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Screening of Generic Safety Issues for License Renewal Considerations

Prepared by
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The MITRE Corporation

Prepared for
U.S. Nuclear Regulatory Commission

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ABSTRACT

The U.S. Nuclear Regulatory Commission (NRC) is developing regulations for renewing the operating licenses of nuclear power plants to ensure that they operate safely beyond the present license terms of 40 years. One consideration relates to past resolutions of generic safety issues (GSIs) that did not result in backfit requirements on the licensees. The consideration of an additional operating term of 20 years which the proposed license renewal rule allows, could have retrospective implication for the basis of those GSI resolutions. As part of its technical support to the NRC for the development of license renewal regulations, MITRE has performed an independent review of the GSIs to identify those that could be potentially affected by license renewal considerations. This report describes the screening process and the results of that work.

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EXECUTIVE SUMMARY

10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants", provides the U.S. Nuclear Regulatory Commission's (NRC's) criteria and procedures for extending operating licenses by an additional period up to 20 years. In the past, generic safety issues (GSIs) were resolved without consideration of the 20 years of additional plant operation permitted under the proposed license renewal rule. Consideration of extended plant life and any increase in population around nuclear plant sites may alter the resolution bases of GSIs that have not been backfitted. These license renewal considerations may influence the resolution bases either directly, in cases where the remaining plant life was explicitly used in the resolution bases, or indirectly by affecting the corresponding value/impact (V/I) estimates.

This report prepared by MITRE presents a systematic evaluation of all GSIs resolved through October 1990 and identifies those whose resolution bases are potentially affected by the possibility of an additional 20 years of plant life permitted under the proposed license renewal rule; projected increase in population around plant sites is considered as well.

MITRE evaluated a total of 249 GSIs that were resolved through October 1990 and identified 139 GSIs that did not result in backfit requirements. The GSIs not backfitted belong to one of the following categories, depending on their resolution basis: GSIs that have been resolved without resulting in any new requirements for either operating or future nuclear power plants; GSIs that were resolved resulting in new requirements only for future plants; and GSIs that were eliminated from further consideration by NRC based on their limited safety significance as determined in the priority ranking process and peer review.

In general, the resolution basis for GSIs consists of qualitative considerations and quantitative values and impacts, all of which could be affected by license renewal. All available quantitative V/I estimates were updated to determine the effect on GSI resolutions of an additional 20-years under a renewed operating license and increase in population in the vicinity of nuclear plant sites.

MITRE did not identify any instances where the remaining plant life or the population density was the sole basis for resolving a GSI that did not result in backfitting. In most cases the role of qualitative arguments in resolution basis outweighed the influence of quantitative V/I estimates. In general, qualitative discussions in support of not backfitting included any one or a combination of the following factors: NRC initiatives (Issuance of Policy Statements and NUREG documents, NRC

organizational changes, etc.); industry initiatives; scope of GSI being covered in other NRC programs; issue being of no concern after further NRC staff investigation; and low risk or V/I estimate.

Based on a review of all resolved GSIs that were not backfitted, MITRE identified three GSIs where V/I estimates played a relatively significant role in their resolution and where the revised V/I estimates were judged to be sufficiently close to or exceeding the 1,000 person-rem/$M guideline that NRC has used in the past for resolving GSIs. In addition, the priority ranking of six GSIs are potentially affected by license renewal considerations; the revised V/I and averted public dose estimates placed them in MEDIUM priority category. Issues prioritized as MEDIUM or HIGH undergo further review and resolution by NRC. None of the GSIs that resulted in new requirements only for future plants are affected by license renewal considerations. GSIs that are potentially affected by license renewal considerations are briefly discussed in Table ES-1.

Table ES-1. GSIs Potentially Affected by License Renewal

GSI Identification	Category*	Title	Discussion
III.A.1.3(2)	3b	Maintain Supplies of Thyroid Blocking Agent	The issue is concerned with stockpiles of KI agent for public use to help prevent radiation injury to the thyroid gland by radionuclide releases in the event of a nuclear power plant accident. A FEMA policy statement that recommended against a nationwide requirement was approved by the NRC. The value impact analysis in NUREG/CR-1433 showed that "KI offered an extremely small benefit in relation to its cost over the uncertainty range." The V/I analysis is unique since it considers the averted public dose in units of thyroid nodules and assumes a population density of 100 persons/mile^2. The V/I estimate calculated by NRC is not affected by the remaining plant life and is only influenced by the population density aspect of license renewal. This issue is currently under review by the NRC staff (55 FR 39768), and license renewal would be factored into any new resolution of this issue.
82	3b	Beyond Design Basis Accidents in Fuel Pools	NUREG-1353 includes the value impact analysis for different options to address damage in spent fuel pools in response to beyond design basis accidents. Evaluation of installing a spray system resulted in V/I estimates of 330 and 833 person-rem/$M for the best-estimate and worst case (Zion station population of 860 persons/mile^2) scenarios, respectively. Consideration of license renewal would increase these V/I estimates to approximately 500 and 1,400 person-rem/$M accordingly.
101	3b	BWR Water Level Redundancy	The issue is concerned with BWR plant response to a level instrument line break concurrent with a single failure. NUREG/CR-5112 includes the value impact analysis for this issue. Based on low probability of core melt and a maximum V/I estimate of 909 person-rem/$M, the resolution of this issue did not call for any additional actions. The staff concluded that all BWR designs already provide acceptable protection, in conjunction with operator training and procedures, to respond to an instrument line break. Consideration of license renewal increases the most limiting V/I estimate to ~1,606 person-rem/$M.

Table ES-1. GSIs Potentially Affected by License Renewal (Concluded)

GSI Identification	Category*	Title	Discussion
II.D.2	LOW	Research on Relief and Safety Valve Test	Consideration of license renewal increases V/I estimate and the total averted public dose to 113 person-rem/$M and 2,432 person-rem, respectively. This may place the issue in MEDIUM priority.
III.D.2.1 (3 separate GISs under Parts 1 thru 3)	LOW	Radiological Monitoring of Effluents'	Consideration of license renewal increases V/I estimate and the total verted public dose to 66 person-rem/$M and 7,714 person-rem, respectively. This may place the issue in MEDIUM priority.
35	LOW	Degradation of Internal Appurtenances in LWRs	Consideration of license renewal increases V/I estimate and the total averted public dose to 77 and 8,325 respectively. This may place the issue in MEDIUM priority.
80	LOW	Pipe Break Effects on Control Rod Drive Hydraulic Lines in the Drywells of BWR Mark I and II Containments	Consideration of license renewal increases V/I estimate and the total averted public dose to 45 person-rem/$M and ~100 person-rem, respectively. This may place the issue in MEDIUM priority.

*Consistent with the designation used by NRC (see Table 1-1)

SECTION 1

INTRODUCTION

The resolution of generic safety issues (GSIs) by the U.S. Nuclear Regulatory Commission (NRC) involves the consideration of several factors, one of which is the remaining operating life of nuclear power plants. 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," provides the criteria and procedures for extending their operating licenses by an additional period of up to 20 years. Resolution of those GSIs that were not backfitted may be affected by the consideration of extended plant life and the increased population density around nuclear plant sites. These factors may alter the resolution bases either directly, as may be explicitly stated in the resolution basis, or indirectly by affecting the quantitative value/impact (V/I) estimates.

This report presents a systematic evaluation of all GSIs resolved through October 1990 and identifies those whose resolution bases are potentially affected by the introduction of an additional 20 years of plant life permitted under the proposed license renewal rule and by the projected increase in population around nuclear plant sites.

1.1 STATEMENT OF THE ISSUE

In situations in which the GSI involves a potentially worthwhile safety enhancement, rather than involving a question as to adequate safety, a comparison of the safety value of the improvement with the cost impact of implementing it ordinarily has a role in the resolution rationale. Both the safety value and the cost impact can increase with added plant operating time. The safety value could increase over time more than the cost impact, as would be the case when costs are largely one-time initial costs but the risk reduction benefit accumulates year after year with continued operation.

As part of its efforts towards developing license renewal regulations, which will permit extending operating licenses by a period up to 20 years, NRC decided to examine the resolved GSIs for possible cases having the following characteristics:

- Backfitting of a new requirement within the original license term was judged not to be worthwhile.
- Addition of a renewal term could increase the safety value without commensurate increase in cost impact.

- The extent and other circumstances of license renewal on values and impacts are such as to suggest the possibility that with the increased operating time backfitting deserved consideration.

1.2 OBJECTIVES

This work was undertaken to investigate the potential impact of the proposed license renewal rule on resolution of GSIs that have not been backfitted. The specific objectives of this effort were to determine the impact of an additional 20 years of plant life and increase in population density on:

- Resolved GSIs that did not result in any new requirements;
- Resolved GSIs that resulted in only forwardfit (no backfit) requirements; and,
- GSIs with LOW priority ranking that were eliminated from further evaluation by the NRC staff based on their limited safety significance.

1.3 BACKGROUND

1.3.1 Categories of Generic Issues

Generic issues include safety, environment, licensing, or other concerns that relate to the design, construction, or operation of all, several, or a class of nuclear power plants. Generic Safety Issues (GSIs) are a subset of generic issues that generally are concerned with the safety of plants and have the potential for leading to safety improvements and promulgation of new or revised regulatory requirements or guidance. Other specific categories of generic issues, including "Regulatory Impact," "Licensing," and "Environmental" issues, do not have direct safety significance.

"Unresolved safety issues" (USIs) are a class of GSIs that are of considerable safety importance; their resolution is high on the NRC staff's agenda. These issues are listed and described in NUREG-0606 (NRC, 1985a). All USIs have already been resolved and have resulted in numerous safety enhancements to the design and operation of nuclear plants.

Another group of GSIs is identified in NUREG-0371 and NUREG-0471, "Task Action Plan Items" (NRC, 1978a; NRC, 1978b). These documents provide NRC's initial consolidation and prioritization of generic activities. In a descending order of importance, the issues were placed into Categories A, B, C, and D.

Following the accident at Three Mile Island unit 2 (TMI), NRC staff developed the Action Plan, NUREG-0660 (NRC, 1980a), to provide a comprehensive and integrated plan to improve safety of nuclear power plants. Subsequent to a review by the Commission, specific items from NUREG-0660 were approved and forwarded to the licensees for implementation. NUREG-0737 (NRC, 1980b) mandated the implementation of these specific issues, known as "TMI Action Plan Items," and provided additional information on schedules, applicability, method of implementation review, submittal dates, and clarification of technical positions.

The NRC's formal process for prioritizing and resolving GSIs is discussed in NUREG-0933, "A Prioritization of Generic Safety Issues" (NRC, 1987). GSIs may be further classified according to their resolution status--they may be: resolved; in the resolution process; or scheduled for prioritization in the future.

1.3.2 Resolved GSIs and Regulatory Analysis

A large number of GSIs have been resolved over the years. Some have resulted in new requirements imposed on nuclear plants. These new requirements are either imposed on operating plants (backfit) or are applicable only to future construction permit or operating license applicants (forwardfit). The need to impose backfit or forwardfit requirements is based on the importance of an issue to public health and safety and its costs as determined by engineering and safety evaluations.

Since 1983, the staff has prepared a regulatory analysis for each substantive regulatory action resulting from the resolution of GSIs. Regulatory analysis is a process that provides a structure for the NRC to identify alternative approaches for resolving a safety issue, to compare the consequences of each identified alternative, and to select the best alternative. The results of regulatory analysis provide a formal statement for the selected regulatory action. The selection is normally based on an evaluation of important attributes, including both qualitative factors and quantitative values and impacts (NRC, 1984; PNL, 1983). The remaining average plant life has been used to support such quantitative evaluations.

1.3.3 Prioritization of GSIs

GSIs are prioritized for subsequent resolution in order to ensure proper allocation of resources of the NRC staff in resolving GSIs in accordance with their importance to safety. NUREG-0933 provides information on the resolution and prioritization status of all generic issues with particular emphasis on GSIs. Table II of NUREG-0933 includes a complete listing of all generic issues and their resolution status. An excerpt from Table II providing information on the generic issue code designation for different stages and methods of resolution is reproduced in Table 1-1. The resolution status of GSIs is tracked through a computerized database management system, the Generic Issue Management Control System (GIMCS), which is updated quarterly (NRC, 1990a). GIMCS supplements NUREG-0933, which is updated annually.

The resolution of GSIs that resulted in new requirements and those that did not are designated "3a" and "3b", respectively, in NUREG-0933 Table II. A "LOW" priority designation is used to identify GSIs that were determined not to require backfit based on their limited safety significance reflected by their low priority ranking and peer review.

The prioritization process includes a preliminary evaluation of values and impacts associated with a proposed solution (PNL, 1982). A V/I analysis balances potential risk reductions against the costs to achieve such reductions and is used to rank GSIs based on established prioritization criteria. The NUREG-0933 prioritization criteria (Figure 1-1) provide the basis for placing a GSI in one of the following categories: HIGH, MEDIUM, LOW, or DROP. The calculated V/I estimates are used as an aid in decision making, not as the sole basis for the ranking results. In conjunction with quantitative V/I analysis, qualitative factors are considered in establishing the prioritization category. In general, safety, engineering judgement, and qualitative arguments have a significant influence on the prioritization of GSIs.

GSIs in LOW and DROP priority categories were eliminated from further evaluation by NRC since there was little or no prospect of safety improvements that were both substantial and worthwhile. However, consideration of the proposed extended plant life and projected increase in population may change the status of GSIs from LOW to MEDIUM priority ranking, which may require further NRC staff consideration of such GSIs, and eventually result in a 3a or 3b resolution status (see Table 1-1.)

Table 1-1. NUREG-0933 Category Designation of Generic Issues*

Table II

Listing of All TMI Action Plan Items, Task Action Plan Items, New Generic Issues, and Human Factors Issues

This Table contains the priority designations for all issues listed in this report. For those issues found to be covered in other Issues described in this document, the appropriate notations have been made in the Safety Priority Ranking column, e.g., 1.A.2.2 in the Safety Priority Ranking column means that Item 1.A.2.6(3) is covered in Item 1.A.2.2. For those issues found to be covered in programs not described in this document, the notation (S) was made in the Safety Priority Ranking column. For resolved issues that have resulted in new requirements for operating plants, the appropriate multiplant licensing action number is listed. The licensing action numbering system bears no relationship to the numbering systems used for identifying the prioritized issues. An explanation of the classification and status of the issues is provided in the legend below.

