

**NUCLEAR REGULATORY COMMISSION**

**[Docket No. 72-09; NRC-2015-0150]**

**Independent Spent Fuel Storage Installation, Department of Energy;**

**Fort St. Vrain**

**AGENCY:** Nuclear Regulatory Commission.

**ACTION:** Exemption; issuance.

**SUMMARY:** The U.S. Nuclear Regulatory Commission (NRC) is issuing an exemption in response to a request submitted by the Department of Energy (DOE or the licensee) on April 27, 2016, from NRC's requirement to comply with the terms, conditions, and specifications concerning testing and surveillance in Special Nuclear Material License No. SNM-2504 for the Fort St. Vrain independent spent fuel storage installation (ISFSI). The exemption request seeks the extension of the time to perform an O-ring leakage rate test required by Technical Specification (TS) 3.3.1 of Appendix A of Special Nuclear Material License No. SNM-2504 and to perform an aging management surveillance described in the Fort St. Vrain (FSV) Final Safety Analysis Report (FSAR). The DOE requests the dates for performance of the testing and surveillance requirements be extended until December 2016. The NRC previously granted DOE an exemption (80 FR 33299 dated, June 11, 2015) extending the completion date for these actions until June 2016.

**DATES:** The exemption is effective on June 21, 2016.

**ADDRESSES:** Please refer to Docket ID **NRC-2015-0150** when contacting the NRC about the availability of information regarding this document. You may obtain publicly-available information related to this document using any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2015-0150**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: [Carol.Gallagher@nrc.gov](mailto:Carol.Gallagher@nrc.gov). For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly-available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to [pdr.resource@nrc.gov](mailto:pdr.resource@nrc.gov). The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in this document.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

**FOR FURTHER INFORMATION CONTACT:** Bernard White, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-6577; e-mail: [Bernard.White@nrc.gov](mailto:Bernard.White@nrc.gov).

## I. Background

The DOE is the holder of Special Nuclear Material License No. SNM-2504 which authorizes receipt, possession, storage, transfer, and use of irradiated fuel elements from the decommissioned FSV Nuclear Generating Station in Platteville, Colorado, under part 72 of title 10 of the *Code of Federal Regulations* (10 CFR).

## **II. Request/Action**

In a letter dated, April 27, 2016, the DOE requested an exemption to delay performance of both the fuel storage container O-ring leakage rate test requirement and the FSAR aging management surveillance of fuel storage containers by six months, until December 31, 2016 (ADAMS Accession No. ML16120A410). Technical Specification 3.1.1 in Appendix A of License No. SNM-2504 stipulates that, the fuel storage container seal leakage rate for shall not exceed  $1 \times 10^{-3}$  reference cubic centimeters per second (ref-cm<sup>3</sup>/s). Surveillance Requirement (SR) 3.3.1.1 requires that one fuel storage container from each vault to be leakage rate tested every five years to confirm that the seal leakage rate is not exceeded. DOE performed the last leakage rate test in June 2010 and the next leakage rate test is scheduled to be completed in June 2016.

Fort St.Vrain implemented its aging management program as part of license renewal in 2011. Condition 9 of SNM-2504 states, in relevant part, that authorized use of the material at the FSV ISFSI shall be “in accordance with statements, representations, and the conditions of the Technical Specifications and Safety Analysis Report.” Condition 11 of SNM-2504 directs the licensee to operate the facility in accordance with the Technical Specifications in Appendix A. In Chapter 9 of the FSV FSAR the licensee committed to assess six fuel storage containers

for potential hydrogen buildup by the end of June 2015. This date was extended until June 2016, with NRC's grant of an exemption. The hydrogen sampling schedule was established to parallel the fuel storage container seal leakage rate testing schedule.

### **III. Discussion**

Pursuant to 10 CFR 72.7, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR part 72 when the exemption is authorized by law, will not endanger life or property or the common defense and security, and is otherwise in the public interest. The DOE requested an exemption from both 10 CFR 72.44(c)(1) and 10 CFR 72.44(c)(3). Section 72.44(c)(1) requires, in part, compliance with functional and operational limits to protect the integrity of waste containers and to guard against the uncontrolled release of radioactive material. Section 72.44(c)(3) requires compliance with surveillance requirement in Limiting Condition of Operation (LCO) 3.3.1 which the licensee will use show that the ISFSI has not exceeded the fuel storage container or storage well seal leakage rate. For these reasons, the staff also grants DOE an exemption from the requirements of 10 CFR 72.44(c)(1) and 10 CFR 72.44(c)(3).

