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10 CFR 50.90
10 CFR 50.91

May 13, 2025

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Oyster Creek Nuclear Generating Station
Renewed Facility Operating License No. DPR-16
NRC Docket No. 50-219 and 72-15

Subject: Holtec Decommissioning International's Revised Responses to Oyster Creek Nuclear Generating Station License Termination Plan Request for Supplemental Information Numbers 5, 8, and 9

Reference:

[1] Letter from Holtec Decommissioning International (HDI) to Nuclear Regulatory Commission (USNRC) – "License Amendment Request to Revise Oyster Creek Nuclear Generating Station Renewed Facility Operating License to Add License Condition 2.C.(18) to Include License Termination Plan Requirements," August 1,2024, (ML 24214A037).

[2] Letter from USNRC (ML24269A046) with Enclosure 1(ML24269A049) to HDI – "Oyster Creek Nuclear Generating Station – License Termination Plan Acceptance Review Request for Supplemental Information," October 4, 2024

[3] Letter from USNRC (ML24284A197) to HDI – "Oyster Creek Nuclear Generating Station – License Termination Plan Acceptance Review Request for Supplemental Information – Revision to Enclosures" (ML24284A196), October 10, 2024

[4] HDI's Response to LTP Request for Supplemental Information (RSI) numbers 10, 11, 12 and 13, March 26,2025 (ML25086A156)

[5] Letter from HDI (ML25119A268) to USNRC – "Holtec Decommissioning International's Response to Oyster Creek Nuclear Generating Station License Termination Plan Request for Supplemental Information," April 29, 2025

[6] Electronic Mail from USNRC Project Manager to Oyster Creek Regulatory Assurance Manager, dated May 6, 2025.

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On August 1, 2024 Holtec Decommissioning International, LLC (HDI) requested approval of a proposed amendment to the Renewed Facility Operating License DPR-16 for Oyster Creek Nuclear Generating Station (OCNGS) to include License Termination Plan (LTP) Requirements (Reference 1).

On October 4, 2024, the NRC issued a request for supplemental information (RSI) required to complete the acceptance review of the proposed License Termination Plan by March 31, 2025 (Reference 2).

On October 10, 2024, the NRC modified some of the requests (Reference 3)

On March 26, 2025, HDI submitted responses to environmental RSI numbers 10 through 13 (Reference 4).

On April 29, 2025, HDI submitted the responses to the remainder of the RSIs (Number 1 through 9) and included the revised LTP with the additional detail. (Reference 5)

On May 6, 2025, USNRC Project Manager contacted The Oyster Creek Regulatory Assurance Manager via electronic mail raising a concern that the HDI response to RSI Number 9 was to the original RSI Number 9 from Reference 2 rather than the revised RSI Number 9 from Reference 3.

Holtec Decommissioning International (HDI) hereby submits the revised response for RSI number 9 as requested by the NRC related to the acceptance review of Oyster Creek's License Termination Plan (LTP) Revision 0 (Reference 3). The RSI question and rationale are revised in the attached document. However, the RSI response is unchanged as the provided response currently answers the intent of the modified RSI.

Additionally, another review of the submitted documents was performed to ensure that the RSI detail for the other RSIs are appropriate to Reference 3. The review identified minor differences in the RSI 5 and 8 language. These changes are captured as a part of this submittal. As with RSI 9, the changes in the language of the RSIs do not result in a change in the provided response.

Enclosure 1 is the response to RSIs 5, 8, and 9 as included in Reference 3.

No changes to the submitted LTP are necessary.

Should you have any questions or require any further information, please contact me at (856) 797-0900 x 3578.

I certify under penalty of perjury that the foregoing is true and correct. Executed on May 13, 2025.

