November 21, 2001

Dr. John T. Larkins, Executive Director
Advisory Committee on Reactor Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: PROPOSED CLOSEOUT OF GENERIC SAFETY ISSUE 172, "MULTIPLE SYSTEM RESPONSES PROGRAM"

Dear Dr. Larkins:

The staff has completed the verification steps associated with the resolution of Generic Safety Issue 172, "Multiple System Responses Program," and proposes to close out the issue with no new or revised requirements. The rationale for closure of this issue is presented in the attached statement for Generic Safety Issue 172.

The staff has made presentations to ACRS on this generic issue as part of the IPE program (November 18 and December 10, 1993) and as part of the IPEEE program (June 22 and July 12, 2001). Please advise me as to whether the ACRS agrees with the proposed close out and whether another ACRS meeting with the staff is required to discuss it.

Sincerely,

/RA/

Scott F. Newberry, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: Proposed Closeout of GSI-172, "Multiple System Responses Program"

Distribution: Thandani, Zimmerman, Newberry, Cunningham, Rubin, Ridgely, VanderMolen, Drouin, Emrit, Ridgely r/f, PRAB Sub/File, DRAA Chron

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PROPOSED CLOSEOUT OF GENERIC SAFETY ISSUE 172
"MULTIPLE SYSTEM RESPONSES PROGRAM"

Background

In resolving Generic Safety Issues (GSIs) over the years, the staff generally found it necessary to make assumptions and establish limitations on the scope of the issues. As a result of its review of the resolution of some GSIs, the ACRS expressed concerns that the assumptions and limitations on the scope of the issues, the lack of thorough coordination among issues, and the inconsistent assumptions for related issues may have resulted in some potentially significant safety concerns not being addressed. Specifically, these concerns were raised in ACRS meetings during the resolution of Unresolved Safety Issue (USI) A-17, "System Interactions in Nuclear Power Plants," USI A-46, "Verification of Seismic Adequacy of Equipment in Operating Plants," and USI A-47, "Safety Implications of Control Systems." To address these concerns, RES initiated the Multiple System Responses Program (MSRP) program in 1986.

The purpose of the MSRP was to gather and review documentation (correspondence, meeting minutes, etc.) for the issues and other programs of interest and, from this documentation, describe potential safety concerns that were identified or expressed by the ACRS or NRC staff. The issues selected for the MSRP were USI A-17, A-46, and A-47. Issues that involved concerns similar to those addressed in the resolution of these three issues were also considered and included: (1) equipment qualification (10 CFR 50.49); (2) fire protection rules (10 CFR 50.48 and 10 CFR 50, Appendix R); and (3) related guidelines and reviews implemented based on the SRP[1]. In the MSRP, evaluations or judgments were not made regarding the validity of the concerns; rather, the concerns were examined, documented, and potential safety issues were defined as specifically as possible. The results of this effort were documented in NUREG/CR-5420[2].

In NUREG/CR-5420, related concerns were grouped into defined potential safety issues and information was provided to assist the staff in evaluating them. This grouping was based on the following criteria: (1) concerns that had the same initiator (e.g., seismic event, flooding/moisture intrusion, fires); (2) concerns that related to a particular class of failures or failure modes (e.g., degradation of component performance rather than "failure," or common cause failures); (3) concerns that related to a particular group of components or systems (e.g., non-safety-related control system and safety-related protection system dependencies); (4) concerns that already existed as GSIs; and (5) concerns that were unrelated to other concerns or that were being evaluated through separate research activities and should be separate issues. Applying these criteria to the identified concerns yielded 21 potential safety issues.

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[1]NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, (1st Edition) November 1975, (2nd Edition) March 1980, (3rd Edition) July 1981.

[2]NUREG/CR-5420, "Multiple System Responses Program - Identification of Concerns Related to A Number of Specific Regulatory Issues," U.S. Nuclear Regulatory Commission, October 1989.