As is explained in following paragraphs, the proposed exemption is lawful, will not endanger life or property, or the common defense and security, and is otherwise in the public interest.

*Authorized by Law*

This exemption delays until December 2016, the licensee's performance of 1) a fuel storage container O-ring leakage rate test required by TS 3.3.1 of Appendix A of Special Nuclear Material License No. SNM-2504 and 2) an FSAR aging management surveillance to inspect six fuel storage containers for hydrogen buildup. Condition 9 of SNM-2504 states, in relevant part, that authorized use of the material at the FSV's ISFSI shall be "in accordance with statements, representations, and the conditions of the Technical Specifications and Safety Analysis Report." Condition 11 of SNM-2504 also directs the licensee to operate the facility in accordance with the Technical Specifications in Appendix A.

The provisions in 10 CFR 72.44(c)(1) and (3) require the licensee to follow the technical specifications and the functional and operational limits for the facility. The testing and inspection requirements from which DOE requested exemption are detailed in the Special Nuclear Material License No. SNM-2504, the FSAR, and FSV's technical specifications and must be complied with pursuant to 10 CFR part 72. Section 72.7 allows the NRC to grant specific exemptions from the requirements of 10 CFR part 72. Issuance of this exemption is consistent with the Atomic Energy Act of 1954, as amended, and not otherwise inconsistent with NRC regulations or other applicable laws. Therefore, the exemption is authorized by law.

*Will Not Endanger Life or Property or the Common Defense and Security*

In granting the March 19, 2015 exemption request, the NRC staff determined that it would not endanger life or property, or the common defense and security. The current exemption extends the deadline for performance of the testing and surveillance requirements until December 2016. The staff evaluated whether the additional six month extension provided by this exemption would change its earlier finding; the staff finds that the current exemption

does not endanger life or property, or the common defense and security for the reasons discussed below.

#### Potential Corrosion

Fort St. Vrain's ISFSI Aging Management Program described in Section 9.8 of FSV's ISFSI FSAR identifies a commitment to test one fuel storage container in each vault for hydrogen buildup. The test is designed to identify corrosion in the interior of the fuel storage containers. In its FSAR the licensee committed to complete testing for hydrogen buildup on the same schedule as the leak test, which required the test to be completed no later than June 2015. In its March 2015 exemption request, FSV concluded that hydrogen buildup had not occurred in fuel storage containers in its ISFSI. The NRC extended the completion date for the sampling for actual hydrogen buildup until to June 2016. Fort St. Vrain's conclusions were supported by the following observations:

1. The fuel was stored in dry helium prior to placement in the fuel storage containers.
2. General corrosion, as opposed to galvanic corrosion, was the only corrosion mechanism of concern for the canister.
3. The expected corrosion reactions would not generate significant quantities of hydrogen, because any water inside the fuel storage container is expected to have neutral pH (i.e., not acidic).

Therefore, FSV concluded there were no safety implications associated with delaying the hydrogen test for one year. The licensee presented the same conclusions and observations in support of its April 2016 request to extend the testing date.

The staff conducted its own evaluation of the data supporting FSV's March 2015 and April 2016 requests and found no safety implications associated with delaying the hydrogen test until December 2016. The staff made specific determinations concerning the safety of granting

the exemption, including that the maximum hydrogen volume fraction is 7 percent inside the fuel storage container. Therefore, a fire or explosion of hydrogen at this level is very unlikely and does not present a significant safety issue. The staff's calculation of the hydrogen volume fraction was a time independent calculation to determine the maximum hydrogen concentration assuming the possible reactants, oxygen and water, were fully consumed. A delay in performing the hydrogen test for six additional months will increase the container storage period from 25 years to 25.5 years without the performance of a hydrogen test. However, the staff finds that the extension will not increase the probability of either a hydrogen ignition event during storage or failure of the fuel storage container integrity due to corrosion, and therefore, fuel storage container safety is not reduced.

