RULEMAKING ISSUE
(Notation Vote)

August 21, 1995 SECY-95-215

FOR: The Commissioners

FROM: James. M. Taylor
Executive Director for Operations

SUBJECT: PROPOSED RULEMAKING FOR REPORTING EQUIPMENT RELIABILITY DATA

PURPOSE:

To obtain Commission approval for the publication of a Federal Register notice of proposed rulemaking.

BACKGROUND:

In a memorandum dated March 24, 1995, I provided, for your information, the staff's rulemaking plan for this proposed rulemaking. On April 26, 1995, the staff briefed the Commission on the proposed rule, as described in SECY-95-099. In response to a staff requirements memorandum (SRM) dated May 4, 1995, I provided a revised package as described in SECY-95-129. In a SRM dated June 28, 1995 (Attachment 1), the Commission approved publishing the proposed rule for public comment subject to several comments and indicated that the revised rulemaking package should be returned to the Commission for approval prior to publication. This revised package responds to those instructions.

DISCUSSION:

The revised notice of proposed rulemaking is provided in Attachment 2. Attachment 3 describes how the staff has addressed each of the Commission's specific comments.

As indicated in the draft statement of considerations (SOC), the proposed rule is necessary to substantially improve the NRC's ability to make risk-effective regulatory decisions consistent with the Commission's policy statement on the use of probabilistic risk assessments (PRAs). The NRC would use the data that

Contacts:

Dennis P. Allison, AEOD
(301) 415-6835

Bennett M. Brady, AEOD
(301) 415-6363

NOTE: TO BE MADE PUBLICLY AVAILABLE WHEN THE FINAL SRM IS MADE AVAILABLE

would be required by the proposed rule in generic issue resolution, developing quantitative indicators that can assist in assessing and predicting plant performance, performing risk-based inspections, and pursuing modifications to specific plants and basic regulations and guidelines. Furthermore, this information would improve the NRC's oversight of licensees' implementation of the maintenance rule. It would also enhance licensee's capabilities to implement the evaluation and goal-setting activities required by the maintenance rule by providing licensees with access to current industry-wide reliability and availability information for risk-significant systems and equipment within the scope of the maintenance rule. These actions would assist the NRC in improving its oversight capabilities with respect to public health and safety and becoming more efficient by focusing its regulatory program on those issues of greatest risk significance and reducing unnecessary regulatory burdens on licensees.

The proposed rule, which has not been changed from what was described in SECY-95-099 and SECY-95-129, would require that licensees for commercial nuclear power reactors report to the NRC summary reliability and availability data for risk-significant systems and equipment. The proposed rule would also require licensees to maintain on site, and to make available for NRC inspection, records and documentation that provide the basis for the summary data reported to the NRC. The systems and equipment for which data would be provided are a subset of the systems and equipment within the scope of the maintenance rule (10 CFR 50.65).

The proposed reporting requirements would apply to the event-mitigating systems and equipment[1] which have or could have a significant effect on risk in terms of avoiding core damage accidents or preserving containment integrity. Summary information reported to the NRC would be:

(a) The number of demands, the number of failures to start associated with such demands, and the dates of any such failures, characterized according to the identification of the train affected, the type of demand (test, inadvertent/spurious, or actual need), and the plant mode at the time of the demand (operating or shutdown),

(b) The number of hours of operation following each successful start, characterized according to the identification of the train affected and whether or not the operation was terminated because of equipment failure, with the dates of any such failures,

(c) The number of hours of unavailability, characterized according to the identification of the train affected, the plant mode at the time of the unavailability (operating or shutdown), the type of unavailability (planned, unplanned, or support system

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[1] In relation to this proposed rule, the term equipment is intended to apply to an ensemble of components treated as a single entity for certain PRAs where a system or train treatment would not be appropriate.

unavailability), and, if due to support system unavailability, identification of the support system,

(d) For each unavailability due to component failure(s), a failure record identifying the component(s) and providing the failure date, duration, mode, cause, and effect, and

(e) The number of hours when two or more trains from the same or different systems were concurrently unavailable, characterized according to the identification of the trains that were unavailable.

The proposed rule is intended to be a simple, performance-based rule supplemented with a detailed regulatory guide. The guide would provide methods for selecting systems and equipment subject to the rule. The guide would also provide methods to define demands, failure, unavailability, and train boundaries for each system consistent with PRA applications and suggest formats for reporting the data to the NRC and maintaining the data on site.

Both the SOC and the regulatory analysis for this proposed rule provide a discussion of the need for the information proposed to be collected and reported, including the safety significance of the information. The regulatory analysis for the proposed rule also discusses in detail the impacts of collecting the information under two alternative regulatory schemes, for the purpose of assessing the burdens imposed upon licensees by the proposed rule. The regulatory analysis and the SOC set forth the conclusion that the burden imposed by the proposed information collection is justified in view of the safety significance of the information with regard to adopting and implementing risk-based regulatory activities as well as improving NRC oversight of the maintenance rule and enhancing licensee's capabilities to implement the maintenance rule. These rationales form the bases for the proposed rulemaking. In accordance with the SRM dated June 28, 1995, the staff will continue to work with industry on voluntary submittal of reliability data.

Note that the Paperwork Reduction Act of 1995 sets forth goals for reduction of information collection burdens over the next 5 years. Imposition of the requirements in the proposed rule may therefore require that the NRC identify offsetting information collection burden reductions in future years.

RESOURCES:

Staff resources to prepare, review, and conduct the rulemaking are expected to be 1.5 FTE in AEOD, 0.5 FTE in RES, and 0.75 FTE in other offices. These FTE resources are included in the FY 1995-1999 Five-Year Plan. Contract support to assist in the preparation of the regulatory guide is estimated to require $350K, and will be reprogrammed from within existing resources.

Costs for implementing the proposed rule are discussed in the draft Regulatory Analysis provided in Attachment 4. The recordkeeping and reporting burden for licensees is estimated to average 1375 hours per commercial power reactor per year.

RECOMMENDATIONS:

That the Commission:

1. Approve publication of the notice of proposed rulemaking (Attachment 2).

2. Note:

   a. The proposed rule will be published in the Federal Register for a public comment period to last until at least 30 days after the associated draft regulatory guide is published for comment;

   b. I certify that this rule, if promulgated, will not have a negative economic impact on small entities because the licensees to which this rule would apply do not qualify as small entities. It is expected that the additional cost of reporting the data to NRC will be small. In the long term, the rule is expected to result in substantial cost savings to licensees with the reduced regulatory burden resulting from the move to risk-based regulation;

   c. The Chief Counsel for Advocacy of the Small Business Administration will be informed of the certification regarding economic impact on small entities and the reasons for it as required by the Regulatory Flexibility Act;

   d. The proposed rule contains information collection requirements that are subject to review by the Office of Management and Budget (OMB). Upon Commission affirmation, formal request for OMB review and clearance will be initiated;

   e. A public announcement will be issued when the proposed rule is filed with the Office of the Federal Register (Attachment 5);

   f. The appropriate Congressional committees will be informed (Attachment 6); and

   g. Copies of the Federal Register notice of proposed rulemaking will be distributed to all operating nuclear power plant licensees. The notice will be sent to other interested parties upon request.

COORDINATION:

The Office of the General Counsel has reviewed this proposed rulemaking and has no legal objection.

James M. Taylor
Executive Director
for Operations

Attachments:
1. Staff requirements memorandum
2. Federal Register notice
3. Responses to Commission Comments
4. Draft Regulatory Analysis
5. Draft press release
6. Draft Congressional letter

Commissioners' comments or consent should be provided directly to the Office of the Secretary by COB Tuesday, September 5, 1995.

Commission Staff Office comments, if any, should be submitted to the Commissioners NLT Monday, August 28, 1995, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

DISTRIBUTION:
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Attachment 1

Staff Requirements Memorandum

June 28, 1995

OFFICE OF THE
SECRETARY

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

June 28, 1995

Action: Jordan, AEOD

Cys: Taylor
Milhoan
Thompson
Blaha
DAllison, AEOD
DMeyer, ADM
DMorrison, RES
WRussell, NRR
RScroggins, OC

MEMORANDUM TO: James M. Taylor
Executive Director for Operations

FROM: John C. Hoyle, Secretary

SUBJECT: SECY-95-129 - PROPOSED RULEMAKING FOR REPORTING EQUIPMENT RELIABILITY DATA

The Commission (with the Chairman and Commissioners Rogers and Jackson agreeing) has approved the proposed rule, subject to the comments listed below. The revised rulemaking package should be returned to the Commission for approval prior to publication.
~~(EDO)~~ AEOD (SECY Suspense: 8/18/95) 9400180

1. The staff should focus its primary justification for the reliability data rule on NRC's oversight role in improving public health and safety, economic burden reduction, and the need for the data to support generic regulatory actions such as rulemaking as well as plant-specific regulatory actions. As part of this justification, the staff should address its technical needs for plant-specific identifiable data, as contrasted to data without plant-specific identification. The staff should ensure that equipment that has played a significant role in precipitating or aggravating significant events that have occurred in U.S. plants are included within the scope of the reliability data rule. Also, the staff should discuss the potential use of the data in predicting or identifying plants, and equipment and systems within plants, that may be at most risk for significant events.

2. Arguments linking the desirability of collecting the reliability data called for to the maintenance rule should either be improved or dropped. If such a linkage can be made, the staff should consider the appropriateness of collecting consistent/equivalent data sets through both this rule and the maintenance rule.

SECY NOTE: THIS SRM, SECY-95-129, AND THE VOTE SHEETS OF ALL COMMISSIONERS WILL BE MADE PUBLICLY AVAILABLE 5 WORKING DAYS FROM THE DATE OF THIS SRM.

3. The staff should continue to work with industry on voluntary submittal of reliability data, under a program that will meet the needs of all parties.

4. The staff should ensure that the draft regulatory guide is available for public comment for a minimum of 30 days during which this proposed rule is available for public comment.

Commissioner de Planque disapproved publication of the proposed rule as presented and preferred further discussion with industry with the goal of stimulating a voluntary program for the collection of reliability data.

cc: The Chairman
Commissioner Rogers
Commissioner de Planque
Commissioner Jackson
OGC
OCA
OIG
Office Directors, Regions, ACRS, ACNW, ASLBP (via E-Mail)

Attachment 2

Federal Register Notice

[7590-01-P]

NUCLEAR REGULATORY COMMISSION

10 CFR PART 50

RIN 3150-AF33

Reporting Reliability and Availability Information for Risk-significant Systems and Equipment

AGENCY: Nuclear Regulatory Commission.

ACTION: Proposed rule.

SUMMARY: The Nuclear Regulatory Commission (NRC) is proposing to amend its regulations to require that licensees for commercial nuclear power reactors report plant specific summary reliability and availability data for risk-significant systems and equipment[1] to the NRC. The proposed rule would also require licensees to maintain on site, and to make available for NRC inspection, records and documentation that provide the basis for the summary data reported to the NRC. The systems and equipment for which data would be

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[1] In relation to this proposed rule, the term equipment is intended to apply to an ensemble of components treated as a single entity for certain probabilistic risk assessments (PRAs) where a system or train treatment would not be appropriate.

provided are a subset of the systems and equipment within the scope of the maintenance rule.

The Commission has determined that reporting of reliability and availability information is necessary to substantially improve the NRC's ability to make risk-effective regulatory decisions consistent with the Commission's policy statement on the use of probabilistic risk assessments (PRAs) (August 16, 1995; 60 FR 42622). This would assist the NRC in improving its oversight capabilities with respect to public health and safety and becoming more efficient by focusing its regulatory program on those issues of greatest risk significance and reducing unnecessary regulatory burdens on licensees. The Commission would use the data that would be required by the proposed rule in generic issue resolution, developing quantitative indicators that can assist in assessing plant safety performance, performing risk-based inspections, and pursuing modifications to specific plants and basic regulations and guidelines. Furthermore, this information would improve the NRC's oversight of licensees' implementation of the maintenance rule. It would also enhance licensee's capabilities to implement the evaluation and goal-setting activities required by the maintenance rule by providing licensees with access to current industry-wide reliability and availability information for risk-significant systems and equipment within the scope of the maintenance rule.

DATES: The comment period will expire after publication in the *Federal Register* of a supplementary notice that provides a specific expiration date.

The Commission intends that this expiration date will be at least 30 days after publication of an associated draft regulatory guide for public comment.

ADDRESSES: Mail written comments to: U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN.: Docketing and Service Branch.

Deliver written comments to One White Flint North, 11555 Rockville Pike, Rockville, MD, between 7:30 am and 4:15 pm on Federal workdays.

Copies of the draft regulatory analysis, the supporting statement submitted to OMB, and comments received may be examined, and/or copied for a fee, at: The NRC Public Document Room, 2120 L Street NW. (Lower Level), Washington, DC.

FOR FURTHER INFORMATION CONTACT: Dennis Allison, Office for Analysis and Evaluation of Operational Data, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, Telephone (301) 415-6835.

SUPPLEMENTARY INFORMATION:

BACKGROUND

Current Requirements.

There are no existing requirements to systematically report reliability and availability information; nor is there an industry-wide database to provide such information.

Current reporting requirements in 10 CFR 50.72, "Immediate notification" and 10 CFR 50.73, "Licensee event report system," require the submittal of extensive descriptive information on selected plant and system level events. The Nuclear Plant Reliability Data System, a data base that industry supports and the Institute for Nuclear Power Operations maintains, provides data on component engineering characteristics and failures. Neither of these sources includes all the data elements (i.e., number of demands on a system, number of hours of operation, and information on maintenance unavailabilities) that are needed to determine the reliability and availability of risk-significant systems and equipment. Maintenance effectiveness monitoring requirements in 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants", also do not contain reporting requirements.

In recent years, plants have performed Individual Plant Evaluations (IPEs), as requested in Generic Letter 88-20 and its supplements, and submitted the results to the NRC. These submittals provide measures of risk

such as core damage frequency, dominant accident sequences, and containment release category information. While system and component reliability data have been collected as part of some utility IPEs, this information is typically not included in the IPE submittals to the NRC.

Prior Efforts.

In late 1991 and through 1992, the NRC staff participated on an INPO-established NRC/industry review group to make recommendations for changes to the Nuclear Plant Reliability Data System (NPRDS). The group's final recommendations to INPO to collect PRA-related reliability and availability data would have provided most of NRC's data needs. However, INPO took no action on these recommendations.

During 1992 and 1993, the NRC staff continued through correspondence and meetings to outline the particular data needed and to seek INPO's assistance in obtaining the data. In a December 1993 meeting with NUMARC (now the Nuclear Energy Institute (NEI)), INPO representatives suggested their Safety System Performance Indicator (SSPI) as a surrogate for reliability data. They proposed expanding the indicator to additional systems and indicated that data elements could be modified to compute actual reliability and availability data. Although general agreements were reached with INPO on which systems and components and what types of data elements are appropriate for risk-related applications and maintenance effectiveness monitoring, no voluntary system of providing data resulted from these discussions. In the fall of 1994, the NRC staff began work on this rulemaking action. In June 1995, NEI proposed to

discuss a voluntary approach of providing reliability and availability data to the NRC based on SSPI data. The NRC staff will continue to work with industry on voluntary submittal of reliability data, under a program that will meet the needs of all parties, while at the same time proceeding to obtain public comment on this proposed rule.

Industry representatives have expressed concern that reliability data, if publicly available, would be subject to misuse. In certain circumstances it is permissible for the NRC to withhold information from public disclosure. For example, pursuant to 10 CFR 2.790(b)(1), a licensee may propose that a document be withheld from public disclosure on the grounds that it contains trade secrets or privileged or confidential commercial or financial information. However, the data that would be reported under this proposed rule would not appear to qualify for withholding. Reliability data used as input to risk-based regulatory decisions should be scrutable and accessible to the public. The Commission's PRA policy statement indicates that appropriate supporting data for PRA analyses that support regulatory decisions should be publicly available. Similarly, the Commission's draft report on public responsiveness (March 31, 1995; 60 FR 16685) indicates that the policy of the NRC is to make information available to the public relating to its health and safety mission, consistent with its legal obligations to protect information and its deliberative and investigative processes. Commenters who believe that there is information subject to a proper 2.790(b)(1) withholding determination requested by the proposed rule should provide a specific justification for such belief.

Move to Risk-Based Regulation.

For several years the Commission has been working towards increased use of PRAs in power reactor regulation. In its policy statement on the use of PRAs, the Commission has indicated that the use of PRA technology should be increased in all regulatory matters to the extent supported by the state-of-the-art in terms of methods and data and this implies that the collection of equipment and human reliability data should be enhanced. Implementation of these policies would improve the regulatory process through (1) improved risk-effective safety decision making, (2) more efficient use of agency resources, and (3) reduction in unnecessary burdens on licensees. These improvements would enhance both efficiency and safety.

The data reported under this proposed rule would improve the NRC's oversight capability with respect to public health and safety by focusing the NRC's regulatory programs in a risk-effective manner. Generally, the NRC's ability to identify plants and systems at increased risk for significant events and, thus, to take appropriate action would be substantially improved. For example, a generic indication of low reliability or availability for a risk-significant system might indicate a technical problem, with its attendant risk, that may warrant generic action. Similarly, a plant-specific indication of low reliability or availability for several risk-significant systems might indicate a programmatic problem, with its attendant risk, and may warrant plant-specific action.

It has been noted that prior to some significant events (such as the scram failure at Salem and the accident at Three Mile Island) there was previously existing data (such as challenge data and reliability data for scram breakers and power operated relief valves) which, if collected, recognized, and acted upon might have led to preventive actions. Accordingly, it is expected that reliability and availability information for risk-significant systems would improve the NRC's oversight capability with respect to public health and safety - i.e., the ability to maintain or enhance safety by identifying and reviewing indications of increased risk and, if appropriate, taking generic or plant-specific action.

Such problems could be subtle in nature. For instance, licensee(s) might schedule train outages for maintenance at certain times, such that risks are substantially increased over what would be expected based on random outages. This situation would not be indicated by current reporting requirements, or even by simply reporting train unavailability, but it could be indicated by the concurrent unavailability of two or more trains, as would be reported under the proposed rule. Additional examples discussed below describe further specific uses of the data that would help to enhance safety.

In order to move towards risk-based regulation and the increased use of PRA information, the NRC needs scrutable, plant-specific and generic[2] reliability and availability information. The framework for an overall move

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[2] Generic data can be readily obtained by averaging appropriate plant-specific data; however, plant-specific information cannot be derived from generic information.

towards risk-based regulation involves the development of a regulatory process which includes operational procedures and decision criteria that requires credible PRA methods, models, and data. This framework would provide for predictable, consistent, and objective risk-based regulatory decision making. The data that would be reported under this rule represent one part of such a framework. In addition, these data are needed to improve the efficiency and effectiveness of current NRC regulatory applications that employ a risk-based perspective in advance of defining the entire framework.

