

May 25, 2007

MEMORANDUM TO: Frank P. Gillespie, Executive Director  
Advisory Committee on Reactor Safeguards

FROM: Cornelius Holden, Director */RA/*  
Division of Risk Assessment  
Office of Nuclear Reactor Regulation

SUBJECT: ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
REVIEW OF PUBLIC COMMENTS AND THE NUCLEAR  
REGULATORY COMMISSION RESPONSES TO NUREG-1852  
“DEMONSTRATING THE FEASIBILITY AND RELIABILITY OF  
OPERATOR MANUAL ACTIONS IN RESPONSE TO FIRE”

The Office of Nuclear Reactor Regulation has completed responses to the public comments and identified revisions to draft NUREG-1852, “Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire,” issued September 2006.

The draft NUREG-1852 was submitted to the Advisory Committee on Reactor Safeguards (ACRS) for review as an attachment to a letter dated September 8, 2006. In response, the ACRS stated in its September 13, 2006, letter that “the Committee plans to review the draft final version of this report after reconciliation of public comments.”

We request that the ACRS review the public comments and the U.S. Nuclear Regulatory Commission (NRC) responses to the revised draft NUREG-1852 (ML071280819). It is the staff’s intent to brief the ACRS on the revised NUREG-1852 during its 543<sup>rd</sup> meeting, June 6-8, 2007 and request a formal letter endorsing the issuance of the NUREG.

The enclosure to this memorandum provides a summary of the public comments and NRC responses to those comments.

Enclosure:  
As stated

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**PUBLIC COMMENTS AND NRC RESPONSES TO NUREG-1852 “DEMONSTRATING  
THE FEASIBILITY AND RELIABILITY OF OPERATOR MANUAL ACTIONS  
IN RESPONSE TO FIRE”**

**CATEGORIES OF INDUSTRY COMMENTS AND NRC RESPONSES:**

1. Operator Manual Actions (OMAs) vs. Circuit Issues
2. NUREG-1852 vs. Fire Safe-Shutdown (SSD)
3. Fire Design Basis
4. Regulatory Footprint
5. Demonstration & Time Margin
6. Staffing & Training
7. Environmental Factors
8. Equipment Functionality
9. Available Indications
10. Defense-in-Depth
11. Inspection Guidance
12. Fire Modeling
13. OMAs vs. Passive Features
14. OMAs & Terrorism

ENCLOSURE

## **SPECIFIC PUBLIC COMMENTS AND NRC RESPONSES**

### **1. Operator Manual Actions (OMAs) vs. Circuit Issues**

- Comment
  - The OMA and circuit analysis issues should be addressed together. They should be jointly resolved before issuing related guidance for inspections and regulatory documents.
- Response
  - The Commission expectations with respect to III.G.2 OMAs have been finalized as reflected by Regulatory Information Summary (RIS) 2006-10, "Regulatory Expectations with Appendix R, Paragraph III.G.2, Operator Manual Actions." A delay in addressing the OMA issues to wait for the circuit issue will cause undue delays in completing corrective actions related to OMAs.

### **2. NUREG-1852 vs. Fire Safe-Shutdown (SSD)**

- Comment
  - OMAs are limited to hot shutdown. The NUREG should reflect that cold shutdown manual actions are allowed by regulation.
- Response
  - Throughout, the NUREG states that it addresses OMAs to achieve and maintain hot shutdown; cold shutdown repairs, allowed for 72 hours, are not the subject of this NUREG.
- Comment
  - Which actions must be feasible and reliable - only those for hot shutdown (III.G.2) or all actions, including cold and alternative shutdown (III.G.3), other than when abandoning the main control room?
- Response
  - All OMAs (III.G.2, III.G.3 and those necessary when abandoning the Main Control Room due to fire) must be feasible and reliable. However, the NUREG is intended to support NRR Staff review of exemptions from Appendix R.
- Comment
  - Hot shutdown has different definitions for pressurized- (PWRs) and boiling-water reactors (BWRs), as per Appendix R, Sections III.G and III.L. The NUREG refers to the Standard Technical Specifications. Regulatory Guide (RG) 1.189 (2001), Section 5, refers to BWR "hot shutdown" and PWR "hot standby."
- Response
  - The NUREG accurately indicates regulatory reliance on technical specification requirements for hot and cold shutdown. The NUREG has been enhanced to clarify "hot shutdown."
- Comment
  - The feasibility criteria appear to require SSD analysis, but they should only support that analysis, not the reverse. The NUREG should clarify that the added feasibility requirements are needed for demonstrating that SSD cables/equipment are not damaged by fire.

