April 30, 1996

FOR: The Commissioners

FROM: James M. Taylor /s/
Executive Director for Operations

SUBJECT: COMPARISON OF COSTS OF GENERIC REQUIREMENTS ESTIMATED BY THE NRC WITH THOSE ESTIMATED BY INDUSTRY; STAFF EFFORT EXPENDED ON GENERIC ACTIVITIES

- PURPOSE:
- BACKGROUND:
- DISCUSSION:

PURPOSE:

To provide the Commission with the information requested in a January 19, 1996, staff requirements memorandum (SRM) concerning (1) comparison of costs of generic requirements estimated by the NRC with those estimated by industry and (2) staff effort expended on generic activities by each office.

BACKGROUND:

On December 19, 1995, NRC staff briefed the Commission on the mechanism for addressing generic safety issues. After this briefing, an SRM was issued from John C. Hoyle to James M. Taylor on January 19, 1996. Among other requests, the SRM asked the staff to review existing licensee costs associated with the resolution of several of the most significant generic issues where licensee cost data are reasonably available in order to compare actual licensee costs with costs estimated in the regulatory analyses and to provide this comparison to the Commission. This is provided in Attachment 1. The SRM also requested a summary of the staff effort expended in each office on generic activities. This is provided in Attachment 2.

In addition, the SRM stated that there should be one agency-wide generic issue resolution tracking system. The staff will report its progress on developing such a tracking system in the near future.

This is not the first time the staff has examined comparisons of the costs of generic requirements estimated by the NRC with those estimated by industry. On August 3, 1989, Edward L. Jordan sent a letter to the Director of the Office of Nuclear Reactor Regulation (NRR) titled, "Responses to AEOD's Survey on Backfitting." The referenced survey requested licensees' views on the conduct of the backfit process. The study demonstrated that the averages of the cost estimates by the NRC and the estimates of actual costs by the utilities for the items examined were generally similar. However, there were several instances where the costs reported by individual licensees greatly exceeded the NRC cost estimates. These were considered to be outliers because the average cost estimates were similar.

DISCUSSION:

The process by which generic issues are resolved is discussed here as a framework for the discussion of cost estimates and staff effort associated with resolution of generic issues. The process for resolving generic issues has evolved over time to assure adequate public health and safety while minimizing the burden on industry. In 10 CFR 50.109, the NRC defines backfitting as "the modification of or addition to systems, structures, components, or design of a facility; or the procedures or organization required to design, construct or operate a facility; any of which may result from a new or amended provision in the Commission rules or the imposition of a regulatory staff position interpreting the Commission rules that is either new or different from a previously applicable staff position." The rule provides the considerations associated with imposing backfits on licensees--whether they be rules, generic communications, or licensee-specific actions. The rule requires a systematic and documented process that considers installation costs and continuing costs associated with a backfit. In 1981, the Commission established the Committee to Review Generic Requirements (CRGR) to review directives and requests to reactor licensees from various components of the NRC staff. The CRGR has the responsibility to review and recommend to the Executive Director for Operations (EDO) approval or disapproval of requirements or staff positions to be imposed by the NRC staff on one or more classes of power reactors. This review applies to NRC staff proposals to change (increase or reduce) existing requirements or positions. The objectives of the CRGR process are to eliminate or remove any unnecessary burdens placed on licensees, reduce the exposure of workers to radiation in implementing these requirements, and conserve NRC resources while, at the same time, assuring adequate protection of the public health and safety and furthering the review of new cost-effective requirements and NRC staff positions. This process applies generally to all NRC regulatory action affecting licensees.

The nuclear industry has in the past criticized NRC for using generic communications to impose new requirements. New requirements are now generally imposed through the rulemaking process and the staff generally limits its use of generic communications to enforcing existing regulations when licensees have not met current requirements. The qualifier "compliance" identifies most such generic communications. In 10 CFR 50.109, the NRC states that a regulatory analysis is not required when "a modification is necessary to bring a facility into compliance with a license or the rules or orders of the Commission, or into conformance with written commitments by the licensee." Because of this exemption, quantitative analyses have generally not been performed for generic communications issued recently, so cost estimates are not readily available for the latest generic letters and bulletins.