Some examples of how reliability and availability information would be used to improve current NRC regulatory applications that consider risk in the decision process are discussed below. One of the examples involves the need for information to support generic regulatory actions - i.e., generic issue resolution and its associated rulemaking or regulatory guide revision. Another example involves the need for information to determine whether further NRC action is needed at specific plants - i.e., indicators of plant performance. Some involve a mixture of plant specific and generic elements. For example, analyzing an event at a given plant could lead to a plant-specific action such as a special inspection and/or to a generic action such as a bulletin or generic letter. Generally, plant-specific information is needed because there can be wide plant-to-plant variations in the design, importance, reliability and availability of particular systems and equipment. It is necessary to identify these plant-specific factors in order to understand reliability and availability issues that may be identified, the significance of reported events, and individual plant safety performance.

Generic Issue Resolution. The NRC currently uses risk estimates in: (1) prioritizing safety issues, (2) deciding whether new requirements or staff positions to address these issues are warranted, and (3) deciding whether proposed new requirements or staff positions should be implemented. Knowing the current, updated reliability and availability of key systems would, in some cases, lead to a better understanding of the risk in these areas and, thus, to more risk-effective decisions. This should both enhance public protection and reduce unnecessary regulatory burdens. Generic data would usually suffice for this purpose; however, in some cases the data would need to be divided to account for specific classes or groups of plants.

Indicators of Plant Performance. PRA models with plant-specific reliability and availability data would be used to develop indicators of plant performance and trends in plant performance which are more closely related to risk than those currently in use. These new indicators would replace some of those currently in use and thereby enhance NRC's ability to make risk-effective decisions with regard to identifying plants for increased or decreased regulatory attention. Plant-specific data are needed in order to identify specific plants for increased or decreased regulatory attention. For example, it is important to detect situations where an individual plant may be having reliability or availability problems with multiple systems.

Accident Sequence Precursor (ASP) and Event Analysis. Plant-specific, train-level reliability and unavailability data will be used to improve the plant-specific ASP models which the NRC uses to compute conditional core damage probability for determining the risk-significance of operational

events. In addition, dates and causes of equipment failures will be used to identify common cause failures and to compute common cause failure rates for input to these models. Improving these methods will enhance the staff's ability to make risk-effective decisions about which events warrant further inspections or investigations and/or generic actions such as bulletins and generic letters. Plant-specific data are needed in order to understand an event and calculate the associated conditional core damage probability. It is also useful to identify systems that have the most influence on the results. Then the risk associated with the potential for similar events at other plants, which may be known to have low reliability for the key systems, can be considered in determining whether further actions are warranted.

Risk-based Inspections. Current and updated system reliability, availability and failure data in a generic and plant-specific risk-based context will be used to enhance the staff's ability to plan inspections focused on the most risk-significant plant systems, components, and operations. Generic data will be used in developing risk-based inspection guides and a framework for inspections. Plant-specific data are needed to focus and optimize inspection activities at specific plants. For example, an individual plant may have an atypical reliability problem with a specific system. Identifying such factors would enable inspectors to focus their attention on the more risk-significant systems and issues at each individual plant. In addition, special studies can be conducted to determine the root cause of reliability problems by comparing the characteristics of plants that have these problems with those that do not.

Aging. Equipment reliability data will help identify equipment that is being degraded by aging and define the extent and the risk-significance of aging problems. This enhances the NRC's oversight capability with regard to the license renewal rule (10 CFR Part 54).

Another class of examples involves the need for information to evaluate anticipated cost beneficial licensing actions, where the rationale is that risk permits reductions in previous margins of safety or less prescriptive requirements without adverse impact on overall safety. The NRC is actively pursuing a variety of modifications to the basic regulations and guidelines that govern the operation of commercial nuclear power reactors. These modifications are characterized by allowing individual licensees to utilize insights from plant-specific risk evaluations to reduce or remove current requirements that are found to have low risk-significance. Current regulatory requirements under consideration for risk-based modification include those prescribing quality assurance, in-service inspection, in-service testing, and surveillance testing. It is anticipated that a significant number of additional requests will be received, relying upon risk-based arguments. These changes could adversely affect the level of safety achieved by the plants if the risk evaluations are flawed or the changes are improperly executed or the changes involved synergistic effects that are not covered by the risk models or captured by historical data. In order to properly monitor the effectiveness of licensees' programs to maintain safety while reducing regulatory burden and to exercise its oversight authority, the NRC needs current, plant-specific data that can provide a direct measure of the current level of safety achieved by each plant. Relaxation of undue regulatory

burdens then can proceed with confidence that there will be appropriate feedback to assure that the level of safety is not being degraded. Some examples are discussed below.

Risk-based Technical Specifications. Technical Specification requirements specify surveillance intervals and allowed outage times for safety equipment for the various modes of plant operation. With plant-specific demand failure and unavailability data, proposed changes to plant-specific Technical Specifications can be more effectively evaluated based on the risk-significance and performance of the plant systems/equipment and based on confidence that there will be appropriate feedback to assure that the level of safety performance is not being degraded. Failure rates from actual demands will be used to verify that failure rates estimated from testing are approximately the same. Results and recommendations from the risk-based technical specifications development efforts would also be incorporated in NRC staff guidance for review of Technical Specifications modifications.

Inservice Testing. Inservice testing requirements, which are based on the provisions of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), measure the functional characteristics of equipment performance, such as pump flow, in order to detect degradation. The ASME and licensee owners' groups are working toward establishing risk-based frequencies for inservice testing, based on plant-specific risk ranking methodologies. Changes in testing frequency can affect reliability in many ways. For example, less frequent valve testing might lead to an increase in the demand failure rate because the valve actuating mechanism tends to bind or

freeze after extended periods of idleness. However, using plant-specific demand failure and unavailability data, proposed changes can be more effectively evaluated based on the risk-significance and performance of plant systems and based on confidence that there will be appropriate feedback to assure that the level of safety is not being degraded.

NRC Maintenance Rule.

The maintenance rule, 10 CFR 50.65, was issued on July 10, 1991 (56 FR 31306). The reliability and availability information that would be required by the proposed reporting rule would improve the NRC's oversight of licensees' implementation of the maintenance rule. It would also enhance licensee's capabilities to implement the evaluation and goal-setting activities required by the maintenance rule by providing licensees with access to current industry-wide reliability and availability information for risk-significant systems and equipment within the scope of the maintenance rule.

NRC Monitoring. As discussed above, current plant-specific data can provide a direct measure of the current level of safety achieved by each plant, which can provide feedback on the effectiveness of licensee programs, including maintenance programs. Accordingly, these data would improve the NRC's monitoring ability by providing risk-based measures of the effectiveness of individual licensee maintenance programs and the overall effectiveness of the maintenance rule.

In addition, the NRC has expressed concern about the extent to which some reactor licensees are taking systems and equipment out of service for maintenance during plant operation. Although this practice may offer economic benefits by reducing plant downtime, it must be properly managed to assure that safety is not compromised, and licensees are required by 10 CFR 50.65(a)(3) to periodically conduct assessments and make adjustments to ensure that the objective of preventing failures through maintenance is appropriately balanced against the objective of minimizing unavailability due to monitoring and preventive maintenance. The NRC would use the hours when any two or more trains from the same or different systems are concurrently unavailable to monitor how well licensees are managing the risk associated with such maintenance. As discussed below, under "Licensee Implementation," the data would also enhance licensees' capabilities to make prudent on-line maintenance decisions.

The maintenance rule is also important to the license renewal rule (10 CFR Part 54). Hence, improving the NRC's oversight of the maintenance rule could strengthen one of the bases for the license renewal rule.

Licensee Implementation. In connection with the NRC's PRA policy, the NRC staff has defined the data elements that would improve the evaluation of maintenance and has established that they are the same as those needed to support a transition toward a risk- and performance-based regulatory process. The NRC believes that the reliability and availability data that would be required by this rule would enhance licensee's capabilities to implement the evaluation and goal-setting activities required by the maintenance rule by

providing licensees with access to current industry-wide reliability and availability information for risk-significant systems and equipment within the scope of the maintenance rule.[3]

In some circumstances, the maintenance rule requires licensees to establish performance or condition goals, taking into account industry-wide operating experience where practical. It also requires periodic program evaluations, including consideration of unavailability due to monitoring or preventive maintenance, taking industry-wide operating experience into account, where practical. Licensees will need to monitor reliability and availability of risk-significant systems, particularly for the periodic

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[3] The systems and equipment covered by this proposed rule are a subset of the systems and equipment within the scope of the maintenance rule. The data elements are more extensive than what would be required for compliance with the maintenance rule; however, for the systems covered, these data elements would serve to improve implementation of the maintenance rule. To cite one example, under 10 CFR 50.65(a)(2), risk-significant systems may be considered to be subject to an effective preventive maintenance program and, thus, not subject to condition or performance monitoring unless "maintenance preventable" failures occur. However, gathering the reliability and availability information specified in this proposed rule, including data elements such as concurrent outages and the causes of failures, would provide a better picture of a risk-significant system's performance and the effectiveness of the preventive maintenance program than simply awaiting the occurrence of "maintenance preventable" failures.

program evaluations.[4] For most risk-significant systems, plant-specific data are too sparse to support a meaningful evaluation of system reliability and availability. With both plant-specific and industry-wide data, statistical techniques using Bayesian analysis can provide more meaningful estimates of equipment performance for comparisons with goals or to perform analysis to minimize unavailability. Industry-wide data would also provide a practical source for comparing plant-specific performance with industry operating experience. Although plant-specific information is generally available on site, and utilities review licensee event reports and other generic event information, NRC site visits, associated with early efforts to prepare for maintenance rule implementation in 1996, indicate that utilities do not use industry operating experience in a systematic and consistent way for goal setting purposes under the maintenance rule. Based on these considerations, the availability of current, industry-wide reliability and availability data would enhance licensee's capabilities to implement the evaluation and goal-setting activities required by the maintenance rule.

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[4] NUMARC 93-01, which the NRC has endorsed as describing one acceptable way of meeting the requirements of the NRC's maintenance rule, indicates in Section 12.2.4 that the adjustment for balancing of objectives needs to be done for risk-significant structures, systems, and components (SSCs). However, for other SSCs it is acceptable to measure operating SSC performance against overall plant performance criteria and standby system performance against specific performance criteria. This is reasonable in that, for systems that are less risk-significant, the expense of a rigorous balancing is not warranted.

As discussed previously, the NRC has recently found cause for concern about how some reactor licensees handle on-line maintenance. Prudent on-line maintenance decisions depend on a full appreciation of the risk-significance of taking equipment out of service (individually or collectively) and use of plant-specific and generic reliability and availability data would play a significant role in improving such decision-making.

Description of Proposed Rule.

The proposed rule would require holders of operating licenses for nuclear power reactors to report reliability and availability data for risk-significant systems and equipment. The proposed reporting requirements would apply to the event-mitigating systems and equipment which have or could have a significant effect on risk in terms of avoiding core damage accidents or preserving containment integrity. Summary information reported to the NRC would be:

(a) The number of demands, the number of failures to start associated with such demands, and the dates of any such failures, characterized according to the identification of the train affected, the type of demand (test, inadvertent/spurious, or actual need), and the plant mode at the time of the demand (operating or shutdown);

(b) The number of hours of operation following each successful start, characterized according to the identification of the train affected and

whether or not the operation was terminated because of equipment failure, with the dates of any such failures;

(c) The number of hours of unavailability, characterized according to the identification of the train affected, the plant mode at the time of the unavailability (operating or shutdown), the type of unavailability (planned, unplanned, or support system unavailability), and, if due to support system unavailability, identification of the support system;

(d) For each unavailability due to component failure(s), a failure record identifying the component(s) and providing the failure date, duration, mode, cause, and effect; and

(e) The number of hours when two or more trains from the same or different systems were concurrently unavailable, characterized according to the identification of the trains that were unavailable.

The summary information would be reported annually and compiled on the basis of calendar quarters, or on a more frequent basis at the option of each individual licensee. Records and documentation of each occurrence of a demand, failure, or unavailability that provide the basis for the summary data reported to the NRC would be required to be maintained on site and made available for NRC inspection.

In developing these data elements the NRC has, over the past three years, reached a consensus on the minimum data needed to support risk-based

applications and enhance implementation of the maintenance rule. During this period NRC staff has also interacted extensively with INPO and NEI in an effort to define the minimum reliability and availability data needed to satisfy the needs of both NRC risk-based regulatory applications and industry (licensee) uses of PRA.

The number of demands and the number of successful starts are needed to determine demand reliability, i.e., the fraction of demands that result in successful starts. (The complement of this fraction is often called the probability of failure on demand). The actual number of demands and successes, as opposed to the ratio, is needed to compute confidence bounds on demand reliability.

The type of demand is needed to determine whether or not the demand reliability estimated by testing is approximately the same as the demand reliability for actual demands. Sometimes it is not, indicating a need for more sophisticated data analysis in making reliability estimates.

The plant mode at the time of a demand is needed to determine the demand frequency, demand reliability, and unavailability according to plant mode. These factors, as well as the risk associated with unreliability and unavailability, can be quite different depending on whether the plant is in operation or shut down.

The hours of operation following successful starts are needed to compute the probability the equipment will function for a specified period of time.

This information is needed for systems that must operate for an extended period following an accident to fulfill a risk-significant safety function.

The hours of unavailability are needed to determine the fraction of time that a train is not available to perform its risk-significant safety function. For some systems this can be an important or dominant contributor to the overall probability of failure to perform the system's safety function. It can be significantly affected by elective maintenance.

The type of unavailability (planned or unplanned) is needed to effectively utilize these estimates. For example, a high unplanned unavailability may indicate a need for more preventive maintenance; a high planned unavailability may indicate the opposite.

The hours of unavailability due to support systems failure or unavailability are needed to properly capture concurrent outages and to eliminate double counting. For example, an Emergency Service Water (ESW) train unavailability may result in other trains being unavailable as well; however, for purposes of estimating risk in a PRA study, that unavailability should not be counted more than once.

The date of each failure is needed to allow screening for potential common cause failures. Failures that occur closely together in time warrant review to see whether a common cause failure may be involved. Common cause failures may indicate a need for revised maintenance procedures or staggered

testing. Common cause failure rates are also needed for PRA models because of their importance in system reliability and availability estimates.

Failure cause and failure mode information are needed to support common cause failure analysis as discussed above and to associate the failure with the correct failure mode for input into PRA models.

Quarterly data are needed to conduct first order trending studies to identify areas of emerging concern with regard to overall plant and system performance. More frequent compilation is acceptable at the discretion of each licensee.

Retention of records and documentation that provide the bases for the summary data report to the NRC for a period of several years is consistent with maintenance rule applications. For example, monitoring reliability for a few years may be used to determine trends in order to achieve the balance described in 10 CFR 50.65(a)(3) - i.e., the balance between preventing failures through maintenance and minimizing unavailability due to monitoring and preventive maintenance. In addition, on-site data are needed to provide a scrutable basis for regulatory decisions. For example, it is expected to be necessary to review the actual times of unavailability in order to estimate the mean repair times for key components for the purpose of updating the staff's PRA models.

Regulatory Guide.

A new regulatory guide will be prepared and issued to provide supplementary guidance. The guide will present an acceptable way to define the event-mitigating risk-significant systems and equipment and it will provide risk-based definitions of failure as well as train and system boundaries consistent with PRA applications. The format in which data would be provided to the NRC and a suggested format for maintaining on-site documentation and record keeping would be included. In order to reduce costs, use of electronic data submittal will be considered a priority objective in developing and implementing the guide. A draft guide will be published for comment before it is finalized. A public workshop is planned after publication of the draft guide. The comment period for this proposed rule will not expire until at least 30 days after publication of the draft regulatory guide.

Definitions. The basic definitions used in reporting under § 50.76 are discussed below; further details will be addressed in the regulatory guide. For example, the basic definition of failure is provided here; further details, such as how to handle a case where the operators prematurely terminate system operation following a real demand, will be discussed in the regulatory guide. In particular, the regulatory guide will define risk-significant safety function(s) and failures for systems and equipment covered by this proposed rule.

Demand is an occurrence where a system or train is called upon to perform its risk-significant safety function. A demand may be manual or automatic. It may occur in response to a real need, a test, an error, an equipment malfunction or other spurious causes. For the purposes of reporting under this rule, the demands of interest are those which are actual demands or closely simulate actual demands for the train or specific equipment involved.

Failure, for the purpose of reporting under this rule, is an occurrence where a system or train fails to perform its risk-significant safety function. A failure may occur as a result of a hardware malfunction, a software malfunction, or a human error. Failures to start in response to a demand are reported under paragraph 50.76(b)(1)(i). Failures to run after a successful start are reported under paragraph 50.76(b)(1)(ii).

Unavailability is an instance where a required system or train is not in a condition to perform or is not capable of performing its risk-significant safety function. This may result from failure to start, from failure to run, or from intentional or unintentional removal of equipment from service (e.g., for maintenance or testing).

Risk-significant safety function is a safety function that has or could have a significant effect on risk in terms of avoiding core damage accidents or preserving containment integrity.

Risk-significant systems and equipment are the systems and equipment which have or could have a significant effect on risk in terms of avoiding

core damage accidents or preserving containment integrity. More than one importance measure would need to be considered in determining the risk-significant systems and equipment. The reporting requirements of this rule apply to event-mitigating risk-significant systems and equipment.[5]

The risk-significant systems and equipment to be addressed will be determined by each licensee. The regulatory guide will describe an acceptable method for making that determination. The general approach will be to weigh various risk measures in order to determine the systems and equipment at each plant that contribute most to risk in terms of avoiding core damage accidents or preserving containment integrity.

It is expected that the rule will produce a set of basic systems for which reliability data will be reported for all plants that have them. However, these basic systems are not sufficient by themselves. Additional systems and equipment to be addressed will depend on plant-specific features. Listed below is the set of basic systems that the Commission is considering identifying in the draft regulatory guide.

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[5] Note that NUMARC 93-01 defines risk-significant SSCs as those SSCs that are significant contributors to risk as determined by PRA/IPE or other methods. The definition proposed here may result in a narrower list of systems and equipment than is the case in maintenance rule applications. It is expected that the differences between definitions will be identified and addressed during the public comment process for the new regulatory guide.

