

FERMI 2  
PROCESS CONTROL PROGRAM

Revision Summary:

- 1) Cancelled procedure SD-OP-090.
- 2) Added procedure SD-OP-090-48306, Process Control Program for Cement Solidification of Oil, Oily Sludges, and Oil Residues at Fermi II.

Implementation Plan:

- 1) This revision goes into effect upon approval.
- 2) Ongoing work may proceed using previous revision.
- 3) Procedures Coordination shall issue a Notice of New/Revised Procedures to communicate this change.
- 4) No additional training is required.

Attachments - None

Enclosures - None

ARMS - INFORMATION SERVICES

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## 1.0 INTRODUCTION

### 1.1 Purpose

The Fermi 2 Process Control Program provides reasonable assurance that all Radwaste processed at Fermi 2 will be processed so that the final product will be suitable for both transportation to a disposal facility and disposal at that facility.

- 1.1.1 The Fermi 2 Process Control Program contains/controls the sampling, analyses, testing and formulation determinations to be made to ensure that the processing and packaging of solid radioactive waste will be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61 and 71 plus State, Burial Site and other requirements governing the disposal of solid radioactive waste. Process parameters specified may include, but are not limited to, waste pH, oil content, water content, solids content, ratio of solidification agent to waste and/or necessary additives for each type of anticipated waste, and the acceptable boundary conditions for the process parameters shall be identified for each waste type, based on laboratory scale and full scale testing or experience.
- 1.1.2 Change Control - The Fermi 2 Process Control Program also specifies the controls over changes in waste processing methodologies to ensure that any revised methodology is adequate to meet the requirements of 1.1.1.
- 1.1.3 Reporting - The Fermi 2 Process Control Program specifies the required regulatory reports regarding solid waste shipments and changes to the solid radwaste processing system.
- 1.1.4 Records - The Fermi 2 Process Control Program specifies the required records regarding reviews performed for changes to the Program.

### 1.2 Regulatory Basis

- 1.2.1 10CFR20.311 d(3) requires that all radwaste generators conduct a quality control program to assure compliance with 10CFR61.55 and 61.56.
- 1.2.2 10CFR50, Appendix A, General Design Criterion 60, specifies that a nuclear power plant shall be designed to handle radioactive solid waste produced during normal reactor operation, including anticipated operational occurrences.
- 1.2.3 10CFR61.56 specifies minimum waste form requirements for all radwaste, as well as specifications for stability when this is required by regulations or disposal site criteria.
- 1.2.4 The Nuclear Regulatory Commission's Technical Position on Waste Form, Revision 1, provides guidance on waste form test methods and results acceptable to the NRC staff for implementing the 10CFR61.56 waste form requirements.

### 1.3 Administrative Controls

- 1.3.1 All waste processing methodologies requiring stability in accordance with reference 2.3 included in the Fermi 2 Process Control Program shall be in compliance with the Nuclear Regulatory Commission's Technical Position on Waste Form, Revision 1. In some cases, the Nuclear Regulatory Commission has granted interim approval to a methodology, pending final approval. It is acceptable to use such methodologies when accompanied with an NRC interim approval cover letter.
- 1.3.2 Licensee initiated changes to the Fermi 2 Process Control Program shall be processed and documented in accordance with Fermi 2 Technical Specification 6.13.2.

### 1.4 Semiannual Radioactive Effluent Release Report

- 1.4.1 Solid radwaste shipment data and discussions of major changes to the solid radioactive waste system shall be included in the Semiannual Radioactive Effluent Release Reports in accordance with Technical Specification 6.9.1.8.

### 1.5 Records

- 1.5.1 Reviews performed for changes to the Fermi 2 Process Control Program shall be retained in accordance with Technical Specification 6.10, Record Retention.