- Response
  - The NUREG does not address the entire set of requirements for SSD analysis. Clearly, to the extent SSD analysis has already addressed the equipment needed to conduct the OMAs, that analysis suffices.
- Comment
  - Requiring added verification that equipment be available, already part of SSD analysis, imposes SSD analysis specifically for OMAs. The NUREG should only require that equipment be accessible, not that it also be available and free of fire damage.
- Response
  - The staff concern pertains to component damage resulting from spurious operation or maloperation that would prevent manipulation of the component as needed to ensure OMA feasibility and reliability (e.g., a licensee must ensure that a motor-operated valve (MOV) does not over torque). The NUREG has been revised to emphasize the need to ensure functionality of equipment and cables needed to implement OMAs.

### 3. Fire Design Basis

- Comment
  - NUREG-1852 reclassifies post-fire SSD as an anticipated operational occurrence (AOO), based on ANSI/ANS 51.1 and 52.1. The NUREG imposes new radiation dose requirements, specifically Title 10 of the *Code of Federal Regulations* Part 20 (10CFR20), Section 20.1201, instead of the appropriate requirements of GDC-19. The NUREG should clarify this by citing NUREG-0737, Item III.B.2, that anticipated the need for local actions in the plant, imposing a 5-rem whole body limit for the event.
- Response
  - NUREG-1852 does not reclassify post-fire SSD as an Anticipated Operational Occurrence (AOO). ANSI 51.1/52.1 classifies fire as an AOO within normal radiation exposure limits. An “initiating event” is the single abnormal occurrence/condition that can trigger an accident scenario and excludes subsequent failures, such as non-suppression, failure to mitigate potential core damage, etc., that comprise the calculation of the scenario frequency, not that of the initiating event. Therefore, the appropriate frequency class for fire as an “initiating event” is that given for an AOO in ANS 51.1/52.1.
- Comment
  - As discussed in ANSI/ANS 51.1/52.1, the actual frequency of each Initiating Occurrence must be determined and Plant Condition code assigned based on the best estimate frequency. Since a fire requiring post-fire SSD and manual operation occurs at a frequency  $\ll$  1/yr, its classification as an AOO is inappropriate. Current regulatory guidance classifies post-fire SSD as a “Special Event” (ANSI/ANS 58.6, ANSI/ANS 58.14).

- Response
  - Fire frequencies are not  $\ll$  1/yr. Failure probabilities for fire detection and suppression systems should not be included when calculating fire initiating frequencies. In response to this comment, the staff reviewed ANSI/ANS 58.6 and ANSI/ANS 58.14, and concluded that there is no correlation between criteria specified in NUREG-1852 and the definition of “special event” in ANSI/ANS 58.6 and ANSI/ANS 58.14 as applicable to III.G.2.
- Comment
  - The NUREG requirements exceed those for other design basis events and Emergency Operating Procedures (EOPs), e.g., requirements to diagnose a failed recovery action and determine differences in crew performance.
- Response
  - EOPs generally assume no plant damage and involve mostly control room actions. Furthermore, unlike EOPs which are integral aspects of regulations and design basis analysis, OMA in III.G.2 areas constitute a deviation from regulatory requirements. That is, OMAs are postulated in lieu of redundant train separation or alternative SSD.
  - Technical Specifications require procedures, and the use of post-fire OMAs is considered a “Procedure for Combating Emergencies and Other Significant Events” per ANSI/ANS-3.2-1982 in accordance with RG 1.33 (1978) and EOPs. NUREG-1358 (1988) informs the nuclear industry of the state of EOPs and provides direct guidance on the verification and validation process.

