

Attachment 4
NEI NUREG 1022 Team Position Paper
Engineering Judgment and Reasonable Operator Actions

Position

Engineering judgment and reasonable operator actions may be used to determine if a structure, system or component (SSC) could have completed its applicable safety function(s) assumed in the plant's accident analysis, was inoperable for longer than allowed by Technical Specifications (TSs), or met other reporting criteria. As used here, the term "engineering judgment" involves a process of logical reasoning by a qualified individual that leads from stated premises to a conclusion. The process should be supported by sufficient documentation to permit verification by a qualified individual. Reasonable operator actions to correct minor problems may be considered when performing a reportability determination; however, heroic actions and unreasonably insightful diagnoses, particularly during stressful situations, should not be assumed.

Engineering Judgment

Neither Title 10 of the Code of Federal Regulations (10 CFR) Section 50.72, "Immediate Notification Requirements for Operating Nuclear Power Reactors," nor Section 50.73, "License Event Report System," uses the term "engineering judgment." However, the Statements of Consideration for Sections 50.72 and 50.73 include the following statements which recognize the role of engineering judgment in reportability determinations:

- In the Federal Register notice that accompanied the proposed rule, the Commission stated that licensee's engineering judgment may be used to decide if an event is reportable. Several commenter's expressed the belief that some wording should be added to the rule to reflect that the NRC will also use judgment in enforcement of this regulation where the licensee is requested to use engineering judgment. The Commission believes that the LER rule adequately discusses the need for and application of the concept of "engineering judgment." The concept itself includes the recognition of the existence of a reasonable range of interpretation regarding this rule, and consequently the Commission recognizes and hereby acknowledges the need for flexibility in enforcement actions associated with this rule. **The Commission believes that this concept is sufficiently clear and that additional explicit guidance is not necessary [48FR33852 dated 7/26/83].**
- The Commission recognizes that the application of this and other paragraphs of this section [Sections 50.73(a)(2)(v) and (vi)] involves the use of engineering judgment on the part of licensees. In this case, a technical judgment must be made whether a failure or operator action that did actually disable one train of a safety system, could have, but did not, affect a redundant train within the ESF system. If so, this would constitute an event that "could have prevented" the fulfillment of a safety function, and, accordingly, must be reported. If a component fails by an apparently random mechanism it may or may not be reportable if the functionally redundant component could fail by the same mechanism. Reporting is required if the failure constitutes a condition where there is reasonable doubt that the functionally redundant train or channel would remain operational until it completed its safety function or is repaired. For example, if a pump in one train of an ESF system fails because of improper lubrication, and engineering judgment indicates that there is a reasonable expectation that the functionally redundant pump in the other train, which was also improperly lubricated, would have also failed before it completed its safety function, then the actual failure is reportable and the

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potential failure of the functionally redundant pump must be discussed in the LER. For safety systems that include three or more trains, the failure of two or more trains should be reported if, in the judgment of the licensee, the functional capability of the overall system was jeopardized [48FR33854 dated 7/26/83].

