UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
OFFICE OF FEDERAL AND STATE MATERIALS
AND ENVIRONMENTAL MANAGEMENT PROGRAMS
WASHINGTON, DC 20555-0001

August 16, 2011

# NRC REGULATORY ISSUE SUMMARY 2011-09
# AVAILABLE RESOURCES ASSOCIATED WITH EXTENDED STORAGE OF LOW-LEVEL RADIOACTIVE WASTE

## ADDRESSEES

All U.S. Nuclear Regulatory Commission (NRC) licensees who provide for extended storage of Low-Level Radioactive Waste (LLRW), and all Radiation Control Program Directors and State Liaison Officers.

## INTENT

The NRC is issuing this Regulatory Issue Summary (RIS) to inform addressees of a consolidated list of available resources that will assist with the extended storage of LLRW and to provide a high-level summary of the type of information contained in the resources. No specific action or written response is required. The NRC is providing this RIS to Agreement States for their information and for distribution to their licensees, as appropriate.

## BACKGROUND

While there are no specific policy statements addressing extended LLRW storage, the Commission and staff have consistently recognized permanent disposal of LLRW as the preferred management strategy over extended storage (for example, see Staff Requirements Memorandum re: SECY-93-323, February 1, 1994 (Agencywide Documents Access and Management System Accession No. ML 080720112)). However, the uncertainty in the availability of access to LLRW disposal facilities for many licensees has posed an ongoing challenge. In response to these concerns, the NRC staff developed regulatory guidance documents and other resources to assist licensees in their efforts to safely store LLRW. In addition, the NRC staff has recognized the usefulness of resources developed by others (e.g., U.S. Department of Energy and the Electric Power Research Institute) in providing additional information related to the safe and secure extended storage of LLRW.

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## SUMMARY OF ISSUE

With assistance from a topical working group comprised of subject matter experts from NRC program offices, Agreement States, and industry and trade groups, the NRC staff has determined that the current guidance on the management of extended LLRW storage is adequate.

However, relevant information is not always readily available or easily accessible. To make this information more readily accessible, the NRC staff has consolidated and is providing access to the various guidance documents, generic communications, staff papers, and other resources considered to be useful for licensees storing LLRW.

The NRC staff will also provide access to a broader list of relevant materials on the NRC's public Web site at http://www.nrc.gov/waste/llw-disposal.html. There, soon after the release of this RIS, licensees and stakeholders will find a specific link for guidance and other reference material related to extended LLRW storage at the website as well. The NRC staff plans to continually update the information on the new link, based on evolving internal and external information.

## BACKFIT DISCUSSION

This RIS requires no action or written response. Any action on the part of addressees in accordance with the guidance contained in this RIS is strictly voluntary and, therefore, is not a backfit under any requirement. Consequently, the NRC staff did not prepare a backfit analysis for this RIS.

## *FEDERAL REGISTER* NOTIFICATION

The NRC did not publish in the *Federal Register* a notice of opportunity for public comment on this RIS because the RIS is informational and does not represent a departure from current regulatory requirements.

## CONGRESSIONAL REVIEW ACT

This RIS is not a rule as designated by the Congressional Review Act (5 U.S.C. §§ 801-886) and, therefore, is not subject to this Act.

## PAPERWORK REDUCTION ACT STATEMENT

This RIS does not contain information collections and, therefore, is not subject to the requirements of the Paperwork Reduction Act of 1995 (44 U.S.C. 3501, et seq.).

## CONTACT

This RIS requires no specific action or written response. If you have any questions about this summary, please contact the technical contact listed below or the appropriate NRC regional office.

