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Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
ATTN: Rulemakings and Adjudications Staff

SUBJECT: Comments on NRC Proposed Rule "Fire Protection Program – Post-Fire Operator Manual Actions," RIN 3150 AH-54

PROJECT NUMBER: 689

We appreciate the opportunity to provide industry[1] comments on this proposed rulemaking addressing NRC acceptance criteria for operator manual actions to achieve and maintain a hot shutdown condition. Comments on this proposed rule are grouped into several categories: background, general comments, conclusions, and enclosure for specific comments, responses to the requests for comment, and an alternative proposal.

Background

The rulemaking package refers to a June 2002 meeting between NEI and NRC where the practice of crediting manual actions was discussed. However, as a point of important clarification, industry provided NRC staff with specific examples of manual actions that were previously approved in safety evaluations and inspection reports. These examples in addition to formal licensee submittals for exemptions to III.G.2 represent two distinct approaches used by the NRC for addressing alternative methods to achieve post-fire safe shutdown.

[1] NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

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Many licensees use manual actions to achieve post-fire safe shutdown as alternatives to satisfy the requirements in Sections III.G.1 and III.G.3 of Appendix R. NRC has reviewed and accepted the use of manual actions without exemption or deviation requests. There are no provisions in NRC regulations or regulatory guidance that prohibit the use of manual actions to achieve III.G.1 or III.G.2 safe shutdown. In fact there are a number of NRC documents containing guidance on the use of manual actions. Specific examples of such guidance were detailed in a January 11, 2002 letter from Mr. Alexander Marion (NEI) to Mr. John Hannon (Chief, Plant Systems Branch – NRR).

Since 2002, industry has believed it imperative to focus on a consistent regulatory process going forward that would enable the use of manual actions (both alternate and redundant) without prior NRC approval as long as the reliance on manual actions does not adversely affect the ability to achieve and maintain safe shutdown. We have supported rulemaking to establish the acceptance criteria and also establish the desired regulatory process. The industry supports the fundamental concept that plant safety and demonstrated feasibility of credited manual action are important rather than the past processes of prior regulatory approval.

Industry has supported the development of reasonable acceptance criteria for demonstrating the feasibility of operator manual actions. In March 2003, NRC developed inspection guidance containing reasonable criteria for determining the feasibility of manual actions.

Unfortunately, nearly three years after the June 2002 meeting the NRC has proposed a rule containing additional provisions that we believe will neither improve plant safety nor demonstrate the feasibility and reliability of operator manual actions.

General Comments

The two provisions of the proposed rulemaking that are of greatest concern are:

1. the requirement for automatic suppression and detection
2. the arbitrary requirement for a time margin factor

Each provision represents a new NRC regulatory position that will result in significant burden on the licensees that use operator manual actions in support of post-fire safe shutdown. The NRC has not demonstrated an improvement in plant safety or reduction in fire risk for either of these new provisions. Moreover, the provisions negate prior NRC approvals, and numerous exemption requests will be necessary thereby further diverting industry and NRC staff resources from more safety significant matters. The time margin factor amounts to nothing more than

an unprecedented 100% penalty against the timing of one's ability to execute a manual action. Operator manual actions that have been deemed acceptable for mitigating postulated design basis accidents and are identified in plant Emergency Operating Procedures (EOPs) do not contain such regulatory requirements. Detailed comments on each of these provisions are contained in Enclosure 1.

The Commission also requested responses to specific questions related to time margin, detection and suppression, and limitation of operator manual actions for Appendix R paragraph III.G.2. Responses to those questions are contained in Enclosure 2.

The regulatory analysis for this proposed rulemaking identified Option 3 as the preferred option for the following reasons:

(1) improves effectiveness and efficiency of the NRC regulatory process by assuring adequate and uniform operator manual actions;
(2) eliminates the need for some licensees to request exemptions from Paragraph III.G.2 or make equivalent modifications; and
(3) reduces NRC costs by reducing the number of exemption requests to be reviewed."

The proposed rule will not reduce the number of exemptions. The plant areas that represent a fire risk (hazard) already contain detection and suppression systems. This rule calls for the installation of additional systems in fire areas requiring manual actions, which will increase the number of exemption requests to address manual actions that have been previously approved as well as those that will need to be submitted for implementation of this rule. Therefore, NRC costs will not be reduced by this proposed rulemaking.

