



OFFICE OF THE
SECRETARY

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

November 10, 1988

MEMORANDUM FOR: Victor Stello, Jr.
Executive Director for Operations

FROM: Samuel J. Chilk, Secretary

SUBJECT: STAFF REQUIREMENTS - SECY-88-277 - AMENDMENT
TO 10 CFR 50 RELATED TO MAINTENANCE OF
NUCLEAR POWER PLANTS

This is to advise you that the Commission (with Chairman Zech and Commissioners Carr and Rogers approving, Commissioner Roberts disapproving, and Commissioner Curtiss not participating) has approved publication in the Federal Register of the proposed rule for public comments, subject to the updates transmitted in your memorandum dated October 13, 1988, and the following comments and changes.

I. In regard to the Federal Register Notice:

1. The Federal Register should solicit public comments on the following:
 - a. The Commission believes that the proposed maintenance rule should be considered under 10 CFR 50.109(a)(4) of the backfit rule which would exempt the maintenance rule from backfit requirements based on the precepts that effective maintenance is necessary to assure adequate public protection and that the proposed rule codifies and standardizes previously existing Commission requirements, both explicit and implicit, in plant technical specifications, licensee safety analysis reports, and 10 CFR 50, Appendix B. The Commission requests public comment concerning the need for a backfit analysis for this rulemaking.
 - b. The Commission believes that the inclusion or balance of plant (BOP) equipment in the proposed maintenance rule is necessary and proper. However, the Commission also recognizes that some licensee maintenance programs, as presently configured, apply to structures, systems, and components that are, without question, irrelevant to protection of public health and safety from radiological hazards associated with the operation of the nuclear power plant. The Commission

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requests public comment concerning what limitation, if any, should be placed on the final maintenance rule to provide some licensee flexibility in this regard.

- c. The Commission desires to establish criteria within the maintenance rule which would form the basis for determining when a maintenance program is fully effective and additional improvement is not warranted from a safety standpoint. Such criteria might be either quantitative or qualitative and could be based on specific measurable attributes, on overall plant performance, on program results, or on other attributes. The Commission requests public comment concerning the need for such criteria, the form of such criteria, and the criteria themselves.
- d. The Commission believes that individual worker accountability plays an important role in an effective maintenance program. The Commission is therefore soliciting comments on the means for incorporating this consideration into a licensee's maintenance program.
-  e. The Commission plans to issue by November 1989, a Regulatory Guide establishing standards and criteria for determining what constitutes an effective maintenance program. This Regulatory Guide is being developed in parallel with the final rulemaking. The Commission encourages the industry to establish its own standards and acceptance criteria. If an acceptable industry standard is available in this time frame, the Commission will consider endorsing the industry standard in the Regulatory Guide. An industry commitment to develop a maintenance standard, consistent with the Commission's schedule to issue a final Regulatory Guide by November 1989, would be necessary during this public comment period.
-  f. Commissioner Roberts had the following views: "I cannot join the majority in supporting the proposed rulemaking on maintenance. In order to have the benefit of the public's comments, it has been my custom to agree to publication of proposed rulemakings. I cannot do so in this instance. I have asked one fundamental question. What are we trying to accomplish with this rule that cannot more effectively and innovatively be accomplished without a regulation? I have not received a

satisfactory answer. I do not believe the case has been made that licensees do not have established maintenance programs. Most importantly to me, there has been no demonstration that this rule would improve implementation of existing programs. Neither have I been provided with compelling documentation on what the problem is and how, specifically, this rule will fix it. On the contrary, the trends staff has provided show continued improvement in the maintenance area.

The proposed rule the Commission is now publishing fails to provide a basis for determining when a maintenance program is effective or when improvements are "appropriate." We are even delaying publication of the accompanying Regulatory Guide until the final rule. Without being afforded the opportunity to review this implementation document, the Commission is left in the position of approving a specious rule. It is no wonder that this rulemaking would elicit such widespread opposition. The public is being ask to comment on a rule of form but no substance. I believe it would be more productive to delay issuance of this proposed rule until the draft regulatory guide is available for comment. Only then can we receive meaningful comments on the rulemaking package.

I am concerned that this rule goes beyond our authority. I can not agree with a rule that would have the NRC regulating maintenance on all systems, structures and components regardless of whether they have a nexus to radiological safety or not. I am troubled by the attitude demonstrated when we request public comments on what limitations, if any, should be placed on the final rule to address structures, systems and components that are "without question irrelevant (my emphasis) to the protection of public health and safety." This clearly abdicates our responsibility to show that a regulation is needed. We must ask ourselves: are we proceeding with this rulemaking for the sake of the rule itself? As attested to by the cases where the Commission cited licensees, the NRC already has the authority to enforce compliance in the maintenance area.

The arguments advanced by both the staff and the Commission in trying to comply with the requirements of the backfit rule have played a

significant role in my decision not to support this proposed rulemaking. The staff argument for the rule's compliance with 50.109 has been made on the basis of cost. The staff states that the backfit analysis shows that "...the rule will provide a substantial increase in the protection of the public health and safety without any additional cost." I am skeptical of the assumptions made in the backfit and regulatory analysis and request comments on both these documents. I also request comments on the views of the ACRS. They state that "...there are characteristics of regulations, and especially the way in which they are typically enforced, that lead us to believe that, under a rule, a move toward uniformity would occur, and this is likely to decrease the effectiveness of some of the better existing programs." I share their concern that the existence of this rule could make things worse and diminish rather than enhance the protection of the public.

Regarding "adequate protection," the Commission appears to be saying that since effective maintenance is necessary to maintain adequate protection, this rule should be excepted under 50.109(a)(4). This exemption would prohibit staff from taking implementation costs into consideration. However, it would require that a documented evaluation be prepared for public comment. Therefore my opposition to the exception is not to the exception itself but to the precedential nature of the use of the adequate protection argument. Let me state that I too strongly believe that effective maintenance is necessary to assure that nuclear power plants are safe and to provide adequate protection to the public. I also believe, just as strongly, that this rule is not necessary to provide that protection, and that as the ACRS noted it may well have the opposite effect. I believe that we can not afford to be careless about the use of the "adequate protection" argument for exception to the backfit rule. The Commission is in litigation about this very issue. The Commission addressed this point in detail under the heading "Adequate Protection" in the Response to Comments on the final 10 CFR Part 50 Revision of Backfit Process for Power Reactors. Let us remember that there had been concerns that in dealing with the backfit rule, the Commission would use the phrase "adequate protection" arbitrarily. The Commission could unwittingly be giving credence to that view.

Additionally, it seems to me that the Commission position as stated in the above comment 1.a is internally inconsistent. The Commission needs to recognize that when it states that this rule is needed to maintain adequate protection, it is saying that the current operating plants now pose undue risk to the public which we are presently tolerating. If I believed that, I would suggest (as I'm sure would the rest of the Commission) that this rule become immediately effective. This is clearly not the case. As the Commission in the very same comment shows, "...the proposed rule codifies and standardizes previously existing (my emphasis) Commission requirements, both explicit and implicit, in plant technical specifications, licensee safety analysis reports, and 10 CFR 50, Appendix B." It seems to me that the Commission can't have it both ways.

I request comments on my views."

2. The attached revised cost table (Attachment-1) as well as the accompanying narrative should be incorporated in the draft Regulatory Analysis.
3. The editorial changes and additions described in Attachment-2 should be incorporated into the Federal Register Notice.

(EDO)

(SECY Suspense: 11/18/88)

-  II. The staff is to continue, on an integrated and high priority basis, its effort to develop a final Regulatory Guide on Maintenance of Nuclear Power Plants by November 1989. The final rulemaking package is due to the Commission by April 21, 1989. The final rule is to be accompanied by a draft Regulatory Guide or industry plan, standards and acceptance criteria, even in preliminary form, and schedule for developing complementary standards for maintenance which the Commission would consider endorsing in the final Regulatory Guide. The industry schedule must be consistent with the plan to issue the final Regulatory Guide in November 1989.

The Commission intends to postpone the effectiveness of the final rule pending publication of the final Regulatory Guide and a reasonable period for licensees to establish compliance with this rule.

(EDO) (Final Rule and Draft Reg Guide,

SECY Suspense: 4/21/89 PRIORITY)

(EDO) (Final Reg Guide, SECY Suspense: 11/89 PRIORITY)

Additional Commissioner comments are incorporated in their vote sheets (Attachment-3).

Attachments:
As stated

cc: Chairman Zech
Commissioner Roberts
Commissioner Carr
Commissioner Rogers
Commissioner Curtiss
OGC
GPA

ATTACHMENT-1

REVISED COST TABLE

**Table S.1. Total Industry Costs Over 30 Years for All Plants
(1988 Present Worth in Millions of 1988 Dollars)**

Industry Cost Element	Option 1			Option 2			Option 3			Option 4		
	L	B	U	L	B	U	L	B	U	L	B	U
Maintenance Plan	3	4	5.9	3	4	5.9	3	4	5.9	3	4	5.9
Recordkeeping and Reporting	26	98	188	26	98	188						
Industry Standard							1.8	2.8	3.7			
Reg. Guide Workshops	0.1	0.4	0.8	0.1	0.4	0.8	0.1	0.4	0.8	0.1	0.4	0.8
Implement Improvements (At Some Plants)												
Preventive Maintenance	300	1500	4500	300	1500	4500	300	1500	4500	300	1500	4500
Maint.-Ops. Coord	1	2.1	10.4	1	2.1	10.4	1	2.1	10.4	1	2.1	10.4
Maint. Info. System	59	150	800	59	150	800	59	150	800	59	150	800
Maintainability	0	0	82	0	0	82	0	0	82	0	0	82
Procedures	5	14	88	5	14	88	5	14	88	5	14	88
Increased Staffing	40	50	80	40	50	80	40	50	80	40	50	80
to Reduce Overtime												
Reduced Risks of Snafus												
Property Damage	-39	-35	-28	-39	-33	-28	-39	-3	-26	-39	-13	-26
Cost Savings Due to Improved Availability and Reduced												
Corrective Maintenance	-2308	-1908	-1508	-2308	-1908	-1508	-2308	-1908	-1508	-2308	-1908	-1508
Total Net Industry Costs	-1085	-115	3009	-1085	-115	3009	-1929	-218	3005	-1991	-218	3001

- Notes:
1. Negative signs denote cost savings.
 2. Values in table are rounded.
 3. The columns labeled "B" contain the base case estimates.
"L" denotes the lower estimates and "U" denotes the upper estimates.