Legend

NOTES:
- *1 - Possible Resolution Identified for Evaluation*
- *2 - Resolution Available (Documented in NUREG, NRC Memorandum, SER, or equivalent)*
- *3 - Resolution Resulted in either: (a) The Establishment of New Regulatory Requirements (By Rule, SRP Change, or equivalent) or (b) No New Requirements*
- *4 - Issue to be Prioritized in the Future*
- *5 - Issue that is not a Generic Safety Issue but should be Assigned Resources for Completion*

HIGH - *High Safety Priority*
MEDIUM - *Medium Safety Priority*
LOW - *Low Safety Priority*
DROP - *Issue Dropped as a Generic Issue*
EI - *Environmental Issue*

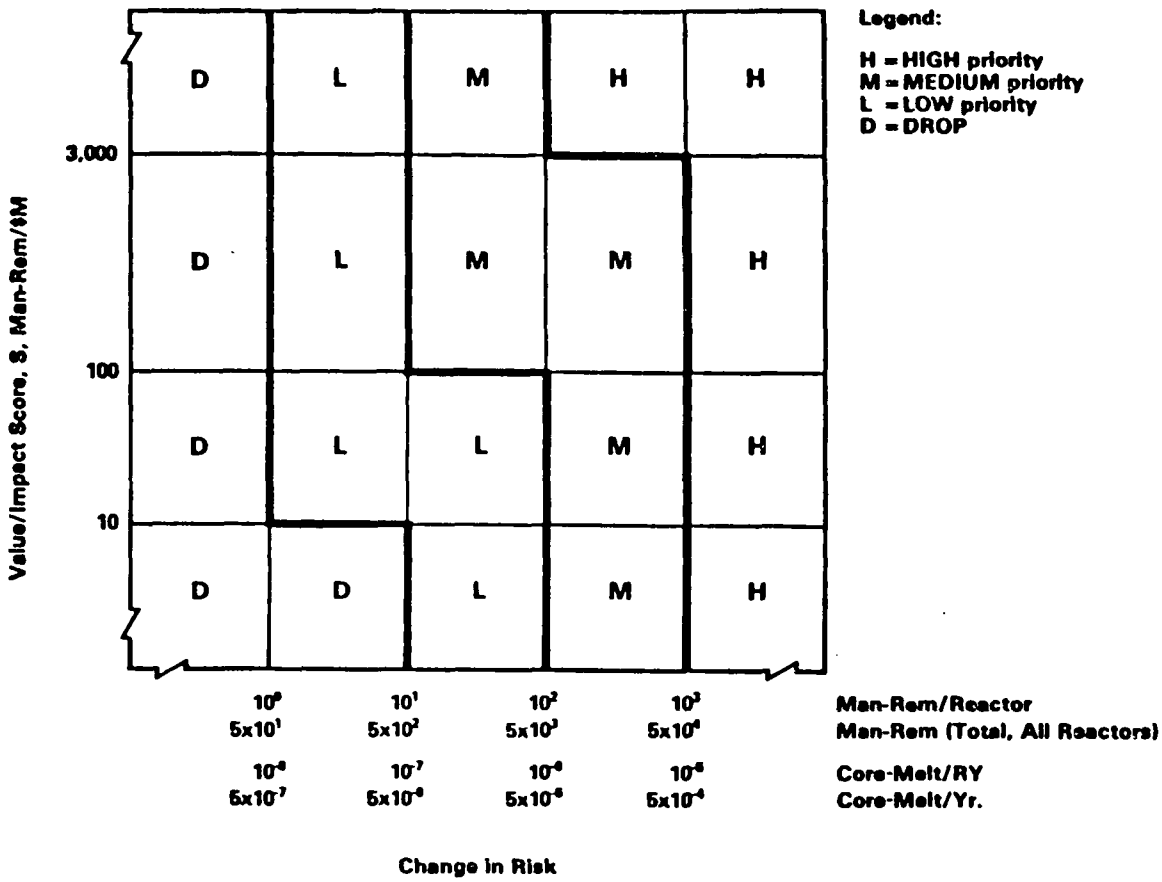
*Source: Copied from NUREG-0933, Revision 11

Table 1-1. NUREG-0933 Category Designation of Generic Issues* (Concluded)

Legend

I	- *Resolved IMI Action Plan Item with Implementation of Resolution Mandated by NUREG-0737*[98]
LI	- *Licensing Issue*
MPA	- *Multiplant Action*
NA	- *Not Applicable*
RI	- *Regulatory Impact*
S	- *Issue Covered*
USI	- *Unresolved Safety Issue*

*Source: Copied from NUREG-0933, Revision 11



Source: NUREG-0933, Revision 3

Figure 1-1. NUREG-0933 Prioritization Criteria

1.4 GENERAL APPROACH

The evaluation consisted of a two-phased approach to achieve the objectives of this report. In Phase 1, the total population of all generic issues was screened to identify the subset of GSIs in Categories 3b, 3a, and LOW that were resolved through October 1990.

In Phase 2, the basis for resolution of GSIs identified in Phase 1 was first reviewed to identify those GSIs that were not backfitted. MITRE constructed a PC-based database to summarize essential information on the resolution of the GSIs that were not backfitted. The basis for resolution generally consists of qualitative and quantitative arguments, which may include consideration of the remaining average plant life and the population density around nuclear plant sites. Subsequently, the additional 20 years of plant operation and increase in population were used to revise available V/I estimates and enter them in the database. Finally, a review of the qualitative and quantitative basis for resolving this set of GSIs was performed to identify those that were potentially affected by license renewal.

1.5 ORGANIZATION OF REPORT

Section 2 provides a more detailed overview of the evaluation and the methodology used in performing it. Phases 1 and 2 of the screening process are described. The two aspects of license renewal, i.e., additional 20 years of operation and increase in population, that could potentially affect the resolution basis of GSIs are also discussed.

In Section 3, the results of the analysis are presented. The screening results of Phases 1 and 2, and a description of the issues potentially affected by license renewal are provided. Appendix A provides a list of GSIs with revised V/I estimates exceeding a value of 500 person-rem/$M irrespective of the resolution basis. Appendix B provides the database of GSIs in Categories 3b, 3a, and LOW that were not backfitted and summarizes pertinent information concerning the basis for resolution of those GSIs. Appendix C provides the projected populations around nuclear plant sites used to adjust the risk reduction estimates in V/I analysis.

Section 4 presents a summary and conclusion of MITRE's evaluation of resolved GSIs.

SECTION 2

METHOD OF ANALYSIS

The analysis and evaluation of resolved GSIs was based on a two-phased approach. Phase 1 consisted of the screening of a total of 772 generic issues to identify those GSIs that were closed out before 1 November 1990 and that were in Categories 3b, 3a, and LOW. Explanation of these categories has been provided in Table 1-1.

In Phase 2, a detailed evaluation of GSIs that resulted from Phase 1 screening was performed to identify those GSIs that were not backfitted. This reduced the list to all 3b issues, a limited number of 3a issues that were not backfitted, and GSIs that were eliminated from further consideration by NRC because of LOW priority designation. These GSIs were evaluated in detail to determine the impact on their resolution by the additional twenty years of plant operation and increase in population around nuclear plant sites.

2.1 PHASE 1 SCREENING

As stated above, this phase included an initial screening of all generic issues to identify those that were resolved as of 1 November 1990. NRC established this date at the inception of the project in recognition of the continuing nature of the ongoing GSI resolution process and the necessity to establish a cutoff date.

NUREG-0933 was the primary source of information for performing the evaluation. Table II of NUREG-0933 provided a complete list of all generic issues and their resolution status. The GIMCS database (NRC, 1990) provided the most up-to-date information on the current status of GSIs in the resolution process. Other references were used as necessary to clarify any ambiguities in the source documents.

The list of generic issues from NUREG-0933 was reviewed and reduced in accordance with the list of categories of issues to be excluded shown in Table 2-1. Deleted from further consideration at this stage were non-safety related issues, GSIs scheduled for resolution after the cut-off date of 1 November 1990, GSIs scheduled for future prioritization, GSIs in DROP prioritization category, and GSIs identified in NUREG-0737 that were mandated to be backfitted by the Commission.

Table 2-1. Categories of Items Deleted from the List of GSIs in Phase-1 Screening

Designation	Description
LI	Licensing issues
E	Environmental issues
RI	Regulatory impact issues
Other GSIs	GSIs that refer to other GSIs
Note 4	GSIs to be prioritized in the future
DROP	GSIs in DROP Priority category
HIGH, MEDIUM	GSIs in HIGH and MEDIUM Priority categories that were not resolved by 1 November 1990
I	GSIs mandated under NUREG-0737

It was decided by NRC that GSIs in DROP category would not be considered in this evaluation since they could at best move to the LOW priority ranking and would not require further evaluation by NRC. In general, consideration of license renewal increases safety benefits and V/I estimates by a factor of less than 2. This factor is representative of a typical case where the original NRC's V/I evaluation considered a remaining plant life of 28 years and the most limiting case where the corresponding impact was a one-time implementation cost independent of the remaining plant life. In order for a GSI in the DROP priority category to shift up to the MEDIUM priority, both the safety benefit and V/I estimates should increase by at least a factor of 10 (see Figure 1-1). A preliminary review of selected DROP priority GSIs did not identify any such cases.

At the conclusion of Phase 1 screening, the remaining GSIs fell into one of the following categories:

- GSIs resolved without resulting in any new requirements (3b);
- GSIs resolved and resulting in new requirements (3a); and,
- GSIs with LOW priority status that were eliminated from further NRC evaluation since their implementation would have limited benefit to safety based on NRC staff judgement or V/I estimates.

2.2 PHASE 2 SCREENING

The resolution bases as described in NUREG-0933 and documents referenced in it were reviewed in depth. Of particular importance were the regulatory analyses underlying the decisions not to backfit. Other references were used to clarify ambiguities in the source documents, especially where no regulatory analysis was performed. In addition, discussion with, and input from, several NRC staff members responsible for individual issues helped MITRE understand and describe the resolution basis for a number of GSIs resolved shortly before 1 November 1990 and for which limited documentation was available. The resolution basis was reviewed from the perspective of license renewal considerations, namely, the additional 20 years of plant operation and projected increase in nearby population.

In general, the resolution basis consists of two aspects: qualitative arguments and quantitative results, such as values, impacts, and

VI ratios. The importance of one or more factors may override the other, depending on the issue of concern and the proposed resolution. MITRE identified all available quantitative information so that the effects of 20 additional years of operation and increase in population could be quantitatively factored into the evaluations of GSIs. Many issues that were not backfitted did not have any regulatory analysis in the resolution document. In such cases, the V/I values from NUREG-0933, if available, were considered in the evaluation.

GSIs in Category 3a resulted in new backfit and/or forwardfit requirements. A review of the resolution of these GSIs available in NUREG-0933 was performed to identify those that were not backfitted. GSIs that had been fully backfitted were eliminated from further review since operating nuclear plants already have been required to make the necessary plant modifications.

Given the rather large number of GSIs that were not backfitted and that required detailed evaluation of their resolution basis, it was decided to prepare a database to collect important information required to determine the potential impacts of license renewal. MITRE selected a PC-based system that would allow transfer of the information to the NRC upon the conclusion of the project.

All pertinent information associated with GSIs in Categories 3b and LOW and Category 3a items that were not backfitted were entered into the database, so that all the information could be reviewed consistently. All available V/I estimates from regulatory analyses or NUREG-0933 were revised as necessary by incorporating an additional 20 years of plant life and increase in population, and the revised V/I ratios were entered into the database.

The methodology used to derive revised value-impact ratios includes two separate calculations for risk reduction and costs to implement a proposed resolution (NRC 1983a). In the V/I analyses revised, there were no instances where occupational radiation exposures and accident avoidance costs (e.g., cleanup and replacement power costs) were explicitly used in the original calculation of V/I ratios.

The equation used to calculate risk reduction (W) for an operating term that includes a 20-year license renewal is as follows:

$$W_{LR} = W_o \times PF \times [(T+20)/T]$$

where

W_{LR} is the total risk reduction over the new operating life, in units of person-rem

W_o is the risk reduction over the original remaining life as provided in original value-impact analyses, in units of person-rem

PF is a dimensionless population adjustment factor representing changes in the average population density considered in the original calculation (see discussion below)

T is the average remaining life of reactors affected as used in the original value-impact analysis, in units of years.

In resolving GSIs in the past, the NRC staff has used an average population density (340 persons per square mile) around nuclear power plants as projected for the year 2000 in its calculation of risk to the public. This date represents the approximate midpoint for all nuclear power plants under their original operating license term. Given the potential for an additional 20 years of plant operation, as allowed in the proposed license renewal rule, the midpoint of plant life would shift to the year 2010. Consequently, the projected population density in the year 2010 was used in recalculating V/I ratios for GSIs that were not backfitted.

The revised V/I calculations in this report use a population adjustment factor (PF) of 1.06 based on projected population data in NRC's "Interim Draft for Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants" (NRC, 1990b). Information from this report is summarized in Appendix C, which shows the projected populations within the 50 mile radii of all nuclear power plants and the cumulative totals for the years 2000 and 2010. The ratio of the total projected population within the 50 mile radii of nuclear plants in the year 2010 to that in the year 2000 is approximately 1.06. The number of remaining years of plant life in the original analyses were generally more than 20 years, so that the maximum correction factor, to account for both a longer term and an increased population density, was approximately 2.

The second aspect of the V/I analysis is calculation of costs associated with the proposed resolution. Costs incurred for implementing safety improvements include: (1) the cost to NRC for developing each requirement and reviewing the utility's design to assure that the

requirement is properly implemented, operated, and maintained; and (2) the utility's cost of design, procurement, installation, and testing to implement the requirement and its cost for operation and maintenance. The equation used to calculate the total cost of implementing safety improvements that includes the additional 20 years of operation under license renewal is as follows:

$$S_{LR} = S_o + 20\ C_o + 20\ I_o$$

where

S_o is the total impact under the original license term, in units of $M

C_o is the annual incremental NRC costs for reviews of safety improvements, in units of $M

I_o is the annual incremental industry costs for operation and maintenance of safety improvements

The revised V/I estimates were simply the ratio of all values to all impacts that were calculated considering license renewal. Typically, since the incremental costs associated with the license renewal period were often zero or minimal, the revised V/I ratio to include license renewal was approximately a factor of 2 greater than the original V/I ratio, not including a 20-year renewal term.

