



Public Meeting

November 29, 2006

NUREG-1852

"Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire"

Application by the Office of Nuclear Reactor Regulation

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- Meeting Outline
 - Application of NUREG-1852 (NRR)
 - Contents of NUREG-1852 (RES)
 - Industry/Public comments



KEY DOCUMENTS

- 10 CFR 50.48: "Fire Protection"
- Regulatory Issue Summary (RIS) 2006-10: "Regulatory Expectations with App. R, III.G.2, Operator Manual Actions (OMAs)"
- Regulatory Issue Summary (RIS) 2005-07, "Compensatory Measures to Satisfy the Fire Protection Program (FPP) Requirements"
- Standard Review Plan (NUREG-0800), 9.5.1: "FPP"
- Regulatory Guide (RG) 1.189: "FP for NPPs" (see DG-1170, section 5.3.3)
- Criteria for inspectors: NRC Inspection Procedure 71111.05T, "FP"



CREDITING OPERATOR MANUAL ACTIONS

Implicit in the following slides is the understanding that licensees must:

- Meet the regulations
- Comply with the standard operating license condition
 - “...would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire”
- Maintain defense-in-depth
- Demonstrate feasible and reliable OMAs (e.g., NUREG-1852)



Application of NUREG-1852

- Nexus between NUREG-1852 and regulatory compliance
 - Future license amendment requests and exemption requests
 - Potential inspection findings
 - Appendix R, III.G.1, 2 and 3 applications
 - Compensatory measures
 - NFPA 805 plants
 - New reactor designs
- Limitations of applicability



Application of NUREG-1852

- Future license amendment or exemption request (deterministic)*
 - SRP 9.5.1 (Rev. 5) and DG-1170 (§5.3.3)
 - the staff will use the criteria in NUREG-1852 as one way to evaluate the feasibility and reliability of OMAs associated with any future requests
- *for RG 1.174 type requests, licensees can use NUREG-1852 criteria to evaluate HEPs



Application of NUREG-1852

- Potential inspection findings
 - Unapproved uses of OMAs (pre-1979 licensee)*

the licensee is required to have prior approval through an exemption request even if the actions meet the criteria of NUREG-1852
 - Approved uses of OMAs (pre-1979 licensee)*

the licensee has prior approval for the use of OMAs through an exemption request. The licensee must be able to demonstrate that they can implement the approved FPP by ensuring the OMAs are feasible and reliable. Absent any discussions in the exemption, meeting the criteria in NUREG-1852 is one way of demonstrating the feasibility and reliability of the actions
- * must maintain defense-in-depth (e.g., detection and auto. suppression)



Application of NUREG-1852

- Uses of OMAs (post-1979 licensee)*
 - the licensee has determined that the use of OMAs does not adversely affect their ability to achieve and maintain safe shutdown. Similar to above, the licensee must be able to demonstrate that they can implement the approved fire protection program by ensuring the OMAs are feasible and reliable. Meeting the criteria in NUREG-1852 is one way of demonstrating the feasibility and reliability of the actions

* must maintain defense-in-depth (e.g., detection and auto. suppression)



Application of NUREG-1852

- Appendix R applications

- III.G.1: in general, the criteria are not meant to be applied in situations where the requirements of III.G.1 separation have been satisfied (i.e., each train is in its own separate fire area separated by three-hour fire barriers)
- III.G.2: meeting the criteria is one way to determine the feasibility and reliability of OMAs used in lieu of the protection requirements of III.G.2 as part of an exemption request*. In general, where the requirements of III.G.2 protection have been satisfied, the criteria are not meant to be applied in situations where the OMA is applied to the non-protected train
- III.G.3: meeting the criteria is one way to determine the feasibility and reliability of OMAs used to demonstrate compliance with III.G.3

*must maintain defense-in-depth (e.g., detection and auto. suppression)



Application of NUREG-1852

- Compensatory Measures
 - OMAs are implemented as compensatory measures in accordance with RIS 2005-07 and the licensee's approved FPP
 - criteria in IP 71111.05T or
 - criteria in NUREG-1852



Application of NUREG-1852

- NFPA 805 plants
 - NFPA 805 plants may use NUREG-1852 as feasibility and reliability criteria in lieu of the criteria specified in RG 1.205 and NEI 04-02
 - the criteria are implicit in an HRA when developing a fire PRA
 - New Reactor Designs
 - there should be minimal reliance on the use of OMAs, as stated in DG-1170
 - if FP-related OMAs are used,* then meeting NUREG-1852 criteria can be used as one way to demonstrate feasibility and reliability
- * must maintain defense-in-depth (e.g., detection and auto. suppression)



