

From: Ray Gallucci
To: John Hannon *NLR*
Date: 2/20/04 11:16AM
Subject: Modifications to Munich paper & slides

Dave suggested some modifications to the paper and slides to reflect the latest schedule. The new files are attached.

CC: David Diec; Paul Lain; Sunil Weerakkody

22-4

OPERATOR MANUAL ACTIONS RULEMAKING

Raymond HV Gallucci, PhD, PE, rhg@nrc.gov
John N Hannon, jnh@nrc.gov
US Nuclear Regulatory Commission
11555 Rockville Pike, MS: O-11 A-11
Rockville, MD, USA 20852

ABSTRACT

In response to recent trends by US nuclear power plant licensees to credit non-approved, but primarily safe, operator manual actions for compliance with passive fire protection requirements for redundant trains of safe shutdown systems, the US Nuclear Regulatory Commission has proposed a rulemaking that would codify approval of these actions, provided they meet a strict set of safety criteria.

BACKGROUND

As a result of the March 1975 fire at the Browns Ferry Nuclear Power Plant, the U.S. Nuclear Regulatory Commission (USNRC) developed Branch Technical Position ASB 9.5-1 in 1976 to provide *Guidelines for Fire Protection at Nuclear Power Plants*. Subsequently, the USNRC incorporated these guidelines into the Code of Federal Regulations (CFR), Title 10 (*Energy*), Part 50 (*Domestic Licensing of Production and Utilization Facilities*), Section 48 (*Fire Protection*), Appendix R (*Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979*). Section III.G prescribed fire protection features for structures, systems, and components important to safe shutdown. Paragraph 2 defined three acceptable methods to protect at least one shutdown train during a fire when redundant trains are located in same fire area:

- 3-hr passive fire barrier;
- 20-ft separation and no intervening combustibles, with fire detection and automatic suppression; or
- 1-hr passive fire barrier with fire detection and automatic suppression.

For plants licensed after January 1, 1979, the USNRC incorporated the Appendix R provisions, including those from Paragraph III.G.2, into NUREG-0800 (*Standard Review Plan*), Section 9.5.1 (*Fire Protection Program*). The USNRC reviewed plant-specific fire protection programs and commitments against Appendix R or NUREG-0800, depending upon the plant's licensing date, thereby establishing the provisions of Paragraph III.G.2 as part of each plant's licensing basis. These reviews were completed in the 1980s.

RECENT TRENDS

In 2000, the USNRC established the Reactor Oversight Process as a risk-informed method to increase the focus on safety significant issues and reduce effort spent on issues of minimal safety significance. Part of this process was Inspection Manual Chapter 609 (*Significance Determination Process*), Appendix F (*Determining Potential Risk Significance of Fire Protection and Post-Fire Safe Shutdown Inspection Findings*), which required USNRC inspectors to re-examine each plant's compliance with its fire protection program, based either on 10CFR50, Appendix R, or NUREG-0800, Section 9.5.1. Through these inspections, the USNRC discovered many instances of plants relying on "operator manual actions," rather than one of

the accepted methods described above, to protect at least one shutdown train during a fire when redundant trains are located in same fire area. In 2002, the USNRC Committee to Review Generic Requirements determined that reliance on "operator manual actions" does not comply with the requirements as given in Appendix R, Paragraph III.G.2, unless approved as an "exemption" (for a pre-1/1/1979 plant) or "deviation" (for a post-1/1/1979 plant) to the plant fire protection program.

The USNRC believes that this reliance on non-approved "operator manual actions" arose during the resolution of the Thermo-Lag fire barrier issue in the mid-1990s, whereby licensees utilized operator manual actions rather than upgrade or replace Thermo-lag originally installed to comply with requirements in Appendix R, Paragraph III.G.2. However, despite the issue of non-compliance, the USNRC believes that most of these operator manual actions that have been credited in lieu of the requirements of Appendix R, Paragraph III.G.2 do not pose a safety concern. Although neither the USNRC nor the licensees established official criteria by which to determine the acceptability of operator manual actions, both are experienced with crediting operator manual actions in connection with Appendix R, Section III.G.3. This permits operator manual actions for "associated non-safety circuits ... of redundant trains of systems necessary to achieve and maintain hot shutdown conditions [that] are located within the same fire area outside of primary containment," under either of the following conditions, provided that "fire detection and a fixed fire suppression system shall be installed in the area, room, or zone under consideration:"

- "Where the protection of systems whose function is required for hot shutdown does not satisfy the requirement of [Appendix R, Paragraph III.G.2]; or
- Where redundant trains of systems required for hot shutdown located in the same fire area may be subject to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems."