#### **4. Regulatory Footprint**

- Comment
  - What is the purpose of the NUREG?
- Response
  - With the withdrawal of the rulemaking, the NRC expects industry to submit exemptions for OMAs in lieu of standard Appendix R, III.G.2, fire protection features (deterministic by design). The NRC needs an acceptable, consistent set of corresponding deterministic criteria by which to review these exemptions to ensure that adequate public health and safety is maintained when approved OMAs are used in lieu of standard III.G.2 compliance.
- Comment
  - NUREG-1852 imposes regulatory requirements for determining acceptability of OMAs in lieu of Appendix R, Section III.G.2.
- Response
  - NUREG-1852 does not impose regulatory requirements. It provides an acceptable, coherent set of criteria to facilitate consistent NRC reviews of OMA feasibility and reliability if licensees choose to submit exemptions to Appendix R, Section III.G.2.

- Comment
  - The NUREG is a major change to the prior Appendix R SSD performance goals and criteria. It mixes performance-based concepts with a deterministic framework and imposes the criteria from the withdrawn manual action rule.
- Response
  - Even though the Commission approved withdrawal of the rule, the NUREG guidance is well within the Commission's direction from applicable Staff Requirements Memoranda. The criteria are based on sound principles and long-standing NRC practice for assessing the feasibility and reliability of OMAs outside the main control room.
- Comment
  - Since OMAs require exemptions, how is a consistent regulatory footprint established?
- Response
  - Pre-1979 fire protection programs are not performance-based: licensees must submit an exemption to credit an OMA in lieu of III.G.2. Post-1979 programs are performance-based: licensees can do an evaluation per Generic Letter (GL) 86-10 and use NUREG-1852 as guidance. Also, unless using NFPA 805 to evaluate OMA feasibility and reliability (Human Reliability Analysis), the situation where a licensee credits both a standard III.G.2 compliance method and an OMA for the protected train should not arise under a deterministic approach.
- Comment
  - Will the NUREG criteria be imposed on pre-approved OMAs?
- Response
  - NRC does not plan to impose the NUREG's criteria on pre-approved OMAs. Nor does the NUREG change any regulatory requirements. The NUREG provides NRR staff with an acceptable approach to ensure consistent reviews of applications for exemptions and maintenance of adequate safety margins.
- Comment
  - The tie between RIS 2006-10 and NUREG-1852 needs to be clear. Further, the NUREG refers to Revision 5 of SRP 9.5.1 for details on how NUREG-1852 will be used in NRC staff reviews, but this revision does not provide details on OMAs.
  - Will suppression and detection be required when applying for an exemption?
- Response
  - Subsequent to the withdrawal of the OMA rulemaking, NRC issued RIS 2006-10 "Regulatory Expectations with Appendix R Paragraph III.G.2 Operator Manual Actions." It describes the corrective actions for failures to have a fire barrier as required by 10CFR50.48 and the use of OMAs as an interim compensatory measure. The RIS, not NUREG-1852, addresses regulatory requirements, including the need for fire detection and automatic suppression.

- Comment
  - The NUREG should reflect that recent NRC correspondence acknowledges that use of certain types of OMAs are allowed or have regulatory acceptance.
- Response
  - The reference to Revision 5 of SRP 9.5.1 has been changed. The technical guidance formerly in the SRP is now contained in Revision 1 of RG 1.189.
- Comment
  - How does this NUREG apply to plant modes of operation other than full power? The thermal-hydraulic (T-H) conditions of the plant vary at the different modes of operation. The NUREG mentions “normal plant evolutions,” which alludes to different modes.
- Response
  - If OMAs are credited at other than full power, then T-H conditions at these modes govern determination of the time available to complete the action. If specific conditions exist during such modes that could present a worst case, they should be addressed on a plant-specific basis. Otherwise, full power should bound all possible applications of the OMA.

## **5. Demonstration & Time Margin**

- Comment
  - The NUREG should allow flexible approaches to demonstrate that operators can effectively communicate during post-fire SSD. No regulatory requirement or industry precedent to protect communications equipment from fire effects currently exists. While it is likely that many fires will damage some equipment, the NUREG should require only that an undamaged communications method be available, not that communications equipment be free of fire damage.
  - In general, communications are demonstrated prior to donning protective gear, with confirmation given once the operator has left the area and removed the gear. The NUREG highlights this possibility. The NUREG further implies that protection of communications equipment is necessary to convey that an OMA has been accomplished.
- Response
  - The NUREG has been revised to emphasize that the form of communication needed to perform OMAs be similarly protected as per normal procedures or planned protocols. The NUREG emphasizes that, if communications equipment is required to perform OMAs, the equipment be available and functional. While the NRC expects the licensee to follow normal procedures or planned protocols, the intent is to recognize the unpredictability of fires. For example, if communication while wearing SCBAs is not demonstrated (for feasibility), it should be considered as an uncertainty in the time margin (for reliability). If the licensee wishes to credit a plant-specific form of communication (e.g., runners), it should do so in its exemption, which the NRC staff would review on a plant-specific basis.

