Whitepaper Regarding Consequences to
Safety System Functional Failures Performance Indicator

Issue

Evidence is beginning to accumulate that changes to Section 3.2.7 of NUREG-1022 made in Revision 3 are leading to an increase in reports of Safety System Functional Failures (SSFFs) for events in which there is not a true loss of safety function, but momentary conditions in which Technical Specification operability criteria are not satisfied. Per the Reactor Oversight Process, the step increase in reporting of these momentary conditions could inflate the counts of SSFFs and trigger a regulatory response not warranted by the facts.

Discussion

The Purpose section of NEI 99-02 for the MS05 indicator states that, "This indicator monitors events or conditions that prevented, or could have prevented, the fulfillment of the safety function of structures or systems that are needed to:

a. Shut down the reactor and maintain it in a safe shutdown condition;

b. Remove residual heat;

c. Control the release of radioactive material; or

d. Mitigate the consequences of an accident."

Additional guidance from Lines 40 to 44 on page 29 of NEI 99-02 states that, "Unless otherwise specified in this guideline, guidance contained in the latest revision to NUREG-1022, "Event Report Guidelines, 10CFR 50.72 and 50.73," that is applicable to reporting under 10 CFR 50.73(a)(2)(v), should be used to assess reportability for this performance indicator. Questions regarding interpretation of NUREG-1022 should not be referred to the FAQ process." Therefore, this whitepaper is submitted to propose an exemption from the guidance for reporting specific data elements under the criteria for this Performance Indicator and not interpretation of the reporting requirements described in NUREG-1022.

Revision 3 to NUREG 1022 became effective on July 1, 2013. Federal Register Notice 78FR9744, Event Reporting Guidelines, NUREG-1022, Revision 3, Notice of Availability, states: "The comments also indicated that the changes, if implemented, will have the effect of requiring licensees to report events or conditions as a 'loss of safety function' where no function is lost since a system may be declared inoperable and still be capable of providing the function relied upon in the plant's safety analysis. Upon further review, the NRC disagrees and the position found in the draft Revision 3 to NUREG–1022 is retained in the final version. For systems within scope, the inadvertent TS inoperability of a system in the mode of applicability constitutes an event or condition for which there is no longer a reasonable expectation that equipment can fulfill its safety function. Therefore, such events or conditions are reportable."

Based on the above guidance, the scope of items previously reported under the loss of safety function criteria has expanded to include some items for which there is no loss of safety function, but that may result in momentary conditions where operability criteria from the Technical Specifications are not satisfied. A specific area of concern has been identified involving inadvertent momentary losses of secondary containment integrity due to the failure to have one secondary containment access door in each access opening closed. This situation can occur due to personnel error or the need to make minor adjustments to equipment. In these instances, secondary containment is considered inoperable due to failure to meet the surveillance requirement. In cases where these events are of short duration (i.e., less than two minutes), it can be readily demonstrated that the secondary containment function can still be satisfied as discussed below.

As discussed in NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants," the coolant activity phase of a loss of coolant accident begins with a postulated pipe rupture and ends when the

first fuel rod has been estimated to fail. For BWRs, the coolant activity phase starts at the initiation of the accident and continues for the first two minutes following the accident. During this phase, the only activity released to the containment atmosphere is that associated with very small amounts of radioactivity dissolved in the coolant itself. The amount of radioactivity in the coolant itself is limited by Standard Technical Specifications 3.4.7, "RCS Specific Activity." The gap activity release phase begins when fuel cladding failure commences. This phase involves the release of that radioactivity that has collected in the gap between the fuel pellet and cladding. This process releases to containment a few percent of the total inventory of the more volatile radionuclides, particularly noble gases, iodine, and cesium. During this phase, the bulk of the fission products continue to be retained in the fuel itself.

As discussed in NRC Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," which is based upon NUREG-1465, the gap release phase for BWRs starts two minutes following initiation of the accident, and continues until the early in-vessel release phase which starts 30 minutes following initiation of the accident.

The Bases for Standard Technical Specifications 3.6.4.1, "Secondary Containment," states that there are two principal accidents for which credit is taken for secondary containment operability. These are a loss of coolant accident (LOCA) and a fuel handling accident involving handling recently irradiated fuel.

Based on the information above, for BWR plants that have adopted an alternative source term in accordance with 10 CFR 50.67, "Accident source term," using the methodology described in NRC Regulatory Guide 1.183, no activity releases are assumed to occur for the first two minutes following initiation of the LOCA.

The above information supports a position that a momentary loss (i.e., less than two minutes) of secondary containment integrity due to the failure to have one secondary containment access door in each access opening closed does not constitute a loss of safety function of secondary containment, unless the momentary loss occurs when handling recently irradiated fuel.

Momentary losses of secondary containment integrity are, however, reportable to the NRC in accordance with 10 CFR 50.72(b)(3)(v) and 10 CFR 50.73(a)(2)(v) based on guidance in NUREG-1022, Revision 3, which states that "a SSC that has been declared inoperable is one in which the SSC capability is degraded to a point where it cannot perform with reasonable expectation or reliability." Secondary containment is required to be declared inoperable for momentary losses of secondary containment integrity as discussed below. Standard Technical Specifications Surveillance Requirement (SR) 3.6.4.1.3 requires verification that one secondary containment access door in each access opening is closed. In accordance with SR 3.0.1, the failure to meet SR 3.6.4.1.3 constitutes failure to meet LCO 3.6.4.1, "Secondary Containment," which requires secondary containment to be operable. Therefore, SR 3.0.1 would require secondary containment to be declared inoperable if SR 3.6.4.1.3 is not met (i.e., even momentarily).

Since July 2013, there has been a significant increase in reporting of safety system functional failures as a result the changes in the reporting guidance. Since these reports also require reporting under this performance indicator, the specified purpose of the indicator has been altered and will result in an inaccurate representation of safety risks associated with these events.

Although momentary losses of secondary containment integrity due to the failure to have one secondary containment access door in each access opening closed results in a reportable condition, there is no actual or potential loss of safety function as long as the access door is not in a degraded condition and is closed within two minutes. The changes to Section 3.2.7 of NUREG-1022 that were made in Revision 3 are driving an increase in PI MS05 and could trigger a regulatory response not warranted by the facts.