USNRC INSPECTION GUIDANCE

Although the USNRC believes that most of the non-approved operator manual actions do not pose a safety concern, a few inspections have indicated that the operator manual actions may not have been feasible, thereby creating doubt that safe shutdown could be assured. In March 2003, the USNRC updated Inspection Procedure, Attachment 71111.05 (*Fire Protection*), adding Enclosure 2 (*Inspection Criteria for Fire Protection Manual Actions*).

"For an interim period, while rulemaking is in progress ... acceptance criteria can be developed which would facilitate evaluations of certain manual actions ... If the inspectors determine that manual actions are reasonable and are expected to meet the criteria outlined in Enclosure 2, then the inspection report will identify this issue as a Green finding ... (an indicator that, while compensatory measures in the form of manual actions have been implemented and are acceptable, the licensee continues to be in violation of the code requirements). If the inspectors determine that the manual actions are not reasonably accomplishable ..., the preliminary finding will be identified as potentially greater than Green and entered into the Significance Determination Process."

The inspection criteria were based on USNRC inspection experience and addressed the following:

- Diagnostic instrumentation
- Environmental considerations
- Staffing and Training

- Communications and Accessibility
- Procedures
- Verification and validation

While this inspection guidance ensured that non-approved operator manual actions being credited for Appendix R, Paragraph III.G.2 would receive a thorough safety review, it did not relieve the licensees of the burden of non-compliance and the need to ultimately file exemption or deviation requests if they chose not to revert to one of the acceptable methods. Consequently, this burden would be transferred to the USNRC in terms of the effort to review and process these exemption requests, most likely at the cost of diverting these resources from issues of potential safety significance.

RULEMAKING PROPOSAL

In June 2003, the USNRC issued SECY-03-0100 (*Rulemaking Plan on Post-Fire Operator Manual Actions*), summarizing the concerns above and proposing a solution through rulemaking:

“... [T]here is insufficient evidence that the generic use of these actions poses a safety issue ... that requires prompt action ... [E]nforcement may not be the best remedy ... [because] ... [I]licensees ... might flood the USNRC with exemption or deviation requests, which could divert USNRC resources from more safety-significant issues and may not result in any net safety improvement ... To resolve the regulatory compliance issue, the staff ... has concluded that generic guidance and acceptance criteria for feasible operator manual actions should be developed ... Documenting compliance ... would demonstrate that safety has been maintained and that the operator manual actions do not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire. Even with Commission consent to proceed with rulemaking, licensees using unapproved operator manual actions would be in non-compliance ... Upon receiving Commission approval of the ... rulemaking plan, the staff will develop an interim enforcement policy to allow discretion, ... provided these licensees have documented the feasibility ... in accordance with the staff’s proposed preliminary generic acceptance criteria.”

In September 2003, the Commission issued a Staff Requirements Memorandum on SECY-03-0100 approving “the staff’s recommendation to proceed with rulemaking ... to revise the fire protection program requirements contained in Appendix R of 10 CFR Part 50 and the associated guidance ... [T]he Commission has approved the staff’s plan to develop an interim enforcement policy to deal with these compliance issues ... The staff should leverage its past experience to develop the general acceptance criteria and expedite this rulemaking effort ... The interim enforcement policy ... in no way obviates the need for licensees to continue documenting the technical feasibility of their operator manual actions.”

PATH FORWARD

In response to the Commission’s Staff Requirements Memorandum, the USNRC staff adopted the following positions:

- Use the existing March 2003 inspection criteria as the basis for interim criteria to ensure that operator manual actions being credited for Appendix R, Paragraph III.G.2 establish an acceptable level of safety, comparable to that for the current methods;
- It remains paramount to assure that the operator manual actions can be accomplished technically and so demonstrated; and
- Develop additional criteria as appropriate to assure the above.

