U.S. NUCLEAR REGULATORY COMMISSION May 2003

REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

REGULATORY GUIDE 1.197

(Draft guide was issued as DG-1115)

DEMONSTRATING CONTROL ROOM ENVELOPE INTEGRITY AT NUCLEAR POWER REACTORS

A. INTRODUCTION

Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," establishes the principal design criteria for the design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety. General Design Criterion 19 (GDC-19), "Control Room," of Appendix A requires that a control room be provided from which actions can be taken to operate the nuclear reactor safely under normal conditions and maintain the reactor in a safe condition under accident conditions, including a loss-of-coolant accident (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. Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50 establishes quality assurance requirements for the design, construction, and operation of those structures, systems, and components that prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public. Criterion III, "Design Control," of Appendix B requires that design control measures provide for verifying or checking the adequacy of design. A suitable testing program is identified as one method of accomplishing this verification.

Regulatory guides are issued to describe and make available to the public such information as methods acceptable to the NRC staff for implementing specific parts of the NRC's regulations, techniques used by the staff in evaluating specific problems or postulated accidents, and data needed by the NRC staff in its review of applications for permits and licenses. Regulatory guides are not substitutes for regulations, and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

This guide was issued after consideration of comments received from the public. Comments and suggestions for improvements in these guides are encouraged at all times, and guides will be revised, as appropriate, to accommodate comments and to reflect new information or experience. Written comments may be submitted to the Rules and Directives Branch, ADM, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

Regulatory guides are issued in ten broad divisions: 1, Power Reactors; 2, Research and Test Reactors; 3, Fuels and Materials Facilities; 4, Environmental and Siting; 5, Materials and Plant Protection; 6, Products; 7, Transportation; 8, Occupational Health; 9, Antitrust and Financial Review; and 10, General.

Single copies of regulatory guides (which may be reproduced) may be obtained free of charge by writing the Distribution Services Section, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by fax to (301)415-2289, or by email to DISTRIBUTION@NRC.GOV. Electronic copies of this guide and other recently issued guides are available at NRC's home page at <WWW.NRC.GOV> through the Electronic Reading Room, Accession Number ML031490664.

This guide provides an approach acceptable to the NRC staff for measuring inleakage into the control room and associated rooms and areas at nuclear power reactors. The amount of inleakage is an input to the design of the control room, and periodic verification of the inleakage provides assurance that the control room will be habitable during normal and accident conditions. This guide provides guidance on methods acceptable to the staff for determining control room envelope (CRE) integrity for the purpose of confirming that the reactor meets GDC-19.

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. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

B. DISCUSSION

The terms “control room” and “CRE” appear frequently. These terms are defined in Regulatory Guide 1.196, “Control Room Habitability at Nuclear Power Reactors” (Ref. 1). The definitions for control room and the control room envelope are repeated here.

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, the computer room (if used as an integral part of the emergency response plan), shift supervisor's office, the 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.

Reactor facilities are typically designed to the requirements of GDC-19. For a radiological challenge, the design requirement is that the control room operator doses must be less than 5 rem whole body or its equivalent to any part of the body or less than 5 rem total effective dose equivalent (TEDE). For a fire or a hazardous chemical challenge, the requirement is that the control room operators must possess the capability to control the reactor from either the control room or the alternate shutdown panel. Guidance on meeting a hazardous chemical challenge is contained in Regulatory Guide 1.78 (Ref. 2) or Regulatory Guide 1.95 (Ref. 3).

The capability to meet GDC-19 is a function of the integrity of the environment surrounding the operators. Lack of integrity jeopardizes the operator’s ability to control the reactor

and to maintain it in a safe condition. The protected environment provided for operators varies with the plant. At some plants this environment is limited to the control room; at others, it is the CRE. In this guide the CRE will be used to designate both. It is understood that the term "control room" should be substituted for CRE for facilities in which CRE is inappropriate.

During the design of a nuclear power plant, analyses are performed to demonstrate that the plant will provide a habitable environment for the control room operators during postulated design basis events. These analyses are performed assuming a certain amount of inleakage. Unanticipated increases in the amount of contaminants entering the CRE may have an adverse effect on the ability of the operator to perform plant control functions. If the response of the operator to accident events is impaired, there could be increased consequences to the public health and safety.

