Nuclear Regulatory Commission Decommissioning Oversight

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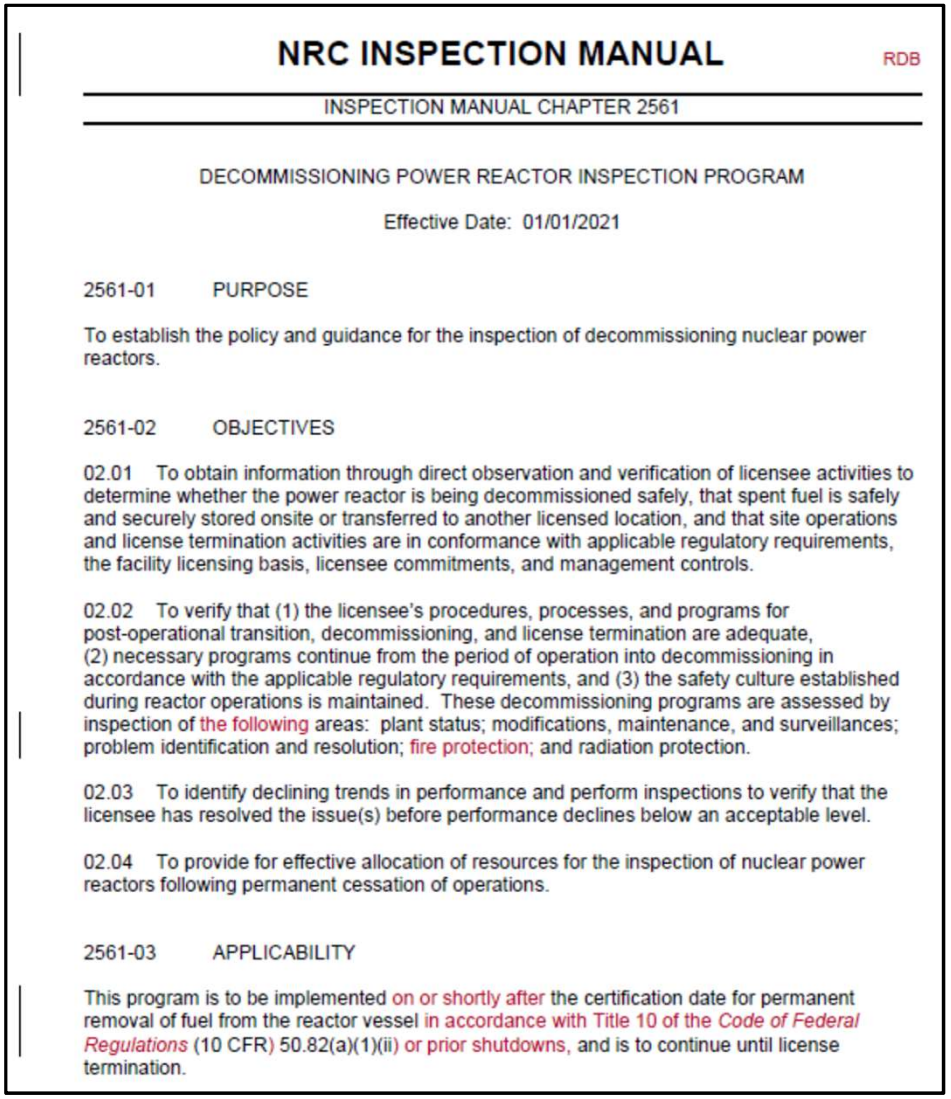

NRC INSPECTION MANUAL

RDB

INSPECTION MANUAL CHAPTER 2561

DECOMMISSIONING POWER REACTOR INSPECTION PROGRAM

Effective Date: 01/01/2021

2561-01 PURPOSE

To establish the policy and guidance for the inspection of decommissioning nuclear power reactors.

2561-02 OBJECTIVES

02.01 To obtain information through direct observation and verification of licensee activities to determine whether the power reactor is being decommissioned safely, that spent fuel is safely and securely stored onsite or transferred to another licensed location, and that site operations and license termination activities are in conformance with applicable regulatory requirements, the facility licensing basis, licensee commitments, and management controls.

02.02 To verify that (1) the licensee's procedures, processes, and programs for post-operational transition, decommissioning, and license termination are adequate, (2) necessary programs continue from the period of operation into decommissioning in accordance with the applicable regulatory requirements, and (3) the safety culture established during reactor operations is maintained. These decommissioning programs are assessed by inspection of the following areas: plant status; modifications, maintenance, and surveillances; problem identification and resolution; fire protection; and radiation protection.