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Sincerely,

Jean A. Fleming

Digitally signed by Jean A. Fleming
DN: cn=Jean A. Fleming, o=Holtec Decommissioning International, LLC, ou=Regulatory and Environmental Affairs, email=J.Fleming@Holtec.com
Date: 2025.05.13 11:28:27 -04'00'

Jean A. Fleming
Vice President, Licensing and Regulatory Affairs
Holtec International

Enclosure 1: Revised Responses to Oyster Creek License Termination Plan Request for Supplemental Information Numbers 5, 8, and 9

cc:
USNRC Regional Administrator, Region I
USNRC Project Manager, NMSS - Oyster Creek Nuclear Generating Station
USNRC Region I, Lead Inspector - Oyster Creek Nuclear Generating Station
Assistant Commissioner, Air Quality, Energy and Sustainability, NJ DEP
Principal Engineer, American Nuclear Insurers
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HDI-OC-25-019

Enclosure 1

Revised Responses to OCNGS License Termination Plan Requests for Supplemental Information Numbers 5, 8 and 9

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RSI-5

Enclosure 5, "Oyster Creek Generating Station Site Radiological Characterization Report": Evaluate other contaminated media (e.g., pavement-covered areas and shallow concrete slabs, sediment, subsurface soils) for the full suite of radionuclides to establish radionuclide fractions and subsequent determination of insignificant contributors, surrogate ratios, and relative ratios.

Rationale:

Most of the samples having HTD results in the characterization report were from surface soils, with only two sediment and no subsurface and asphalt samples having HTD results. Although there were sediment, asphalt, and subsurface samples exceeding the assessment criteria, these samples do not appear to be in the subset analyzed for HTDs.

Holtec Response:

During the initial Oyster Creek characterization performed in 2022 and described in the "Oyster Creek Generating Station Site Characterization Report", the focus was primarily on surface soils, which are the most accessible media and provide an important baseline for contamination levels. The depth profile for deep soil samples obtained during initial characterization was limited to 4 feet due to safety concerns and resistance that made the hand-AUGER sampling method impractical. In 2025, additional soil samples were obtained, including subsurface samples to depths of up to 20 feet.

Most of the "other contaminated media" samples (sediment, asphalt, and subsurface soils) were collected from the Radiologically Controlled Area (RCA), North Protected Area (NPA), and South Protected Area (SPA). Roof gravel samples were obtained from buildings that will remain following demolition activities.

Pavement-covered areas and shallow concrete slabs will be used during decommissioning activities for equipment laydown and demolition support, in addition to waste and backfill material sorting, staging and survey. Pavement and hard-facing material such as sidewalks will be removed as required to expose underlying soils for scanning and direct measurement. Contaminated shallow concrete slabs and equipment pads will be removed consistent with the Oyster Creek demolition strategy. The radiological characteristics of concrete and asphalt are subject to change due to impacts from the ongoing demolition process. The bulk of this media will ultimately become radioactive waste, precluding the need to perform analyses for the full suite of potential radionuclides of concern (ROCs). Any surface or subsurface media that remains following decommissioning activities will be subject to FSS, including sampling and, where applicable, full suite analyses.

Roof gravel media was subject to impact from particulate radiological effluents and foot traffic and is very unlikely to contain hard-to-detect (HTD) radionuclides. The determination of the need for HTD analyses of this media will be made at the time of Final Status Survey of the building surfaces.

Sediment samples were biased toward areas with the potential for impact from historical plant operation, and included dry sediment from storm drain catchment areas, in most cases obtained

above asphalt layers. Wet sediment samples were obtained from the bottom of the plant discharge canal (DCA). These samples validated Historical Site Assessment (HSA) conclusions concerning potential radiological impacts and informed the scope of continuing characterization, including the need for future HTD analyses.

As described in the response to RSI-3, additional characterization activities have been performed in areas of concern identified in the HSA as having been potentially impacted by historical leaks and spills. Technical Support Document 24-111, “Soil Core Bores - Characterization Survey Plan for Oyster Creek Nuclear Generating Station”, includes the plan for the additional focused surface and subsurface soil characterization campaign. The characterization campaign obtained samples of surface soil in addition to subsurface soil samples at incremental depths of up to 20 feet. Selected surface and subsurface soil samples were analyzed for the full suite of 21 Oyster Creek – specific ROCs. The results of the additional surface and subsurface soil analyses are summarized in Chapter 2 of Revision 1 of the Oyster Creek LTP.