BASIC PWR SYSTEMS	BASIC BWR SYSTEMS
Auxiliary feedwater	Reactor core isolation cooling
High pressure safety injection	Isolation condenser, high pressure coolant injection or high pressure core spray, as appropriate
Reactor protection	Reactor protection
Low pressure safety injection	Low pressure coolant injection and core spray
Emergency ac power	Emergency ac power
Power operated relief valves (as needed for feed and bleed)	

As discussed above, the systems and equipment to be included in the scope of the rule would be those that are predicted, on the basis of PRA studies, to be risk-significant. To ensure that this approach is consistent with operating experience, the NRC has considered the systems and equipment that have been substantially involved in significant events in U. S. reactors.

These systems were found to fall into the following categories:

1. Basic systems. As indicated above, the NRC expects that these systems would be included in the scope of the rule for all plants. The basic systems on the proposed list have been confirmed to have been substantially involved in significant events.

2. Plant-specific systems. Systems such as service water and component cooling water are risk-significant, but the significance varies widely, depending upon plant-specific designs. It is expected that these systems will be included, as appropriate, based on plant-specific PRA studies. Other systems, such as containment purge, appear infrequently in connection with significant events and are not expected to be risk-significant for any plants.

3. Initiating systems. Systems such as main feedwater and offsite power are primarily considered to be initiators of significant events, rather than mitigation systems. Existing reporting requirements in 10 CFR 50.72 and 10 CFR 50.73 provide enough information to characterize the important initiating systems for the purpose of PRA studies.

4. Non-measurable items. Items such as reactor coolant system corrosion are not amenable to meaningful measurement by the methods of this proposed rule.

Based on this review, the systems and equipment to be included in the scope of the rule are considered reasonably consistent with operating

experience in terms of involvement in significant events. Accordingly, it is expected that reliability and availability information for those systems and equipment will be well suited for identifying plants and systems at increased risk for significant events.

Minimizing Costs. The NRC intends that the data required to be collected and reported under this proposed rule be essentially the same as would be required for monitoring reliability and/or availability for other purposes, such as monitoring system reliability where that is the option chosen for compliance with the maintenance rule. Thus, it should be practical to gather and report the data without significant additional cost. This will be a priority goal in developing the guidance to be included in the new regulatory guide.

Sunset Provision. As experience is gained with implementing the proposed rule and utilizing the information required to be collected and reported, a reassessment may be necessary or desirable. One way of assuring such a reassessment would be to include a "sunset provision" in the rule, whereby the rule would automatically expire after a specified period of time unless: (i) a condition specified in the rule is fulfilled, or (ii) the Commission engages in a rulemaking which extends the effectiveness of the rule. The Commission requests public comments on whether the proposed rule should contain such a sunset provision, and if so, the period of time after which the rule should automatically expire.

Grandfather Provision. There may be some plants for which, at the time that the proposed rule may be adopted by the Commission as a final rule, licensees have already announced plans to discontinue operation in the near future. Furthermore, licensees may determine in the future to discontinue operation at some plants. In either case, there may be less reason to require collection and reporting of the information contemplated by the proposed rule at such plants and it may be advisable to exempt such plants from the information collection and reporting requirements of the proposed rule (i.e., "grandfathering"). The Commission requests public comments on whether the proposed rule should exempt plants that have announced (or will announce) plans to discontinue operation within a short time (e.g., two years).

Conclusion.

As discussed under the subject "Move to Risk-Based Regulation", the information to be collected by the proposed rule is necessary for the development and implementation of risk-based regulatory processes. Risk-based regulatory approaches provide a means for the Commission to maintain, and in some cases improve, safety while reducing impacts on licensees as well as NRC resource expenditures, by focusing regulatory requirements and activities on the most risk-significant areas. In addition, this information would improve the NRC's oversight of licensees' implementation of the maintenance rule. It would also enhance licensee's capabilities to implement the evaluation and goal-setting activities required by the maintenance rule by providing licensees with access to current industry-wide reliability and availability information for risk-significant systems and equipment within the scope of the

maintenance rule. The Commission has also prepared a regulatory analysis (see "Regulatory Analysis") which identified alternatives for collecting the information for use by both licensees and the NRC, and evaluated the costs of each viable alternative. Based upon these factors, the Commission believes that the costs of the proposed rule's information collection and reporting requirements are justified in view of the potential safety significance and projected benefits of the information in NRC regulatory activities.

Submission of Comments in Electronic Format

Commenters are encouraged to submit, in addition to the original paper copy, a copy of their comments in an electronic format on IBM PC DOS-compatible 3.5- or 5.25-inch, double-sided, diskettes. Data files should be provided in WordPerfect 5.0 or 5.1. ASCII code is also acceptable, or if formatted text is required, data files should be submitted in IBM Revisable Format Text Document Content Architecture (RFT/DCA) format.

Environmental Impact: Categorical Exclusion

The proposed rule sets forth requirements for the collection, maintenance, and reporting of risk-significant system and equipment reliability and availability data. The NRC has determined that this proposed rule is the type of action described in categorical exclusion, 10 CFR 51.22(c)(3)(ii). Therefore, neither an environmental impact statement nor an environmental assessment has been prepared for this proposed regulation.

Paperwork Reduction Act Statement

This proposed rule amends information collection requirements that are subject to the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.). This rule has been submitted to the Office of Management and Budget for review and approval of the Paperwork Reduction Act requirements.

The public reporting burden for this collection of information is estimated to average 1375 hours per response (i.e., per commercial nuclear power reactor per year), including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to the Information and Records Management Branch (T-6F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0011), Office of Management and Budget, Washington, DC 20503.

Regulatory Analysis

The Commission has prepared a draft regulatory analysis on this proposed regulation. The analysis examines the costs and benefits of the alternatives considered by the Commission. The draft analysis is available for inspection in the NRC Public Document Room, 2120 L Street NW. (Lower Level), Washington, DC. Single copies of the draft analysis may be obtained from: Dennis Allison,

Office for Analysis and Evaluation of Operational Data, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, Telephone (301) 415-6835.

Regulatory Flexibility Certification

In accordance with the Regulatory Flexibility Act of 1980 (5 U.S.C. 605 (B)), the Commission certifies that this rule will not, if promulgated, have a significant economic impact on a substantial number of small entities. The proposed rule affects only the licensing and operation of nuclear power plants. The companies that own these plants do not fall within the scope of the definition of "small entities" set forth in the Regulatory Flexibility Act or the size standards adopted by the NRC on April 11, 1995 (60 FR 18344 - 10 CFR 2.810.

Backfit Analysis

The proposed rule sets forth requirements for reporting and record keeping. The NRC has determined that the backfit rule, 10 CFR 50.109, does not apply to this proposed rule, and therefore, a backfit analysis is not required for this proposed rule because these amendments do not involve any provisions which would impose backfits as defined in 10 CFR 50.109(a)(1).

However, as discussed above in "Regulatory Analysis," the Commission has prepared a regulatory analysis which summarizes the purpose and intended use

of the information proposed to be collected, identifies alternatives for collection and reporting of the proposed information, and identifies the impacts and benefits of the alternatives.

This regulatory analysis constitutes a disciplined process for evaluating the potential benefits and projected impacts (burdens) of information collection and reporting requirements such as the proposed rule. The Commission therefore concludes that the objective underlying the Commission's adoption of the Backfit Rule - that regulatory impacts are assessed under established criteria in a disciplined process - is being met for this proposed rule.

List of Subjects in 10 CFR Part 50

Antitrust, Classified information, Criminal penalties, Fire protection, Intergovernmental relations, Nuclear power plants and reactors, Radiation protection, Reactor siting criteria, Reporting and record keeping requirements.

For the reasons set out in the preamble and under the authority of the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and 5 U.S.C. 553, the NRC is proposing to adopt the following amendments to 10 CFR Part 50.

PART 50 DOMESTIC LICENSING OF PRODUCTION AND UTILIZATION FACILITIES

1. The authority citation for Part 50 continues to read as follows:

AUTHORITY: Sections 102, 103, 104, 105, 161, 182, 183, 186, 189, 68 Stat. 936, 937, 938, 948, 953, 954, 955, 956, as amended, sec. 234, 83 Stat. 1244, as amended (42 U.S.C. 2132, 2133, 2134, 2135, 2201, 2232, 2233, 2236, 2239, 2282); secs. 201, as amended, 202, 206, 88 Stat. 1242, as amended, 1244, 1246 (42 U.S. C. 5841, 5842, 5846).

Section 50.7 also issued under Pub. L. 95-601, sec. 10, 92 Stat. 2951 as amended by Pub. L. 102-486, sec. 2902, 106 Stat 3123, (42 U.S.C. 5851). Section 50.10 also issued under secs. 101, 185, 68 Stat. 936, 955, as amended (42 U.S.C. 2131, 2235); sec. 102, Pub. L. 91-190, 83 Stat. 853 (42 U.S.C. 4332). Sections 50.13, and 50.54(dd), and 50.103 also issued under sec. 108, 68 Stat. 939, as amended (42 U.S.C. 2138). Sections 50.23, 50.35, 50.55, and 50.56 also issued under sec. 185, 68 Stat. 955 (42 U.S.C. 2235). Sections 50.33a, 50.55a and Appendix Q also issued under sec. 102, Pub. L. 91-190, 83 Stat. 853 (42 U.S.C. 4332). Sections 50.34 and 50.54 also issued under sec. 204, 88 Stat. 1245 (42 U.S.C. 5844). Sections 50.58, 50.91, and 50.92 also issued under Pub. L. 97-415, 96 Stat. 2073 (42 U.S.C. 2239). Section 50.78 also issued under sec. 122, 68 Stat. 939 (42 U.S.C. 2152). Sections 50.80 - 50.81 also issued under sec. 184, 68 Stat. 954, as amended (42 U.S.C. 2234). Appendix F also issued under sec. 187, 68 Stat. 955 (42 U.S.C. 2237).

2. Section 50.8 (b) is revised to read as follows:

§ 50.8 Information collection requirements: OMB approval.

* * * * *

(b) The approved information collection requirements contained in this part appear in §§ 50.30, 50.33, 50.33a, 50.34, 50.34a, 50.35, 50.36, 50.36a, 50.48, 50.49, 50.54, 50.55, 50.55a, 50.59, 50.60, 50.61, 50.63, 50.64, 50.65, 50.71, 50.72, 50.75, 50.76, 50.80, 50.82, 50.90, 50.91, 50.120, and Appendices A, B, E, G, H, I, J, K, M, N, O, Q, and R.

* * * * *

3. Section 50.76 is added to read as follows:

§ 50.76 Reporting reliability and availability information for risk-significant systems and equipment.

(a) Applicability. This section applies to all holders of operating licenses for commercial nuclear power plants under 10 CFR 50.21b or 50.22 and all holders of combined operating licenses for commercial nuclear power plants under 10 CFR 52.97.

(b) Requirements.

(1) Each licensee shall submit an annual report to the NRC that contains the following information, compiled on the basis of calendar quarters, or on a more frequent basis at the option of each licensee, for systems and ensembles of components in paragraph (b)(2) of this section:

(i) The number of demands, the number of failures to start associated with such demands, and the dates of such failures, characterized according to the identification of the train affected, the type of demand (test, inadvertent/spurious, or actual need), and the plant mode at the time of the demand (operating or shutdown);

(ii) The number of hours of operation following each successful start, characterized according to the identification of the train affected and whether or not the operation was terminated because of equipment failure, with the dates of any such failures;

(iii) The number of hours of unavailability, characterized according to the identification of the train affected, the plant mode at the time of the unavailability (operating or shutdown), the type of unavailability (planned, unplanned, or support system unavailability), and, if due to support system unavailability, identification of the support system;

(iv) For each unavailability due to component failure(s), a failure record identifying the component(s) and providing the failure date, duration, mode, cause, and effect; and

(v) The number of hours when two or more trains from the same or different systems were concurrently unavailable, characterized according to the identification of the trains that were unavailable.

(2) The requirements of paragraph (b)(1) of this section apply to those event-mitigation systems, and ensembles of components treated as single entities in certain probabilistic risk-assessments where a system or train treatment would not be appropriate, which have or could have a significant effect on risk in terms of avoiding core damage accidents or preserving containment integrity.

(3) Each licensee shall maintain records and documentation of each occurrence of a demand, failure, or unavailability that provide the basis for the data reported in paragraph (b)(1) of this section on site and available for NRC inspection for a period of 5 years after the date of the report specified in paragraph (b)(1) of this section.

(c) Implementation. Licensees shall begin collecting the information required by paragraph (b) of this section on January 1, 1997, and shall submit the first report required by paragraph (b)(1) of this section by January 31,

1998. Thereafter, each annual report required by paragraph (b)(1) of this section shall be submitted by January 31 of the following year.

Dated at Rockville, MD, this _____ day of _____, 1995.

For the Nuclear Regulatory Commission,

John C. Hoyle,

Secretary of the Commission.

Attachment 3

Responses to Commission Comments

Responses to Commission Comments

Commission Comment:

The staff should focus its primary justification for the reliability data rule on NRC's oversight role in improving public health and safety, economic burden reduction, and the need for the data to support generic regulatory actions such as rulemaking as well as plant-specific regulatory actions.

Response:

As indicated in the SOC under the subject "Need for Reliability and Availability Information", the primary justification has been focused on the NRC's oversight role in improving public health and safety, economic burden reduction, and the need for the data to support generic regulatory actions such as rulemaking as well as plant-specific regulatory actions.

Commission Comment:

As part of this justification, the staff should address its technical needs for plant-specific identifiable data, as contrasted to data without plant-specific identification.

Response:

As indicated in the same section of the SOC, the staff has addressed its technical needs for plant-specific identifiable data. The text indicates that, in a general sense, plant-specific information is needed because there can be wide plant-to-plant variations in the design, importance, reliability and availability of particular systems and equipment. It is necessary to identify these plant-specific factors in order to understand reliability and availability issues that may be identified, the significance of reported events, and individual plant safety performance. In addition, for each specific application, the text indicates whether or not plant-specific information is needed for that application, and, if so, why it is needed.

Commission Comment:

The staff should ensure that equipment that has played a significant role in precipitating or aggravating significant events that have occurred in U.S. plants are included within the scope of the reliability data rule.

Response:

As indicated in the SOC under the subject "Regulatory Guide", the proposed rule would apply to systems and equipment that are predicted to be risk-significant based on PRA studies. To ensure that this approach is consistent with experience, the staff has considered the systems and equipment that have been substantially involved in significant events at U. S. reactors. The

events and the systems and equipment that were considered are listed in an Appendix to this Attachment. The systems and equipment involved were found to fall into the following categories:

(1) Basic systems. The staff expects that these systems would be included for all plants. The proposed list of basic systems was confirmed in the sense that the systems on the proposed list have been substantially involved in significant events.

(2) Plant-specific systems. Some systems such as service water and component cooling water are risk-significant, but the significance varies widely, depending upon plant-specific designs. It is expected that these systems will be included for some plants, as appropriate based on plant-specific PRA studies. Other systems, such as containment purge, appear infrequently in connection with significant events and are not expected to be risk-significant for any plants.

(3) Initiating systems. Systems such as main feedwater and offsite power are primarily considered to be initiators of significant events, rather than mitigation systems. Existing reporting requirements in 10 CFR 50.72 and 10 CFR 50.73 provide enough information to characterize the important initiating systems for the purpose of PRA studies.

(4) Inappropriate items. Items such as reactor coolant system corrosion would have to be measured by different types of data than those described in this proposed rule.

Based on this review, the proposed approach appears to be reasonably consistent with operating experience. In addition, it was noted that prior to some events (such as the Salem ATWS and the TMI accident) there was a failure to collect, recognize the significance of, and act upon previously existing data (such as challenge data and reliability data for scram breakers and power operated relief valves).

Commission Comment:

Also, the staff should discuss the potential use of the data in predicting or identifying plants, and equipment and systems within plants, that may be at most risk for significant events.

Response:

As indicated in the SOC, under the subject "Need for Reliability and Availability Information", the text has been revised to include a discussion of the potential use of the data in predicting or identifying plants, and equipment and systems within plants, that may be at increased risk for significant events.

Commission Comment:

Arguments linking the desirability of collecting the reliability data called for to the maintenance rule should either be improved or dropped. If such a

linkage can be made, the staff should consider the appropriateness of collecting consistent/equivalent data sets through both this rule and the maintenance rule.

Response:

The SOC has been revised to eliminate the implication that the data are required for maintenance rule purposes. However, the discussion under the subject "NRC Maintenance Rule" does indicate that the data will (1) improve the NRC's oversight capabilities and (2) enhance licensees' implementation capabilities.

The Staff has considered collecting consistent/equivalent data sets through both this proposed rule and the Maintenance Rule. The Staff has carefully defined the information to be collected by the proposed rule so that the data set collected will be useful for all of the regulatory activities identified in the SOC, including licensee implementation and NRC oversight of the maintenance rule. Assuring such consistency will avoid duplicative reporting requirements in the maintenance rule as mandated under the Paperwork Reduction Act.

Commission Comment:

The staff should continue to work with industry on voluntary submittal of reliability data, under a program that will meet the needs of all parties.

Response:

As indicated in the SOC under the subject "Prior Efforts," the staff will continue to discuss with industry the possibility of voluntary submittal of reliability data, under a program that will meet the needs of all parties.

Commission Comment:

The staff should ensure that the draft regulatory guide is available for public comment for a minimum of 30 days during which this proposed rule is available for public comment.

Response:

The SOC has been revised to indicate that the draft regulatory guide will be available for public comment for a minimum of 30 days before the comment period for this proposed rule expires.

Appendix

Events and Systems Considered

Selected Early Events

Event	Precipitating/Aggravating Systems
Fire at Browns Ferry, 1975	The principal problems were those caused by the fire, procedures, and training (rather than the reliability and availability of systems and equipment)
Accident at Three Mile Island, 1979	Main feedwater and condensate (MFW), power operated relief valves (PORVs). Procedures and training were also important. In addition, failures to recognize the significance of and act upon previously existing data, such as precursor events and PORV challenge and reliability data, were significant.
Scram failure at Salem, 1983	Reactor protection system (RPS) scram breakers. Previously existing scram breaker challenge and reliability data would have indicated the likelihood scram breaker failure.