The estimated labor rate of $88/hour that is assumed in the regulatory analysis for calculation of review fees for review/approval of exemption requests is significantly underestimated. The estimate should assume the same rates recently published in a proposed rule on 10 CFR Parts 170 and 171 that will increase the labor rate for NRC staff review to $205/hour for power reactors.

Conclusion:

In summary we recommend that the two provisions noted in this letter be eliminated. A safety case has not been demonstrated to suggest an improvement in plant safety with the addition of these provisions. The regulatory analysis states the following, "The results from NRC fire protection inspections to date indicate there is insufficient evidence that the generic use of these manual actions poses a safety concern."

The proposed rulemaking on operator manual actions will not achieve its intended objectives for reducing licensee burden, increasing plant safety, and eliminating the need for exemption and/or deviation requests. We offer a proposed alternative for your consideration as provided in Enclosure 3.

We would be pleased to meet with the NRC staff to discuss these comments in further detail. Please contact me at 202.739.8080; am@nei.org if you have any questions.

Sincerely,

Alex Marion

Alexander Marion

c: Dr. Brian W. Sheron
Ms. Suzanne C. Black
Mr. John N. Hannon

Automatic Suppression and Detection:

Fire Protection Programs in the commercial nuclear industry are based on the concept of defense-in-depth. The components of this concept are: (1) preventing fires from starting; (2) rapidly detecting and suppressing any fires that do start; and (3) providing passive fire protection features to prevent fire spread and damage. Defense-in-depth is also supplemented by a post-fire safe shutdown analysis to demonstrate the ability to achieve and maintain post-fire safe shutdown in the event of a fire in any plant fire area.

Fire Hazards Analyses are used to identify areas where fire hazards exist and where suppression and detection are necessary to mitigate the potential effects of fires. These analyses were prepared as a part of the initial licensing for each plant and were reviewed by the following:

- Fire Protection personnel from the licensee's Architect Engineer responsible for initial plant design,
- Fire Protection personnel from the licensee,
- Fire Protection personnel from the Insurance Carrier for the plant, and
- Fire Protection personnel from NRC (NRR and the Region) during numerous inspections, including the resolution of findings, unresolved items (URIs), etc.

Recommendations from each of these groups have been incorporated into the design of the plant's fire protection features. Based on the reviews conducted and the changes made over time, each plant is configured such that the areas where fire hazards exist are protected with suppression and detection. Conversely, those areas where suppression and/or detection have not been provided represent areas where there is no significant fire hazard that could threaten the safe shutdown capability.

The proposed rulemaking would require additional suppression and detection throughout any fire area where a manual action is credited to achieve post-fire safe shutdown. This requirement would lead licensees to provide full area suppression throughout many portions of fire areas that currently do not require suppression based on the licensee's Fire Hazard Analysis. The addition of additional water suppression systems will increase the risk of internal flooding. It is also likely that the risk increase due to flooding may be significantly larger that any risk reduction attributed to the addition of suppression in III.G.2 areas of the plant. The estimated cost, based on standard industry information for design and installation of suppression systems, is in the range of $10 million to $100 million, per site.

Time Margin Studies:

The defense-in-depth features of Fire Protection programs throughout the industry are designed to assure that plant equipment is not damaged by fires. The safe shutdown philosophy relies on these features to assure that damage to equipment required for safely shutting down the plant will not be caused by a plant fire. In the unlikely event that fire-induced equipment damage does occur, the post-fire safe shutdown analysis protects or assures the operability of equipment credited in Emergency Operating Procedures. As a result, the Control Room Operator will shut down the plant in the event of a fire using the same symptom-based procedures that are used for abnormal operating events and design basis events.

The defense-in-depth features of the fire protection program will preclude the need to shut down the plant for the vast majority of fires. Nevertheless, if a fire does force plant shutdown additional equipment beyond that which is protected in the post-fire safe shutdown analysis will be available. Fire induced equipment impacts are not expected to occur and any that do occur will be managed in conjunction with the symptom-based response.

The proposed rule requires that time margin studies assume that plant fires will damage multiple pieces of plant equipment with the potential to adversely affect post-fire safe shutdown. The time margin study further assumes that the actual timing of fire damage to the equipment can be accurately predicted. This assumption is contrary to actual fire experience which led the industry to develop the conservative defense-in-depth philosophy that currently exists in plant fire protection programs.