02.03 To identify declining trends in performance and perform inspections to verify that the licensee has resolved the issue(s) before performance declines below an acceptable level.

02.04 To provide for effective allocation of resources for the inspection of nuclear power reactors following permanent cessation of operations.

2561-03 APPLICABILITY

This program is to be implemented on or shortly after the certification date for permanent removal of fuel from the reactor vessel in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.82(a)(1)(ii) or prior shutdowns, and is to continue until license termination.

NRC's oversight activities (i.e., what they look at when) are governed by its Inspection Manual Chapter 2561, "Decommissioning Power Reactor Inspection Program."

This NRC inspection program becomes applicable when an owner certifies to the NRC that all fuel has been permanently removed from the reactor vessel.

IMC 2561 Estimated Inspection Resources

ESTIMATED (DIRECT AND INDIRECT) INSPECTION HOURS (CORE IPs)

Core IP	Title
37801	Safety Reviews, Design Changes, and Mods at PSRs
40801	Problem Identification and Resolution at PSRs
60801	Spent Fuel Pool Maintenance, Surveillance, and Safety at PSRs
64704	Fire Protection Program
71801	Decommissioning Performance and Status Reviews at PSRs
83750	Occupational Radiation Exposure
83801	Inspection of Remedial and Final Surveys at PSRs
84750	Radioactive Waste Treatment, and Effluent and Environmental Monitoring
86750	Solid Radioactive Waste Management and Transportation of Radioactive Materials

NRC routinely conducts nine inspection procedures at permanently shutdown reactors (PSRs) along with security checks and for-cause inspections (e.g., allegation response.)

Because New York is an NRC Agreement State, State employees may accompany NRC inspectors during these inspections. Anything identified by State employees would be processed, if applicable, by the NRC's inspection and enforcement processes.

NOTES:

1 - Multiply estimated hours by 1.5 for multi-unit decommissioning sites

2 - These are estimated hours only and may be changed to reflect actual inspection needs

3 - For decommissioning facilities co-located with an operating unit, radiation protection and other site programs will be reviewed by the resident inspector(s)

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Owners are allowed to change how they conduct activities without prior NRC review and approval – as long as the proposed change remains within safety boundaries previously authorized by the NRC. IP 37801 reviews evaluations performed by owners for proposed changes to verify that prior NRC approval was not required.

IP 37801 also assesses training provided to workers for evaluating proposed changes to ensure they are properly qualified for this important task.

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Owners are required to find safety problems and fix them in a timely and effective manner. IP 40801 examines the corrective action program to assess whether the owner is complying with this regulatory requirement.

Ineffective problem identification and resolution enables problems to accumulate with time. Effective problem identification and resolution preserves the necessary safety margins.

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Under IP 60801, NRC inspectors examine areas such as how well the chemistry of the spent fuel pool water is maintained to protect against corrosion degradation of the fuel rods, how well the system used to cool the spent fuel pool water is operated and maintained, the reliability of the instruments installed to warn worker of lowering spent fuel pool water level or increasing water temperature.

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Under IP 64704, NRC inspectors examine controls over storage of combustible materials, staffing and training of fire brigade workers, reliability of fire detection and suppression equipment, and integrity of fire barriers installed to prevent a fire from spreading into adjacent areas.

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IP 71801 provides the NRC with a high level evaluation of how an owner is conducting decommissioning efforts. NRC inspectors examine budgets, staffing levels, training, and performance results to determine how well the owner is managing the decommissioning activities.

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NRC inspectors under IP 83750 examine whether the owner is properly controlling worker access to radiation areas. The NRC inspectors also examine how effectively radiation hazards are being identified and workers protected against unnecessary radiation exposures.

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IMC 2561 Estimated Inspection Resources

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40801	Problem Identification and Resolution at PSRs
60801	Spent Fuel Pool Maintenance, Surveillance, and Safety at PSRs
64704	Fire Protection Program
71801	Decommissioning Performance and Status Reviews at PSRs
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83801	Inspection of Remedial and Final Surveys at PSRs
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86750	Solid Radioactive Waste Management and Transportation of Radioactive Materials

NRC inspectors under IP 83801 review radiological surveys conducted by the owner after decommissioning activities to verify that residual reactivity levels are within acceptable levels. The NRC also conducts its own sampling and analysis to confirm the results provided by the owner.