Appendix B is the GSI database including essential information extracted from various sources, such as the original V/I estimates and summary descriptions of resolution bases. The database also provides the results of this review and evaluation, such as the revised V/I estimates and determinations of any impact of license renewal considerations on the resolution basis of GSIs.

SECTION 3

RESULTS

The methodology described in Section 2 was implemented to determine the potential impact of the proposed license renewal rule on the resolution of GSIs that had not been backfitted. The results of analysis for different categories of GSIs are discussed in this Section.

3.1 PHASE 1 SCREENING

A review of all generic issues was performed to identify GSIs that were resolved as of 1 November 1990 and that were in Categories 3b, 3a, or LOW. The screening basis summarized in Table 2-1 was used. At the conclusion of this phase 249 GSIs of a total of 772 generic issues remained on the list. Figure 3-1 depicts the breakdown of generic issues according to the various categories and highlights categories of GSIs that were analyzed further in Phase 2.

3.2 PHASE 2 SCREENING

The initial stage of screening in this phase consisted of identifying those GSIs, out of the 249 GSIs from Phase 1, that were not backfitted. All of the 111 issues in Category 3b and all of the 22 GSIs in Category LOW were not backfitted. The resolution basis of GSIs in Category 3a were reviewed to identify those that were not backfitted. NUREG-0933 was the primary source of information for determination of resolution status. Five GSIs out of a total of 116 in Category 3a were not backfitted. GSI 131, with an "S" resolution category (see Table 1-1) indicating that the issue was covered under other NRC programs, was also included for evaluation in Phase 2. Thus, a total of 139 GSIs out of a total of 249 GSIs were determined not to have been backfitted. These GSIs were reviewed in detail to determine any potential revision in their resolution basis by license renewal considerations.

As noted in the previous Section, the detailed review focused on the qualitative resolution basis and, when available, on the quantitative V/I information. This is summarized under the fields labeled "Resolution Rationale," and "Revised V/I," respectively, in the GSI database.

The impact of a six percent increase in population density on calculation of averted public dose is overshadowed by consideration of the additional 20 years of plant operation that accounts for approximately 80 percent of the total increase in averted public dose.

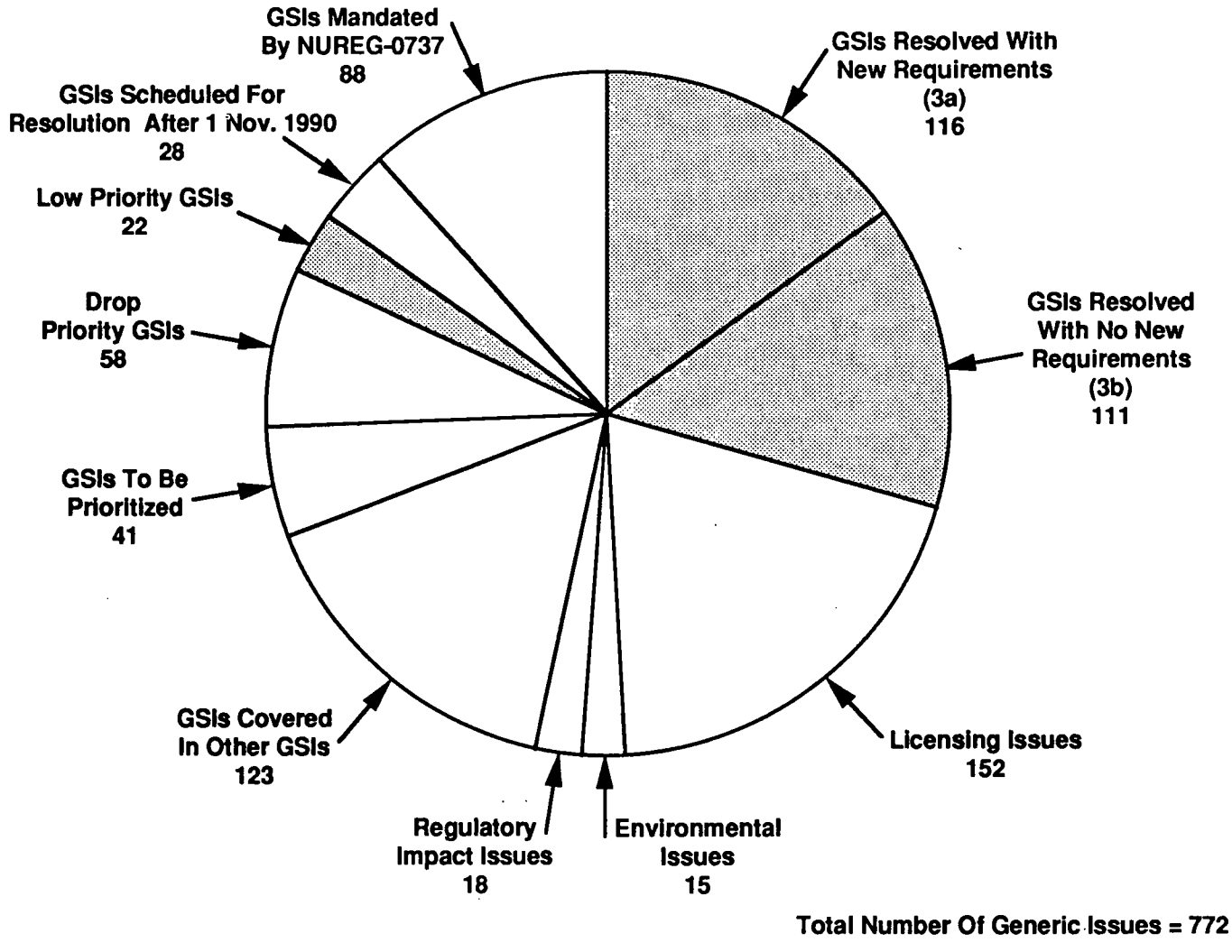


Figure 3-1. Breakdown of Generic Issues

3.3 NON-BACKFITTED GSIs THAT COULD BE AFFECTED BY LICENSE RENEWAL

A detailed review of all GSIs that were not backfitted did not identify any instances where the remaining plant life or the population density was the sole basis for determining that backfitting was not required. Approximately forty percent of these GSIs had a quantitative V/I analysis where the explicit consideration of extended remaining life or population density could indirectly influence the resolution basis (see Figure 3-2). However, in most instances, the role of qualitative factors outweighed the consideration of V/I estimate or other quantitative factors in determining that backfitting was not required.

Of the 116 GSIs in Categories 3b and 3a, MITRE identified only three Category 3b GSIs where quantitative V/I estimates played a relatively significant role in their resolution and where the revised V/I estimates were judged to be sufficiently close to the reference guideline of 1,000 person-rem/$M that NRC has used in the past for resolving GSIs. Only six GSIs in Category LOW are affected by license renewal. The discussion in the following subsections is organized according to the three categories of GSIs: 3b, 3a, and LOW.

Appendix A includes a list of resolved GSIs that were not backfitted (Categories 3b and 3a) with revised V/I estimates exceeding the value of 500 person-rem/$M. MITRE selected this value to highlight those GSIs with V/I estimates close to the reference value of 1,000 person-rem/$M for which qualitative factors considered in their resolution not to backfit played a dominant role. The resolution basis for these GSIs is provided in Appendix B.

3.3.1 Category 3b GSIs

Of the 111 issues in Category 3b, only 10 issues had a regulatory analysis and another 30 issues had a V/I analysis performed in support of their prioritization. The remaining 71 issues were resolved based on qualitative factors and engineering judgement. Three of 10 regulatory analyses did not contain any quantified V/I estimates.

GSIs in Category 3b were resolved on the basis of a number of different reasons. However, during the course of the evaluation, it became apparent that the resolution bases could be grouped. These groups are listed below and their letter designations are used in the database to indicate how each GSI was resolved.

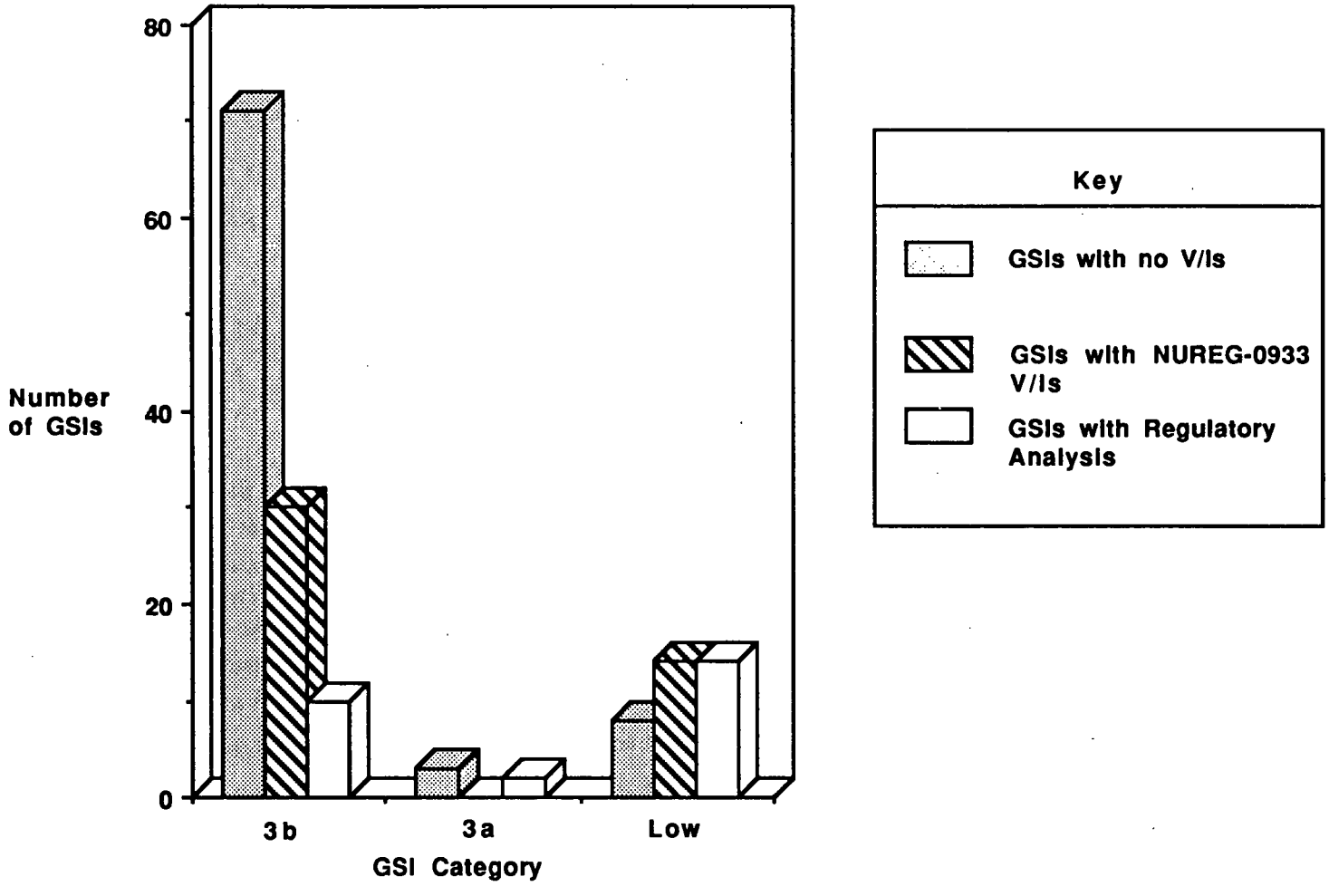


Figure 3-2. Availability of Regulatory Analysis and V/I Prioritization Estimates for Non-Backfitted GSIs

A GSIs resolved based on NRC initiatives including the following: issuance of policy statements (A1); actions taken to address other concerns (A2); issuance of documents, including NUREGs; computer code manual upgrades, etc., (A3); administrative and organizational changes (A4); and GSIs to be revisited by the staff in the future (A5).

B Further investigation of the issue by NRC determined that there was no concern.

C The issue was covered in other NRC programs (e.g., Individual Plant Examination (IPE), Nuclear Plant Aging Research (NPAR), etc.).

D Industry initiatives and actions mitigated or eliminated the concern.

E Low risk and negligible V/I values.

Figure 3-3 depicts a breakdown of the resolution bases for Category 3b issues consistent with the grouping described above.

A review of the resolution bases of GSIs in Category 3b identified only three GSIs that are potentially affected by license renewal considerations. These are discussed below.

GSI III.A.1.3(2): Maintain Supplies of Thyroid Blocking Agent for the Public

Federal Emergency Management Administration (FEMA) developed a policy statement against a nationwide requirement for the distribution or stock-piling of KI for use by the general public and left the final decision for its use to state and local authorities on a site-specific basis. The NRC concurred with the policy statement that was based on a V/I estimate.

Units for the cost/benefit analysis were $/thyroid nodule averted and ranged from $300,000 to $40 million/nodule, depending on distance from the plant. This was compared to an average cost of treating a thyroid nodule case of $17,000. The analysis was performed independent of plant lifetime and the number of plants operating in the U.S., although the analysis acknowledged that multiple reactors at sites would decrease the cost/benefit ratios correspondingly. Also, the analysis assumed a uniform population distribution of 100 persons/mile^2 rather than the standard 340 persons/mile^2 used in V/I analysis of potential GSI resolutions.