The staff has worked with NEI to identify new regulatory requirements where both industry and the staff did cost assessments on a reasonably comparable basis during the last five years. Cost evaluation data of actual rules and generic communications are included as Attachment 1. One evaluation indicated that industry estimates of cost were higher than those contained within the NRC regulatory analyses. The estimated industry costs were greater by as much as a factor of three depending on the assumed discount rate. Other evaluations use implied cost data from available industry documentation. One difference in assumptions that exists is the costs associated with labor where the staff used a marginal labor cost, meaning that labor is available and the cost is just the wage cost for the additional hours, whereas industry used a burdened labor cost, meaning that new personnel were assumed to be needed for the hours (with the attendant overhead cost). This may account for some of the cost variance while other differences in analysis assumptions may account for the rest. The limited detail and limited comparability of the available cost data do not allow any more definitive conclusions as to why the differences exist.

The annual effort expended by each office on generic activities is provided in Attachment 2. The direct staff effort expended on generic activities includes the effort expended on (1) identification, screening, and prioritization, (2) technical evaluation, (3) development of technical and regulatory positions, and (4) the review and issuance of

these positions including consideration of public comments. Staff effort expended on rulemaking activities and on implementation of generic requirements by individual plants (as part of multi-plant actions) is not included in the estimates. NRR and NMSS identify new generic issues by evaluation of operational data and develop the resolution for the generic issues that are identified, with priority given to those of highest safety significance. The prioritization of Generic Safety Issues (those generic issues which may affect the design, construction, or operation of all, several, or a class of licensees and that may have the potential for safety improvements and promulgation of new or revised requirements or guidance) is primarily performed by RES. AEOD identifies generic issues through examination of industry trends and patterns.

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Attachments:
1. Generic Issue Cost Evaluation Process
2. Summary of Estimated Annual Staff Effort Expended by Each Office on Generic Activities

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ATTACHMENT 1

GENERIC ISSUE COST EVALUATION PROCESS

- ACTUAL COST COMPARISONS
  - 1. IWE/IWL (Proposed Rule)
  - Industry Analysis
  - 2. A-47 Implementation
  - 3. Appendix J Revisions
  - 4. Fitness-for-Duty (Proposed Rule)

This document identifies several rulemakings and one generic letter, some of which have been promulgated and some of which are currently under development, and compares (1) the costs estimated in the regulatory analysis to (2) the licensees' actual costs (or estimated costs in the case of proposed rules). A discrepancy exists and will continue to exist in the costs associated with labor. NRC regulatory analyses generally assume that the labor costs are marginal, meaning that labor is available and the cost is solely the hourly wages for the additional work. Many industry estimates assume that new personnel will be needed for working the additional hours, assuming additional overhead costs that were not included in the regulatory analyses. Our initial search was for those rules that imposed a new requirement on licenses, and therefore a new cost. However, it became evident that a number of rules recently promulgated or currently being developed actually decrease licensee costs, so several of these were included in the evaluation. In addition to those evaluated in the following cost comparisons, other rules that decrease licensee costs include: (1) Amendment to 10 CFR 20.305, "Disposal of Waste Oil by Incineration" (estimated savings of $56 million); (2) "Requalification Requirements for Licensed Operators" (estimated savings of $37 million); and (3) "Frequency of Radiological Effluent Reports" (estimated savings of $17 million). Similar to the rulemaking experience, several generic communications have resulted in savings to licensees. A good example is the implementation of voltage-based inspection criteria for steam generator tubes; one licensee has estimated a savings of $11 million per year because of adoption of voltage-based inspection criteria.