Ranges for the Cost Estimates in Chapter 5

PNL has been asked to provide ranges for the cost estimates in Chapter 5 of the maintenance regulatory analysis. This note discusses each of the major cost elements in Chapter 5 and presents upper and lower estimates for each. A summary table, corresponding to Tables S.1 and 5.1 in the regulatory analysis, is also provided.

The ranges are intended to give some indication of the sensitivity of the cost estimates to variations in some of the major assumptions. It should be stressed that the ranges are not statistical confidence interval, and should not be interpreted as such.

There are two basic uncertainties in the regulatory analysis that dominate all the others. Both were explicitly discussed in the regulatory analysis.

First, the number of plants that will require substantial maintenance improvements is not precisely known. Both the costs and benefits can be strongly related to this factor. Industry asserts that the maintenance initiatives undertaken in recent years have resulted in major improvements and that now there are very few plants with weak maintenance. NRC asserts that a significant number of plants still need substantial improvement. Neither NRC nor industry has a good, up-to-date, quantitative basis for estimating this number with precision. The best-documented basis is still NUREG-1212, which was published more than 2 years ago. The regulatory analysis relied heavily on NUREG-1212.

Second, the improvements that plants will be required to make are not precisely defined. The standard that plants will have to meet has not yet been written. And even if the standard already existed, the costs would be sensitive to how it was interpreted and implemented. Therefore, any estimate of costs to comply with the standard must be highly uncertain at this time.

Maintenance Plan Development Costs

As an upper estimate, it is assumed that the more substantial effort discussed in Chapter 5 (6 staff-months per plant, or \$54,000) applies to all 110 plants, for a total cost of \$5.9 million. As a lower estimate, the smaller level of effort (3 staff-months per plant, or \$27,000) is assumed to apply at all 110 plants, for a total cost of \$3 million. The base case assumed a 1:2 mixture of these two levels of effort, for a total cost of \$4 million.

Recordkeeping and Reporting Costs

The base case estimate was \$98 million. The dominant factor was the assumption that the average plant would need to devote an additional 1820 staff-hours per year to data collection, data entry, and report generation. (This consisted of 1/2 staff-year, or 1000 hours, of professional labor for data collection at \$54 per hour, 1/4 staff-year, or 500 hours, for a data-entry technician at \$31 per hour, and 8 staff-weeks or 320 hours of professional labor for reporting). This added up to \$86,800 per plant per year; when summed over all plants and over 30 years, this element accounted for \$90 million of the total recordkeeping and reporting cost of \$98 million. In developing a

range for recordkeeping and reporting costs, it is sufficient to focus on the dominant \$90 million estimate.

This estimate could vary depending on the extent of existing in-plant data collection activities. If it is assumed that the average plant already collects the necessary data and stores it in a readily retrievable form, the only incremental cost would be the cost of producing the reports, or 320 hours per year times \$54 per hour. This amounts to \$17,300 per plant per year. Summed over 110 plants and 30 years of remaining plant life, the total is \$17.9 million, as compared to the base case of \$90 million. Thus the total recordkeeping and reporting cost estimate would be roughly \$26 million instead of \$98 million. This is an optimistic lower bound; many plants do not currently collect all of the information needed for the postulated maintenance performance indicators.

As an upper estimate, it is assumed that the average per-plant labor for collecting performance indicator data, entering it into a data base, and generating reports is twice as high as the base case. This assumption results in a total recordkeeping and reporting cost of \$188 million.

Industry Standard Development Costs

The regulatory analysis provided a range of \$1.76 million to \$3.73 million for this cost element, with a nominal (base case) value of \$2.75 million.

Regulatory Guide Development Costs

In the base case, it was assumed that 2 workshops would be held to obtain industry input on the development of the Regulatory Guide, and that two staff members would attend from each plant. As a lower estimate, a single workshop attended by only one person per plant may be assumed, which would reduce the estimated cost by a factor of 4, to \$95,000. As an upper estimate, it may be assumed that a third workshop might be needed, which would increase the base case cost by 50% to \$570,000.

Costs to Implement Needed Maintenance Improvements

Before presenting ranges for the costs of each of the postulated maintenance improvements, it is worth stressing that the principal source of uncertainty is not in the individual cost elements identified under this heading. Rather, as stated in the regulatory analysis, the more basic issue is to determine what improvements will be required:

"It is difficult to estimate with any precision the specific actions that each plant will have to take to improve its maintenance program based on the rule. There are two principal reasons for this. First, available data on plant-specific maintenance programs and practices are limited. Second, at this early stage in the maintenance rulemaking process, there is not yet a clear, detailed definition of what constitutes an effective maintenance program."

Preventive Maintenance

The base case estimate was founded on essentially two factors:

1. Roughly 25% of the 110 plants would have to implement extensive upgrades of their preventive maintenance programs. This estimate was derived from information in NUREG-1212.
2. The average cost of the upgrade would be \$56 million. This was based mainly on the Salem experience.

As a lower estimate, it may be argued that industry initiatives in the last two to three years have already addressed the issues discussed in NUREG-1212, so that only a handful (perhaps 5%) of plants would now need substantial improvement. Therefore, a factor of five reduction from the base case estimate will be used as the lower estimate.

As an upper estimate, it may be argued that the maintenance rule will lead to ratcheting and that a large number of plants will need to make substantial improvements, even those that were judged in NUREG-1212 to have adequate or extensive preventive maintenance programs. The only plants that might not be affected would be those that already have programs comparable to the one at Salem. If it is assumed that 75% of the plants would be significantly affected, the base case estimate would be tripled.

Maintenance-Operations Coordination

For the base case, it was assumed that all plants would need to strengthen the maintenance-operations interface by formally assigning the responsibility for maintenance-operations coordination to a designated individual. NUREG-1212 had found that 13% of the plants had no position with this responsibility. The additional effort was assumed to be 400 staff-hours per year, which is roughly one day a week. As a lower estimate, it may be argued that industry initiatives since the publication of NUREG-1212 have addressed this issue, and that only a handful of plants (i.e., 5) will still need to devote additional effort in this area. Thus, the base case estimate of \$2.1 million would be reduced by a factor of 2 to roughly \$1 million.

As an upper estimate, it may be argued that one day a week or 400 staff-hours a year is not sufficient to achieve the necessary improvements at the 10 plants. It might be necessary to assign a person full-time to this responsibility, i.e., 2000 hours a year, which would increase the base case cost estimate by a factor of 5 to \$10.4 million.

Maintenance Information Systems

For the base case it was assumed that 25% of the plants would need to upgrade portions of their maintenance information systems to provide enhanced capabilities for trending of equipment reliability. The initial cost per affected plant to acquire additional hardware and train staff was estimated as \$250,000 and the annual operating cost per affected plant was estimated as \$540,000, which assumed 5 people full time. After summing the operating costs over 30 years and discounting to present value at a 10% real discount rate, the operating costs per affected plant were about \$5.1 million and the total

cost including the additional hardware and training was \$5.3 million per affected plant. For all affected plants, the total estimated cost was \$147 million.

As a lower estimate, it will be assumed that only 10% rather than 25% of the plants might incur such costs, which would reduce the estimate by a factor of 2.5. The resulting estimate is about \$59 million.

As an upper estimate, it may be argued that all plants should have sophisticated equipment reliability trending capabilities. If 25% of the plants already have such capabilities and another 25% will acquire them through their preventive maintenance upgrades (as discussed separately), then the remaining 50% of the plants would still need upgrades and should be included in this cost estimate. This would increase the cost by a factor of two. If, in addition, the average cost of the upgrade were doubled to allow for more extensive computer equipment and more staff, another factor of two increase in the costs would result. Thus, the upper estimate will be taken as \$600 million, or four times the base case.

Maintainability

For the base case, it was assumed that the rule would not require any maintainability improvements. To provide some perspective on the maintainability issue, the regulatory analysis discussed a hypothetical maintainability improvement effort and estimated its cost as about \$82 million. This can be used as an upper estimate, although it should be recognized that maintainability improvements costs could be significantly higher, depending on how extensive the requirements were.

Spare Parts

The regulatory analysis discussed the possible need for computerized spare parts management, and estimated that the few plants that needed improvement in this area would combine this upgrade with the preventive maintenance upgrade discussed separately. Therefore, the incremental cost under this heading would be zero. As an upper estimate, one could argue that a few plants would need to implement computerized spare parts management. However, the costs should still be negligible compared to other cost categories. Therefore, no upper estimate is given for this cost element.

Procedures

It was assumed that 5 plants would need to extensively overhaul their maintenance procedures at a cost of \$2.7 million per plant, for a total cost of \$13.5 million. As an upper estimate, the number of affected plants might be significantly larger, perhaps by a factor of 5 (i.e., 25 plants). The total cost would then be \$67.5 million.

As a lower estimate, it may be argued that industry initiatives have reduced the number of plants needing procedures upgrades to 2, rather than the 5 assumed in the base case. The total cost would then be roughly \$5.4 million.

Staffing to Reduce Overtime

The regulatory analysis provided a range of \$40 million to \$60 million, with \$50 million as the nominal or base case estimate.

Reduced Risks of Onsite Property Damage

The regulatory analysis estimated a range of \$26 million to \$39 million. \$33 million was used as the base case.

Cost Savings Due to Improved Availability

The base case estimate assumed that 20 to 30 affected plants (with substantial room for improvements in maintenance) would achieve a 5 percentage point improvement in capacity factor. This resulted in cost savings ranging from \$1.5 billion to \$2.3 billion. The mid-point of the range, \$1.9 billion, was used as the base case.

ATTACHMENT-2

EDITORIAL AND ADDITIONS

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

Ensuring the Effectiveness of
Maintenance Programs for Nuclear Power Plants

AGENCY: Nuclear Regulatory Commission.

ACTION: Proposed Rule.