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IMC 2561 Estimated Inspection Resources

ESTIMATED (DIRECT AND INDIRECT) INSPECTION HOURS (CORE IPs)

Core IP	Title
37801	Safety Reviews, Design Changes, and Mods at PSRs
40801	Problem Identification and Resolution at PSRs
60801	Spent Fuel Pool Maintenance, Surveillance, and Safety at PSRs
64704	Fire Protection Program
71801	Decommissioning Performance and Status Reviews at PSRs
83750	Occupational Radiation Exposure
83801	Inspection of Remedial and Final Surveys at PSRs
84750	Radioactive Waste Treatment, and Effluent and Environmental Monitoring
86750	Solid Radioactive Waste Management and Transportation of Radioactive Materials

Under IP 84750, NRC inspectors assess the owner's Radiological Environmental Monitoring Program by verifying that releases of radioactivity to the air and water are monitored and controlled to less than the limits in federal regulations, by verifying proper calibration of radiation monitoring equipment, by verifying the proper location and operation of offsite sampling stations, by verifying adequate quality control of laboratory processes analyzing radiation samples, and by evaluating the implementation of the Groundwater Protection Initiation program.

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IMC 2561 Estimated Inspection Resources

ESTIMATED (DIRECT AND INDIRECT) INSPECTION HOURS (CORE IPs)

Core IP	Title
37801	Safety Reviews, Design Changes, and Mods at PSRs
40801	Problem Identification and Resolution at PSRs
60801	Spent Fuel Pool Maintenance, Surveillance, and Safety at PSRs
64704	Fire Protection Program
71801	Decommissioning Performance and Status Reviews at PSRs
83750	Occupational Radiation Exposure
83801	Inspection of Remedial and Final Surveys at PSRs
84750	Radioactive Waste Treatment, and Effluent and Environmental Monitoring
86750	Solid Radioactive Waste Management and Transportation of Radioactive Materials

Under IP 84750, NRC inspectors examine how solid radioactive materials are stored onsite, how solid radioactive materials are packaged for transport, and how solid radioactive materials are shipped to a licensed disposal facility.

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IMC 2561 Estimated Inspection Resources

ESTIMATED (DIRECT AND INDIRECT) INSPECTION HOURS (CORE IPs)

Core IP	Title	Cat 1 Post-Operation Transition Phase
37801	Safety Reviews, Design Changes, and Mods at PSRs	58 - 72
40801	Problem Identification and Resolution at PSRs	52 - 77
60801	Spent Fuel Pool Maintenance, Surveillance, and Safety at PSRs	32 - 48
64704	Fire Protection Program	8 - 24
71801	Decommissioning Performance and Status Reviews at PSRs	84 - 150
83750	Occupational Radiation Exposure	48 - 72
83801	Inspection of Remedial and Final Surveys at PSRs	Varies
84750	Radioactive Waste Treatment, and Effluent and Environmental Monitoring	32 - 48
86750	Solid Radioactive Waste Management and Transportation of Radioactive Materials	58 - 86

NOTES:

1 - Multiply estimated hours by 1.5 for multi-unit decommissioning sites

2 - These are estimated hours only and may be changed to reflect actual inspection needs

3 - For decommissioning facilities co-located with an operating unit, radiation protection and other site programs will be reviewed by the resident inspector(s)

The NRC's decommissioning oversight program changes as the activities progress from permanent reactor shutdown to license termination.

Category 1 covers the transition period between reactor operation and commencement of decommissioning activities.

Note that the inspection hours are for a site with one reactor. For sites with multiple reactors, like Indian Point, the inspection hours are 1.5 times higher.

Thus, the 32 to 48 hours for IP 84750 translate to 48 to 72 hours at Indian Point.

IMC 2561 Estimated Inspection Resources

ESTIMATED (DIRECT AND INDIRECT) INSPECTION HOURS (CORE IPs)

Core IP	Title	Cat 1 Post-Operation Transition Phase
37801	Safety Reviews, Design Changes, and Mods at PSRs	58 - 72
40801	Problem Identification and Resolution at PSRs	52 - 77
60801	Spent Fuel Pool Maintenance, Surveillance, and Safety at PSRs	32 - 48
64704	Fire Protection Program	8 - 24
71801	Decommissioning Performance and Status Reviews at PSRs	84 - 150
83750	Occupational Radiation Exposure	48 - 72
83801	Inspection of Remedial and Final Surveys at PSRs	Varies
84750	Radioactive Waste Treatment, and Effluent and Environmental Monitoring	32 - 48
86750	Solid Radioactive Waste Management and Transportation of Radioactive Materials	58 - 86

The inspection hours cover direct and indirect inspection efforts, not just "eyeball" time at the site.

