AFFIRMATION ITEM

RESPONSE SHEET

TO: **Annette Vietti-Cook, Secretary**

FROM: **Commissioner Caputo**

SUBJECT: **SECY-20-0043: Direct Final Rule: Reactor Vessel Material Surveillance Program (RIN 3150-AK07; NRC-2017-0151)**

Approved X **Disapproved** ____ **Abstain** ____ **Not Participating** ____

COMMENTS: **Below** X **Attached** X **None** ____

The staff seeks Commission approval to publish in the Federal Register, the enclosed notice of a direct final rule (Enclosure 1) and companion proposed rule (Enclosure 2) that amends Appendix H, "Reactor Vessel Material Surveillance Program Requirements," to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR), "Domestic Licensing of Production and Utilization Facilities."

The direct final rule reduces regulatory burden by amending the reactor vessel material surveillance program requirements for commercial light-water power reactors in Appendix H to 10 CFR Part 50 making optional the testing of specimens that do not provide meaningful information to assess the integrity of the reactor vessel, extending the timeframe for licensees to submit the summary technical report of each capsule withdrawal and the test results from 1 year to 18 months and clarifies the requirements for the design of surveillance programs and the withdrawal schedules for reactor vessels purchased after 1982.

I approve the draft direct final rule and the companion proposed rule for publication in the Federal Register, as edited in the attached.

Entered in STARS
Yes X
No ____

Signature

8/19/2020
Date

[7590-01-P]

ACX edits

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[NRC-2017-0151]

RIN 3150-AK07

Reactor Vessel Material Surveillance Program

AGENCY: Nuclear Regulatory Commission.

ACTION: Direct final rule.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is amending the reactor vessel material surveillance program requirements for commercial light-water power reactors. This direct final rule revises the requirements associated with the testing of specimens contained within surveillance capsules and reporting the surveillance test results. This direct final rule also clarifies the requirements for the design of surveillance programs and the withdrawal schedules for reactor vessels purchased after 1982. These changes reduce regulatory burden, with no effect on public health and safety.

DATES: This direct final rule is effective **[INSERT DATE 120 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**, unless significant adverse comments are received by **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**. If this direct final rule is withdrawn as a result of such comments, timely notice of the withdrawal will be published in the *Federal* Register.

that the rule would be ineffective or unacceptable without incorporation of the change or addition.

3) The comment causes the NRC staff to make a change (other than editorial) to the rule.

For detailed instructions on filing comments, please see the ADDRESSES section of this document.

III. Background

A. Description of a Reactor Vessel Material Surveillance Program

The reactor vessel and its internal components support and align the fuel assemblies that make up the reactor core and provide a flow path to ensure adequate heat removal from the fuel assemblies. It also provides containment and a floodable volume to maintain core cooling in the event of an accident causing loss of the primary coolant. The reactor vessel is ~~comprised of~~ a cylindrical shell with a welded hemispherical bottom head and a removable hemispherical upper head. Some vessel shells were fabricated from curved plates that were joined by longitudinal and circumferential welds. Others were manufactured using forged rings and, therefore, only have circumferential welds that join the rings. These plate and forging materials are referred to as base metals. Maintenance of the structural integrity of the reactor vessel is essential in ensuring plant safety, because there is no redundant system to maintain core cooling in the event of a vessel failure.

One characteristic of reactor vessel steels is that their material properties change as a function of temperature and neutron irradiation. The primary material property of interest for the purposes of reactor vessel integrity is the fracture toughness of the reactor vessel material. Extensive experimental work determined that Charpy impact

the future condition of the reactor vessel. Therefore, the NRC instituted reactor vessel material surveillance programs as a requirement of appendix H, "Reactor Vessel Material Surveillance Program Requirements" (appendix H), to part 50 of title 10 of the *Code of Federal Regulations* (10 CFR), "Domestic Licensing of Production and Utilization Facilities," so that the placement and testing of Charpy impact specimens in capsules between the inner diameter vessel wall and the core can provide data for assessing and projecting the change in fracture toughness of the reactor vessel.

T~~hus, t~~he ~~purpose~~purposes for requiring a reactor vessel material surveillance program is to monitor changes in the fracture toughness properties in the beltline region[2] of the reactor vessel and to use this information to analyze the reactor vessel integrity. Surveillance programs are designed not only to examine the current status of reactor vessel material properties but also to predict the changes in these properties resulting from the cumulative effects of neutron irradiation.