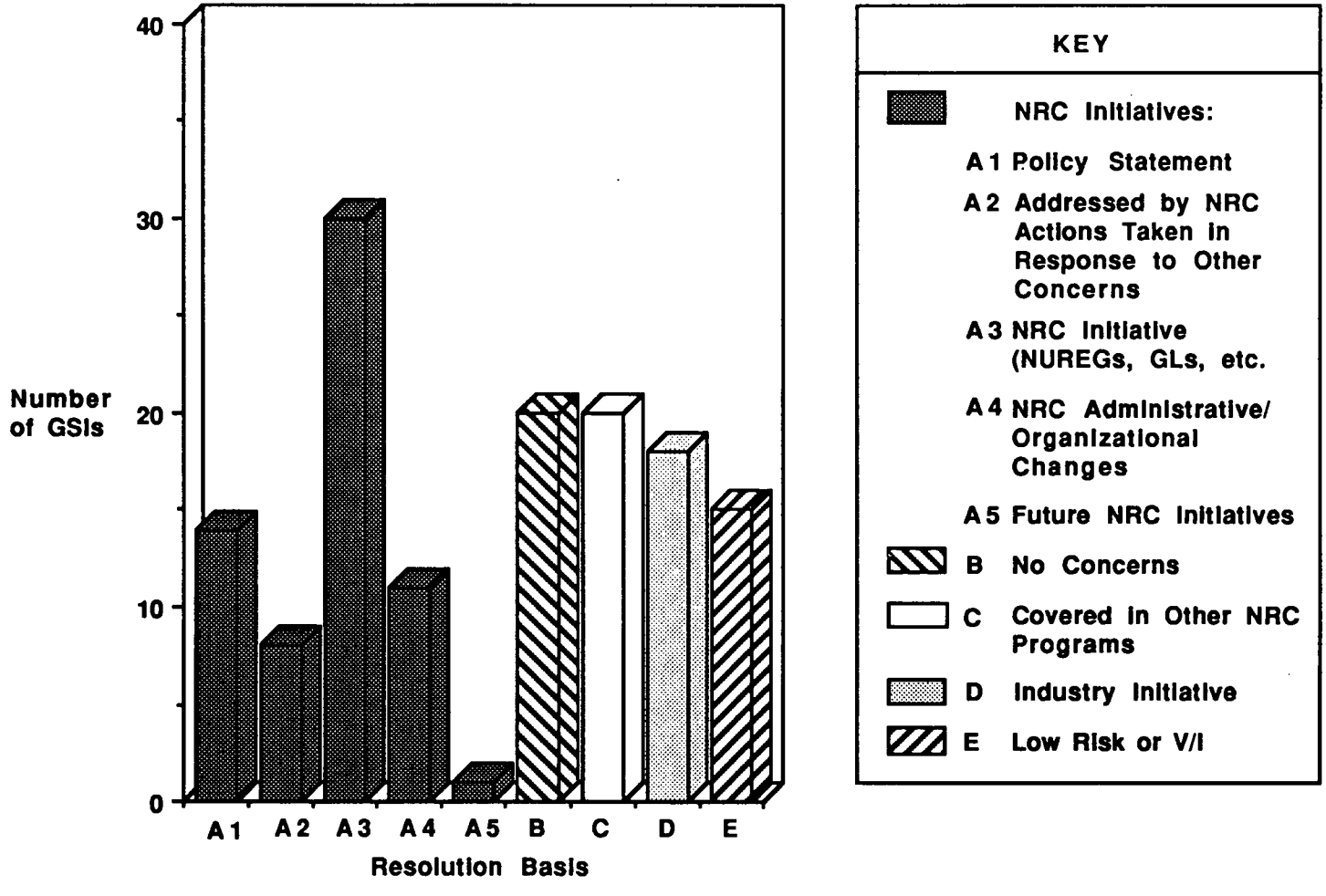


Figure 3-3. Resolution Basis for GSIs
That Did Not Result in New Requirements (Category 3b Issues)

Cost and benefit results are provided on an annual, single reactor incidence basis. Thus the results would remain constant regardless of renewal term, except for any changes in the population density. However, given that the unit of analysis and population density assumed are different for this issue, MITRE did not revise the results of the V/I analysis. The NRC plans to perform an updated V/I analysis to consider the implications of latest available research and new information on estimated iodine releases from severe reactor accidents on the values and impacts of alternative approaches to address the issue (55 FR 29768).

GSI 82: Beyond Design Basis Accidents in Fuel Pools

Several alternatives to address damage in spent fuel pools in response to beyond design basis accidents were evaluated in the regulatory analysis (NRC, 1989). Alternative 4, installation of a spray system, resulted in V/I estimates of approximately 330 and 833 person-rem/$M for the best-estimate and worst case scenarios, respectively. Because of license renewal considerations, the best-estimate and worst case V/I estimates could increase to approximately 500 and 1,400 person-rem/$M, respectively.

It should be noted that the original V/I analysis has considerable uncertainties. Furthermore, the worst case estimate applies to the Zion Nuclear Station with its specific meteorology and population density of 860 people per square mile.

GSI 101: BWR Water Level Redundancy

This GSI is concerned with the ability of BWRs to mitigate water level instrument sensing line leaks or breaks that could affect both control and protection systems.

Based on the low probability of core melt (<2E-6) and the highest V/I estimate of 909 person-rem/$M to reduce public risk, the resolution of GSI 101 did not call for any additional actions. The NRC concluded that all BWR designs already provide acceptable protection, in conjunction with operator training and procedures, to mitigate a line break in any of the water level instruments.

License renewal consideration increases the most-limiting V/I estimate in the regulatory analysis to over 1,600 person-rem/$M for one group of plants with a particular proposed modification to the Automatic Depressurization System.

3.3.2 Category 3a GSIs

Of the total of 116 GSIs that resulted in new requirements on the licensees, only five issues were forwardfitted without any backfit requirements. These issues are identified and summarized in the GSI database in Appendix B. These five GSIs were identified in the mid to late 1970's and were resolved based on a variety of reasons, including initiatives by the industry. There is limited quantitative information available in support of their resolution. Only two GSIs in this category had a quantitative regulatory analysis. Consideration of license renewal factors would increase the V/I estimates for these two Category 3a issues beyond the NRC's guideline of 1,000 person-rem/$M. However, other factors considered in the resolution override the V/I estimates, so that these GSIs are not affected by license renewal.

3.3.3 Category LOW GSIs

Of the 22 GSIs in Category LOW, 14 GSIs had a V/I estimate. The remaining issues were placed in Category LOW based on qualitative reasons and engineering judgement. In addition, GSI-66, which is in Category 3b, includes four sub-issues that were eliminated from further evaluation based on their DROP priority categorization on a ranking scale that combined LOW and DROP priority ranking. MITRE reviewed these Category "DROP" issues since they could move up to MEDIUM priority ranking, and determined that they were not affected by license renewal.

Based on V/I estimates and averted public dose, as well as qualitative information supporting the resolutions, MITRE identified the following six Category LOW GSIs that could move up to MEDIUM priority.

GSI II.D.2: Research on Relief and Safety Valve Test Requirements

The revised V/I estimate of 113 person-rem/$M in conjunction with the revised total averted public dose of 2,432 person-rem could place the issue in the MEDIUM priority category.

GSI III.D.2.1: Radiological Monitoring of Effluents

This issue consists of three distinct GSIs (III.D.2.1.1 through III.D.2.1.3) that were evaluated together. The revised V/I value of 66 person-rem/$M and revised averted total public dose of 7,714 person-rem could place the issue in the MEDIUM priority category.

GSI 35: Degradation of Internal Appurtenances in LWRs

Originally the issue was placed in the LOW priority category since all scores, except for the core damage frequency, which was marginally in the Category MEDIUM, placed the issue in Category LOW. The revised V/I of 77 person-rem/$M and the revised total averted public dose of 8,325 person-rem could move the issue to the MEDIUM priority rank.

GSI 80: Pipe Break Effects on CRD Hydraulic Lines in the Drywells of BWRs Mark I and II Containments

The issue was originally assigned LOW priority ranking because of V/I estimates. The revised V/I of 45 person-rem/$M and the revised total averted public dose of approximately 100 person-rem could move the issue to the MEDIUM priority rank.

SECTION 4

SUMMARY AND CONCLUSION

MITRE conducted a review and evaluation of resolved GSIs that have not been backfitted to determine the potential impact of an additional 20 years of plant operation permitted under the proposed license renewal rule, and the projected increase in population density.

The review was based on a systematic evaluation of 772 generic issues, in a two-phased approach, to identify those GSIs that were resolved through October 1990 and that did not result in backfitting. As a result of Phase 1 screening, 249 in Categories 3b, 3a, and LOW were identified to have been resolved through October 1990. A further review of this set of GSIs in Phase 2 identified 139 issues that did not result in backfit requirements. MITRE constructed a database to capture essential information associated with these 139 GSI, including the following: resolution basis and references, original V/I estimate, and revised V/I estimate. The database will provide NRC with the capability to perform future analyses and monitoring of non-backfitted GSIs.

There were no instances where the remaining plant life or the population density was the sole basis for resolving a GSI without imposing backfit requirements. However, a limited number of GSIs that have a V/I estimate could be affected by license renewal considerations (see Figure 4-1). The GSIs that are potentially affected by license renewal considerations are briefly discussed in Table 4-1.

GSIs in Category 3b are those that have been resolved without resulting in any new requirements for either operating or future nuclear power plants. Of the 111 GSIs in this category, only three GSIs could be affected by license renewal considerations.

GSIs in Category 3a are those that have been resolved with new requirements for either operating and/or future plants. Of a total of 116 GSIs in this category, five were not backfitted. However, none of these GSIs was affected by license renewal considerations. The V/I estimates for two GSIs in this category exceeded 1,000 person-rem/$M. However, the qualitative resolution basis outweighed the quantitative revised V/I estimates (see Appendix B).

GSIs in Category LOW are those that have been eliminated from further evaluation by NRC based on their limited safety significance as determined in the priority ranking process and peer review. Of the 22 GSIs in this category, only 14 had V/I estimates. These were revised to account for

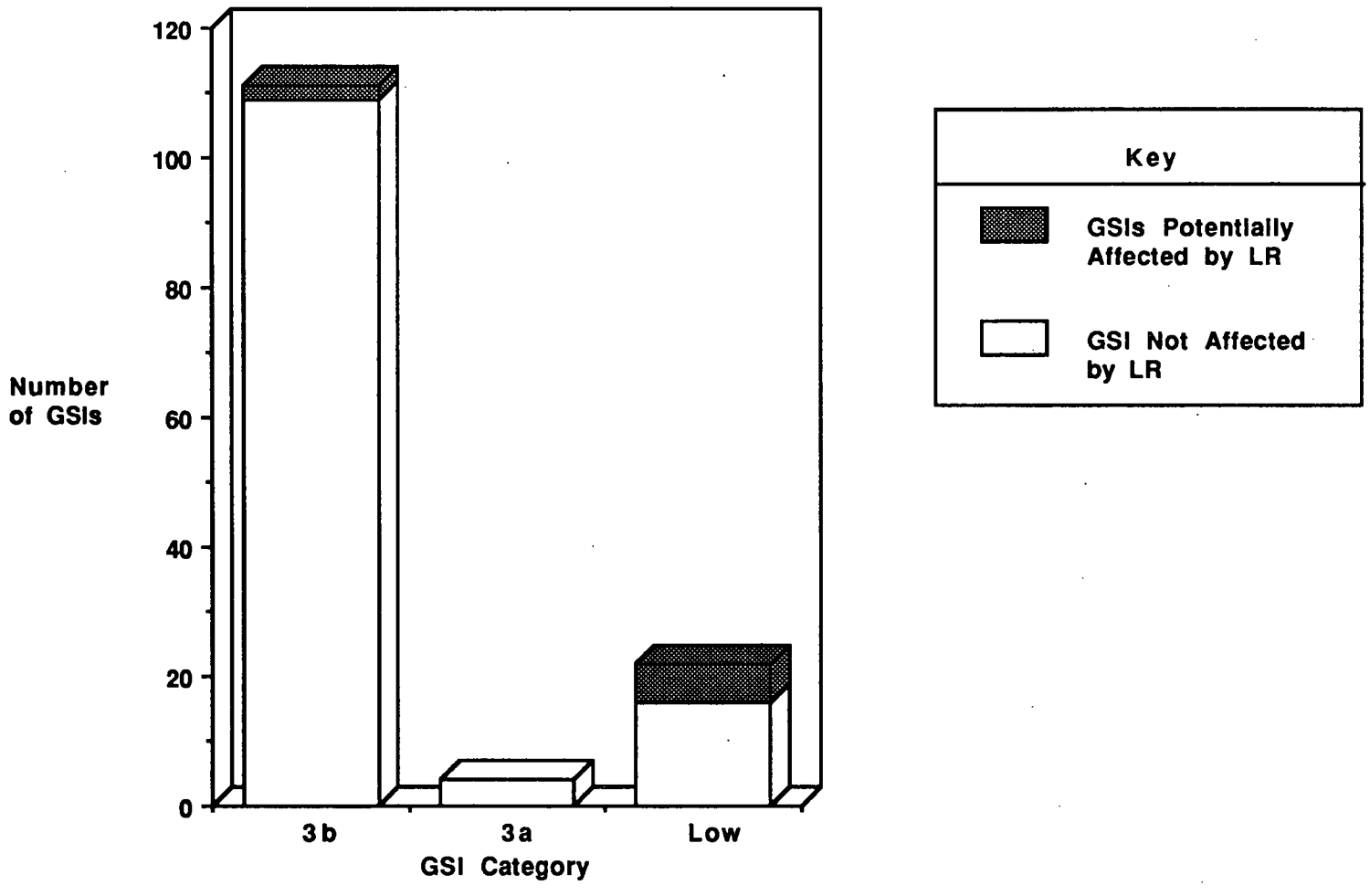


Figure 4-1. Effect of License Renewal on Resolved GSIs That Were Not Backfitted

Table 4-1. GSIs Potentially Affected by License Renewal

GSI Identification	Category*	Title	Discussion
III.A.1.3(2)	3b	Maintain Supplies of Thyroid Blocking Agent	The issue is concerned with stockpiles of KI agent for public use to help prevent radiation injury to the thyroid gland by radionuclide releases in the event of a nuclear power plant accident. A FEMA policy statement that recommended against a nationwide requirement was approved by the NRC. The value impact analysis in NUREG/CR-1433 showed that "KI offered an extremely small benefit in relation to its cost over the uncertainty range." The V/I analysis is unique since it considers the averted public dose in units of thyroid nodules and assumes a population density of 100 persons/mile^2. The V/I estimate calculated by NRC is not affected by the remaining plant life and is only influenced by the population density aspect of license renewal. This issue is currently under review by the NRC staff (55 FR 39768), and license renewal would be factored into any new resolution of this issue.
82	3b	Beyond Design Basis Accidents in Fuel Pools	NUREG-1353 includes the value impact analysis for different options to address damage in spent fuel pools in response to beyond design basis accidents. Evaluation of installing a spray system resulted in V/I estimates of 330 and 833 person-rem/$M for the best-estimate and worst case (Zion station population of 860 persons/mile^2) scenarios, respectively. Consideration of license renewal would increase these V/I estimates to approximately 500 and 1,400 person-rem/$M accordingly.
101	3b	BWR Water Level Redundancy	The issue is concerned with BWR plant response to a level instrument line break concurrent with a single failure. NUREG/CR-5112 includes the value impact analysis for this issue. Based on low probability of core melt and a maximum V/I estimate of 909 person-rem/$M, the resolution of this issue did not call for any additional actions. The staff concluded that all BWR designs already provide acceptable protection, in conjunction with operator training and procedures, to respond to an instrument line break. Consideration of license renewal increases the most limiting V/I estimate to ~1,606 person-rem/$M.