Introducing a time element requirement into post-fire safe shutdown analysis is a significant concern, because predicting the timing of actual fire damage to equipment required for post-fire safe shutdown will necessarily involve the use of engineering assumptions. These assumptions, albeit conservative, cannot accurately predict damage states resulting from actual fires. Furthermore, the conclusions from engineering analysis based on engineered assumptions will need to be included in post-fire safe shutdown procedures.

The outcome will be an engineered event-based response to the fire condition. An event-based response will conflict with the symptom-based response that is used in operating procedures for other plant events. The introduction of an event-based response to fires with the potential to conflict with the symptom-based response is potentially adverse to safety.

Request for Comment 1: (Time Margin)

"The time margin factor is offered in this statement as a best estimate and basis for obtaining stakeholder feedback. The Commission requests opinions specifically on the time margin aspects because of stakeholder interest in this subject and the Commission's desire to consider all stakeholders' input for this important criterion.

Specifically, the Commission asks the following questions:

(A) Considering the factors for time margin discussed above (including the conditional dependence on a worst-case demonstration meeting all the other acceptance criteria), should the time margin consist of a single multiplicative factor (e.g., 2 times), or a range of multiplicative factors (e.g., 2-4 times)? Please provide a basis for your proposed time frames or factors."

No. The time margins should not consist of a "single multiplicative factor" or a "range of multiplicative factors." This proposal does not consider the fact the operations personnel are trained on procedures and drills to effectively achieve the desired manual actions. A requirement for a "multiplicative factor" in effect amounts to nothing more than a penalty. Operator actions are credited for response to abnormal events and design basis event as addressed in plant operating procedures, and no similar penalty is applied for non-fire events. NRC proposed action of imposing a time margin is unprecedented. Operator manual actions that have been deemed acceptable for mitigating postulated design basis accidents and are identified in plant Emergency Operating Procedures (EOPs) do not contain such regulatory requirements. No similar time margin factor has been applied to Alternative Shutdown operator actions previously reviewed and approved under III.G.3 nor has the NRC previously applied a time margin factor for those plants that previously sought exemptions to III.G.3. The burden of proof rests with the NRC to provide a basis that clearly demonstrates improvement in plant safety.

The application of additional conservatism to account for "(i) differences between the analyzed and actual conditions and (ii) human performance uncertainties that may be encountered" is inconsistent with the underlying assumptions of Appendix R analyses. Appendix R safe shutdown analyses are performed using "worst case" assumptions that a fire instantaneously damages all unprotected cables and equipment in the fire area, regardless of the suppression, detection, and fire hazards in the area. The analysis also assumes that all equipment is available prior to the fire, that single failure criteria need not be superimposed (beyond what is attributable to the fire damage itself), and that equipment that is not affected by the fire operates as expected (does not randomly fail). These assumptions are based on various NRC guidance documents which dictate that the worst case fire is not

required to be postulated simultaneous with non-fire related failures in safety systems, plant accidents or the most severe natural phenomena. Applying an additional margin for uncertainties, on top of the postulated worst case event, is without prior NRC precedent in post-fire safe shutdown analysis.

"(B) If a range is appropriate, what should the range be and what parameters or variables should be considered in determining which part of the range is applicable in a given situation? Please provide a basis for your proposed time frames or factors."

Refer to the response to the previous question.

"(C) Should there be a minimum additive time (e.g., 10 minutes) for situations where the time in the demonstration is so short that a multiplicative factor would not properly account for the required time margin (e.g., a time in the demonstration of < 5 minutes). Please provide a basis for your proposed time frames or factors."

No and refer to the response to question (A).

"(D) Are there other means of establishing margin (e.g., through consideration of conservative assumptions in the thermal hydraulic timeline)? Please provide a technical basis."

Margin currently exists in the fundamental design for the plant, in the defense-in-depth elements of a fire protection program and system/component response to various events. This is supplemented by highly trained operations personnel who safely operate the plant under normal conditions and demonstrate the ability to achieve and maintain safe shutdown in response to transient conditions.

Request for Comment 2:

"After considering technical implications and historical background of the proposed criteria as discussed above, the Commission decided that the proposed operator manual actions rulemaking will require fire detectors and an automatic fire suppression system in the fire area to permit operator manual actions as a compliance option under paragraph III.G.2, provided the acceptance criteria delineated in a new paragraph III.P are satisfied. The basis for the requirement is discussed above. However, because of the stakeholder interest in this subject, the Commission is asking specific feedback and opinions from stakeholders on requiring an automatic versus fixed fire suppression system in the fire area.