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Enclosures:
1. Consolidated List of Guidance Documents
2. History of Low-Level Radioactive Waste Storage
3. References
4. List of Generic Communications Issued



**List of Recently Issued Office of Federal and State Material and Environmental Management Programs Generic Communications**

| Date | GC No. | Subject | Addressees |
|---|---|---|---|
| 05/25/10 | RIS-2010-04 | Monitoring the Status of Regulated Activities During a Pandemic | All holders of operating licenses for nuclear power reactors and research and test reactors under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," except those that have ceased operations and have certified that fuel has been permanently removed from the reactor vessel and have no spent fuel stored on-site. All U.S. Nuclear Regulatory Commission (NRC) fuel cycle facilities licensed under 10 CFR Part 40, "Domestic Licensing of Source Material" or 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material" and gaseous diffusion plants certified under 10 CFR Part 76, "Certification of Gaseous Diffusion Plants." All holders of site-specific licenses for independent spent fuel storage installations (ISFSIs) under the provisions of 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-level Radioactive Waste, and Reactor-related Greater than Class C Waste," and all holders of 10 CFR Part 50 licenses with ISFSIs under the general license provisions of 10 CFR Part 72. All NRC materials licensees authorized to possess Category 1 or Category 2 quantities of radioactive materials, under the provisions of 10 CFR Parts 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," 40, and 70. |
| 09/10/10 | RIS-2010-09 | Radiation Safety Officers For Medical-Use Licenses Under 10 CFR Part 35 | All U.S. Nuclear Regulatory Commission (NRC) medical-use licensees, NRC master material licensees, Agreement State Radiation Control Program Directors, and State Liaison Officers. |
| 01/25/11 | RIS-2011-01 | NRC Policy On Release Of Iodine-131 Therapy Patients Under 10 CFR 35.75 To Locations Other Than Private Residences | All U.S. Nuclear Regulatory Commission (NRC) medical-use licensees, NRC master material licensees, Agreement State Radiation Control Program Directors, and State Liaison Officers. |

Note: This list contains the six most recently issued generic communications, issued by the Office of Federal and State Materials and Environmental Management Programs (FSME). A full listing of all generic communications may be viewed at the NRC public website at the following address: http://www.nrc.gov/reading-rm/doc-collections/gen-comm/index.html

**List of Recently Issued Office of Federal and State Material and Environmental Management Programs Generic Communications**

| Date | GC No. | Subject | Addressees |
|---|---|---|---|
| 11/19/2010 | IN-2010-24 | Notice of Possible Source Leakage During Non-Routine Maintenance on a Gammacell 40 Irradiator | All academic Type A broad scope licensees; all medical institutions; all self shielded irradiators less than or equal to 10,000 cues licensees; all Radiation Control Program Directors and State Liaison Officers. |
| 04/27/2011 | IN-2011-11 | Reporting Requirement for Heat and Smoke Detector Failures in 10 CFR Part 36 Irradiators | All holders of irradiator licenses issued by the U.S. Nuclear Regulatory Commission under to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 36, "Licensees and Radiation Safety Requirements for Irradiators," Agreement State Radiation Control Program Directors and State Liaison Officers |
| 01/21/10 | RIS-2010-02 | The Global Threat Reduction Initiative (GTRI) Federally Funded Voluntary Security Enhancements for High-Risk Radiological Material | All holders of operating licenses for nuclear power reactors and research and test reactors under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," except those that have ceased operations and have certified that fuel has been permanently removed from the reactor vessel and have no spent fuel stored on-site. All U.S. Nuclear Regulatory Commission (NRC) fuel cycle facilities licensed under 10 CFR Part 40, "Domestic Licensing of Source Material" or 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material" and gaseous diffusion plants certified under 10 CFR Part 76, "Certification of Gaseous Diffusion Plants." All holders of site-specific licenses for independent spent fuel storage installations (ISFSIs) under the provisions of 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-level Radioactive Waste, and Reactor-related Greater than Class C Waste," and all holders of 10 CFR Part 50 licenses with ISFSIs under the general license provisions of 10 CFR Part 72. All NRC materials licensees authorized to possess Category 1 or Category 2 quantities of radioactive materials, under the provisions of 10 CFR Parts 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," 40, and 70. |



**Consolidated List of Guidance Documents, Staff Papers, Generic Communications, and Other Resources to Assist Extended Storage of Low-Level Radioactive Waste**

The following discussions, related to specific licensed activities, provide a high-level summary of information beneficial to the extended storage of Low-Level Radioactive Waste (LLRW). The discussions allude to guidance and other reference material for reactor licensees (both power and non-power), materials, and fuel cycle licensees, fuel cycle licensees storing large quantities of depleted uranium, and future reprocessing facility licensees that might need to store LLRW. The referenced material is intended to facilitate the safe, secure storage of LLRW.

