# SPECIAL CONSIDERATIONS IN LOW-LEVEL RADWASTE PROCESSING AND DISPOSAL

J. Steger, Chairman
L. J. Mezga, Co-Chairman

# NRC LICENSING CRITERIA FOR PORTABLE RADWASTE SYSTEMS

John J. Hayes, Jr.
Meteorology and Effluent Treatment Branch
U.S. Nuclear Regulatory Commission
Washington, DC 20555

## ABSTRACT

The shortcomings of various components of the liquid and solid radwaste systems at nuclear power reactors has resulted in the contracting of the functions performed by these systems to various contractors who utilize portable equipment. In addition, some streams, for which treament was not originally anticipated, have been processed by portable equipment.

The NRC criteria applicable to portable liquid and solid radwaste systems is presented along with a discussion on what is required to provide an adequate 10 CFR Part 50.59 review for those situations where changes are made to an existing system. The criteria the NRC is considering for facilities which may intend to utilize portable incinerators is also presented.

## BACKGROUND

The failure of various components of the liquid radwaste system, in particular evaporators, and the failure of installed solid radwaste systems at nuclear power plants to operate to the degree of efficiency to which they were anticipated has resulted in the contracting of these functions to various contractors which utilize portable equipment to perform the operations. In August of 1978, the Government Accounting Office (GAO) had requested in their report EMD-78-101[1] that the NRC assure that there were no unanswered safety questions concerning contractor's portable waste solidification systems. The GAO was concerned that the portable systems were increasing the potential exposure of workers to unnecessary radiation and were causing unplanned releases of radioactivity to the environment. In addition, GAO charged that some systems were ineffectively solidifying waste. The NRC responded to the GAO recommendations in SECY-78-576[2] and requested that Exxon Nuclear Idaho Company, Incorporated, perform an evaluation on the safety aspects of portable solidification systems as they affect nuclear industry workers and the general public. The results of this study were reported in NUREG/CR-2731[3].

Inspections at operating reactors in 1980 revealed numerous instances in which licensees have failed to perform adequate safety evaluations to support changes made to the design and/or operation of facility radioactive waste treatment systems. These safety evaluations are required by 10 CFR Part 50.59 whenever changes are made in the facility as described in the Safety Analysis Report (SAR). The inadequacies of these evaluations resulted in unidentified radiological safety hazards occurring and for such situations to remain unevaluated and uncorrected. These inadequately evaluated system changes resulted in two system failures that caused an uncontrolled release of radioactivity to the environment.

The closing of low level waste burial sites and the actions taken by states to restrict the quantity of low level waste accepted has led utilities to consider various volume reduction techniques. One of the methods being considered is portable incineration.

This paper will discuss the NRC's criteria for portable radwaste systems, NRC guidance in preparing a proper 10 CFR 50.59 evaluation, and finally criteria the NRC is considering for portable radwaste incinerators which are being considered for a number of nuclear power plant applications.

## CRITERIA FOR PORTABLE RADWASTE SYSTEM

The guidance for changes to radwaste treatment systems is contained in the NRC's Office of Inspection and Enforcement Circular No. 80-18[4]. This guidance can be supplemented by that contained in Standard Review Plan (SRP) 11.4, Branch Technical Position (BTP) ETSB 11-3[5].

For all radioactive waste systems, the appropriate portions of 10 CFR 20, 30, 50, 71 and 100 are applicable, along with the facility Technical Specifications and 40 CFR 190, in determining compliance. Some of the specific criteria applicable to modification of radwaste systems include evaluation of:

(1) the system modifications against the seismic, quality group and quality assurance criteria of Regulatory Guide 1.143[6];

(2) the provisions for controlling releases of radioactive liquids as presented in Regulatory Guide 1.143;

(3) the radiological control of effluents evaluated against the criteria of SRP Section 11.5, "Process and Effluent Radiological Monitoring and Sampling Systems," and in Regulatory Guide 1.21;

(4) system design and operation to ensure that the radiological consequences of unexpected and uncontrolled releases of radioactivity that is stored or transferred in a waste system are a small fraction of the 10 CFR Part 100 guidelines which, for liquid releases, this limit is radionuclide concentrations less than Column 2, Table II, Appendix B of 10 CFR Part 20; and

(5) systems which could contain potentially explosive mixtures against the criteria in SRP 11.3, "Gaseous Waste Management System".

Plants which may utilize mobile (portable) solidification and/or dewatering systems should incorporate into the design and the use the following:

(1) ensure that the tanks containing wet wastes are limited to inplant installation and such tanks should not be a part of the portable system;

(2) limit the use of flexible piping to only those necessary interfaces with plant systems;

(3) hydrostatic testing of flexible piping in accordance with Regulatory Guide 1.143;

(4) location of systems on concrete pads with curbs and drainage provisions for containing radioactive spills and interfacing drains with the plant's liquid radwaste system; and

(5) ventilation systems with either self-contained filters or interface with the plant's ventilation exhaust system.

Regulatory Guide 1.143 seismic criteria is not applicable for structures housing solid waste systems.

## PROPER 10CFR50.59 EVALUATIONS

Before the portable radwaste systems may be installed, a proper 10 CFR 50.59 safety evaluation must be performed. The following discussion will present the details of what constitutes a proper 10 CFR 50.59 safety evaluation, in general and in particular, for a modification to a radwaste treatment system.

Paragraph (a)(1) of 10 CFR 50.59 allows a licensee to make changes to a nuclear facility and its operation as described in its SAR, without prior approval provided that a change in Technical Specifications is not involved or an "unreviewed safety question" does not exist. A proposed change is deemed to involve an unreviewed safety question if:

(1) the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety, previously evaluated in the SAR, may be increased;

(2) the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR may be created; or

(3) the margin of safety as defined in the basis, for any technical specification is reduced.

