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

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NTIS

November 10, 1981

TO ALL HOLDERS OF AND APPLICANTS FOR OPERATING LICENSES AND CONSTRUCTION PERMITS

SUBJECT: STORAGE OF LOW-LEVEL RADIOACTIVE WASTES AT POWER REACTOR SITES
(Generic Letter 81-38)

Gentlemen:

As a result of a reduction in waste disposal availability in the United States, many nuclear power reactor licensees are taking or are planning to take steps to provide for additional onsite storage of low-level radioactive wastes generated onsite. These steps range from storing packaged wastes in unused space to construction of new facilities for volume reduction and extended storage. The NRC has been considering the variety of plans which are underway and how they should be reviewed and approved.

Actions on waste storage can influence the development and implementation of final disposal plans by states, acting individually or on a regional basis, to establish additional disposal capacity. Some states have indicated to NRC that utilization of disposal services by nuclear power plant licensees is essential if disposal sites are to be developed by states or regional compacts. Thus, it is important that the NRC not take deliberate action that would hinder the establishment of additional disposal capacity by the states and yet, consistent with NRC regulatory safety requirements, permit necessary operational flexibility by its licensees. It is with these points in mind that the following guidance is provided.

For proposed increases in storage capacity for low-level waste generated by normal reactor operation and maintenance at power reactor sites, the safety of the proposal must be evaluated by the licensee under the provisions of 10 CFR 50.59. If (1) your existing license conditions or technical specifications do not prohibit increased storage, (2) no unreviewed safety question exists, and (3) the proposed increased storage capacity does not exceed the generated waste projected for five years, the licensee may provide the added capacity, document the 50.59 evaluation and report it to the Commission annually or as specified in the license.

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Radiological safety guidance has been developed by the staff for the design and operation of interim contingency low-level waste storage facilities. Necessary design features and administrative controls will be dictated by such factors as the waste form, concentrations of radioactive material in individual waste containers, total amount of radioactivity to be stored, and retrievability of waste. A copy of the guidance document is enclosed with this letter. This guidance shall be used in the design, construction and operation of your storage facility. In addition, the NRC will judge the adequacy of your 50.59 evaluation based on your compliance with the guidance. Please note also that IE Circular No. 80-19, dated August 22, 1980, provides information on preparing 50.59 evaluations for changes to radioactive waste treatment systems.

If you determine that an unreviewed safety question exists, authority for use should be requested through application to the Office of Nuclear Material Safety and Safeguards (NMSS) pursuant to 10 CFR 30, accompanied by an environmental evaluation that considers the incremental impact as related to reactor operations. Such application for a separate Part 30 license is for the administrative convenience of the Commission and is not intended to be substantively different than an application for amendment of the facility operating license. Application for use should also be accompanied by a showing that the storage provisions will not impact on the safety of reactor operations and will not foreclose alternatives for disposal of the wastes.

NMSS will notice the receipt of application in the Federal Register, offer an opportunity for public hearing if significant public interest is demonstrated, and will perform an environmental assessment to determine if the proposed activity will significantly affect the quality of the environment. Facility construction prior to the staff's determination would be carried out at the licensee's risk. Any license issued will be for a standard five-year term, renewable if continued need is demonstrated and if safety of continued storage is established. NRC licensing jurisdiction will be retained in Agreement States in accordance with 10 CFR 150.15(a)(1) for storage of low-level waste generated and stored onsite. Indemnity coverage will be provided under and in accordance with your existing indemnity agreement with the Commission.

If it is determined that the storage provisions could impact on the safety of reactor operations or an existing license condition or technical specification limit on the amount of waste storage, a change in the conditions of the reactor facility license may be necessary.