Power Reactors:

All power reactors licensed by the U.S. Nuclear Regulatory Commission (NRC) pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," regardless of where they are in their life cycle (licensing, operations, or decommissioning), should anticipate the need for life-of-plant management for all accumulated or anticipated LLRW. The means of accomplishing life-of-plant LLRW management are likely to vary with individual plant needs and circumstances. LLRW management may include direct or indirect shipment for permanent disposal at a disposal facility licensed under 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," or equivalent Agreement State regulations; collocation of LLRW from multiple plants for extended storage at one plant under an amended 10 CFR Part 50 license; collocation of LLRW from one or more plants at an offsite facility licensed under 10 CFR Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," or equivalent Agreement State regulations; life-of-plant storage of LLRW with no disposal pathway; or arrangements with third-party vendors for offsite management.

SECY-94-198, "Review of Existing Guidance Concerning the Extended Storage of Low-Level Radioactive Waste," dated August 1, 1994 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML071640462), contains the most up-to-date and complete discussion of LLRW storage at Nuclear Power Plant (NPP) sites. SECY-94-198 clarifies the guidelines in Generic Letter (GL) 81-38, "Storage of Low-Level Radioactive Wastes at Power Reactor Sites," dated November 10, 1981 (ADAMS Accession No. ML031110064). Specifically, SECY- 94-198 notes that there is no 5 year time limit on LLRW storage; no requirement for a separate 10 CFR Part 30 license for LLRW storage; and, in instances where no changes in facility or procedures as described in the safety analysis report are involved, there is no requirement for a separate safety review under 10 CFR 50.59, "Changes, Tests, and Experiments."

Regulatory Issue Summary (RIS) 2008-32, "Interim Low-Level Radioactive Waste Storage at Reactor Sites," dated December 30, 2008 (ADAMS Accession No. ML082190768), summarized information that had been provided in previous staff documents and generic communications.

RIS 2008-32 also acknowledged that Electric Power Research Institute (EPRI) 1018644, "Guidelines for Operating an Interim On-Site Low-Level Radioactive Waste Storage Facility-Revision 1," issued February 2009 (publicly available at www.epri.com) is generally consistent with NRC guidelines. RIS 2008-32 refers to a draft version of the EPRI document, however, there were no significant changes in the final. These documents address all major elements critical to the safe operation of an LLRW storage facility at an operating NPP, including waste classification, packaging, recordkeeping, and inspections, as well as startup and shutdown considerations.

Current guidance related to the design (and construction) of in plant LLRW storage facilities in NPPs appears in Regulatory Guide 1.143 "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water Cooled Nuclear Power Plants," Rev. 2, dated November 2001 (ADAMS Accession No. ML013100305).

Additional insights related to the construction and operation of LLRW storage facilities from an inspection and licensing perspective at NPPs is found in Inspection Procedure (IP) 71124.08, "Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation," dated December 2, 2009 (ADAMS Accession No. ML092190672), and NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Chapter 11, "Radioactive Waste Management," Appendix 11.4-A, "Design Guidance for Temporary Storage of Low-Level Radioactive Waste" (ADAMS Accession No. ML070710397). SECY-94-198 also contains a limited amount of information related to design bases.

Appendix 11.4-A of NUREG-0800 also contains minimum security considerations necessary for the storage of LLRW outside the NPP protected area.

NUREG-1757, "Consolidated Decommissioning Guidance: Decommissioning Process for Materials Licensees," Volume 1 (ADAMS Accession No. ML032530410) contains additional information that may be useful regarding the extended storage of NPP-decommissioning generated LLRW. This information is relevant to the continued storage of LLRW during the decommissioning process for which permanent disposal is problematic because of limited disposal access. Plant-specific requirements for such storage may also be incorporated into licenses in the form of license conditions and in plant-specific defueled safety analysis reports.

Regulatory requirements specifically related to the storage of NPP-related greater than Class C (GTCC) LLRW are in 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste."

The following additional resources relate to the safe, secure extended storage of LLRW at NPPs:

- IP 84101, "Radioactive Waste Management," dated December 30, 1991.
- IP 84750, "Radioactive Waste Treatment and Effluent and Environmental Monitoring," dated March 15, 1994.