Table 4-1. GSIs Potentially Affected by License Renewal (Concluded)

GSI Identification	Category*	Title	Discussion
II.D.2	LOW	Research on Relief and Safety Valve Test	Consideration of license renewal increases V/I estimate and the total averted public dose to 113 person-rem/$M and 2,432 person-rem, respectively. This may place the issue in MEDIUM priority.
III.D.2.1 (3 separate GISs under Parts 1 thru 3)	LOW	Radiological Monitoring of Effluents'	Consideration of license renewal increases V/I estimate and the total verted public dose to 66 person-rem/$M and 7,714 person-rem, respectively. This may place the issue in MEDIUM priority.
35	LOW	Degradation of Internal Appurtenances in LWRs	Consideration of license renewal increases V/I estimate and the total averted public dose to 77 and 8,325 respectively. This may place the issue in MEDIUM priority.
80	LOW	Pipe Break Effects on Control Rod Drive Hydraulic Lines in the Drywells of BWR Mark I and II Containments	Consideration of license renewal increases V/I estimate and the total averted public dose to 45 person-rem/$M and ~100 person-rem, respectively. This may place the issue in MEDIUM priority.

*Consistent with the designation used by NRC (see Table 1-1)

the additional plant life and population density increase. Five of the 14 GSIs in Category LOW are potentially affected by license renewal considerations and may shift to MEDIUM priority status.

APPENDIX A

GSIs IN CATEGORIES 3b AND 3a WITH REVISED V/I ESTIMATES EXCEEDING 500 PERSON-REM/$M

GSI Identi-fication	Title	Category (NUREG-0933)	V/I Reference	Revised V/I Person-rem/SM
I.C.9	Long-term Program Plan for Upgrading of Procedures	3b	NUREG-0933	522
I.D.4	Control Room Design Standard	3b	NUREG-0933	1,022
II.C.1	Interim Reliability Evaluation Program (IREP)	3b	NUREG-0933	977
II.C.2	Continuation of Interim Reliability Evaluation Program (NREP)	3b	NUREG-0933	983
II.C.4	Reliability Engineering	3b	NUREG-0933	528
II.E.2.2	Research on Small Break LOCAs and Anomalus Transients	3b	NUREG-0933	1,750
III.A.1.3(2)	Public (Maintain supplies of thyroid blocking agent)	3b	NUREG/CR-1443	See Note 1
III.A.3.4	Nuclear Data Link	3b	NUREG-0933	3,530
III.D.2.5	Offsite Dose Calculation Manual	3b	NUREG-0933	1,211
III.D.3.1	Radiation Protection Plans (Worker Radiation Protection Improvement)	3b	NUREG-0933	3,439
IV.E.5	Assess currently Operating Plants (Safety Decision-Making)	3b	NUREG-0933	2,137
A-12	Fracture Toughness of Steam Generator and Reactor Coolant Pump Supports (USI)	3a	NUREG-0577 (Rev.1)	Ranges between 153 and ~60,000
A-43	Containment Emergency Sump Performance (Former USI)	3a	NUREG-0869	Ranges between 4,652 and 13,533
A-45	Shutdown Decay Heat Removal Requirements (Former USI)	3b	NUREG-1289	Varies widely
B-5	Buckling Behavior of Steel Containments	3b	NUREG-0933	782

APPENDIX A

GSIs IN CATEGORIES 3b AND 3a WITH REVISED V/I ESTIMATES EXCEEDING 500 PERSON-REM/$M (Concluded)

GSI Identi-fication	Title	Category (NUREG-0933)	V/I Reference	Revised V/I Person-rem/SM
82	Beyond Design Basis Accidents in Fuel Pools	3b	NUREG-1353	~500
101	BWR Water Level Redundancy	3b	NUREG/CR-5112	1,606
115	Reliability of Westinghouse Solid State Plant Protection System	3b	NUREG-1341	1,956
122.2	Initiating Feed and Bleed	3b	NUREG-0933	4,244
125.I.3	SPDS Availability (Davis-Besse Loss of All Feedwater Event of June 9, 1985, Long-Term Actions)	3b	NUREG-0933	982

NOTE 1: The cost-benefit ratio in the regulatory analysis of $300,000 to $40M per thyroid nodule is independent of the remaining plant life and assumes a population density of 100 persons/mile^2. The issue is currently under review by NRC and license renewal would be factored into any new resolution of the issue.

APPENDIX B

DESCRIPTION OF GSI DATABASE

The following is a description of the different data fields in the GSI database printout. "LR" is used to abbreviate license renewal in the database.

GSI IDENTIFICATION: Identification number of the Generic Safety Issue (GSI), consistent with NUREG-0933.

TITLE: Title of the GSI as it appears in NUREG-0933 and its Table II. Additional text providing supplemental information is included in parentheses.

ISSUE TYPE: GSI type consistent with NUREG-0933 as being one of the following:

TMIAP	TMI Action Plan
TAP	Task Action Plan
NGI	New Generic Issues
HF	Human Factors

CATEGORY: Designation of the issue consistent with NUREG-0933, Table II, and GMICS (10 August 1990) information (i.e., 3a, 3b, and LOW)

DECISION RATIONALE: A brief description of the resolution basis. In general, information is obtained from NUREG-0933 unless other references as designated in NUREG-0933 are specifically identified. Any relevant risk information such as core damage frequency, total and per plant averted dose, etc., is also included. Revised estimates of these parameters based on extended plant life and increased population are also included in a separate paragraph, where necessary.

V/I REFERENCE: References providing value/impact (V/I) information. A reference to NUREG-0933 indicates that only a V/I ratio used in the prioritization was available. Other references are indicative of the presence of a more detailed analysis (e.g., Regulatory Analysis). An "N" in this column indicates that no references that provided V/I estimates were identified.

OLD V/I (P-rem/$M): V/I estimate, if available. Otherwise, an "N/A", indicating Not Available, appears in the column.

REV V/I (P-rem/$M): Revised V/I estimate including the impact of License Renewal (i.e., additional 20 years and population density increase). In general consideration of licensing renewal typically increases V/I ratios by at most a factor of 1.7 assuming the original average remaining plant life of approximately 28 years. All available V/I estimates have been revised to include license renewal factors.

RES. BASIS: The basis for the resolution of 3b items. Any one or a combination of the following codes are used as the basis for the resolution of the issue:

- A1 Resolved with the issuance of a Policy Statement
- A2 Is resolved because of the NRC action taken in response to other concerns and not the GSI
- A3 The issue is resolved and resulted in an NRC action including:
  - Tech Specs changes
  - Issuing NUREGs/BTP/Clarified SRPs
  - Changes to inspection programs
  - Computer code development
- A4 The issue is resolved and resulted in interval administrative or organization changes
- A5 Resolved requiring future assessments
- B Resolved since there was no problem based on further review
- C Covered or subsumed in other NRC programs (e.g., IPE, NPAR)
- D Resolved based on industry initiatives
- E Resolved based on values and/or impacts

RES. DATE: The year when the issue was resolved as specified in GIMCS. Resolution dates not identified in GIMCS are designated as "<83". "N/A" designation for resolution date of LOW category GSIs indicates the date as not being available.

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
I.A.2.2	Training and Qualification of Operations Personnel	TMIAP	3b	Ref 777: The Commission formally recognized the industry progress to improve training & qualifications. In 1985, issued a Policy Statement on the issue "..endorsing the INPO-managed training Accreditation Program...."	NUREG-0933	177	193	A1,D	85
I.A.2.5	Plant Drills	TMIAP	3b	Ongoing work by DHFS was completed in 1985 and published for information as a NUREG. The short-term objective of manipulating controls was acheived in NUREG-0737. The long-term goal of developing NRC standards for drills was left to INPO & the industry. The issue was given LOW priority since V/I analysis overestimated the risk. Total averted public dose of 4,805 P-rem increases to 8,562 by LR.	NUREG-0933	62	67	A3,D	<83
I.A.2.6(2)	Staff Review of NRR 80-117	TMIAP	3b	Resolved under item I.A.2.6(1), which resulted in revised RG 1.8. NUREG-0933 reports V/I of 60 for Item I.A.2.6(1) which is in 3a category.	N	N/A	N/A	A2	<83
I.A.2.6(4)	Operator Workshops	TMIAP	3b	Ref 804: Both methods of conducting workshop & survey test cases proved to be effective means of getting feedback. Because of low V/I value and industry willingness to provide feedback during the study, the issue should be resolved. Total averted public dose of 7,140 P-rem increases to 9,930 because of LR.	NUREG-0933	165	177	D,E	85
I.A.2.6(5)	Develop Inspection Procedures for Training Program	TMIAP	3b	same as Item I.A.2.6(2)	N	N/A	N/A	A2	<83

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
I.A.2.7	Accreditation of Training Institutions	TMIAP	3b	Ref 777: The commission formally recognized the industry progress to improve training & qualifications. In 1985, issued a Policy Statement on the issue "..endorsing the INPO-managed training Accreditation Program...".	NUREG-0933	64.4	71	A1,D	85
I.A.3.2	Operator Licensing Program Changes	TMIAP	3b	The following actions were taken: 1- all Regions were given operator licensing authority, 2- a study of op. licensing program was documented in NUREG-1021, and 3- reporting of operator error was deleted.	N	N/A	N/A	A3,B	<83
I.A.3.3	Requirements for Operator Fitness	TMIAP	3b	Ref 956: A regulatory approach to fitness for duty was originally pursued. In 1986, a Commission Policy Statement recognized the industry efforts and resolved the issue.	NUREG-0933	13.4	14.3	A1,D	87
I.A.3.4	Licensing of Additional Operations Personnel	TMIAP	3b	Ref 778: There was insufficient evidence to support new requirements. In accordance with current Commission statement, related to NUMARC initiatives, there would be no proposed rule for 2 years. Also the Policy Statement on training and qualification will cover inspection of utilities' training program.	NUREG-0933	20	23	A1	85
I.A.4.1(1)	Short-term Study of Training Simulators	TMIAP	3b	As required by TMI Action Plan, a study of training simulators was conducted & documented in NUREG/CR-1482. Issue I.A.4.1(2) required implementation of corrective actions identified in Part 1, which resulted in issuing RG-1.149.	N	N/A	N/A	A3	<83

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
I.B.1.1(1)	Prepare Draft Criteria (Organization & Management Long-term Improvement)	TMIAP	3b	Ref 956: Items 1-4 of I.B.1.1 are terminated based upon industry initiatives through NUMARC and the Commisssion's Policy Guidelines. This is in tune with the Commisssion policy: "..NRC is moving toward performance-based rather than prescriptive regulation.." NUREG-0933 V/I for all 7 parts of I.B.1.1 is ~760.	N	N/A	N/A	A1,D	87
I.B.1.1(2)	Prepare Commission Paper	TMIAP	3b	Same as I.B.1.1(1).	N	N/A	N/A	A1,D	87
I.B.1.1(3)	Issue Requirements for the Upgrading of Management and Technical Issues	TMIAP	3b	Same as I.B.1.1(1).	N	N/A	N/A	A1,D	87
I.B.1.1(4)	Review Responses to Determine Acceptability	TMIAP	3b	Same as I.B.1.1(1).	N	N/A	N/A	A1,D	87
I.B.1.1(5)	Review Implementation of Upgrading Activities	TMIAP	3b	Same as I.B.1.1(1). Also Ref 956 indicates that IE routinely develops inspection procedures which address new or revised requirements.	N	N/A	N/A	A1,D	87
I.B.1.2(1)	Prepare Draft Criteria (Evaluation of Org. & Manag. Involvements of Near-term Operating License Applicants)	TMIAP	3b	The issue was to be applicable to NTOLs and findings were incorporated into corresponding SERs. All 3 parts of issue I.B.1.2 were resolved.	N	N/A	N/A	A3	<83
I.B.1.2(2)	Review Near-term Operating License Facilities	TMIAP	3b	Same as I.B.1.2(1).	N	N/A	N/A	A3	<83
I.B.1.2(3)	Include Findings in the SER for each Near-term Operating	TMIAP	3b	Same as I.B.1.2(1).	N	N/A	N/A	A3	<83

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	License Facility								
I.C.1(4)	Confirmatory Analyses of Selected Transients (Operating Procedures)	TMIAP	3b	Ref 383: Confirmatory analysis of selected vendor transient calculations resulted in: 1- confirmed calcs, 2- confirmed calcs. & required changes to guidelines, 3- NRC methods need development & 4- need for additional experimental data. (NUREG-0933 reports a V/I of 1,650 person-rem/$M for all 4 parts of I.C.1.)	N	N/A	N/A	A3	<83
I.C.9	Long-term Program Plan for Upgrading of Procedures	TMIAP	3b	Ref 955: That part of the item dealing with EOPs has been implemented under I.C.1 mandated under Supplement 1 to NUREG-0737. The scope of this issue is limited to long-term upgrade of abnormal and operating procedures. Issue HF-02, Maintenance & Surveillance Program, includes addressing maintenance procedures. The remaining concerns are covered in Human Factors Program, Issue HF-01.	NUREG-0933	461	522	C	86
I.D.4	Control Room Design Standard	TMIAP	3b	Ref 1101: The objective was to establish guidelines thru IEEE and RGs. Issue I.D.1 requirements as documented in NUREG-0700 (referenced in SRP 18.1) covers the scope of Issue I.D.4.	NUREG-0933	604	1,022	C	88
I.D.5(1)	Operator Process Communications (Improved CR Instrumentation Research)	TMIAP	3b	The objective was to evaluate man-machine interface in CR. RES research was documented in NUREG/CR-2147 and a research information letter (Ref 245) made several recommendations for the future, including assessment of	N	N/A	N/A	A3	<83