The provisions for added capacity should be used only for interim contingency storage, and low-level wastes should continue to be shipped to disposal sites to the extent practicable. The "Low Level Radioactive Waste Policy Act" of 1980 gives primary responsibility for the disposal of low-level waste to the states. Some states have initiated disposal plans, and we believe it is important that power reactor licensees, as major waste generators, work with and provide technical assistance and other support to assist individual states or regions in developing new disposal sites. You are encouraged to take an active role in the development of additional disposal sites.

Some licensees are considering the installation of major volume reduction processes, e.g., incineration, dehydration, or crystallization to substantially reduce the volume of waste for disposal. You are encouraged to examine the costs and benefits of such processes for your operations. However, notwithstanding the use of volume reduction, you are also encouraged to take an active role in the development of additional disposal sites.

For proposed increases in storage capacity for more than five years (long-term), the application and review procedures will be pursuant to 10 CFR 30 with consideration of container integrity and retrievability, volume reduction, influence on state planning for disposal, and implications of de facto onsite disposal. Any long-term license issued will be for a five-year, renewable term.

If you have any questions about these matters, please let us know.

Sincerely,

William J. Dircks
Executive Director
for Operations

Enclosure:
Guidance Document

cc: Service List

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NRC FORM 318 (10-80) NRCM 0240 OFFICIAL RECORD COPY USGPO: 1981—335-960

Distribution: Please see attached list

OCT 30 1981

MEMORANDUM FOR: William J. Dircks
Executive Director for Operations

FROM: John G. Davis, Director
Office of Nuclear Material Safety and Safeguards

SUBJECT: LETTER TO UTILITIES ON STORAGE OF LOW LEVEL WASTES AT REACTOR SITES (SECY-81-383)

Enclosed for your signature is a letter to power reactor licensees and applicants informing them of the NRC position on the establishment of onsite contingency storage for low level wastes. The letter is as revised and approved by the Commission (memorandum from the Secretary to you dated October 9, 1981 re: S81-383). The enclosure to the letter contains radiological safety guidance for the design, construction and operation of low level waste storage facilities as finalized by NRR.

Please note that this letter (first paragraph, page 2) states that licensees "shall" use the guidance in design, construction, and operation of the storage facility. As you know, recent emphasis to staff is that guidance does not constitute requirements. Staff prefers the use of the word "should" rather than "shall."

While the letter is aimed primarily at utilities with operating reactors, we believe that it is appropriate to send this generic letter to applicants and holders of CP's as well because of the general philosophy that it contains with respect to waste generation and storage.

After you have signed the letter, SP plans to transmit a copy of the letter to appropriate state officials.

(Signed) John G. Davis

John G. Davis, Director
Office of Nuclear Material Safety
and Safeguards

Enclosure:
Letter to power reactor licensees
and applicants

cc: H. R. Denton
G. W. Kerr
V. Stello

PLEASE SEE PREVIOUS CONCURRENCES ATTACHED

OFFICE	CONTACT:		FCAF	FCAF	FC	FC	NMSS
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DATE	42-74205		74205 10/26/81*	10/26/81*	10/26/81*	10/26/81*	10/30/81

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Enclosure

RADIOLOGICAL SAFETY GUIDANCE FOR ONSITE CONTINGENCY STORAGE CAPACITY

I. Introduction

The objective of this technical position is to provide guidance to licensees considering additional onsite low level radioactive waste storage capabilities. While it may be prudent and/or necessary to establish additional onsite storage capability, waste should not be placed in contingency storage if the ability to dispose of waste at a licensed disposal site exists. The shipping of waste at the earliest practicable time minimizes the need for eventual waste reprocessing due to possibly changing burial ground requirements, reduces occupational and non-occupational exposures and potential accident consequences, and in the event of burial ground closure, maximizes the amount of storage space available for use.