The NRC staff concludes that hydrogen ignition events associated with handling fuel storage containers are very unlikely to occur because the Modular Vault Dry Store building where the fuel storage canisters are located contains no volatile materials or gases. A full discussion of this issue is found in FSV's SAR 3 (see ADAMS Accession No. ML102380351). The Component Operational Testing procedures in the Aging Management Program, which must be implemented after license renewal, are described in FSV's SAR (see ADAMS Accession No. ML103640385). These procedures eliminate hydrogen ignition sources by sampling and analyzing the air inside containers for the presence of hydrogen and purging hydrogen before moving or removing lids from containers holding spent fuel.

#### Leakage Rate

Limiting Condition of Operation 3.3.1 in Appendix A of License No. SNM-2504 states that the fuel storage containers seal leakage rate shall not exceed  $1 \times 10^{-3}$  ref-cm<sup>3</sup>/s. Surveillance Requirement 3.3.1.1 stipulates that one fuel storage container from each vault be subject to a leakage rate test every 5 years. The basis for SR 3.3.1.1 is that performance of a

leakage rate test of at least six fuel storage containers every 5 years provides reasonable assurance of continued integrity. The original leakage rate test at FSV was performed in 1991 after the loading of canisters; subsequent leakage rate tests were performed on one fuel storage container from each vault in years 1996, 2001, 2005, and 2010. The results of all FSV's leakage rate tests have never exceeded the maximum rate of  $1 \times 10^{-3}$  ref-cm<sup>3</sup>/s.

As part of its April 2016 exemption request, DOE evaluated whether the exemption is consistent with the confinement barrier requirements described in FSV's FSAR at 3.3.2.1 and in SR 3.3.1.1. The DOE classified the failure of the redundant metal O-ring seals in a fuel storage cylinder as a low probability event. In addition, Section 8.2.15 of the FSV FSAR identifies no credible failure mechanisms for the fuel storage container O-rings. The DOE calculated that in June 2017, the average and maximum O-ring seal leakage rates for fuel storage containers are expected to be  $3.75 \times 10^{-4}$  and  $6.76 \times 10^{-4}$  ref-cm<sup>3</sup>/s, respectively. These conservative calculations are presented in Engineering Design File-10727, Estimation of 2017 Leak Rates of Fort St. Vrain Fuel Storage Containers (ADAMS Accession No. ML15104A064). Both the average and maximum seal leakage rate values are below the maximum leakage rate of  $1 \times 10^{-3}$  ref-cm<sup>3</sup>/s, permitted by TS 3.3.1. The DOE identified O-ring failure as a potential failure mode that could result in leakage in excess of  $1 \times 10^{-3}$  ref-cm<sup>3</sup>/s, although DOE did not provide specific details of potential O-ring failure mechanisms.

The NRC staff's evaluation notes that typical failure modes for O-ring seals include:

1. corrosion of the O-ring,
2. corrosion of the O-ring flange sealing surface (area in contact with the O-ring), and
3. creep or relaxation of the O-ring.

The DOE's March 2015 exemption request, as supplemented on June 1, 2015 (ADAMS Accession No. ML15153A280), describes the O-rings as silver plated alloy X-750 in the work-



hardened condition. The O-rings are installed with a grease/lubricant to facilitate sealing and prevent damage to the O-rings during lid installation and compression of the O-rings. The presence of grease, the construction materials used, and the limited amount of water in the vicinity of the O-rings reduce the likelihood of corrosion of the O-rings and the O-ring seal area on the fuel storage containers.

The NRC staff reviewed the testing methods and the test pressures generated by previous leakage rate tests. In addition, the staff evaluated the correlations between leakage rate and pressure drop for the O-ring seals. These estimated O-ring seal leakage rates were reported in EDF-10727. The NRC staff determined that the data and correlations that DOE used accurately predict the June 2017 fuel storage container O-ring seal leakage rates. The staff confirmed that DOE's average and maximum 2017 leakage rate estimates of  $3.75 \times 10^{-4}$  and  $6.76 \times 10^{-4}$  ref-cm<sup>3</sup>/s are both acceptable and below the maximum limit of  $1 \times 10^{-3}$  ref-cm<sup>3</sup>/s in LCO 3.3.1.