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				NUREG-0700, EPRI/INPO/NRR/DOD cooperation, & modification of risk analysis programs.					
I.D.5(4)	Process Monitoring Instrumentation	TMIAP	3b	A directly related issue, Item II.F.2 in NUREG-0737, mandated that industry develop & implement PWR liquid level detection systems. Also NRC evaluated a number of systems at LOCA experiment facilities.	N	N/A	N/A	C	<83
I.F.1	Expand QA List	TMIAP	3b	Ref 1181: The Commission disapproved the proposed rule. It was determined that SERs approved statements made in SARs. Important to safety (ITS) components that were also safety related (S/R) were identified and not ITS that were non S/R. Operating plants were identifying ITS/NSR consistent with their licensing bases. The cost to licensees was estimated to be $22.25M.	N	N/A	N/A	B	89
I.F.2(1)	Assure the Independence of the Organization Performing the Checking Function	TMIAP	LOW	QA in nuclear plants was an issue of high priority. However, it was felt that resolution of QA deficiency, as described under issue I.F.2 (except for parts 2, 3, 6, and 9 that imposed new requirements), failed to address the problem of management acceptance of QA programs. Parts 1, 4, 5, 7, 8, 10 and 11 of issue I.F.2 were given LOW priority.	N	N/A	N/A	N/A	N/A
I.F.2(4)	Establish Criteria for Determining QA Requirements	TMIAP	LOW	Same as Issue I.F.2(1).	N	N/A	N/A	N/A	N/A
I.F.2(5)	Establish Qualification Requirements for QA and QC	TMIAP	LOW	Same as Issue I.F.2(1).	N	N/A	N/A	N/A	N/A

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I.F.2(7)	Clarify that the QA Program Is a Condition of the Construction Permit and Operating License	TMIAP	LOW	Same as Issue I.F.2(1).	N	N/A	N/A	N/A	N/A
I.F.2(8)	Compare NRC QA Requirements with Those of Other Agencies	TMIAP	LOW	Same as Issue I.F.2(1)	N	N/A	N/A	N/A	N/A
I.F.2(10)	Clarify Requirements for Maintenance of "As Built"	TMIAP	LOW	Same as Issue I.F.2(1)	N	N/A	N/A	N/A	N/A
I.F.2(11)	Define Role of QA in Design and Analysis Activities	TMIAP	LOW	Same as Issue I.F.2(1)	N	N/A	N/A	N/A	N/A
II.A.1	Siting Policy Reformulation	TMIAP	3b	Ref 655: The Commission determined that before taking on this issue, a new source term must be approved and the safety goals established. The issue would be reassessed in the future.	NUREG-0933	60	102	A5	84
II.C.1	Interim Reliability	TMIAP	3b	Ref 813: PRA analysis for 4 plants were completed and the results were documented in NUREGs. Other programs, such as ASAP, extended PRA modeling to other plants. This issue was primarily intended to develop and document methods to perform reliability analyses. The intent of the program was accomplished. A formal information letter would be sent to NRR to close out the issue.	NUREG-0933	931	977	A3	85
II.C.2	Continuation of Interim Reliability Evaluation Program (NREP)	TMIAP	3b	Ref 816: The purpose of this issue, as stated in NUREG-0660, was to "initiate" IREP studies on all	NUREG-0933	954	983	C	85

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				remaining operating plants. ISAP program required under Issue IV.E.5 initiated the analyses at some plants. In addition, the Severe Accident Policy Statement requires plants to perform limited-scope PRA to identify plant weaknesses. These actions fulfill the requirements of Items II.C.2 and IV.E.5.					
II.C.4	Reliability Engineering	TMIAP	3b	Ref 1131: NRC design requirements in 10CFR50 reflected reliability principles. Operational reliability could be implemented more effectively in performance-based regulation instead of a prescriptive manner. Elements of a reliability program were included in recent NRC initiatives to improve maintenance, aging, improved risk-based Tech Specs, plant performance indicators, and more recently, EGD reliability.	NUREG-0933	478	528	C	89
II.D.2	Research on Relief and Safety Valve Test Requirements	TMIAP	LOW	The portion of this issue involving valve testing was covered under II.D.1 which imposed new requirements. The second part was concerned with a possibility of ATWS because of inadequate depressurization. The issue was assigned LOW priority category. The averted public dose of 1,300 P-rem for half of all plants (55 reactors) that are potentially affected increases to 2,432 because of LR.	NUREG-0933	63	113	N/A	N/A
II.E.2.2	Research on Small Break LOCAs and Anomalus Transients	TMIAP	3b	Ref 817: The issue is concerned with uncertainties in codes used for SBLOCA analysis. Based on test	NUREG-0933	1,000	1,750	A3	85

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				results, TRAC & RELAP were modified and the issue was closed out.					
II.E.2.3	Uncertainties in Performance Predictions	TMIAP	LOW	RSB noted that many of the technical aspects of this issue are being investigated under Item II.K.3(30), "revised SBLOCA model to comply with 50.46 and Appendix K," which was in progress. Based on V/I value and overlapping activities of II.K.3(30), the issue was given LOW priority. Total averted public dose of 1,565 increases to 2,607 because of LR.	NUREG-0933	52	59	N/A	N/A
II.E.3.4	Alternate Concept Research	TMIAP	3b	RES expected Sandia to complete the study on the usefulness of installing an add-on DHR system in existing plants (NUREG/CR-2883) in 1983. The results would be used in A-45.	N	N/A	N/A	A3	<83
II.E.4.3	Integrity Check (Containment)	TMIAP	3b	NUREG/CR-4330 analyses indicated that containment leakage contributes 1-2 man-rem/RY of the total exposure for DBAs. Reduction of containment leakage by a factor of 10 reduced risk very little. This issue dealt with design basis events & not severe accidents, which are covered by IPE. NUREG-0933 V/I is ~220. Issue was HIGH priority because of high CDF. NUREG-1273 reports a dose reduction as high as 280 P-rem/RY.	NUREG-1273	N/A	N/A	E	88
II.E.4.4(4)	Evaluate Venting and Purging During Normal Operation	TMIAP	3b	Ref 382: The primary concern was failure of the purge line isolation valves. The efforts called for by the issue including NRC actions were completed. The issue was resolved without requirements based on study	NUREG-0933	17	32	A2	<83

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				results & implementation of AWB & CSB recommendations. NUREG-0933 reported a maximum V/I of 17 for combined parts II.E.4.4(4) and II.E.4.4(5).					
II.E.4.4(5)	Issue Modified Venting and Purging Requirements.	TMIAP	3b	Ref 382: A study of the radiological consequences of containment purging was conducted under II.E.4.4(4). The study results indicated that then-existing requirements were adequate.	N	N/A	N/A	B	<83
II.H.1	Maintain Safety of TMI-2 and Minimize Environmental Impacts	TMIAP	3b	The issue is programmatically resolved with appropriate management resources and priorities assigned. Ref 377 (TMIPO memorandum) stated the status of cleanup operations.	N	N/A	N/A	A3	<83
III.A.1.3(1)	Workers (Maintain supplies of thyroid blocking agent)	TMIAP	3b	The licensee was already required to maintain supplies of thyroid blocking agent as a protective measure for emergency workers.	N	N/A	N/A	C	85
III.A.1.3(2)	Maintain Supplies of Thyroid Blocking Agent (for the Public)	TMIAP	3b	A FEMA Federal Policy statement that was reviewed and accepted by the Commisssion recommended against a nationwide requirement for distribution of KI for use by the public. The V/I analysis, that was reviewed and revised by NRC, showed that KI offered an extremely small benefit in relation to its cost over the uncertainty range. The issue is receiving further review by NRC (55 FR 39768.)	NUREG/CR-1443	Ranges from $300,000 to $40M per Nodule	I/V values decrease by less than 10%	A1,E	85
III.A.3.1(1)	Define NRC Role in Emergency Situations	TMIAP	3b	Refs 408 and 548: The proposed revision to NRC Manual, Chapter 0502, was approved by the Commisssion &	N	N/A	N/A	A4	<83

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				resolved all 5 parts of the issue. Resolution of III.A.3.1 also resolves B-71, which was essentially superceded by III.A.3.1.					
III.A.3.1(2)	Revise and Upgrade Plans and Procedures for the NRC Emergency Operations Center	TMIAP	3b	Same as Item III.A.3.1(1).	N	N/A	N/A	A4	<83
III.A.3.1(3)	Revise Manual Chapter 0502, Other Agency Procedures, and NUREG-0610	TMIAP	3b	Same as Item III.A.3.1(1).	N	N/A	N/A	A4	<83
III.A.3.1(4)	Prepare Commission Paper	TMIAP	3b	Same as Item III.A.3.1(1).	N	N/A	N/A	A4	<83
III.A.3.1(5)	Revise Implementing Procedures and Instructions for Regional Offices	TMIAP	3b	Same as Item III.A.3.1(1).	N	N/A	N/A	A4	<83
III.A.3.2	Improve Operations Center	TMIAP	3b	Refs 235 & 379: Near-term improvements to Operations Center (OC) were made. A study determined the long-term needs, including a complete redesign of OC. OIE considered this issue important & wanted completion by the end of 1983.	N	N/A	N/A	A2	<83
III.A.3.4	Nuclear Data Link	TMIAP	3b	Initial study by Sandia identified several options, none of which were acceptable. The Staff determined that Emergency Response Data System developed by the Licensees, and already approved by the Commission, provided a means for electronic transfer of information, & licensees should not backfit their Emergency Response Data System.	NUREG-0933	2,100	3,530	C	85

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III.A.3.5	Training, Drills, and Tests	TMIAP	3b	Refs 235 & 379: Exercises, scheduling and training were being conducted with gradually increasing scope & had been incorporated into routine ongoing NRC operations.	N	N/A	N/A	C	<83
III.A.3.6(1)	International (Interaction of NRC & Other Agencies)	TMIAP	3b	NUREG-0728 published in 1980 described general NRC responsibilities & plans for responding to emergencies and coordination w/ other agencies. NUREG-0845 published in 1982 contained detailed procedures for interaction with others.	N	N/A	N/A	A4	<83
III.A.3.6(2)	Federal (Interaction of NRC & Other Agencies)	TMIAP	3b	Same as III.A.3.6(1).	N	N/A	N/A	A4	<83
III.A.3.6(3)	State and Local (Interaction of NRC & Other Agencies)	TMIAP	3b	Same as III.A.3.6(1).	N	N/A	N/A	A4	<83
III.B.1	Transfer of Responsibilities to FEMA (Emergency Preparedness of State and Local Governments)	TMIAP	3b	Memorandum of Understanding between FEMA and NRC was issued. FEMA and NRC had completed evaluation of the first round of joint excercise at all operating plants. Items III.B.1 and II.B.2 were combined in the evaluation.	N	N/A	N/A	A4	<83
III.B.2(1)	The Licensing Process (Implementation of FEMA & NRC responsibilities)	TMIAP	3b	Combined with Item III.B.1 above.	N	N/A	N/A	A4	<83
III.B.2(2)	Federal Guidance (Implementation of FEMA & NRC responsibilities)	TMIAP	3b	Combined with Item III.B.1 above.	N	N/A	N/A	A4	<83

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III.D.1.3(4)	Sponsor Studies to Evaluate Charcoal Adsorbers	TMIAP	3b	All four parts of Issue III.D.1.3 were combined and evaluated together. The first three parts were covered by different programs under Severe Accident Research Program (SARP). Part 4 associated with the evaluation of charcoal filter performance under accident conditions was completed and results reported in NUREG/CR-2550.	N	N/A	N/A	A3,C	<83
III.D.2.1(1)	Evaluate the Feasibility and Perform a Value-Impact Analysis of Modifying Effluent-Monitoring Design Criteria	TMIAP	LOW	All three parts of Issue III.D.2.1 were evaluated together. Minor person-rem savings might occur under accident conditions due to better direction of the field survey team. Also there was a potential risk increase of 36 P-rem for all plants, lowering the V/I estimates further. There was no accident avoidance cost since the issue was related to post-accident scenarios. The issue was assigned LOW priority. The total averted public exposure of 3,797 P-rem increases to 7,714 because of LR.	NUREG-0933	41	66	N/A	N/A
III.D.2.1(2)	Study the Feasibility of Requiring the Development of Effective Means for Monitoring and Sampling Noble Gases and Radioiodine Released to the Atmosphere	TMIAP	LOW	The issue is combined and evaluated under Issue III.D.2.1(1).	N	N/A	N/A	N/A	N/A
III.D.2.1(3)	Revise Regulatory Guides	TMIAP	LOW	The issue is combined and evaluated under Issue III.D.2.1(1).	N	N/A	N/A	N/A	N/A
III.D.2.2(1)	Perform Study of Radioiodoine, Carbon-14, and Tritium Behavior	TMIAP	3b	The item was completed in 1981 and results were documented in NUREG-0771 & 0772. This item is closed with no	N	N/A	N/A	A3	<83

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				new requirements.					
III.D.2.3(1)	Develop Procedures to Discriminate between Sites/Plants (Liquid Pathway Radiological Control)	TMIAP	3b	Analyses for Zion and IP3 were published in NUREG-0850. NUREG-1054 provided a simplified method. Environmental SRP (ESRP) 7.1.1 was drafted with no new requirement & finally published as a NUREG.	N	N/A	N/A	A3	85
III.D.2.3(2)	Discriminate between Sites & Plants that Require Consideration of Liquid Pathway Interdiction Techniques	TMIAP	3b	Same as Part III.D.2.3(1).	N	N/A	N/A	A3	85
III.D.2.3(3)	Establish Feasible Method of Pathway Interdiction	TMIAP	3b	Same as Part III.D.2.3(1).	N	N/A	N/A	A3	85
III.D.2.3(4)	Prepare a Summary Report	TMIAP	3b	Same as part III.D.2.3(1)	N	N/A	N/A	A3	85
III.D.2.4(1)	Study Feasibility of Environmental Monitors (Offsite Dose Measurements)	TMIAP	3b	The issue included installation of monitors measuring for real-time rate of exposure to noble gases and raidioiodines. The issue was combined with proposed revisions to RG 1.97. Based on a feasibility study, the NRC staff concluded that these monitors were not practical.	N	N/A	N/A	B	<83
III.D.2.5	Offsite Dose Calculation Manual	TMIAP	3b	The purpose of the issue was to develop a manual. The Offsite Dose Calculation Manual, NUREG/CR-3332 was published in 1983.	NUREG-0933	758	1,211	A3	84
III.D.3.1	Radiation Protection Plans (Worker Radiation Protection Improvement)	TMIAP	3b	The staff accepted alternative regulatory concept that recognizes industry self-policing program. A	NUREG-0933	1,880	3,439	A3,D	86