The nuclear industry has in the past criticized NRC for using generic communications to impose new requirements. New requirements are now generally imposed through the rulemaking process and the staff generally limits its use of generic communications to enforcing existing regulations when licensees have not met current requirements. The qualifier "compliance" identifies most such generic communications. In 10 CFR 50.109, the NRC states that a regulatory analysis is not required when "a modification is necessary to bring a facility into compliance with a license or the rules or orders of the Commission, or into conformance with written commitments by the licensee." Because of this exemption, quantitative analyses have generally not been performed for generic communications issued recently, so cost estimates are not readily available for the latest generic letters and bulletins.

ACTUAL COST COMPARISONS

- Proposed incorporation of Subsections IWE and IWL (inspection requirements for containment) of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) into 10 CFR Part 50 Proposed Rule
- Implementation of steam generator overfill requirements (as recommended by Unresolved Safety Issue (USI) A-47, "Safety Implication of Control Systems," for Combustion Engineering (CE) plants (Generic Letter 89-19))
- 10 CFR Part 50, Appendix J revisions (local leak-rate test and integrated leak-rate test scope and frequency) Regulatory Relaxation
- Proposed 10 CFR Part 26 revisions (scope of fitness-for-duty programs) Regulatory Relaxation

1. IWE/IWL (Proposed Rule)

Containment testing and examination are provided for in General Design Criteria 16 and 53, and in 10 CFR Part 50 (Appendix J). The existing regulations have no specific guidance on how to conduct the necessary containment examinations. Information on how to conduct these examinations exists, however, in Subsections IWE and IWL of the ASME Boiler and Pressure Vessel Code. NRC proposes to incorporate the detailed requirements found in Subsection IWE and IWL into 10 CFR 50.55a. The Commission determined that this backfit was necessary to ensure compliance and that a backfit analysis was not required. However, because the Commission believes that this final action would substantially increase safety and that the direct and indirect costs of implementation are justified in view of the increased protection, a backfit analysis has been performed in support of a finding that this rule constitutes a substantial increase in public health and safety.

The final rule will require each licensee to develop and implement an initial inservice inspection (ISI) plan and 10-year updates to the ISI plan. This estimate includes labor hours for developing the initial ISI plan; labor hours to update the plan; labor hours to perform periodic examinations; labor hours for revising procedures; and labor hours for training and certifying personnel. The costs are detailed below and are all in 1994 dollars (for elements that are cost adjusted to reflect 1994 value, the low estimate is for a 10 percent real discount rate and the high estimate is for a 5 percent real discount rate):

Lifetime costs estimated by NRC staff for a facility presently using Regulatory Guide 1.35, Rev. 3:

	High Estimate	**Low Estimate**

Cost per Reactor	$1108K	$735K

Lifetime costs estimated by NRC staff for a facility presently using Regulatory Guide 1.35, Rev. 2:

	High Estimate	Low Estimate
Cost per Reactor	$789K	$455K

The costs associated with the use of Regulatory Guide 1.35, Rev. 3 are higher than for the use of Rev. 2 because Rev. 3 changed the tendon detensioning and sampling requirements such that a cost savings would be realized. It was assumed for these cost estimates that those savings would no longer be applicable.

Industry Analysis

The industry has analyzed the additional costs to the licensees to implement the proposed rule. This estimate includes labor hours for developing the initial ISI plan; labor hours to update the plan; labor hours to perform periodic examinations, including time for reviewing instructions; labor hours for revising the many licensee internal procedures and instructions to comply with the new ISI plan; labor hours for training and certifying personnel to the 1992 code requirements; and labor hours for developing exemption requests to the NRC, responding to the staff comments, and revising the ISI plan and procedures accordingly. An average labor cost of $60 per hour was used. The estimated cost of the proposed rule was in excess of $100 million industry-wide during the first 10-year interval ($1.18 million cost per plant). The NRC analysis discussed above contains lifetime costs of implementation. The NRC analysis indicates that costs for only the first interval would be between $374K and $463K, based on a 10 percent and 5 percent real discount rate, respectively. Thus, the industry cost estimate is approximately 150 percent to 300 percent higher than the NRC regulatory analysis.

