of doors, wall/roof/floor penetrations, dampers and floor drains that are part of the main control room envelope; and

e. Assessing main control room habitability at the frequencies specified in Regulatory Guide 1.197.

5.0 ADMINISTRATIVE CONTROLS

5.6 Reporting Requirements

5.6.7 Post Accident Monitoring Report

When a report is required by Condition B or G of LCO 3.3.[3], "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.8 **[** Tendon Surveillance Report

Any abnormal degradation of the containment structure detected during the tests required by the Pre-stressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken. **]**

5.6.9 **[** Steam Generator Tube Inspection Report **]**

- REVIEWER'S NOTES -

1. Reports required by the Licensee's current licensing basis regarding steam generator tube surveillance requirements shall be included here. An appropriate administrative controls format should be used.

2. These reports may be required covering inspection, test, and maintenance activities. These reports are determined on an individual basis for each unit and their preparation and submittal are designated in the Technical Specifications.

5.6.10 **[**Control Room Emergency Filtratiion System Report**]**

A report shall be submitted within 90 days outlining the compensatory measures, the cause of Condition C in Specification 3.7.10, and the plans and schedule for restoring the inleakage to $\leq$ the acceptable inleakage established in Specification 5.5.18.

B 3.7 PLANT SYSTEMS

B 3.7.10 Control Room Emergency Filtration System (CREFS)

BASES

BACKGROUND

The CREFS provides a protected environment from which operators can control the unit following an uncontrolled release of radioactivity [, chemicals, or toxic gas].

The CREFS consists of two independent, redundant trains that recirculate and filter the control room air. Each train consists of a prefilter or demister, a high efficiency particulate air (HEPA) filter, an activated charcoal adsorber section for removal of gaseous activity (principally iodines), and a fan. Ductwork, valves or dampers, and instrumentation also form part of the system, as well as demisters to remove water droplets from the air stream. A second bank of HEPA filters follows the adsorber section to collect carbon fines and provide backup in case of failure of the main HEPA filter bank.

The CREFS is an emergency system, parts of which may also operate during normal unit operations in the standby mode of operation. Upon receipt of the actuating signal(s), normal air supply to the control room is isolated, and the stream of ventilation air is recirculated through the system filter trains. The prefilters or demisters remove any large particles in the air, and any entrained water droplets present, to prevent excessive loading of the HEPA filters and charcoal adsorbers. Continuous operation of each train for at least 10 hours per month, with the heaters on, reduces moisture buildup on the HEPA filters and adsorbers. Both the demister and heater are important to the effectiveness of the charcoal adsorbers.

Actuation of the CREFS places the system in either of two separate states (emergency radiation state or toxic gas isolation state) of the emergency mode of operation, depending on the initiation signal. Actuation of the system to the emergency radiation state of the emergency mode of operation, closes the unfiltered outside air intake and unfiltered exhaust dampers, and aligns the system for recirculation of the control room air through the redundant trains of HEPA and the charcoal filters. The emergency radiation state also initiates pressurization and filtered ventilation of the air supply to the control room.

Outside air is filtered, diluted with building air from the electrical equipment and cable spreading rooms, and added to the air being recirculated from the control room. Pressurization of the control room ~~prevents~~ minimizes infiltration of unfiltered air from the surrounding areas of the building. The actions taken in the toxic gas isolation state are the

BACKGROUND (continued)

same, except that the signal switches control room ventilation to an isolation alignment to prevent outside air from entering the control room.

[The air entering the control room is continuously monitored by radiation and toxic gas detectors. One detector output above the setpoint will cause actuation of the emergency radiation state or toxic gas isolation state, as required. The actions of the toxic gas isolation state are more restrictive, and will override the actions of the emergency radiation state.]

A single train will pressurize the control room to about [0.125] inches water gauge. The CREFS operation in maintaining the control room habitable is discussed in the FSAR, Section [6.4] (Ref. 1).

Redundant supply and recirculation trains provide the required filtration should an excessive pressure drop develop across the other filter train. Normally open isolation dampers are arranged in series pairs so that the failure of one damper to shut will not result in a breach of isolation. The CREFS is designed in accordance with Seismic Category I requirements.

The CREFS is designed to maintain the control room environment for 30 days of continuous occupancy after a Design Basis Accident (DBA) without exceeding a 5 rem whole body dose or its equivalent to any part of the body [or 5 rem TEDE per GDC-19].

APPLICABLE SAFETY ANALYSES

The CREFS components are arranged in redundant, safety related ventilation trains. The location of components and ducting within the control room envelope ensures an adequate supply of filtered air to all areas requiring access. The CREFS provides airborne radiological protection for the control room operators, as demonstrated by the control room accident dose analyses for the most limiting design basis ~~loss of coolant~~ accident, fission product release presented in the FSAR, Chapter [15] (Ref. 2).

The analysis of toxic gas releases demonstrates that the toxicity limits are not exceeded in the control room following a toxic chemical release, as presented in Reference 1.

The worst case single active failure of a component of the CREFS, assuming a loss of offsite power, does not impair the ability of the system to perform its design function.