For radiological challenges, a CRE design based on isolation of the normal supply air flow and pressurization of the CRE with the supply air treated by an emergency ventilation filtration system is referred to as a positive pressure CRE. Facilities with this type of design generally have implemented testing programs that verify that the CRE is at a positive differential pressure (ΔP) relative to adjacent areas. Demonstration of a positive pressure was thought to validate the CRE's integrity. This demonstration generally has been implemented via technical specification surveillance requirements for the control room emergency ventilation filtration system. Plants with a CRE design based on isolation without intentional pressurization (i.e., a neutral[1] pressure CRE) typically do not have a similar surveillance requirement.

During the period 1991-2001, CRE integrity tests were performed at approximately 30% of the reactor control rooms. All CREs were tested in their radiological mode of operation and some were tested in their hazardous chemical alignment. Only one CRE met its design value for CRE inleakage (i.e., filtered and unfiltered) for radiological challenges. None met their design value for inleakage when tested in their hazardous chemical mode.

This integrity testing experience showed that ΔP testing may not be reliable for confirming CRE integrity. All the positive pressure designs with technical specification surveillance requirements had been able to demonstrate that their CRE was positive with respect to adjacent areas. Yet the integrity testing demonstrated that CRE inleakage was, except for one case, always greater than the licensing basis value for inleakage.

Utilization of the ΔP surveillance test as an indicator of CRE integrity has two inherent deficiencies. First, it is not a measure of CRE inleakage. Second, an inference is made from the ΔP measurement that contamination will be unable to enter the CRE if the CRE is at a higher pressure than adjacent areas. The ΔP measurement assumes that the only source of pressurization flow to the CRE is the pressurization flow through the emergency filtration unit. The integrity testing between 1991-2001 showed that this may not be the case. Other unidentified sources of air may be the origin of the pressurization flow. These unidentified sources of pressurization flow may originate from inleakage into the suction side of the fan or into ductwork located outside the

[1] The term neutral means only that the CRE is not intentionally pressurized. With no intentional pressurization, the pressure of the CRE relative to adjacent areas may be either neutral or slightly negative or slightly positive.

CRE or from non-control-room ventilation systems with pressurized ductwork traversing the CRE. The ΔP test neither identifies the other sources of pressurization flow nor measures the magnitude of these sources. These sources are typically contaminated air and are usually unaccounted for in the facility's analyses.

The CRE integrity results discussed above were obtained using the version of American Society for Testing and Materials (ASTM) consensus standard E741, "Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution" (Ref. 4), in effect at the time of the test. E741 is well suited for assessing the integrity of CREs.

Although maintaining CRE integrity will minimize the inleakage of radioactive materials released during an accident and thereby minimize operator exposure to radiation, radiation is only one of the potential design basis challenges to the protection of the operator. Inleakage of other contaminants can have a greater impact on habitability. An inleakage rate tolerable for one contaminant may be intolerable for another. The CRE licensing basis describes the hazardous chemical releases considered in the CRE design and the design features and administrative controls implemented to mitigate the consequences of these releases on the control room operator. Regulatory Guide 1.78 (Ref. 2) provides guidance on evaluating control room habitability during postulated hazardous chemical releases. Section 3.4 of Regulatory Guide 1.78 identifies ASTM E741 (Ref. 4) as an effective method for testing for CRE inleakage but defers to this guide for additional guidance. Smoke and other byproducts from fires within the CRE and in adjacent areas can have an adverse impact on control room habitability and on the ability to control the reactor from either the control room or the alternate shutdown panel. This guide may be used to determine the CRE's inleakage characteristics when operating in response to a fire challenge. These characteristics may be factored into a qualitative assessment to ensure that the control room and the alternate shutdown panel are not likely to be simultaneously contaminated and rendered uninhabitable by a fire.

The integrity of the CRE can be affected by gradual degradation in associated equipment such as seals, floor drain traps, fans, ductwork and other components; drift in throttled dampers; maintenance on the CRE boundary; changes in differential pressures caused by ventilation system changes; and inadvertent misalignments of ventilation systems. Since inleakage is a function of pressure differentials between the CRE and external areas, changes in air pressures in these areas can impact the CRE inleakage. These changes could be the result of modification or degradation of the ventilation systems serving these areas. Preventive and corrective maintenance programs, in conjunction with periodic integrity testing, provide a level of confidence that control room habitability is being maintained. Regulatory Guide 1.196 (Ref. 1) provides guidance on CRE maintenance programs.