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				memorandum of understanding was issued between NRC & INPO. A trend analysis indicated ALARA was integrated into the licensees' programs.					
IV.C.1	Extends Lessons Learned from TMI to Other NRC Programs	TMIAP	3b	Ref 410: The purpose was to extend lessons from TMI to other programs, including transportation, waste management, research reactors, etc. Studies performed by NMSS resulted in the issuance of a draft BTP on waste form based on TMI experience.	N	N/A	N/A	A3	83
IV.E.5	Assess Currently Operating Plants (Safety Decision-Making)	TMIAP	3b	Work completed by NRC on this item was closely related to accomplishments in item II.C.2 on IREP. Also ISAP has covered a number of plants. The Severe Accident Policy Statement required OLs to perform plant-specific PRAs.	NUREG-0933	1,081	2,137	C	85
IV.F.1	Increase OIE Security of the Power-Ascention Program	TMIAP	3b	OIE reported that procedures have been issued to increase inspection coverage during power ascention testing. The item was resolved with changes in NRC inspection procedures.	N	N/A	N/A	A3	<83
IV.F.2	Evaluate Impact of Financial Disincentives to the Safety of Nuclear Plants	TMIAP	3b	The Staff acknowledged that there was some financial disincentive to plants. Any financial benefit associated w/ taking safety risks was small. Other financial issues were addressed under proposed 50.54(W) on insurance requirements.	N	N/A	N/A	B	<83
A-1	Water Hammer (USI)	TAP	3a	As indicated in GL 89-21, the staff concluded that the frequency and severity of water hammer occurences	N	N/A	N/A	N/A	84

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				had been significantly reduced through incorporation of design features, proper design of feedwater valve and control systems, and increased operator awareness and training. No additional requirements were imposed on the existing plants. SRP changes were implemented and guidelines for upgrading training programs was developed under Issue I.A.2.3.					
A-12	Fracture Toughness of Steam Generator and Reactor Coolant Pump Supports (USI)	TAP	3a	During licensing of North Anna a concern was raised regarding the potential for lamllar tearing and low fracture toughness of S/G and RCP support materials. Tech spec changes for North Anna to raise the S/G support temperature prior to pressurization was made. NUREG-0577 was published and SRP changes were made. The V/I analysis, although not conclusive because of uncertainties, was a supporting factor in not backfitting. The database includes the two extreme V/I values for performing initial study and hardware modifications, respectively. Since any initial assessment of support material could result in implementing modifications, the smaller V/I estimate was used in the decision not to backfit.	NUREG-0577 (Rev.1)	Ranges between ~32,000 and 80	Ranges between ~60,000 and 153	N/A	84
A-15	System and Steam Generator Decontamination	TAP	3b	Two methods of strong solution decontamination and dilute contamination solutions were considered. NUREG/CR 2963 reported the decontamination criteria.	N	N/A	N/A	A3	<83

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A-17	Systems Interactions in Nuclear Power Plants (USI)	TAP	3b	Resolution of Adverse System Interaction (ASI) had not proved to be cost-effective in past & did not guarantee that all ASIs would be identified. GL 89-18 was issued, IPE and GSIs A-46 and GSI-128, cover some ASIs. Also GL 89-21 indicates that the staff expected licensees to evaluate events in accordance with the requirements of I.C.5 mandated by NUREG-0737. A proposed change to SRP was not implemented.	NUREG-1229	N/A	N/A	C,E	89
A-21	Main Steam Line Break Inside Containment Evaluation of Environmental Conditions for Equipment Qualifications	TAP	LOW	The issue was given LOW prioritization based on the total averted dose of 618 person-rem and the V/I value of <40 person-rem/$M. Total averted public dose increases from 660 P-rem to 1,023 because of LR.	NUREG-0933	40	67	N/A	N/A
A-29	Vulnerability to Industrial Sabotage	TAP	3b	Ref 1267: Insider sabotage had not been a problem in U.S. Section 50.73 covers security that completely eliminates or mitigates sabotage. SALP ensured effectiveness of security programs. Seismic actions under A-46, extension of IPE to include flooding-type events, and NGI-128 included certain aspects of the issue. NUREG-1267, the regulatory analysis, did not include any quantitative arguments. NUREG-0933 reports a V/I of 34 & averted dose of 24,140, which placed it in MEDIUM priority.	NUREG-1267	N/A	N/A	C	90
A-31	RHR Shutdown Requirements (USI)	TAP	3a	As indicated in GL-89-21, the ability to transfer heat from the reactor to	N	N/A	N/A	N/A	78

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				the environment is an important safety function. The issue was resolved with the issuance of SRP Section 5.4.7, which was applicable to plants licensed after January 1, 1979. There was no backfit for operating plants based on evaluations.					
A-38	Tornado Missiles	TAP	LOW	There was uncertainty in estimating cost savings resulting from relaxation of missile protection requirements. The issue was given LOW prioritization instead of DROP, since new plants could be built in the indefinite future.	NUREG-0933	0.4	0.42	N/A	<83
A-39	Determination of Safety Relief Valve Pool Dynamic Loads and Temperature Limits (USI)	TAP	3a	The issue involved hydrodynamic loads in the suppression pool resulting from initial vent clearing of relief valve piping and steam quenching due to high local pool temperature. NUREGs 0763, 0783, and 0802 were published, and SRP Section 6.2.1.1.C was issued. GL 89-21 indicates that Mark I plants were covered under Issue A-7, which was backfitted. Discussions with NRC staff indicates that Mark I plants voluntarily implemented modifications.	N	N/A	N/A	N/A	83
A-41	Long Term Seismic Program	TAP	3b	Ref 692: The purpose of this issue was to gather and develop information. There were 2 programs: 1- quantification of seismic margins and 2- earthquakes in eastern U.S. These programs were intended to gather & develop information. Also other NRC plans cover some issues in A-41.	N	N/A	N/A	C	85

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
A-43	Containment Emergency Sump Performance (Former USI)	TAP	3a	NUREG-0869: CRGR concluded that the issue should not be backfitted because of potentially overstated risk by a factor of greater than "10 or 100" and underestimated costs.	NUREG-0869	Ranges between 2,344 and 6,818	Ranges between 4,652 and 13,533	N/A	86
A-45	Shutdown Decay Heat Removal Requirements (Former USI)	TAP	3b	Ref 1443: 6 plants were analyzed considering 6 different alternatives. The issue was determined to be plant-specific and not generic. Original V/Is vary widely & sometimes exceeds the 1,000 limit. IPE would address the issue. Also Issue A-44 would cover a part of it.	NUREG-1289	Varies widely and does exceed 1,000	Up by a factor of ~2 because of one-time costs	C,E	88
B-5	Buckling Behavior of Steel Containments	TAP	3b	Ref 1107: There were two parts to this issue: 1- ductility of two-way slabs which was resolved based on availability of sufficient information and 2- buckling of steel containment, which was resolved based on evaluations conducted by NRR indicating that the proposed SRP safety margins were overly conservative, and that there was general consensus that existing plants had acceptable safety margin.	NUREG-0933	495	782	B	88
B-9	Electrical Cable Penetrations of Containment	TAP	3b	Draft ORNL report indicated that then-existing requirements in IEEE 317-1976 and RG 1.65 provided adequate guidance on design of penetrations, and the issue was resolved.	N	N/A	N/A	B	<83
B-12	Containment Cooling Requirements (Non-LOCA) for BWRs Only	TAP	3b	Ref 991: The issue was resolved since: 1- normal ventilation was not essential for cold shutdown, 2- failure of the system did not cause accidents, and 3- the ventilation was	N	N/A	N/A	B	<83

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
				not considered in accident analyses.					
B-19	Thermal-Hydraulic Stability	TAP	3b	Ref 769: There were no immediate safety concerns. BWROG initiatives had resulted in Tech Specs changes for some BWRs. The new GL requirements were consistent with GDCs 10 & 12.	N	N/A	N/A	A3,D	85
B-26	Structural Integrity of Containment Penetration	TAP	3b	Ref 647: The V/I analysis in NUREG-0933 was reviewed and changed. The revised V/I value of 23 P-rem/$M and ORE of 1,200 placed the issue in DROP category. Total averted public dose increases from 373 P-rem to 630 by LR, which could place the issue in LOW category.	Ref 647	23	30	B	84
B-48	BWR CRD Mechanical Failure	TAP	3b	It appears that there were Tech Specs changes imposed to shutdown within 48 hours if an inoperable CR was detected. GE was working with utilities to replace collets.	N	N/A	N/A	A3	<83
B-54	Ice Condenser Containments	TAP	3b	Ref 648: Modifications 4 and 5 to CONTEMPT user's manual were issued providing the capability to analyze ice-condensor containments.	NUREG-0933	23	38	A3	85
B-58	Passive Mechanical Failures	TAP	3b	Ref 863: Substantial work was done in this area. Nuclear Plant Aging Research (NPAR) program covered the scope of issues C-11 and B-58. NPAR may result in changes to regulatory requirements.	NUREG-0933	210	214	C	85

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
B-60	Loose Parts Monitoring System	TAP	3b	Ref 670: SRP 4.4 referencing RG 1.133 (issued in 1981) established the requirements for CP & OL plants. The issue could not be backfitted since there was no basis for LPMS risk reduction, economical incentives to plants, and insufficient NRC resources to review and properly evaluate LPMS.	N	N/A	N/A	E	84
B-70	Power Grid Frequency Degradation and Effects on RCP	TAP	3b	Ref 83: The issue was resolved without any actions and deleted the proposed SRP changes. The rationale was based on industry experience, consideration of frequency decay in original analysis, past ORNL analysis, and capability to alleviate this conditon.	N	N/A	N/A	B	<83
C-2	Containment Penetration Due to Inadvertant Spray Operation to Determine Adequacy of Containment External Design Pressure	TAP	3b	Ref 412: Then-existing SRP Section 6.2.1.1 required the licensees to perform an analysis of containment depressurization, and therefore the issue was resolved.	N	N/A	N/A	B	<83
C-7	PWR System Piping	TAP	3b	Ref 384: Based on operating experience, then-existing ISI program for thin-walled piping was adequate. Issue C-7 was resolved without any actions.	N	N/A	N/A	B	<83
C-11	Failure and Reliability of Pumps and Valves	TAP	3b	Ref 863: Substantial work was done in this area. Nuclear Plant Aging Research (NPAR) program covered the scope of issues C-11 and B-58. NPAR may result in changes to regulatory requirements.	NUREG-0933	93	175	C	85
C-12	Primary System Vibration	TAP	3b	Ref 384: Then-existing SRP	N	N/A	N/A	B	<83

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
	Assessment			requirements, in conjunctions with guidelines of RG 1.133 and RG 1.20, were deemed sufficient to resolve the issue.					
D-1	Advisability of a Seismic Scram	TAP	LOW	San Onofre and Diablo Canyon have seismic scram systems installed. There is a potential for spurious reactor scram. The potential benefit of a seismic scram system was potentially overestimated. Therefore, the issue was given LOW priority. The total averted public dose of 790 p-rem increases to 1,430 by LR.	NUREG-0933	14	18	N/A	N/A
D-3	Control Rod Drop Accident	TAP	3b	Ref 382: This was an ACRS generic concern relative to calculational uncertainty in negative reactivity insertions (2 vs 3-D computer models). Ref. 166 indicates that the issue was closed to ACRS satisfaction. GE's analysis was adequate even though it was a two-dimentional analysis.	N	N/A	N/A	B	<83
3	Setpoint Drift in Instrumentation	NGI	3b	Ref 903: Rev. 2 of RG 1.105 referencing ISA standards was issued after receiving public comments on the proposed changes. SRP did not have to be changed. Ref 50 includes a draft qualitative regulatory analysis in support of Revision 2 to RG 1.105.	N	N/A	N/A	A2	86
4	End-of-life and Maintenance Criteria	NGI	3b	The purpose was to establish criteria for maintenance intervals and equipment aging. Then-existing SRP 3.11 and RGs 1.33 and 1.89 provided adequate guidance to the industry.	N	N/A	N/A	B	<83

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
6	Separation of BWR Control Rod from Drive	NGI	3b	Ref 382: LER review indicated that separation of control rod & drive did not increase separation or RDA probability. Previous studies indicated that the probability of fuel damage from RDA was small. Also increased GE analysis margin further minimizes consequences.	N	N/A	N/A	B	<83
12	BWR Jet Pump Integrity	NGI	3b	Ref 666: IE Bulletin 80-07 required inspection of hold down beams. Industry initiative to either replace beams or commit to an acceptable IST/ISI program resolved the issue.	NUREG-0933	284	501	D	84
14	PWR Pipe Crack	NGI	3b	Ref 865: Both long-term (SRP changes) and short-term (augmented inspection) had very low value/impact ratios (1.5E-4 to 1.5E-2 person-rem/$M). Based on low V/I's and large ORE, the issue was considered resolved.	Ref 865	<1	<1	E	86
20	Effects of Electromagnetic Pulse on Plants	NGI	3b	Ref 607: The results of a study performed by Sandia on Watts Bar was published in NUREG/CR-3069. With the Commisssion approval the issue was resolved with no requirements.	N	N/A	N/A	A3	84
22	Inadvertant Boron Dilution Event	NGI	3b	Originally the issue was recommended to be dropped based on low V/I ratios. Further study by DSI indicated that the event was not severe enough to warrent backfitting. Existing SRP 15.4.6 requirements address the concern. Also recommended deleting the SRP requirements based on low risk values.	NUREG-0933	12	21	E	85

