Section 19

DRAFT SUPPORTING STATEMENT
FOR
FRACTURE TOUGHNESS TESTS, SURVEILLANCE AND REPORTS

10 CFR 50.60 AND APPENDICES G AND H

DESCRIPTION OF THE INFORMATION COLLECTION

Section 50.60, "Acceptance criteria for fracture prevention measures for lightwater nuclear power reactors for normal operation" provisions are as follows: (a) except as provided in paragraph (b) of 50.60, all lightwater nuclear power reactors, other than reactor facilities for which 50.82(a)(1) certifications have been submitted, must meet the fracture toughness and material surveillance program requirements for the reactor coolant pressure boundary set forth in Appendices G and H; and (b) proposed alternatives to the described requirements in Appendices G and H may be used when an exemption is granted by the Commission. In addition, the licensee must demonstrate that (1) compliance with the specified requirements would result in hardships or unusual difficulties without a compensating increase in the level of quality and safety, and (2) the proposed alternatives would provide an adequate level of quality and safety.

Appendix G to 10 CFR Part 50 specifies minimum fracture toughness requirements for ferritic materials of pressure-retaining components of the reactor coolant pressure boundary of light water nuclear power reactors. The Section I Note requires the adequacy of the fracture toughness of other ferritic materials not covered in Section I to be demonstrated on an individual basis. Section III.A requires supplemental information for a reactor vessel constructed to an ASME Code earlier than the Summer 1972 Addenda of the 1971 Edition to demonstrate equivalence with the fracture toughness requirements of Appendix G. Section III.B requires the submission and approval prior to testing of test methods for supplemental fracture toughness described in Section IV.A.1.b. Section III.C requires that records of the fracture toughness test program be retained until termination of the license to comply with ASME Code requirements. Section IV.A.1 requires licensees to maintain upper-shelf energy throughout the life of the reactor vessel of no less than 50 ft-lb unless it is demonstrated that lower values of upper-shelf energy will provide margins of safety against fracture equivalent to those required by Appendix G of the ASME Code. The analysis for satisfying this section must be submitted for review and approval on an individual case basis at least 3 years prior to the date when the predicted Charpy upper-shelf energy will no longer satisfy the requirements of Section IV.A.1, or on a schedule approved by the NRC. Section IV.A.2 requires licensees to provide pressure-temperature limits for the reactor vessel. Both upper-shelf energy and pressure-temperature limits are dependent upon the predicted radiation damage to the reactor vessel.

Appendix H of 10 CFR Part 50 requires a material surveillance program for each reactor vessel to monitor changes in the fracture toughness of the reactor vessel beltline materials resulting from their exposure to neutron irradiation and the thermal environment. Under the program, fracture toughness test data are obtained from material specimens exposed in surveillance capsules, which are withdrawn periodically from the reactor vessel. Section III.B.1 requires test procedures and reporting requirements that meet the requirements of ASTM E 185-82 to the extent practical for the configuration of the specimens in the capsule. Section III.B.3 requires a proposed withdrawal schedule and technical justification to be submitted to and approved by the NRC. Section III.C.1 requires integrated surveillance programs for reactors with similar design and operating features to be submitted to NRC for approval. Criteria for approval include, among other items, an adequate dosimetry program, a contingency plan to assure that the surveillance program for each reactor will not be jeopardized by operation at reduced power level or by an extended outage of another reactor from which data are expected. Section III.C.3 requires that any reduction in the amount of testing must be authorized by NRC. Section IV requires: A.) a summary technical report, submitted to NRC, of test results obtained from each capsule withdrawal, within one year of the date of capsule withdrawal, unless an extension is granted by NRC; B.) that the report include the data specified in III.B.1 of Appendix H and the results of all fracture toughness tests conducted on the beltline materials in the irradiated and unirradiated conditions; and C.) if a change in the TS is required, either in the pressure-temperature limits or in the operating procedures required to meet the limits, the expected date for submittal of the revised TS must be provided with the report.