- Finally the Commission recognizes that the licensee may also use engineering judgment to decide when personnel actions *could* have prevented fulfillment of a safety function. For example, when an individual improperly operates or maintains a component, he might conceivably have made the same error for all of the functionally redundant components (e.g., if he incorrectly calibrates one bistable amplifier in the Reactor Protection System, he could conceivably incorrectly calibrate all bistable amplifiers). However, for an event to be reportable it is necessary that the actions actually affect or involve components in more than one train or channel of a safety system, and the result of the actions must be undesirable from the perspective of protecting the health and safety of the public. The components can be functionally redundant (e.g., two pumps in different trains) or not functionally redundant (e.g., the operator correctly stops a pump in Train "A" and, instead of shutting the pump discharge valve in Train "A," he mistakenly shuts the pump discharge valve in Train "B") [48FR33855 dated 7/26/83].
- The Commission recognizes that the licensee may use engineering judgment and experience to determine whether an unanalyzed condition existed [48FR33856 dated 7/26/83].
- The Commission recognizes that the application of this and other paragraphs of this section [50.72] involve a technical judgment by licensees. In this case, a technical judgment must be made whether a failure or operator action that disabled one train of a safety system could have, but did not, affect a redundant train. If so, this would constitute an event that "could have prevented" the fulfillment of a safety function, and, accordingly, must be reported [48FR39044 dated 8/29/83].
- When applying engineering judgment, and there is a doubt regarding whether to report or not, the Commission's policy is that licensees should make the report [48FR39042 dated 8/29/83].
- During testing, two containment isolation valves failed to function as a result of improper air gaps in the solenoid operated valves that controlled the supply of instrument air to the containment isolation valves. The valves were powered from the same electrical division. Thus, § 50.73(a)(2)(vii) [common cause inoperability of independent trains or channels] would not apply. The two valves isolated fluid process lines in two different systems. Thus § 50.73 (a)(2)(v) [condition that could have prevented fulfillment of the safety function of a structure or system] would apply only if engineering judgment indicates there was a reasonable expectation of preventing fulfillment of the safety function for redundant valves within the same system [65Fr63782 dated 10/25/00].

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NUREG-1022, "Licensee Event Report System," includes similar statements regarding the use of engineering judgment. For example:

- The Commission recognizes that the licensee may use engineering judgment and experience to determine whether an unanalyzed condition existed [NUREG-1022 Revision 0 dated September 1983].
- The Commission recognizes that the application of this and other paragraphs of this section involves the use of engineering judgment on the part of licensees. In this case, a technical judgment must be made whether a failure or operator action that did actually disable one train of a safety system, could have, but did not, affect a redundant train within the ESF system. If so, this would constitute an event that "could have prevented" the fulfillment of a safety function, and, accordingly, must be reported [NUREG-1022 Revision 0 dated September 1983].
- [Question 1.3] Suppose that there are seven days to fix a problem and it is likely the problem can be fixed during this time period. Management elects to shut down and fix this problem and other problems. Is an LER required?

Answer: Some judgment is required. An LER is not required if the situation could have been corrected before the plant was required to be shutdown, and no other criteria in 50.73 apply. The shutdown is reportable, however, if the situation could not have been corrected before the plant was required to be shut down, or if other criteria of 50.73 apply [NUREG-1022 Supplement 1 dated February 1984].

- [Question 5.1] For potential threats such as tornados, how close does it have to come before it constitutes an "actual" threat to the plant?

Answer: The licensee must use engineering judgment to determine if there was an actual threat. For example, with regard to tornadoes, the decision would be based on such factors as the size of the tornado, and its location and path. There are no prescribed limits, but in general, situations involving only monitoring by the plant's staff are not reportable, but when preventative actions are taken or if there are serious concerns, then the situation should be carefully reviewed for reportability [NUREG-1022 Supplement 1 dated February 1984].

- [Question 7.5] There are many components, systems, and plant features (e.g., fire stops, cooling fans, room isolations) controlled through Technical Specifications and thus must be considered to be "safety related." Do you want an LER for all these minor items?

Answer: See question 7.4. An LER should be submitted whenever an event or condition meets the criteria of 50.73. Several of these criteria involve engineering judgment, and thus, licensees have the ability and responsibility to determine the reportability based upon the situation and the requirements of the rule.

- [Question 11.1] What is the basis for "engineering judgment?" Does that mean a documented engineering analysis or a judgment by a technically qualified individual?

Answer: Engineering judgment may include either a documented engineering analysis or a judgment by a technically qualified individual depending on the complexity, seriousness and nature of the event or condition. A documented engineering analysis is not a requirement as a basis for an engineering judgment for all events or conditions, but it would be appropriate for particularly complex situations requiring in-depth analysis. In

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addition, although not required by the rule, it may behoove the licensee to record in writing that a judgment was exercised by identifying the individual making the judgment, the date made, and briefly documenting the basis for this judgment.