Following a series of public meetings in autumn 2003 with interested stakeholders, including both the nuclear industry and public interest groups, the USNRC issued Federal Register Notices 66501-66503 [03-29560] and 69730 [03-30859] (*Post-Fire Safe Shutdown; Criteria for Determining Feasibility of Manual Actions*):

"The USNRC is considering a revision to the fire protection regulations in 10 CFR Part 50, Appendix R, Paragraph III.G.2 to allow the use of manual actions by nuclear power plant operators to achieve hot shutdown conditions in the event of fires in certain areas provided the actions are evaluated against specific criteria and determined to be acceptable ... [U]ntil the fire protection regulations are revised, the USNRC is planning to issue an interim enforcement policy to exercise enforcement discretion if licensees' manual actions meet the USNRC's interim acceptance criteria ... The USNRC staff has developed draft interim acceptance criteria for manual actions ... They are an extension of the 'Inspection Criteria for Fire Protection Manual Actions' issued by the USNRC in March 2003 in Inspection Procedure 71111.05."

For the rulemaking, "operator manual actions" have been defined as "those actions taken by operators to perform manipulation of components and equipment from outside the main control room to achieve and maintain post-fire safe shutdown. These actions are performed locally by operators, typically at the equipment." They are distinguished from actions taken by operators from inside the main control room, which are typically performed by the operator controlling equipment located remote from the main control room. The acceptance criteria are similar to those from March 2003, with additional enhancements based on the following:

- Human action performance criteria used in USNRC Inspection Manual Chapter 609 (*Significance Determination Process*) and adapted for the proposed update to Appendix F (*Determining Potential Risk Significance of Fire Protection and Post-Fire Safe Shutdown Inspection Findings*)
- Input from USNRC's Office of Regulatory Research, specifically a 2003 study by Sandia National Laboratory (*Draft Letter Report, Risk Insights Related to Post-Fire Operator Manual Actions*)
- Feedback from a September 2003 meeting with the USNRC Advisory Committee on Reactor Safeguards Sub-committee on Fire Protection
- Performance Shaping Factors used in Human Reliability Analysis techniques.

The criteria address the following:

- Available indications, including diagnostics
- Environmental considerations related to visibility, habitability, and accessibility, including emergency lighting, radiation, temperature, humidity, smoke and toxic gases
- Staffing, under all shift levels, and training
- Communications
- Equipment required to support operator manual actions, readily available and functional at the time needed, and not adversely affected by the fire
- Procedures
- Demonstration of the required operator manual actions through time-authenticated walkdowns utilizing a randomly-selected crew and equipment
- Complexity and number of operator manual actions required to effect safe shutdown, based on analysis of the postulated fire time line, including a safety margin that accounts for all identifiable variabilities and human cognitive uncertainties.

INTERIM ENFORCEMENT DISCRETION

Upon completion of a public comment period in January 2004, the above criteria will be finalized for use in interim enforcement discretion. This will enable the USNRC to refrain from taking regulatory actions against the licensees found to be non-compliant with the current requirements of Paragraph III.G.2, pending the final rule which will codify the use of operator manual actions in conjunction with fire detection and an automatic fire suppression system to achieve and maintain post-fire safe shutdown.

RULEMAKING ACTIVITIES

The USNRC is codifying the final list of acceptance criteria for operator manual actions being published as part of the policy on interim enforcement discretion. The USNRC anticipates no major changes to the acceptance criteria for interim enforcement discretion when adopted for final rulemaking, although the opportunity for additional public comment and revision will be provided. The USNRC plans to update Regulatory Guide 1.189 (*Fire Protection for Operating Nuclear Power Plants*) to incorporate detailed guidance for determining if operator manual actions meet the requirements of the final acceptance criteria. The USNRC plans to complete the final rulemaking, and issue the modified Appendix R, Paragraph III.G.2, in 2006.