C. REGULATORY POSITION

CRE integrity testing is performed to demonstrate that the CRE's inleakage characteristics are consistent with the "licensing bases"[2] and "design bases" for the facility. Appendix I of NEI 99-03, "Control Room Habitability Assessment Guidance" (Ref. 6), provides guidance on the attributes of an acceptable test program, the prerequisites to testing, and the determination of the system modes of operation for testing. This guidance is useful when supplemented with the clarifications and exceptions noted below.

Regulatory Position 1 describes the types of CRE integrity testing, testing methods acceptable to the NRC staff, the treatment of test results and their uncertainty, and the periodicity of testing. Regulatory Position 2 provides clarifications on testing. These clarifications cover licensing bases, the ventilation systems alignment, operation and performance, the limiting condition for testing, test preparations, acceptance criteria, and compensatory actions.

1. TESTING

Section 4 of Appendix I to NEI 99-03 (Ref. 6) describes the attributes of an acceptable test program. The staff endorses these attributes with the following clarification. Any test to determine CRE integrity should be performed while the CRE, its associated ventilation systems, and the ventilation systems located in, traversing, or serving areas adjacent to the CRE are functioning in a manner that reflects CRE inleakage when these ventilation systems are operating in response to a particular challenge.

1.1 Integrated Test

An integrated test is a test that determines the total amount of CRE inleakage for the particular challenge. Typical challenges to a CRE for which an integrated test may be performed are radiological, chemical, or fire.

Section 7 of NEI 99-03 (Ref. 6) describes ASTM E741 (Ref. 4) as an appropriate test method for determining the total inleakage for all CRE designs. Details on the use of ASTM E741 are provided in Sections 5.3.1and 5.4.1 of Appendix I of NEI 99-03. Appropriate application of ASTM E741 is an acceptable method for performing an integrated test of a CRE's inleakage characteristics.

1.2 Component Test

Sections 5.3.2 and 5.4.2 of Appendix I to NEI 99-03 (Ref. 6) provide details on component testing. A component test does not measure the total inleakage for the CRE unless all sources of inleakage are identified and measured.

[2] As used in this guide, 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. 5), provides additional guidance. The design bases are a subset of the licensing bases. Thus, the term licensing bases in this guide will refer to both.

Section 5.3.2 of Appendix I to NEI 99-03 provides four characteristics of a CRE design that support the use of component testing. The NRC staff considers each of these characteristics as necessary for component testing to be acceptable. However, on a case-by-case basis, the staff may approve a plant's use of a component test when a majority of the CRE heating, ventilation, and air-conditioning (HVAC) equipment and associated ductwork is external to the CRE. To be considered for approval, the ductwork should be welded-seamed and the air handling units and the ventilation filtration units of similarly robust design. The following conditions are also necessary for a component test to be acceptable:

- An integrated inleakage test, as described in Regulatory Position 1.1, is conducted in concert with the component test.

- The results of the integrated and component tests correlate; and

- The components tested should account for no less than 95% of the CRE inleakage as determined by the integrated inleakage test (Regulatory Position 1.1).

The first condition is necessary when subsequent CRE integrity tests are intended to be component tests. This condition determines the overall inleakage of the CRE under circumstances similar to the component test. It is a prerequisite for the other two conditions.

The second condition is used to justify use of component tests in subsequent testing. A component test is deemed to be correlated to an integrated test if (1) the tests are conducted under similar conditions and within a reasonable time of each other and (2) the results of the two tests are comparable. The results need not be identical.

The third condition confirms the accuracy of the selection of components vulnerable to inleakage. This condition determines whether all the major sources of inleakage have been identified. It also confirms that the inleakage from CRE walls, ceilings, and floors is no more than 5% of the CRE's total inleakage. Since performance of subsequent component tests presumes that future increases in inleakage will be manifested in the components previously determined to be vulnerable, continual testing of components that account for 95% of the inleakage should capture most increases in inleakage. The selection of 95% is consistent with the confidence levels used in other design basis applications. However, it must be recognized that subsequent increases in inleakage may not always occur in the components identified via the correlation. There may be situations in which the performance of a test in accordance with Regulatory Position 1.1 is necessary to ensure the 95% correlation.

