



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

November 14, 2023

Brigid Lowery, Director  
Assessment and Remediation Division  
Office of Superfund Remediation  
and Technology Innovation  
U.S. Environmental Protection Agency  
M.S. 5201P  
1200 Pennsylvania Avenue, NW  
Washington, DC 20004

SUBJECT: COMPLETION OF DECOMMISSIONING ACTIVITIES AT THE ZION NUCLEAR POWER STATION SITE OUTSIDE THE BOUNDARY OF THE ON-SITE INDEPENDENT SPENT FUEL STORAGE INSTALLATION (NUCLEAR REGULATORY COMMISSION LICENSE NOS. DPR-39 AND DPR-48)

Dear Ms. Lowery:

I am writing to inform you of the completion of the active on-site decommissioning activities outside the boundary of the Independent Spent Fuel Storage Installation (ISFSI) at the Zion Nuclear Power Station, Unit Nos. 1 and 2 (ZNPS, also referred to as Zion), site in Zion, Illinois. The U.S. Nuclear Regulatory Commission (NRC) staff has completed the review of Zion final status survey (FSS) reports for the remediated portions of the site. The data in the FSS reports demonstrate that the site meets the radiological criteria for unrestricted use in Subpart E, "Radiological Criteria for License Termination," of Part 20, "Standards for Protection Against Radiation," to Title 10 of the *Code of Federal Regulations* (10 CFR). The NRC staff's safety evaluation of the FSS reports was issued on November 8, 2023 (Agencywide Documents Access and Management System (ADAMS) Accession No. [ML23310A312](#)).

In a letter dated August 24, 2016 ([ML16084A308](#)), the NRC notified the U.S. Environmental Protection Agency (EPA) that the license termination plan (LTP) for the Zion site contained proposed Derived Concentration Guideline Levels (DCGLs) that exceeded the consultation trigger values for four radionuclides (Cobalt-60, Cesium-137, Cesium -134, Nickel-63, and Strontium-90) related to the resident farmer future use scenario. Specifically, these radionuclides exceed the soil concentration levels from Table 1 of the Memorandum of Understanding (MOU) between EPA and the NRC titled, "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites," dated October 9, 2002 ([ML022830208](#)). The Level 1 consultation was triggered for soil because the sum of fraction (SOF) for both surface soil (SOF = 5.3) and subsurface soil (SOF =2.84) were exceeded. However, the residual radioactivity at the site was expected to be much lower than the proposed DCGL values because meeting the "not to exceed 25 millirem per year (mrem/yr)" criterion of 10 CFR 20.1402, "Radiological criteria for unrestricted use," must be demonstrated using an all pathways, SOF approach. Each individual DCGL represents a concentration level corresponding to 25 mrem/yr. Thus, in applying the SOF requirement, the actual cleanup values were reduced to ensure that the potential dose from all residual radioactivity at the site from all media is less than 25 mrem/yr.

The consultation letter noted above (termed a Level 1 consultation by the NRC) also stated that the NRC would review Zion's FSS reports following completion of site remediation, and initiate a second consultation, as discussed in Section V.C.2 of the MOU (termed a Level 2 consultation), if the actual residual soil contamination levels exceeded the consultation trigger values in Table 1 of the MOU. The EPA responded to the Level 1 consultation by letter dated December 22, 2016 ([ML17160A083](#)). As discussed below, the NRC staff has concluded that a Level 2 consultation is not required based on the residual radioactivity remaining at the Zion site.

After completion of decommissioning activities outside the boundary of the on-site ISFSI, including soil, structure, and buried piping removal, ZionSolutions, LLC (ZS), the licensee, conducted its FSS in accordance with the guidance in the "Multi-Agency Radiation Survey and Site Investigation Manual," NUREG-1575, Rev. 1 (MARSSIM) ([ML003761476](#) Pkg) and its approved LTP, dated September 28, 2018 ([ML18163A313](#)). ZS partitioned the approximately 112-acre site into 128 individual survey units, consisting of seven basement survey units and 116 land survey units (including three below grade excavation survey units), and five buried piping survey units ranging in size from less than one to more than 27,000 square meters. Using the MARSSIM guidance, ZS collected and analyzed soil samples in the 128 survey units. In accordance with the FSS plan, Zion also performed radiological scanning measurements of the soil surfaces within each of the survey units using handheld equipment.