A. JUSTIFICATION

1. Need for the Collection of Information

The information in the report required by Appendix G will be used by the staff to perform a safety evaluation of the reactor vessel. This evaluation will be the basis for approval to continue operation for a specified time and approval of the additional procedures that will be required to continue operation beyond that time. The three-year lead time is needed to provide time to obtain supplemental fracture toughness data on archive material that has been subjected to accelerated irradiation, and to evaluate the fracture analyses that will be submitted which use that data.

Appendix G, Section III.A, contains the materials test requirements for the Charpy V-notch tests and drop weight tests. Section III.C specifies that records are to be kept on the test data, the qualification of test personnel, and the calibration of test equipment.

The records maintained by licensees for the life of the facility in response to the requirement are available for inspection by the staff to determine compliance with Appendix G. There is a continuing requirement that certain pieces of the data will be needed to support a licensee's fracture control plan or fracture analysis for some component in an operating plant.

The records that must be retained per Appendix G are of considerable value to the plant owner in the event of some sort of material deterioration problem or the discovery of a flaw that requires a fracture analysis. The frequency of occurrence of such situations for a given plant is difficult to estimate, but averages perhaps once every 10 years. The value to the plant owner lies in the ability to provide a sound basis for estimates of material toughness that are an essential part of the fracture analysis. In 1995 the staff issued Generic Letter 92-01, Supplement 1, which requested all licensees and permittees to provide: (a) a description of actions taken or planned to locate all data relevant to the determination of reactor pressure vessel (RPV) integrity, (b) an assessment of any change in best-estimate chemistry based on consideration of all relevant data, (c) a determination of the need to use the ratio procedure in Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," for surveillance data, and (d) the need for a revision to existing RPV integrity evaluations.

The impact of not obtaining the information from records would be that the fracture analyses would have to be based on conservative estimates derived from the published data base of typical material properties. The impact of an overly-conservative analysis could be the removal of some unimportant defect found in inspection with considerable economic loss due to the power outage and unnecessary exposure of maintenance personnel to radiation, or possibly, shutdown of the plant prior to the end of its license.

Surveillance program withdrawal schedules which are required by Section III of Appendix H, are periodically changed by licensees. The impact of not obtaining the information is that the program may not adequately monitor changes in the fracture toughness of reactor vessel beltline materials.

Surveillance reports required by Appendix H provide the basis for approval of the pressure-temperature operating limits for the reactor. The impact of not obtaining the reports required by Section IV of Appendix H would be that the pressure-temperature limits for the reactor would have to be checked against conservative estimates of radiation damage such as those given in Regulatory Guide 1.99, Revision 2. At the present time, there are too many uncertainties in the assessment of radiation damage to a reactor vessel to permit a licensee to forego monitoring radiation damage and reporting the surveillance test results to the NRC.

2. Agency Use of Information

This information is needed to ensure that the reactor vessel does not exceed radiation embrittlement limits and meets the requirements of General Design Criteria 31 and 32, as specified in Appendix A to 10 CFR Part 50.

3. Reduction of Burden Through Information Technology

There is no legal obstacle to the use of information technology. Moreover, NRC encourages its use; however, at the current time, no responses are submitted electronically.

4. Effort to Identify Duplication and Use Similar Information

The information is available only from nuclear power reactor licensees and does not duplicate other information collections made by the NRC or other government agencies. The Information Requirements Control Automated System (IRCAS) was searched, and no duplication was found.

5. Effort to Reduce Small Business Burden

The subject regulations do not affect small business.

6. Consequences to Federal Program or Policy Activities if the Collection is not Conducted or is Conducted Less Frequently

If this information were not collected or collected less frequently, the NRC would be unable to ensure that reactor vessels had not exceeded radiation embrittlement.

7. Circumstances Which Justify Variations from OMB Guidelines

The provisions of these regulations require that this information be maintained for the life of the plant in order to detect material deteriorations or flaws which might affect the health and safety of the public.

8. Consultations Outside the NRC

Notice of opportunity for public comment on this collection has been published in the Federal Register.

9. Payment or Gift to Respondents

Not applicable.

10. Confidentiality of Information

Proprietary or confidential information is protected in accordance with 10 CFR 2.790 of the NRC regulations.

11. Justification for Sensitive Questions

These regulations do not require sensitive information.