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
35	Degradation of Internal Appurtenances in LWRs	NGI	LOW	The scope of this issue was limited to loose objects in the secondary systems since other issues (B-60, A-45, B-5, II.E.3.2) covered other aspects of loose part concerns. The issue was given LOW priority since all scores placed it in that category. The core-melt/yr value of 9E-5 could put the issue marginally in MEDIUM category. There was a large uncertainty in risk and cost value. Total averted public dose of 5,000 P-rem increases to 8,325 because of LR.	NUREG-0933	75	77	N/A	<83
36	Loss of Service Water	NGI	3b	Ref 902: The DHR & SGTR concerns of AEOD were addressed under other issues (A-45 & 67.5.2). The scope of issue 36 was limited to revision of SRPs 9.2.1 & 9.2.2 providing additional clarifications (not requirements). SRP changes were made.	N	N/A	N/A	A3	86
47	Loss of Offsite Power	NGI	3b	AEOD made 8 recommendations. NRR addressed all concerns either by referencing other Generic Issues covering them (A-44, I.C.6, I.C.1), MAPs, or provides justification in support of their resolution.	N	N/A	N/A	B,C	<83
50	BWR Reactor Vessel Level Instrumentation	NGI	3b	AEOD made 3 recommendations. All BWRs through BWROG agreed to voluntarily implement recommended modifications for 2 of 3 issues. The last concern they would not. Issue 50 was resolved and the third AEOD concern would be retained as NGI 101.	N	N/A	N/A	A2,D	84

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
61	SRV Line Break Inside the BWR Wetwell Airspace of Mark I and II Containments	NGI	3b	Ref 998: The reference summarizes the results of risk analysis (NUREG/CR-4594). The estimated CDF ranges between 2.5E-7 and 2E-10 CDF/RY and has a risk less than 5 p-rem/RY. When compared to other contributers to risk, the results did not support the need to perform a cost and V/I analysis or impose new requirements.	NUREG-0933	164	304	E	86
64	Identificaton of Protection Instrument Sensing Lines	NGI	3b	The BTP drafted in 1982 was never issued because it would constitute a new requirement. ICSB took a forwardfit position which was rejected by CRGR based on limited safety benefit and uncertain cost estimate. CRGR recommended NRC to consider this issue in a proposed RG IC 126-5, which endorses ISA Standard S67.02.	N	N/A	N/A	A2,E	<83
66	Steam Generator Requirements	NGI	3b	Ref 1147: Issue 66 was an evolution or extension of A-3, A-4 & A-5 concerning S/G tube integrity. NUREG-0844 documented results of these issues with no requirements. Issuance of the NUREG also resolved Issue 66. Some parts of Issue 66 were redirected as Staff Action Item. Issue 67 which may result in future requirements. Some were licensing issues and the remaining parts were of little value to public risk reduction. Ref 512 is a prioritization report. Parts 66.1.2, 11.9, and 66.11, which were in DROP category, are not substantially affected by LR.	Ref 512 for 66.1.1 and 66.5+6	375 and 38-58	395 97-147	B,C,E	88
69	B&W Plant Make-up Nozzle	NGI	3b	Ref 667: B&W Owners' Group reviewed	N	N/A	N/A	D	84

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	Cracking			the issue and made 4 recommendations. NRC accepted 3 recommendations as adequate to resolve the issue. All plants volunteered to implement actions (Toledo Edison challenged 1 item). NRC will follow the issue under MAP.					
80	Pipe Break Effects on Control Rod Drive Hydraulic Lines in the Drywells of BWR Mark I and II Containments	NGI	LOW	The ACRS was concerned with the effects of a LOCA (pipe whip) on CRD hydraulic systems in Mark II and III containments, which are smaller and more congested than Mark I design. The issue was assigned LOW priority status. The averted public dose of 60 P-rem/reactor increases to ~100 because of LR.	NUREG-0933	26	45	N/A	<83
82	Beyond Design Basis Accidents in Fuel Pools	NGI	3b	NUREG-1353: The risk was not greater than risk from core damage accidents due to seismic events beyond SSE. Seven alternatives were identifed in the Regulatory Analysis. The No Action alternative was selected based on V/I ratios. The worst case V/I estimate of 830 P-rem/$M (for Zion with population of 860 persons/sq. mile) could increase to over 1,000 P-rem/$M due to LR considerations. The best estimate V/I ratio shown in the database is for the alternative to install a pool spray system.	NUREG-1353	~300	~500	E	89
84	CE PORVs	NGI	3b	The issue was raised by ACRS regarding older CE plants without PORVs. The scope was limited to only	NUREG-1044	97	~130	E	90

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
				6 plants. PORVs may be beneficial for beyond design basis events. The decision on the issue was deferred, pending resolution of A-45. Per GIMCS, the issue was resolved in 1990 with a 3b classification. The Commission decided not to backfit since PORVs were not required to meet any of the regulations, and the cost-benefit analysis did not justify it.					
88	Earthquakes and Emergency Planning	NGI	3b	The issue was initiated by UCS. Proposed amendments to 10 CFR 50 App. E were issued for public comments. The Commisssion noted that based on the review of public comments, EP requirements were well-defined w/o need for amendments.	N	N/A	N/A	B	<83
90	Technical Specifications for Anticipatory Trips	NGI	LOW	The issue was given LOW priority based on low safety significance and V/I number. The V/I analysis did not consider the averted cleanup cost, especially for the PORV opening. This could have significantly increased the priority category. Total averted public dose of 172 P-rem increases to 356 because of LR.	NUREG-0933	85	105	N/A	<83
91	Main Crankshaft Failures in Transamerica DeLaval EDGs	NGI	3b	Ref 1071: TDI Owners' Group developed a program to address the issue. In response, the NRC issued an SER (NUREG-1216) concluding that the Owners' recommendations, plus additional actions, would address the issue. NUREG-1216 described a maintenance and reliability program for TDI EDGs.	N	N/A	N/A	A3,D	87

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GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
92	Fuel Crumbling During LOCA	NGI	LOW	The issue was placed in LOW priority category based on low safety significance and V/I numbers. However, it was determined that the on-going effort to devolop more realistic ECCS performance models would consider the fuel crumbling issue. Total averted public dose of 20 P-rem increases to 30 because of LR.	NUREG-0933	20	20	N/A	<83
101	BWR Water Level Redundancy	NGI	3b	Ref 1214: The issue deals with instrument sensing line break coincident with a single failure. Based on low core damage frequency (<1E-6) and high cost/benefit ratio, the issue was not backfitted. NRC concluded that design of BWRs in conjunction with operator training and procedures provided adequate protection. NUREG/CR-5112 was attached to GL 89-11 and was forwarded to all plants. The original V/I estimate assumed a 30-year plant life. V/I estimate shown in the database is for ADS modifications of Group 3 BWRs. Issue 101 resulted from Issue 50.	NUREG/CR-5112 (May 1989 errata)	909	1,606	E	<83
102	Human Errors Involving Wrong Unit or Wrong Train	NGI	3b	The results of NRC review were documented in NUREG-1192. The issue was being addressed under broader EOP inspection program, CR design review, and future integrated inspections. Also discovered that INPO reviews of plants were based on NUREG-1192.	N	N/A	N/A	A3,C, D	<83
115	Reliability of Westinghouse Solid State Plant Protection System	NGI	3b	Ref 1201: ATWS Rule did not require SCRAM system diversity for W plants. Issue 115 involves the under voltage	NUREG-1341	981	1,956	D	<83

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
				cards in the reactor protection system. Industry initiatives to enhance the system by implementing changes proposed by Westighouse resolved the issue.					
122.2	Initiating Feed and Bleed	NGI	3b	The issue was resolved based on: 1- new EOPs issued in response to TMI, 2- existing EOPs provided guidance for feed-and-bleed, 3- plants were enhancing F&B procedures, 4- NRC had program for inspection of EOPs including F&B.	NUREG-0933	2,100	4,244	B	89
122.3	Physical Security System Constraints	NGI	LOW	The issue was placed in the LOW priority category based on the safety significance values and V/I analysis. The averted public dose of 0.45 P-rem/reactor increases to 0.8 because of LR.	NUREG-0933	From 0.05 to 2.25	4	N/A	86
125.I.3	SPDS Availability (Davis-Besse Loss of All Feedwater Event of June 9 1985, Long-Term Actions)	NGI	3b	GL 82-33 (Supplement 1 to NUREG-0737) required implementation of SPDS in response to TMIAP item I.D.3 requirements. It was determined that 2/3s of plants did not have SPDS operational. GL 89-06 enclosing NUREG-1342 was issued. Based on NRC's effort in pursuing I.D.2, this issue was resolved.	NUREG-0933	670	982	A2	89
125.II.7	Automatic Isolation of Feedwater During SG Line Break	NGI	3b	Ref 1134 including NUREG-1332: CDF and risk reduction associated with removal of auto. AFW isolation signal was on the order of 1E-7 and 40 P-rem per plant, respectively. The scope of issue might also increase the risk for some plants with no flow restrictors. Issue resolved with no action.	NUREG-1332	130	205	E	88

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
125.II.14	Remote Operation of Equipment Which Must Now Be Operated Locally	NGI	LOW	The issue is placed in the LOW priority category based on the V/I value calculated for a worst case scenario. The averted public dose of 2.3 P-rem/reactor increases to 4.6 because of LR.	NUREG-0933	46	93	N/A	86
127	Testing and Maintenance of Manual Valves in Safety Related Systems	NGI	LOW	A V/I analysis was not peformed because of the inability to ascertain the expected reduction in public risk. However, the risk was judged to be low. An Information Notice was sent out.	N	N/A	N/A	N/A	N/A
131	Potential Seismic Interaction Involving the Movable In-core Flux Mapping System Used in Westinghouse-Designed Plants	NGI	S	The issue concerns a potential RCS leakage during a seismic event above and beyond that analyzed in SARs and is limited to Westinghouse plants. The issue was given a MEDIUM priority rank based on the estimated core frequency values (6.42E-6/RY). Based on RES management review, it was decided that the issue could more effectively be addressed under IPE's external event.	NUREG-0933	149	262	C	90
134	Rule on Degree and Experience Requirements	NGI	3b	The Commission issued a Policy Statement in 1989 on Education Requirements for the SRO and SS, and withdrew the proposed rule on the subject.	N	N/A	N/A	A1	<83
HF1.2	Engineering Expertise on Shift	HF	3b	The issue was resolved with issuance of Policy Statement in October 1985, and no new requirements were established.	N	N/A	N/A	A1	86

GSI IDENTIFICATION	TITLE	ISSUE TYPE	CATE GORY	DECISION RATIONALE	V/I REFERENCE	OLD V/I P-rem/$M	REV. V/I P-rem/$M	RES. BASIS	RES. DATE
HF1.3	Guidance on Limits and Conditions of Shift Work	HF	3b	The issue was resolved with the issuance of GL 82-12 and GL 82-16, and no new requirements were established.	N	N/A	N/A	A1	86
HF-8	Maintenance and Surveillance Program	HF	3b	The issue was resolved with issuance of Policy Statement on Maintenance, and no new requirements were established.	NUREG-0933	26	27	A1	88

APPENDIX C

Projected Populations Around Nuclear Power Plants in Years 2000 and 2010

Nuclear Plant	Year 2000	Year 2010
Arkansas One	210000	220000
Beaver Valley	3840000	3910000
Bellefonte	1150000	1230000
Big Rock Point	210000	210000
Braidwood	4650000	4750000
Browns Ferry	810000	850000
Brunswick	250000	270000
Byron	1030000	1060000
Callaway	420000	430000
Calvert Cliffs	3140000	3260000
Catawba	1730000	1860000
Clinton	770000	790000
Comanche Peak	1310000	1460000
Donald C. Cook	1310000	1350000
Cooper	190000	200000
Crystal River	490000	550000
Davis-Besse	1990000	2050000
Diablo Canyon	330000	350000
Dresden	7050000	7200000
Duane Arnold	660000	690000
Farley	410000	440000
Fermi	5630000	5840000
Fitzpatrick	810000	800000
Fort Calhoun	800000	830000
Ginna	1120000	1100000
Grand Gulf	380000	410000
Haddam Neck	3770000	3910000
Shearon Harris	1570000	1690000
Hatch	360000	380000
Hope Creek	4960000	5050000
Indian Point	15000000	14890000
Kewaunee	670000	690000
La Salle	1220000	1260000
Limerick	7070000	7170000
Maine Yankee	700000	750000
McGuire	1900000	2040000
Millstone	2860000	2960000
Monticello	2360000	2520000
North Anna	1250000	1340000
Nine Mile Point	810000	790000
Oconee	1080000	1170000

Projected Populations Around Nuclear Power Plants
in Years 2000 and 2010

Nuclear Plant	Year 2000	Year 2010
Oyster Creek	4190000	4300000
Palisades	1220000	1260000
Palo Verde	1330000	1450000
Peach Bottom	4850000	5010000
Perry Nuclear	2530000	2570000
Pilgrim	4590000	4690000
Point Beach	640000	660000
Prairie Island	2490000	2650000
Quad-Cities	760000	780000
Rancho Seco	2200000	2360000
River Bend	860000	920000
H.B. Robinson	810000	880000
Salem	4910000	5000000
San Onofre	5950000	6400000
Seabrook	3900000	4010000
Sequoyah	1020000	1090000
Shoreham	5400000	5420000
South Texas	300000	320000
St. Lucie	780000	860000
Summer	990000	1080000
Surry	2080000	2240000
Susquehanna	1510000	1530000
Three Mile Island	2210000	2240000
Trojan	2160000	2430000
Turkey Point	3070000	3420000
Vermont Yankee	1580000	1620000
Vogtle	690000	750000
Waterford	2130000	2290000
Watts Bar	1040000	1120000
WNP-2	310000	330000
Wolf Creek	210000	220000
Yankee Rowe	1760000	1800000
Zion	7720000	7900000
Total Population	1.6E+08	1.7E+08

Source: Interim Draft for Generic Environmental Impact Statement for Licence Renewal of Nuclear Power Plants, dated October 15, 1990

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Washington, DC 20555

10. SUPPLEMENTARY NOTES

11. ABSTRACT *(200 words or less)*

The U.S. Nuclear Regulatory Commission (NRC) is developing regulations for renewing the operating licenses of nuclear power plants to ensure that they operate safely beyond the present license terms of 40 years. One consideration relates to past resolutions of generic safety issues (GSIs) that did not result in backfit requirements on the licensees. The consideration of an additional operating term of 20 years which the proposed license renewal rule allows, could have retrospective implication for the basis of those GSI resolutions. As part of its technical support to the NRC for the development of license renewal regulations, MITRE has performed an independent review of the GSIs to identify those that could be potentially affected by license renewal considerations. This report describes the screening process and the results of that work.

12. KEY WORDS/DESCRIPTORS *(List words or phrases that will assist researchers in locating the report.)*

generic safety issues
license renewal
nuclear plants

13. AVAILABILITY STATEMENT

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SCREENING OF GENERIC SAFETY ISSUES FOR LICENSE RENEWAL CONSIDERATIONS

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