The NRC staff reviewed the data in the Zion FSS reports and compared the residual radioactivity levels to the trigger values for soil in Table 1 of the MOU related to the residential use scenario. Table 1 states that, except for Radium-226, Thorium-232, or total uranium, soil concentrations should be aggregated using an SOF approach to determine the site-specific consultation trigger concentrations. Consistent with the MOU, the residual radioactive material concentrations for Cobalt-60, Cesium-137, Cesium -134, Nickel-63, and Strontium-90 (as determined from the sample analyses) were aggregated using the SOF approach to determine the site-specific consultation trigger values for each of the 128 Zion survey units. Also, the NRC staff concluded that a Level 2 consultation is not required for groundwater for the same reasons given in its Level 1 consultation.

Using the MARSSIM guidance, the analytical results from the Zion soil samples were used to calculate the average SOF values for the 128 survey units. The NRC staff determined that none of the soil samples exceeded the SOF trigger value of 1.0 when compared to Table 1 of the MOU. In addition, when comparing the actual Zion FSS radionuclide analysis results to the MOU trigger levels for soil concentration in picocuries per gram (pCi/g), the NRC staff did not identify any survey units with an average of systematic sample measurements of soil concentration that exceeded the MOU trigger levels. Therefore, the NRC staff concludes that the "as left" survey unit doses are below the Table 1 MOU levels, as well as below the Zion DCGLs, and meet the 10 CFR Part 20, Subpart E, release criteria. After evaluating this information, the NRC determined that a Level 2 consultation with the EPA under the MOU is not required.

During the site decommissioning process, the NRC performed a number of on-site inspections of ZS' actions to verify that the cleanup was being conducted as described in the approved LTP. The NRC also performed independent measurements and sample analysis to verify ZS' FSS results by leveraging the services of the Oak Ridge Institute for Science and Education and concluded they were consistent with the FSS data provided by the Zion licensee. Based on these actions, the NRC has concluded that: (1) decommissioning activities were performed in accordance with the approved Zion LTP; (2) the FSS data was collected and evaluated consistent with the MARSSIM guidance; and (3) the FSS data and NRC's independent

measurements demonstrate that the site meets the NRC radiological criteria for release for unrestricted use.

The NRC staff completed the review of the Zion decommissioning submittals in support of a partial site release that terminated the NRC license outside the boundary of the on-site ISFSI. The NRC issued the license termination decision of the site outside the ISFSI boundary on November 8, 2023 ([ML23286A304](#) Pkg).

Discrete radioactive particles (DRPs) were generated during implementation of the LTP which resulted in on-site cross-contamination during decommissioning. The DRPs were identified and removed from the Zion site. NRC also conducted confirmatory surveys which included the verification that the DRPs were identified and removed from the Zion site. More detail on these surveys and conclusions to help inform the decision regarding unrestricted release are provided Attachment A, "Particle Assessment for Zion Nuclear Power Station" and Attachment B, "Identified Discrete Radioactive Particles and Associated Cleanup Actions," of the NRC staff's Partial Site Release Safety Evaluation Report ([ML23286A306](#)).

In accordance with 10 CFR 2.390, a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's ADAMS. ADAMS is accessible from the NRC Web site at <https://www.nrc.gov/reading-rm/adams.html>.

If you or your staff have any questions regarding this letter, or the ongoing license termination activities at the Zion site, please contact Shaun Anderson at 301-415-2039 or via email at [Shaun.Anderson@NRC.gov](mailto:Shaun.Anderson@NRC.gov).

Sincerely,



Signed by Marshall, Jane  
on 11/14/23

Jane E. Marshall, Director  
Division of Decommissioning, Uranium Recovery,  
and Waste Programs  
Office of Nuclear Material Safety  
and Safeguards

Docket Nos.: 50-295 and 50-304  
License No.: DPR-39 and DPR-48

cc: Distribution via Zion Listserv  
Stuart Walker, EPA

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