Incident Investigation Team (IIT) Events

Event	Precipitating/Aggravating Systems
Davis Besse, 1985	MFW, auxiliary feedwater (AFW)
San Onofre, 1985	Offsite power, MFW (check valves)
Rancho Seco, 1985	DC power, integrated control system (ICS), MFW, AFW (flow control valves, isolation valves)
Vogtle, 1990	Offsite power (switchyard), emergency diesel generators (EDGs)
Nine Mile Point, 1991	Offsite power (main transformer), uninterruptable power supply (UPS), MFW (condensate booster pumps)

Abnormal Occurrence (AO) Events

Event	Precipitating/Aggravating Systems
BWRs, Oct'93 - present Brunswick, 1995	Reactor vessel internals (intergranular stress corrosion cracking)
Perry, 1992	Main steam isolation valves (MSIVs)
Palo Verde, 1993	Steam Generator (SG) tube rupture
Shearon Harris, 1992	High Pressure Coolant Injection (HPCI)
Arkansas Nuclear 1 & 2, 1992, and McGuire, 1 & 2,	SG degraded tubes
Millstone, 1992	Engineered Safety Features Actuation System (ESFAS)
Fort Calhoun, 1987	Instrument air (check valves)
Trojan, 1989	Containment (structure)
North Anna, 1989	SG tube leak
McGuire, 1989	SG tube rupture
Fort Calhoun, 1987	Instrument air
Perry, 1987	MSIVs
Farley, 1987	High Pressure Safety Injection (HPSI)
North Anna, 1987	SG tube rupture
LaSalle, 1986	RPS (level transmitters)
Oconee, 1986	Low pressure service water
Surry, 1985	MFW (pipe break)
Indian Point,1985	Intermediate head safety injection pump
Maine Yankee, 1985	SG (closed root valves in steam line)
Brunswick, 1985	MSIVs
Indian Point, 1984	Containment spray

AO Events (continued)

Event	Precipitating/Aggravating Systems
Hatch, 1984	Containment (structure)
Big Rock Point, 1984	Reactor depressurization
San Onofre, 1984	Containment spray
Six units, 1975-1984	High pressure coolant injection (HPCI), low pressure coolant injection (LPCI), and low pressure core spray (LPCS)
Fort St. Vrain, 1984	RPS (control rods)
Susquehanna, 1984	EDGs
Haddam Neck, 1984	Refueling cavity water seal
Susquehanna, 1984	RPS (control rods)
McGuire, 1984	Accumulator isolation valves
Main Yankee, 1983	MFW
Salem 1983	RPS (scram breakers)
Turkey Point, 1983	AFW
Nine Mile Point and other BWRs	Reactor coolant system (RCS) cracks
Hatch, 1983	MSIV, RPS (scram discharge volume drain line isolation valve), reactor core isolation cooling (RCIC)
Shoreham, 1983	EDGs
Dresden, 1983	Component Coding Water (CCW), EDGs
Turkey Point, 1983	Residual heal removal (RHR)
Ginna, 1983	SG tube rupture
Farley, 1982	Containment spray
Beaver Valley, 1981	HPCI
San Onofre, 1981	HPCI

AO Events (continued)

Event	Precipitating/Aggravating Systems
Six units, 1981	Coolant blockage
Crystal River, 1980	Instrumentation control system (annunciators and indicators)
Browns Ferry, 1980	RPS (scram discharge volume)
Davis Besse, 1980	Offsite power (13.8 KV switchgear)
San Onofre, 1980	Salt water cooling system
Indian Point, 1980	Service water, containment fan cooling system
Palisades, 1979	Containment purge system
Arkansas Nuclear One, 1979	Offsite power
Oyster Creek, 1979	Fuel assemblies
Millstone,1977	Fuel assemblies
Duane Arnold, 1978	RCS (piping)
Millstone and Salem, 1978	Containment ventilation system
North Anna, Surry, Beaver Valley, 1977	Containment recirculation spray
La Crosse, 1977	Fuel assemblies
13 plants, 1974-1976	Cracking in feedwater nozzles
Surry, 1976	SG tube integrity
Point Beach, 1975	SG tube rupture
Robinson, 1975	RCS
Five BWRs, 1974-1975	RCS cracks
Six PWRs, 1972-1975	MFW, AFW (water hammer events)

Accident Sequence Precursor (ASP) Events

System/Year	87	88	89	90	91	92	93
Emergency ac	x	x	x	x	x	x	x
AFW	x	x	x	x	x	x	x
HPSI	x	x	x	x	x	x	x
RHR/LPCI/LPCS	x		x	x	x	x	x
RCIC	x	x	x	x	x	x	
Service water	x	x	x	x	x		x
MFW	x	x		x	x	x	
HPCI	x		x	x	x	x	
Safety relief (SRVs)	x		x	x	x	x	
PORVs	x			x	x		x
Chem. & vol. control (CVCS)		x		x	x		
Containment spray (CS)			x	x	x		
Instrument air	x		x	x			
Component cooling water (CCW)		x	x	x			
RPS	x			x	x		
SG tube rupture	x		x				x
Vital ac power	x					x	
Isolation condenser		x		x			
Atmospheric dump/main steam safety valves	x		x				
DC power						x	
Turbine bypass		x					
MSIVs							x
Annunciators						x	
Offsite power					x		
Uninterruptable power supply					x		

Attachment 4

Draft Regulatory Analysis

DRAFT

REGULATORY ANALYSIS

REPORTING RELIABILITY AND AVAILABILITY INFORMATION FOR RISK-SIGNIFICANT SYSTEMS AND EQUIPMENT

August 17, 1995

ABSTRACT

The Nuclear Regulatory Commission (NRC) proposes to modify its reporting requirements to collect reliability and availability data from commercial nuclear power plant licensees. The systems and equipment within the scope of the proposed rule are a subset of the systems and equipment within the scope of the NRC's maintenance rule. The NRC has determined that reporting of reliability and availability information is necessary to substantially improve the NRC's ability to make risk-effective regulatory decisions consistent with the Commission's policy statement on the use of probabilistic risk assessments (PRAs). This would assist the NRC in improving its oversight capabilities with respect to public health and safety and becoming more efficient by focusing its regulatory program on those issues of greatest risk significance and reducing unnecessary regulatory burdens on licensees. The Commission would use the data that would be required by the proposed rule in generic issue resolution, developing quantitative indicators that can assist in assessing and predicting plant performance, performing risk-based inspections, and pursuing modifications to specific plants and basic regulations and guidelines. Furthermore, this information would improve the NRC's oversight of licensees' implementation of the maintenance rule. It would also enhance licensee's capabilities to implement the evaluation and goal-setting activities required by the maintenance rule by providing licensees with access to current industry-wide reliability and availability information for risk-significant systems and equipment within the scope of the maintenance rule. This regulatory analysis (RA) considers alternatives that would assist the NRC in achieving these safety and regulatory goals in the most efficient manner.

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CONTENTS (Continued)

1. Introduction

This chapter provides a discussion of the issue under consideration including the statement of the problem, the objectives of the Proposed Action, and a summary of technical findings, conclusions, and recommendations. Chapter 2 presents the alternatives considered, and identifies the Preferred Alternative. Chapter 3 describes the value/cost impacts and limitations of all alternatives, and presents the technical bases for the results of the regulatory analysis. Criteria used to select the recommended action are discussed in Chapter 4. Chapter 5 presents information related to implementing the recommended action.

1.1 Statement of the Problem

For several years, the Commission has been working to increase the use of PRAs in power reactor regulation. In its policy statement on the use of PRAs (August 16, 1995; 60 FR 42622), the Commission indicated that the use of PRA technology should be increased in all regulatory matters to the extent supported by the state-of-the-art in terms of methods and data and this implies the staff must significantly enhance the collection of equipment and human reliability data. Implementation of these policies would improve the regulatory process through (1) improved risk-effective safety decision making, (2) more efficient use of agency resources, and (3) reduction in unnecessary burdens on licensees.

These improvements would assist the NRC in improving its oversight capabilities with respect to public health and safety and becoming more efficient by focusing its regulatory program on those issues of greatest risk significance and reducing unnecessary regulatory burdens on licensees. The Commission would use the data that would be required by the proposed rule in generic issue resolution, developing quantitative indicators that can assist in assessing plant safety performance, performing risk-based inspections, and pursuing modifications to specific plants and basic regulations and guidelines. Furthermore, this information would improve the NRC's oversight of licensees' implementation of the maintenance rule. It would also enhance licensee's capabilities to implement the evaluation and goal-setting activities required by the maintenance rule by providing licensees with access to current industry-wide reliability and availability information for risk-significant systems and equipment within the scope of the maintenance rule.

In order to move towards risk-based regulation and the increased use of PRA information, the NRC staff needs scrutable, plant-specific and generic reliability and availability information. At present, there is no NRC or industry data base for consistent, industry-wide plant-specific reliability and availability data for risk-significant systems. Further, there is no program under development by nuclear power plant licensees to gather and share reliability and availability information among licensees, or even to gather such information using consistent, industry-wide definitions.

1.1.1 Nature of the Proposed Action

The NRC staff seeks rulemaking to require commercial nuclear power reactor licensees to report summaries of consistent reliability and availability data for risk-significant systems and equipment to the NRC, and to maintain

supporting data at the site. This regulatory analysis evaluates alternatives for collecting such data in the most efficient manner.

1.1.2 Background

Prior efforts to develop a program to collect and report, on a voluntary basis, the reliability data needed to support risk-based decisionmaking have not been successful. NRC management has interacted extensively with the Institute of Nuclear Power Operations (INPO) and the Nuclear Energy Institute (NEI) over the past three years in attempts to develop a voluntary approach to collect reliability data and to make them available to NRC.

In late 1991 and through 1992, the NRC staff participated on an INPO-established NRC/industry review group to make recommendations for changes to the Nuclear Plant Reliability Data System (NPRDS). The group's final recommendations to INPO to collect PRA-related reliability and availability data would have provided most of NRC's data needs. However, INPO took no action on these recommendations.

During 1992 and 1993, the NRC staff continued through correspondence and meetings to outline the particular data needed and to seek INPO's assistance in obtaining the data. In a December 1993 meeting with NUMARC (now the Nuclear Energy Institute (NEI)), INPO representatives suggested their Safety System Performance Indicator (SSPI) as a surrogate for reliability data. They proposed expanding the indicator to additional systems and indicated that data elements could be modified to compute actual reliability and availability data. Although general agreements were reached with INPO on which systems and components and what types of data elements are appropriate for risk-related applications and maintenance effectiveness monitoring, no voluntary system of providing data resulted from these discussions. In the fall of 1994, the NRC staff began work on this rulemaking action. In June 1995, NEI proposed to discuss a voluntary approach of providing reliability and availability data to the NRC based on SSPI data. The NRC staff will continue to work with industry on voluntary submittal of reliability data, under a program that will meet the needs of all parties, while at the same time proceeding to obtain public comment on this proposed rule.

The role of the Proposed Action in substantially improving the NRC's ability to move towards risk-based regulation, the efficient use of agency resources, and reducing unnecessary burdens on licensees as well as in improving NRC oversight and facilitating licensee implementation of the maintenance rule is discussed below.

Move to Risk-Based Regulation.

For several years the Commission has been working towards increased use of PRAs in power reactor regulation. In its policy statement on the use of PRAs, the Commission has indicated that the use of PRA technology should be increased in all regulatory matters to the extent supported by the state-of-the-art in terms of methods and data and this implies that the collection of equipment and human reliability data should be enhanced. Implementation of these policies would improve the regulatory process through (1) improved risk-effective safety decision making, (2) more efficient use of agency resources, and (3) reduction in unnecessary burdens on licensees. These improvements would enhance both efficiency and safety.

The data reported under the proposed rule would improve the NRC's oversight capability with respect to public health and safety by focusing the NRC's regulatory programs in a risk-effective manner. Generally, the NRC's ability to identify plants and systems at increased risk for significant events and, thus, to take appropriate action would be substantially improved. For example, a generic indication of low reliability or availability for a risk-significant system might indicate a technical problem, with its attendant risk, that may warrant generic action. Similarly, a plant-specific indication of low reliability or availability for several risk-significant systems might indicate a programmatic problem, with its attendant risk, and may warrant plant-specific action.

It has been noted that prior to some significant events (such as the scram failure at Salem and the accident at Three Mile Island) there was previously existing data (such as challenge data and reliability data for scram breakers and power operated relief valves) which, if collected, recognized, and acted upon might have led to preventive actions. Accordingly, it is expected that reliability and availability information for risk-significant systems would improve the NRC's oversight capability with respect to public health and safety - i.e., the ability to maintain or enhance safety by identifying and reviewing indications of increased risk and, if appropriate, taking generic or plant-specific action.

Such problems could be subtle in nature. For instance, licensee(s) might schedule train outages for maintenance at certain times, such that risks are substantially increased over what would be expected based on random outages. This situation would not be indicated by current reporting requirements, or even by simply reporting train unavailability, but it could be indicated by the concurrent unavailability of two or more trains, as would be reported under the proposed rule. Additional examples discussed below describe further specific uses of the data that would help to enhance safety.

In order to move towards risk-based regulation and the increased use of PRA information, the NRC needs scrutable, plant-specific and generic[1] reliability and availability information. The framework for an overall move towards risk-based regulation involves the development of a regulatory process which includes operational procedures and decision criteria that requires credible PRA methods, models, and data. This framework would provide for predictable, consistent, and objective risk-based regulatory decision making. The data that would be reported under the proposed rule represent one part of such a framework. In addition, these data are needed to improve the efficiency and effectiveness of current NRC regulatory applications that employ a risk-based perspective in advance of defining the entire framework.

Some examples of how reliability and availability information would be used to improve current NRC regulatory applications that consider risk in the decision process are discussed below. One of the examples involves the need for information to support generic regulatory actions - i.e., generic issue resolution and its associated rulemaking or regulatory guide revision. Another example involves the need for information to determine whether further

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[1] Generic data can be readily obtained by averaging appropriate plant-specific data; however, plant-specific information cannot be derived from generic information.

NRC action is needed at specific plants - i.e., indicators of plant performance. Some involve a mixture of plant specific and generic elements. For example, analyzing an event at a given plant could lead to a plant-specific action such as a special inspection and/or to a generic action such as a bulletin or generic letter. Generally, plant-specific information is needed because there can be wide plant-to-plant variations in the design, importance, reliability and availability of particular systems and equipment. It is necessary to identify these plant-specific factors in order to understand reliability and availability issues that may be identified, the significance of reported events, and individual plant safety performance.

Generic Issue Resolution. The NRC currently uses risk estimates in: (1) prioritizing safety issues, (2) deciding whether new requirements or staff positions to address these issues are warranted, and (3) deciding whether proposed new requirements or staff positions should be implemented. Knowing the current, updated reliability and availability of key systems would, in some cases, lead to a better understanding of the risk in these areas and, thus, to more risk-effective decisions. This should both enhance public protection and reduce unnecessary regulatory burdens. Generic data would usually suffice for this purpose; however, in some cases the data would need to be divided to account for specific classes or groups of plants.

Indicators of Plant Performance. PRA models with plant-specific reliability and availability data would be used to develop indicators of plant performance and trends in plant performance which are more closely related to risk than those currently in use. These new indicators would replace some of those currently in use and thereby enhance NRC's ability to make risk-effective decisions with regard to identifying plants for increased or decreased regulatory attention. Plant-specific data are needed in order to identify specific plants for increased or decreased regulatory attention. For example, it is important to detect situations where an individual plant may be having reliability or availability problems with multiple systems.

Accident Sequence Precursor (ASP) and Event Analysis. Plant-specific, train-level reliability and unavailability data will be used to improve the plant-specific ASP models which the NRC uses to compute conditional core damage probability for determining the risk-significance of operational events. In addition, dates and causes of equipment failures will be used to identify common cause failures and to compute common cause failure rates for input to these models. Improving these methods will enhance the staff's ability to make risk-effective decisions about which events warrant further inspections or investigations and/or generic actions such as bulletins and generic letters. Plant-specific data are needed in order to understand an event and calculate the associated conditional core damage probability. It is also useful to identify systems that have the most influence on the results. Then the risk associated with the potential for similar events at other plants, which may be known to have low reliability for the key systems, can be considered in determining whether further actions are warranted.

Risk-based Inspections. Current and updated system reliability, availability and failure data in a generic and plant-specific risk-based context will be used to enhance the staff's ability to plan inspections focused on the most risk-significant plant systems, components, and operations. Generic data will be used in developing risk-based inspection guides and a framework for inspections. Plant-specific data are needed to focus and optimize inspection

activities at specific plants. For example, an individual plant may have an atypical reliability problem with a specific system. Identifying such factors would enable inspectors to focus their attention on the more risk-significant systems and issues at each individual plant. In addition, special studies can be conducted to determine the root cause of reliability problems by comparing the characteristics of plants that have these problems with those that do not.

Aging. Equipment reliability data will help identify equipment that is being degraded by aging and define the extent and the risk-significance of aging problems. This enhances the NRC's oversight capability with regard to the license renewal rule (10 CFR Part 54).

Another class of examples involves the need for information to evaluate anticipated cost beneficial licensing actions, where the rationale is that risk permits reductions in previous margins of safety or less prescriptive requirements without adverse impact on overall safety. The NRC is actively pursuing a variety of modifications to the basic regulations and guidelines that govern the operation of commercial nuclear power reactors. These modifications are characterized by allowing individual licensees to utilize insights from plant-specific risk evaluations to reduce or remove current requirements that are found to have low risk-significance. Current regulatory requirements under consideration for risk-based modification include those prescribing quality assurance, in-service inspection, in-service testing, and surveillance testing. It is anticipated that a significant number of additional requests will be received, relying upon risk-based arguments. These changes could adversely affect the level of safety achieved by the plants if the risk evaluations are flawed or the changes are improperly executed or the changes involved synergistic effects that are not covered by the risk models or captured by historical data. In order to properly monitor the effectiveness of licensees' programs to maintain safety while reducing regulatory burden and to exercise its oversight authority, the NRC needs current, plant-specific data that can provide a direct measure of the current level of safety achieved by each plant. Relaxation of undue regulatory burdens then can proceed with confidence that there will be appropriate feedback to assure that the level of safety is not being degraded. Some examples are discussed below.

Risk-based Technical Specifications. Technical Specification requirements specify surveillance intervals and allowed outage times for safety equipment for the various modes of plant operation. With plant-specific demand failure and unavailability data, proposed changes to plant-specific Technical Specifications can be more effectively evaluated based on the risk-significance and performance of the plant systems/equipment and based on confidence that there will be appropriate feedback to assure that the level of safety performance is not being degraded. Failure rates from actual demands will be used to verify that failure rates estimated from testing are approximately the same. Results and recommendations from the risk-based technical specifications development efforts would also be incorporated in NRC staff guidance for review of Technical Specifications modifications.