HDI has concluded that the analyses of subgrade concrete represent the most comprehensive, representative and conservative approach for the evaluation of the relative impact of the 21 Oyster Creek ROCs. TSD 25-032 “Radionuclides of Concern in Support of the Oyster Creek Station License Termination Plan”, which is included with the Oyster Creek LTP Revision 1 submittal, evaluates the results of concrete samples that were analyzed for the 21 radionuclides in the initial suite of radionuclides of concern (ROCs) identified in Technical Basis Document (TBD) 20-6002-1362, “Radionuclide Selection for DCGL Development Oyster Creek Station Site Characterization Project”, which is included with the Oyster Creek LTP Revision 1 submittal as Enclosure 4. TSD 25-032 refines the initial ROCs into a final set of radionuclides of concern for use during final status survey (FSS). Radionuclide mixture fractions are established for the initial ROCs, and the results are used to eliminate some radionuclides as insignificant contributors (IC) to dose. Additionally, surrogate ratios were determined for the hard-to-detect ROCs.

Continuing characterization will be performed as restrictions related to accessibility and background levels are eliminated and potential contamination from demolition and waste hauling activities are identified and investigated.

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RSI-8

Insignificant Contributors: Provide representative (additional) RCA sample data by area and media to support the determination of radionuclide fractions and the subsequent evaluation of insignificant contributors based on this data. Explain what further investigations were or will be conducted to determine the horizontal and vertical extent of the Sr-90 contamination in the RCA.

Rationale

Enclosure 4, "Radionuclide Selection for DCGL Development Oyster Creek Station Site Characterization Project," and Enclosure 18, "Dose Contribution from Insignificant Radionuclides in the Oyster Creek Site-Specific Suite of Radiological Nuclides," described the evaluation for insignificant contributor determination. Several concerns were identified:

(a) Enclosure 4: The dose contributions for Silver-108m, Barium-133, Hafnium-178m, Manganese-53, Niobium-92m, Lead-205, Promethium-145, Samarium-146, and Terbium-158, which are not available in the Decontamination and Decommissioning (DandD) code, were evaluated using the inhalation, ingestion, and direct exposures in Federal Guidance Report No. 11,"Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," and Federal Guidance Report No.12, "External Exposure to Radionuclides In Air, Water, and Soil." The dose conversion factors for the individual radionuclides were ratioed to that of Co-60 and multiplied by the dose result for Co-60 for each of the scenarios; however, justification was not provided to demonstrate that Co-60 would be sufficiently representative of the radiological and environmental properties of these radionuclides.

(b) Enclosure 18: The licensee collected five biased soil samples from the RCA for analysis of HTD radionuclides. From these samples, HDI concluded that the HTDs collectively contributed less than 10% of the dose criterion and could therefore be eliminated from further detailed analysis. However, to determine the magnitude and extent of residual radioactivity, a sufficient number of samples is required to capture statistical variability in the data by areas and media. Five RCA soil samples does not represent a sufficient sample number, nor has it been demonstrated that these samples are representative of all open land areas, building structures, and embedded and buried piping.

(c) Enclosure 18: Sr-90 was detected above the MDC in one of five samples used for the insignificant contributor analysis in Enclosure 18. Sr-90 is expected to be more mobile; therefore, the significant gamma emitting contributors may not be co-located with HTD radionuclides. Additional data across multiple media would be needed to support HDI's determination that Sr-90 is insignificant.

(d) Section 3.3 of NUREG-1757, Volume 2, Rev. 2, indicates that less uncertainty should be considered when determining insignificant radionuclides and exposure pathways. Therefore, analyses of LLBP exposure scenarios should be considered when determining whether a radionuclide or pathway is insignificant and can be removed from detailed analysis (i.e., if a radionuclide is significant to dose for a LLBP exposure scenario such as the resident gardener scenario, then the radionuclide should be analyzed for in Final Status Survey (FSS) and in detailed dose analysis; this does not preclude use of surrogate ratios for HTD radionuclides

that are important to dose for LLBP exposure scenarios if approved by the NRC). See also RSI-9 requesting information on LLBP exposure scenarios.