There may be circumstances in which an integrated test showed inleakage to be zero and it is intended that subsequent tests be component tests. For this situation, future tests may be component tests provided that such testing includes all components identified as vulnerabilities when the correlation was performed and includes all vulnerabilities identified since the correlation.

In addition to the conditions noted above, component testing should include:

- Peer reviews to identify inleakage vulnerabilities;

- Quantitative testing methods; and

- Verification, prior to testing, of the consistency of air sources and ventilation system flow rates with the licensing basis.

It should be recognized that missed vulnerabilities will not necessarily result in indeterminate test results when component testing.

1.3 Alternative Test Methods

Regulatory guides describe methods acceptable to the NRC staff for demonstrating compliance with regulations. This guide provides guidance on the type of information the staff needs to assess the capability of an alternative test method to demonstrate CRE integrity.

Any alternative test method should incorporate characteristics for test attributes detailed in Section 4 of Appendix I of NEI 99-03 (Ref. 6) with the clarification noted under Regulatory Position 1, "Testing." The inleakage test results from the use of the alternative test method should be submitted to the NRC staff for review with the following information:

- Summary of the test method;
- Description of the test apparatus and tolerances;
- Parameter specifications;
- Material requirements;
- Safety implications of the test (e.g., personnel safety, impact on plant operations and on plant equipment);
- Preparations before initiation of the test;
- Calibration of the test equipment;
- Description of the test procedure;
- Manner of calculating inleakage and associated error from test results;
- Uncertainty (e.g., precision, accuracy) of results obtained with the test method;
- Correlation of the results of the alternative test method with a test performed in accordance with Regulatory Position 1.1; and

- Assessment that determines the acceptability of the alternative test in lieu of a test performed in accordance with Regulatory Position 1.1.

Correlation requirements for an alternative test method should be comparable to those in Regulatory Position 1.2.

Allowing the use of an alternative test method provides opportunities for both the advancement and the development of new testing methodologies that may improve the efficiency and accuracy of the test and decrease costs.

1.4 Test Results and Uncertainty

Test uncertainty may be an issue when reporting inleakage test results for pressurized CREs with low inleakage. For such CREs, inleakage is usually determined by calculating the total inleakage and subtracting from the total the makeup flow to the CRE (typically the flow rate through the CRE's emergency filtration unit). When the difference between these two numbers is small (usually an indication that the CRE's inleakage is small), the uncertainty may approach the nominal value for inleakage. Adding the uncertainty to the nominal results of the test for inleakage could result in some facilities that do not meet GDC-19 because of the added uncertainty in the analyses.

If the CRE has been demonstrated to have low inleakage, the uncertainty may be an artifact of the calculations and not representative of the CRE's integrity. There may be a limited number of actions that may be taken to improve the leakage characteristics of low-inleakage CREs. Therefore, the staff has concluded that it is optional to include the uncertainty for facilities that demonstrate a CRE inleakage less than 100 cfm. The option will allow the significance of the uncertainty to be addressed on a plant-specific basis.

1.5 Periodicity

All CREs should be tested to establish the baseline value for inleakage and tested thereafter on a performance-based periodic frequency consistent with Figure 1. Facilities that have not tested their CREs for integrity should perform an integrated test consistent with Regulatory Position 1.1.

In addition to the above, CRE testing should be performed when changes are made to the structures, systems, components, and procedures that could impact CRE integrity. The structures, systems, and components could be within the envelope itself or could serve or be within areas adjacent to the envelope. Additional testing may be warranted if the conditions associated with a particular challenge result in a change in operating mode, alignment, or response that could result in a new limiting condition. Testing should be commensurate with the type and degree of modification or repair that has been made. For some changes, a new baseline test may be required.

2. CLARIFICATIONS

2.1 Licensing Bases

Appendix I to NEI 99-03 refers to "licensing bases" and "design bases." The licensing bases should be considered in establishing all aspects of the CRE integrity test program. Guidance on establishing the licensing bases for the CRE, its associated ventilation systems, and those located in, traversing or serving areas adjacent to the CRE is provided in Regulatory Guide 1.196 (Ref. 1). In developing the CRE integrity test program, consideration should be given to the licensing bases as

applicable to all CRE ventilation systems' operating modes (normal and emergency) and for all CRE challenges (hazardous chemical, fire, and radiological). Consideration should also be given to the licensing bases of ventilation systems in areas adjacent to the CRE. These systems often affect the pressure differential across the CRE boundary, which affects CRE inleakage.