Inservice Testing. Inservice testing requirements, which are based on the provisions of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), measure the functional characteristics of equipment performance, such as pump flow, in order to detect degradation. The ASME and licensee owners' groups are working toward establishing risk-based frequencies

for inservice testing, based on plant-specific risk ranking methodologies. Changes in testing frequency can affect reliability in many ways. For example, less frequent valve testing might lead to an increase in the demand failure rate because the valve actuating mechanism tends to bind or freeze after extended periods of idleness. However, using plant-specific demand failure and unavailability data, proposed changes can be more effectively evaluated based on the risk-significance and performance of plant systems and based on confidence that there will be appropriate feedback to assure that the level of safety is not being degraded.

NRC Maintenance Rule.

The maintenance rule, 10 CFR 50.65, was issued on July 10, 1991 (56 FR 31306). The reliability and availability information that would be required by the proposed reporting rule would improve the NRC's oversight of licensees' implementation of the maintenance rule. It would also enhance licensee's capabilities to implement the evaluation and goal-setting activities required by the maintenance rule by providing licensees with access to current industry-wide reliability and availability information for risk-significant systems and equipment within the scope of the maintenance rule.

NRC Monitoring. As discussed above, current plant-specific data can provide a direct measure of the current level of safety achieved by each plant, which can provide feedback on the effectiveness of licensee programs, including maintenance programs. Accordingly, these data would improve the NRC's monitoring ability by providing risk-based measures of the effectiveness of individual licensee maintenance programs and the overall effectiveness of the maintenance rule.

In addition, the NRC has expressed concern about the extent to which some reactor licensees are taking systems and equipment out of service for maintenance during plant operation. Although this practice may offer economic benefits by reducing plant downtime, it must be properly managed to assure that safety is not compromised, and licensees are required by 10 CFR 50.65(a)(3) to periodically conduct assessments and make adjustments to ensure that the objective of preventing failures through maintenance is appropriately balanced against the objective of minimizing unavailability due to monitoring and preventive maintenance. The NRC would use the hours when any two or more trains from the same or different systems are concurrently unavailable to monitor how well licensees are managing the risk associated with such maintenance. As discussed below, under "Licensee Implementation," the data would also enhance licensees' capabilities to make prudent on-line maintenance decisions.

The maintenance rule is also important to the license renewal rule (10 CFR Part 54). Hence, improving the NRC's oversight of the maintenance rule could strengthen one of the bases for the license renewal rule.

Licensee Implementation. In connection with the NRC's PRA policy, the NRC staff has defined the data elements that would improve the evaluation of maintenance and has established that they are the same as those needed to support a transition toward a risk- and performance-based regulatory process. The NRC believes that the reliability and availability data that would be required by this rule would enhance licensee's capabilities to implement the evaluation and goal-setting activities required by the maintenance rule by

providing licensees with access to current industry-wide reliability and availability information for risk-significant systems and equipment within the scope of the maintenance rule.[2]

In some circumstances, the maintenance rule requires licensees to establish performance or condition goals, taking into account industry-wide operating experience where practical. It also requires periodic program evaluations, including consideration of unavailability due to monitoring or preventive maintenance, taking industry-wide operating experience into account, where practical. Licensees will need to monitor reliability and availability of risk-significant systems, particularly for the periodic program evaluations.[3] For most risk-significant systems, plant-specific data are too sparse to support a meaningful evaluation of system reliability and availability. With both plant-specific and industry-wide data, statistical techniques using Bayesian analysis can provide more meaningful estimates of equipment performance for comparisons with goals or to perform analysis to minimize unavailability. Industry-wide data would also provide a practical source for comparing plant-specific performance with industry operating experience. Although plant-specific information is generally available on site, and utilities review licensee event reports and other generic event information, NRC site visits, associated with early efforts to prepare for maintenance rule implementation in 1996, indicate that utilities do not use industry operating experience in a systematic and consistent way for goal setting purposes under the maintenance rule. Based on these considerations, the availability of current, industry-wide reliability and availability data would enhance licensee's capabilities to implement the evaluation and goal-setting activities required by the maintenance rule.

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[2] The systems and equipment covered by this proposed rule are a subset of the systems and equipment within the scope of the maintenance rule. The data elements are more extensive than what would be required for compliance with the maintenance rule; however, for the systems covered, these data elements would serve to improve implementation of the maintenance rule. To cite one example, under 10 CFR 50.65(a)(2), risk-significant systems may be considered to be subject to an effective preventive maintenance program and, thus, not subject to condition or performance monitoring unless "maintenance preventable" failures occur. However, gathering the reliability and availability information specified in this proposed rule, including data elements such as concurrent outages and the causes of failures, would provide a better picture of a risk-significant system's performance and the effectiveness of the preventive maintenance program than simply awaiting the occurrence of "maintenance preventable" failures.

[3] NUMARC 93-01, which the NRC has endorsed as describing one acceptable way of meeting the requirements of the NRC's maintenance rule, indicates in Section 12.2.4 that the adjustment for balancing of objectives needs to be done for risk-significant structures, systems, and components (SSCs). However, for other SSCs it is acceptable to measure operating SSC performance against overall plant performance criteria and standby system performance against specific performance criteria. This is reasonable in that, for systems that are less risk-significant, the expense of a rigorous balancing is not warranted.

As discussed previously, the NRC has recently found cause for concern about how some reactor licensees handle on-line maintenance. Prudent on-line maintenance decisions depend on a full appreciation of the risk-significance of taking equipment out of service (individually or collectively) and use of plant-specific and generic reliability and availability data would play a significant role in improving such decision-making.

Marginal to Safety Program. In 1984, the NRC's Annual Planning and Program Guidance (PPG) document stated that "Existing regulatory requirements that have marginal importance to safety should be eliminated." In accordance with the PPG document, the staff initiated a program to make regulatory requirements more efficient by eliminating those with marginal impact on safety. The NRC's initiative recognizes the dynamic nature of the regulatory process and that the importance and safety contribution of some existing regulatory requirements may not have been accurately predicted when adopted, or, may have diminished with time. The success of the NRC's initiative depends on the availability of methods, models and data to quantify marginal risk impacts.

Program for Regulatory Improvement. The NRC's Marginal-to-Safety Program is part of a broader NRC initiative for regulatory improvement. Through its Program for Regulatory Improvement, the staff plans to institutionalize an effort to eliminate requirements marginal to safety and to reduce regulatory burden. The NRC staff's plan, which satisfies the recent requirement for a periodic review of existing regulations in Executive Order 12866 of September 30, 1993, was approved by the Commission on August 26, 1992. The Program for Regulatory Improvement is aimed at the fundamental principle adopted by the Commission that all regulatory burdens must be justified and that its regulatory process must be efficient. In practice this supports the elimination or modification of requirements where burdens are not commensurate with their safety significance. By freeing up resources, the activities in this program should result in enhanced regulatory focus, including data gathering, in areas that are more safety significant.

The Program for Regulatory Improvement will include, whenever feasible and appropriate, the consideration of performance-oriented and risk-based approaches. In performance-oriented approaches, regulatory objectives are established without prescribing the methods or hardware necessary to accomplish the objective, and licensees are allowed the flexibility to propose cost-effective methods for implementation. Risk-based approaches use probabilistic risk analysis as the systematic framework for developing or modifying requirements.

In January 27, 1993 (58 FR 6196), the staff published a general framework for developing performance-oriented and risk-based regulations. To increase flexibility for licensees, the detailed and prescriptive technical requirements contained in regulations could be improved and replaced with performance-based requirements and supporting regulatory guides. The regulatory guides would allow alternative approaches, although compliance with current detailed regulatory requirements would continue to be acceptable. The performance-based requirements would reward superior operating practices.

The NRC plans to use its Safety Goals and PRA tools (51 FR 28044; August 4, 1986), to the extent deemed appropriate, in the development of performance-based regulations.

Performance-Based Regulations. In adopting a performance-based regulatory approach, the NRC has adopted criteria to guide its decisionmaking (58 FR 6196; January 27, 1993). An existing NRC regulatory requirement may be modified provided that:

- The new performance-based regulation is less prescriptive and allows the licensee flexibility to adopt cost-effective methods for implementing the safety objectives of the original rule.
- The regulatory safety objectives are derived, to the extent feasible, from risk considerations and are consistent with the NRC's Safety Goals.
- Detailed technical methods for measuring or judging the acceptability of a licensee's performance relative to the regulatory safety objectives are, to the extent practical, provided in industry standards and guidance documents which are endorsed in NRC regulatory guides.
- The new regulation is optional for current licensees so that licensees can decide to remain in compliance with current regulations.
- The regulation is supported by necessary modifications to, or development of, the full body of regulatory practice including, for example, standard review plans, inspection procedures, guides, and other regulatory documents.
- The new regulation is formulated to provide incentives for innovations leading to improvements in safety through better design, construction, operating, and maintenance practices.

Sound risk- and performance-based regulation is dependent upon a compatible data base. Thus, the NRC's initiative toward risk-based rules is dependent upon, and assumes the existence of, a data base which can provide the information necessary to run PRA models and conduct risk-based safety assessments.

Current Data Sources and Their Deficiencies. The uses for PRA noted above currently depend upon generic data, often not verified or updated, supplemented with a limited amount of plant-specific data. There are no existing NRC requirements for licensees to systematically report reliability and availability information nor are licensees gathering it on a consistent basis. The Nuclear Plant Reliability Data System (NPRDS), a data base supported by industry and maintained by INPO, provides data on component engineering characteristics and failures. However, INPO has explicitly stated that the provisions of demand failure-rate data or non-failure-related causes of component unavailability are not part of NPRDS. In recent years, plants have performed individual plant examinations (IPEs) as requested in Generic Letter 88-20 and its supplements, and submitted the results to the NRC. These submittals provide measures of risk such as core damage frequency (CDF), dominant accident sequences, and release category information. However, IPE submittals do not provide sufficient information for the staff to make dependable estimates of system reliability and availability. Refer to Section 1.1.5 for additional information on current regulatory requirements.

None of the sources noted above include updated data elements that are needed to determine the current reliability and availability of risk-significant

systems and equipment. Neither do the reports provided under 10 CFR 50.72 and 50.73 (discussed in Section 1.1.5).

The NRC staff offices have worked together over the past four years to develop a consensus on the minimum data needed by the NRC to support risk-based applications. During this period NRC staff has also interacted extensively with the Institute of Nuclear Power Operations (INPO) and the Nuclear Energy Institute (NEI) over the past three years in an effort to define the minimum reliability and availability data needed to satisfy the needs both NRC risk-based regulatory applications and industry (licensee) uses of PRA. A consensus was reached among the NRC program offices and a general agreement was obtained with INPO and NEI on the minimum data elements that would satisfy the aforementioned applications.

1.1.3 Analytical Effort

The regulatory analysis has identified alternatives to current data-gathering requirements which would meet the staff's safety objective and regulatory goals described in Section 1.2. Chapter 3 describes the value and cost impact analyses performed for these alternatives. Other considerations are noted below.

Environmental Impact: Categorical Exclusion. The Proposed Action sets forth requirements for the collection, maintenance, and reporting of risk-significant system and equipment reliability and availability data. The staff has determined that the Proposed Action is the type described in categorical exclusion, 10 CFR 51.22(c)(3)(iii). Therefore, neither an environmental impact statement nor an environmental assessment has been prepared in support of the Proposed Action.

Backfit Analysis. The Proposed Action sets forth requirements for reporting and recordkeeping. The NRC staff has determined that the Backfit Rule does not apply to information collection and reporting requirements.

Analysis Required by Statute. Paperwork Reduction Act and Regulatory Flexibility Act analyses have been conducted and the results are reported in Chapter 3.

1.1.4 Scope and Applicability

The Proposed Action for reliability and availability data gathering will apply to a select list of risk-significant, accident-mitigating systems and equipment at plants operated by holders of operating licenses for commercial nuclear power plants under 10 CFR 50.21b or 50.22 and by holders of combined operating licenses for commercial nuclear power plants under 10 CFR 52.97. The systems and equipment for which data would be provided are a subset of the systems and equipment within the scope of the maintenance rule. The actual number of systems impacted depends on the selection criteria to be developed in an industry guidance document or in the NRC's regulatory guide. However, the number of systems is estimated between six and sixteen based on conversations with industry over the last few years.

The Proposed Action does not require licensees to gather data on human reliability at this time because of the difficulties in fully defining human reliability data requirements and gathering data. However, human errors that

contribute to equipment failures would be captured in the reports on such failures.

The Proposed Action does not apply to other fuel cycle facilities, or byproduct, source or special nuclear materials licensees.

1.1.5 Current Regulatory Requirements

Currently, there are no rules to require systematic feedback of reliability and availability data nor are licensees gathering such information on a consistent basis or sharing such information on an industry-wide basis. However, two existing rules border on the collection of risk-based information. These are described below.

10 CFR 50.72, "Immediate Notification Requirements for Operating Nuclear Power Reactors," requires immediate or near-immediate notification of the Commission in the event of emergencies (as defined by the licensee's approved Emergency Plan), shutdowns required by or deviations from the technical specifications, any conditions resulting in or potentially resulting in seriously degraded operations, natural phenomena or external conditions that pose safety threats, conditions that result in or should have resulted in actuation of the ECCS, any conditions that result in the actuation of an engineered safety feature or could have prevented the safety function of a system, or any significant effluent releases.

10 CFR 50.73, "Licensee Event Report System," requires the submission of licensee event reports for those events requiring notification under 50.72, and in addition requires a detailed description and analysis of those events, including causation, potential safety consequences and implications, identification of manufacturers and model numbers of failed components, and planned corrective actions.

1.1.6 Achievements and Costs of the Current Rules

Current requirements meet many but not all needs of risk-based regulation. In addition, current regulatory requirements do not provide information in a form and on a frequency which can be utilized in implementing the requirements of the maintenance rule which require, where practical, consideration of industry-wide operating experience or which can be utilized in the NRC's oversight of maintenance rule implementation. The analysis in Chapter 3 provides value and impact estimates that are incremental to the baseline case, thus avoiding the need for the latter's quantification.

1.1.7 Proposed Regulatory Actions

The NRC is proposing to make data collection suitable for implementing risk-based regulation and more useful for maintenance rule purposes by increasing its currency and the efficiency of its collection and use. Systems and equipment affected are those which have or could have a significant effect on estimated core damage frequency or preserving containment integrity. Data on human reliability and from licensees other than power reactors are excluded. Specific alternatives, including the Preferred Alternative, are discussed in Chapter 2.

The NRC staff is evaluating which elements could be deleted from 10 CFR 50.72 and 50.73 that would no longer be needed in light of the Proposed Action.

1.1.8 Significance of Taking No Action

Without the reliability data rule, the NRC's ability to move towards risk-based regulation would be limited. The reliability data rule is intended to help improve the efficiency of the staff and enable, in a practical way, the implementation of the Commission's proposed policies on Safety Goals and PRA. It would also support a fundamental Commission principle that all regulatory burdens must be justified and that its regulatory process must be efficient. By freeing up resources, the applications supported by this rule should result in enhanced regulatory focus on fewer areas that are more safety significant, and a reduced industry burden responding to marginal safety significant issues.

With regard to the maintenance rule, without this proposed rule, the NRC and industry would not gain the improvements in oversight and implementation that are expected if the preferred alternative is implemented.

1.2 Objectives

The overall safety objective of the NRC's Proposed Action to gather reliability and availability data is:

- *to enhance the NRC's capability to effectively and efficiently evaluate the impact on reactor plant risk of (1) NRC rules and regulations, (2) licensee performance, and (3) the implementation of the maintenance rule.*

One yardstick used to assess compliance with the effectiveness component of the safety objective is risk impact, as measured by changes in (a) core damage frequency, (b) preserving containment integrity and (c) expected radiation exposures to populations and to individuals. Another measure of effectiveness of the safety goal is public acceptance. A yardstick used to assess the efficiency component of the safety objective is, as measured by the savings in time devoted to obtaining, reducing and using required data in the regulatory decisionmaking process.

To achieve the overall objective, the rulemaking process will be guided by the following:

- *The frequency, form and substance of data collection will be standardized, and compatible with the needs of risk-based regulation and the intent of the maintenance rule, including the need to reduce uncertainty;*

- *The process will be electronic to the extent practical, and facilitate access by multiple users;*

- *The details of which safety-significant system and equipment data are to be reported will be specified in regulatory guides as an incentive to licensees to develop innovative and improved means of obtaining and reporting data;*

- *The process will support those activities that will engender public confidence in risk-based regulation;*

- *To maximize the values of the Proposed Action, it will be implemented on a schedule closely following implementation of the NRC's maintenance rule.*

1.3 Executive Summary

The following statements present the technical findings, conclusions and recommendations, and are based on the analyses conducted in Chapter 3 and the decision rationale applied in Chapter 4.

1.3.1 Technical Findings

Promulgation of the Alternative A is estimated to result in implementation costs to the NRC and industry of $0.7 million and $4 million, respectively. Industry will also incur ongoing operational costs; on a per plant basis these are estimated to be about $54 thousand and $110 thousand per year for 80 and 30 plants, respectively. The ongoing costs to the NRC are estimated to be zero, due to offsets from other programs. The present value of these NRC and industry implementation and operational costs, assuming implementation of the rule in 1996, 20 years of ongoing operations, and a 7 percent discount rate, are about $87 million. For Alternative B, the present value of all implementation and operational costs is about $80 million greater than for Alternative A.

The rule is expected to yield significant benefits to both the NRC's and industry's operations. For the NRC these benefits reflect improved efficiency in reaching regulatory decisions. For industry the benefits will derive from the implementation of risk based regulations and PRA policies. For the NRC, the benefits have been quantitatively assessed only for efficiencies achieved in evaluating licensee events, performing diagnostic evaluations, and reviewing and approving risk based technical specifications. Together, improved efficiency in these areas are estimated to yield at least $1.1 million per year in cost savings. Given the 20-year period the rule is assumed to be in effect, this is equivalent to a present worth benefit of $10 million.

Quantitative estimates of the benefits to industry have not been made due to the difficulties of apportioning credit between the data and the other integral components of the framework for moving to risk-based regulations. However, the magnitude of the benefits to industry can be appreciated by considering the costs of down-time and the benefits of expediting the move towards risk-based regulations. One day of down-time for a typical reactor costs about $300 thousand, a figure dominated by the cost of replacement power. Industry's total cost for the preferred alternative will be offset if the information and insights provided by the data only avert one day of down-time per plant every 30 years. Similarly, expediting a single risk-based regulatory change can offset the total cost to industry of the rule.