Application of NUREG-1852

- Limitations of applicability
 - criteria in NUREG-1852 are not intended to apply to actions taken inside the Main Control Room (e.g., during abandonment of the main control room due to fire)
 - NUREG-1852 does not establish defense-in-depth criteria for substituting OMAs in lieu of FP regulatory requirements (e.g., Appendix R, section III.G.2)



NUREG-1852

Demonstrating the Feasibility and
Reliability of Operator Manual Actions In
Response to Fire

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Office of Nuclear Regulatory Research

Public Meeting November 29, 2006



NUREG-1852

- Purpose of the briefing
- NUREG-1852
 - Background
 - Objectives and status
 - Approach
 - Overview
 - Discussion of each criterion
 - Summary



Purpose of the Briefing

- Discuss the contents of NUREG-1852
- Receive initial comments from the public



NUREG-1852 — Background

- Draft Reg Guide-1136, *“Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire,”* July 2005, was developed in support of the fire manual actions rulemaking
- Rulemaking activity was stopped
 - However, licensees can propose the use of manual actions for post-fire events
 - NRC staff will have to make decisions on the feasibility and reliability of proposed actions to achieve/maintain safe shutdown
 - Need to retain the technical work and guidance developed
- Draft NUREG-1852 provides a technical bases and guidance for the “acceptability” of such actions



NUREG-1852 — Objectives/Status

- Objectives
 - Provide technical bases and guidance for evaluating whether manual actions are both feasible and reliable
 - To be used as reference guide by the staff reviewing licensee submittals
- Scope
 - Does not address control room evacuation
 - Does not establish defense-in-depth criteria to show that manual actions can be a substitute for regulatory requirements (III.G.2) for fire protection
- Status
 - Released for public comment, October 2006
 - Comment period ends, January 2007
 - Final in Spring 07



NUREG-1852 — Approach

- Deterministic criteria developed on the basis of
 - Existing inspection guidance, insights and experience developed through the years of inspecting manual actions currently used by licensees in response to fire
 - Human factors guidance documents and standards addressing human actions in general and in response to fire in particular (e.g., SRP Chapter 18.0, “Human Factors Engineering”, Info. Notice 97-78, and the ANS/ANSI 58.8 standard)
 - Review of findings/insights from plant updated PRAs, IPEEE reports, Fire Re-Quantification project, and from HRA development and applications
 - In many respects, the criteria documented in NUREG-1852 are/were implicitly used by staff in review and inspection activities—now are explicitly documented



NUREG-1852— Overview

- Criteria for both feasibility and reliability of the actions
- Two parts:
 - Documentation of the criteria along with the technical basis
 - Guidance for implementing the criteria
- Essentially the same as that contained in DG-1136
- Difference:
 - No specific time margin is recommended in NUREG-1852
 - A factor of 2 was recommended in DG-1136
 - Demonstrating that “extra” time needs to be available to cover variability/uncertainty in fire conditions and manual action time is still emphasized and discussed
 - Licensees can justify their approach for addressing variability and uncertainties
- The change was done as result of public comments and Commission direction (SRM on SECY-04-0233, 1/18/05)



Overview of the Criteria

- Adequate time available to ensure feasibility and reliability
- Environmental factors
- Equipment functionality and accessibility
- Availability of indications
- Communications
- Portable equipment
- Personnel protection equipment
- Procedures, training and staffing
- Demonstrations of the credited human actions



Feasibility

- An action is considered as feasible if it can be shown that it can be accomplished within the “estimated” available time
- Guidance
 - An estimate of the time available is performed through analyses
 - Unique fire related uncertainties are taken into consideration in the estimation of the time available
 - An estimate of the time to diagnose the need for the action and implement it should be done on the basis of walkdowns, talkthroughs, judgment, and substantiated thru demonstrations
 - A comparison of the “estimated” time and the time identified as needed to successfully diagnose and perform an action shows that adequate time is available, OR
 - If "conservative" estimations of the time available is performed, justify that the conservative assumptions are adequate to "make-up" the additional time needed to cover the demonstrated time required



Reliability

- A feasible action is reliable if it can be shown that the estimated available time envelopes the various sources of uncertainties
 - problems with equipment, e.g., locked doors
 - environmental effects, e.g., smoke and toxic gas
 - different travel paths
 - variability among crews
 - conditions/actions impractical or impossible to demonstrate
- Guidance
 - Justify that conservatism in time estimations envelopes the additional uncertainties for both diagnosing and performing an action
 - Show that an adequate “time margin” exists for applicable uncertainties in addition to the time required for the action as measured in the demonstration
 - Justify any other approach employed to address reliability
 - NOTE: The “time margin” serves as a surrogate measure to account for the uncertainties typically considered in a PRA/HRA.