24. NUREG-1556, Volume 15, "Consolidated Guidance About Materials Licenses: Guidance About Changes of Control and About Bankruptcy Involving Byproduct, Source, or Special Nuclear Materials Licenses," U.S. Nuclear Regulatory Commission, November 2000 (ADAMS Accession No. ML003778305).

25. NUREG-1757, "Consolidated Decommissioning Guidance," Volume 1, "Decommissioning Process for Materials Licensees," Revision 2, U.S. Nuclear Regulatory Commission, September 2006 (ADAMS Accession No. ML032530410).

26. NUREG/CR-4062, "Extended Storage of Low-Level Radioactive Waste: Potential Problem Areas," U.S. Nuclear Regulatory Commission, December 1985 (ADAMS Accession Nos. ML080710258, ML093421424).

27. NUREG/CR-5569, "Health Physics Positions Data Base," U.S. Nuclear Regulatory Commission, February 1994 (ADAMS Accession No. ML093220108).

28. Regulatory Issue Summary (RIS) 08-012, "Considerations for Extended Interim Storage of Low-Level Radioactive Waste by Fuel Cycle and Materials Licensees," U.S. Nuclear Regulatory Commission, May 9, 2008 (ADAMS Accession No. ML073330725).

29. RIS 08-032, "Interim Low-Level Radioactive Waste Storage at Reactor Sites," U.S. Nuclear Regulatory Commission, December 30, 2008 (ADAMS Accession No. ML082190768).

30. 40 CFR Part 266, Subpart N, "Conditional Exemption for Low-Level Mixed Waste Storage, Treatment, Transportation, and Disposal," U.S. Environmental Protection Agency.

31. "Tools for Decommissioning Funding Plans," Washington Department of Health ( http://www.doh.wa.gov/ehp/rp/materials/rmliclab.htm).

32. Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants," Revision 2, Nov. 2001 (ADAMS Accession No. ML013100305).

12. SECY-93-323, "Withdrawal of Proposed Rulemaking To Establish Procedures and Criteria for On-Site Storage of Low-Level Radioactive Waste After January 1, 1996," U.S. Nuclear Regulatory Commission, November 29, 1993 (ADAMS Accession Nos. ML080720112, ML080720113).

13. SECY-94-198, "Review of Existing Guidance Concerning the Extended Storage of Low-Level Radioactive Waste," U.S. Nuclear Regulatory Commission, August 1, 1994 (ADAMS Accession No. ML071640462).

14. SECY-03-0223, "Rulemaking Plan: Assured Isolation Facilities," U.S. Nuclear Regulatory Commission, December 24, 2003 (ADAMS Accession No. ML033430241).

15. SECY-05-0024, "Annual Review of Need for Rulemaking on Low-Level Waste Storage," U.S. Nuclear Regulatory Commission, January 31, 2005 (ADAMS Accession No. ML043360188).

16. SECY-06-0193, "Annual Review of the Need for Rulemaking and/or Regulatory Guidance on Low-Level Radioactive Waste (LLRW) Storage," U.S. Nuclear Regulatory Commission, September 6, 2006 (ADAMS Accession No. ML061730187).

17. SECY-07-0183, "Annual Review of the Need for Rulemaking and/or Regulatory Guidance on Low-Level Radioactive Waste Storage," U.S. Nuclear Regulatory Commission, October 22, 2007 (ADAMS Accession No. ML072500106).

18. SECY-08-0124, "Annual Review of the Need for Rulemaking and/or Regulatory Guidance on Low-Level Radioactive Waste Storage," U.S. Nuclear Regulatory Commission, August 29, 2008 (ADAMS Accession No. ML081970503).

19. SECY-09-0188, "Annual Review of the Need for Rulemaking and/or Regulatory Guidance on Low-Level Radioactive Waste Storage," U.S. Nuclear Regulatory Commission, December 31, 2009 (ADAMS Accession No. ML093200008).

20. SECY-10-0164, "Annual Review of the Need for Rulemaking or Regulatory Guidance on Extended Low-Level Radioactive Waste Storage," U.S. Nuclear Regulatory Commission, December 23, 2010 (ADAMS Accession No. ML103090031).