1.3.2 Conclusions

The NRC concludes that its safety objective stated in Section 1.2 can be attained, while at the same time achieving a significant net savings in industry and NRC resources. The Preferred Alternative also advances NRC policies and programs, including greater use of its safety goals, application of PRA, the Regulatory Improvement Program, the Marginal-to-safety Program, and other risk- and performance-based initiatives such as focused site

inspections, technical specifications, and the Accident Sequence Precursor Program.

1.3.3 Recommendations

Given these conclusions, the NRC staff recommends proceeding with rulemaking to gather data on reliability and availability for risk-significant systems and equipment. A regulatory guide should be prepared detailing the procedure for identifying risk-significant systems and equipment.

2. Alternatives

This chapter describes the alternatives considered for collecting reliability and availability data, and identifies the Preferred Alternative.

2.1 Specific Alternatives

The No-Action Alternative (Status Quo)

This alternative does not require the NRC to take any action.

It is assumed that licensees would continue reporting in accordance with current requirements. It is also assumed that, as has been the case in the past, the staff would occasionally find a need to gather extensive reliability and availability information for a specific purpose, such as was done in preparing the justification for the station blackout rule 10 CFR 50.63. When this is the case, the data collection would be difficult and expensive. Finally , it is assumed that there would be progress towards risk-based regulation; however, that progress would be impeded by the lack of systematic collection of reliability and availability information.

Alternative A: Collect Reliability Data by Rule

In this alternative, a new NRC rule would require utilities to report reliability and availability data periodically for a limited number of risk-significant systems and components, and in a form that would enhance its effective and efficient use in risk analysis. This requirement would enable the NRC to collect plant-specific and industry-wide reliability and availability data of the substance and form (a) to support NRC's transition into risk-based regulation, (b) to improve the NRC's oversight of licensee implementation of and overall effectiveness of the maintenance rule, (c) to enhance licensee implementation of the maintenance rule, (d) to automate the data collection and assessment process, thus bringing greater efficiencies to the process, (e) to implement risk-based performance indication and trending, and (f) to reduce uncertainties in some of the data and models associated with PRA.

A new reliability and availability data-gathering rule will require each licensee to submit an annual report to the NRC that contains the following information, compiled on the basis of calendar quarters, on risk-significant systems and equipment:

- The number of demands, the number of failures to start associated with such demands, and the dates of any such failures, characterized according to the identification of the train affected, the type of demand (test, inadvertent/spurious, or actual need), and the plant mode at the time of the demand (operating or shutdown),

- The number of hours of operation following each successful start, characterized according to the identification of the train affected and whether or not the operation was terminated because of equipment failure, with the dates of any such failures,

- The number of hours of unavailability, characterized according to the identification of the train affected, the plant mode at the time of the un-

availability (operating or shutdown), the type of unavailability (planned, unplanned, or support system unavailability), and, if due to support system unavailability, identification of the support system,

- For each unavailability due to component failure(s), a failure record identifying the component(s) and providing the failure date, duration, mode, cause, and effect, and

- The number of hours when two or more trains from the same or different systems were concurrently unavailable, characterized according to the identification of the trains that were unavailable.

These data will be gathered for a subset of the equipment to be monitored as part of the maintenance rule. Some additional data detail will be required, however, and a uniform method of data collection will be imposed under this alternative.

The data to be gathered under the rule will provide direct, risk-related, indicators of plant performance based on actual component reliability and failure history. Such indicators provide a measure of the effectiveness of regulatory, plant, and system performance, and eliminate the need for extensive component data analysis or interpretation.

Alternative B: Use of NRC Resources to Gather Reliability Data

The NRC has the authority under 10 CFR 50.54, Conditions of Licensees, and/or 10 CFR 50.70, Inspections, to gather reliability and availability information. In this alternative, it is assumed that the NRC would gather the information listed in Alternative A directly by inspection. The benefits of doing so would be essentially the same as Alternative A. The primary difference between Alternatives A and B is the cost and the efficiency of data collection.

Alternative C: Voluntary Submission of Reliability Data by Industry

Alternative C is identical to Alternative A without the need for rulemaking. In this alternative, it is assumed that licensees would submit the information voluntarily. The schedule, values, and impacts would be essentially the same as for Alternative A except there would be no rulemaking costs. After several years of negotiation over this issue, the NRC has not reached an agreement with industry to obtain reliability data voluntarily. Accordingly, for the purpose of this regulatory analysis, this alternative is not considered predictable and no further examination is provided.

2.2 The Preferred Alternative

Alternative A is the Preferred Alternative and its incremental benefits and costs with respect to the No-Action Alternative and Alternative B are evaluated in Chapter 3.

3. Consequences

The preliminary analysis of Section 2 eliminated all but two alternatives for satisfying the requirements for reliability data collection. This section compares the consequences of Alternative A to those of the only other viable option, Alternative B. Section 3.1 provides an overview of the consequence assessment. The affected attributes are identified in Section 3.2. Alternatives A and B have very similar benefits, the small differences are discussed in Section 3.3. Selected incremental costs for Alternatives A and B, relative to the No-Action Alternative, are developed in Sections 3.4 and 3.5, respectively. In Section 3.6, the overall consequences are summarized. Sections 3.7 and 3.8 summarize the Paper Work Reduction Act and the Regulatory Flexibility Act Statements, respectively.

3.1 Overview of Consequence Assessment

3.1.1 Consequence Estimates

Consequence estimates for Alternative A and Alternative B are estimates of increments relative to the No-Action Alternative. In the final regulatory analysis, it is expected that the sources and magnitudes of uncertainties in estimates and the methods used to quantify uncertainty will be discussed. However, this draft regulatory analysis contains only a best-estimate analysis.

The groups that are expected to be affected by Alternatives A and B are the general public, Part 50 licensees and their employees, and the NRC. For each group, the attributes that characterize the consequences of each alternative were identified and differences in consequences were estimated by year for the entire time period that groups will be affected. For the purpose of this regulatory analysis, it is assumed that plants are not relicensed.

3.1.2 Assumptions and Bases

3.1.2.1 General Assumptions

The major assumptions made and bases employed in quantifying differences in consequences associated with Alternatives A and B are:

- Costs are presented in 1995 dollars.
- Net present costs are shown as their current value assuming implementation starts in mid-1996; beyond 1996, annual submittals and other recurring activities occur for the remainder of the plant life, 110 plants with a plant life of 20 years beyond the 1996 date being assumed.
- A discount rate of 7 percent (OMB Guidelines).
- An average loaded labor rate of $70/hr for licensee technical staff implementing the data collecting, tabulation, and reporting elements of Alternative A and $40/hr for licensee staff responsible for storing and maintaining the records (SEA FORECAST code).
- NRC labor is estimated at $54/hr, which reflects marginal costs for NRC staff.

- Loaded rates for NRC contractors.

- Estimates by industry representatives vary widely as to the number of plants that are planning to collect the specific reliability and availability data once the maintenance rule is implemented. Based on interactions with licensees in connection with several programs, the staff believes that most licensees are either collecting or plan to collect reliability and availability data. For the purpose of this regulatory analysis, it was assumed that 80 plants would already be collecting similar data and 30 would not.

- Estimates of data collection efforts are based on the following average amounts of data at each plant:

  - 4000 pages in one year of operation logs

  - 8000 pages in one year of maintenance logs

  - 1000 pages in one year of unusual occurrence report (UOR) and licensee event report (LER) logs.

In assessing consequences, probable courses of action by licensees and the NRC in applying each Alternative were established. Resources expended by these parties include labor required to collect additional data and engineering and analytical efforts needed to set up programs.

Most estimates were obtained by eliciting expert opinion. Because areas of expertise varied, a consensus opinion was elicited. The participants agreed that most of the estimates are very uncertain, and public comment should be solicited.

3.1.2.2 Assumptions Regarding Alternative A

Alternative A would require that holders of operating licenses for nuclear power reactors periodically report reliability and availability data for risk-significant systems and equipment which have or could have a significant effect on estimated core damage frequency or preserving containment integrity. Summary information reported to the NRC would comprise:

- The number of demands, the number of failures to start associated with such demands, and the dates of any such failures, characterized according to the identification of the train affected, the type of demand (test, inadvertent/spurious, or actual need), and the plant mode at the time of the demand (operating or shutdown);

- The number of hours of operation following each successful start, characterized according to the identification of the train affected and whether or not the operation was terminated because of equipment failure, with the dates of any such failures;

- The number of hours of unavailability, characterized according to the identification of the train affected, the plant mode at the time of the unavailability (operating or shutdown), the type of unavailability (planned, unplanned, or support system unavailability), and if due to support system unavailability, identification of the support system;

- For each unavailability due to component failure(s), a failure record identifying the component(s) and providing the failure date, duration, mode, cause, and effect;

- The number of hours when two or more trains from the same or different systems were concurrently unavailable, characterized according to the identification of the trains that were unavailable.

Each successful response to a demand for all or almost all of a system, train, or other equipment ensemble would be reported, but not successful demands on individual components, such as occur in valve exercise tests. The summary information would be tabulated on a quarterly basis and reported annually. Records and documentation that provide the basis for summary data reported to the NRC would be required to be maintained on-site and made available for NRC inspection. The NRC intends to issue a regulatory guide which will provide additional detail in the form of guidance on acceptable methods for implementing the rule.

This regulatory analysis assumed that the NRC would develop data base software for storage and retrieval of the data collected under the rule. This package would provide:

- user-friendly modules for data input, with validation checks;

- reports of raw data for the Public Document Room;

- automatic update of both plant-specific and generic train-level reliability estimates, using Bayesian or other appropriate methods; and

- annual reports of the updated system- and train-level reliability estimates and performance indicators based on the updated reliability estimates.

It was assumed the NRC would incur incremental costs in developing this software, in software quality assurance at Level 1 (software used in a safety-related decision), and in developing and entering prior distributions for the Bayesian analyses. The NRC does not plan to have this software offer alternative approaches to data aggregation, trend analyses, other kinds of reports, or user-friendly querying capabilities with which to extract data from the data base, although such additional features could be added. No credit was therefore taken for benefits from such additional features and no cost was attributed to them. Subsequent data base maintenance and data entry would be offset by reductions in similar activities devoted to other programs (such as the existing Performance Indicator Program) and would therefore entail no incremental cost.

It was assumed that the 75 plant-specific probabilistic risk assessment models developed for the Accident Sequence Precursor (ASP) Program would make use of the data reported under the new rule. ASP models are designed to help estimate conditional core damage probabilities and CDF increments associated with the reactor events reported by licensees to the NRC in accordance with the requirements of 10 CFR 50.72 and 10 CFR 50.73. They are also useful in estimating the increments in CDF associated with inspection findings and changes in CDF associated with proposed changes in plant design or operational requirements. Refer to Appendix A for additional information on ASP.

The use of up-to-date, plant-specific data would significantly enhance the accuracy of the ASP models for all of their applications including estimation of the risk significance of changes in the availability of the safety systems to be reported. The NRC expects to suggest in the regulatory guide that the data should be collected consistent with the need to properly represent dependencies between trains or between functions.

3.1.2.3 Assumptions Regarding Alternative B

Under Alternative B the NRC would collect the reliability data directly from plant records. The data requirements defined in Section 3.1.2.2 under Alternative A would be the same for this alternative. Also, as for Alternative A, the data would be tabulated on a quarterly basis and reported annually. For the estimation of the consequences of Alternative B the following assumptions were utilized:

- There would not be any cost of a rulemaking (including a regulatory guide) except for costs already incurred;
- The NRC will utilize contractor support to collect the data. The NRC would incur contractor and procurement costs for the data collection effort;
- The cost of developing the data base software for storage and retrieval of the collected data will be the same as Alternative A;
- NRC headquarters program management time is the same for Alternative A;
- Records and documentation that provided the basis for the summary data would not be maintained available for inspection.

3.2 Identification of Attributes

As required by NRC regulatory analysis guidelines, those attributes that could be affected by the alternatives considered to accomplish the Proposed Action are identified in this section. Once identified, the attributes may be quantified using the techniques presented in the Reliability Analysis Technical Evaluation Handbook (NRC93A). While many of the attributes can be quantified in monetary terms, others are treated qualitatively. The following sections present a discussion of attributes affected by Alternatives A and B.

Public and Occupational Health

Although not amenable to quantitative evaluation, certain benefits of Alternatives A and B should improve safety by reducing the core damage frequency or preserving containment integrity.

NRC Implementation

Initial impacts for the NRC are assumed to include the creation of an industry-wide data base of reliability data for risk-significant equipment. It is also assumed that the NRC will incur the costs of rulemaking and costs in the first year for inspecting licensees' implementation of the rule, if Alternative A is adopted. Under Alternative B the NRC will incur costs for the procurement of contractor support and the cost of that support.

NRC Operation Costs

NRC operation will benefit from the improvements in regulatory efficiency made possible by the collected data. Under Alternative B, the NRC will incur the costs of data collection.

Industry Implementation

Under Alternative A, licensee implementation costs are incurred in identifying the risk significant systems and in setting up to collect the reliability data. In addition, provision must be made for records storage onsite such that records are available for NRC inspection.

Industry Operation

Industry operation will benefit from risk-based regulation made possible by the collected data. The fraction of benefits that can be attributable to this rule is hard to isolate, as these benefits will accrue from actions to implement risk-based regulation, as well as actions to implement data collection. For Alternative A there are the operational costs from the collection of the data, the preparation of the yearly report, and the maintenance and storage of the supporting data. For Alternative B there are lower costs in providing support during NRC data collection.

Regulatory Efficiency

Regulatory efficiency will benefit from the availability of data to improve the NRC's ability to move towards risk-based regulation and to enhance the NRC's oversight capabilities and licensees' implementation capabilities with regard to the maintenance rule.

3.3 Benefits Common to Alternatives A and B

For the most part, Alternatives A and B provide the same benefits by collecting the needed reliability data. The only identified difference relates to the quality of the data: if the licensee collects the data there may, in the long run, be a better quality in the initial log entries, whereas if the NRC collects the data there may be better consistency from plant-to-plant in the way the data are summarized.

Some operational benefits that accrue to the NRC and industry from Alternatives A and B are integral with the benefits of implementing other aspects of risk-based regulation and/or the maintenance rule. It is not feasible to desegregate these benefits and attribute a specific portion of them to data collection alone. Accordingly, much of the following discussion of benefits is qualitative.

NRC Operational Benefits

Three quantifiable benefits of Alternatives A and B would reduce NRC operation costs:

- reduced cost of responding to licensee events, inspection findings, and proposed changes in design or operation;

- reduced cost for diagnostic evaluations;
- reduced cost for evaluation of requests for technical specification relief.

Licensee events. The availability of better data will help to reduce expenditures of NRC resources in situations where the risk is low . It was estimated that data to be collected would be used to support the evaluation at least 20 percent of those licensee events, inspection findings, and proposed changes in design or operation that receive detailed evaluations, because at least this many would be covered by models supported by the collected data. From PRAs it has been found that approximately 70 percent of contributing events are not risk important. An improved ability to identify an issue as "not risk significant" would reduce NRC expenditures. The present NRC effort in responding to events, inspection findings and proposed changes in design or operation is at least 100 full-time equivalents. It was estimated that a reduction equivalent to 7% of this amount would be achieved. Using a cost of $54 per hour for a year of 1800 hours yielded a savings of at least $600,000 per year.

Diagnostic evaluations. Risk-based performance indicators (Pis) will improve the process of objectively identifying plants where a diagnostic evaluation might be warranted and could help focus the effort. It was assumed that the number of diagnostic evaluations would be reduced by at least 10 percent and that the availability of better data would permit at least a 10 percent reduction in total NRC costs for each diagnostic evaluation. Now, each diagnostic evaluation requires at least four person-years of NRC and contractor effort plus travel, for a total cost of at least $400,000. Reducing the cost by 10 percent for at least 1.5 such evaluation each year results in a savings of at least $60,000 per year. Reducing the frequency of diagnostic evaluations by at least 10 percent would save at least an additional $54,000 per year, bringing the total benefit to at least $100,000 per year.

Technical specifications. For risk-based technical specifications, documented plant-specific data are needed to accurately determine failure rates and repair times for the surveillance test interval's (STI) and allowed outage time's (AOT) contributions to risk. More accurate failure and repair data are needed in these cases—while a factor of 2 uncertainty in the failure rate or repair time can translate to a factor of 2 difference in the allowed STI or AOT, for redundant components, the uncertainties multiply so that for two redundant trains, a factor of 2 translates to a factor of 4 difference in the allowed STI or AOT. The NRC has approved STI and AOT modifications previously and is preparing a program for risk-based technical specifications which will require more comprehensive plant-specific data, but that initiative is in an early stage and its effects were not considered in this analysis. Each year the NRC staff spends on the average 70,000 hours reviewing requests for technical specification relief. For this analysis, it was assumed that the collected data would cover the evaluation needs of at least 20 percent of the requests each year. It was further assumed that Alternatives A and B would reduce the cost of the NRC for evaluating these 20 percent by at least 5 percent. Based on the average annual NRC expenditure on technical specifications review, the savings from this benefit is at least $93,000 per year.

Additional benefits that accrue to the NRC are addressed qualitatively below, and derive primarily from the feedback of data.

General rulemaking support. The collected data could be used to support any rulemaking in which system- and train-level reliabilities are important to the value-impact analysis. The usefulness would begin with the preliminary cost-benefit analysis, where more accurate data could avoid initiation of rulemaking of only marginal net value. Early abandonment of a marginal rule would avoid both NRC costs and the industry burden in responding to the proposal. At a later stage, less uncertainty in estimating values may lead to a marginal rule being dropped, thereby avoiding an unnecessary burden on licensees. Alternatively, it may lead to a rule being adopted that might not otherwise have been justifiable, thereby improving risk-effectiveness. Finally, after a rule has been adopted, feedback of the data will permit more precise monitoring of the effectiveness of the rule, so that the regulatory action can be revisited if it has not had the intended effect.

Generic issues. The collected data may also support the identification and resolution of generic issues. The availability of the data may lead to identification of adverse industry trends, age-related or otherwise, or to currently unsuspected generic issues, resulting in risk-effective resolutions. On the other hand, use of the data for more accurate prioritization of a generic issue may reduce NRC expenditures on detailed evaluations of marginal issues and avoid an industry burden in responding to the issue. Finally, less uncertainty in estimating potential benefits of proposed resolutions makes it more likely that the resolution selected will be risk-effective.