Environmental Factors

- Environmental factors are conditions that could negatively impact the ability to perform the manual actions, e.g.,
 - Radiation, lighting, temperature, smoke, toxic gas
- Guidance: Environmental factors should be shown to be consistent with established human factors considerations, e.g.,
 - Lighting should be provided per regulations and the fire protection program
 - Radiation should not exceed the 10CFR20.1201 limits
 - Temperature and humidity should not prevent successful performance
 - Smoke and gas should not impair accessibility or hinder successful performance



Equipment Functionality and Accessibility

- Equipment necessary to achieve and maintain post-fire hot shutdown is accessible, available, and not damaged or otherwise adversely affected by the fire and its effects (e.g., heat, smoke, and water)
- Guidance: In crediting functionality of equipment, consider the unique fire effects that may render the equipment inoperable
 - Generally no credit for actions and equipment involving the use or manipulation of equipment in areas that could be exposed to the fire effects
 - “Functionality of equipment” must be ensured
 - Knowledgeable personnel should have access to all necessary equipment



Availability of Indications

- Indications should be available to (1) support diagnosis of the need for an action, (2) determine which actions are appropriate, and (3) provide feedback to the operators
- Guidance: Available indications should be sufficient to successfully accomplish tasks (1), (2), and (3)
 - Indicating instruments should be functional and accessible according to “Functionality and Accessibility” criterion, either in the control room or locally
 - Compensatory measures should be provided for areas where no alarms or other compelling signals are available
 - Indications should be sufficiently redundant
 - Indications should be maintained as functional



Communications

- Equipment for effective communications should be available and meet the functionality and accessibility criterion
- Guidance: It should be shown that
 - Potential fire will not damage or disable communications equipment and/or personnel ability to successfully use the equipment given factors such as wearing protective clothing
 - Communications will work under environmentally challenging conditions such as extreme moisture
 - Personnel have substantial training on activities involving communication
 - Communication while wearing SCBAs, if necessary, can be successfully accomplished



Portable Equipment & Personnel Protection Equipment

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- Portable equipment, especially unique tools (e.g., keys, flashlights, ladders) should be readily available and their location should be known and constant
 - Personnel protection equipment such as protective clothing, gloves, and SCBAs should be available and access should be unimpeded so that it will not delay performing the actions
 - Guidance
 - Equipment readily available and controlled
 - Personnel should be trained in the use of the equipment
 - Use of the equipment should be considered in the manual action time especially if it will have an effect of slowing down the time to implement the action



“Procedures and Training” & Staffing

- Written plant procedures should be maintained that cover all the manual actions that each operator might be required to perform; plant training program should ensure that these operators receive training in these procedures
 - Procedures should be maintained current and reflect actual plant configuration
- Adequate numbers of qualified personnel should be on site at all times so that shutdown conditions can be achieved and maintained in the event of a fire
 - Essential individuals should not have collateral duties, i.e., all operating staffing levels should have enough people to perform any manual actions that could be needed since a fire could occur at any time



Demonstrations

- Demonstrate, by at least one randomly-selected established crew, that the credited operator manual actions are both feasible and reliable
 - Ensure that credited actions are achievable within the constraints, including available time
 - Show adequate time exists to ensure reliability, i.e., extra time exists to account for factors not covered in the demonstration and inherent variability/uncertainty
 - Demonstrate capability to handle complexities such as diagnosis to perform actions, number of actions needed, dependence of one-action-to-another, and handling of multiple procedures at the same time
- Guidance
 - Plant staff should not rely on manual actions until it is demonstrated that they can be performed consistent with the analysis
 - Demonstrations should be as realistic as possible
 - Subsequent “full-blown” demonstrations may not be necessary



NUREG-1852--Summary

- NUREG-1852 establishes criteria to support NRC reviews of licensee requests to use manual actions to maintain safe shutdown after a fire event
- Was created by building-on and documenting existing NRC guidance and practices
- Addresses both feasibility and reliability
- Will be revised after public comment
- Will brief the ACRS on comments received and how they were addressed
- To be published in Spring 2007