HDI has reconsidered the methodology for evaluation of insignificant radionuclides and concluded that the results of subgrade concrete characterization presented in RSI-6 represent the most comprehensive and representative data appropriate for evaluation of Oyster Creek radionuclides of concern, radionuclide ratios, and insignificant dose contributors.

License Termination Plan Enclosure 6, Oyster Creek Nuclear Generating Station Below Grade Structures Radiological Characterization Report, documents the concrete characterization campaign performed to identify the nature and extent of radiological contamination in several Oyster Creek subgrade structures that will remain in place following decommissioning activities. The analytical results from the concrete characterization campaign were used in the development of Technical Support Document (TSD) No. 25-032, "Radionuclides of Concern in Support of the Oyster Creek Station License Termination Plan", which is included with Oyster Creek License Termination Revision 1 submittal as Enclosure X.

As documented in the response to RSI-3, additional characterization activities to determine the horizontal and vertical extent of contamination were performed in areas of concern identified in the HSA as having been potentially impacted by historical leaks and spills. Technical Support Document 24-111, "Soil Core Bores - Characterization Survey Plan for Oyster Creek Nuclear Generating Station", includes the plan for the additional focused surface and subsurface soil characterization campaign. The characterization campaign obtained samples of surface soil in addition to subsurface soil samples at incremental depths of up to 20 feet. Selected surface and subsurface soil samples were analyzed for the full suite of 21 Oyster Creek – specific ROCs. The results of the additional surface and subsurface soil analyses are summarized in Chapter 2 of Revision 1 of the Oyster Creek LTP.

Additional horizontal and vertical extent of contamination will be performed as necessary to plan radiological remediation. Remedial action support surveys will be performed to determine the adequacy of remediation and prepare for Final Status Survey. Continuing characterization will be performed as restrictions related to accessibility and background levels are eliminated and potential contamination from demolition and waste hauling activities are identified and investigated. Post-remediation, Oyster Creek will reassess the need for detailed HTD analysis as part of the Final Status Survey (FSS) planning process, ensuring that the final site conditions are thoroughly assessed and compliant with release criteria.

HDI has evaluated the additional concerns identified in "Rationale" items 8(a) through 8(d) associated with RSI-8 and offers the following clarifications:

Rationale 8(a)

Co-60 represented over 99% of the total dose in the resident farmer and building occupancy scenarios. Given Co-60's significant contribution and its role as an activation product, it is an appropriate proxy for other radionuclides unavailable in the DandD code. Most of the radionuclides in question, except Ba-133 and Sm-146, share similar properties with Co-60, decaying through electron capture or internal transition, and are expected to contribute minimally to the overall dose. While Ba-133 is a fission product, its low dose constant compared to Cs-137 supports its limited impact on overall dose calculations. Given Co-60's

dominant contribution to dose, it was used as an indicator radionuclide for calculating the dose contributions of these other radionuclides, and this approach remains technically sound based on current modeling.

Rationale 8(b)

Oyster Creek LTP Chapter 2 presents the results of extensive concrete characterization of subgrade structures including the results of full suite analyses for many of the wall and floor samples obtained at various depths.

TSD 25-032 evaluates the results of concrete samples that were analyzed for the 21 radionuclides in the initial suite of radionuclides of concern (ROCs) identified in Technical Basis Document (TBD) 20-6002-1362, “Radionuclide Selection for DCGL Development Oyster Creek Station Site Characterization Project”. TSD 25-032 refines the initial ROCs into a final set of radionuclides of concern for use during final status survey (FSS). Radionuclide mixture fractions are established for the initial ROCs, and the results are used to eliminate some radionuclides as insignificant contributors (IC) to dose. Additionally, surrogate ratios were determined for the hard-to-detect ROCs.