Focused inspections. The collected data are also applicable to NRC inspections. The availability of plant-specific data will facilitate these inspections. Also, access to generic data will allow inspectors to verify that the licensee's documented assessment has taken into consideration industry-wide experience.

Maintenance. Maintenance effectiveness monitoring examines the risk effects of maintenance programs by following the downtime caused by maintenance and the benefits of detecting and correcting degradations before failures occur. The system and train reliability and availability data to be collected under Alternatives A and B will provide useful indications, at the system or train level, of maintenance effectiveness.

Industry Operational Benefits

The operational benefits to industry that accrue from Alternatives A and B are integral with the benefits of implementing the maintenance rule and/or risk-based regulation and PRA policies. Therefore, while certain benefits are quantified, no credit has been allocated to data collection alone.

Benefits that accrue to industry are discussed below, largely in a qualitative manner.

Plant availability. Risk-based configuration monitoring requires documented plant-specific data to determine the times when multiple components are down. Plant-specific and generic failure rates are needed to determine the reliabilities and availabilities of the trains which are not down in order to accurately determine the risk increase (e.g., CDF increase) due to the configuration. Risk-based configuration monitoring will facilitate on-line maintenance. In trial applications conducted by the NRC, risk-significant configurations have been identified resulting in tighter controls, while, at

the same time, on-line maintenance was allowed when the risk increase was negligible. Thus, there were favorable consequences for both values and impacts. NRC is carrying out configuration monitoring at four pilot plants and is planning to extend the program. Assuming that 30 percent of shutdown time is due to maintenance and that 30 percent more on-line maintenance will be performed, a 9 percent reduction in shutdown time will result. While the extent of the availability increase would depend on the previous plant performance, it should be at least 1 percent. Assuming a benefit of at least $300,000 per additional day of plant operation, savings of at least $900,000 per facility-year are available. Some of this benefit will occur in any event, e.g., as a result of implementation of the maintenance rule.

Shutdown time. Earlier intervention in problems associated with system/train reliability and availability require performance data. The benefits of earlier intervention particularly by the licensees could be substantial. Assuming that at least one plant is placed on the watch list every five years because of system/train reliability and availability problems, earlier intervention might result in a reduction of at least 30 days in the outage time required to remedy the problems or, perhaps, avoid the need for an extended shutdown altogether. Some benefit in this regard would be achieved in any event, e.g., by implementation of the maintenance rule.

Technical specifications. If the NRC could approve at least 50 more requests each year than it could without the collected data, then the number of additional approvals would be at least 0.5 per facility-year. Assuming that each approval results in a reduction of licensee burden that has an average present value of at least $100,000, this benefit would be worth at least $50,000 per facility-year.

The other identified benefits not quantified in this analysis are described in the following paragraphs.

Marginal to safety. The collected data could be applied to eliminate system- or train-level requirements that are marginal to safety. The data would permit the NRC to be less conservative in evaluating industry rulemaking initiatives. Less uncertainty in estimating risks may lead to elimination of requirements, thereby reducing burdens on licensees. Potential rulemaking topics identified by the NRC and industry include containment leakage testing, quality assurance, fire protection, post-accident monitoring, plant security, and 10 CFR 50.54(f) information requests.

Configuration monitoring. The collected data will support risk-based configuration monitoring, and limited risk profile monitoring. Risk-based configuration monitoring has been addressed earlier. Risk profile monitoring extends risk-based configuration monitoring to include and allow trade-offs in test interval times, trends in failure rates, and maintenance contributions. Risk profile monitoring would also allow dynamic technical specifications which depend upon the plant configuration and current performance to be implemented. Although specific data needs have not been defined, they would be closely akin to or derived from the data kept on site under the preferred alternative.

Quality control. In performance-based quality control, documented plant-specific data are needed to monitor the performance of equipment to ensure that reliability is acceptable and risk is controlled. With performance monitoring that is comprehensive, it covers the demands experienced in an

accident and can identify deteriorating reliability performance at an early stage, the current restrictive quality control requirements can be superseded by performance-based control. NRC is presently planning a program of performance-based control which requires plant specific data. However, because it is not clear what data will be required, the use of the collected data for this application was not evaluated further. Although specific data needs have not been defined, they would be closely akin to or derived from the data kept on site under the preferred alternative.

Licensee initiatives. Other areas in which reliability data to be collected under Alternatives A and B will be useful include response to licensee risk-based initiatives, and licensee amendment reviews, including cost beneficial licensing actions (CBLAs). This area overlaps with other areas discussed above.

Technical specifications. One benefit concerning technical specification change requests was not quantified. It is expected that the availability of the collected data will bring greater consistency to NRC evaluations of a class of technical specifications change requests, enabling licensees to anticipate NRC decisions. This may result in licensees deciding not to prepare certain requests, reducing both NRC and licensee costs. It is not certain, however, that any such instances would occur.

Other potential benefits to industry are use of collected data for internal purposes and reductions in licensing burdens attributable to expedited risk-based regulation discussed under benefits to NRC operation.

Improvements in Knowledge. The public, industry and NRC will benefit from improvements in knowledge from collecting and conducting risk-based analyses. Placing the collected data in the public domain will enable citizens to improve their understanding of the source and extent of risks in commercial power reactors and to monitor the performance of the NRC in controlling those risks.

3.4 Incremental Costs for Alternative A

This section develops the costs of Alternative A as incremental amounts relative to the No-Action Alternative.

NRC Implementation Costs. The NRC would implement Alternative A by:

- completing the rulemaking;
- developing a regulatory guide for implementation of the rule;
- conducting workshops for licensees to promote understanding of Alternative A requirements and how the NRC expects it to be implemented;
- reviewing 74 submittals of lists of systems and equipment to be reported;
- preparing an industry-wide data base of reliability data for risk-significant equipment and training NRC staff on use of the data base and associated systems.

The costs for each NRC incremental activity are identified as follows:

Rulemaking. This rulemaking effort is estimated to require 3 person-years of NRC staff time prior to the rule going into effect. Included in this effort is the preparation of a regulatory guide. The regulatory guide will simplify and focus data collection and reporting efforts and facilitate the conduct of workshops. In particular, the guide should reduce the variation in licensee implementation efforts.

Workshops. The cost of each regional workshop for licensees is estimated to be about $25,000, based on recent NRC experience in conducting public workshops on the proposed changes to 10 CFR Part 51. This estimate includes rental of facilities, preparation of transcripts, workshop materials and handouts, and contractor expenses involved in handling many of the details of such workshops. This estimate also assumes that the draft regulatory guide will be available to workshop participants, enhancing the efficiency of the workshop and reducing its costs. About two workshops for the implementation of Alternative A are expected.

Reviews. The new rule is currently scheduled to be published in final form in May 1996. The NRC expects to conduct an initial inspection of licensee programs, each review requiring 4 person-hours for review and 2 person-hours for examination of records. Based on 74 dissimilar plant designs this effort will require approximately 0.25 person-years.

Data base and training. Developing the data base and systems for storage of data and subsequent analysis, training NRC staff on the use of that data base and preparing the first annual report is estimated to require 2.0 person-years and $35,000 for other expenses (hardware, software, travel, etc.). In addition, it is estimated that 0.25 person-years of NRC headquarters staff time will be required for program management.

NRC Operational Costs. The recurring activities that the NRC is expected to undertake in support of Alternative A are:

- receiving data reports from licensees;
- reviewing/checking data for reasonableness, internal consistency and consistency with monthly reports;
- entering data to the data base;
- training NRC Staff on the use of data base and associated system;
- preparing an annual report.

The cost for this effort is estimated to be 1 person-year and $15,000 for other expenses (hardware, software, travel, misc.).

In addition, it is estimated that 0.1 person-years of NRC headquarters staff time will be required for program management. However, the NRC will save the cost of maintaining the current performance indicator data base, which will offset all these recurring costs.

Industry Implementation Costs

Identification of systems within the scope of the rule. A first step in a licensee's program to respond to the requirements of Alternative A is to determine which plant systems are risk-significant. This step will entail a review of all major plant systems and submittal of a list of risk-significant systems to the NRC. This work could be accomplished with an effort of about five to ten person-days per plant; a ten person-day effort translates into a discounted cost of $6,000 per plant. It is anticipated that activities already completed or in progress for the maintenance rule would lessen the burden since these systems are within the scope of the maintenance rule. In addition, the regulatory guide also may ease the task by specifying systems for which reliability data are to be reported. It is estimated that a range of 6 to 16 systems identified as risk significant will be reported by the licensees. In this analysis, however, it is assumed that each licensee will submit a list of 11 systems for NRC review.

As discussed previously, it is assumed that 80 plants are generating the data required for the reliability data collection rule. The remaining 30 plants are planning to meet the objectives of the maintenance rule without generating the data necessary to comply with the reliability data collection rule. The initial effort required to establish a data collection program for licensees currently generating the appropriate data is estimated to be $10,000 which includes the development of the data base software for the input and retrieval of the data. For the licensees who are not currently collecting reliability and availability data the effort to establish a program is estimated to be $40,000. The increased cost is a result of the absence of a data collection program through the maintenance rule. For each licensee group it will be necessary to establish storage of data records onsite for NRC review. It is estimated that this results in a one-time cost of $10,000 for each licensee. This cost includes space allocation, computer purchase, and any associated hardware.

Industry Operational Costs. The industry's costs are entailed in collecting, reporting, and storing the data. These costs are quantified in the next paragraphs.

Submittal of yearly summary report and storage and maintenance of records. Each licensee will have to tabulate reliability data by quarter for each risk-significant system for annual submittal in a summary report. It is assumed that the licensee employee assigned to this effort will search the operations, maintenance, UOR and LER logs daily. This will provide a more efficient data review and collection process. Additionally, the licensee will benefit from interfacing daily with maintenance and operations personnel and any benefit from activities performed under the maintenance rule. It is estimated for those licensees (80) that would already collect reliability data that the net increase in burden will be approximately 8 person-weeks for data collection and reporting, 3 weeks for project management and 16 person weeks of support staff labor. For 80 plants over 20 years, this translates into a net present cost of approximately $46,000,000.

These cost estimates correspond to an effort of about on-half staff year. This appears realistic considering that these licensees would already be collecting reliability and availability information for their risk-significant systems in connection with maintenance rule implementation and considering the

limited number of systems involved and the limited amount of information involved. It is consistent with informal discussions with some licensee representatives.

For those licensees (30) who are not collecting reliability data under the maintenance rule the net increase in burden will be approximately 16 person-weeks for data collection, 6 weeks for project management and 32 weeks of support staff labor. For 30 plants over 10 years, this translates into a net present cost of approximately $38,000,000.

When all licensees are considered the total net burden over 20 years is estimated to be about $83,000,000.

The records prepared to meet Alternative A will be stored and maintained by the licensee and made available on-site for NRC inspection. These records will describe each demand, failure or unavailability of a risk significant system referred to in the annual summary report. This effort required to store and maintain records is included in the above estimates as part of the support staff labor.

3.5 Incremental Costs for Alternative B

NRC Implementation Costs. The NRC will implement Alternative B by obtaining contractor support to collect the reliability data from each nuclear power plant. The costs associated with this effort include:

- NRC contracting costs
- 1st year contractor costs

The cost of each NRC incremental activity are identified as follows:

NRC Contracting Costs. NRC contracting costs to issue the Request For Proposal and award a contract to the adequate and cost competitive contractor is estimated to require one staff-year at a cost of approximately $100,000.

Cost of Contractor Effort (1st year costs). The successful bidding contractor will have implementation costs to begin the data collecting effort. These costs include laptop computers at a cost of $90,000; customized software for data formatting and reporting at a cost of $100,000; and employee training (80 people) for one day at a cost of $35,000. This results in a first year cost of $225,000.

NRC Operational Costs. The recurring activities under Alternative B are:

- data collection and reporting
- NRC program management
- contractor training

The cost for each recurring activity is estimated as follows:

Data collection and reporting. For this effort it is assumed that the data collection will begin after the first year of data is available. Each data collection effort will require approximately 6 person months of total effort

by a team of two individuals. It is estimated that each team will visit the plant site 3 times over the course of the data collection effort. The effort is based on the following data collection assumptions:

- the contractor will review and flag pertinent data and then enter the flagged data into data base software on the laptop computers;
- each team can visit 3 sites per year;
- approximately 40 teams will be required to collect the data yearly.

The combination of labor and travel results in a yearly cost for each site of approximately $128,000. There are also annual costs spread over all collection efforts for contractor project management ($140,000), contractor support staff ($14,000) and annual recurring training ($16,000). These costs combined result in an annual net cost of $14,500,000 over all plants to collect yearly reliability and availability data tabulated on a quarterly basis. This results in a present worth over 20 years of approximately $160,000,000.

The increase in costs under Alternative B compared to Alternative A results from the process under which the data is collected. For Alternative A the data review and collection will be done on a daily basis and results in greater efficiency through the following:

- Real time (daily) review of data
- Accessibility to shift supervisor, maintenance personnel, etc. to resolve questionable data
- Site synergism
- Plant specific systems knowledge (knows reportable system train and balance of systems components
- Mesh with the maintenance rule (Relocated. Was first on the list.)
- Learns the job by repetition frequency (daily)

Alternative B is accomplished with personnel potentially unfamiliar with the site and through a tedious review of a full year of information.

NRC Project Management. It is estimated that NRC staff management of the data collection effort will require 0.5 staff years at a cost of approximately $56,000.

Industry Implementation Costs. There are no industry implementation costs for Alternative B.

Industry Operational Costs. To support the data collection effort it is assumed to require 0.25 staff years of licensee support during the data collection effort. This results in a recurring burden of approximately $9,000 with a present worth of approximately $11,000,000 for the assumed 20 year effort.

3.6 Results

Table 3-1 and Table 3-2 summarize the consequences for Alternatives A and B, respectively. Promulgation of the Alternative A is estimated to result in implementation costs to the NRC and industry of $700,000 and $4,000,000, respectively. Industry will also incur ongoing operational costs; on a per plant basis these are estimated to be about $54 and $110 thousand per year for 80 percent and 30 percent of the plants, respectively. The ongoing costs to the NRC are estimated to be zero, due to offsets from other programs. The present value of these NRC and industry implementation and operational costs, assuming implementation of the rule in 1996, 20 years of ongoing operations, and a 7 percent discount rate, are about $87 million. For Alternative B, the present value of all implementation and operational costs is about $80 million greater than for Alternative A.

The rule is expected to yield significant benefits to both the NRC's and industry's operations. For the NRC these benefits reflect improved efficiency in reaching regulatory decisions. For industry the benefits will derive from the implementation of risk based regulations and PRA policies. For the NRC, the benefits have been quantitatively assessed only for efficiencies achieved in evaluating licensee events, performing diagnostic evaluations, and reviewing and approving risk based technical specifications. Together, improved efficiency in these areas are estimated to yield at least $1.1 million per year in cost savings. Given the 20-year period the rule is assumed to be in effect, this is equivalent to a present worth benefit of $10 million.

Quantitative estimates of the benefits to industry have not been made due to the difficulties of apportioning credit between the data and the other integral components of the maintenance rule implementation and the framework for moving to risk-based regulations. However, the magnitude of the benefits to industry can be appreciated by considering the costs of down-time and the benefits of expediting the move towards risk-based regulations. One day of down-time for a typical reactor costs about $300 thousand, a figure dominated by the cost of replacement power. Industry's total cost for the proposed rule will be offset if the information and insights provided by the data only avert one day of down-time per plant every 30 years. Similarly, expediting a single risk-based regulatory change can offset the total cost to industry of the rule.

Table 3-1. Summary of Consequences of Alternative A

NRC Implementation:	
Complete rulemaking, develop regulatory guide, conduct workshops, develop data base and review implementation.	Increased costs with a present worth of about $0.7 million.
NRC Operation:	
Handling data, training staff and preparing annual reports.	These costs would be offset by reductions in other programs such as performance indicators.
Event reviews, diagnostic evaluations and technical specification amendments.	Decreased costs of about $0.8 million per year with a present worth of $8.5 million.
Rulemaking support, generic issues, focused inspections and maintenance monitoring.	Significant cost decreases are expected due to improved efficiency.
Industry Implementation:	
Develop systems list and develop data base.	Increased costs of about $26 thousand per plant for licensees that would already be collecting reliability data (80 plants). Increased costs of about $56 thousand per plant for other licensees(30 plants). The combined present worth for all licensees is about $4 million.
Industry Operation:	
Submittal of annual report and storage and maintenance of records.	Increased costs of about $56 thousand and $113 thousand per plant per year for 80 plants and 30 plants, respectively, with a present worth of about $83 million.
Plant availability improvement is expected as a result of risk-based regulation as well as enhanced NRC oversight capabilities and licensee implementation capabilities with regard to the maintenance rule.	A 1% improvement would reduce costs by $0.9 million per plant per year for a total present worth of $750 million. However, it is not feasible to allocate a specific portion of the improvement to data collection alone.
Technical specification changes. Improvements in the rate of approvals is expected.	An improvement of 0.5 changes per year per plant would yield about $50 thousand per plant per year for a total of present worth of $43 million. However, it is not feasible to allocate a specific portion of the improvement to data collection alone.
Plant shutdowns, marginal to safety program, configuration monitoring, quality control, licensee initiatives, technical specification change review consistency.	Significant cost decreases are expected a result of improved efficiency in these areas.

Table 3-2. Summary of Consequences of Alternative B

NRC Implementation:	
Obtain contractor support through a Request for Proposal.	Increased costs with a present worth of about $0.1 million.
Contractor computer and software costs.	Increased costs with a present worth of about $0.2 million.
NRC Operation:	
Annual contractor support to collect reliability data from 110 reactor sites.	Increased cost of about $14.5 million/yr with a present worth of approximately $160 million.
Handling data, training staff and preparing annual reports.	These costs would be offset by reductions in other programs such as performance indicators.
Event reviews, diagnostic evaluations and technical specification amendments.	Decreased costs of about $0.8 million per year with a present worth of $8.5 million.
Rulemaking support, generic issues, focused inspections and maintenance monitoring.	Significant cost decreases are expected due to improved efficiency.
Industry Implementation:	
No incremental implementation costs.	
Industry Operation:	
Provide licensee support to contractors collecting data.	Increased costs of $9 thousand per plant per year with a present worth of approximately $11 million.
Plant availability improvement is expected as a result of risk-based regulation as well as enhanced NRC oversight capabilities and licensee implementation capabilities with regard to the maintenance rule.	A 1% improvement would reduce costs by $0.9 million per plant per year for a total present worth of $750 million. However, it is not feasible to allocate a specific portion of the improvement to data collection alone.
Technical specification changes. Improvements in the rate of approvals is expected.	An improvement of 0.5 changes per year per plant would yield $50 thousand per plant per year for a total of present worth of $43 million. However, it is not feasible to allocate a specific portion of the improvement to data collection alone.
Plant shutdowns, marginal to safety program, configuration monitoring, quality control, licensee initiatives, technical specification change review consistency.	Significant cost decreases are expected a result of improved efficiency in these areas.