12. Estimated Industry Burden and Burden Hour Cost

Appendix G

Licensees submit the following information annually.

Section III.B

1 report (1 from 1 licensee) x 200 hours/report = 200 hours; 200 x $141 = $28,200.

Section IV.A.1

1 report (1 from 1 licensee) x 250 hours/report = 250 hours; 250 hours x $141 = $35,250.

Section IV.A.2

20 reports (1 from 20 licensees) x 80 hours/report = 1,600 hours, 1,600 hours x $141 = $225,600.

Over the next three years, licensees are expected to file information for these sections only.

The burden to maintain the records required by III.C is not significant (less than 80 hours industry wide) and is included in the overall summary table to the entire Part 50 submittal, "Summary of Supporting Statements."

Appendix H

Section III.B.1

Surveillance withdrawal schedules for operator reators are in place. Subsequent changes to the withdrawal schedules are submitted under Section III.B.3.

Section III.B.3

About five reports (1 from 5 licensees) are expected to be filed per year at an estimated burden of 40 hours per report = 200 hours; 200 hours x $141 = $28,200.

Section III.C.1

One report from one licensee is expected annually at an estimated burden of 80 hours = 80 hours; 80 hours x $141 = $11,280.

Section III.C.3

The burden for requesting exemptions from testing requirements is included in the overall burden for the 50.12 exemption requests in Section 1.

Section IV.A-C

20 reports (1 from 20 licensees) are expected to be submitted annually. 20 reports x 160 hours/report = 3,200 hours; 3,200 hours x $141 = $451,200.

Over the next three years, licensees are expected to file information for these sections of Appendix H only.

The total estimated annual burden for industry is, therefore, 5,530 hours (200+250+1,600+200+80+3,200 hours) at a cost of $779,730 (5,530 hours x $141).

13. Estimate of Other Additional Costs

None.

14. Estimated Annualized Cost to the Federal Government

Appendix G

The NRC reviews annually the information described below on fracture toughness. Since Appendix G reports affect the plant's licensing requirements, all of the reports must be reviewed by the NRC.

Section III.B

1 report (1 from 1 licensee) x 160 hours/report = 160 hours; 160 x $141 = $22,560.

Section IV.A.1

1 report (1 from 1 licensee) x 200 hours/report = 200 hours; 200 x $141 = $28,200.

Section IV.A.2

20 reports (1 from 20 licensees) x 60 hours/report = 1,200 hours; 1,200 x $141 = $169,200.

Appendix H

Section III.B.3

5 reports (1 from 5 licensees) x 40 hours/report = 200 hours; 200 x $141 = $28,200.

Section III.C.1

1 report (1 from 1 licensee) x 40 hours/report = 40 hours; 40 x $141 = $5,640.

Section IV.A

Since Appendix H, Section IV.A, reports are surveillance reports, the staff does a cursory review of all reports, and only reviews reports in detail when they affect licensing requirements. Hence, of these 20 reports received by the staff, only 10 get a detailed review.

20 reports x 1 hour/report = 20 hours; 20 x $141 = $2,420

10 reports x 40 hours/report = 400 hours; 400 x $141 = $56,400.

Therefore, the total estimated Federal burden is 2,220 hours (160+200+1,200+200+40+20+400) and the cost is expected to be $313,020 (2,220 x $141).

This cost is fully recovered through fee assessments to NRC licensees pursuant to 10 CFR Parts 170 and/or 171.

15. Reasons for Changes in Burden or Cost

The estimated overall burden for industry has decreased from 7,930 to 5,530 hours. Since licensees have removed many capsules already and P-T limits are submitted for a longer period of time, fewer Appendices G and H reports will be submitted.

16. Publication for Statistical Use

The collected information is not published for statistical purposes.

17. Reason for Not Displaying the Expiration Date

The requirement is contained in a regulation. Amending the Code of Federal Regulations to display information that, in an annual publication, could become obsolete would be unduly burdensome and too difficult to keep current.

18. Exceptions to the Certification Statement

None.

B. COLLECTIONS OF INFORMATION EMPLOYING STATISTICAL METHODS

Not applicable.