2.2 Alignment, Operation, and Performance

Appendix H of NEI 99-03 (Ref. 6) provides guidance on the assessment of a CRE and associated ventilation systems prior to performing any CRE inleakage testing. Appendix H is an acceptable assessment tool with the following caveats:

- Any assessment should include the facility's ability to meet the reactor control aspects of GDC-19 in response to a fire challenge.

- The impact of the loss of offsite power and a single active failure should be considered when identifying inleakage vulnerabilities.

- False walls within the CRE should be recognized as a potential vulnerability for inleakage.

- Ventilation system flow rates and the air sources associated with those flow rates should be verified to be consistent with the licensing basis analyses.

The licensing bases of the ventilation systems within the CRE and in areas adjacent to the CRE should be consistent with the ventilation systems' alignment, operations, performance, and procedures (both normal and emergency). If they are not, changes must be made to bring the inconsistent aspect and the licensing basis into agreement. If it is impossible to bring the offending aspect into agreement, reanalysis is required. Testing should be conducted in the alignment that results in the greatest consequence to the control room operator for the particular type of challenge. Since the assessment of the fire challenge is qualitative rather than quantitative, the alignment for this challenge will be that which results in the greatest challenge to the operator's ability to control the reactor from either the control room or the alternate shutdown panel. There may be special situations in which testing in the accident configuration may result in an underestimate of the inleakage. In such instances, testing in the nonaccident mode is acceptable. As an example, if it is impossible to establish alignment because of assumptions of loss of offsite power or single failure, an alternative alignment may be used provided such an alignment is documented and the results are deemed to be conservative.

2.3 Testing To Establish the Limiting Condition

The limiting condition with regard to CRE integrity testing is the configuration that results in the greatest consequence to the operators. The limiting condition may depend on:

- The operating mode of control room ventilation systems and ventilation systems in areas adjacent to the CRE;
- Inleakage into the CRE;

- Performance of the control room ventilation systems and those located in adjacent areas;
- Concentration of challenge;
- Accident mitigation features;
- Limiting single failure;
- Availability of offsite power;
- Response of ventilation systems serving areas adjacent to the CRE;
- Automatic or manually initiated configuration changes during the event; and
- Possible synergies between the above variables.

Given the number of variables, it may not always be possible to identify the limiting condition for a CRE integrity test a priori. Testing of multiple configurations could be necessary and may be desirable. Nonetheless, it may be possible to develop a bounding case. The CRE integrity test should be performed for the limiting condition, and for any other configuration for which an engineering evaluation cannot show with reasonable assurance that the associated inleakage would be bounded by the value measured for the alignment tested.

2.4 Test Preparation

Actions permitted prior to the performance of an integrity test depend upon whether the test is a baseline or a periodic test. Prior to a baseline test, actions are permitted to bring the CRE and associated systems to a condition in which the performance is consistent with their licensing basis. An example of such an action might be ensuring that ventilation systems reflect the appropriate flow rates and sources of air.

If a periodic test is to be performed, the permitted actions are limited. Actions that are permanent in nature are permitted. Examples include replacing louvered dampers with bubble-tight dampers, replacing lock-seam ductwork with welded-seamed ductwork, and permanently sealing ductwork, housings, or air handling units. Pre-conditioning of the CRE and associated ventilation systems should not be performed. Examples of pre-conditioning include door seal replacement and temporary fixes or activities performed to enhance CRE integrity prior to a CRE integrity test. The necessity to perform pre-conditioning actions is an indication that the facility's control room habitability programs are ineffective or the interval for the maintenance or control room habitability performance assessment activities is too long and the interval needs to be shortened. Pre-conditioning obfuscates the effectiveness of the facility's programs for maintaining control room habitability integrity. Only with a true "as found" inleakage measurement can degradation of the CRE and its associated ventilation systems' integrity be assessed and the effectiveness of the control room habitability program determined.

2.5 Inleakage Test Acceptance Criteria

For any given challenge, the acceptance criterion for inleakage is a function of the CRE's configuration and the operation and performance of the CRE's ventilation systems and those located in, traversing, or serving areas adjacent to the CRE. For each challenge, there is an acceptance criterion for testing. The acceptance criterion is the value of inleakage that resulted in the maximum consequence to the control room operator. It is possible that the maximum

consequence may arise from a configuration that does not result in the maximum amount of CRE inleakage.