- Comment
  - The NUREG should not require accounting for all possible OMA timing delays because it is impossible to determine these as well as the associated variations. The NRC has previously accepted use of "nominal" values and "best estimate" codes for plant response to fire events. Industry believes that sufficient margin is inherent in the analysis methodology itself, which assumes that all fire damage occurs and consequently all OMAs must be sequenced and evaluated in the timing.
- Response
  - In response to this comment, NRC revised the NUREG to emphasize the desirability of considering uncertainties as part of the demonstration to justify adequate time to perform an OMA. The Demonstration and Time Margin criteria are closely related; one cannot "skimp" on one without having to enhance the other.
  - The NUREG guidance is flexible on treating OMA uncertainties to address the elimination of a single time margin during the rulemaking. A licensee may perform a best-estimate analysis for the time allowed and demonstrate execution of the OMAs under somewhat ideal conditions, then include additional time to account for uncertainties. As an alternative a licensee may perform a conservative assessment of the time allowed, and then realistically demonstrate the OMAs to bound the execution time. A tradeoff always exists between the realism of the demonstration and the uncertainties to be addressed. More realistic demonstrations yield less uncertainty and smaller time margins.
- Comment
  - Due to a lack of clear quantitative guidance, both utility analysts and regulators will default to the factor of 2 inferred in Appendix B, "Summary of Expert Opinion Election to Determine Time Margins." Furthermore, the expert panel consisted entirely of NRC and their contractor staff, mostly PRA practitioners. It could not provide diverse perspectives on practical assessment and implementation of nuclear plant OMAs.
- Response
  - Appendix B of the NUREG provides an example of how one expert panel developed a time margin, which just so happened to yield a factor of ~2. OMAs by nature are performance-based, so allowing them even via exemption must involve performance-based aspects.
  - The expert panel consisted of one former SRO and two PRA experts. This expertise, in the staff's view, is sufficient to provide one reasonable method of addressing Time Margin.
  - There is no expectation that NRC reviewers will default to the factor-of-2 time margin since the appendix is not binding. The licensee still needs to consider time margin, and the appendix provides an example of one somewhat successful attempt. The licensee must defend its approach, whether following the NUREG or using another method. Since the nuclear industry objected to an "objective" time margin, the rulemaking was relaxed to allow other options. The NUREG preserves the flavor of this decision.

- Comment
  - The NUREG requirement to perform OMA demonstrations under simulated fire conditions should be removed. There is no similar requirement for Design Basis Events (DBEs). The NUREG misinterprets requirements for fire brigade drills which, while "strenuous," do not "simulate actual fire conditions."
  - The NUREG requires an increase in the time to conduct OMAs due to random "impediments" such as locked doors, stiff hand-wheels, or erratic communications. This imposition is inconsistent with previous NRC guidance on SSD analyses, as they exceed those required for operator actions in plant EOPs.
- Response
  - EOPs generally assume no plant damage and involve mostly control room actions. Furthermore, unlike EOPs which are integral aspects of regulations and design basis analysis, OMAs in III.G.2 areas constitute a deviation from regulatory requirements. That is, OMAs are postulated in lieu of redundant train separation or alternative SSD.
  - Nevertheless, the NUREG has been revised to reflect that its guidance may be applied as appropriate, recognizing that specific manual actions may need to meet the guidance to varying degrees: i.e., not all of the factors will be relevant for all situations. It further clarifies the acceptability of using bounding techniques to cover similar OMAs under similar circumstances.
- Comment
  - Appendix R does not require that the single failure criterion be addressed. The NUREG appears to conflict with this, making it likely that differences in subjective technical opinions will arise between the licensee and the NRC.
- Response
  - The single failure criterion is irrelevant because there is no train free of fire damage unless compliant with III.G.2.
- Comment
  - NUREG-1852 time factors inadequately address environmental conditions associated with fire and OMA reliability. Only Appendix B, "Summary of Expert Opinion Elicitation to Determine Time Margins for OMAs in Response to Fire," scantily addresses the need to account for variability in human performance.
- Response
  - Taken together, as intended, the demonstration and time margin adequately address environmental conditions. The NUREG specifies "that additional uncertainties in the estimate of the time required ... are accounted for in the analysis before the final determination that adequate time exists." The actions cannot be credited unless the fire effects will allow them. The NUREG's main body and Appendix B discuss the need to address the time margin uncertainties associated with environmental conditions.