Given the above, the NRC clearly recognized that application of Sections 50.72 and 50.73 involves the use of engineering judgment on the part of licensees and acknowledges the concept itself includes the recognition of the existence of a reasonable range of interpretation regarding this rule as well as the need for flexibility in enforcement actions associated with this rule. In addition, the Commission stated that this concept is sufficiently clear and that additional explicit guidance is not necessary. The NUREG also further explains the Commission's intent by stating that licensees should record that a judgment was exercised and document the basis for the judgment.

Therefore, we believe it is clear that NRC has accepted, and always intended to accept, the use of reasonable engineering judgment by licensees.

Reasonable Operator Actions

Neither Title 10 of the Code of Federal Regulations (10 CFR) Section 50.72, "Immediate Notification Requirements for Operating Nuclear Power Reactors," nor Section 50.73, "License Event Report System," uses the term "operator action." However, the Statements of Consideration for Sections 50.72 and 50.73 clearly recognize that operator actions can affect the course of an event or condition. For example:

- The Commission recognizes that the application of this and other paragraphs of this section [Sections 50.73(a)(2)(v) and (vi)] involves the use of engineering judgment on the part of licensees. In this case, a technical judgment must be made whether a failure or operator action that did actually disable one train of a safety system, could have, but did not, affect a redundant train within the ESF system [48FR33854 dated 7/26/83].
- Finally the Commission recognizes that the licensee may also use engineering judgment to decide when personnel actions *could* have prevented fulfillment of a safety function. For example, when an individual improperly operates or maintains a component, he might conceivably have made the same error for all of the functionally redundant components [48FR33855 dated 7/26/83].
- Paragraph 50.73(b)(l) requires that the licensee provide a brief abstract describing the major occurrences during the event, including all actual component or system failures that contributed to the event, all relevant operator errors or violations of procedures, and any significant corrective action taken or planned as a result of the event [48FR33857 dated 7/26/83].

NUREG-1022 also recognizes that operator actions can affect the course of an event or condition. For example:

- [Question 7.6] How long does safety equipment have to operate in order to fulfill its safety function and what guidelines should be used regarding operator assistance or repair? For example, an operator can adjust the amount of cooling water which might allow a pump to continue to operate.

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Answer: A safety system must operate long enough to complete its intended function as defined in the FSAR. Reasonable operator actions to correct minor problems may be considered, however, heroic actions and unreasonably insightful diagnoses, particularly during stressful situations, should not be assumed. In addition, in the FSAR, analysis is performed on how long the system/component is expected to operate without operator action [NUREG-1022 Supplement 1 dated February 1984].

- A safety system must operate long enough to complete its intended function as defined in the FSAR. Reasonable operator actions to correct minor problems may be considered, however, heroic actions and unreasonably insightful diagnoses, particularly during stressful situations, should not be assumed. In addition, in the FSAR, analysis is performed on how long the system/component is expected to operate without operator action. [NUREG-1022 Revision 1 dated December 1997].
- (18) Operator Inaction or Wrong Action

Question: In some systems used to control the release of radioactivity, a detector controls certain equipment. In other systems, a monitor is present and the operator is required to initiate action under certain conditions. The operator is not “wired” in. Are failures of the operator to act reportable?

Answer: Yes. The operator may be viewed as a “component” that is an integral, and frequently essential, part of a “system.” Thus, if an event or condition meets the reporting criterion, it is to be reported regardless of the initiating cause [NUREG 1022, Revision 2, dated October 2000].