Rationale 8(c)

HDI has concluded that the analyses of subgrade concrete represent the most comprehensive, representative and conservative approach for the evaluation of the relative impact of the 21 Oyster Creek ROCs, including Sr-90.

Rationale 8 (d)

As described in the HDI response to RSI-8(a), RSI-8(b) and RSI8(c) above, HDI has concluded that the analyses of subgrade concrete for the 21 Oyster Creek radionuclides of concern represent the most comprehensive, representative and conservative approach for the evaluation of significant and insignificant dose contributors. The nuclide fractions and insignificant contributors will be used in the evaluation of the dose consequences of Less Likely But Plausible scenarios documented in the response to RSI-9.

RSI-9

Provide the LLBP exposure scenario results outlined in the OCNGS LTP to support the staff's risk informed decision making. HDI has chosen the industrial scenario for its assessment, assumes the soil may be arable, deselected specific radionuclides, and eliminated the groundwater pathway from the dose assessment within the industrial scenario. HDI's analysis should demonstrate that the radionuclide or pathway must be insignificant for all exposure scenarios considered (e.g., residential scenarios as well as the proposed industrial scenario) in order to justify the use of the industrial scenario.

Rationale:

The LLBP analysis is used to risk-inform the decision about the industrial scenario selection. As explained in NUREG-1757, Vol 2, Rev. 2, "If the licensee bases its compliance exposure scenario on reasonably foreseeable land use scenarios which are not clearly bounding, the licensee should also identify LLBP land use scenarios. These are scenarios that could lead to higher doses compared to the reasonably foreseeable land use scenario used to demonstrate compliance with the LTR (license termination rule) criteria. The evaluation of LLBP exposure scenarios ensures that, if land uses other than the reasonably foreseeable land use were to occur in the future, unacceptably high risks would not result."

HDI Response to RSI-9

The compliance scenario selected for the OCNGS site is an Industrial Use (IU) scenario. In addition to the compliance scenario, HDI also evaluated the potential impact of two less likely but plausible (LLBP) exposure scenarios: Residential and Recreational. Due to possessing fewer open pathways, the recreational scenario is bounded by the residential scenario. The residential scenario is evaluated to determine the potential dose impact on a critical receptor 30 years after license termination, resulting from a future change in land-use for the OCNGS site.

For each dose-significant radionuclide of concern (ROC), doses under the IU scenario resulting from an initial soil concentration of 1 pCi/g were calculated across all media, summed, and scaled using the NRC's 25 mrem/year criterion for unrestricted release. The resulting soil concentrations were decay-adjusted assuming a 30 year period between license termination and possible transition to a residential LLBP land use.

As shown in LTP Table 6-4, comparing the decay-adjusted concentrations to the dose-equivalent concentrations under the LLBP Residential scenario demonstrates that, if the OCNGS site were to be released at soil concentrations meeting the 25 mrem/year limit under the IU scenario, the residual soil concentrations would meet the unrestricted use criteria under the LLBP Residential scenario 30 years later.

In addition to this evaluation, HDI assessed a hypothetical open drinking water pathway using untreated site groundwater as the drinking water source under the IU scenario. Although this scenario is extremely unlikely, it was conservatively evaluated to support the risk-informed decision further. The analysis shows that, even with the addition of an onsite well as the source for drinking water, there is no significant impact on dose to a hypothetical receptor. This conclusion is supported by the following:

- Tritium is the only radionuclide detected in OCNGS groundwater over several decades of monitoring;
- While tritium is mobile, its contribution to dose under any plausible drinking water exposure scenario is negligible;
- Other ROCs have not been detected in groundwater or are considered immobile and unlikely to migrate to receptor points.

In summary, HDI's evaluation demonstrates that the selected Industrial Use scenario is both reasonable and bounding in comparison to LLBP scenarios, including residential use and use of site groundwater as a drinking water source.