A fire challenge presents a unique situation because the fire challenge assessment is qualitative rather than quantitative. The acceptance criterion may be an assessment that concludes that the byproducts of a fire could not occur simultaneously in the CRE and the alternate shutdown panel area. Or it may be a value for inleakage that demonstrates that the amount of contamination in the CRE and alternate shutdown panel areas would not prevent reactor control at one location.

Any analysis to demonstrate that a facility meets GDC-19 should include a value for inleakage that is due to ingress to and egress from the CRE. This value is combined with the baseline test value for inleakage in the analyses. When integrity tests are performed to determine the CRE's integrity characteristics, the acceptance criterion for the test should be the licensing basis amount less the amount designated for ingress and egress. The staff considers 10 cfm as a reasonable estimate for ingress and egress for control rooms without vestibules.

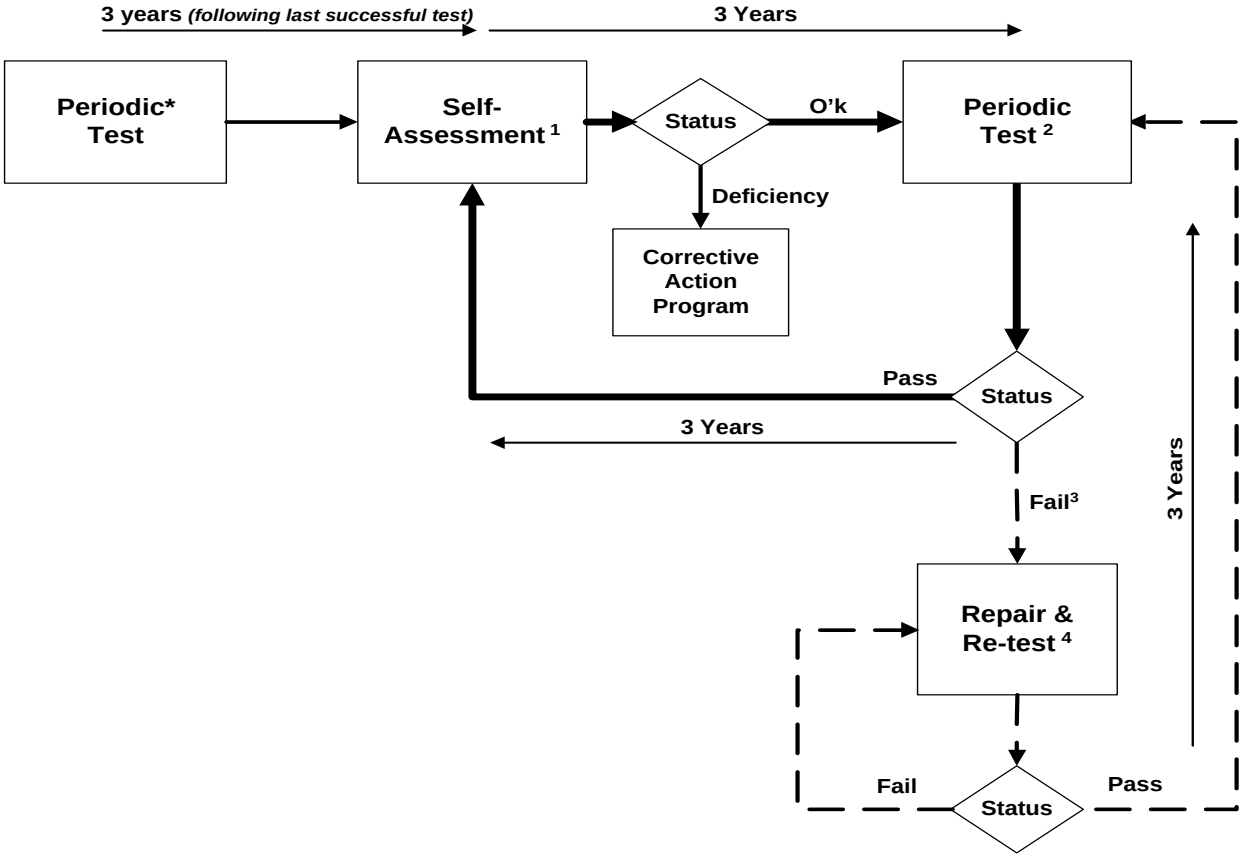
2.6 Compensatory Actions

Section 5.1, "Prerequisites to Testing," of Appendix I of NEI 99-03 (Ref. 6) provides for the development of contingency plans, including measures to compensate for unacceptable inleakage results when it is determined that the inleakage associated with the radiological mode of operation is greater than the licensing basis value. Guidance is provided on the use of personal respiratory protection devices and the use of potassium iodide (KI) on an interim basis while corrective actions are being taken to resolve the unacceptable integrity testing results for radiological challenges. This regulatory guide endorses Appendix F of NEI 99-03 (Ref. 6) subject to the exceptions delineated in Regulatory Guide 1.196 and the caveat that the guidance in Appendix F is limited to compensatory actions that address only radiological challenges. Appendix F provides no guidance on the type of compensatory actions that should be implemented when unacceptable results are identified for the hazardous chemical or fire challenge operating modes. When unacceptable results are identified for operating modes for hazardous chemical or fire challenges, licensees should identify appropriate compensatory actions.

D. IMPLEMENTATION

The purpose of this section is to provide 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 for evaluating the adequacy of CRE integrity testing for plants for which the construction permit or license application is docketed after the issue date of this guide and plants for which the licensee voluntarily commits to the provisions of this guide.



* Baseline on first pass.

1 Ongoing CRE maintenance program activities between assessments and tests.

2 In addition to periodic tests, tests are should be conducted when:

(1) Changes are made to structures, systems, and components that could impact CRE integrity, including systems internal and external to the CRE. The tests must be commensurate with the types and degrees of modifications and repairs and the potential impact upon integrity.