SUMMARY: The Commission is proposing to amend its regulations to require commercial nuclear power plant licensees to strengthen their maintenance activities in order to reduce the likelihood of failures and events caused by the lack of effective maintenance. The Commission believes safety ^{can be} must be enhanced by defining an adequate maintenance program to ensure the effectiveness of such programs throughout the nuclear industry. The proposed rule requires plant maintenance programs to include specific activities, including the monitoring of the effectiveness of plant maintenance programs.

DATE: Comment period expires [insert a date 2 months after the date of publication]. Comments received after this date will be considered if it is practical to do so, but assurance of consideration cannot be given except as to comments received on or before this date.

ADDRESSES: Mail written comments to: Secretary, U.S. Nuclear Regulatory Commission, 11155 Rockville Pike, Rockville, MD 20852, Attention: Docketing and Service Branch.

Deliver comments to: 11155 Rockville Pike, Rockville, MD 20852
between 7:30 am and 4:15 pm weekdays.

Copies of the paper on rulemaking options, transcript and proceedings of the Public Workshop, draft NUREG report, draft regulatory analysis, environmental assessment and finding of no significant impact, the supporting statement submitted to OMB, and comments received may be examined at: the NRC Public Document Room, 2120 L Street, Lower Level, N.W., Washington, D.C. 20037.

FOR FURTHER INFORMATION CONTACT: Moni Dey, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, (301) 492-3730.

SUPPLEMENTARY INFORMATION:

BACKGROUND

On March 23, 1988, the Commission published a final Policy Statement on Maintenance of Nuclear Power Plants. In the Policy Statement, the Commission stated that it expected to publish a Notice of Proposed Rulemaking in the near future and provided the general framework for the proposed rule.

The Commission has a program to continually evaluate the operational performance of nuclear power plants. Analysis of operational events has shown that, in some cases, nuclear power plant equipment is not being maintained at a level to ensure that the equipment will perform, with a high degree of reliability, its intended function when required. A limited NRC examination of nuclear power plant maintenance programs has found a wide variation in the effectiveness of these programs. At some plants, maintenance has been a significant contributor to plant reliability problems and hence, is of safety concern. The Commission believes safety can be enhanced by strengthening the effectiveness of maintenance programs throughout the nuclear industry and this is the objective of this proposed rule.

End must

DESCRIPTION

Balance of plant

It is the objective of the Commission that all components, systems and structures of nuclear power plants be effectively maintained so that plant equipment will perform its intended function when required. The scope of the proposed rule is intended to cover all systems, structures and components including those in the ^(BOP). To accomplish this objective, the proposed rule would require each commercial nuclear power plant to develop and implement a well-defined program to assure that maintenance activities are conducted to preserve or restore, with prompt repair, the capability, performance and reliability of plant structures, systems, and components. The program should clearly define the components and activities included, as well as the management systems used to control those activities. Further, the program should include feedback of specific results to ensure corrective actions, provisions for overall program evaluation, and the identification of possible component or system design problems. Compliance with the rule would be verified by NRC audit and inspection.

The proposed rule does not require that licensees ~~be required to~~ report Maintenance Performance Indicators (MPIs). However, each licensee would be required to have his own ^{system for} monitoring ^{maintenance effectiveness} ~~system~~ which would be subject to NRC review. The Commission solicits comments on the application and usefulness of MPIs as part of the rule, and whether a set of MPIs exists which could indicate the effectiveness of plant maintenance programs. In addition, the Commission solicits feedback ^{to require reporting a specific set of} on whether MPIs ~~should be included~~ ^{to the NRC as part of} in the rule.

PUBLIC WORKSHOP

The Commission held a Public Workshop on July 11-13, 1988 in Washington, D.C. to solicit early input for the formulation of the rule from the public and regulated industry. Prior to the Workshop, a paper on rulemaking options was distributed to interested parties to facilitate

Workshop discussions. The paper on rulemaking options¹, and the transcript and proceedings (NUREG/CP - 0099)² of the Workshop are available for inspection in the NRC Public Document Room, 2120 L Street, Lower Level, N.W., Washington, D.C. 20037

As a result of Workshop discussions, the Commission has come to the following conclusions:

1. Rulemaking should encourage industry initiatives directed toward improving maintenance, since such initiatives promote industry responsibility for problem identification and resolution;
2. Prescriptive rulemaking options may impede industry initiatives and responsibility to improve maintenance; and
3. Rulemaking should be directed toward specifying the NRC's expectations in maintenance and requiring ^{ing license} monitoring of the effectiveness of maintenance programs.

Therefore, the Commission proposes a maintenance rule which gives incentive for industry to develop a standard for a maintenance program, which NRC may endorse in a Regulatory Guide.

¹ Memorandum from Victor Stello, Jr., Executive Director for Operations, to the Commissioners, "Proposed Rulemaking for the Maintenance of Nuclear Power Plants," dated June 27, 1988..

² Copies of NUREG series reports may be purchased through the U.S. Government Printing Office by calling (202) 275-2060 or by writing to the U.S. Government Printing Office, P.O. Box 37082, Washington, D.C. 20013-7082. Copies may also be purchased from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161. A copy is available for inspection or copying for a fee in the NRC Public Document Room, 2120 L Street, Lower Level, N.W., Washington, D.C. 20037.

EXPECTATIONS FOR MAINTENANCE STANDARD

The Commission encourages industry to develop a Maintenance Standard which will provide guidance for complying with requirements of the proposed rule. The Commission believes that the development of a standard will guide current industry initiatives towards developing and implementing acceptable maintenance programs, and that utility participation in preparation of a Maintenance Standard will provide additional incentive and responsibility for improving plant maintenance programs.

The Commission . . . to develop a Regulatory Guide to provide guidance for complying with the rule if industry does not develop an adequate standard. However, the Commission prefers to endorse an industry-developed standard. To meet the Commission's plans for implementation of the rule the ^{industry} commitment to develop a Maintenance Standard should be made now and a final standard should be proposed no later than September 1, 1989. The Commission expects to publish a Regulatory Guide endorsing a Maintenance Standard or providing NRC guidance by April 1, 1990. The comprehensive program requirements of the proposed rule would be required to be fully implemented within one year following publication of the Regulatory Guide.

The proposed rule defines those attributes the Commission considers necessary for an acceptable Maintenance Program. To be acceptable, any standard developed to implement the rule should have the following characteristics:

- Should define the plant systems, structures and components included in the maintenance program (the scope of the rule covers all systems, structures and components including those in the BOP);
- Should require a systematic evaluation ("systems approach") of the functions and objectives of plant systems, components and structures to determine maintenance activities and requirements;

- Should provide clear and specific programmatic requirements that can be practically implemented to achieve high reliability;
- Should be comprehensive in addressing the activities and functions included in the proposed rule plus provisions for self assessment;
- Should reference standards or guidelines such as those developed by ANS, ASME, IEEE, ASTM, INPO, or EPRI where practical to provide (a) specific programmatic requirements or (b) guidance for maintenance of specific type of equipment;
- Should allow flexibility for adoption of new innovative technologies as they are validated; and
- Should provide for sufficient documentation so that program effectiveness and compliance with requirements of the standard can be evaluated.

INSERT ➡

*Nuclear Plant
Reliability Data System*

As noted above, an integral part of a good maintenance program is the monitor and feedback of results. Programs should utilize quantitative measures to monitor and adjust the maintenance program activities. Measures that are based upon actual component reliability and failure history provide useful indicators of maintenance effectiveness. Such measures need a well structured and computer oriented system; e.g., (NPRDS) to capture and track equipment history data. The Commission notes and encourages the use of the industry-wide NPRDS for this purpose in view of the multiple uses for this data.

In addition, the Commission has conducted studies to review effective maintenance approaches and practices in other countries and industries and has documented findings in a draft NUREG series report.³ The Commission seeks comments on draft NUREG report which may be submitted to the NRC as indicated under the ADDRESSES heading.

³ A free single copy of draft NUREG-1333, "Maintenance Approaches and Practices: Selected Foreign Nuclear Power Programs and Other U.S. Industries: Review and Lessons Learned," to the extent of supply, may be obtained by writing to the Distribution Services Section, Document Control Branch, Division of Support Services, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. A copy also available for inspection or copying for a fee in the NRC Public Document Room, 2120 L Street, Lower Level, NW., Washington, D.C. 20037.

- o Should provide clear and specific programmatic requirements that can be practically implemented to achieve high reliability;
- o Should be comprehensive in addressing the activities and functions included in the proposed rule plus provisions for self assessment;
- o Should reference standards or guidelines such as those developed by ANS, ASME, IEEE, ASTM, INPO, or EPRI where practical to provide (a) specific programmatic requirements or (b) guidance for maintenance of specific types of equipment;
- o Should allow flexibility for adoption of new innovative technologies as they are validated; and
- o Should provide for sufficient documentation so that program effectiveness and compliance with requirements of the standard can be evaluated.

INSERT

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industries and has documented the findings in a draft NUREG series report.¹ The Commission seeks comments on the draft NUREG report which may be submitted to the NRC as indicated under the ADDRESSES heading.

As noted above, an integral part of a good maintenance program is the monitoring and feedback of results. Programs should utilize quantitative measures to monitor and adjust the maintenance program activities. Measures that are based upon actual component reliability and failure history provide useful indication of maintenance effectiveness. Such measures need a well structured and component oriented system; e.g., NPRDS to capture and track equipment history data. The Commission notes and encourages the use of the industry-wide NPRDS for this purpose in view of the multiple uses for this data.

The Commission views maintenance rulemaking as an opportunity to encourage (a) good maintenance practices, (b) the adoption of common maintenance standards, and (c) the development of valid quantitative measures of effectiveness which could become the basis for regulation by outcomes rather than processes. The

¹A free single copy of draft NUREG-1333, "Maintenance Approaches and Practices in Selected Foreign Nuclear Power Programs and Other U.S. Industries: Review and Lessons Learned," to the extent of supply, may be obtained by writing to the Distribution Services Section, Document Control Branch, Division of Support Services, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. A copy is also available for inspection or copying for a fee in the NRC Public Document Room, 2120 L Street, Lower Level, NW., Washington, D. C. 20037.