Generic Letter 88-20, NUREG-1335,[3] and NUREG-1407[4] identified certain unresolved and generic safety issues to be addressed by licensees in their Individual Plant Examination (IPE) (internal events) or Individual Plant Examination of External Events (IPEEE) submittals. Generic Safety Issue 172 was not explicitly identified in either Generic Letter 88-20, NUREG-1335, or NUREG-1407. Subsequent to the issuance of these documents, the NRC evaluated the scope and the specific information requested in the generic letter and the associated reports. The NRC concluded that the plant-specific analyses being requested in the IPE and IPEEE could also be used, through satisfactory IPE and IPEEE submittal review, to evaluate and verify
GSI-172.

Of the 21 MSRP issues, the staff concluded that 11 were to be covered in the IPE or IPEEE programs. The remaining ten issues were dropped from further consideration as new and separate issues because eight were included in the scope of existing generic issues or other ongoing NRC programs, one had negligible risk reduction potential, and one was deemed to be a compliance concern. This conclusion was reached after several meetings between the ACRS and the staff and an extensive review[5] of the ACRS concerns by the staff. A comprehensive report[6] on the staff's findings was submitted to the ACRS. The table on the next page lists all 21 MSRP issues and their disposition.

Discussion

Each of the 11 MSRP issues that were covered in the IPE and IPEEE programs are discussed below with a description of the issue and the staff's findings from reviewing the licensees' IPE and IPEEE submittals. The licensees' methodologies in the IPE and IPEEE have varied; some quantitative, some qualitative, and some a mixture of both. In addition, the level of effort, scope, and detail varied significantly among the submittals. A complete discussion of these issues and related topics for external events is provided in Chapter 5 of NUREG-1742[7]. A report discussing these issues and related topics for internal events is being prepared for publication.

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[3]NUREG-1335, "Individual Plant Examination Submittal Guidance," U.S. Nuclear Regulatory Commission, August 1989.

[4]NUREG-1407, "Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities," U.S. Nuclear Regulatory Commission, June 1991.

[5]Memorandum for T. Speis from A. Thadani, "Review of NUREG/CR-5420," April 30, 1995. [9505230058]

[6]Memorandum for J. Larkins from E. Beckjord, "Evaluation of Potential Safety Issues from the Multiple System Responses Program," June 3, 1994. [9406230143]

[7]NUREG-1742, "Perspectives Gained from the Individual Plant Examination of External Events (IPEEE) Program," U.S. Nuclear Regulatory Commission, Draft for Public Comment, April 2001.

MSRP Issue	Disposition
Effects of Fire Suppression System Actuation on Non-Safety-Related and Safety-Related Equipment	IPEEE
Seismically Induced Fire Suppression System Actuation	IPEEE
Seismically Induced Fires	IPEEE
Effects of Hydrogen Line Ruptures	IPEEE
Non-Safety-Related Control System/Safety-Related Protection System Dependencies	IPE and IPEEE
Effects of Flooding and/or Moisture Intrusion on Non-Safety-Related and Safety-Related Equipment	IPE and IPEEE
Seismically Induced Spatial and Functional Interactions	IPEEE
Seismically Induced Flooding	IPEEE
Seismically Induced Relay Chatter	IPEEE
Common Cause Failures Related to Human Errors	IPE and IPEEE
Evaluation of Earthquake Magnitudes Greater Than Safe Shutdown Earthquake	IPEEE
Failure Modes of Digital Computer Control Systems	Drop
Specific Scenarios Not Considered in USI A-47	Drop
Effects of Degradation of HVAC Equipment on Control and Protection Systems	Drop
Failure Modes Resulting from Degraded Electric Power Sources	Drop
Failure Modes Resulting from Degraded Compressed Air Systems	Drop
Potential Effects of Untimely Component Operation	Drop
Propagation of Environments Associated with Design Basis Earthquakes	Drop
Evaluation of Heat, Smoke, and Water Propagation Effects Resulting from Fires	Drop
Synergistic Effects of Harsh Environmental Conditions	Drop
Environmental Qualification of Seals, Gaskets, Packing, and Lubricating Fluids Associated with Mechanical Equipment	Drop

1. Effects of Fire Suppression System Actuation on Non-Safety-Related and Safety-Related Equipment (addressed in the IPEEE)

Fire suppression system actuation can have an adverse effect on safety-related components either through direct contact with suppression agents or through indirect interaction with non-safety-related components. This concern was identified as Item 7.4.13 in NUREG/CR-5420.