The Commission asks the following specific question:

(A) Under the proposed option of using operator manual actions under III.G.2.c-1, when redundant trains are located in the same fire area, should the requirement for a suppression system in the fire area be automatic or fixed? Automatic suppression system is required in III.G.2(b) and (c). However, a fixed system is specified in III.G.3. Provide your rationale for why requiring fixed or automatic suppression would provide the appropriate level of protection in the proposed paragraph III.G.2(C-1)."

The fire hazards analysis for a given fire area determines the need for and the type of suppression system. Fire prevention and detection are important aspects of effective fire protection for high and low hazard areas. Fire detection is provided in areas containing safety-related or safe shutdown equipment, and high hazard areas typically include suppression systems.

Therefore, the type of suppression system should not be a function of whether or not operator manual action is used, but rather a function of the fire hazard in a given area.

Nevertheless, the proposed rulemaking discusses why the staff considered fixed or automatic suppression, but does not provide sufficient rationale for why the staff is proposing a requirement for the addition of suppression systems. The defense-in-depth approach to fire protection ensures that areas containing significant fire hazards are appropriately protected. Each plant has performed an IPEEE Fire Risk analysis per Generic Letter 88-20, Supplement 4. These analyses evaluated the risk impact of operator actions, and have been previously reviewed and accepted by the NRC.

Request for Comment 3:

"After considering a number of technical and regulatory implications, the Commission decided to limit the applicability of this proposed rule on operator manual actions to paragraph III.G.2. However, because of the stakeholder interest in this subject, the Commission is also asking for specific feedback and opinions from stakeholders on applying operator manual actions acceptance criteria to paragraphs III.G.1 and III.G.3. Depending on the comments received, the Commission may extend application of the criteria to paragraphs III.G.1 and III.G.3.

The Commission asks the following specific question:

(A) Should the operator manual action acceptance criteria developed for III.G.2 also be applied to operator manual actions for III.G.1 and III.G.3? Are there advantages or disadvantages not noted by the Commission that should be considered? Please provide a discussion outlining the basis for your response taking into account the considerations outlined above."

The NRC has approved the use of operator manual actions for III.G.1 and IIIG.3. The practice has been established. There is fundamentally no reason why operator manual actions cannot be allowed for III.G.1 and III.G.3 as long as the actions are demonstrated to be feasible. The acceptance criteria contained in NRC Inspection Manual 71111.05 (March 6, 2003) provide a reasonable approach for assessing the feasibility of operator manual actions.

The alternative wording proposed in Enclosure 3 would endorse the use of operator manual actions for redundant post-fire safe shutdown under Section III.G.1. This would eliminate the need for changes to Section III.G.2.

Alternative Rulemaking Wording:

[See Italicized and bolded wording below.]

III.G. Fire protection of safe shutdown capability.

1. Fire protection features shall be provided for structures, systems, and components important to safe shutdown. These features shall be capable of limiting fire damage so that:

   a. One train of systems necessary to achieve and maintain hot shutdown conditions* from either the control room or emergency control station(s)** is free of fire damage***; and
   b. Systems necessary to achieve and maintain cold shutdown from either the control room or emergency control station(s) can be repaired within 72 hours.

   * The Definition of achieving and maintaining hot shutdown is that a plant must reach a condition where the reactor is in hot shutdown (or hot standby for a PWR) as defined by plant technical specifications and there are no conditions that will directly result in fuel clad damage or rupture of any primary coolant boundary or immediately (i.e. within 3 hours after the start of the fire) result in the rupture of the primary containment while systems necessary for achieving and maintaining cold shutdown are being manually initiated or repaired. As an example, for a BWR, stable hot shutdown would be satisfied by successfully scramming the reactor and having a make up source available for reactor vessel injection with the capability of preventing fuel clad damage.

   **The Emergency Control Station is defined as any plant location where local control capability has been provided for operating a system or component as a specific plant design feature. For example, Control Switches provided at MCC or Switchgear for starting or stopping components or switches installed in Local Panels (e.g. relay rooms) for local operation of equipment.

   ***Free of fire damage is understood as "the structure, system, or component under consideration is capable of performing its intended function during and after the postulated fire, as needed, without repair." The intended function may be performed automatically or by manual operation, from either the main control room, emergency control

station(s), or locally at the component. Operator manual actions performed outside of the Control Room or the Emergency Control Station must be feasible and reliable.

