Section 18

FINAL SUPPORTING STATEMENT
FOR
FRACTURE TOUGHNESS TESTS, SURVEILLANCE AND REPORTS

10 CFR 50.60, 10 CFR 50 Appendix G, and 10 CFR 50 Appendix H

DESCRIPTION OF THE INFORMATION COLLECTION

The information collected in accordance with 10 CFR 50.60, 10 CFR 50 Appendix G, and 10 CFR 50 Appendix H demonstrates that each licensee's reactor pressure vessel materials remain resistant to brittle and/or ductile failure throughout the licensed operating lifetime of their facility.

10 CFR 50.60, "Acceptance criteria for fracture prevention measures for light water nuclear power reactors for normal operation" provisions are as follows: (a) except as provided in 10 CFR 50.60(b), all light water nuclear power reactors, other than reactor facilities for which 10 CFR 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 10 CFR 50 Appendix G and 10 CFR 50 Appendix H; and (b) proposed alternatives to the described requirements in 10 CFR 50 Appendix G and 10 CFR 50 Appendix 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.

10 CFR 50 Appendix G 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 American Society of Mechanical Engineers (ASME) Code earlier than the Summer 1972 Addenda of the 1971 Edition to demonstrate equivalence with the fracture toughness requirements of 10 CFR 50 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-lbs 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, “Fracture Toughness Criteria for Protection Against Failure.” 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.

10 CFR 50 Appendix H 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 American Society for Testing and Materials (ASTM) E 185-82, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels," 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 Section III.B.1 of 10 CFR 50 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 Technical Specifications (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.

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.

   10 CFR 50 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 10 CFR 50 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 10 CFR 50 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 NRC 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 10 CFR 50 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 10 CFR 50 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 10 CFR 50 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 10 CFR 50 Appendix A.

3. Reduction of Burden Through Information Technology

   There are no legal obstacles to reducing the burden associated with this information collection. The NRC encourages respondents to use information technology when it would be beneficial to them. NRC issued a regulation on October 10, 2003 (68 FR 58791), consistent with the Government Paperwork Elimination Act, which allows its licensees, vendors, applicants, and members of the public the option to make submissions electronically via CD-ROM, e-mail, special Web-based interface or other means. It is estimated that approximately 50% of the potential responses are filed electronically.

4. Effort to Identify Duplication and Use Similar Information

   No sources of similar information are available. There is no duplication of requirements. NRC has in place an ongoing program to examine all information collections with the

goal of eliminating all duplication and/or unnecessary information collections.

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 limits specified by 10 CFR Part 50, Appendix G and could be subject to failure during operation.

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

   Opportunity for public comment on the information collection requirements for this clearance package was published in the Federal Register on May 14, 2013 (78 FR 28244). No comments were received.

9. Payment or Gift to Respondents

   Not applicable.

10. Confidentiality of Information

    Confidential and proprietary information is protected in accordance with NRC regulations at 10 CFR 9.17(a) and 10 CFR 2.390(b). However, no information normally considered confidential or proprietary is requested.

11. Justification for Sensitive Questions

    These regulations do not require sensitive information.

12. Estimated Industry Burden and Burden Hour Cost

    10 CFR 50 Appendix G

    Over the next three years, licensees are expected to file information for these sections of 10 CFR 50 Appendix G only:

Annual Reporting Burden

Section	Number of Licensees	Reports per Licensee	Total Reports	Burden per Report	Total Annual Burden	Cost @ $274/hr
Section III.B	0	0	0	200	0	$0
Section IV.A.1	4	1	4	150	600	$164,400
Section IV.A.2	20	1	20	100	2,000	$548,000
Total App. G Reporting	24		24		2,600	$712,400

10 CFR 50 Appendix H

Over the next three years, licensees are expected to file information for these sections of 10 CFR 50 Appendix H only:

Annual Reporting Burden

Section	Number of Licensees	Reports per Licensee	Total Reports	Burden per Report	Total Annual Burden	Cost @ $274/hr
Section III.B.1*						
Section III.B.3	5	1	5	40	200	$54,800
Section III.C.1	0	0	0	80	0	$0
Section III.C.3**						
Section IV.A-C	10	1	10	160	1,600	$438,400
Total App. H Reporting	15		15		1,800	$493,200

* Surveillance withdrawal schedules for operating reactors are in place. Subsequent changes to the withdrawal schedules are submitted under Section III.B.3.

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

The annual recordkeeping burden is estimated to be 10% of the reporting burden and is included in the reporting burden estimate tables.

The total estimated annual burden for industry is 4,400 hours (Reporting 3,960 hours + Recordkeeping 440 hours) at a cost of $1,205,600 (4,400 hours x $274). A total of 39 responses are anticipated.

13. Estimate of Other Additional Costs

The NRC has determined that the quantity of records to be maintained is roughly proportional to the recordkeeping burden and, therefore, can be used to calculate approximate records storage costs. Based on the number of pages maintained for a typical clearance, the records storage cost has been determined to be equal to 0.0004 times the recordkeeping burden cost. Because the recordkeeping burden is estimated to be 440 hours, the storage cost for this clearance is $48 (440 hours x 0.0004 x $274/hour).

14. Estimated Annualized Cost to the Federal Government

10 CFR 50 Appendix G

The NRC reviews annually the information described below on fracture toughness. Since 10 CFR 50 Appendix G reports affect the plant's licensing requirements, all of the reports must be reviewed by the NRC.

Section	Number of Reports	Burden per Report	Total Annual Gov't Burden	Cost @ $274/hr
Section III.B	0	0	0	$0
Section IV.A.1	4	100	400	$109,600
Section IV.A.2	20	80	1,600	$438,400
Total Burden for App. G	24		2,000	$548,000

10 CFR 50 Appendix H

Section	Number of Reports	Burden per Report	Total Annual Gov't Burden	Cost @ $274/hr
Section III.B.3	5	40	200	$54,800
Section III.C.1	0	0	0	$0
Section IV.A-C	10	25	250	$68,500
Total Burden for App. H	15		450	$123,300

Therefore, the total estimated Federal burden is 2,450 hours (2,000 + 450 hours) and the cost is expected to be $671,300 (2,450 x $274).

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

15. Reasons for Changes in Burden or Cost

    During the last renewal of this information collection (in 2007), the NRC increased the estimated number of responses from 1 to 4 for Section IV.A.1 and decreased the estimated number of responses from 20 to 10 under Section IV.A-C. We have found this to be a more accurate projection of the collection over time; therefore, there has been no change in burden. There has been a change to the base burden cost from $257 to $274 per hour.

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.

COLLECTIONS OF INFORMATION EMPLOYING STATISTICAL METHODS

Not applicable.