## 2.0 REFERENCES

- 2.1 NRC Technical Position on Waste Form, Revision 1
- 2.2 10CFR20, Standards for Protection against Radiation
- 2.3 10CFR61, Licensing Requirements for Land Disposal of Radiative Material
- 2.4 Fermi 2 10CFR61 Compliance Program Manual
- 2.5 Technical Specification 6.10, Record Retention
- 2.6 Technical Specification 6.13.2, Licensee-Initiated Changes to the PCP
- 2.7 Technical Specification 6.15, Licensee-Initiated Major Changes to Radioactive Liquid, Gaseous, and Solid Waste Treatment Systems
- 2.8 UFSAR Chapter 11, Radioactive Waste Management
- 2.9 NE-85-0722, Nuclear Engineering Letter to NRC concerning Fermi 2 Process Control Program
- 2.10 NUREG - 0800, Section 11.2, Liquid Waste Management Systems
- 2.11 NUREG - 0800, Section 11.4, Solid Waste Management Systems
- 2.12 Safety Evaluation 88-0186, Revision 1, Present Use of Radwaste System Equipment
- 2.13 Safety Evaluation 91-0015, Temporary Storage of Mixed Waste in the Onsite Storage Facility (OSSF)
- 2.14 Design Calculation 4945, UFSAR Update Analysis for the Present Radwaste System Operations
- 2.15 Generic Letter 81-38, Storage of Low-Level Radioactive Wastes at Power Reactor Sites
- 2.16 Regulatory Guide 1.143, Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants
- 2.17 Utility Nuclear Waste Management Group (UNWMG) PCP Guidelines, LLW-86-65
- 2.18 Chem-Nuclear Topical Report CNSI-2 (4313-01354-01) Mobile Cement Solidification System
- 2.19 Chem-Nuclear Waste Form Topical Report, WM 97, WM 98, WM 101
- 2.20 CNSI RDS-1000 Radioactive Waste Dewatering System Topical Report, RDS-25506-01-P-A, Revision 1
- 2.21 CNSI Procedure FO-AD-002, Operating Guidelines for Use of Polyethylene High Integrity Containers

- 2.22 CNSI Procedure FO-OP-032-483, Set Up and Operating Procedure for the RDS-1000 Unit at Detroit Edison - Fermi 2
- 2.23 CNSI Procedure SD-OP-003, Process Control Program for Solidification of Stable Waste Forms
- 2.24 CNSI Procedure SD-OP-048, Process Control Program and Operating Procedure for In-Situ Solidification of Suspended Objects
- 2.25 CNSI Procedure SD-OP-063, Set Up and Operating Procedure for the Cement Solidification Unit
- 2.26 NSI Procedure SD-OP-064, Operating Procedure for the Portable Cement Solidification Unit No. 125
- 2.27 CNSI Procedure SD-OP-090-48306, Process Control Program for Cement Solidification of Oil, Oily Sludges and Oil Residues at Fermi II.
- 2.28 CNSI Procedure SD-OP-097, Process Control Program for Cement Solidification of Unstable Waste
- 2.29 CNSI Procedure SD-OP-098, Waste Solidification in Chem-Nuclear Systems, Inc. Polyethylene High Integrity Container
- 2.30 Regulatory Guide 1.21, Measuring, Evaluating and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Material in Liquid and Gaseous Effluents from Light-Water-Cooled- Nuclear Power Plants, Revision 1, June 1974

### 3.0 RESPONSIBILITIES

- 3.1 The Superintendent of Radwaste/designee is responsible for the implementation of the Fermi 2 Process Control Program and ensuring the Vendors Process Control Program meets the requirements set forth by the NRC and that those Programs are approved by the OSRO prior to use.
- 3.2 The Radwaste Supervisor is responsible for interfacing with contracted vendors. The purpose of this interface is to ensure the timely and efficient processing of waste forms generated at Fermi 2.
- 3.3 All personnel working under this procedure shall know their responsibilities to the ALARA Program.
- 3.4 The Vendor and General Supervisor, Radwaste are to ensure that the general design of the processing equipment is in accordance with the vendors topical report and that this equipment is installed, and tested in accordance with Reference 2.25 for Solidification and 2.22 for Dewatering.
- 3.5 The Vendor and Radwaste Supervisor are to ensure that the chemicals and/or materials used in a particular waste processing method are equal to or better than that which is required by the Vendor's approved Process Control Program.

#### **4.0 DEFINITIONS**

##### **4.1 Batch**

An isolated quantity of feed waste to be processed having essentially constant physical and chemical characteristics (i.e., the amount of waste contained within a tank). If new waste is added to the waste being processed then a new batch is created and further sampling is required.

##### **4.2 Dry Active Waste (DAW)**

Any dry radioactive material (i.e. contaminated tools, equipment, clothing, trash, etc.)

##### **4.3 [ watering**

The process of removing liquids from wet radioactive waste so that the form of waste is suitable for disposal.

##### **4.4 Encapsulation**

The process of encapsulating, in cement, solid radioactive waste which is non-uniform in size and cannot normally be homogeneously mixed (i.e., filters, sources, etc.)

##### **4.5 Free Standing Liquid**

Liquid which is still visible after processing, or liquid drainable from the low point of a punctured container.

##### **4.6 High Integrity Container (HIC)**

A container which provides stability for the type of waste being processed in accordance with Reference 2.3.

##### **4.7 Prequalification Test Sample**

Test conducted on laboratory samples to demonstrate the ability to produce an acceptable waste form using the type of wet waste and solidification agent expected.