## 6. Staffing & Training

- Comment
  - The NUREG requirement that operators who perform manual actions be on-site at all times is too prescriptive in not considering plant-specific situations where actions may not be needed for many hours. This requirement should acknowledge plant staff augmentation available under the Emergency Plan. The NUREG also implies that an operator can no longer be on the fire brigade as a “collateral duty during a fire.”
- Response
  - The NUREG has been revised to allow plant staff credited with performing OMAs to be “available” rather than “on-site.”
  - An operator cannot serve on the Fire Brigade and be responsible to perform an OMA at the same time. (S)He could serve as a Fire Brigade member on shift provided another operator had his/her OMA responsibility that same shift. (S)He can have other duties during the fire, provided that those duties do not involve OMAs.
- Comment
  - Demonstrating all of the crew differences, i.e., the "expected variability among individuals and crews," exceeds what is normally conducted even under Human Reliability Analysis.
- Response
  - The NUREG criteria with respect to expected variability among individuals and crews do not exceed what are normally included in Human Reliability Analysis (HRA). HRA addresses such variabilities implicitly, using uncertainty and sensitivity analyses. If one chooses to submit a risk-informed exemption via RG 1.174 or adopt NFPA 805, then these criteria are implicit in the uncertainty estimate for human error probability.
- Comment
  - The NRC licensing process ensures that nuclear power plant operators meet competency standards under all expected accident conditions. NRC Form 396, assessed per ANSI standards, attests to the physical and mental fitness for licensure as an operator. A utility typically ensures that non-licensed operators meet similar requirements.
  - The NUREG requires that each crew perform an integrated demonstration on fire scenarios, a significant new burden on Operations Training suggesting use of the simulator jointly with in-plant operator actions (not a routine form of training). Initial verification and validation (V&V) of OMA feasibility should suffice when combined with periodic task-based training and Job Performance Measures (JPMs). The NUREG also requires continuous V&V of OMAs, a very burdensome configuration control problem that is not justified from IPEEE insights.
  - Are training, demonstration, and drilling required for each specific OMA or is it acceptable to do so on types of OMAs? The NUREG appears to find it acceptable to demonstrate only a few bounding procedures, but this still seems to be a new expectation. For types of actions on which operators regularly train, such additional specific activities on each individual component should not be required.

- Response
  - The staff believes that the demonstration used to determine OMA feasibility and reliability in lieu of physical separation criteria must be sufficiently rigorous to maintain an adequate level of defense-in-depth. The NUREG allows the licensee to determine what actions and scenarios are so complex that they merit subsequent periodic demonstrations. Otherwise, routine training or practice within an existing training program should suffice. The NUREG has been revised to further clarify the acceptability of using bounding techniques to cover similar OMAs demonstrated under similar circumstances.
- Comments
  - The NUREG requires that OMA-related procedures be assessed as current and adequate, which is additional to already existing licensee self-assessments. Determining a procedure's adequacy is subjectively difficult. Procedures already undergo extensive review, and adequacy is determined by programmatic requirements as well as walk-throughs by each crew.
- Response
  - Procedures must be assessed when crediting OMAs in response to fires in lieu of physical separation criteria to ensure that they can work effectively with alarms, personnel, etc., in the specific context of the particular fire scenario(s). For example, although the licensee verified and validated procedures during development, the procedures may not have considered the unique conditions presented by the relevant fire scenario(s). Assessment under these unique conditions could reveal previously unidentified shortcomings which can be critical when licensees rely on OMAs in lieu of reliable passive features.
- Comments
  - A "reliable action" is described as one that can be performed with a high success rate under varying conditions that typify uncertainties in the available time. What is considered a "high success rate?" If a crew fails, what remedial actions are required to remain bounded within the Appendix R design function which is crediting the OMA? NEI 04-02, Appendix B, discusses feasibility and reliability of "recovery actions" as part of a "change evaluation process." RG 1.205 endorsed NEI 04-02, with clarifications, but there is no reference to or consideration of the content of NEI 04-02 or RG 1.205 in this NUREG.
- Response
  - If use of a specific human error probability is key to crediting an OMA, then a risk-informed/performance-based approach is appropriate via a RG-1.174 exemption or NFPA-805 transition. The NUREG specifically refrains from quantifying the term "reliable." The intent of the NUREG is to address criteria that, if met, will make the OMA as reliable as reasonably achievable considering uncertainties inherent to fire scenarios and human responses.