The determination as to whether a commercial nuclear power reactor vessel requires a material surveillance program under appendix H to 10 CFR part 50 is made at the time of plant licensing under 10 CFR part 50 or 10 CFR part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." If this surveillance program is required, it is designed and implemented at that time using the existing requirements. Certain aspects of the program, such as the specific materials to be monitored, the number of required surveillance capsules to be inserted in the reactor vessel, and the initial capsule withdrawal schedule were designed for the original licensed period of operation (i.e., 40-years). The editions of the American Society for Testing and Materials International (ASTM) E 185, which are incorporated by reference in

[2] NRC Regulatory Issue Summary 2014-11, "Information on Licensing Applications for Fracture Toughness Requirements for Ferric Reactor Coolant Pressure Boundary Components," includes a definition of reactor vessel beltline.

appendix H to 10 CFR part 50, recommend three, four, or five surveillance capsules to be included in the design of reactor vessel material surveillance programs for the original licensed period of operation, based on the irradiation sensitivity of the material used to fabricate the reactor vessel.[3] Most plants have included several additional surveillance capsules beyond the number recommended by ASTM E 185. These capsules are referred to as "standby capsules." The surveillance program for each reactor vessel provides assurance that the plant's operating limits (e.g., the pressure-temperature limits) continue to meet the provisions in Appendix G of ASME Boiler and Pressure Vessel Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components," as required by appendix G "Fracture Toughness Requirements" to 10 CFR part 50~~.~~ ~~"Fracture Toughness Requirements."~~ The program also provides assurance that the reactor vessel material upper shelf energy meets the requirements of appendix G to 10 CFR part 50. These assessments are used to ensure the integrity of the reactor vessel.

In addition to the Charpy impact specimens for determining the embrittlement in the reactor vessel, the surveillance capsules typically contain neutron dosimeters, thermal monitors, and tension specimens[4]. Surveillance capsules may also contain correlation monitor material, which is a material with composition, properties, and response to radiation that have been well-characterized. The overall accuracy of neutron fluence measurements is dependent upon knowledge of the neutron spectrum. Therefore, a variety of neutron detector materials (dosimetry wires) are included in each

[3] The requirements in appendix H to 10 CFR part 50 are based, in part, on the information contained within ASTM E 185-73, "Standard Recommended Practice for Surveillance Tests for Nuclear Reactor Vessels;" ASTM 185-79, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels;" and ASTM E 185-82, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels," which are incorporated by reference.

[4] Tension specimens have a standardized sample cross-section, with two shoulders and a gage (section) in between.

surveillance capsule and used in the determination of neutron fluence for the vessel. The thermal monitors that are placed in the capsules (e.g., low-melting-point elements or eutectic alloys) are used to identify the irradiated specimen's maximum exposure temperature.

B. Current Requirements under Appendix H to 10 CFR Part 50

Appendix H to 10 CFR part 50 requires light-water nuclear power reactor licensees to have a reactor vessel material surveillance program to monitor changes in the fracture toughness properties of the reactor vessel materials adjacent to the reactor core. Unless it can be shown that the end of design life neutron fluence is below certain criteria, the NRC requires licensees to implement a materials surveillance program that tests irradiated material specimens that are located in surveillance capsules in the reactor vessels. The program evaluates changes in material fracture toughness and thereby assesses the integrity of the reactor vessel. For each capsule withdrawal, the test procedures and reporting requirements must meet the requirements of ASTM E 18582, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Reactor Vessels," to the extent practicable for the configuration of the specimens in the capsule.

The design of the surveillance program and the withdrawal schedule must meet the requirements of the edition of ASTM E 185 that is current on the issue date of the ASME Code to which the reactor vessel was purchased. Later editions of ASTM E 185, up to and including those editions through 1982, may be used. Appendix H to 10 CFR part 50 specifically incorporates by reference ASTM E 18573, "Standard Recommended Practice for Surveillance Tests for Nuclear Reactor Vessels;" ASTM E 18579, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels;" and ASTM E 18582. In sum, the surveillance

program must comply with ASTM E 185, as modified by appendix H to 10 CFR part 50. The number, design, and location of these surveillance capsules within the reactor vessel are established during the design of the program, before initial plant operation.