##### **4.8 Production Test Sample**

A sample used to demonstrate the ability of the onsite solidification agent and waste batch to produce an acceptable waste form using the parameters identified in the PCP.

##### **4.9 Waste Classification**

The determination of waste class as outlined in Reference 2.3 (2.4) by radionuclide isotopic analysis and/or scaling factors between easy-to-measure isotopes and the difficult-to-measure isotopes.



#### 4.10 Wet Radioactive Waste

Any radioactive liquid or liquid/solid slurry which does not meet the burial site requirements for free standing liquid (i.e. sludge, non-dewatered resin, evaporator bottoms, contaminated oil etc.)

5.0 LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE

- 5.1 Solid Radwaste shall stay within the Limiting Conditions for Operation in accordance with Technical Specification 3/4 11.3, Solid Radioactive Waste Treatment.

## 6.0 REPORTING REQUIREMENTS

### 6.1 Reporting Condition of Non-Acceptance

6.1.1 Documentation of the following will be required in accordance with FIP-RA1-01, "General Regulatory Reporting Requirements," and FIP-RA1-02, "Notifications."

1. The failure of high integrity containers used to ensure a stable waste form. Container failure can be evidenced by changed container dimensions, cracking, or damage resulting from mishandling (e.g., slopping or impacting against another object).
2. The misuse of high integrity containers, evidenced by a quantity of free liquid greater than 1% of container volume or other misuse as prohibited by 10CFR61.56.
3. The production of a solidified Class B or C waste form that has any of the following characteristics:
  - a. Contains free liquid in quantities exceeding 0.5% of the volume of the waste.
  - b. Contains waste with radionuclides in concentrations exceeding those considered during waste form qualification testing accepted by the regulatory agency, which could lead to errors in assessment of waste class.
  - c. Contains a significantly different waste loading than that used in qualification testing accepted by the regulatory agency.
  - d. Contains chemical ingredients not present in qualification testing accepted by the regulatory agency, and those quantities are sufficient to unacceptably degrade the waste product and cannot be pretreated prior to Solidification.
  - e. Shows instability as evidenced by crumbling, cracking, spalling, voids, softening, disintegration, nonhomogeneity or dimensional changes.
  - f. Evidence of processing phenomena that exceeded the limiting processing conditions identified in applicable topical reports on process control programs (e.g., foaming, temperature extremes, premature or slow hardening and production of a volatile material).

6.2 Solid radwaste shipment data and discussions of major changes to the solid radioactive waste system shall be included in the Semiannual Radioactive Effluent Release Reports in accordance with Technical Specification 6.9.1.8, Semiannual Radioactive Effluent Report.

6.3 Licensee-initiated major changes to the radioactive waste systems (liquid, gaseous, and solid) shall be reported in accordance with Technical Specification 6.15, Major Changes to Radioactive Liquid, Gaseous, and Solid Waste Treatment Systems.

## 7.0 PROCEDURE

### 7.1 General Requirements

- 7.1.1 All processing of radioactive waste shall be done under an approved Process Control Program for the type of waste being processed.
- 7.1.2 All solidification, dewatering and sampling activities performed inside the RCA shall have an RWP in accordance with FIP-RC1-01, "Accessing and Working in Radiologically Controlled Areas."
- 7.1.3 The Quality Control functions will be Audited by the Fermi 2 QA Department in accordance with FIP-AS1-01, "Audits and Surveillances."
- 7.1.4 All HICs used at Fermi 2 for disposal of radioactive waste will be approved for the type of waste being processed. This approval will be based on the chemical and physical limitations of the container. Each HIC will be certified that it meets the acceptance criteria set by the Certificate of Compliance.
- 7.1.5 Reference 2.4 provides instructions for developing scaling factors necessary for ensuring compliance with 10 CFR 61.
- 7.1.6 Preparation of manifest and shipping paperwork shall be in accordance with NPP-RC3-01, "Radwaste Shipping Operations."
- 7.1.7 All documents shall be maintained in accordance with FIP-RM1-01, "Records Management."
- 7.1.8 With solidification or dewatering not meeting disposal site and shipping and transportation requirements, take Action in accordance with Technical Specification 3/4 11.3, Solid Radioactive Waste Treatment.