## 7. Environmental Factors

- Comment
  - The NUREG should not require consideration of “temporary conditions” due to their low likelihood in conjunction with a fire. 10CFR50.59 allows for temporary changes up to 90 days, though these typically last only a few. This should have little effect on the overall OMA human error probability or associated risk. Additionally, it would be impossible to determine all of the possible temporary conditions that may occur.
- Response

The staff revised the NUREG to clarify that it does not expect licensees to address low probability temporary situations, but to consider routine situations that may impact OMA timing.
- Comment
  - What criteria should be used to determine when a heat stress analysis is required? What criteria should be used to account for smoke and toxic gas? Currently NRC has closed Generic Safety Issue (GSI)-148, “Smoke Control and Manual Fire Fighting Effectiveness,” which dealt with this issue. The conclusion was that the issue was plant-specific, was acceptably resolved under the IPEEE, and no generic backfit of new requirements could be justified. What regulatory process is being used to reopen this closed issue?
- Response
  - The NRC is not re-opening closed issues via this NUREG. It points out that environmental conditions, e.g., heat stress or smoke/toxic gas, must be evaluated for plant-specific fires to determine OMA feasibility and reliability. The related IPEEE issue is not relevant here, nor is a GSI involved. The NUREG offers references to heat stress studies, etc., to use when evaluating the effects on OMAs, but intentionally does not advocate any particular one. The NUREG adopted this approach to provide plant-specific flexibility. Expectations are that items such as heat stress or smoke will be addressed when the potential exists to reduce OMA success or harm an individual. The NUREG has been revised to reflect this expectation.

## 8. Equipment Functionality

- Comment
  - The NUREG states that credit should not be taken to manipulate components exposed to fire, except for rare cases such as non-fire affected components in the zone long after the fire is extinguished. Many licensees have credited manual operation of valves in affected fire zones after the fire is extinguished and access to the area is re-established as an approved Fire Hazards Analysis assumption that valves remain operable via local manual operation following extinguishment of the fire and return of the valve components to the normal ambient temperatures. NRC acknowledges the concept of “re-entry” in SECY-90-016 and has previously accepted a variety of “re-entry times” based on the fire hazards and protection available in the area, varying from 30 minutes upward.
  - The NUREG should indicate when an area could be considered “accessible” after a fire. In the past, staff reviewers and plants have utilized 1 hr as the guideline.

- Response
  - Fires that damage one train may make it critical to perform an OMA since one cannot consistently predict fire effects. Each exemption request must address a specific scenario and in some specific plant exemptions a 1-hour re-entry may be possible and has been granted; however, it is not considered general guidance. The licensee must ensure that a fire does not result in valve maloperation or system, structure or component (SSC) damage that would render equipment inoperable when required for the OMA.
  - Per SECY-90-016, "Evolutionary Light Water Reactor (LWR) Certification Issues and Their Relationship to Current Regulatory," re-entry into a fire area for repairs and operator actions is generally not allowed: "Therefore ... designers must ensure that SSD can be achieved, assuming that all equipment in any one fire area will be rendered inoperable by fire and that re-entry into the fire area for repairs and operator actions is not possible [excluding the main control room]."