The CREFS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Two independent and redundant CREFS trains are required to be OPERABLE to ensure that at least one is available assuming a single failure disables the other train. Total system failure could result in exceeding a dose of 5 rem whole body or its equivalent to any part of the body [or 5 rem TEDE per GDC-19] to the control room operator in the event of a large radioactive release.

The CREFS is considered OPERABLE when the individual components necessary to limit operator exposure are OPERABLE in both trains. A CREFS train is OPERABLE when the associated:

a. Fan is OPERABLE,

b. HEPA filters and charcoal adsorbers are not excessively restricting flow, and are capable of performing their filtration functions, and

c. Heater, demister, ductwork, valves, and dampers are OPERABLE, and air circulation can be maintained.

In addition, the control room boundary must be maintained, including the integrity of the walls, floors, ceilings, ductwork, and access doors. The measured inleakage must also be maintained within the assumptions of the design analysis.

The LCO is modified by a Note allowing the control room boundary to be opened intermittently under administrative controls. For entry and exit through doors, the administrative control of the opening is performed by the person(s) entering or exiting the area. For other openings, these controls consist of stationing a dedicated individual at the opening who is in continuous communication with the control room. This individual will have a method to rapidly close the opening when a need for control room isolation is indicated.

APPLICABILITY

In MODES 1, 2, 3, 4, [5, and 6,] and during movement of [recently] irradiated fuel assemblies, CREFS must be OPERABLE to control operator exposure during and following a DBA.

In [MODE 5 or 6], the CREFS is required to cope with the release from the rupture of an outside waste gas tank.

During movement of [recently] irradiated fuel assemblies, the CREFS must be OPERABLE to cope with the release from a fuel handling accident [involving handling recently irradiated fuel]. [The CREFS is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [ ] days), due to radioactive decay.]

APPLICABILITY (continued)

ACTIONS

A.1

When one CREFS train is inoperable, action must be taken to restore OPERABLE status within 7 days. In this Condition, the remaining OPERABLE CREFS train is adequate to perform the control room protection function. However, the overall reliability is reduced because a single failure in the OPERABLE CREFS train could result in loss of CREFS function. The 7 day Completion Time is based on the low probability of a DBA occurring during this time period, and ability of the remaining train to provide the required capability.

B.1

- REVIEWER'S NOTE -

Adoption of Condition B is dependent on a commitment from the licensee to have written procedures available describing compensatory measures to be taken in the event of an intentional or unintentional entry into Condition B.

If the control room boundary is inoperable in MODE 1, 2, 3, or 4, the CREFS trains cannot perform their intended functions. Actions must be taken to restore an ~~OPERABLE~~ inoperable control room boundary within 24 hours. During the period that the control room boundary is inoperable, appropriate compensatory measures (consistent with the intent of GDC 19) ~~should~~ must be utilized to protect control room operators from potential hazards such as radioactive contamination, toxic chemicals, smoke, temperature and relative humidity, and physical security. Preplanned measures should be available to address these concerns for intentional and unintentional entry into the ~~c~~Condition. The 24 hour Completion Time is reasonable based on the low probability of a DBA occurring during this time period, and the use of compensatory measures. The 24 hour Completion time is a typically reasonable time to diagnose, plan and ~~possibly~~ repair, and test most problems with the control room boundary..

C.1 and C.2

If SR 3.7.10.5 is not met, General Design Criteria (GDC) 19 may not be met. Actions must be taken to insure that GDC 19 is met. During the period when SR 3.7.10.5 is not met, appropriate compensatory measures (consistent with the intent of GDC 19) must be utilized to protect control room operators from potential hazards such as radioactive contamination, ACTIONS (continued)

toxic chemicals, smoke, temperature and relative humidity, and physical security. Preplanned measures should be available to address these concerns for entry into Condition C. The 14 day Completion Time is reasonable based on the low probability of a DBA occurring during this time period, and the use of compensatory measures.

D.1

Condition D applies when the Required Actions C.2 and its associated Completion Time is not met. This Required Action specifies initiation of actions in Specification 5.6.10, which requires a written report to be submitted to the NRC. This report discusses the compensatory measures, the cause of the Condition C, and plans and schedule for restoring the inleakage to ≤ the acceptable inleakage established in Specification 5.5.18. Consistent with LCO 3.0.2, if SR 3.7.10.5 is met before the report is due, the report is not required to be submitted. This action is appropriate in lieu of a shutdown requirement since compensatory measures to insure General Design Criteria 19 is met have been initiated.

~~C~~E.1 and ~~C~~E.2

In MODE 1, 2, 3, or 4, if the inoperable CREFS train or control room boundary cannot be restored to OPERABLE status within the required Completion Time, the unit must be placed in a MODE that minimizes accident risk. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

~~D~~F.1 and ~~D~~F.2

[In MODE 5 or 6, or] during movement of [recently] irradiated fuel assemblies, if the inoperable CREFS train cannot be restored to OPERABLE status within the required Completion Time, action must be taken to immediately place the OPERABLE CREFS train in the emergency mode. This action ensures that the remaining train is OPERABLE, that no failures preventing automatic actuation will occur, and that any active failure would be readily detected.