Most (97%) of the IPEEE submittals reported that the licensee had qualitatively examined issues related to inadvertent fire suppression system actuation. To varying degrees, such examinations included the potential for, and effects of, inadvertent fire suppression systems actuation. The most consistent strong points of these evaluations appear to be the treatment of inadvertent fire suppression systems actuation and the identification of concerns regarding potential interaction with safety-related equipment. Licensees tended to limit their evaluations exclusively to assessing direct impacts on safe shutdown equipment or safety-related equipment. Most considered non-safety-related equipment to be unnecessary for safe shutdown, or stated that the equipment and floor drains would be adequate to prevent unacceptable internal flooding. The staff concludes that this issue has been adequately verified.

2. Seismically Induced Fire Suppression System Actuation (addressed in the IPEEE)

Seismic events can potentially cause multiple fire suppression system actuations which, in turn, may cause failures of redundant trains of safety-related systems. Analyses currently required by fire protection regulations generally only examine inadvertent actuations of fire suppression systems as a single, independent event, whereas a seismic event could cause multiple actuations of fire suppression systems in various areas of the plant. This concern was identified as Item 7.4.17 in NUREG/CR-5420.

Most (96%) of the IPEEE submittals reported that the licensees qualitatively examined issues related to seismically induced fire suppression system actuation. To varying degrees, such examinations included the potential and effects of seismically initiated actuation and degradation of fire suppression systems. In most of the submittals, licensees included considerations related to seismically induced fire suppression system actuation within the scope of their overall seismic walkdown. The most consistent strong point of these evaluations appears to be the treatment of inadvertent actuation of the fire suppression system. In most other cases, licensees limited their evaluations exclusively to assessing direct impacts on safe shutdown equipment.

Some licensees sought to include all relevant plant areas and equipment in their evaluations. Such relevant items include, for instance, fire suppression system components and non-safety-related piping and tanks, which may not be part of the seismic plant model or safe-shutdown equipment list, but may nonetheless be important or may have indirect effects on safety-related equipment.

In a number of the IPEEE submittals, the seismic evaluation resulted in plant improvements which would benefit this issue. Some of the relevant improvements included strengthening component anchorages, replacing vulnerable (e.g., mercury) relays and switches, and implementing procedures to properly secure transient fire-protection equipment.

The staff concludes that this issue has been adequately verified.

3. Seismically Induced Fires (addressed in the IPEEE)

Seismically induced fires have the potential to cause multiple failures of safety-related systems. The occurrence of a seismic event could create fires in multiple locations, thereby simultaneously degrading fire suppression capability and, therefore, preventing mitigation of fire damage to multiple safety-related systems. The ACRS expressed concern that seismically induced fires were not adequately addressed in the resolution of USI A-46, other seismic requirements, or fire protection regulations. This concern was identified as Item 7.4.16 in NUREG/CR-5420.

Most (96%) of the IPEEE submittals reported that the licensees qualitatively examined seismically induced fire interaction issues. A few licensees performed a PRA study for seismically induced fire-initiating events; albeit the level of detail varied from a simplistic probabilistic analysis to inclusion in their plant's seismic or fire PRA.

In most of the submittals, licensees included seismically induced fire considerations within the scope of their overall seismic walkdown. In most other cases, licensees limited their seismically induced fire evaluations exclusively to assessing direct impacts on safe shutdown equipment. Some licensees sought to include all relevant plant areas and equipment in their evaluations of the potential and effects of seismically induced fire events. Such relevant items include, for example, non-safety-related piping and tanks containing flammable materials, which may not be part of the seismic plant model or safe shutdown equipment list, but may have indirect effects on safety-related equipment.