## 9. Available Indications

- Comment
  - Alarm effectiveness is not relevant to OMA feasibility or reliability. There is no similar requirement for other operator actions, e.g., emergency response for a design basis accident. For these, the requirements are just to ensure alarm operability, without an "assessment of effectiveness" via determination of the alarm failure rate. For most preventive actions, only the fire alarm is needed; indications to verify successful completion may not be needed and, for some actions, may not be possible
- Response
  - Alarm effectiveness encompasses two fundamental requirements to ensure that OMAs are feasible and reliable. It pertains to (a) whether the postulated fire creates conditions that actuate the alarm, and (b) the alarm's functionality. The NUREG discusses alarm effectiveness because it is relevant to both OMA feasibility and reliability.
- Comment
  - Diagnosis identifies the need for an action. Indication to recover a failed action is not typically considered. This diagnosis may need to be provided, but only if the confirmation of the action is needed to continue performance of additional actions. Unless the action is considered highly unreliable, the indication that the recovery action has failed should not affect its overall reliability, which is not a concern for a deterministic approach as provided in NUREG-1852.
- Response
  - Feedback indication of successful performance depends on the action. One must verify that the OMAs have been completed because of differences in these substitutes for physical separation and the need to maintain a comparable level of defense-in-depth (DID). The NUREG has been revised to clarify that the feedback of indication is necessary, specifically where indication of the completed action is not already directly observable.

## 10. Defense-in-Depth

- Comment
  - The NUREG should state how DID considerations, which exceed minimum requirements, are addressed, including credit to offset time margins and reliability issues. The boundary conditions in a post-fire SSD analysis differ significantly from those inferred by NUREG-1852, many of which are theoretical in nature and very difficult to apply. For example, including a time margin factor is based solely on fire SSD considerations. The DID design philosophy in all Fire Protection Programs is based on a three echelons, of which this element is only one. Each should "meet certain minimum requirements" such that strengthening one "can compensate in some measure for weaknesses, either known or unknown, in others."
- Response
  - RIS 2006-10, not this NUREG, addresses DID for post-fire response. III.G.2 stipulates passive fire protection through highly reliable, operable fire barriers. Licensees may rely on typically less reliable OMAs only if they properly demonstrate that they maintain adequate fire safety.
- Comment
  - Reference to RG 1.33, Appendix A, requiring post-fire SSD procedures represents a new staff position, inconsistent with GL 86-10, Staff Position 5.2.3. Previously, RG 1.33, Appendix A, Item 6.v, had generally been interpreted as applying to the Fire Fighting/Brigade activities. Considering the previous staff position provided in GL 86-10, Position 5.2.3, it is clear that NUREG-1852 is re-interpreting the Administrative and Detection/Suppression echelons of DID.
- Response
  - GL 86-10, Position 5.2.3, addresses the use of procedures for areas requiring Alternate Shutdown Capability (III.G.3). NRC expected licensees to comply with III.G.2 by relying on passive separation features as opposed to OMAs. Therefore, the criteria in this NUREG do not contradict with NRC guidance and requirements.
  - The NRC requires plants to have SSD procedures. RG 1.33 and ANSI/ANS 3.2-1982 give guidance on OMA feasibility and reliability. The RG 1.33 (Rev. 2) QA Program Requirements were issued in 1978, and ANSI/ANS-3.2-1982 reiterates the need for a post-fire SSD procedure.

## 11. Inspection Guidance

- Comment
  - The NUREG should not reference inspection guidance since this is not part of regulation, nor is it subject to review in a similar way to other regulatory documents. Additionally, inspection guidance should be based on existing regulation. As such, it is not appropriate as a basis for OMA requirements. It is likely the current inspection guidance will be revised once NUREG-1852 is published, thus making the discussion inaccurate.

- Response
  - Following withdrawal of the proposed OMA rule, the Commission’s guidance was incorporated into RIS 2006-10. The NUREG was developed to provide guidance on acceptable methods for assessing OMA feasibility and reliability. The NUREG has been revised to clarify that inspections and inspection guidance are cited only to demonstrate that the criteria already exist to some extent and are consistent with expectations already established with regard to fire inspections.
- Comment
  - The NRC presentation at the November 29, 2006, public meeting implied that the use of OMAs would require fire detection and automatic suppression to maintain defense-in-depth. Such references in this NUREG inappropriately cite the wrong process to establish regulatory expectations. Also at this same presentation, the NRC indicated that they would backfit NUREG-1852 criteria onto existing actions through the inspection process. Unless a licensee has specifically committed to the NUREG, such use of the NUREG is a backfit.
- Response
  - RIS 2006-10, not NUREG-1852, addresses regulatory requirements, including the need for fire detection and automatic suppression. Any mention of fire detection and automatic suppression in the NUREG is made in reference to RIS 2006-10.