Appendix H to 10 CFR part 50 also specifies that each capsule withdrawal and the test results must be the subject of a summary technical report to be submitted [to the NRC] within one year of the date of capsule withdrawal, unless an extension is granted by the Director, Office of Nuclear Reactor Regulation. The NRC uses the results from the surveillance program to assess licensee submittals related to pressure-temperature limits under ~~in accordance with~~ appendix G to 10 CFR part 50 and to assess pressurized water reactor licensee's compliance with § 50.61, "Fracture toughness requirements for protection against pressurized thermal shock events," or § 50.61a, "Alternate fracture toughness requirements for protection against pressurized thermal shock events."

C. The Need for Rulemaking

When appendix H to 10 CFR part 50 was established as a requirement in 1973 (38 FR 19012), limited information and data were available on the subject of reactor vessel embrittlement. Thus, appendix H to 10 CFR part 50 required the inclusion of a comprehensive collection of specimen types representing the reactor vessel beltline materials in each surveillance capsule. Since 1973, a significant number of surveillance capsules have been withdrawn and tested. Analyses of these results support reconsidering the specimen types required for testing, and the required time for reporting the results from surveillance capsule testing. One outcome of this effort was that some specimen types were found to contribute to the characterization of reactor vessel embrittlement, while others did not. Therefore, the NRC determined that these latter types were unnecessary to meet the objectives of appendix H to 10 CFR part 50 and should no longer be required. Revising appendix H to 10 CFR part 50 to address this

situation reduces the regulatory burden on licensees for data collection, with no effect on public health and safety.

In 1983, appendix H to 10 CFR part 50 was again revised to require licensees to submit test results to the NRC within one year of the date of capsule withdrawal, unless an extension is granted by the Director, Office of Nuclear Reactor Regulation (48 FR 24008). As stated in the 1983 rulemaking, the reason for ~~primary purposes of~~ the requirement was the need for~~are~~ timely reporting of test results and notification of any problems. At that time, there was still a limited amount of data from irradiated materials from which to estimate embrittlement trends of reactor vessels at nuclear power plants~~;~~, ~~thus,~~ making it important ~~crucial~~ to receive ~~for~~ timely reporting of test results.

Licensees that participate in an integrated surveillance program have found it burdensome to meet this one-year requirement.[5] This is related to the fact that an integrated surveillance program requires coordination among the multiple licensees participating in the program. A significant number of test specimens have been analyzed since 1983, the results of which support the reduced need for prompt reporting of the test results. Based on this finding, the NRC determined that the reporting requirement in appendix H to 10 CFR part 50 should be revised. Extending the reporting period reduces this regulatory burden, with the objective of eliminating the need for licensees to prepare and submit extension requests, and the use of NRC resources to review such requests. This revision has no effect on public health and safety.

[5] Appendix H to 10 CFR part 50 permits the use of an integrated surveillance program (ISP) as an alternative to a plant-specific surveillance program. In an ISP, the representative materials chosen for surveillance of a reactor vessel are irradiated in one or more other reactor vessels that have similar design and operating features. The data obtained from these test specimens may then be used in the analysis of other plants participating in the program.

D. Regulatory Basis to Support Rulemaking

In January 2019, the Commission issued Staff Requirements Memorandum (SRM)-COMSECY-18-0016, "Request Commission Approval to Use the Direct Final Rule Process to Revise the Testing and Reporting Requirements in 10 CFR Part 50, Appendix H, Reactor Vessel Material Surveillance Program Requirements (RIN 3150-AK07)," and approved publication of the supporting regulatory basis and use of the direct final rule process. On April 3, 2019, the NRC issued the regulatory basis which provides an in-depth discussion on the technical merits of this rulemaking (84 FR 12876).[6] The regulatory basis includes additional information on the regulatory framework, types of reactor vessel material surveillance programs, regulatory topics that initiated this rulemaking effort, and options to address these topics. The regulatory basis shows that there is sufficient justification to proceed with rulemaking to amend appendix H to 10 CFR part 50 to reduce certain test specimens and extend the period to submit surveillance capsule reports to the NRC. In addition, SRM-COMSECY-18-0016, the Commission directed that the staff should clarify~~ication of~~ the requirements for the design of surveillance programs and the withdrawal schedules for reactor vessels purchased after 1982. These revisions will not impose any additional requirements for the current fleet of operating reactors. The regulatory basis is available as indicated in the "Availability of Documents" section of this document.