21. Staff Requirements Memorandum (SRM)/SECY-02-0127, "Proposed Response to State of Ohio on Its Assured Isolation Storage Facility Draft Rules," U.S. Nuclear Regulatory Commission, September 5, 2002. (ADAMS Accession No. ML022480322).

22. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Section 11.4, "Solid Waste Management System," Revision 3, U.S. Nuclear Regulatory Commission, March 2007 (ADAMS Accession No. ML070710397).

23. NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," U.S. Nuclear Regulatory Commission, February 1996 (ADAMS Accession No. ML042430055).



- IP 84850, "Radioactive Waste Management—Inspection of Waste Generator Requirements of 10 CFR Part 20 and 10 CFR Part 61," dated December 22, 2008.
- IP 84900, "Low-Level Radioactive Waste Storage," dated December 22, 2008.
- IP 86750, "Solid Radioactive Waste Management and Transportation of Radioactive Materials," dated March 15, 1994.

Non-Power Reactors (Research and Test Reactors and Other Reactors Used for Purposes Other Than Generation of Power):

Considerations related to the development of storage capacity as part of the licensing of non-power reactors appear in NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," issued February 1996, Section 11.2, "Radioactive Waste Management Program" (ADAMS Accession No. ML042430055).

Additional material that may relate to extended storage considerations for LLRW generated by the operation and decommissioning of non-power reactors includes the following:

- SECY-94-198, "Review of Existing Guidance Concerning the Extended Storage of Low-Level Radioactive Waste," U.S. Nuclear Regulatory Commission, August 1, 1994.
- RIS 2008-12, "Considerations for Extended Interim Storage of Low-Level Radioactive Waste by Fuel Cycle and Materials Licensees," U.S. Nuclear Regulatory Commission, May 9, 2008.
- RIS 2008-32, "Interim Low-Level Radioactive Waste Storage at Reactor Sites," U.S. Nuclear Regulatory Commission, December 30, 2008.
- NUREG-1757, "Consolidated Decommissioning Guidance: Decommissioning Process for Materials Licensees," Volume 1, Revision 2, U.S. Nuclear Regulatory Commission, September 2006.

Materials and Fuel Cycle Licensees:

The NRC originally provided generally applicable recommendations related to the extended storage of LLRW by all materials and fuel cycle licensees in Information Notice (IN) 90-09, "Extended Interim Storage of Low-Level Radioactive Waste by Fuel Cycle and Materials Licensees," issued February 1990. SECY-94-198 updated and clarified this information. The NRC specifically developed RIS 2008-12 (ADAMS Accession No. ML073330725) to reaffirm and update information contained in IN 90-09. These documents provide materials licensees with information related to general design considerations and operational aspects of LLRW storage, including waste form, waste package integrity, physical environment and challenges, contaminant release, financial assurance, and security, as well as licensing considerations for a discrete LLRW storage facility.

There is a particular concern related to the need to store disused radioactive sealed sources because of their small size and portability, as well as the lack of disposal options available for

them. IN 93-50, "Extended Storage of Sealed Sources," dated July 8, 1993 (ADAMS Accession No. ML031070481), contains specific considerations related to the storage of radioactive sealed sources.

IP 84900 and IP 84850 (cited above) contain information related to inspection procedures for the storage of LLRW resulting from the use of radioactive materials.

Additional information about LLRW storage by materials licensees can be found in:

- NUREG-1556, Volume 15, "Consolidated Guidance About Materials Licenses: Guidance About Changes of Control and About Bankruptcy Involving Byproduct, Source, or Special Nuclear Materials Licenses" (ADAMS Accession No. ML003778305) which, although not providing information specific to the extended storage of LLRW, does contain useful information for licensees facing financial difficulty and potential bankruptcy.

- Office of Federal and State Materials and Environmental Management Programs LLRW toolbox (http://nrc-stp.ornl.gov/llrw.html).