3.7 Regulatory Flexibility Act Statement

In accordance with the Regulatory Flexibility Act of 1980, (5 U.S.C. 605(B)), the Commission certifies that this rule will not, if promulgated, have a significant economic impact on small entities. The Preferred Alternative affects only the licensing and operation of nuclear power plants. The companies that own these plants are not "small entities" as defined in the Regulatory Flexibility Act of the Small Business Size Standards set out in regulations issued by the Small Business Administration Act in 13 CFR Part 121.

3.8 Paper Work Reduction Act Statement

Alternative A amends information collection requirements that are subject to the Paper Work Reduction Act of 1980 (44 U.S.C. 3501 et seq). This rule has been submitted to the Office of Management and Budget for review and approval of the Paper Work Reduction Act requirements. The rule will be part to 10 CFR 50 (10 CFR 50.76) and sets forth requirements for the collection, maintenance, and reporting of risk-significant system and equipment reliability and availability data.

Justification

Need for Scrutable, Plant-specific Reliability and Availability Data. To move towards risk-based regulation and the increased use of PRA information, the NRC staff needs scrutable, plant-specific reliability and availability data compiled for risk-significant systems and equipment. For example, the staff currently uses risk estimates in prioritizing its work on safety issues, deciding whether work to develop new requirements or staff positions to address such issues is warranted and deciding whether proposed new requirements or staff positions should be implemented. Knowing the reliability and availability of key systems would, in some cases, lead to more risk-effective decisions in these areas. This should both enhance public protection and reduce unnecessary regulatory burdens.

Reliability and availability data for risk-significant systems would have other benefits as well. The increased knowledge would help the NRC staff in the evaluation of, among others, plant-specific licensing actions, development of risk-based technical specifications, risk-based inspection planning, Safety Goal implementation, accident sequence precursor analyses, and aging analyses.

The data would also improve the NRC's ability to monitor licensee implementation of and the overall effectiveness of the NRC's maintenance rule by providing risk-based measures of the effectiveness of licensee programs, including maintenance programs. Further, the data would enhance licensee capabilities for implementation of the maintenance rule by providing a source of consistent and comparable reliability data to assist in the licensee monitoring and goal setting activities required by the maintenance rule.

Section 50.76 (b) requires that a holder of an operating permit for commercial nuclear power plant submit an annual report to the NRC that contains the following information, complied on the basis of calendar quarters, for systems and equipment in (b)(2) of 50.76:

- The number of demands and failures associated with those demands;

- The number of hours of operation following each demand for systems required to continue operation to fulfill a safety function;
- The number of hours a system or train is unavailable;
- The number of hours when two or more trains were concurrently unavailable;
- For each unavailability due to component failure(s), a failure record for the component(s) providing failure cause, failure mode, and other relevant information required to link the failure to the correct cause and mode for reliability analyses.

The Alternative A requirements shall apply to those systems and equipment whose failure or unavailability would have a significant effect on estimated core damage frequency or preserving containment integrity. Also, each licensee shall maintain records and documentation, on-site and available for NRC inspection, of each occurrence of a demand, failure, or unavailability that provide the basis for the data reported.

Description of Information Collection

Number and Type of Respondents. The information collection requirement applies annually to 110 commercial reactor power plants.

Estimate of Burden. It is estimated that about 423 additional staff hours will be needed in the first year for a licensee to comply with the information collection requirement. The average incremental annual burden per licensee is estimated to be about 1375 staff hours.

The magnitude of the burden is acceptable because the net benefit has a potential for being large (i.e., greater than $100,000,000) assuming implementation of Alternative A in conjunction with the implementation of risk-based regulation and the PRA policies.

Estimate of Cost to the Federal Government. The estimated incremental cost of NRC efforts for reliability data collection is 3.4 staff years, at a rate of $115 per hour, for a total of approximately $700,000. For this rule it is concluded that there will not be any incremental recurring activities. These costs will be totally offset by reduced operating costs. The support of the Performance Indicator Data base is assumed to transfer to this activity with no additional cost.

4. Decision Rationale

The recommendation to promulgate a new rule to collect reliability and availability data from utilities is based on the rule's ability (1) to satisfy the safety objective and goals established for this rulemaking, including substantial improvements in the NRC's ability to move towards risk-based regulation, (2) to avoid unnecessary future expenditures of substantial resources, and (3) to achieve the NRC's administrative goal of leaving details of regulatory implementation to guidance.

4.1 Preferred Alternative

Based upon the qualitative and quantitative analyses performed, the Preferred Alternative is Alternative A, "Collect Reliability Data by Rule."

The Preferred Alternative represents the staff's position subject to any improvements or clarifications identified through the public comment period. The analysis and rationale leading to this recommendation are presented below.

4.2 Safety Objective

The overall safety objective of the NRC's reliability data collection initiative is:

- *To enhance the NRC's capability to effectively and efficiently evaluate the impact on reactor plant risk of (1) NRC rules and regulations, (2) licensee performance, and (3) the implementation of the maintenance rule.*

To achieve the overall safety objective, the following regulatory goals were established to guide the rulemaking process:

- *The frequency, form and substance of data collection will be standardized, and compatible with the needs of risk-based regulation and the intent of the maintenance rule, including the need to reduce uncertainty.*

The Preferred Alternative will achieve this goal. The NRC has initiated analytical programs and developed PRA models to support its efforts to evaluate plant risk and has promulgated the maintenance rule.

The PRA models developed, although evolving, identify the data necessary to perform calculations of risk. A brief description of one of these programs, the Accident Sequence Precursor (ASP) Program, is presented in Appendix A.

By establishing the frequency of data collection, the Preferred Alternative assures that the latest data are fed back, thus that they are available for analysis and that they are trendable. Trendability is desired because it provides an indication of improvement or degradation over time and, thus, can provide an early warning of potential trouble. By establishing the form and substance for data collection, the rule assures that (a) the appropriate data are collected, and (b) that the data collected are comparable across the spectrum of power reactors. The form of data submittal will be specified in a regulatory guide. Comparability of data allows both the industry and the NRC staff to identify when improvements made at certain plants could become "a lesson learned the easy way" for other plants. By collecting data in a form

compatible with NRC's maintenance rule and risk models, the NRC staff can devote more of its time to safety analysis instead of data reduction and manipulation, thereby increasing its efficiency and effectiveness.

The treatment of uncertainties is important to regulatory decisionmaking. Uncertainties exist in any regulatory approach and result from knowledge limitations which are manifest in imperfect models and data. The Preferred Alternative will improve considerably the quality of the data currently being used to drive PRA models and, thus, reduce uncertainties. As uncertainties are reduced, the NRC expects to reduce unnecessary conservatism in current regulatory requirements.

With regard to the maintenance rule, the NRC will monitor to ensure that licensees effectively implement the maintenance rule and that the maintenance rule is effective in reducing risk. In addition, licensees will conduct program evaluations taking into account, where practical, industry-wide operating experience and make adjustments where necessary to ensure that the objective of preventing failures through maintenance is appropriately balanced against the objective of minimizing unavailability due to monitoring or preventive maintenance. In some circumstances, licensees will also conduct monitoring of performance or condition against licensee-established goals.

- *The process shall support those activities that will engender public confidence in risk-based regulation.*

The Preferred Alternative will achieve this goal. The NRC has committed, via its safety goal and PRA policies, to move toward risk-based regulation. As noted previously, with respect to analytical tools, support for this transition is manifest in the development of appropriate probabilistic models, methods and data. The data requested under the Preferred Alternative are a prerequisite for the coherent and efficient transition to risk-based regulation.

To implement its policies, the NRC has invested resources in the development of rules, models and methods. The Safety Goal and PRA policies have committed the NRC toward the greater use of PRA in all nuclear regulatory activities "...to the extent supported by state-of-the-art in PRA methods and data...." (NRC95). NRC's models and methods are the state-of-the-art. However, use of NRC's probabilistic models and methods to the degree envisioned by the Commission in its policy statements is unlikely to be realized without appropriate data. The Preferred Alternative identifies these data, and the state-of-the-art in data collection would permit its electronic transmission and storage in a data base.

- *The process shall be electronic to the extent practical, and facilitate access by multiple users.*

The Preferred Alternative will achieve this goal. The data to be collected are limited and closely defined, greatly facilitating their placement on an open data base.

- *To maximize the values of the proposed rule, it shall be implemented on a schedule closely following implementation of the NRC's maintenance rule, which becomes effective in July 1996.*

If promulgated as planned, the Preferred Alternative will share the same effective date as the maintenance rule. This would achieve the goal of having a data management system in place to begin benefitting from the useful data expected to be generated. The data to be collected under the Preferred Alternative are to be collected from a subset of the systems and equipment to be monitored as part of the maintenance rule. Accordingly, many licensees will find it beneficial to implement data collection programs for the reliability data and maintenance rules at the same time.

4.3 Resources

The estimated impact to the nuclear power plant industry and the NRC of the Preferred Alternative in conjunction with implementation of risk-based regulation and PRA policies for the remaining lifetime of its reactors is a savings of at least $10,000,000, excluding benefits to industry of risk-based regulation. The latter has not been quantified, however, industry's total cost for the Preferred Alternative will be offset if the information and insights provided by the data avert only one day of down-time per plant every 30 years.

4.4 Administrative Goals

The NRC's administrative goal for this rulemaking is consistent with those established for the Marginal-to-Safety Program and published in the Federal Register on January 27, 1993 (58 FR 6196):

- *The details of which safety-significant system and component data are to be reported shall be specified in regulatory guides as an incentive to licensees to develop innovative and improved means of obtaining and reporting data.*

The Preferred Alternative will achieve this goal. A regulatory guide is under preparation which will provide the methodology and criteria for identifying those plant systems and equipment considered risk-significant. Further, the guide will encourage utilities to adopt innovative means for collecting and reporting the data provided that the regulatory goal of comparability across the industry is not defeated in the process.

4.5 Other Considerations

Significant societal cost reduction is possible from the adoption of the Preferred Alternative.

Implementation of a compliance program is judged to be feasible given that the industry has had over a decade of experience complying with existing requirements, and submitting data to the NPRDS. Although there will be some new aspects to the new rule, its implementation will be essentially the same.

No regulatory obstacles are foreseen in implementing the requirements of the new rule except as may be reasonably anticipated with a new rule regarding issues of common understanding of requirements and objective inspection and enforcement of those requirements. Implementation of the Proposed Rule is discussed in Chapter 5.

Environmental Impact: Categorical Exclusion. The Preferred Alternative sets forth requirements for the collection, maintenance, and reporting of risk-significant system and equipment reliability and availability data. The staff has determined that this Preferred Alternative is the type of action described in categorical exclusion, 10 CFR 51.22(c)(3)(iii). Therefore, neither an environmental impact statement nor an environmental assessment has been prepared in support of this proposed regulation.

Backfit Analysis. The Preferred Alternative sets forth requirements for reporting and recordkeeping. The NRC staff has determined that the Backfit Rule's requirements and definitions, as specified in 10 CFR 50.109, do not apply.

4.6 Summary

In establishing a common understanding with licensees on how to measure progress in achieving the full benefits of PRA and other regulatory and safety goals, the NRC was guided by its Safety Goals, its proposed policy of moving toward risk-based regulation, the maintenance rule and ongoing discussions with licensees. By directing resources at the most risk-significant systems and components, understanding and safety should be enhanced. Further, a better understanding of reliability and availability of risk-significant systems will help mitigate two impediments to the greater use of PRA, the lack of data and model uncertainties. The staff is confident that it has communicated effectively with the licensees and the public on the reasoning supporting the Preferred Alternative. It is a fundamental principle of this rulemaking that changes to existing data collection requirements will be based objectively upon the risk significance of systems and components as determined by established analytical methods. To facilitate a common understanding, the NRC is proposing to endorse industry's guidance document on the specifics of data collection in its own regulatory guide.

The anticipated use of a guidance document developed by industry and approved for use by the NRC also helps to ensure consistent interpretation and application of compliance requirements.

In consideration of the analyses presented above, the staff believes that the Preferred Alternative is consistent with, and supportive of, the requirements established for the maintenance rule and performance-based regulations.

5. Implementation

This chapter provides the proposed schedule for enacting and implementing the Proposed Rule, and assesses interfaces with other existing or proposed regulatory requirements.

5.1 Schedule

To implement the Proposed Rule, the following schedule of actions is proposed.

The NRC

- Publish Proposed Rule - 9/95
- Issue Draft Regulatory Guide - 11/95
- Publish Final Rule/RG - 5/96
- Effective Date - 7/96

5.2 Relationship to Other Existing or Proposed Requirements

The Proposed Rule will require the collection of data from a subset of the systems and equipment to be monitored as part of the maintenance rule. Accordingly, it is appropriate that the Proposed Rule become effective in a time frame consistent with the effectiveness of the maintenance rule.

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APPENDIX A

DESCRIPTION OF THE ACCIDENT SEQUENCE PRECURSOR PROBABILISTIC RISK ASSESSMENT MODELS

Seventy-five simplified, plant-specific probabilistic risk assessment (PRA) models have been developed for the Accident Sequence Precursor (ASP) Program. The models exist in the SAPHIRE (IRRAS) format, with four event trees for boiling water reactors (BWRs) (Transient, Small Loss-of-Coolant Accident [LOCA], Loss of Offsite Power [LOSP], and Anticipated Transient Without Scram [ATWS]), and five event trees for pressurized water reactors (PWRs)(the same as for BWRs plus Steam Generator Tube Rupture [SGTR]). Fault trees are detailed to the train level except where it is necessary to use super-component groups to properly represent dependencies between trains of the same system or between functions in the event trees. Except for emergency and alternate AC power, support systems are not included. These models were developed from plant descriptions contained in the Safety Analysis Reports (SARs) submitted by licensees. Information about plant-specific systems that have significant influence on core damage frequency (CDF) has been gleaned from Individual Plant Examination (IPE) and Station Blackout Rule submittals.

ASP models were designed to estimate conditional core damage probabilities and CDF increments associated with the requirements of 10 CFR 50.72 and 50.73. They are also useful in estimating the increments in CDF associated with inspection findings and proposed changes in plant design or operations. The models could also be used to estimate the risk significance of changes in the availability of the safety systems as would be reported under the proposed reliability data rule.

The following systems are represented in the ASP models:

BRWs	PWRs
Reactor Protection System	Reactor Protection System
Main Steam / Condenser	Main Feedwater
Main Feedwater	Auxiliary Feedwater
Condensate	Pressurizer PORVs
HPSI or HPCS	Charging System
RCIC or IC	High Pressure Injection
ADS	Low Pressure Injection
CRD (injection)	Atmospheric Steam Dumps
LPCI	Main Steam / Condenser
LPCS	RHR
RHRSW or Fire Water (injection)	ECCS recirculation
RHR (SP and RCS cooling)	Boration
Containment Venting	EDGs
SLC	Alternate AC Power
EDGs	
Alternate AC Power	

Attachment 5

Draft Press Release

DRAFT PUBLIC ANNOUNCEMENT

NRC PROPOSES RULE FOR REPORTING EQUIPMENT RELIABILITY DATA

The Nuclear Regulatory Commission (NRC) is proposing to amend its regulations dealing with the information that commercial nuclear power reactors report to the NRC.

The proposed rule would append the Commission's regulations in 10 CFR 50 to require that licensees for commercial nuclear power reactors report to the NRC summary reliability and availability data for risk-significant systems and equipment. The proposed rule would also require licensees to maintain on-site, and to make available for NRC inspection, records and documentation that provide the basis for the summary data reported to the NRC. The proposed reporting requirements would apply to the event mitigating systems and equipment which have or could have a significant effect on estimated core damage frequency or the conditional probability of early containment failure given a core damage accident.

This information is needed to substantially improve the NRC's ability to make risk-effective regulatory decisions. The Commission would use the information in generic issue resolution, developing quantitative indicators of plant safety performance, performing risk-based inspections, and pursuing modifications to specific plants and basic regulations and guidelines. Furthermore, this information would improve the NRC's oversight of licensees' implementation of the NRC's maintenance rule and enhance licensee's capabilities to implement the evaluation and goal setting requirements of the maintenance rule. These actions would assist the NRC in improving its oversight capabilities with respect to public health and safety and becoming more efficient by focusing its regulatory program on those issues of greatest risk significance and reducing unnecessary regulatory burdens on licensees.

A draft NRC regulatory guide will be published for public comment at a later date. The guide will provide methods for selecting systems and equipment subject to the rule, definitions of the reliability and availability data to be reported, guidelines for defining system and train boundaries, and a suggested format for reporting the data to NRC.

Attachment 6

Draft Congressional Letters

The Honorable Dan Schaefer, Chairman
Subcommittee on Energy and Power
Committee on Commerce
United States House of Representatives
Washington, D. C. 20515

Dear Mr. Chairman:

The NRC has sent to the Office of the Federal Register for publication the enclosed proposed amendment to the Commission's rules in 10 CFR Part 50. The proposed rule, if adopted, would require licensees to report to the NRC summary reliability and availability data for risk-significant systems and equipment. This information is needed to substantially improve the NRC's ability to make risk-effective regulatory decisions. The Commission would use the information in generic issue resolution, developing quantitative indicators of plant safety performance, performing risk-based inspections, and pursuing modifications to specific plants and basic regulations and guidelines. Furthermore, this information would improve the NRC's oversight of licensees' implementation of the NRC's maintenance rule and enhance licensee's capabilities to implement the evaluation and goal setting requirements of the maintenance rule. These actions would assist the NRC in improving its oversight capabilities with respect to public health and safety and becoming more efficient by focusing its regulatory program on those issues of greatest risk significance and reducing unnecessary regulatory burdens on licensees.

The Commission is issuing the proposed rule for public comment. A draft regulatory guide will be published for comment at a later date.

Sincerely,

Dennis K. Rathbun, Director
Office of Congressional Affairs

Enclosure: As stated

cc: Representative Frank Pallone

The Honorable Lauch Fairloth, Chairman
Subcommittee on Clean Air, Wetlands,
Private Property and Nuclear Safety
Committee on Environment and Public Works
United States Senate
Washington, D. C. 20510

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Sincerely,

Dennis K. Rathbun, Director
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cc: Senator Bob Graham