In some of the IPEEE submittals, the seismic evaluations resulted in plant improvements which would benefit this issue. An example of the relevant improvements is the installation of restraints for gas cylinders.

The staff concludes that this issue has been adequately verified.

4. Effects of Hydrogen Line Ruptures (addressed in the IPEEE)

Nuclear power plants use hydrogen in electrical generators to reduce windage losses and as a heat transfer agent. Hydrogen is also used as a cover gas in some tanks (e.g., volume control tanks). Leaks or breaks in hydrogen supply piping could result in the accumulation of a combustible mixture of air and hydrogen in vital areas, resulting in a fire and/or explosion that could damage vital safety-related systems in the plants. This concern was identified as Item 7.4.21 in NUREG/CR-5420 and addressed the potential for hydrogen line ruptures to occur in the auxiliary building.

Most (93%) of the submittals provided sufficient information to verify this MSRP issue. The licensees considered the potential effects of ruptures of hydrogen lines and tanks. These licensees found that the potential rupture of either hydrogen lines or tanks did not significantly contribute to the core damage frequency. The staff concludes that this issue has been adequately verified.

5. Non-Safety-Related Control System/Safety-Related Protection System Dependencies (addressed in the IPE and the IPEEE)

Multiple failures in non-safety-related control systems may adversely impact safety-related protection systems as a result of potential unrecognized dependencies between control and

protection systems. The concern is that plant-specific implementation of the regulations regarding separation and independence of control and protection systems may be inadequate. This concern was expressed by the ACRS during their review of the resolution of USI A-47 and was identified as Item 7.4.2 in NUREG/CR-5420. The licensees' IPE process should provide a framework for systematic evaluation of interdependencies between safety-related and non-safety-related systems and identify potential sources of vulnerabilities. The dependencies between safety-related and non-safety-related systems resulting from external events had not been addressed previously.

As part of the IPE program, licensees provided information regarding system dependencies. In general, the types of dependencies considered included: shared component, instrumentation, and control; isolation; motive power; equipment cooling; heating, ventilating, and air conditioning systems; operator actions; and environmental and phenomenological effects. The IPE submittals also included "systems dependency" tables which summarized dependencies among systems. The degree of dependence (complete, partial, or delayed) was also indicated and described. The IPE review concluded that adequate information was provided by all licensees to verify this issue.

Most (94%) of the licensees provided adequate information to verify the external events related aspects of this issue. These licensees verified that the plants have the ability to transfer adequate control from the main control room to alternate locations to achieve plant safe shutdown conditions (i.e., is electrically independent of the control room). The licensees stated that no unrecoverable effects from errant equipment would be sustained until control was regained. Once the transfer is accomplished from the control room, the area with the fire is independent from the systems that would be used to control the plant, thereby precluding the total loss of system function for those systems. The staff concludes that this issue has been adequately verified.

6. Effects of Flooding and/or Moisture Intrusion on Non-Safety-Related and Safety-Related Equipment (addressed in the IPE and the IPEEE)

Flooding and water intrusion events can affect safety-related equipment either directly or indirectly through flooding or moisture intrusion of multiple trains of non-safety-related equipment. This type of event can result from external flooding events, tank and pipe ruptures, actuation of fire suppression systems, or backflow through part of the plant drainage system. This concern was identified as Item 7.4.14 in NUREG/CR-5420. The IPE process addressed the concerns of moisture intrusion and internal flooding (i.e., tank and pipe ruptures or backflow through part of the plant drainage system). The IPEEE program addressed the external flooding-related aspects of this issue.

The IPE review indicates that internal flooding is a small contributor to the total plant core damage frequency (CDF) for most plants. For those plants where internal flooding is significant, it is typically due to plant-specific features. Most of the licensees (96%) analyzed internal flood events as part of their IPE; the remaining performed the analysis as part of their IPEEE. The IPE review concluded that adequate information was provided by all licensees to verify this issue.