— INSERT —

herein proposed rule addresses (a) and (b) but not (c). Follow-on rulemaking is envisioned which would build on the bases established in this rule and would define those validated measurable quantities or indicators that could credibly become the basis for regulatory attention or action in the future instead of the systems for maintenance established under (a) and (b) of this proposed rule.

The draft NUREG^{ies} report concludes that the following are practices in foreign country^{ial} and other U.S. industry maintenance programs which have been found to contribute significantly to effective maintenance:

1. Focus on long term maintenance objectives; establish a proactive maintenance program as opposed to reactive maintenance;
2. Use of a reliability centered approach to maintenance, including consideration of the man-machine interface;
3. Collection and engineering evaluation of failure data (root cause analysis);
4. Use of an integrated information system for collecting data and monitoring the effectiveness of a maintenance program;
5. Use of maintenance technician training/certification programs;
6. Derive planning and scheduling from overall program objectives;
7. Enhance environment/motivation of maintenance technicians (e.g. thru cross-training, "Crew Chief" concept); and
8. Clearly define interfaces between maintenance and other activities (engineering support, operations QA, QC, corporate offices, safety review).

The Commission encourages in the development of any Maintenance Standard, consideration of the findings in the above referenced draft NUREG report and any other pertinent studies on effective maintenance practices.

The Commission also encourages ^{the industry} the Maintenance Standard to consider incorporating appropriate maintenance derived from plant aging studiesⁱⁿ

Similar to the ASME code system,

CERTIFICATION OF PLANT MAINTENANCE PROGRAMS

The Commission wishes to encourage industry initiatives and responsibility for problem identification and resolution. Therefore, as a further way of encouraging industry participation and responsibility, the Commission is willing to consider a process of utilizing a designated third party^A to review and certify licensee maintenance programs for conformance with the Maintenance Standard. This process, if successful, could alleviate the need for detailed NRC inspection of all licensee maintenance programs. The Commission solicits proposals for conducting such a certification process.

COMMENTS REQUESTED

In addition to comments on the content of this Notice of Proposed Rulemaking, the Commission specifically solicits input on the following questions:

1. Is it appropriate for the nuclear power industry to develop a Maintenance Standard and, if so, would the industry develop such a Maintenance Standard?
2. What level of detail should be included in the Maintenance Standard?
3. Is two years a reasonable time to develop, and implement a standard?
4. Is it appropriate for a designated third party to certify plant maintenance programs

to comply with the Maintenance Standard; and, if so, would an organization be willing to perform such certification?

5. Should an industry-wide component failure reporting system, e.g., NPRDS, be used by all plants in order to support the sharing of generic ^{maintenance} ~~operating~~ experience and facilitate monitoring of maintenance effectiveness?
6. Are performance indicators that are being used by industry, may be used in the future, or have been used in the past appropriate candidates as quantitative measures of maintenance effectiveness? The Commission is particularly interested in experience or analysis concerning indicators or the use of indicators of component reliability as maintenance performance indicators.

IMPACT

The accompanying draft regulatory analysis shows that,
TP The economic impact of the proposed requirement on licensees should be negligible. Although initial financial investments will be required by some licensees to establish a systematic and comprehensive maintenance program, the savings due to decreased corrective maintenance costs and increased plant availability should outweigh the investment costs. The Commission requests cooperation of informed sources in order to develop further details and verification of this analysis.

Although the Commission believes that this proposed rule is by virtue of 10 CFR 50.109(z)(4) not subject to the requirement for a backfit finding and analysis, ^{- 8a -} it has nevertheless performed an analysis of cost and other backfit factors as an alternative ground for proceeding with the proposed rule and to facilitate public comment.

~~Send~~ comments regarding this burden estimate or any other
~~collection~~ collection of information, including suggestions for
~~burden~~ burden, to the Records and Reports Management Branch,
~~Information Support Services/IRM~~ Information Support Services/IRM, Office of Administration and
~~Management~~ Management, U.S. Nuclear Regulatory Commission, Washington, D.C.
~~the~~ the Office of Information and Regulatory Affairs, Office of
~~Budget~~ Budget, Washington, D.C. 20503.

REGULATORY ANALYSIS

~~Commission~~ Commission has prepared a draft regulatory analysis on this
~~regulation~~ regulation. The analysis examines the costs and benefits of the
~~considered~~ considered by the Commission. The draft analysis is
~~inspection~~ inspection in the NRC Public Document Room, 2120 L St., N.W.,
~~20037~~ 20037. Single copies of the draft analysis may be
~~Moni Dey~~ Moni Dey, U.S. Nuclear Regulatory Commission, Washington,
~~492-3730~~ 492-3730.

~~Commission~~ Commission requests public comment on the draft regulatory
~~comments~~ comments on the draft analysis may be submitted to the NRC as
~~the~~ the ADDRESSES heading.

BACKFIT ANALYSIS

~~as above~~
~~by 10 CFR 50.100~~ *as above*, the Commission has completed a backfit
~~the~~ the proposed rule. The Commission has determined, based on
~~that~~ that backfitting to comply with the requirements of this
~~will~~ will provide a substantial increase in protection to public
~~without~~ without any additional costs. The backfit analysis on
~~determination~~ determination is based is as follows:

AND Documentation For
THE Proposition That the
Proposed Rule Satisfies the
"Adequate Protection" Exception in
10 CFR 50.109(a)(4); and Documentation for the
proposition that the proposed
rule satisfies the "adequate protection"
exception in 10 CFR 50.109(a)(4) Analysis
[7590-01]

Analysis and Determination That the Rulemaking to
Amend 10CFR50 Concerning Maintenance Complies
with Backfit Rule 10 CFR 50.109 In Any Event

While

The Commission's existing regulations do not explicitly address
the requirements of a ^{comprehensive and effective} maintenance program. The
Commission believes that safety can be enhanced by improving the
effectiveness of maintenance programs throughout the nuclear industry.
The proposed rule requires nuclear power plant maintenance programs to
have a set of functions and activities which the Commission believes are
essential for a comprehensive and effective program.

The findings and conclusions of the Commission's assessment of the
effectiveness of plant maintenance programs can be found in NUREG-1212,
"Status of Maintenance in the U.S. Nuclear Power Industry." The study
showed weaknesses at plants in a number of areas of maintenance which the
Commission believes is critical for an overall effective program.
Further, analysis of operational events has shown that, in some cases,
nuclear power plant equipment is not being maintained with a high degree
of reliability that the equipment will perform its intended function when
required. The objective of the proposed rule is to require improvements
for those plants that are poorly maintained, and also to prevent the
declining performance of plants that are well-maintained. ^{The proposed rule, by}
^{addressing in an easily understood way the requirement that there be an effective}
The benefit of improvements in maintenance has been estimated to be in
the order of 250,000 person-rem for the lifetime of all nuclear power
plants. Common sense also suggests that a well-maintained plant poses
less risk than one poorly maintained. The proposed rule will help ensure
a satisfactory level of performance for maintenance programs by specifying
those activities and practices which, through experience, have been shown
to be key elements of effective maintenance programs, and should result in
a substantial enhancement of public health and safety.

Improvements in maintenance serve to meet dual objectives: (1)
enhance safety; and also (2) increase plant availability and capacity

Commission believes that effective maintenance is necessary
for adequate protection.

for adequate protection

in any easily understood
and comprehensive
manner
explicitly
addressed
effectively

which define
what is
required
for
adequate
protection

maintain
equipment to
prevent
accidents
and
ensure
public
health
and
safety

issued under Sec. 184, 68 Stat. 954, as amended (42 U.S.C. 2234).
Section 50.103 also issued under Sec. 108, 68 Stat. 939, as amended
(42 U.S.C. 2237).

For the purposes of Sec. 223, 68 Stat. 958, as amended (42 U.S.C. 2273), §§ 50.10(a), (b), and (c) 50.44, 50.46, 50.48 and 50.54 and 50.54(a) are issued under Sec. 161b, 68 Stat. 948, as amended (42 U.S.C. 2201(b)); §§ 50.10(b) and (c) and 50.54 are issued under Sec. 161i, 68 Stat. 949, as amended (42 U.S.C. 2201(i)); and §§ 50.9, 50.55(e), 50.59(b), 50.70, 50.71, 50.72, 50.73 and 50.78 are issued under Sec. 161o, 68 Stat. 950, as amended (42 U.S.C. 2201(o)).

2. A new § 50.65 is added to read as follows:

§ 50.65 Requirements to ensure the effectiveness of
maintenance programs for nuclear power plants.

- (a) Applicability. The requirements of this section apply to all nuclear power reactors licensed under § 50.21 b or 50.22.
- (b) Definitions. For the purpose of this section ^{planned and systematic} the Commission defines maintenance as the aggregate of those actions required to preserve and promptly restore operability, reliability, and availability of, or to prevent the failure of, plant structures, systems, and components. The Commission intends the scope of the rule to cover all systems, structures and components, including those in the Balance-of-Plant ~~commensurate with their~~ ~~importance to safety, health, and environment; and~~ ~~defined~~

Maintenance includes not only activities traditionally associated with identifying and correcting actual or potential degraded

conditions, i.e., repair, surveillance, diagnostic examinations, and preventive measures; but extends to all supporting functions for the conduct of these activities. Maintenance includes the following activities:

- (1) Technology in the areas of:
 - (i) Corrective maintenance,
 - (ii) Preventive maintenance,
 - (iii) Predictive maintenance, and
 - (iv) Maintenance Surveillance;
- (2) Engineering in support of maintenance;
- (3) Quality assurance and quality control of maintenance activities;
- (4) Incorporation of plant modifications into the maintenance program;
- (5) Equipment history and trending;
- (6) Maintenance record keeping;
- (7) Management of parts, tools, and facilities;
- (8) Maintenance procedures;
- (9) Post-Maintenance testing and return-to-service activities;
- (10) Measures of overall maintenance program effectiveness;

- (11) Maintenance management and organization in the areas of:
 - (i) Planning,
 - (ii) Scheduling,
 - (iii) Staffing,
 - (iv) Shift coverage, and
 - (v) Resource allocation;
- (12) Control of contracted maintenance services;
- (13) Radiological exposure control (including ALARA) during maintenance activities;
- (14) Maintenance personnel qualification and training;
- (15) Internal communications between the maintenance organization and plant operations and support groups;
- (16) Communications between plant and corporate management and the maintenance organization; and
- (17) ^{Consideration of} Maintenance recommendations or requirements of individual vendors.