## **12. Fire Modeling**

- Comment
  - The NUREG requires that the worst-case time for damage (including spurious operation) be assumed. However, this may result in unrealistic scenarios if damage is assumed too soon. An option should be considered where the damage time is calculated assuming a worst-case fire location and an upper bound fire size (e.g., see the Fire Significance Determination Process). Conservative fire modeling should be allowed for determining the expected upper bound damage time for timeline analysis.
- Response
  - The NUREG discusses which uncertainties to address when determining OMA feasibility and reliability, stating “that there are at least two (and perhaps other) ways to account for these uncertainties. A licensee may perform a conservative analysis with a justification that the fire-related uncertainties are enveloped ... an alternative approach available to a licensee is to perform fire modeling for some fires accounting for these uncertainties.” The concept of using conservative timing is already addressed in the NUREG, provided the associated justification is included.
- Comment
  - The NUREG serves a reference guide to address OMA feasibility and reliability based on a deterministic approach. Could the use of NUREG 1805, “Fire Dynamics Tools (FDTs) Quantitative Fire Hazard Analysis Methods for the USNRC Fire Protection Inspection Program” as a modeling tool be applied to screen the necessity of an OMA?

- Response
  - The NUREG intended that the worst-case timing for equipment damage be determined by (1) making a non-mechanistic conservative assumption or (2) performing some level of fire modeling. The licensee may use NUREG-1805, within the context of uncertainties of fire models provided in NUREG-1824. The NUREG has been revised to more explicitly state that some level of fire modeling is useful to determine the worst case timing.

### **13. OMAs vs. Passive Features**

- Comment
  - By exempting the industry from maintaining qualified passive fire protection features as intended by law, NUREG-1852 diminishes the DID for fire protection of SSD systems and increases the risks to the public's health, safety and security.
  - Instead of prioritizing compliance with preferred passive physical fire protection features, the NUREG allows industry a compliance strategy through the submission of a massive number of exemptions through the employment of a complicated array of numerous dubious OMAs. NUREG-1852 would allow the nuclear industry to avoid compliance and NRC to avoid enforcement action for duly promulgated law by trivializing the prioritization of physical fire protection features and instead unduly promote the abuse of the exemption process.
- Response
  - To receive an OMA exemption, a licensee must identify all relevant OMAs by fire area or scenario, considering the requirements for DID under III.G.2 as to fire detectors and automatic suppression. NRC has granted such exemptions in the past, specific to the licensee and situation, where the criteria were met. NRC's preference is that licensees meet III.G.2 by relying on passive separation features. However, NRC recognizes that (a) under certain conditions OMAs may provide an alternative method of providing a comparable level of safety, and (b) 10CFR50.12 provides the regulatory vehicle to receive, review, and approve requests for exemptions. The NRC's expectations for compliance have not changed, nor are they within the scope of NUREG-1852 (see instead RIS 2006-10, "Regulatory Expectations with Appendix R, Paragraph III.G.2, Operator Manual Actions.")

### **14. OMAs & Terrorism**

- Comment
  - The NUREG fails to account adequately for mitigating responses to aircraft impacts and other forms of terrorism. The known broad industry non-compliances with physical fire protection for SSD do not lend public confidence to the Commission's assertions that plant operators can and will control and contain the consequences of terrorist attack causing significant fires. In NUREG/CR-2859, Argonne experts state that, "based on the review of past licensing experience, it appears that fire and explosion hazards have been treated with less care than the direct aircraft impact and the resulting structural response. Therefore, the claim that these fire/explosion effects do not represent a threat to nuclear power plant facilities has not been clearly demonstrated. "

- Response
  - The NRC re-evaluated the aircraft crash issue after NUREG/CR-2859 was published (many years before 9/11/2001). A February 2002 NRC Order required licensees to examine the effects from extensive losses due to fires/explosions and identify “mitigative strategies” using resources already existing or “reliably available.” NRC inspections (2002-2005) and additional studies examined implementation of the mitigative strategies. The NRC continues to ensure appropriate licensee implementation.
  - Aircraft attack, in particular, was considered. For the facilities analyzed, the likelihood of both damaging the reactor core and releasing radioactivity that could affect public health and safety is low, with adequate time to implement mitigating actions and off-site emergency plans such that the NRC’s emergency planning basis remains valid.