However, at least one licensee (Northeast Utilities) has indicated in an April 25, 1994, letter to the Commission that its estimated costs for implementing the program would be approximately $850K, which is well within the bounds of the costs in the staff's regulatory analysis.

2. A-47 Implementation

NRC identified overfill events in pressurized-water-reactor steam generators (SGs) as potentially significant transients that could lead to unacceptable consequences. Review of how control system failures contribute to these events was a major part of the Unresolved Safety Issue (USI) A-47 program. This program evaluated control system failures that could be more severe than those previously analyzed in the final safety analysis report.

The specific core-melt scenario of concern is an overfeed event that leads to flooding of the steamline with relatively cold feedwater, a possible water hammer, an unisolable main steamline break (MSLB) outside containment, multiple SG tube ruptures (SGTRs) and failure of emergency core cooling due to exhaustion of the refueling water storage task (RWST) inventory. The estimated core-melt frequency due to overfill was approximately $4 \times I0^{-6}$ per year.

To reduce the risk from SG overfill, Generic Letter (GL) 89-19, "Request for Action Related to Resolution of Unresolved Safety Issue A-47," recommended that all pressurized-water reactors provide automatic SG overfill protection, and that plant procedures and technical specifications for all plants contain provisions to periodically verify the operability of the overfill protection.

NUREG-1218 (Regulatory Analysis for Resolution of USI A-47, dated July 1989) used data from draft NUREG-0844 (NRC Integrated Program for the Resolution of Unresolved Safety Issues A-3, A-4, and A-5 Regarding Steam Generator Tube Integrity, dated April 1985), which established the probability of tube rupture due to an MSLB as 0.034. The total probability of tube rupture due to an MSLB was revised to 0.0505 in the final NUREG-0844 report, dated September 1988. Although the overall SGTR probability was increased, the probability of rupturing more than 10 SG tubes was decreased by nearly an order of magnitude, to 0.0005 from 0.003. The core melt estimate is dominated by the sequence of rupturing greater than 10 SG tubes and the shorter time to exhaust the RWST inventory. Combustion Engineering (CE) stated that replacing pertinent probabilities with revised information from the final NUREG-0844 report results in a reduction in exposure in NUREG/CR-3958 from 570 man-rem to 183 man-rem. On the basis of an acceptance threshold of $1000/man-rem reduction, the benefit associated with installation of an overfill protection system did not justify the approximate installation cost of $200,000 that NRC concluded was appropriate in NUREG-1218. However, industry did not disagree with the cost estimated for the installation of an overfill protection system.

On the basis of this discussion, the staff revised the recommendations of the generic letter to state that if the licensee for each CE plant had: (1) implemented the appropriate operator training and procedures to address SG overfill events and (2) performed an evaluation to confirm the applicability of the CE Owners Group analyses its plant, then the automatic SG overfill protection system is not needed, and the plant met the recommendations of Generic Letter 89-19.

3. Appendix J Revisions

Leakage-rate testing on nuclear power plant containments is required by 10 CFR Part 50 (Appendix J). The NRC has implemented an initiative to identify performance-based alternatives to the previous Appendix J requirements which would still meet the agency's safety goals.

Previously, local leakage-rate tests (LLRTs) of containment penetrations had to be performed at intervals that do not exceed two years, with the exception that air-lock testing had to be performed at least every six months. As these tests need not be performed on the critical path, and as the tests are usually performed by utility personnel using equipment already owned by the utility, costs of LLRTs are estimated simply on the basis of the required labor hours. The cost for a full battery of LLRTs for a typical reactor was estimated to be about $165,000.

Previously, integrated leak rate tests (ILRTs) of containment integrity had to be performed at least three times in a 10-year period, with the third test coinciding with the 10-year inservice inspection. Unlike LLRTs, utilities frequently contract for consultants to supervise the ILRTs and rent the air compressors and air handling systems needed for the tests. Thus, equipment rental costs also need to be considered. Moreover, ILRTs, which require specifically rigging the containment for the test, are always conducted on the critical path. Therefore, replacement power costs must be also be included in estimating the costs of conducting ILRTs. The total cost for an ILRT is estimated to be $1.89 million.