(c) Requirements. Each holder of an operating license subject to ^{activity} this section shall (1) establish, implement, and maintain an effective and documented maintenance program ^{that addresses all elements} defined in paragraph (b) of this section, and (2) ^{regularly} assess the effectiveness of this maintenance program and, based upon this assessment, make improvements, as appropriate.

(d) Implementation. By [insert a date 2 years after the effective date of the amendment] each licensee shall certify, by letter to

the Director of the Office of Nuclear Reactor Regulation, that a comprehensive documented maintenance program ^{and activities} is being maintained and implemented, which addresses all elements ~~of a maintenance program~~ defined in paragraph (b) of this section including measures to monitor ^{the effectiveness of the maintenance pro} and improve the program, where appropriate. In addition, each licensee shall develop [insert a date 3 months after the effective date of the amendment] a timely and expeditious plan and schedule (including Key Milestones) for meeting the requirements of this section.

Dated at Rockville, Maryland this _____ day of _____, 1988

For the Nuclear Regulatory Commission.

Samuel J. Chilk,
Secretary of the Commission.

ATTACHMENT-3

COMMISSIONERS' VOTE SHEETS

NOTATION VOTE

RESPONSE SHEET

TO: SAMUEL J. CHILK, SECRETARY OF THE COMMISSION
FROM: CHAIRMAN ZECH
SUBJECT: SECY-88-277 - AMENDMENT TO 10 CFR 50 RELATED TO
MAINTENANCE OF NUCLEAR POWER PLANTS

APPROVED x* DISAPPROVED _____ ABSTAIN _____

NOT PARTICIPATING _____ REQUEST DISCUSSION _____

COMMENTS:

*Subject to the attached comments.

Landon W. Zech Jr.
SIGNATURE

10-24-88

DATE

YES

NO

ENTERED ON "AS" 1 / 1 /
NRC-SECY FORM MAY, 1987

CHAIRMAN ZECH'S COMMENTS ON SECY-88-277:

I am in favor of publishing this proposed rule on Maintenance of Nuclear Power Plants, subject to the detailed comments listed below. I believe that effective maintenance is essential to the continued safe operation of nuclear power plants and that such a rule is needed in order to make clear the Commission's safety requirements regarding effective maintenance, to further enhance the effectiveness of maintenance at some plants, and to assure the continued effectiveness of maintenance at the others. I recognize that the industry has made significant progress over the past several years in improving overall performance including maintenance performance, and I encourage their continued efforts in this regard. While I recognize the difficulty of specifying uniform requirements for maintenance given the present generation of "custom built plants", I believe that the staff's proposed general approach to rulemaking will provide the necessary flexibility to accommodate plant specific differences. I commend the NRC staff to carefully study comments received from the industry and the public, in recognition of the vast wealth of knowledge and experience that they have acquired in the area of maintenance, and to meticulously prepare the final rule in such a way that the result will be to enhance, rather than detract from, the effectiveness of current maintenance practices. I also commend the NRC staff to continue to monitor industry emphasis and progress in improving maintenance effectiveness during the rulemaking process.

The following detailed comments should be included in the publication of the proposed rule:

1. In my view this proposed maintenance rule should be considered under 10 CFR 50.109(a)(4) of the backfit rule, based on the precepts that effective maintenance is necessary to assure that the facility poses no undue risk to the public health and safety and that the proposed rule codifies and standardizes previously existing Commission requirements, both explicit and implicit, in plant technical specifications, licensee safety analysis reports, and 10 CFR 50, Appendix B.

I believe that effective maintenance is necessary to provide reasonable assurance that plant structures, systems, or components (SSCs) will perform their intended function when required. The demonstration of system operability via test, required in the plant technical specifications, is a valid demonstration of the capability of a SSC to perform its intended safety function if the SSC remains in the design configuration and its performance capability is maintained within the design parameters assumed in plant safety analyses.

In the past, the Commission has enforced maintenance requirements at nuclear power plants largely based on technical specification requirements, commitments contained in plant safety analysis reports, and the quality assurance criteria of 10CFR50, Appendix B. The maintenance requirements in many cases are implicit in those documents rather than explicit. In my view, this proposed rulemaking action will primarily provide explicit treatment for pre-existing requirements for maintenance, clarify the Commission's expectations for the attainment of uniformly high standards of maintenance at all nuclear power plants, and provide the enforcement tools that may be needed to achieve the Commission's expectations.

2. I believe that the extension of NRC's maintenance rule to balance of plant equipment is necessary and proper. However, some licensee maintenance programs, as presently configured, apply to structures, systems, and components that are, without question, irrelevant to protection of public health and safety from radiological hazards associated with the operation of the nuclear power plant. The staff should carefully consider what limitation, if any, should be placed on the final maintenance rule, to provide some licensee flexibility in this regard.
3. The staff must carefully consider the criteria that it will apply to determine when a maintenance program is fully effective and further improvements are no longer warranted from a safety standpoint. I encourage the staff to provide clarification of its criteria, either in the final rule, or in the accompanying regulatory guide.
4. The Federal Register Notice should solicit public comments concerning comments 1, 2, and 3 above. The following are proposed questions for inclusion in the notice:
 - A. Chairman Tech believes that the proposed maintenance rule should be exempt from the backfit rule requirements based on the precepts that effective maintenance is necessary to assure adequate public protection and that the proposed rule codifies and standardizes previously existing Commission requirements, both explicit and implicit, in plant technical specifications, licensee safety analysis reports, and 10 CFR 50, Appendix B. The Commission requests public comment concerning the need for a backfit analysis for this rulemaking.

- B. Chairman Iech believes that the inclusion of balance of plant (BOP) equipment in the proposed maintenance rule is necessary and proper. However, Chairman Iech also recognizes that some licensee maintenance programs, as presently configured, apply to structures, systems, and components that are, without question, irrelevant to protection of public health and safety from radiological hazards associated with the operation of the nuclear power plant. The Commission requests public comment concerning what limitation, if any, should be placed on the final maintenance rule, to provide some licensee flexibility in this regard.
- C. Chairman Iech desires to establish criteria within the maintenance rule which would form the basis for determining when a maintenance program is fully effective and additional improvement is not warranted from a safety standpoint. Such criteria might be either quantitative or qualitative and could be based on specific measurable attributes, on overall plant performance, on program results, or on other attributes. The Commission requests public comment concerning the need for such criteria, the form of such criteria, and the criteria themselves.
5. I agree with Commissioner Roger's vote sheet comment regarding performance-based rulemaking. I support his desire to maintain this option for the future.
- d. In addition to the above comments, specific editorial changes are marked on the attached sheets.

DESCRIPTION

Balance of plant

It is the objective of the Commission that all components, systems and structures of nuclear power plants be effectively maintained so that plant equipment will perform its intended function when required. The scope of the proposed rule is intended to cover all systems, structures and components including those in the ^(BOP). To accomplish this objective, the proposed rule would require each commercial nuclear power plant to develop and implement a well-defined program to assure that maintenance activities are conducted to preserve or restore, with prompt repair, the availability, performance and reliability of plant structures, systems, and components. The program should clearly define the components and activities included, as well as the management systems used to control those activities. Further, the program should include feedback of specific results to ensure corrective actions, provisions for overall program evaluation, and the identification of possible component or system design problems. Compliance with the rule would be verified by NRC audit and inspection.

The proposed rule does not require that licensees ~~be required to~~ report Maintenance Performance Indicators (MPIs). However, each licensee would be required to have his own ^{System for} ~~monitoring system~~ ^{Maintenance effectiveness} which would be subject to NRC review. The Commission solicits comments on the application and usefulness of MPIs as part of the rule, and whether a set of MPIs exists which could indicate the effectiveness of plant maintenance programs. In addition, the Commission solicits feedback ^{to require reporting a specific set of} on whether MPIs ~~should be included~~ ^{to the NRC as part} in the rule.

PUBLIC WORKSHOP

The Commission held a Public Workshop on July 11-13, 1988 in Washington, D.C. to solicit early input for the formulation of the rule from the public and regulated industry. Prior to the workshop, a paper on rulemaking options was distributed to interested parties to facilitate

Workshop discussions. The paper on rulemaking options¹, and the transcript and proceedings (NUREG/CP - 0099)² of the Workshop are available for inspection in the NRC Public Document Room, 2120 L Street, Lower Level, N.W., Washington, D.C. 20037

As a result of Workshop discussions, the Commission has come to the following conclusions:

1. Rulemaking should encourage industry initiatives directed toward improving maintenance, since such initiatives promote industry responsibility for problem identification and resolution;
2. Prescriptive rulemaking options may impede industry initiatives and responsibility to improve maintenance; and
3. Rulemaking should be directed toward specifying the NRC's expectations in maintenance and requiring ^{by license} monitoring of the effectiveness of maintenance programs.

Therefore, the Commission proposes a maintenance rule which gives incentive for industry to develop a standard for a maintenance program, which NRC may endorse in a Regulatory Guide.

¹ Memorandum from Victor Stello, Jr., Executive Director for Operations, to the Commissioners, "Proposed Rulemaking for the Maintenance of Nuclear Power Plants," dated June 27, 1988.

² Copies of NUREG series reports may be purchased through the U.S. Government Printing Office by calling (202) 275-2060 or by writing to the U.S. Government Printing Office, P.O. Box 37082, Washington, D.C. 20013-7082. Copies may also be purchased from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161. A copy is available for inspection or copying for a fee in the NRC Public Document Room, 2120 L Street, Lower Level, N.W., Washington, D.C. 20037.

EXPECTATIONS FOR MAINTENANCE STANDARD

The Commission encourages industry to develop a Maintenance Standard which will provide guidance for complying with requirements of the proposed rule. The Commission believes that the development of a standard will guide current industry initiatives towards developing and implementing acceptable maintenance programs, and that utility participation in preparation of a Maintenance Standard will provide additional incentive and responsibility for improving plant maintenance programs.

