Issue:

10 CFR 50.73(a)(2)(v) requires reporting of the following:

> *"Any event or condition that 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."*

A similar requirement is specified in 10CFR50.72 for notification of these conditions if they exist at the time of discovery.

Recent experience with this reporting criterion indicates some lack of clarity with sub-criterion D, "Mitigate the consequences of an accident."

Some recent interpretations have applied sub-criterion D as a "catch-all" (i.e., including structures or systems that are not explicitly included in criteria A, B, or C, but perform some mitigative function in a post event environment. Traditionally, widely applied industry practice has been to apply sub-criterion D to dose mitigation type systems (such as containment isolation and emergency filtration).

History

Safety Guide 16 (1971)

Under the guidance for non-routine reports, "reporting of abnormal events," the following condition was listed (among others). This condition required a telephone notification to NRC within 24 hours, with a follow-up written report within 10 days.

> *"(d) Incidents or conditions which prevented or could have prevented the performance of the intended safety function of an engineered safety feature or of the reactor protection system."*

Regulatory Guide 1.16, issued in October of 1973 included this same criterion.

The reporting criteria for abnormal occurrences underwent a significant expansion with the issuance of **Revision 2 of Regulatory Guide 1.16, in 1974**.
RG 1.16, Revision 2 includes the following criterion:

> *"(6) Failure or malfunction of one or more components which prevents or could prevent, by itself, the fulfillment of the functional requirements of systems required to function to cope with accidents analyzed in the SAR. The following are examples:*
> *(a) Clogged fuel line(s) resulting in failure to supply fuel to the emergency generators.*
> *(b) Multiple instrument drift resulting in loss of protective function."*

Revision 3 of RG 1.16, issued in January 1975, added another example to the reporting criterion**.**

> *"(5) Failure or malfunction of one or more components which prevents or could prevent, by itself, the fulfillment of the functional requirements of system(s) used to cope with accidents analyzed in the SAR. The following are examples:*
> *(a) Clogged fuel line(s) resulting in failure to supply fuel to the emergency generators.*
> *(b) Multiple instrument drift resulting in loss of protective function.*
> (c) *HPCI failure to start or failure to continue running once initiated."*

This reporting criterion remained unchanged in the issuance of Revision 4 of RG 1.16 in August 1975.

The guidance remained the same until the issuance of new requirements post-TMI.

In response to the accident at Three Mile Island, NRC issued a direct final rule (without public comments) requiring immediate notification (within one hour) of any of 12 types of significant events. Among these 12 events was the following:

> *"(6) Personnel error or procedural inadequacy which, during normal operations, anticipated operational occurrences, or accident conditions, prevents or could prevent, by itself, the fulfillment of the safety function those structures, systems, and components important to safety that are needed to (i) shut down the reactor safely and maintain it in a safe shutdown condition, or (ii) remove residual heat following reactor shutdown, or (iii) limit the release of radioactive material to acceptable levels or reduce the potential for such release."*

In 1983, after some experience with the 1980 direct rule, a revised rule for immediate notification (10 CFR 50.72) was issued. At the same time, a final rule was issued for licensee event reports (LER) under 10 CFR 50.73. In the implementation of those rules 10 CFR 50.73(a)(2)(v) and 10 CFR 50.72(b)(2)(iii) were revised to state:

> *"Licensees shall report: Any event or condition that alone 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."*

Criteria A, B, and C remained mostly the same as the original 3 items (i, ii, and iii) under item 6 in the first version of 10 CFR 50.72. Criterion D was introduced in this revision. The proposed rule did not include this criterion and the statements of consideration accompanying the final rule did not provide any discussion regarding the addition of this criterion.

The following are excerpts from the Statements of Consideration (SOC) accompanying the 1983 implementation of the final Licensee Event Reporting (LER) [**48FR33854]** rule:

> ***"This paragraph is also based on the assumption that safety-related systems and structures are intended to mitigate the consequences of an accident.*** *While 50.73(a)(2)(iv) of this final rule applies to actual actuations of an ESF, 50.73(a)(2)(v) of this final rule covers an event or condition where redundant structures, components, or trains of a safety system could have failed to perform their intended function because of one or more personnel errors, including procedure violations; equipment failures: or design, analysis, fabrication, construction, or procedural deficiencies."*
>
> *"**The applicability of this paragraph includes those safety systems designed to mitigate the consequences of an accident (e.g. containment isolation, emergency filtration).*** *Hence, minor operational events involving a specific component such as valve packing leaks, which could be considered a lack of control of radioactive material, should not be reported under this paragraph. System leaks or other similar events may, however, be reportable under other paragraphs."*

NUREG-1022, Revision 1, issued in January 1998 provides the following clarifying information regarding this reporting criterion.