A typical inspection consists of three phases:

1) **Planning – Inspectors review plant-specific and industry records to identify the samples to be examined.**
2) **Implementation – The inspectors review documents, perform walkdowns of the site, and interview workers.**
3) **Evaluation and Reporting – Results from walkdowns and document reviews are evaluated against regulatory requirements and documented in an inspection report.**

The inspection hours include all three phases.

NOTES:

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3 - For decommissioning facilities co-located with an operating unit, radiation protection and other site programs will be reviewed by the resident inspector(s)

IMC 2561 Estimated Inspection Resources

ESTIMATED (DIRECT AND INDIRECT) INSPECTION HOURS (CORE IPs)

Core IP	Title	Cat 1	Cat 2
		Post-Operation Transition Phase	Actively Decommissioning (DECON), Fuel in the Spent Fuel Pool
37801	Safety Reviews, Design Changes, and Mods at PSRs	58 - 72	26 - 40
40801	Problem Identification and Resolution at PSRs	52 - 77	52 - 77
60801	Spent Fuel Pool Maintenance, Surveillance, and Safety at PSRs	32 - 48	8 - 30
64704	Fire Protection Program	8 - 24	32 - 48
71801	Decommissioning Performance and Status Reviews at PSRs	84 - 150	74 - 136
83750	Occupational Radiation Exposure	48 - 72	48 - 72
83801	Inspection of Remedial and Final Surveys at PSRs	Varies	Varies
84750	Radioactive Waste Treatment, and Effluent and Environmental Monitoring	32 - 48	32 - 48
86750	Solid Radioactive Waste Management and Transportation of Radioactive Materials	58 - 86	58 - 86

Category 2 covers commencement of decommissioning activities.

With all the fuel out of the reactor vessel and into the spent fuel pool, monitored during Category 1, the level of effort needed to ensure the spent fuel pool remains safe decreases.

But with dismantling of some systems and structures and de-energization of others, the fire protection oversight ramps up to reflect the potentially increased fire hazard.

NOTES:

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IMC 2561 Estimated Inspection Resources

ESTIMATED (DIRECT AND INDIRECT) INSPECTION HOURS (CORE IPs)

Core IP	Title	Cat 1	Cat 2	Cat 3
		Post-Operation Transition Phase	Actively Decommissioning (DECON), Fuel in the Spent Fuel Pool	Decommissioning (DECON), No Fuel in the Spent Fuel Pool
37801	Safety Reviews, Design Changes, and Mods at PSRs	58 - 72	26 - 40	8 – 16
40801	Problem Identification and Resolution at PSRs	52 - 77	52 - 77	52 - 77
60801	Spent Fuel Pool Maintenance, Surveillance, and Safety at PSRs	32 - 48	8 - 30	0
64704	Fire Protection Program	8 - 24	32 - 48	14 - 22
71801	Decommissioning Performance and Status Reviews at PSRs	84 - 150	74 - 136	66 - 124
83750	Occupational Radiation Exposure	48 - 72	48 - 72	48 - 72
83801	Inspection of Remedial and Final Surveys at PSRs	Varies	Varies	Varies
84750	Radioactive Waste Treatment, and Effluent and Environmental Monitoring	32 - 48	32 - 48	14 - 22
86750	Solid Radioactive Waste Management and Transportation of Radioactive Materials	58 - 86	58 - 86	20 - 70

NOTES:

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Category 2 covers decommissioning activities after all spent fuel has been placed in dry storage.

NRC's oversight focus and resources continue to change as the decommissioning progresses.

IMC 2561 Estimated Inspection Resources

ESTIMATED (DIRECT AND INDIRECT) INSPECTION HOURS (CORE IPs)

Core IP	Title	Cat 1	Cat 2	Cat 3	Cat 8
		Post-Operation Transition Phase	Actively Decommissioning (DECON), Fuel in the Spent Fuel Pool	Decommissioning (DECON), No Fuel in the Spent Fuel Pool	Final Status Surveys Underway, No Fuel in the Spent Fuel Pool
37801	Safety Reviews, Design Changes, and Mods at PSRs	58 - 72	26 - 40	8 – 16	4 - 14
40801	Problem Identification and Resolution at PSRs	52 - 77	52 - 77	52 - 77	6 - 10
60801	Spent Fuel Pool Maintenance, Surveillance, and Safety at PSRs	32 - 48	8 - 30	0	0
64704	Fire Protection Program	8 - 24	32 - 48	14 - 22	1 - 12
71801	Decommissioning Performance and Status Reviews at PSRs	84 - 150	74 - 136	66 - 124	11 - 67
83750	Occupational Radiation Exposure	48 - 72	48 - 72	48 - 72	24 - 36
83801	Inspection of Remedial and Final Surveys at PSRs	Varies	Varies	Varies	149 - 161
84750	Radioactive Waste Treatment, and Effluent and Environmental Monitoring	32 - 48	32 - 48	14 - 22	10 - 20
86750	Solid Radioactive Waste Management and Transportation of Radioactive Materials	58 - 86	58 - 86	20 - 70	12 - 20

Categories 4-7 address the SAFSTOR option where the decommissioning is held off for up to 50 years – an option not pursued at Indian Point.