IV. Discussion

The purpose of this action is to reduce the regulatory burden on reactor licensees and the NRC that is associated with test specimens contained within surveillance

[6] A subsequent notice was published on April 12, 2019 (84 FR 14845), to correct the ADAMS accession number for the regulatory basis.

capsules and the reporting of surveillance test results, with no effect on public health and safety. This action also clarifies the requirements for the design of surveillance programs and the withdrawal schedules for reactor vessels purchased after 1982, as directed in SRM-COMSECY-18-0016. The NRC has determined that the following revisions to appendix H to 10 CFR part 50 achieve the goal of reducing regulatory burden. These revisions do not impose any additional requirements for the current fleet of operating reactors.

1. Heat-Affected Zone Specimens

The editions of ASTM E 185 incorporated by reference in appendix H to 10 CFR part 50 specify that the surveillance test specimens shall include base metal, weld metal, and heat-affected zone materials. Heat-affected zone specimens were first required in reactor vessel material surveillance programs in 1966 (ASTM E 18566, "Recommended Practice for Surveillance Tests on Structural Materials in Nuclear Reactors"). Cracks in heat-affected zone material had been observed to cause the failure of components in non-nuclear-applications, and from early research, these failures were in heat-affected zone materials with high hardness measurements, which is associated with low fracture toughness.

The heat-affected zone has been shown to exhibit superior fracture toughness compared to the base metal. In addition, test results from surveillance specimens have shown significant scatter of the heat-affected zone Charpy test data because of the inhomogeneous nature of the heat-affected zone material. This was the basis for eliminating the requirement for heat-affected zone specimens after the 1994 edition of ASTM E 185; thus, it is no longer prudent to ~~no longer~~ require the inclusion or testing of heat-affected zone materials.

changes in the reactor vessel material and serve as a consistency check relative to Charpy data.

Past experience and test results have demonstrated that the differences in the test temperatures specified in ASTM E 185 can be small, which could yield small differences in tensile properties and redundant tensile information. Eliminating one test temperature and testing at room temperature and service temperature at all irradiation levels, allows for the comparison of the change in strength properties due to irradiation and temperature.

For these reasons, the NRC is revising appendix H to 10 CFR part 50 to only require the inclusion or testing of one tension specimen at room temperature and one tension specimen at service temperature, for all materials and irradiation levels as part of the reactor vessel material surveillance program. Thus, this reduces the number of tensions specimens required in new and reconstituted surveillance capsules and for testing in existing surveillance capsules. For existing capsules that are currently in the reactor vessel, licensees can continue their practice to test the tension specimens in accordance with ASTM E 185. For new and reconstituted capsules that may be inserted into the reactor vessel in the future, licensees could choose to continue this practice. ~~in accordance with the ASTM E 185.~~ This revision has no effect on public health and safety.

3. Correlation Monitor Material

Correlation monitor material is a well characterized reactor vessel material that has been included in many surveillance capsules. Correlation monitor material is selected so that it has a comparable composition and processing history to the reactor vessel material. The purpose of a correlation monitor material in a surveillance capsule

operating temperature of 288 degrees Celsius (550 degrees Fahrenheit). Therefore, knowledge of the irradiation temperature history of surveillance capsules is important to ensure that the surveillance data are properly interpreted and do not portray a non-conservative estimate of the reactor vessel neutron embrittlement.

Temperature monitors are targeted to melt at specific temperatures, normally somewhat ~~more~~higher than the planned operating temperature, to identify the highest temperature seen by the surveillance capsule. The monitors provide an indication of whether the melt temperature was reached but they do not provide a time-based exposure history of the monitor.

Several things can complicate the interpretation of the information from temperature monitors. The first complication arises when the surveillance capsule experiences a short duration thermal transient that increases the coolant inlet temperature. This could result in a positive indication from the temperature monitors, which is insignificant to the overall exposure conditions of the surveillance capsule. A second complication is caused by possible interpretation issues, where apparent "melting" of the temperature monitors is caused by long-term exposure of the monitor to temperatures near, but below its melting point.