Most (96%) of the licensees provided adequate information to verify this issue. Frequently, the discussion of this issue in the IPEEE submittals related to the ability to adequately protect safety-related equipment from external flooding. External flooding is covered by the licensees'

high winds, flood, and other (HFO) IPEEE external event analyses. A satisfactory HFO evaluation verifies the flooding aspect of this issue.

The other aspect of this issue relates to moisture intrusion into equipment. All but three submittals provided adequate information for the staff to conclude that this aspect of this issue was verified. Generally, this information related to the licensees having adequately addressed the potential effects of seismically induced failure or actuation of the fire protection system and the potential effects of misdirected spray from manual fire-fighting activities, since these are the two main sources of water for potential moisture intrusion into equipment.

The staff concludes that this issue has been adequately verified.

7. Seismically Induced Spatial and Functional Interactions (addressed in the IPEEE)

Seismic events have the potential to cause multiple failures of safety-related systems through spatial and functional interactions. Some particular sources of concern include ruptures in small piping that may disable essential plant shutdown systems; direct impact of non-seismically qualified structures, systems, and components that may cause small piping failures; seismic functional interactions of control and safety-related protection systems via multiple non-safety-related control system failures; and indirect impacts, such as dust generation, that disable essential plant shutdown systems. The ACRS expressed concern that not all of the potential seismically-induced system interactions that could adversely affect safe shutdown of a plant have been thoroughly identified and investigated. This concern was identified as Item 7.4.15 in NUREG/CR-5420.

Most (97%) of the IPEEE submittals provided sufficient information on the licensees' examinations related to seismic spatial and functional interaction issues. In most of the submittals, licensees considered seismic spatial-functional interaction within the scope of their overall seismic walkdown. In most cases, licensees limited their evaluations of seismic spatial and functional interactions exclusively to assessing the direct impacts on safe shutdown equipment.

In some of the IPEEE submittals, the seismic evaluations resulted in plant improvements which benefitted this issue. Some of the relevant improvements included strengthening component anchorages, anchoring cabinets together, and implementing procedures to properly secure transient fire-protection equipment. In one instance, the licensee evaluated the potential for seismically induced toxic chemical release as part of its seismic interactions walkdown. As a result, the licensee identified a plant-specific improvement related to strengthening the anchorage of an ammonia storage tank.

The staff concludes that this issue has been adequately verified.

8. Seismically Induced Flooding (addressed in the IPEEE)

Seismically induced flooding events can potentially cause multiple failures of safety-related systems. First, although the ACRS believes that a safe shutdown earthquake (SSE) will likely not cause large-diameter piping to rupture, the ACRS feels that the seismic adequacy of smaller-diameter piping had not been adequately proven. Rupture of small piping could provide flood sources that could potentially affect multiple safety-related components simultaneously.

Second, non-seismically qualified tanks are a potential source of flooding that the ACRS believes had not been adequately addressed. This concern was identified as Item 7.4.18 in NUREG/CR-5420.

Most (91%) of the IPEEE submittals provided sufficient information on the licensees' examinations related to the seismically induced flooding issue. Some licensees undertook quantitative assessments of components' seismic capacities related to seismically induced flooding interactions. A few licensees performed a PRA study for seismically induced flooding events, albeit the level of detail varied from simplistic probabilistic analysis to inclusion in their plant's seismic PRA.

In most of the submittals, licensees included seismically induced flooding considerations within the scope of their overall seismic walkdown. All but six of the licensees provided adequate information to verify this issue. In most other cases, licensees limited their seismically induced flooding evaluations exclusively to assessing direct impacts on safe shutdown equipment.

Some licensees sought to include all relevant plant areas and equipment in their evaluations of the potential for and effects of seismically induced flooding events. Such relevant items include, for example, non-safety-related piping and tanks that may not be part of the seismic plant model or safe-shutdown equipment list, but may nonetheless be important or may have indirect effects on safety equipment.