> *"…the intent of these criteria is to capture those events where there would have been a failure of a safety system to properly complete a safety function, regardless of when the failures were discovered or whether the system was needed at the time."*
>
> *"The definition of the systems included in the scope of these criteria is provided in the rules themselves; it is not determined by the phrases "safety-related" and "important to safety.""*
>
> *"The term "safety function" refers to any of the four functions (A through D) listed in these reporting criteria that are required during any plant mode or accident situation as described or relied on in the plant safety analysis report or required by the regulations."*

Conclusion:

Based on the historical record, 10 CFR 50.73(a)(2)(v) and 10 CFR 50.72(b)(2)(iii) are intended to apply to a defined set of systems, structures and components (SSCs). The definition is of this set is bounded by several parameters. Among these are parameters are:

(a) reliance upon them in the plant safety analysis or regulations
(b) the safety functions outlined in A through D

It is made clear through the guidance that to be included in the set, the SSC need not be specified as "safety-related" or "important to safety." The key nexus to the rule is whether or not the SSC is relied upon to perform one of the functions listed in A-D, or otherwise stated, whether or not its failure would prevent the fulfillment of the safety functions described in A-D of the rule.

There is no explanation in the accompanying Federal Register Notices (Statements of Consideration), applicable guidance documents, or related generic communications that explains the addition of subcriterion D in these reporting rules. Therefore it is necessary to read the rule and existing guidance in a holistic manner to understand its context and purpose.

One key passage from the Statements of Consideration accompanying the initial implementation of 10 CFR 50.73 (LER Rule) is the following phrase:

> ***"This paragraph is also based on the assumption that safety-related systems and structures are intended to mitigate the consequences of an accident.*** *While 50.73(a)(2)(iv) of this final rule applies to actual actuations of an ESF, 50.73(a)(2)(v) of this final rule covers an event or condition where redundant structures, components, or trains of a safety system could have failed to perform their intended function…"*

This passage indicates a clear linkage between the two reporting rules for ESF Actuations and the rule for Safety System Functional Failures. That is, the clear implication is that the set of SSCs covered in both rules are the same. At the time of the initial implementation of 10 CFR 50.73, the SSCs covered in 50.73(a)(2)(iv) was:

> *"Licensees shall report "any event or condition that resulted in a manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS)…."*

This, in conjunction with the clear tie established in the SOC between the rules, sheds considerable light on the scope of the SSCs involved in the consideration of whether a safety function (i.e., A-D) can be fulfilled or not.

It is noteworthy that in the October 2000 revision to 10 CFR 50.73 (and 50.72), 10 CFR 50.73(a)(2)(iv) resulted in removing the term "engineered safety feature" and including a list of SSCs. A review of this list makes it clear that these are SSCs that are typically credited in plant safety analyses for accident mitigation. These are SSCs that perform functions to support the safety functions listed in A-C of 10 CFR 50.73(a)(2)(v).

It is also interesting that in this revision to the rules, references to SSCs that function to mitigate the consequences of an accident such as reactor water cleanup and various ventilation and filtration systems were specifically removed.

The use of the term *"accident"* in light of the historical evolution of the rule indicates that the set of accidents under consideration would be those analyzed in the plant safety analysis (e.g., Chapter 15 type accidents) and limited only those SSCs credited in those analyses.

While not clarified in the rules or guidance, it is logical that the subcriterion D should not be construed to be a "catch-all." Had this been the intention behind its addition to the rule, subcriteria A-C could have been eliminated. That is, taken to the extreme, the functions described in A-C could also be interpreted in the broadest sense as fulfilling the role of mitigating the consequences of an accident. While the rule and the guidance do not make it clear exactly what the scope of subcriterion D was intended to be, it follows from the form of the preceding criteria that it was meant to be a specific set of functions (and SSCs that fulfill those functions). By means of logical elimination of the functions listed in A-C, the remaining functions for accident mitigation are those beyond shutting down the reactor, removing heat, and containing radioactive material and preventing its spread. In this sense, the functions and SSCs are those that perform the roles of cleaning and filtering potential effluents of an analyzed

accident. Examples of such systems could include filtering systems such as Emergency Gas Treatment Systems for PWRs or Standby Gas Treatment Systems for BWRs.

Therefore, we believe that any clarification beyond that currently provided in the Rule and application of Criterion D beyond those SSCs credited in the plant safety analysis (e.g., Chapter 15 type accidents) is an expansion of the current Rule