For these reasons, the NRC is revising appendix H to 10 CFR part 50 to make optional the requirement to include or evaluate temperature monitors as part of the reactor vessel material surveillance program. For existing capsules that are currently in the reactor vessel, licensees can continue their practice to evaluate the temperature monitors. For new and reconstituted capsules that may be inserted into the reactor vessel in the future, licensees are no longer required to include temperature monitors in the capsules but could choose to continue this practice. As an alternative to these temperature monitors, an estimate of the average capsule temperature during full power

The NRC has prepared a regulatory analysis for this direct final rule. The analysis examines the costs and benefits of the alternatives considered by the NRC. Based on the analysis, the NRC concludes that this action is cost beneficial and reduces the regulatory burden on reactor licensees and the NRC for an issue that is not significant to safety. This issue is not significant to safety because this direct final rule reduces the testing of some specimens and eliminates the testing of other specimens that were found not to provide meaningful information to assess the integrity of the reactor vessel. Also, extending by 6 months the period for submitting the report of test results to the NRC is not significant to safety. This is because the increase in neutron fluence over 6 months is very small, and therefore the projected increase in embrittlement for the 6-month period would also be very small. This small impact, in conjunction with the margin of safety which is inherent in the pressure-temperature limit curves, minimizes any impact due to the 6-month increase. The regulatory analysis is available as indicated in the "Availability of Documents" section of this document.

VIII. Backfitting and Issue Finality

The NRC's backfitting provisions for holders of construction permits, and applicants and holders of operating licenses, and combined licenses, appear in § 50.109, "Backfitting" (the Backfit Rule). Issue finality provisions, which are analogous to the backfitting provisions in § 50.109, appear in § 52.63, "Finality of Standard Design Certifications;" § 52.83, "Finality of Referenced NRC Approvals; Partial Initial Decision on Site Suitability;" § 52.98, "Finality of Combined Licenses; Information Requests;" § 52.145, "Finality of Standard Design Approvals, Information Request;" and § 52.171, "Finality of Manufacturing Licenses; Information Requests."

[7590-01-P]

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NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[NRC-2017-0151]

RIN 3150-AK07

Reactor Vessel Material Surveillance Program

AGENCY: Nuclear Regulatory Commission.

ACTION: Proposed rule.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is proposing to amend the reactor vessel material surveillance program requirements for commercial light-water power reactors. This action would amend the requirements associated with the testing of specimens contained within surveillance capsules and reporting the surveillance test results. This action would also clarify the requirements for the design of surveillance programs and the withdrawal schedules for reactor vessels purchased after 1982. These changes would reduce regulatory burden, with no effect on public health and safety.

DATES: Submit comments by **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**. Comments received after this date will be considered if it is practical to do so, but the NRC is able to ensure consideration only for comments received on or before this date.

III. Background

A. Description of a Reactor Vessel Material Surveillance Program

The reactor vessel and its internal components support and align the fuel assemblies that make up the reactor core and provide a flow path to ensure adequate heat removal from the fuel assemblies. It also provides containment and a floodable volume to maintain core cooling in the event of an accident causing loss of the primary coolant. The reactor vessel is ~~comprised of~~ a cylindrical shell with a welded hemispherical bottom head and a removable hemispherical upper head. Some vessel shells were fabricated from curved plates that were joined by longitudinal and circumferential welds. Others were manufactured using forged rings and, therefore, only have circumferential welds that join the rings. These plate and forging materials are referred to as base metals. Maintenance of the structural integrity of the reactor vessel is essential in ensuring plant safety, because there is no redundant system to maintain core cooling in the event of a vessel failure.

One characteristic of reactor vessel steels is that their material properties change as a function of temperature and neutron irradiation. The primary material property of interest for the purposes of reactor vessel integrity is the fracture toughness of the reactor vessel material. Extensive experimental work determined that Charpy impact energy tests, which measure the amount of energy required to fail a small material specimen, can be correlated to changes in fracture toughness of a material. Thus, the Charpy impact specimens[1] from the beltline materials (i.e., base metal, weld metal, and

[1] A bar of metal, or other material, having a V-groove notch machined across the 10 mm thickness dimension.

capsules between the inner diameter vessel wall and the core can provide data for assessing and projecting the change in fracture toughness of the reactor vessel.

T~~hus, t~~he ~~purpose~~purposes for requiring a reactor vessel material surveillance program is to monitor changes in the fracture toughness properties in the beltline region[2] of the reactor vessel and to use this information to analyze the reactor vessel integrity. Surveillance programs are designed not only to examine the current status of reactor vessel material properties but also to predict the changes in these properties resulting from the cumulative effects of neutron irradiation.