Fuel Cycle Facilities Managing Large Quantities of Depleted Uranium Hexafluoride:

Some fuel cycle facilities involved in the uranium enrichment process may be required to store large quantities of Depleted Uranium Hexafluoride ($DUF_6$) awaiting deconversion to a more stable (disposal-ready) form. The U.S. Department of Energy (DOE) has significant experience in dealing with such material. DOE guidance related to storage of $DUF_6$ cylinders is relevant to specific licensees and is usually incorporated in facility license applications. Further, NRC is currently considering whether additional safety measures may be required for the disposal of large quantities of Depleted Uranium (DU). The outcome of these deliberations may affect the need for continued storage of $DUF_6$, notwithstanding its chemical form.

Additional information related to the extended storage of LLRW at fuel cycle facilities is in DOE Order 435.1, "Radioactive Waste Management," Change 1, dated August 28, 2001 (ADAMS Accession Nos. ML101590125, ML110800217).

Reprocessing Facilities:

As the Nation's policy regarding the reprocessing of spent nuclear fuel evolves, statutory and regulatory changes may lead to previously unanticipated LLRW waste streams for which disposal is problematic. This could lead to the need for storage of a whole new type of LLRW.

Reprocessing could lead to the creation of new types of LLRW that might then need to be stored. While it is likely that current guidance would be sufficient to address the storage of this waste, such a conclusion is premature without more detail and analysis.



**References**

1. DOE/LLW-146, "Annotated List of Regulation and Guidance Applicable to Temporary Storage of Commercial Low-Level Radioactive Waste, U.S. Department of Energy, April 1992 (ADAMS Accession No. ML11193A041).

2. DOE Order 435.1, "Radioactive Waste Management," Change 1, U.S. Department of Energy, August 28, 2001.

3. Generic Letter (GL) 81-38, "Storage of Low Level Radioactive Wastes at Power Reactor Sites," U.S. Nuclear Regulatory Commission, November 10, 1981 (ADAMS Accession No. ML031110064); Clarification, January 31, 1991 (ADAMS Accession No. ML103470309).

4. GL 85-14, "Commercial Storage at Power Reactor Sites of Low-Level Radioactive Waste Not Generated by the Utility," U.S. Nuclear Regulatory Commission, August 1, 1985 (Legacy Library 9111210185[1]).

5. Information Notice (IN) 89-13, "Alternate Waste Management Procedures in Case of Denial of Access to Low-Level Waste Disposal Sites," U.S. Nuclear Regulatory Commission, February 8, 1989 (Legacy Library 8902070339).

6. IN 90-09, "Extended Interim Storage of Low-Level Radioactive Waste by Fuel Cycle and Materials Licensees," U.S. Nuclear Regulatory Commission, February 5, 1990 (ADAMS Accession No. ML031130300).

7. IN 93-50, "Extended Storage of Sealed Sources," U.S. Nuclear Regulatory Commission, July 8, 1993 (ADAMS Accession No. ML031070481).

8. IN 94-23, "Guidelines to Hazardous Mixed Waste Generators on the Elements of a Mixed Waste Program," U.S. Nuclear Regulatory Commission, March 25, 1994 (ADAMS Accession No. ML031060489).

9. SECY-80-511, "Storage of Low-Level Radioactive Waste at Power Reactor Sites, U.S. Nuclear Regulatory Commission, December 1980 (ADAMS Accession No. ML112150093).

10. SECY-81-383, "Storage of Low-Level Radioactive Wastes at Power Reactor Sites," U.S. Nuclear Regulatory Commission, June 19, 1981 (Legacy Library 8107200129).

11. SECY-90-318, "Low-Level Radioactive Waste Policy Amendments Act Title Transfer and Possession Provisions," U.S. Nuclear Regulatory Commission, September 12, 1990 (Legacy Library 9009250218).

[1] Available by contacting NRC Public Document Room located at NRC Headquarters at One White Flint North, 11555 Rockville Pike, Rockville, MD 20853, Room OWFN-1 F21, 301-415-4737.

or procedures are involved. The Commission did not formally respond to SECY-94-198 through an SRM. Therefore, it became and remains the accepted staff position. Further, the information provided in SECY-94-198 remains consistent with subsequent resources discussed elsewhere in this document.

In 1994, Barnwell reopened to licenses countrywide after a 6-month hiatus. However, the imminent closure of the facility once again in 2008 prompted the NRC staff to reassess the adequacy of its LLRW guidelines for materials and fuel cycle licensees as well as reactor licensees.