The duration of the intended storage, the type and form of waste, and the amount of radioactive material present will dictate the safeguards and the level of complexity required to assure public health and safety, and minimal risk to operating personnel. The longer the intended storage period, the greater the degree of controls that will be required for radiation protection and accident prevention. For purposes of this document, the duration of temporary waste storage is to be up to five (5) years. The magnitude of the onsite storage safety hazard is predicated on the type of waste being stored, the amount of radionuclides present, and how readily they might be transported into the environment. In general, it is preferable to store radioactive material in solid form. Under some circumstances, however, temporary storage in a liquid form may be desirable or required. The specific design and operation of any storage facility will be significantly influenced by the various waste forms, consequently, this document addresses wet waste, solidified wet waste and dry low level radioactive waste.

Guidance similar to that provided in this enclosure has been incorporated in NUREG-0800, NRC/NRR Standard Review Plan, July 1981, as Appendix 11.4-A to SRP 11.4, Solid Waste Management Systems.

II. General Information

Prior to any implementation of additional onsite storage, substantial safety review and environmental assessments should be conducted to assure adequate public health and safety and minimal environmental impact. The acceptance criteria and performance objectives of any proposed storage facility, or area, will need to meet minimal requirements in areas of design, operations, safety considerations and policy

considerations. For purposes of this technical position, the major emphasis will be on safety considerations in the storing, handling and eventual disposition of the radioactive waste. Design and operational acceptability will be based on minimal requirements which are defined in existing SRPs, Regulatory Guides, and industry standards for proper management of radioactive waste. Considerations for waste minimization and volume reduction will also have to be incorporated into an overall site waste management plan and the onsite storage alternative. Additional waste management considerations for ALARA, decontamination, and decommissioning of the temporary storage facility, including disposal, should be performed as early as possible because future requirements for waste forms may make stored wastes unacceptable for final disposition.

Facility design and operation should assure that radiological consequences of design basis events (fire, tornado, seismic event, flood) should not exceed a small fraction (10%) of 10 CFR Part 100, i.e., no more than a few rem whole body dose.

The added capacity would typically extend storage to accommodate no more than an amount of waste generated during a nominal five-year period. In addition, waste should not be stored for a duration that exceeds five-years. Storage of waste in excess of the quantities and duration described herein requires Part 30 licensing approval. The design capacity (ft^3, Ci) should be determined from historical waste generation rates for the station, considering both volume minimization/reduction programs and the need for surge capacity due to operations which may generate unusually large amounts of waste.

The five-year period is sufficient to allow licensees to design and construct additional volume reduction facilities (incinerators, etc.), as necessary, and then process wastes that may have been stored during construction. Regional state compacts to create additional low-level waste disposal sites should also be established within the next five years.

III. Generally Applicable Guidance

(a) The quantity of radioactive material allowed and the shielding configurations will be dictated by the dose rate criteria for both the site boundary and unrestricted areas onsite. The 40 CFR 190 limits will restrict the annual dose from direct radiation and effluent releases from all sources of uranium fuel cycle and 10 CFR Part 20.105 limits the exposure rates in unrestricted areas. Offsite doses from onsite storage must be sufficiently low to account for other uranium fuel cycle sources (e.g., an additional dose of $\leq$ 1 mrem/year is

not likely to cause the limits of 40 CFR 190 to be exceeded). Onsite dose limits associated with temporary storage will be controlled per 10 CFR Part 20 including the ALARA principal of 10 CFR 20.1.

(b) Compatibility of the container materials with the waste forms and with environmental conditions external to the containers is necessary to prevent significant container corrosion. Container selection should be based on data which demonstrates minimal corrosion from the anticipated internal and external environment for a period well in excess of the planned storage duration. Container integrity after the period of storage should be sufficient to allow handling during transportation and disposal without container breach.

Gas generation from organic materials in waste containers can also lead to container breach and potentially flammable/explosive conditions. To minimize the number of potential problems, the waste form gas generation rates from radiolysis, biodegradation, or chemical reaction should be evaluated with respect to container breach and the creation of flammable/explosive conditions. Unless storage containers are equipped with special vent designs which allow depressurization and do not permit the migration of radioactive materials, resins highly loaded with radioactive material, such as BWR reactor water cleanup system resins, should not be stored for a period in excess of approximately one year.