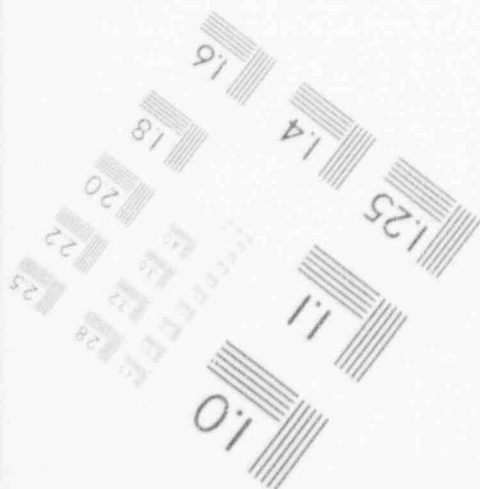
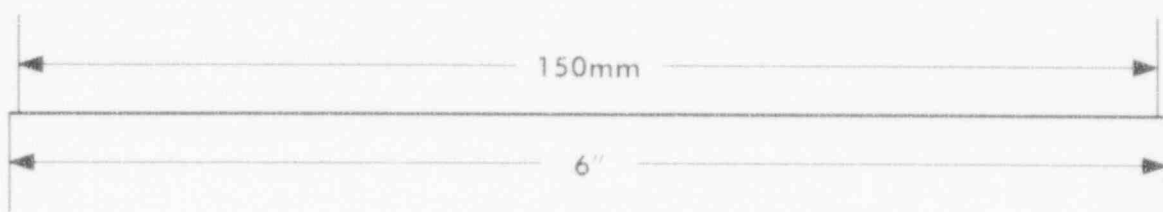
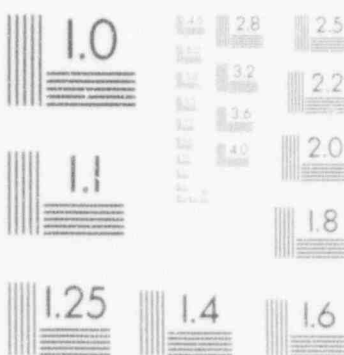
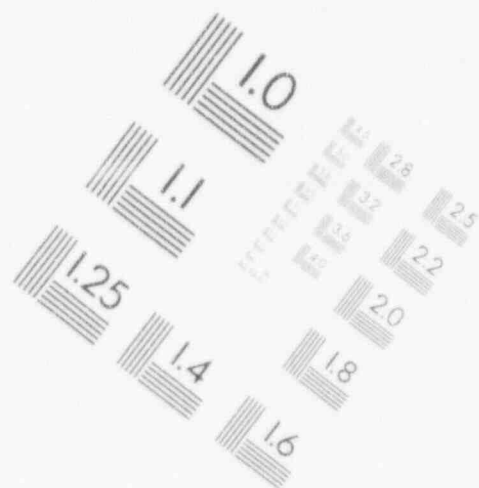
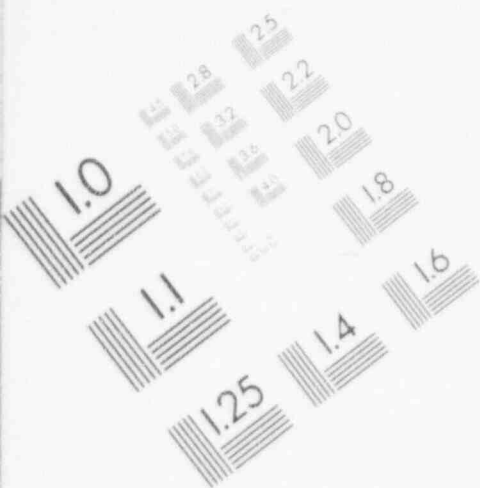
The Commission plans to develop a Regulatory Guide to provide guidance for complying with the rule if industry does not develop an adequate standard. However, the Commission prefers to endorse an industry-developed standard. To meet the Commission's plans for implementation of the rule the ^{industry} commitment to develop a Maintenance Standard should be made now and a final standard should be proposed no later than September 1, 1989. The Commission expects to publish a Regulatory Guide endorsing a Maintenance Standard or providing NRC guidance by April 1, 1990. The comprehensive program requirements of the proposed rule would be required to be fully implemented within one year following publication of the Regulatory Guide.

The proposed rule defines those attributes the Commission considers necessary for an acceptable Maintenance Program. To be acceptable, any standard developed to implement the rule should have the following characteristics:

- Should define the plant systems, structures and components included in the maintenance program (the scope of the rule covers all systems, structures and components including those in the BOP);
- Should require a systematic evaluation ("systems approach") of the functions and objectives of plant systems, components and structures to determine maintenance activities and requirements;

2

IMAGE EVALUATION TEST TARGET (MT-3)



PHOTOGRAPHIC SCIENCES CORPORATION

770 BASKET ROAD

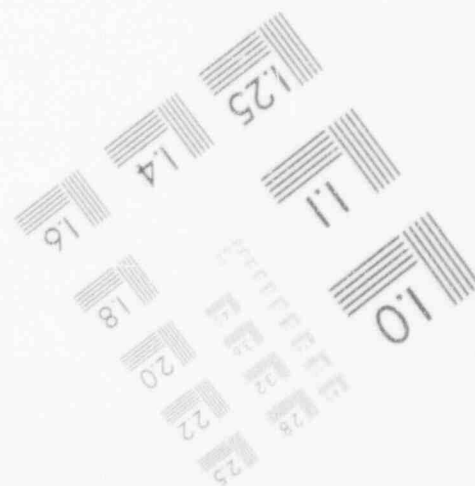
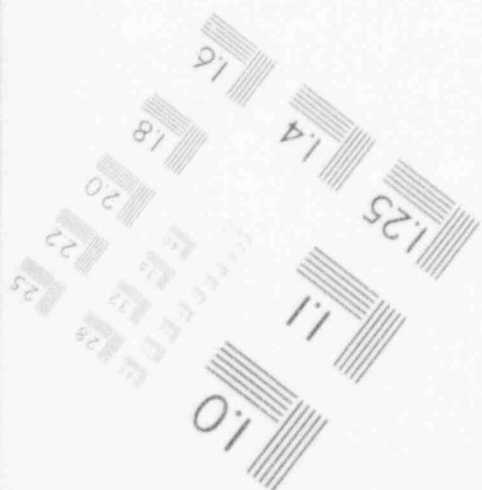
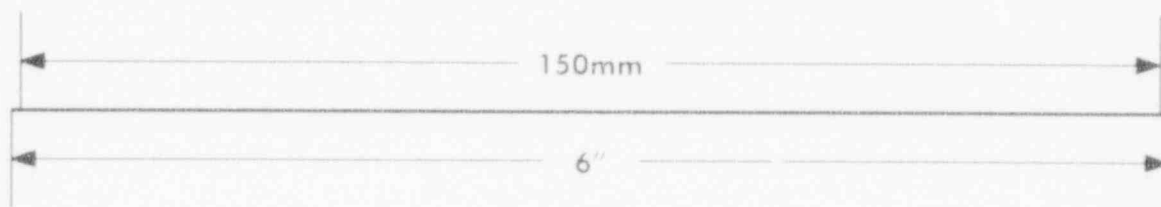
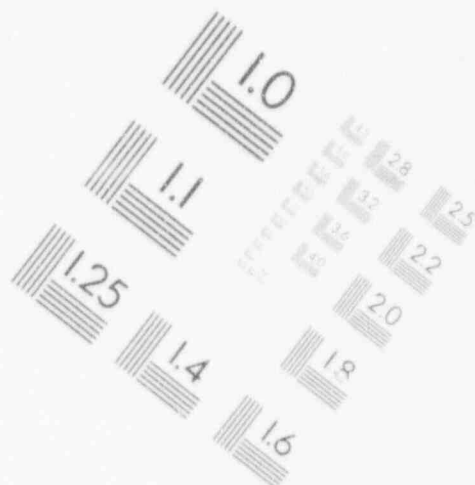
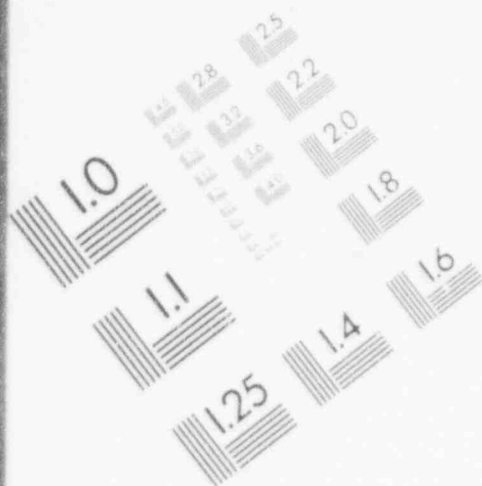
P.O. BOX 338

WEBSTER, NEW YORK 14580

(716) 265-1600

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IMAGE EVALUATION TEST TARGET (MT-3)



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770 BASKET ROAD
P.O. BOX 338
WEBSTER, NEW YORK 14580
(716) 265-1600

- Should provide clear and specific programmatic requirements that can be practically implemented to achieve high reliability;
- Should be comprehensive in addressing the activities and functions included in the proposed rule plus provisions for self assessment;
- Should reference standards or guidelines such as those developed by ANSI, ASME, IEEE, ASTM, INPO, or EPRI where practical to provide (a) specific programmatic requirements or (b) guidance for maintenance of specific types of equipment;
- Should allow flexibility for adoption of new innovative technologies as they are validated; and
- Should provide for sufficient documentation so that program effectiveness and compliance with requirements of the standard can be evaluated.

As noted above, an integral part of a good maintenance program is the monitoring and feedback of results. Programs should utilize quantitative measures to monitor and adjust the maintenance program activities. Measures that are based upon actual component reliability and failure history provide useful indicators of maintenance effectiveness. Such measures need a well structured and computer oriented system; e.g., (NPRDS) to capture and track equipment history data. Commission notes and encourages the use of the industry-wide NPRDS for this purpose in view of the multiple uses for this data.

*in Nuclear Plant
Reliability Data System*

In addition, the Commission has conducted studies to review effective maintenance approaches and practices in other countries and industries and has documented findings in a draft NUREG series report.³ The Commission seeks comments on the draft NUREG report which may be submitted to the NRC as indicated under the ADDRESSES heading.