In some of the IPEEE submittals, the seismic evaluations resulted in plant improvements which benefitted this issue. Some of the relevant improvements include adding seals to waterproof electrical cabinets and implementing enhanced drain inspection procedures.

The staff concludes that this issue has been adequately verified.

9. Seismically Induced Relay Chatter (addressed in the IPEEE)

Essential relays must operate during and after an earthquake, and must meet one of the following conditions: (1) remain functional (i.e., without occurrence of contact chattering), (2) be seismically qualified, or (3) be chatter acceptable. It is possible that contact chatter of relays not required to operate during seismic events may produce some unanalyzed faulting mode that may affect the operability of equipment required to mitigate the event. These would be defined as "low-ruggedness" or "bad actor" relays. This concern was identified as Item 7.4.19 in NUREG/CR-5420.

All of the submittals provided adequate information to verify this issue. In a few plants, low-ruggedness relays have been encountered in the circuits involving only IPEEE success paths (i.e., IPEEE equipment that was not redundant to USI A-46). Of the 27 licensees that performed a seismic PRA (SPRA) as part of their IPEEE, 14 included relays in the PRA models. Others performed separate evaluations to determine the ruggedness of relays. When relays are explicitly modeled in the PRA, the effect of low-ruggedness relay chatter on accident sequences is clearly identified and quantified. Most of SPRAs did not credit recovery actions in their logic model.

When licensees encountered low-ruggedness relays, they often existed only in alarm circuitry, were assessed as having negligible consequences, or the licensees assumed that operator actions would provide for effective reset. The staff concludes that this issue has been adequately verified.

10. Common Cause Failures Related to Human Errors (addressed in the IPE and the IPEEE)

Common cause failures resulting from human errors include operator acts of commission or omission that could be initiating events or could affect redundant safety-related trains needed to mitigate the events. Other human errors that could initiate common cause failures include manufacturing errors in components that affect redundant trains, and installation, maintenance, or testing errors that are repeated on redundant trains. Since personnel are always intimately involved in all phases of nuclear power plant planning, operation, testing, and maintenance, there is the potential for human errors which may contribute or lead to systems interaction events or common cause failure. This concern was identified as Item 7.4.1 in NUREG/CR-5420.

All licensees addressed the potential of human error during normal plant operations in their IPEs. Most licensees explicitly modeled pre-initiator events in the IPEs although some assumed that the contribution of human error in system unavailability is included in the equipment failure probabilities. On the basis that all licensees met the intent of GL 88-20, the staff has concluded that all licensees have adequately addressed this issue.

In the IPEEEs, licensees were requested to address the human errors involving operator recovery actions following the occurrence of external events. Most (88%) of the IPEEE submittals provided some treatment or discussion of non-seismic failures and human actions. For seismic PRAs, operator actions were introduced in seismic event-tree and fault-tree models, which generally reflect the logic used in the plant’s internal events PRA. However, the seismic impacts on operator error rates were modeled in a highly variable fashion. In some instances, licensees developed simplified operator error fragilities. In other instances, licensees applied judgemental scaling factors (in relation to the importance of the human action) on internal event error rates, or other means to account for seismically related performance shaping factors.

With regard to the treatment of human actions in IPEEEs that used a seismic margin assessment (SMA), the staff’s reviews found that the submittals typically provided only limited discussion of the impact of seismic events on operator error rates. Generally, the SMA IPEEE submittals took the approach of relying on those success paths that are most familiar to plant operators and that use the most reliable equipment. In one SMA, the licensee applied quantitative screening criteria with respect to random failure rates and human error rates. Licensees have generally reported the timing and locations of required human actions, and have commented qualitatively on their reliability.