The determination as to whether a commercial nuclear power reactor vessel requires a material surveillance program under appendix H to 10 CFR part 50 is made at the time of plant licensing under 10 CFR part 50 or 10 CFR part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." If this surveillance program is required, it is designed and implemented at that time using the existing requirements. Certain aspects of the program, such as the specific materials to be monitored, the number of required surveillance capsules to be inserted in the reactor vessel, and the initial capsule withdrawal schedule were designed for the original licensed period of operation (i.e., 40-years). The editions of the American Society for Testing and Materials International (ASTM) E 185 which are incorporated by reference in appendix H to 10 CFR part 50 recommend three, four, or five surveillance capsules to be included in the design of the reactor vessel material surveillance programs for the original licensed period of operation, based on the irradiation sensitivity of the material used to fabricate the reactor vessel.[3] Most plants have included several additional surveillance capsules

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[2] NRC Regulatory Issue Summary 2014-11, "Information on Licensing Applications for Fracture Toughness Requirements for Ferric Reactor Coolant Pressure Boundary Components," includes a definition of reactor vessel beltline.

[3] The requirements in appendix H to 10 CFR part 50 are based, in part, on the information contained within ASTM E 185-73, "Standard Recommended Practice for Surveillance Tests for Nuclear Reactor Vessels;" ASTM E 185-79, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled

beyond the number recommended by ASTM E 185. These capsules are referred to as "standby capsules." The surveillance program for each reactor vessel provides assurance that the plant's operating limits (e.g., the pressure-temperature limits) continue to meet the provisions in Appendix G of ASME Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," as required by appendix G "Fracture Toughness Requirements" to 10 CFR part 50.~~,~~ ~~"Fracture Toughness Requirements."~~ The program also provides assurance that the reactor vessel material upper shelf energy meets the requirements of appendix G to 10 CFR part 50. These assessments are used to ensure the integrity of the reactor vessel.

In addition to the Charpy impact specimens for determining the embrittlement in the reactor vessel, the surveillance capsules typically contain neutron dosimeters, thermal monitors, and tension specimens.[4] Surveillance capsules may also contain correlation monitor material, which is a material with composition, properties, and response to radiation that have been well-characterized. The overall accuracy of neutron fluence measurements is dependent upon knowledge of the neutron spectrum. Therefore, a variety of neutron detector materials (dosimetry wires) are included in each surveillance capsule and used in the determination of neutron fluence for the vessel. The thermal monitors that are placed in the capsules (e.g., low melting point elements or eutectic alloys) are used to identify the irradiated specimen's maximum exposure temperature. ~~irradiated specimen temperature~~.

B. Current Requirements under Appendix H to 10 CFR Part 50

Nuclear Power Reactor Vessels;" and ASTM E 185-82, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels," which are incorporated by reference.

[4] Tension specimens have a standardized sample cross-section, with two shoulders and a gage (section) in between.

by the Director, Office of Nuclear Reactor Regulation. The NRC uses the results from the surveillance program to assess licensee submittals related to pressure-temperature limits ~~in accordance with~~ under appendix G to 10 CFR part 50 and to assess pressurized water reactor licensee's compliance with § 50.61, "Fracture toughness requirements for protection against pressurized thermal shock events," or § 50.61a, "Alternate fracture toughness requirements for protection against pressurized thermal shock events."

C. The Need for Rulemaking

When appendix H to 10 CFR part 50 was established as a requirement in 1973 (38 FR 19012), limited information and data were available on the subject of reactor vessel embrittlement. Thus, appendix H to 10 CFR part 50 required the inclusion of a comprehensive collection of specimen types representing the reactor vessel beltline materials in each surveillance capsule. Since 1973, a significant number of surveillance capsules have been withdrawn and tested. Analyses of these results support reconsidering the specimen types required for testing, and the required time for reporting the results from surveillance capsule testing. One outcome of this effort was that some specimen types were found to contribute to the characterization of reactor vessel embrittlement, while others did not. Therefore, the NRC determined that these latter types were unnecessary to meet the objectives of appendix H to 10 CFR part 50 and should no longer be required. Revising appendix H to 10 CFR part 50 to address this situation would reduce the regulatory burden on licensees for data collection, with no effect on public health and safety.

In 1983, appendix H to 10 CFR part 50 was again revised to require licensees to submit test results to the NRC within one year of the date of capsule withdrawal, unless an extension is granted by the Director, Office of Nuclear Reactor Regulation

(48 FR 24008). As stated in the 1983 rulemaking, the reason for the requirement, was the need for timely reporting of test results and notification of any problems. ~~As stated in the 1983 rulemaking, the primary purposes of the requirement are timely reporting of test results and notification of any problems.~~ At that time, there was still a limited amount of data from irradiated materials from which to estimate embrittlement trends of reactor vessels at nuclear power plants; thus, making it crucial for timely reporting of test results.