³ A free single copy of draft NUREG-1333, "Maintenance Approaches and Practices Selected Foreign Nuclear Power Programs and Other U.S. Industries: Review of Lessons Learned," to the extent of supply, may be obtained by writing to the Distribution Services Section, Document Control Branch, Division of Support Services, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. A fee is also available for inspection or copying for a fee in the NRC Public Document Room, 2120 L Street, Lower Level, NW., Washington, D.C. 20037.

ies *ial*
The draft NUREG report concludes that the following are practices in foreign country and other U.S. industry maintenance programs which have been found to contribute significantly to effective maintenance:

1. Focus on long term maintenance objectives; establish a proactive maintenance program as opposed to reactive maintenance;
2. Use of a reliability centered approach to maintenance, including consideration of the man-machine interface;
3. Collection and engineering evaluation of failure data (root cause analysis);
4. Use of an integrated information system for collecting data and monitoring the effectiveness of a maintenance program;
5. Use of maintenance technician training/certification programs;
6. Derive planning and scheduling from overall program objectives;
7. Enhance environment/motivation of maintenance technicians (e.g. thru cross-training, "Crew Chief" concept); and
8. Clearly define interfaces between maintenance and other activities (engineering support, operations QA, QC, corporate offices, safety review).

The Commission encourages in the development of any Maintenance Standard, consideration of the findings in the above referenced draft NUREG report and any other pertinent studies on effective maintenance practices.

The Commission also encourages *the industry* the Maintenance Standard to consider incorporating appropriate maintenance derived from plant aging studies *in*

CERTIFICATION OF PLANT MAINTENANCE PROGRAMS

The Commission wishes to encourage industry initiatives and responsibility for problem identification and resolution. Therefore, as a further way of encouraging industry participation and responsibility, the Commission is willing to consider a process of utilizing a designated third party to review and certify licensee maintenance programs for conformance with the Maintenance Standard. This process, if successful, could alleviate the need for detailed NRC inspection of all licensee maintenance programs. The Commission solicits proposals for conducting such a certification process.

COMMENTS REQUESTED

In addition to comments on the content of this Notice of Proposed Rule-making, the Commission specifically solicits input on the following questions:

1. Is it appropriate for the nuclear power industry to develop a Maintenance Standard and, if so, would the industry develop such a Maintenance Standard?
2. What level of detail should be included in the Maintenance Standard?
3. Is two years a reasonable time to develop, and implement a standard?
4. Is it appropriate for a designated third party to certify plant maintenance programs to comply with the Maintenance Standard; and, if so, would an organization be willing to perform such certification?
5. Should an industry-wide component failure reporting system, e.g., NPRDS, be used by all plants in order to support the sharing of gener-
maintenance - operating experience and facilitate monitoring of maintenance effectiveness? *draft regulatory impact analysis shows that,*

The accompanying IMPACT

The economic impact of the proposed requirement on licensees should be negligible. Although initial financial investments will be required by some licensees to establish a systematic and comprehensive maintenance program, the savings due to decreased corrective maintenance costs and increased plant availability should outweigh the investment costs. The Commission requests cooperation of informed sources in order to develop further details and verification of this analysis.

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- (5) Equipment history and trending;
- (6) Maintenance record keeping;
- (7) Management of parts, tools, and facilities;
- (8) Maintenance procedures;
- (9) Post-Maintenance testing and return-to-service activities;
- (10) Measures of overall maintenance program effectiveness;

- Should provide clear and specific programmatic requirements that can be practically implemented to achieve high reliability;
- Should be comprehensive in addressing the activities and functions included in the proposed rule plus provisions for self assessment;
- Should reference standards or guidelines such as those developed by ANS, ASME, IEEE, ASTM, INPO, or EPRI where practical to provide (a) specific programmatic requirements or (b) guidance for maintenance of specific types of equipment;
- Should allow flexibility for adoption of new innovative technologies as they are validated; and
- Should provide for sufficient documentation so that program effectiveness and compliance with requirements of the standard can be evaluated.

As noted above, an integral part of a good maintenance program is the monitoring and feedback of results. Programs should utilize quantitative measures to monitor and adjust the maintenance program activities. Measures that are based upon actual component reliability and failure history provide useful indicators of maintenance effectiveness. Such measures need a well structured and computer oriented system; e.g., (NPRDS) to capture and track equipment history data. Commission notes and encourages the use of the industry-wide NPRDS for this purpose in view of the multiple uses for this data.

*in Nuclear Plant
Reliability Data System*

In addition, the Commission has conducted studies to review effective maintenance approaches and practices in other countries and industries and has documented findings in a draft NUREG series report.³ The Commission seeks comments on the draft NUREG report which may be submitted to the NRC as indicated under the ADDRESSES heading.

³ A free single copy of draft NUREG-1333, "Maintenance Approaches and Practices Selected Foreign Nuclear Power Programs and Other U.S. Industries: Review of Lessons Learned," to the extent of supply, may be obtained by writing to the Distribution Services Section, Document Control Branch, Division of Support Services, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. A fee is also available for inspection or copying for a fee in the NRC Public Document Room, 2120 L Street, Lower Level, NW., Washington, D.C. 20037.

ies *ial*
The draft NUREG report concludes that the following are practices in foreign country and other U.S. industry maintenance programs which have been found to contribute significantly to effective maintenance:

1. Focus on long term maintenance objectives; establish a proactive maintenance program as opposed to reactive maintenance;
2. Use of a reliability centered approach to maintenance, including consideration of the man-machine interface;
3. Collection and engineering evaluation of failure data (root cause analysis);
4. Use of an integrated information system for collecting data and monitoring the effectiveness of a maintenance program;
5. Use of maintenance technician training/certification programs;
6. Derive planning and scheduling from overall program objectives;
7. Enhance environment/motivation of maintenance technicians (e.g. thru cross-training, "Crew Chief" concept); and
8. Clearly define interfaces between maintenance and other activities (engineering support, operations QA, QC, corporate offices, safety review).

The Commission encourages in the development of any Maintenance Standard, consideration of the findings in the above referenced draft NUREG report and any other pertinent studies on effective maintenance practices.

the industry
The Commission also encourages the Maintenance Standard to consider incorporating appropriate maintenance derived from plant aging studies *in*

CERTIFICATION OF PLANT MAINTENANCE PROGRAMS

The Commission wishes to encourage industry initiatives and responsibility for problem identification and resolution. Therefore, as a further way of encouraging industry participation and responsibility, the Commission is willing to consider a process of utilizing a designated third party to review and certify licensee maintenance programs for conformance with the Maintenance Standard. This process, if successful, could alleviate the need for detailed NRC inspection of all licensee maintenance programs. The Commission solicits proposals for conducting such a certification process.

COMMENTS REQUESTED

In addition to comments on the content of this Notice of Proposed Rule-making, the Commission specifically solicits input on the following questions:

1. Is it appropriate for the nuclear power industry to develop a Maintenance Standard and, if so, would the industry develop such a Maintenance Standard?
2. What level of detail should be included in the Maintenance Standard?
3. Is two years a reasonable time to develop, and implement a standard?
4. Is it appropriate for a designated third party to certify plant maintenance programs to comply with the Maintenance Standard; and, if so, would an organization be willing to perform such certification?
5. Should an industry-wide component failure reporting system, e.g., NPRDS, be used by all plants in order to support the sharing of gener-
maintenance ~~operating~~ experience and facilitate monitoring of maintenance effectiveness?
draft regulatory impact analysis shows that,

The accompanying
 IMPACT

The economic impact of the proposed requirement on licensees should be negligible. Although initial financial investments will be required by some licensees to establish a systematic and comprehensive maintenance program, the savings due to decreased corrective maintenance costs and increased plant availability should outweigh the investment costs. The Commission requests cooperation of informed sources in order to develop further details and verification of this analysis.

conditions, i.e., repair, surveillance, diagnostic examinations, and preventive measures; but extends to all supporting functions for the conduct of these activities. Maintenance includes the following activities:

- (1) Technology in the areas of:
 - (i) Corrective maintenance,
 - (ii) Preventive maintenance,
 - (iii) Predictive maintenance, and
 - (iv) Maintenance Surveillance;
- (2) Engineering in support of maintenance;
- (3) Quality assurance and quality control of maintenance activities;
- (4) Incorporation of plant modifications into the maintenance program;
- (5) Equipment history and trending;
- (6) Maintenance record keeping;
- (7) Management of parts, tools, and facilities;
- (8) Maintenance procedures;
- (9) Post-Maintenance testing and return-to-service activities;
- (10) Measures of overall maintenance program effectiveness;

issued under Sec. 184, 68 Stat. 954, as amended (42 U.S.C. 2234).
Section 50.103 also issued under Sec. 108, 68 Stat. 939, as amended
(42 U.S.C. 2237).

For the purposes of Sec. 223, 68 Stat. 958, as amended (42 U.S.C. 2273), §§ 50.10(a), (b), and (c) 50.44, 50.46, 50.48 and 50.54 and 50.54(a) are issued under Sec. 161b, 68 Stat. 948, as amended (42 U.S.C. 2201(b)); §§ 50.10(b) and (c) and 50.54 are issued under Sec. 161i, 68, stat. 949, as amended (42 U.S.C. 2201(i)); and §§ 50.9, 50.55(e), 50.59(b), 50.70, 50.71, 50.72, 50.73 and 50.78 are issued under Sec. 161o, 68 Stat. 950, as amended (42 U.S.C. 2201(o)).

2. A new § 50.65 is added to read as follows:

§ 50.65 Requirements to ensure the effectiveness of
maintenance programs for nuclear power plants.