A program of at least periodic (quarterly) visual inspection of container integrity (swelling, corrosion products, breach) should be performed. Inspection can be accomplished by use of TV monitors; by walk-throughs if storage facility layout, shielding, and the container storage array permit; or by selecting waste containers that are representative of the types of waste and containers stored in the facility and placing them in a location specifically designed for inspection purposes. All inspection procedures developed should minimize occupational exposure. The use of high integrity containers (300 year lifetime design) would permit an inspection program of reduced scope.

(c) If possible, the preferred location of the additional storage facility is inside the plant protected area. If adequate space in the protected area is not available, the storage facility should be placed on the plant site and both a physical security program (fence, locked and alarmed gates/doors, periodic patrols) and a restricted area for radiation protection purposes should be established. The facility should not be placed in a location that

requires transportation of the waste over public roads unless no other feasible alternatives exist. Any transportation over public roads must be conducted in accordance with NRC and DOT regulations.

(d) For low level dry waste and solidified waste storage:

1. Potential release pathways of all radionuclides present in the solidified waste form shall be monitored as per 10 CFR 50, Appendix A. Surveillance programs shall incorporate adequate methods for detecting failure of container integrity and measuring releases to the environment. For outside storage, periodic direct radiation and surface contamination monitoring shall be conducted to insure that levels are below limits specified in 10 CFR 20.202, 20.205, and 49 CFR 173.397. All containers should be decontaminated to these levels or below before storage.

2. Provisions should be incorporated for collecting liquid drainage including provisions for sampling all collected liquids. Routing of the collected liquids should be to radwaste systems if contamination is detected or to normal discharge pathways if the water ingress is from external sources and remains uncontaminated.

3. Waste stored in outside areas should be held securely by installed hold down systems. The hold down system should secure all containers during severe environmental conditions up to and including the design basis event for this waste storage facility.

4. Container integrity should be assured against corrosion from the external environment; external weather protection should be included where necessary and practical. Storage containers should be raised off storage pads where water accumulation can be expected to cause external corrosion and possible degradation of container integrity.

5. Total curie limits should be established based on the design of the storage area and the safety features provided.

6. Inventory records of waste types, contents, dates of storage, shipment, etc., should be maintained.

IV. Wet Radioactive Waste Storage

(a) Wet radioactive waste will be defined as any liquid or liquid/solid slurry. For storage considerations, wet waste is further defined

as any waste which contains free liquid in amounts which exceed the requirements for burial as established by the burial ground licensing authority.

(b) The facility supporting structure and tanks should be designed to prevent uncontrolled releases of radioactive materials due to spillage or accident conditions.

(c) The following design objectives and criteria are applicable for wet radioactive waste storage facilities:

1. Structures that house liquid radwaste storage tanks should be designed to seismic criteria as defined in Standard Review Plan (Section 11.2). Foundations and walls shall also be designed and fabricated to contain the liquid inventory which might be released during a container/tank failure.

2. All tanks or containers should be designed to withstand the corrosive nature of the wet waste stored. The duration of storage under which the corrosive conditions exist shall also be considered in the design.

3. All storage structures should have curbs or elevated thresholds with floor drains and sumps to safely collect wet waste assuming the failure of all tanks or containers. Provisions should be incorporated to remove spilled wet waste to the radwaste treatment systems.

4. All tanks and containers shall have provisions to monitor liquid levels and to alarm potential overflow conditions.

5. All potential release pathways of radionuclides (e.g., evolved gases, breach of container, etc.) shall be controlled, if feasible, and monitored as per 10 CFR 50, Appendix A (General Design Criteria 60 and 64). Surveillance programs should incorporate adequate methods for monitoring breach of container integrity or accidental releases.