The NRC has identified 15 alternatives to the previous testing requirements which allow licensees more flexibility to test containment leakage while still meeting the agency's safety goals. The provisions of the alternatives range from those of Alternative 8, which maintains the current Appendix J acceptance criteria and ILRT frequency but relaxes LLRTs to "lower-reliability" penetrations only during refueling outages, to those of Alternative 15, which relaxes the current Appendix

J acceptance criteria, reduces the ILRT frequency to one per 20 years, and relaxes LLRTs to "lower reliability" penetrations only during refueling outages.

For the total savings listed below, the low estimate is for a 10 percent real discount rate and the high estimate is for a 5 percent real discount rate, and both are based on a future reactor life of 20 years:

	High Estimate	Low Estimate
Savings per Reactor (Alternative 8)	$0.47 million	$0.33 million
	High Estimate	**Low Estimate**
Savings per Reactor (Alternative 15)	$7.9 million	$5.4 million

No industry estimates were available for comparison.

4. Fitness-for-Duty (Proposed Rule)

In its SRM of March 27, 1991, following a briefing on implementation issues on March 7, 1991, the Commission directed that the fitness-for-duty (FFD) rule be changed to ensure that all FFD program personnel were subject to testing. To clarify the Commission's original intent that, although some of these people work outside the protected area, licensees must carefully select and monitor persons responsible for administering the program based upon the highest standards for honesty and integrity. This addition to the rule includes the majority of the one-time initial costs of $44K industry-wide (the specific breakdown is $33K for the mentioned addition, and $11K for requiring onsite testers to determine validity of specimens on site).

Other revisions to the rule that increase costs are assurances that appeal rights apply to all violations, more restrictive specimen temperature ranges, and return-to-duty testing after extended absences. These provisions result in an estimated additional annual burden of $350K industry-wide.

Provisions of the rule that result in cost savings include extension of refresher training intervals, acceptance of generic portions of training provided by another licensee, acceptability of personnel covered by other acceptable FFD programs, and clarification of testing requirements. These changes result in an estimated annual savings of $27.5 million industry-wide.

Thus, the net annual savings industry-wide is approximately $27 million. For the total savings listed below, the low estimate is for a 10 percent real discount rate, while the high estimate is for a 5 percent real discount rate):

	High Estimate	Low Estimate
Savings per Reactor	$4.3 million	$2.8 million

Although industry data were not readily available for pricing out this proposed rule, the costs associated with implementation of FFD programs used to determine the savings correlated well with FFD program cost data that NUMARC gave to the NRC in 1991, indicating that the savings estimates should be representative of industry estimates.

ATTACHMENT 2

SUMMARY OF ESTIMATED ANNUAL STAFF EFFORT EXPENDED BY EACH OFFICE ON GENERIC ACTIVITIES

The direct staff effort expended on generic activities includes the effort expended on (1) identification, screening, and prioritization, (2) technical evaluation, (3) development of technical and regulatory positions, and (4) the review and issuance of these positions including consideration of public comments. Staff effort expended on rulemaking activities and on implementation of generic requirements by individual plants (as part of multi-plant actions) is not included in the estimates. NRR and NMSS identify new generic issues by evaluation of operational data and develop the resolution for the generic issues that are identified, with priority given to those of highest safety significance. The prioritization of Generic Safety Issues (those generic issues which may affect the design, construction, or operation of all, several, or a class of licensees and that may have the potential for safety improvements and promulgation of new or revised requirements or guidance) is primarily performed by RES. AEOD identifies generic issues through examination of industry trends and patterns. The annual effort expended by each office on generic activities is tabulated below.

OFFICE	DIRECT TECHNICAL FTE	$K (CONTRACTOR SUPPORT)
AEOD	29	9,300
NMSS	4	0
NRR	67	5,000
RES	7	3,900
TOTAL	107	18,200