Licensees that participate in an integrated surveillance program have found it burdensome to meet this one-year requirement.[5] This is related to the fact that an integrated surveillance program requires coordination among the multiple licensees participating in the program. A significant number of test specimens have been analyzed since 1983, the results of which support the reduced need for prompt reporting of the test results. Therefore, there is a reduced need for prompt reporting of the test results. Based on this finding, the NRC determined that the reporting requirement in appendix H to 10 CFR part 50 should be revised. Extending the reporting period would reduce this regulatory burden, with the objective of eliminating the need for licensees to prepare and submit extension requests, and the use of NRC resources to review such requests. This revision would have no effect on public health and safety.

D. Regulatory Basis to Support Rulemaking

In January 2019, the Commission issued Staff Requirements Memorandum (SRM)-COMSECY-18-0016, "Request Commission Approval to Use the Direct Final Rule Process to Revise the Testing and Reporting Requirements in 10 CFR Part 50,

[5] Appendix H to 10 CFR part 50 permits the use of an integrated surveillance program (ISP) as an alternative to a plant-specific surveillance program. In an ISP, the representative materials chosen for surveillance of a reactor vessel are irradiated in one or more other reactor vessel vessels that have similar design and operating features. The data obtained from these test specimens may then be used in the analysis of other plants participating in the program.

Appendix H, Reactor Vessel Material Surveillance Program Requirements (RIN 3150-AK07)," and approved publication of the supporting regulatory basis and use of the direct final rule process. On April 3, 2019, the NRC issued the regulatory basis which provides an in-depth discussion on the technical merits of this rulemaking (84 FR 12876).[6] The regulatory basis includes additional information on the regulatory framework, types of reactor vessel material surveillance programs, regulatory topics that initiated this rulemaking effort, and options to address these topics. The regulatory basis shows that there is sufficient justification to proceed with rulemaking to amend appendix H to 10 CFR part 50 to eliminate and reduce certain test specimens and extend the period to submit surveillance capsule reports to the NRC. In addition, in SRM-COMSECY-18-0016, the Commission directed that the staff should clarify the requirements for the design of surveillance programs and the withdrawal schedules for reactor vessels purchased after 1982. ~~In addition, SRM-COMSECY-18-0016, directed clarification of the requirements for the design of surveillance programs and the withdrawal schedules for reactor vessels purchased after 1982.~~ These revisions would not impose any additional requirements for the current fleet of operating reactors. The regulatory basis is available as indicated in the "Availability of Documents" section of this document.

IV. Plain Writing

The Plain Writing Act of 2010 (Pub. L. 111-274) requires Federal agencies to write documents in a clear, concise, well-organized manner that also follows other best practices appropriate to the subject or field and the intended audience. The NRC has

[6] A subsequent notice was published on April 12, 2019 (84 FR 14845), to correct the ADAMS accession number for the regulatory basis.

voluntary consensus standards bodies unless using such a standard is inconsistent with applicable law or otherwise impractical. In this proposed rule, the NRC would ~~is amending the~~amend the reactor vessel materials surveillance program requirements to reduce the regulatory burden for non-safety-significant issues associated with the testing of surveillance capsule specimens and reporting the surveillance test results. It also clarifies the requirements for the design of surveillance programs and the withdrawal schedules for reactor vessels purchased after 1982. Specifically, this direct final rule allows licensees to reduce the testing of some specimens and eliminates the testing of other specimens that were found not to provide meaningful information to assess the integrity of the reactor vessel. It also extends by 6 months the period for licensees to submit the report of test results to the NRC. The increase in neutron fluence over 6 months is very small, and therefore the projected increase in embrittlement over this period would also be very small. This small impact, in conjunction with the margin of safety which is inherent in the pressure-temperature limit curves, minimizes any impact due to the 6 month increase. This action does not constitute the establishment of new conditions on the ASTM standards that are currently incorporated by reference in appendix H to 10 CFR part 50 nor a standard that contains generally applicable requirements. This action maintains the use of the ASTM standards that are currently incorporated by reference in appendix H to 10 CFR part 50 but makes optional certain aspects of the ASTM standards that have been determined not to be necessary for safe operation of nuclear power plants.

VII. Availability of Documents

The documents identified in the following table are available to interested persons through one or more of the following methods, as indicated.