6. All temporarily stored wet waste will require additional reprocessing prior to shipment offsite; therefore, provisions should be established to integrate the required treatment with the waste processing and solidification systems. The interface and associated systems should be designed and tested in accordance with the codes and standards described in Standard Review Plan Section 11.

V. Solidified Radioactive Waste Storage

(a) Solidified radwaste for storage purposes shall be defined as that waste which meets burial site solidified waste criteria. For purposes of this document, resins or filter sludges dewatered to the above criteria will be defined under this waste classification/criteria.

(b) Any storage plans should address container protection as well as any reprocessing requirements for eventual shipment and burial.

(c) Casks, tanks, and liners containing solidified radioactive waste should be designed with good engineering judgment to preclude or reduce the probability of occurrence of uncontrolled releases of radioactive materials due to handling, transportation or storage. Accident mitigation and control for design basis events (e.g., fire, flooding, tornadoes, etc.) must be evaluated and protected against unless otherwise justified.

(d) The following design objectives and criteria are applicable for solidified waste storage containers and facilities:

1. All solidified radwaste should be located in restricted areas where effective material control and accountability can be maintained. While structures are not required to meet seismic criteria, protection should be afforded to insure the radioactivity is contained safely by use of good engineering judgment, such as the use of curbs and drains to contain spills of dewatered resins or sludges.

2. If liquids exist which are corrosive, proven provisions should be made to protect the container (i.e., special liners or coatings) and/or neutralize the excess liquids. If deemed appropriate and necessary, highly non-corrosive materials (e.g., stainless steel) should be used. Potential corrosion between the solid waste forms and the container should also be considered. In the case of dewatered resins, highly corrosive acids and bases can be generated which will significantly reduce the longevity of the container. The Process Control Program (PCP) should implement steps to assure the above does not occur; provisions on container material selection and precoating should be made to insure that container breach does not occur during temporary storage periods.

3. Provision should be made for additional reprocessing or repackaging due to container failure and/or, as required for

final transporting and burial as per DOT and burial site criteria. Contamination isolation and decontamination capabilities should be developed. When significant handling and personnel exposure can be anticipated, ALARA methodology should be incorporated as per Regulatory Guides 8.8 and 8.10.

4. Procedures should be developed and implemented for early detection, prevention and mitigation of accidents (e.g., fires). Storage areas and facility designs should incorporate good engineering features and capabilities for contingencies so as to handle accidents and provide safeguard systems such as fire detectors and suppression systems, (e.g., smoke detector and sprinklers). Personnel training and administrative procedures should be estabished to insure both control of radioactive materials and minimum personnel exposures. Fire suppression devices may not be necessary if combustible materials are minimal in the area.

V. Low Level Dry Waste Storage

(a) Low level dry waste is classified as contaminated material (e.g., paper, trash, air filters) which contains radioactive material dispersed in small concentrations throughout large volumes of inert material and contains no free water. Generally, this consists of dry material such as rags, clothing, paper and small equipment (i.e., tools and instruments) which cannot be easily decontaminated.

(b) Licensees should implement controls to segregate and minimize the generation of low level dry waste to lessen the impact on waste storage. Integration of Volume Reduction (VR) hardware should be considered to minimize the need for additional waste storage facilities.

(c) The following design objectives and criteria are applicable for low level dry waste storage containers and facilities.

1. All dry or compacted radwaste should be located in restricted areas where effective material control and accountability can be maintained. While structures are not required to meet seismic criteria, protection should be afforded to insure the radioactivity is contained safely by use of good engineering judgment.

2. The waste container should be designed to insure radioactive material containment during normal and abnormal occurrences. The waste container materials should not support combustion. The packaged material should not cause fires through spontaneous chemical reactions, retained heat, etc.

3. Containers should generally comply with the criteria of 10 CFR 71 and 49 CFR 170 to minimize the need for repackaging for shipment.

4. Increased container handling and personnel exposure can be anticipated, consequently, all ALARA methodology should be incorporated per Regulatory Guides 8.8 and 8.10.