Paragraph (b) of 10 CFR 50.59 requires that records of changes made under the authority of paragraph (a)(1) be maintained. These records are required to include a written safety evaluation that provides the basis for determining whether an "unreviewed safety question" exists. Paragraph (b) also requires an Annual Report of such changes to the NRC.

Paragraph (c) of 10 CFR 50.59 requires that the proposed changes in Technical Specifications be submitted to the NRC as an application for license amendment, as well as proposed changes to the facility or procedures and the proposed conduct of tests that involve an "unreviewed safety question."

Maintenance activities that do not result in a permanent or a temporary change to the system or replace components with replacement parts procurred with the same or equivalent purchase specification, do not require a written safety evaluation to meet 10 CFR 50.59 requirements. However, if components described in the SAR are removed, component functions altered, substitute components utilized, or changes remain following the completion of a maintenance activity, then a safety evaluation to meet 10 CFR 50.59 requirements is required and any change must be reported to the NRC as required by paragraph (b) of 10 CFR 50.59.

For all cases requiring a written safety evaluation, the safety evaluation must set forth the basis and criteria used to determine that the proposed change does or does not involve an "unreviewed safety question." A simple statement of conclusion is not adequate, but must be supported by a written safety evaluation and the depth of the evaluation must be sufficient to determine whether or not an "unreviewed safety question" is involved. These evaluations and analyses must be reviewed and approved by an appropriate level of management before the proposed change is made. Typically, this is done by the plant nuclear safety review committee.

In the evaluation and analysis of the proposed change, the licensee must ensure that all potential safety hazards are identified and that corrective actions are taken to eliminate, mitigate, or control the hazards to an acceptable level. All realistic failure modes and/or malfunctions must be considered and protection provided commensurate with the potential consequences.

For any change in a plant's radioactive waste system, as described in the SAR, a safety evaluation is required in accordance with 10 CFR 50.59. In this evaluation and in the "unreviewed safety question" determination, the previously discussed evaluation criteria should be utilized. If the proposed modification, whether it be a design, operation, or test change, represents a departure from this evaluation criteria, then one of the following actions should be taken:

(1) modify the proposed change so that it meets the criteria;

(2) present sufficient data in the evaluation/determination to demonstrate the acceptability of the departure; or

(3) receive NRC approval prior to implementing the modification.

Administrative control specification 6.15 of the Radiological Effluent Technical Specification (RETS) now requires that all changes to the solid, liquid, and gaseous radwaste systems be documented in either the annual FSAR update or in the semi-annual effluent release report for the period in which the change took place.

## CRITERIA FOR PORTABLE INCINERATORS

The NRC is currently considering criteria which may be utilized in assessing the utilization of portable incinerators at nuclear power plants. In considering various criteria, the staff has found that the specific criteria which are applicable to modifications of other radwaste treatment systems are also applicable to portable incinerators. The

incinerator design should meet the quality group and quality assurance criteria of Regulatory Guide 1.143. If the system should involve radioactive liquids, then the provisions for controlling releases of such liquids should be in accordance with Regulatory Guide 1.143. The effluents from the incinerator should be monitored and sampled in accordance with the criteria of SRP 11.5. If an incinerator could contain a potentially explosive gas mixture, the system would be reviewed against the criteria in SRP 11.3. The incinerator would also be reviewed with respect to the fire protection criteria of BTP CMEB 9.5-1 of SRP 9.5.1.

The system design and operation would be reviewed to ensure that normal effluents from the incinerator would not result in the total plant effluents exceeding the design objective doses of Appendix I to 10 CFR Part 50 or the doses of 40 CFR 190. The system would also be reviewed to ensure that the unexpected and uncontrolled release of radioactivity stored in any component of the system does not result in liquid releases which would exceed the radionuclide concentrations of Column 2, Table II, Appendix B of 10 CFR 20 or result in gaseous releases which would result in a whole body dose of 0.5 rem or a thyroid dose of 1.5 rem.

It should be noted that for operating reactors to incinerate radioactive material, approval is required under 10 CFR 20.305. Near term operating license applicants may receive their approval to incinerate under their 10 CFR 50 application.

## SUMMARY

Guidance on the use of portable radwaste treatment systems may be found in the NRC publications cited here, IE Circular, BTP's, SRP's and regulatory guidance. The guidance for portable incinerators is essentially the same as for liquid and solid radwaste portable systems.

## REFERENCES


1. "Need for Greater Regulation of Commercial Low-Level Radioactive Waste," GAO Report EMD-78-101, August 1978.

2. Denton, H. R., "Response to GAO Recommendations on Need for Greater Regulatory Oversite of Commercial Low-Level Radioactive Waste," Memorandum to the Commissioners, SECY-78-576, November 6, 1978.

3. NUREG/CR-2731, "An Evaluation of the Safety Aspects of the Design and Operation of Temporary/Mobile Radiaoctive Waste Solidification Systems," F. N. McDonald and L. W. McClure, Exxon Nuclear Idaho Company, Inc., May 1982.

4. IE Circular No. 80-18, "10CFR50.59 Safety Evaluations for Changes to Radioactive Waste Treatment Systems," U.S. NRC, Office of Inspection and Enforcement, August 22, 1980.

5. Branch Technical Position ETSB 11-3, "Design Guidance for Solid Radioactive Waste Management Systems Installed in Light-Water-Cooled Nuclear Power Reactor Plants," Revision 2, July 1981.

6. Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures and Components Installed in Light-Water-Cooled Nuclear Power Plants," Revision 1, 1979.