(2) A new limiting condition or alignment arises for which no inleakage data is available (e.g., a toxic gas source appears where previously there was none).

3 "Test" failure is inleakage in excess of the licensing basis value for the particular challenge to CRE integrity.

4 If the test acceptance criterion is increased through recalculation of the consequences to the control room operators, a re-test is not required. However, a full test should be conducted three years later to ascertain whether the CRE's integrity has continued to degrade.

Figure 1 Periodic Testing and Assessment Schedule

REFERENCES

1. USNRC, "Control Room Habitability at Light-Water Nuclear Power Reactors," Regulatory Guide 1.196, June 2003.[1]

2. USNRC, "Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," Regulatory Guide 1.78, Revision 1, January 2002.[1]

3. USNRC, "Protection of Nuclear Power Plant Control Room Operators Against an Accidental Chlorine Release," Regulatory Guide 1.95, Revision 1, January 1977.[1]

4. American Society for Testing and Materials, "Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution," ASTM E741-00, 2000.[2]

5. USNRC, "Guidance and Examples for Identifying 10 CFR 50.2 Design Bases," Regulatory Guide 1.186, December 2000.[1]

6. Nuclear Energy Institute, "Control Room Habitability Assessment Guidance," NEI 99-03, Revision 0, June 2001.[3]

[1] Single copies of regulatory guides, both active and draft, may be obtained free of charge by writing the Reproduction and Distribution Services Section, OCIO, USNRC, Washington, DC 20555-0001, or by fax to (301) 415-2289, or by e-mail to <DISTRIBUTION@NRC.GOV>. Active guides may also be purchased from the National Technical Information Service on a standing order basis. Details on this service may be obtained by writing NTIS, 5285 Port Royal Road, Springfield, VA 22161; telephone (703) 487-4650; online <http://www.ntis.gov/ordernow>. Certain documents are also available through the NRC's Electronic Reading Room at <www.NRC.GOV>.

[2] American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

[3] Copies are available for inspection or copying for a fee from the NRC Public Document Room at 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>.

APPENDIX A
Acronyms

ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
CRE	Control room envelope
DBA	Design basis accident
GDC	General Design Criteria in Appendix A to10 CFR Part 50
LOCA	Loss-of-coolant accident
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
OMB	Office of Management and Budget
ΔP	Differential pressure

REGULATORY ANALYSIS

A draft regulatory analysis was published with the draft of this guide when it was issued for public comment (DG-1115, March 2002). No changes were necessary, so a separate value/impact statement for this regulatory guide has not been prepared. A copy of DG-1115 and the value/impact statement is available for inspection or copying for a fee in the NRC's Public Document Room at 11555 Rockville Pike, Rockville, MD. An electronic version of DG-1115 is available in the NRC's Electronic Reading Room under Accession No. ML020790191.