On May 9, 2008, the staff issued Regulatory Issue Summary (RIS) 2008-12, "Considerations for Extended Interim Storage of Low-Level Radioactive Waste by Fuel Cycle and Materials Licensees" (ADAMS Accession No. ML073330725). The RIS essentially updated information contained in IN 90-09 and supplemented it with recent information related to security requirements. It also adjusted certain recommendations related to waste form to allow for increased flexibility in future disposition options. On December 30, 2008, the staff issued RIS 08-32, "Interim Low-Level Radioactive Waste Storage at Reactor Sites" (ADAMS Accession No. ML082190768), reiterating information that it had provided in SECY-94-198 as well as in the generic communications noted above. RIS 08-32 also provided staff acknowledgement of storage guidelines prepared for reactors by the Electric Power Research Institute (EPRI), "Guidelines for Operating an Interim On-Site Low-Level Radioactive Waste Storage Facility," Revision 1, issued February 2009.

The NRC and others have developed numerous documents directly related or associated with extended interim storage of LLRW. The NRC information includes NUREGs, inspection procedures, position statements, policy statements, and tools on the NRC Web site. Other non-NRC resources include U.S. Department of Energy orders, U.S. Environmental Protection Agency regulations, State regulations and guidance, and industry guidance (e.g., EPRI guidelines). This paper discusses the usefulness of these documents in supplementing guidance for extended LLRW storage during the entire regulatory life cycle.



Other Relevant Guidance:

NRC staff plans to update other relevant guidance in the LLRW storage electronic database found at http://www.nrc.gov/waste/llw-disposal.html. At that site a specific link will be made available with information related to extended storage of LLRW. There, users will be able to find an up-to-date bibliography of reference material related to extended storage of LLRW for all licensing circumstances. This site will contain links or ADAMS accession numbers for references, as well as a brief description of the documents. Where applicable, the reference will be tied to particular elements that contribute to safe, secure LLRW storage.

**History of Low-Level Radioactive Waste Storage Guidance and Information**

The U.S. Nuclear Regulatory Commission (NRC) has always considered permanent disposal as the preferred means of Low-Level Radioactive Waste (LLRW) management. However, as early as the late 1970s, uncertainties about the continued availability of access to LLRW disposal facilities prompted the NRC staff to consider the need for regulatory requirements for extended storage of LLRW, particularly at nuclear power plants. In anticipation of this need, the staff prepared SECY-80-511, "Storage of Low-Level Radioactive Wastes at Power Reactor Sites," issued December 1980. In SECY-80-511, the staff outlined criteria and guidelines for both extended interim storage and long-term storage. The former would require a safety review under Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59, "Changes, Tests, and Experiments," and the latter would require an application for a separate license under 10 CFR Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," and an environmental report to the Office of Nuclear Material Safety and Safeguards (NMSS). SECY-80-511 proposed a storage time limit of 5 years. The Commission's Staff Requirements Memorandum (SRM) to SECY-80-511, dated December 10, 1980, prompted staff to prepare SECY-81-383, "Storage of Radioactive Wastes at Power Reactor Sites," dated June 19, 1981. In an SRM dated October 9, 1981, the Commission approved staff plans for a review of applications for additional storage capacity for LLRW at power reactor sites and directed the staff to notify licensees by letter. The letter stipulated the possible need for regulatory action by both the Office of Nuclear Reactor Regulation and NMSS, depending on licensee circumstances and the length of storage. The letter also included a technical position entitled "Radiological Safety Guidance for Onsite Contingency Storage Capacity." In the technical position, the staff presented general guidelines for design, operations, container integrity, monitoring, and maintenance of LLRW storage facilities. The guidance also suggested the need to establish waste inventory limits and the importance of recordkeeping.

On November 11, 1981, the NRC issued guidelines to all holders of, and applicants for, operating licenses and construction permits in the form of Generic Letter (GL) 81-38, "Storage of Low-Level Radioactive Wastes at Power Reactor Sites," dated November 10, 1981 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML031110064). Consistent with SECY-80-511 (and SECY-81-383), the guidelines stated that waste should not be stored for a duration that exceeds 5 years without obtaining a 10 CFR Part 30 license. GL 81-38 directs licensees to apply for a Part 30 license if the design capacity for a new storage facility exceeds the waste generation projected for 5 years. GL 81-38 further stipulates that proposed increases in storage capacity for LLRW generated by normal reactor operation and maintenance require the licensee to evaluate the safety of the proposal under the provisions of 10 CFR 50.59.