Note: No changes are proposed to Section III.G.2 and Section III.P is not necessary.

Discussion of the Proposed Alternative:

These definitions provided in this proposed alternative reflect the various staff positions and interpretations that have been used over the years. These provide a regulatory basis for the use of operator manual actions and should be included in an appropriate guidance document with the following additional references:

- Generic Letter 81-12 and Clarification
- Internal NRC memorandum dated Juky2, 1982, from R. Mattson to R. Vollmer
- NRC meeting with Nuclear Utility Fire Protection Group (NUFPG), March 16, 1983
- SECY 83-269 Attachment C, July 5, 1983
- ACRS Fire Protection Subcommittee Meeting September 23, 1983
- Generic Letter 86-10
- 1984 NRC sponsored regional workshops
- Technical Report R7017/U71010-3/95, "A Historical Fire Protection Licensing Document Describing Requirements for Commercial Nuclear Power Plants Operating in the United States"
- NRC Workshop on Post-Fire Safe Shutdown Circuit Analysis, July 23, 1998
- Regulatory Guide 1.189 April 2001

The definitions of ***achieving and maintaining hot shutdown*** and ***the Emergency Control Station*** provide definitions that are required for an effective and uniform understanding and implementation of the regulation. The definition of ***free of fire damage*** embodies the acceptability of using manual operator actions in support of redundant post-fire safe shutdown. Redundant post-fire safe shutdown is governed by the requirements of Appendix R Section III.G.1 and III.G.2. With

respect to the industry contention that no changes are required to Section III.G.2, the following is provided.

The emphasis for Section III.G.1 of Appendix R is the ability to perform required post-fire safe shutdown functions. Structures, systems and components necessary to perform these functions need to be ***free of fire damage***. A required post-fire safe shutdown function can be impacted either directly by fire impact to a safe shutdown components or its circuitry or indirectly by fire impact to the associated circuits. A required post-fire safe shutdown function is ***free of fire damage*** if the component or circuitry required for the proper operation of the component that performs this function is not located in the fire area of concern. A required post-fire safe shutdown function is also ***free of fire damage*** if the component or its circuitry is located within the fire area of concern, but fire damage to the component or its circuitry does not prevent the performance of the function by a manual operator action. Examples of this are provided below:

- Automatic initiation logic circuits for a safety system credited for post-fire safe shutdown are located in the fire area of concern. A fire may damage the automatic initiation logic for a safety system, but the circuitry required for manual operation of the system from the Control Room is unaffected by the fire. The post-fire safe shutdown function performed by this component is, therefore, still **free of fire damage**, even though the system may not automatically initiate as a result of fire induced circuit damage.

- Control circuitry for a valve that can spuriously open as a result of a hot short and cause a loss of inventory from a tank containing water used for reactor vessel inventory make up in the event of a fire is located in the fire area of concern. A fire may cause the hot short that result in this flow diversion. The flow diversion, however, will not impact the ability to inject water into the reactor for a minimum of 10 hours after the fire damage. Within the first ten hours post-fire, a manual operator action will need to be performed to manually close the valve using the valve hand wheel. Therefore, based on this manual operator action, the post-fire safe shutdown function of reactor vessel inventory make up is ***free of fire damage***. To be used, this manual operator action must be demonstrated to be feasible and reliable.

If the circuitry for a component is located within the fire area of concern, if as a result of the postulated fire damage to the circuitry for the component a post-fire safe shutdown function is impacted and if a manual action is neither feasible nor reliable, then the required post-fire safe shutdown function is not free of fire damage. In this case, one of the circuit protection means described in Appendix R Section III.G.2 needs to be used.

For the circuits falling into this latter category, protective fire protection features such as a 3-hour fire barrier or a 1-hour fire barrier with suppression and detection are appropriate. These measures are considered to be appropriate since in each of these cases, failure of the fire barrier will result in the loss of the post-fire safe shutdown function. In the cases where a manual operator action can be performed, however, fire protection features are not necessary, since a fire induced failure of the circuitry does not result in a loss of the post-fire safe shutdown function. The availability of the post-fire safe shutdown function is assured through the manual operator action. For those actions performed by the operator outside of the Control Room or the emergency control station, the feasibility and reliability review performed for the manual operator action provide an equivalent level of protection for the post-fire safe shutdown function to that afforded by the fire protection features provided in Appendix R Section III.G.2.

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