With the final surveys performed to obtain license termination being the primary activity in Category 8, NRC's inspection focus and resources correspond.

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Examples of violations reported by NRC's decommissioning oversight inspections include:

Oyster Creek (NJ): During transfer of spent fuel into a dry cask on February 24, 2021, a fitting with a history of breaking failed, allowing radioactively contaminated water to leak and cause an unplanned radiation dose to a worker. The violation involved failing to correct a problem to prevent its recurrence. (ML21132A064)

Pilgrim (MA): A package of radioactive waste was shipped to a waste disposal facility on January 19, 2021, with a manifest that misreported its total radioactivity content by 40%. (ML21133A273)

Peach Bottom Unit 1 (PA): On November 10, 2020, the NRC issued a violation for failing to conduct a radiological survey of all accessible portions of the exclusion area and failing to inspect the area below the containment vessel for potential water accumulation. (ML20315A407)

Zion (IL): On March 18, 2020, the NRC issued a violation for having placed concrete debris from demolition of plant buildings into a clean zone without ensuing the material was free of residual radioactivity. (ML20080J249)

Millstone Unit 1 (CT): On August 7, 2018, the NRC issued a violation because the dampers installed to relieve air pressure inside the reactor building (which houses the spent fuel pool) in event of a tornado were not being properly maintained. (ML21067A097)

Examples of violations reported by NRC's decommissioning oversight inspections include:

Humboldt Bay (CA): On May 21, 2019, the NRC issued a violation for failing to conduct daily response checks on the gamma spectroscopy instrument used for field surveys as required by the license termination plan. (ML19135A315)

San Onofre Unit 1 (CA): On November 30, 2018, workers failed to follow approved procedures when they removed tie down cables from the reactor pressure vessel canister in the wrong sequence. (ML19044A506)

LaCrosse (WI): After the tritium concentration in an onsite monitoring well indicated 24,200 pCi/L, the source was found to be the reactor building exhaust. During reactor operation between 1967 and 1987, neutron activation resulted in tritium becoming entrained in concrete. When demolition inside the reactor building began on November 20, 2017, tritium released from the concrete flowed through the reactor building vent. The vent was only four feet off the ground. Rain and melting snow carried tritium into the nearby monitoring well. The violation involved failure to adequately monitor and control radioactive effluents. (ML19045A237)

Zion (IL): On July 18, 2017, the NRC issued a violation for inaccuracies in the 2016 Annual Radiological Environmental Operating Report submitted to the NRC. The NRC inspectors found that the numbers in the report literally did not add up correctly. A corrected report was submitted. (ML17200C932)

Vermont Yankee (VT): On May 4, 2016, the NRC issued a violation for withdrawing decommissioning funds for an activity not directly related to decommissioning planning. (ML16125A036)

Examples of violations reported by NRC's decommissioning oversight inspections include:

Zion (IL): On February 16, 2016, the NRC issued a violation for failure to revise the cask handling procedures to specify an unloading method after the spent fuel pool, part of the original plan, become unavailable. (ML16047A002)

San Onofre (CA): On October 8, 2015, the NRC issued a violation for a modification to the makeup system for the spent fuel pool. The NRC-approved design featured systems and components designed to withstand design basis earthquake forces. Without NRC's approval, the design was modified to rely on non-earthquake resistant components. (ML15274A558)

Kewaunee (WI): On March 10, 2014, the NRC issued two violations – one for revising the emergency plan after cessation of reactor operations without NRC approval and the second for failing to adequately analysis on-shift staffing requirements during emergencies. (ML14069A225)

Indian Point Unit 1 (NY): On July 19, 2012, the NRC issued a violation for failure to perform semi-annual radiological surveys inside the Unit 1 containment since August 2011. (ML12205A417)

Rancho Seco (CA): On January 9, 2009, the NRC issued a violation for failure to properly block and brace a radioactively contaminated pipe being shipped by railcar to a disposal facility. The pipe shifted during transport and breached the sidewall of the gondola railcar. (ML090090386)