In anticipation of possible interest by other licensees to seek storage of offsite-generated LLRW at power reactor sites, the staff issued GL 85-14, "Commercial Storage at Power Reactor Sites of Low-Level Radioactive Waste Not Generated by the Utility," on August 1, 1985. In that communication, the staff enumerated specific items to consider for such storage while strongly encouraging generators to continue to ship LLRW for disposal to the maximum extent practicable.



On February 8, 1989, the staff issued Information Notice (IN) 89-13, "Alternate Waste Management Procedures in Case of Denial of Access to Low-Level Waste Disposal Sites." Unlike communications discussed previously, the staff addressed IN 89-13 to all specific licensees, not just power reactor licensees. While IN 89-13 did not relate specifically to LLRW storage, IN 89-13 did relate to waste management practices, including waste minimization, decay-in-storage, and other practices that might facilitate management of stored waste in case disposal access was denied. The staff had recently issued emergency site LLRW access regulations (10 CFR Part 62, "Criteria and Procedures for Emergency Access to Non-Federal and Regional Low-Level Waste Disposal Facilities"), which represented the NRC's implementation of authority that the NRC obtained under the Low-Level Radioactive Waste Policy Amendments Act of 1985. IN 89-13 represented one attempt to minimize the likelihood that the emergency access authority would need to be implemented.

In anticipation of the potential closure of LLRW facilities or limitations in access as a result of milestones associated with the Low-Level Radioactive Waste Policy Amendments Act of 1985, the NRC staff prepared guidelines to assist materials licensees with the management of LLRW in storage. On February 5, 1990, the NRC staff issued IN 90-09, "Extended Interim Storage of Low-Level Radioactive Waste by Fuel Cycle and Materials Licensees" (ADAMS Accession No. ML031130300). These guidelines were similar to those in GL 81-38.

Subsequently, the NRC issued recommendations specific to the storage of sealed radioactive sources (IN 93-50, "Extended Storage of Sealed Sources," dated July 8, 1993 (ADAMS Accession No. ML031070481)), and radioactive mixed waste (IN 94-23, "Guidance to Hazardous, Radioactive, and Mixed Waste Generators on the Elements of a Waste Minimization Program," dated March 25, 1994 (ADAMS Accession No. ML031060489)).

The staff sent a proposed rulemaking package (SECY-92-168) to the Commission on May 8, 1992, that would have essentially prohibited onsite extended storage of LLRW after January 1, 1996. In response to numerous comments by States and other stakeholders on the negative impacts of such a rulemaking, it was withdrawn in SECY-93-323, "Withdrawal of Proposed Rulemaking to Establish Procedures and Criteria for On-Site Storage of Low-Level Radioactive Waste after January 1, 1996," dated November 29, 1993 (ADAMS Accession Nos. ML080720112, ML080720113).

In 1994, in response to the closure of the Barnwell LLRW disposal facility to generators in most States, the staff sought to consolidate storage recommendations and correct perceived requirements that had been introduced in earlier guidance documents. In SECY-94-198, "Review of Existing Guidance Concerning the Extended Storage of Low-Level Radioactive Waste," dated August 1, 1994 (ADAMS Accession No. ML071640462), the staff clarified its positions related to storage time limits, and, for power reactor licensees, the need for incremental safety reviews under 10 CFR 50.59 for storage and eliminated the guidance suggesting a separate 10 CFR Part 30 license was required for extended storage facilities. As stated above, SECY-94-198 also consolidated storage guidelines for various types of licenses (GL 81-38, GL 85-14, IN 89-13, and IN 90-09, all discussed above) into one document. SECY-94-198 reiterated that a separate 10 CFR Part 30 license is not required for LLRW storage at reactor sites; furthermore, there is no 5-year limit on storage, nor is there necessarily a requirement for a separate 10 CFR 50.59 review in instances where no changes in facility