For the fire IPEEE evaluations, some licensees simply applied a performance shaping factor of, for example 5 or 10, as a multiplier on all the existing IPE human error probabilities to reflect potential influences (e.g., increased stress) that a fire might create for the operators. Some licensees examined each human action and used expert judgement to decide whether a multiplier (or a simple increase in the value) should be applied to reflect fire conditions. Others assigned “conservative” screening values (generally around 0.1, but ranging to 1.0 for events that might be directly influenced by the fire) with the idea of doing a more detailed evaluation, if needed. Finally, some licensees re-evaluated all of the existing human error probabilities and re-quantified them to more precisely model the potential effects of the fire on human performance. A few licensees used the existing human error probabilities without making any adjustments to reflect the potential impact of fire conditions. For these cases, the staff IPEEE review concluded that revising the human error probabilities would not change the dominant fire CDF contributors for that plant.

The staff concludes that this issue has been adequately verified.

11. Evaluation of Earthquake Magnitudes Greater Than Safe Shutdown Earthquake (addressed in the IPEEE)

This ACRS expressed concern that adequate margin may not have been included in the design of some safety-related equipment. In this context, seismic margin is defined as the capability of a plant to sustain an earthquake larger than its SSE. This concern was identified as Item 7.4.20 in NUREG/CR-5420. As part of the IPEEE, all licensees were expected to identify potential seismic vulnerabilities or assess the seismic capacities of their plants by performing either a seismic PRA or a seismic margins assessment (SMA). The licensees' evaluations for potential vulnerabilities (or unusually low plant seismic capacity) to seismic events addressed this issue.

All licensees verified this issue by providing an acceptable seismic IPEEE. The specific seismic review level earthquake varies, depending on the plants' location and the IPEEE review level earthquake identified in NUREG-1407. All submittals provided adequate information to verify this issue. The staff concludes that this issue has been adequately verified.

Conclusion

As mentioned previously in the Background section, GSI-172 was not explicitly identified in Generic Letter 88-20 or associated staff guidance documents on the IPE and IPEEE programs. Even so, all of the IPE submittals provided sufficient information to adequately verify the internal event aspects of the MSRP issues. Also, most (81%) of the IPEEE submittals provided sufficient information to adequately verify external event aspects of all 11 MSRP issues. The remaining IPEEE submittals did not provide adequate information to verify one or more of these MSRP issues. Approximately 97% of the IPEEE submittals provided sufficient information to adequately verify 8 or more of the 11 MSRP issues. None of the submittals explicitly identified any plant modification or improvement directly related to these MSRP issues. However, improvements made in conjunction with other external events could also produce a benefit relative to these MSRP issues.

Licensees for all operating nuclear power plants have provided responses to Generic Letter 88-20.[8] The staff's review of these IPE and IPEEE submittals is complete. The conclusion of this review, as documented in NUREG-1560[9] and NUREG-1742, is that all licensees have met the intent of Generic Letter 88-20.

The staff is not aware of any significant difference between the few plants that had not provided adequate information to verify all MSRP issues and the large majority of plants that have verified all of the MSRP issues. Also, no plant identified a significant contributor to CDF

[8]NRC Letter to All Licensees Holding Operating Licenses and Construction Permits for Nuclear Power Reactor Facilities, "Individual Plant Examination for Severe Accident Vulnerabilities - 10 CFR § 50.54(f), (Generic Letter No. 88-20)," November 23, 1988 [8811280048], (Supplement 1) August 29, 1989 [8908300001], (Supplement 2) April 4, 1990 [9003300127], (Supplement 3) July 6, 1990 [9007020114], (Supplement 4) June 28, 1991 [9106270324], (Supplement 5) September 8, 1995.

[9]NUREG-1560, "Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance," U.S. Nuclear Regulatory Commission, December 1997.

associated specifically with the MSRP issues. Therefore, there is no basis to conclude that a significant contributor to CDF would be identified at those few pants that did not provide adequate information to verify all of the MSRP issues. Based on this large sample verification in conjunction with meeting the intent of Generic Letter 88-20, the staff concludes that the objectives of GSI-172 have been achieved. Therefore, the staff proposes to close out this generic issue with no new or revised requirements.