Although NUREG-1022, Revision 2, recognizes that operator action can affect the course of an event or condition, its focus is on the negative aspects of operator action and those events or conditions where, in the judgment of the licensee, there is a reasonable expectation that a safety system cannot complete its safety analysis function(s) under postulated accident conditions. It did not explicitly carry forward the guidance in NUREG-1022, Supplement 1, and NUREG-1022, Revision 1, regarding the positive aspects of operator action. For example, NUREG-1022, Revision 2, clearly indicates that an operator may be viewed as a “component” that is an integral, and frequently essential, part of a “system” and that operator inaction or wrong action may be reportable. However, NUREG-1022, Revision 2, does not explicitly acknowledge that reasonable operator actions can positively affect the course of an event and provide reasonable expectation that a safety system can complete its safety analysis function(s) under postulated accident conditions. When making reportability determinations, licensees must evaluate operator actions from both a positive and negative perspective.

Instead of carrying forward the guidance in NUREG-1022, Supplement 1, and NUREG-1022, Revision 1, regarding the positive aspects of reasonable operator action, NUREG-1022, Revision 2, included a pointer to Generic Letter 91-18, “Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability,” and its associated Part 9900 Technical Guidance, “Operable/Operability: Ensuring the Functional Capability of a System or Component.”

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For example, NUREG-1022, Revision 2, Section 3.2.7, states:

- A system must operate long enough to complete its intended safety function as defined in the safety analysis report. Generic Letter 91-18 provides guidance on determining whether a system is operable. Reasonable operator actions to correct minor problems may be considered; however, heroic actions and unusually perceptive diagnoses, particularly during stressful situations, should not be assumed. If a potentially serious human error is made that could have prevented fulfillment of a safety function, but recovery factors resulted in the error being corrected, the error is still reportable."

The lined-out phrase was not removed because it was wrong or inappropriate. It was removed to avoid duplication and misinterpretation of the more detailed guidance in Generic Letter 91-18. Since removal of the lined-out phrase, Generic Letter 91-18 has been superseded by RIS 2005-20, "Revision to Guidance Formally contained in NRC Generic Letter 91-18. . ." and its associated Part 9900 Technical Guidance, "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety." Hereafter, that guidance is simply referred to as RIS 2005-20.

According to RIS 2005-20, the process following discovery of a degraded or nonconforming condition involving an SSC required to be operable by TSs has two major parts: (1) operability determination (provided there is a reasonable expectation of operability) and (2) condition resolution (accomplished through application of the licensee's corrective action program in accordance with the requirements of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action").

After a licensee identifies an event or condition that at the time of discovery calls into question operability, it either declares the SSC inoperable or promptly begins an operability determination to confirm that the SSC can complete its specified safety function(s) consistent with the current licensing basis for the facility. According to RIS 2005-20, Section 4.4, the operability determination can be based on analysis, a test or partial test, experience with operating events, engineering judgment or a combination of these factors.

According to RIS 2005-20, Section 7.3, if the licensee declares the SSC inoperable, it may propose compensatory actions to restore the SSC to an operable but degraded or nonconforming status. Appendix C.5 of RIS 2005-20 contains guidance on the temporary use of manual actions instead of automatic actions to support operability determinations.

If compensatory actions are used to maintain or restore operability and they constitute changes to the facility or procedures described in the Updated Final safety Analysis Report (UFSAR), then those changes must be evaluated via the appropriate change process (e.g., 10 CFR 50.59) with due consideration of relevant factors such as Information Notice (IN) 97-78, "Crediting of Operator Actions in Place of Automatic and Modifications of Operator Actions, Including Response Times." The use of qualitative engineering judgment is typically involved when evaluating areas that are not readily quantifiable, such as likelihood of failures, their importance to the system and to the plant, and the practicality and incremental improvements of various options available for resolving identified failures.

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When reviewing such situations for reportability, the licensee should determine, among other things, if the SSC was inoperable for longer than required by TSs and if there is a reasonable expectation of completing or preventing fulfillment of a safety function in the plant's accident analysis. Engineering judgment and reasonable operator actions may be considered when performing the reportability determination; however, heroic actions and unreasonably insightful diagnoses, particularly during stressful situations, should not be assumed.