- (a) Applicability. The requirements of this section apply to all nuclear power reactors licensed under § 50.21 b or 50.22.
- (b) Definitions. For the purpose of this section ^{planned and systematic} the Commission defines maintenance as the aggregate of those actions required to preserve and promptly restore operability, reliability, and availability of, or to prevent the failure of, plant structures, systems, and components. The Commission intends the scope of the rule to cover all systems, structures and components, including those in the Balance-of-Plant, ~~commensurate with their~~

Maintenance includes not only activities traditionally associated with identifying and correcting actual or potential degraded

- (11) Maintenance management and organization in the areas of:
 - (i) Planning,
 - (ii) Scheduling,
 - (iii) Staffing,
 - (iv) Shift coverage, and
 - (v) Resource allocation;
 - (12) Control of contracted maintenance services;
 - (13) Radiological exposure control (including ALARA) during maintenance activities;
 - (14) Maintenance personnel qualification and training;
 - (15) Internal communications between the maintenance organization and plant operations and support groups;
 - (16) Communications between plant and corporate management and the maintenance organization; and
 - (17) ^{Consideration of} Maintenance recommendations or requirements of individual vendors.
- (c) Requirements. Each holder of an operating license subject to this section shall (1) establish, implement, and maintain an effective and documented maintenance program ^{that addresses all elements and} defined in paragraph (b) of this section, and (2) ^{regularly} assess the effectiveness of this maintenance program and, based upon this assessment, make improvements, as appropriate. _____
- (d) Implementation. By [insert a date 2 years after the effective date of the amendment] each licensee shall certify, by letter to

the Director of the Office of Nuclear Reactor Regulation, that a comprehensive documented maintenance program ^{and activities} is being maintained and implemented, which addresses all elements ~~of a maintenance program~~ defined in paragraph (b) of this section including measures to monitor ^{the effectiveness of the maintenance} and improve the program, where appropriate. In addition, each licensee shall develop ^{to} [insert a date 3 months after the effective date of the amendment] a timely and expeditious plan and schedule (including Key Milestones) for meeting the requirements of this section.

Dated at Rockville, Maryland this _____ day of _____, 1988

For the Nuclear Regulatory Commission.

Samuel J. Chilk,
Secretary of the Commission.

NOTATION VOTE

RESPONSE SHEET

TO: SAMUEL J. CHILK, SECRETARY OF THE COMMISSION
FROM: COMMISSIONER ROBERTS
SUBJECT: SECY-88-277 - AMENDMENT TO 10 CFR 50 RELATED TO
MAINTENANCE OF NUCLEAR POWER PLANTS

APPROVED _____ DISAPPROVED X _____ ABSTAIN _____
NOT PARTICIPATING _____ REQUEST DISCUSSION _____

COMMENTS:

Samuel J. Chilc
SIGNATURE
10/24/88
DATE

YES ☐ NO ☐
ENTERED ON "AS" ☐ ☐
NRC-SECY FORM MAY, 1987

TMR COMMENTS ON SECY-88-277

I fully support the views of the ACRS on this proposed rulemaking and can not approve this proposed maintenance rule. The rule as proposed would require that each licensee establish, implement, and maintain an effective and documented maintenance program and to assess the effectiveness of this program and make improvements, as appropriate. Without being afforded the opportunity to review the accompanying Regulatory Guide, the Commission is left in a position of approving a specious rule.

Furthermore, I do not believe that the staff has adequately made a case that licensees do not have established maintenance programs. Staff has not demonstrated that this rule would improve the implementation of the existing programs. Staff provides no basis to determine when a maintenance program is effective or when improvements are "appropriate". I also do not agree with a rule that would have us regulating maintenance on all systems, structures and components regardless of whether they have a nexus with radiological safety or not. I am skeptical of the assumptions made in the backfit and regulatory analyses and specifically request comments on both of these documents.

I also request comments on the views of the ACRS. I share its concern that the existence of this rule could make things worse. They state that "... there are characteristics of regulations, and especially the way in which they are typically enforced, that lead us to believe that, under a rule, a move toward uniformity would occur, and this is likely to decrease the effectiveness of some of the better existing programs." It is because I believe on the importance of good maintenance practices that I am voting against this rule.

NOTATION VOTE

RESPONSE SHEET

TO: SAMUEL J. CHILK, SECRETARY OF THE COMMISSION
FROM: COMMISSIONER CARR
SUBJECT: SECY-88-277 - AMENDMENT TO 10 CFR 50 RELATED TO
MAINTENANCE OF NUCLEAR POWER PLANTS

APPROVED X w/comments DISAPPROVED _____ IN _____
NOT PARTICIPATING _____ REQUEST DISCUSSION _____
COMMENTS: See attached comments.

Kenneth M. Carr

SIGNATURE

10-26-88

DATE

YES

NO

ENTERED ON "AS"
NRC-SECY FORM MAY, 1987

Commissioner Carr's vote on SECY-88-277

I agree with the Chairman's and Commissioner Rogers' comments. In addition, I have the following comments.

1. I believe that maintenance programs should provide a means for establishing individual worker accountability for maintenance performed. I recommend that staff carefully consider how this criterion can be incorporated into the rulemaking and I would solicit comment on this subject in the rulemaking notice.
2. The current staff proposal is for issuance of the Final Rule in April 1989 with the Regulatory Guide to follow in November 1989. A better course of action would be to delay issuance of the Final Rule so that it can be put forward along with the Regulatory Guide which will provide essential information on rule implementation. Therefore, I recommend that the Regulatory Guide, which will endorse the industry standard or define the NRC guidance, be issued concurrently with the Final Rule by November 1989.

NOTATION VOTE

RESPONSE SHEET

TO: SAMUEL J. CHILK, SECRETARY OF THE COMMISSION

FROM: COMMISSIONER ROGERS

SUBJECT: SECY-88-277 - AMENDMENT TO 10 CFR 50 RELATED TO
MAINTENANCE OF NUCLEAR POWER PLANTS

Subject To
APPROVED COMMENTS KCR DISAPPROVED _____ ABSTAIN _____

NOT PARTICIPATING _____ REQUEST DISCUSSION _____

COMMENTS:

I hold the opinion that the Commission now has a unique opportunity here to take an important new positive step in regulation. Therefore, I feel that the proposed rule should include an additional statement that allows that to take place. My approval of the proposed rule is contingent upon such an addition. The suggested additional wording is included in the new pages 6 and 8 which are attached. KCR

Kenneth C. Rogers
SIGNATURE

October 18, 1988
DATE

YES NO

ENTERED ON "AS"

SECY-88-277 - AMENDMENT TO 10 CFR 50

☐ ☐

1007

- o Should provide clear and specific programmatic requirements that can be practically implemented to achieve high reliability;
- o Should be comprehensive in addressing the activities and functions included in the proposed rule plus provisions for self assessment;
- o Should reference standards or guidelines such as those developed by ANS, ASME, IEEE, ASTM, INPO, or EPRI where practical to provide (a) specific programmatic requirements or (b) guidance for maintenance of specific types of equipment;
- o Should allow flexibility for adoption of new innovative technologies as they are validated; and
- o Should provide for sufficient documentation so that program effectiveness and compliance with requirements of the standard can be evaluated.

The Commission has conducted studies to review effective maintenance approaches and practices in other countries and

industries and has documented the findings in a draft NUREG series report.³ The Commission seeks comments on the draft NUREG report which may be submitted to the NRC as indicated under the ADDRESSES heading.

As noted above, an integral part of a good maintenance program is the monitoring and feedback of results. Programs should utilize quantitative measures to monitor and adjust the maintenance program activities. Measures that are based upon actual component reliability and failure history provide useful indication of maintenance effectiveness. Such measures need a well structured and component oriented system; e.g., NFRDS to capture and track equipment history data. The Commission notes and encourages the use of the industry-wide NFRDS for this purpose in view of the multiple uses for this data.

The Commission views maintenance rulemaking as an opportunity to encourage (a) good maintenance practices, (b) the adoption of common maintenance standards, and (c) the development of valid quantitative measures of effectiveness which could become the basis for regulation by outcomes rather than processes. The

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herein proposed rule addresses (a) and (b) but not (c). Follow-on rulemaking is envisioned which would build on the bases established in this rule and would define those validated measurable quantities or indicators that could credibly become the basis for regulatory attention or action in the future instead of the systems for maintenance established under (a) and (b) of this proposed rule.

CERTIFICATION OF PLANT MAINTENANCE PROGRAMS

The Commission wishes to encourage industry initiatives and responsibility for problem identification and resolution. Therefore, as a further way of encouraging industry participation and responsibility, the Commission is willing to consider a process of utilizing a designated third party to review and certify licensee maintenance programs for conformance with the Maintenance Standard. This process, if successful, could alleviate the need for detailed NRC inspection of all licensee maintenance programs. The Commission solicits proposals for conducting such a certification process.

COMMENTS REQUESTED

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3. Is two years a reasonable time to develop, and implement a standard?
4. Is it appropriate for a designated third party to certify plant maintenance programs

to comply with the Maintenance Standard; and, if so, would an organization be willing to perform such certification?

5. Should an industry-wide component failure reporting system, e.g., NPRDS, be used by all plants in order to support the sharing of generic operating experience and facilitate monitoring of maintenance effectiveness?
6. Are performance indicators that are being used by industry, may be used in the future, or have been used in the past appropriate candidates as quantitative measures of maintenance effectiveness? The Commission is particularly interested in experience or analysis concerning indicators or the use of indicators of component reliability as maintenance performance indicators.

KCI

IMPACT

The economic impact of the proposed requirement on licensees should be negligible. Although initial financial investments will be required by some licensees to establish a systematic and comprehensive maintenance program, the savings due to decreased corrective maintenance costs and increased plant availability should outweigh the investment costs. The Commission requests cooperation of informed sources in order to develop further details and verification of this analysis.

NOTATION VOTE

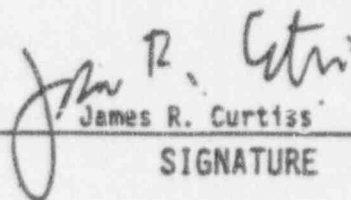
RESPONSE SHEET

TO: SAMUEL J. CHILK, SECRETARY OF THE COMMISSION
FROM: COMMISSIONER CURTISS
SUBJECT: SECY-88-277 - AMENDMENT TO 10 CFR 50 RELATED TO
MAINTENANCE OF NUCLEAR POWER PLANTS

APPROVED _____ DISAPPROVED _____ ABSTAIN _____

NOT PARTICIPATING xx REQUEST DISCUSSION _____

COMMENTS:


James R. Curtiss
SIGNATURE

October 27, 1988

DATE

YES

NO

ENTERED ON "AS" ☐ ☒
NRC-SECY FORM MAY, 1987