The NRC staff also reviewed Section 8.2.15 of FSV's FSAR and DOE's analyses of the consequences associated with a radiological release from a fuel storage container. The staff confirmed that even if the leakage rate of  $1 \times 10^{-3}$  ref-cm<sup>3</sup>/s were grossly exceeded, the consequences would be minimal. For example,

1. The radiological consequences at the controlled area boundary would be within the requirements of 10 CFR 72.106.
2. A radiological release with a leakage rate greater than  $1 \times 10^{-3}$  ref-cm<sup>3</sup>/s that passes beyond the redundant O-ring seals would be bounded by the maximum credible accident described in the FSV's FSAR at 8.2.15.
3. Furthermore, the failure of the redundant metallic seals (loss of confinement) is considered a low probability event during the entire storage period.

Based on the findings discussed in this section, the NRC staff concludes that granting the DOE's exemption will not endanger public health and safety or the common defense and security. Delaying the fuel storage container O-ring leakage rate test required by TS 3.1.1 and the aging management monitoring of six fuel storage containers for hydrogen buildup until December 2016, will not increase the likelihood of a seal leak occurring. Therefore, the extension permitted by the current exemption does not change the licensing basis of the ISFSI design and it does not alter the staff's conclusion in June 2015, that the fuel storage container design and lid seals are acceptable.

#### *Otherwise in the Public Interest*

In the March 2016 exemption application, the DOE sought a delay of the fuel storage container O-ring leakage rate test and FSAR aging management surveillance for one year. The DOE explained that the extension would allow it to prioritize activities at the FSV site and reduce the administrative burden on the licensee and the NRC staff to perform the June 2016 test. The staff finds these statements are still valid and support a six-month extension, therefore issuance of the proposed exemption is otherwise in the public interest.

#### *Environmental Consideration*

The NRC staff evaluated whether significant environmental impacts are associated with the issuance of the requested exemption. The NRC staff determined that the proposed action fits a category of actions that does not require an environmental assessment or environmental impact statement. The exemption meets the categorical exclusion criteria of 10 CFR 51.22(c)(25)(i) – (vi).

Granting an exemption from the requirements of 10 CFR 72.44(c)(1) and 10 CFR 72.44(c)(3) will extend the time for DOE to conduct the inspection and surveillance of the fuel

storage container O-ring leakage rate test required by TS 3.3.1 and the FSAR aging management surveillance of fuel storage containers for hydrogen buildup required by license Condition No. 9. A categorical exclusion for inspection and surveillance requirements is provided under 10 CFR 51.22(c)(25)(vi)(C), when the criteria in 10 CFR 51.22(c)(25)(i)-(v) are also satisfied. In its review of the exemption request, the NRC staff determined that, under 10 CFR 51.22(c)(25) granting the exemption: (i) does not involve a significant hazards consideration because it does not reduce a margin of safety, create a new or different kind of accident not previously evaluated, or significantly increase the probability or consequences of an unevaluated accident; (ii) would not significantly change the types or amounts of effluents that may be released offsite because the exemption does not change or produce additional avenues of effluent release; (iii) would not significantly increase occupational or public radiation exposure, individually or cumulatively, because the exemption does not introduce new or increased radiological hazards; (iv) would not result in significant construction impacts because the exemption does not involve construction or other ground disturbing activities, or change the footprint of the existing ISFSI; and (v) would not increase the potential for or the consequences of radiological accidents. For example, a gross leak from a fuel storage container or excessive hydrogen buildup in a fuel storage container is unlikely because the exemption does not reduce the ability of the container to confine radioactive material or create new accident precursors at FSV's ISFSI. Accordingly, this exemption meets the eligibility criteria for categorical exclusion in 10 CFR 51.22(c)(25). There are no significant radiological environmental impacts associated with the proposed action.

#### **IV. Conclusions**

Accordingly, the NRC has determined that, pursuant to 10 CFR 72.7, this exemption is authorized by law, will not endanger life or property or the common defense and security, and is otherwise in the public interest. Therefore, the NRC hereby grants DOE an exemption from the regulations at 10 CFR 72.44(c)(1) and 10 CFR 72.44(c)(3) to permit a delay by six months of the monitoring and surveillance scheduled for June 2016. The exemption extends the date for completion of the O-ring leakage rate test under SR 3.3.1.1 for one fuel storage container from each vault and the FSAR aging management inspection of FSCs for hydrogen until December 31, 2016. This exemption is effective as of June 21, 2016.

Dated at Rockville, Maryland, this 15<sup>th</sup> day of June, 2016.

For the Nuclear Regulatory Commission.

**/RA/**

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