If the licensee discovers that a TS SSC may have been inoperable or unable to perform its safety analysis functions in the past (i.e., the degraded/nonconforming condition no longer exists), then there is no immediate operability concern. However, the event may still be reportable. When reviewing such situations for reportability, many licensees use engineering judgment to determine if the SSC was inoperable for longer than allowed by TSs or incapable of completing its accident analysis function(s) in the past. Such judgments are typically documented and available for NRC inspection.

In summary, the Statements of Consideration for Sections 50.72 and 50.73 clearly recognize that operator actions can affect the course of an event or condition. In many cases, licenses must use engineering judgment to determine if operator actions have a positive or negative impact on the course of an event. Reasonable operator actions to correct minor problems may be considered when performing a reportability determination; however, heroic actions and unreasonably insightful diagnoses, particularly during stressful situations, should not be assumed. That approach is consistent with the language of the rule, its associated guidance documents, and other regulatory processes such as RIS 2005-20 and 10 CFR 50.59.

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Examples

1. A licensee declared the “A” Train of the nuclear service water system inoperable due to deficient procedure guidance that relied on the non-safety instrument air system to manually backwash the system assuming a Design Basis Accident (DBA) during periods of known macro-fouling. A review over the past three years identified that the “A” Train had been inoperable for longer than allowed by TS and was reportable in accordance with 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by TS. In addition, the review identified several occasions whereby both the “A” Train and the “B” Train were simultaneously inoperable and incapable of completing the system’s safety analysis functions. The licensee determined that the event was also reportable per 10 CFR 50.72(b)(3)(v) and 10 CFR 50.73(a)(2)(v) as an event or condition that could have prevented the fulfillment of a safety function.
2. The control room area chilled water system is designed to maintain the control room temperature for thirty days of continuous occupancy following a design basis accident. The “A” Train of the system was declared inoperable for maintenance. During that time, a refrigerant leak was discovered on the “B” Train chiller that would have prevented it from performing its safety analysis function for thirty days. Since both trains were simultaneously inoperable, the licensee entered LCO 3.0.3 and determined that “A” Train could not be declared operable prior to commencing the TS required shutdown. However, the licensee proposed a compensatory action to replenish refrigerant on “B” Train during the thirty day mission time. The compensatory action was evaluated under the provisions of 10 CFR 50.59 taking into consideration IN 97-78. Once the compensatory action was approved, the licensee declared “B” Train operable and exited TS LCO 3.0.3 prior to adding negative reactivity. When reviewing this event for reportability, the licensee determined that neither “A” Train nor “B” Train was inoperable for longer than allowed by TS and that the system remained capable of completing its safety analysis function for as long as required by the accident analysis. The licensee used engineering judgment to conclude that there was a reasonable expectation that the safety function would have been completed under postulated design basis accident conditions.
3. A licensee discovered that it had allowed the annulus doors to be held open for short periods in the past without declaring both trains of the annulus ventilation system inoperable and entering LCO 3.0.3. The annulus ventilation system is designed to draw a negative pressure in the annulus. Inherent in the design of the system is the need for an intact pressure boundary within which the negative pressure will be created. The reactor building envelope, which includes the annulus doors, is an integral part of the system pressure boundary. If the annulus doors are open, neither train of the system will be able to produce the required negative pressure. When evaluating this condition for reportability as an event or condition that could have prevented fulfillment of a safety function, the licensee noted that it had administrative controls in place which clearly recognized that propping open the annulus doors would result in the inability of the system to produce the required negative pressure and that the system function would be restored when the doors were reclosed. In addition, the administrative controls required that a person be stationed at the doors when they were propped open. Thus, although both trains of the annulus ventilation system were unknowingly inoperable in the past, the licensee had reasonable expectation of completing the safety function.