OPERATOR MANUAL ACTIONS RULEMAKING

Raymond Gallucci, Senior Engineer, Author
Presented by John Hannon, Chief
Plant Systems Branch
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission (NRC)

02/20/2004

1

OUTLINE

- Present background leading to Operator Manual Actions Rulemaking
- Define Operator Manual Actions
- Discuss acceptance criteria and their technical bases
- Examine path forward and anticipated schedule

02/20/2004

2

BACKGROUND

- 10 CFR 50.48 imposed fire protection (FP) requirements from App. R, Paragraph III.G.2, to pre-1/1/1979 licensed plants
 - Three acceptable methods to protect at least one shutdown train during a fire when redundant trains are located in same fire area
 - 3-hr passive fire barrier
 - 20-ft separation and no intervening combustibles, with fire detection and automatic suppression
 - 1-hr passive fire barrier with fire detection and automatic suppression

02/20/2004

3

BACKGROUND (continued)

- For post-1/1/1979 licensed plants, App. R provisions were incorporated into Branch Technical Position (BTP) CMEB-9.5-1 and NUREG-0800 (Standard Review Plan)
- To "resolve" FP issues related to Thermo-Lag barriers in mid-1990s, some licensees credited "operator manual actions" for III.G.2 rather than provide fire barriers and/or separation with detection/suppression, or seek an exemption

02/20/2004

4

BACKGROUND (continued)

- Since advent of Reactor Oversight Process in 2000, NRC FP inspections have found enough licensees relying on unapproved operator manual actions to raise a III.G.2 compliance concern
- More importantly, some of these operator manual actions may not have been shown to be feasible, thereby creating doubt that safe shutdown could be assured

02/20/2004

5

BACKGROUND (continued)

- In March 2003, NRC issued FP Inspection Procedure, Attachment 71111.05, Enclosure 2 – *Inspection Criteria for FP Manual Actions*, based on inspection experience, that addressed
 - Diagnostic instrumentation
 - Environmental considerations
 - Staffing and Training
 - Communications and Accessibility
 - Procedures
 - Verification and validation

02/20/2004

6

BACKGROUND (continued)

- In June 2003, NRC issued SECY-03-0100, *Rulemaking Plan on Post-Fire Operator Manual Actions*, to revise the FP program requirements contained in Appendix R of 10 CFR Part 50
- In September 2003, the Commission issued a Staff Requirements Memorandum (SRM) on SECY-03-0100 approving "the staff's recommendation to proceed with rulemaking"

02/20/2004

7

DEFINITION

- Operator manual actions
 - Actions taken by operators to perform manipulation of components and equipment from *outside the main control room (MCR)* to achieve and maintain post-fire safe shutdown. **These actions are performed locally by operators, typically at the equipment.**
- Acceptance criteria apply only to manual actions performed outside the MCR, not manual actions performed inside the MCR

02/20/2004

8

ACCEPTANCE CRITERIA

- Available indications
- Environmental considerations
 - Smoke and toxic gases
 - Temperature and humidity conditions
 - Radiation
 - Emergency lighting
 - Local accessibility

02/20/2004

9

ACCEPTANCE CRITERIA (cont'd)

- Staffing and Training
- Communications
- Equipment
- Procedures
- Demonstration
- Complexity and number

02/20/2004

10

BASES

- NRC *Significance Determination Process*
- NRC FP Inspection Procedure –
Inspection Criteria for FP Manual Actions
- Sandia Report, *Risk Insights Related to
Post-Fire Operator Manual Actions*
- Human Reliability Analysis
 - Insights from Advisory Committee on Reactor
Safeguards Sub-committee on FP

02/20/2004

11

PATH FORWARD

- Develop final acceptance criteria for operator manual actions considering additional input from
 - Office of Nuclear Regulatory Research
 - Office of Enforcement
 - Advisory Committee on Reactor Safeguards
 - FP Sub-committee
 - External stakeholders
 - Public
 - Industry

02/20/2004

12

SCHEDULE

- Interim enforcement discretion
 - *Federal Register Notice* with public comment period, November 2003 through January 2004
 - Commission approval on policy in 2004
- Final rulemaking
 - Rule scheduled for 2006
 - *Federal Register Notice(s)*, with public comment periods for stakeholder feedback

02/20/2004

15