An alternative to Required Action ~~D~~F.1 is to immediately suspend activities that could result in a release of radioactivity that might require isolation of the control room. This places the unit in a condition that

ACTIONS (continued)

minimizes risk. This does not preclude the movement of fuel to a safe position.

Required Action ~~D~~F.1 is modified by a Note indicating to place the system in the toxic gas protection mode if automatic transfer to toxic gas protection mode is inoperable.

~~E~~G.1

[In MODE 5 or 6, or] during movement of [recently] irradiated fuel assemblies, with two CREFS trains inoperable for reasons other than Condition C, action must be taken immediately to suspend activities that could result in a release of radioactivity that might enter the control room. This places the unit in a condition that minimizes accident risk. This does not preclude the movement of fuel to a safe position.

~~F~~H.1

If both CREFS trains are inoperable in MODE 1, 2, 3, or 4 for reasons other than an inoperable control room boundary (i.e., Condition B), the CREFS may not be capable of performing the intended function and the unit is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.7.10.1

Standby systems should be checked periodically to ensure that they function properly. As the environment and normal operating conditions on this system are not too severe, testing each train once every month provides an adequate check of this system. Monthly heater operations dry out any moisture accumulated in the charcoal from humidity in the ambient air. [Systems with heaters must be operated for ≥ 10 continuous hours with the heaters energized. Systems without heaters need only be operated for ≥ 15 minutes to demonstrate the function of the system.] The 31 day Frequency is based on the reliability of the equipment and the two train redundancy availability.

SR 3.7.10.2

This SR verifies that the required CREFS testing is performed in accordance with the [Ventilation Filter Testing Program (VFTP)]. The [VFTP] includes testing the performance of the HEPA filter, charcoal adsorber efficiency, minimum flow rate, and the physical properties of the activated charcoal. Specific test Frequencies and additional information

SURVEILLANCE REQUIREMENTS (continued)

are discussed in detail in the [VFTP].

SR 3.7.10.3

This SR verifies that each CREFS train starts and operates on an actual or simulated actuation signal. The Frequency of [18] months is specified in Regulatory Guide 1.52 (Ref. 3).

SR 3.7.10.4

This SR verifies the ~~integrity of the control room enclosure, and the assumed inleakage rates of the potentially contaminated air~~ capability of the CREFS to pressurize the control room envelope. The control room positive pressure, with respect to potentially contaminated adjacent areas, is periodically tested to verify ~~proper~~ this function~~ing~~ of the CREFS. During the emergency mode of operation, the CREFS is designed to pressurize the control room ≥ [0.125] inches water gauge positive pressure with respect to adjacent areas in order to ~~prevent~~ minimize unfiltered inleakage. The CREFS is designed to maintain this positive pressure with one train at a makeup flow rate of [3000] cfm. The Frequency of [18] months on a STAGGERED TEST BASIS is consistent with the guidance provided in NUREG-0800 (Ref. 4).

SR 3.7.10.5

This SR verifies that the control room habitability requirements are met in accordance with the Control Room Integrity Program. It addresses both radiological and hazardous chemicals from sources external to the control room. Specific test frequencies and additional information are discussed in detail in the Control Room Integrity Program.

Appendix C

ACRONYMS

ASHRAE	American Society for Heating, Refrigeration and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
B&W	Babcock and Wilcox
BWR	Boiling Water Reactor
CE	Combustion Engineering
CRE	Control Room Envelope
CRH	Control Room Habitability
CRHS	Control Room Habitability System
ASTM	American Society for Testing and Materials
ESF	Engineered Safety Feature
FSAR	Final Safety Analysis Report
GE	General Electric
GDC	General Design Criteria
LOCA	Loss-of-Coolant Accident
LOOP	Loss of Offsite Power
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
OL	Operating License
OMB	Office of Management and Budget
SCBA	Self-Contained Breathing Apparatus
SRP	Standard Review Plan
SSC	Structures, Systems, and Components
STS	Standard Technical Specification
TMI	Three Mile Island
TSTF	Technical Specification Task Force
TSC	Technical Support Center
UFSAR	Updated Final Safety Analysis Report

REGULATORY ANALYSIS

A separate regulatory analysis was not prepared for this regulatory guide. The regulatory analysis prepared for Draft Regulatory Guide DG-1114, "Control Room Habitability at Light-Water Nuclear Power Reactors" (March 2002), provides the regulatory basis for this regulatory guide as well. DG-1114 was issued for public comment as the draft of this present regulatory guide. A copy of the regulatory analysis is available for inspection and copying for a fee at the U.S. Nuclear Regulatory Commission Public Document Room, 11555 Rockville Pike, Rockville, MD; the PDR's mailing address is USNRC PDR, Washington, DC 20555; telephone (301)415-4737 or 1-(800)397-4209; fax (301)415-3548; e-mail <PDR@NRC.GOV>.