### 7.2 Solidification Requirements

- 7.2.1 For high activity waste being solidified, where handling of the full sized Production Test Sample could result in personnel radiation exposure that is inconsistent with the ALARA principles, a reduced sample size (25 ml) may be used.
- 7.2.2 A Production Test Sample shall be solidified from at least every tenth solidification from the same batch.
- 7.2.3 As a minimum the PCP for stable Cement Solidification Process shall require annually:
  - 1. A Production Test Sample selected from the most recent production level solidification batch will be subjected to the testing requirements in Appendix A, Section II of the NRC Technical Position on Waste Form, Revision 1.
- 7.2.4 Unstable Waste shall meet the following criteria:
  - 1. Resist penetration

2. Free standing monolith
3. No free standing water

### 7.3 Dewatering Requirements

- 7.3.1 As a minimum the PCP for Dewatering shall include and/or reference documentation necessary to ensure the dewatering process and equipment being used will produce a waste form that will meet the disposal facilities requirement for free standing liquids.

### 7.4 Encapsulation Requirements

- 7.4.1 As a minimum the PCP for Encapsulation shall include and/or reference documentation necessary to ensure the Encapsulation process and equipment being used will produce a waste form that will meet the disposal facilities requirement as stated in step 7.2.4.

### 7.5 Solidification Process Control Program

#### 7.5.1 Sampling

1. Obtain a representative sample of the waste batch. This sample will be used to determine the actual process formulation for solidification. Record this information as required by the PCP.

**NOTE:** To keep personal radiation exposure ALARA, the sample taken may be used for both test solidification and chemistry isotopic analyses.

2. Chemistry shall obtain a representative sample of the waste batch in accordance with "Chemistry Specification". This sample will be used for radiochemical analysis and to determine the quantity of oil in the batch of waste. Record this information as required by the PCP.

#### 7.5.2 Waste Classification

1. Prior to Solidification a Waste Classification will be determined by the Shipping Supervisor. Record this information as required by the PCP.

**NOTE:** The Waste Classification and Production Test Solidification may be performed at the same time.

#### 7.5.3 Production Test Solidification

1. Radwaste will perform a test solidification of the waste batch in accordance with the PCP. Prior to the test solidification, Chemistry will obtain the pH of the waste. The pH of the waste will be adjusted, as necessary, to ensure it is within the desired range for the PCP to be performed. The pH will be adjusted using the guidelines specified in the PCP.

2. If pretreatment of the batch of waste is necessary, the test sample shall have the required pretreatment prior to the test sample solidification.
3. If the oil content of the waste batch is greater than 1% by volume, secure solidification operations and notify the Radwaste Supervisor. If the oil content of the waste batch is greater than 8% by volume then the solidification must be done using Reference 2.27.
4. If the Initial Production Test Sample from a batch of waste fails to verify solidification, obtain representative samples from the same batch of that wet waste until at least 3 consecutive Initial Production Test Samples demonstrate solidification prior to full scale solidification.

## 7.6 Dewatering Process Control Program

### 7.6.1 Sampling

1. Chemistry shall obtain a representative sample of the waste batch in accordance with "Chemistry Specification." This sample will be used for radiochemical analysis and to determine the quantity of oil in the batch of waste. Record this information as required by the PCP.

### 7.6.2 Waste Classification

1. Waste Classification will be determined by the Shipping Supervisor. Record this information as required by the PCP.

## 7.7 Encapsulation Process Control Program

High activity filters, Irradiated Components and other material which may require encapsulation

### 7.7.1 Sampling

Chemistry shall obtain a sample of the waste to be encapsulated. This sample will be either a qualitative or a quantitative sample. This sample will be used for radiochemical analysis and to determine the quantity of oil in the waste.

### 7.7.2 Waste Classification

1. Prior to encapsulation, a waste classification will be determined by the Shipping Supervisor.

## 8.0 ACCEPTANCE CRITERIA

### 8.1 Solidification Process Control Program

8.1.1 The test sample will be considered acceptable if it meets:

1. Free standing liquid requirements for the disposal facility
2. Stability requirements if it is evident from the physical appearance that the test sample will maintain its shape if removed from the container

8.1.2 Once the test sample demonstrates an acceptable waste form and waste classification is acceptable for near surface burial, solidification may be performed as per formulas stated in the PCP and the applicable Operating procedures. The container shall be considered acceptable if it meets the solidification limitations set forth in the PCP and the disposal site requirements for free standing liquids.

8.1.3 Once solidification is completed the container will be stored in accordance with NPP-RC3-03, "Use of the Onsite Radwaste Facility," while waiting for shipment.

### 8.2 Dewatering Process Control Program

8.2.1 The container shall be considered acceptable if it meets the dewatering limitations set forth in the PCP and the disposal site requirements for free standing liquids.

8.2.2 The dewatering results will be recorded in accordance with Reference 2.22.

8.2.3 Once dewatering is completed the container will be stored in accordance with NPP-RC3-03, "Use of the On Site Radwaste Facility," while waiting for shipment.

### 8.3 Encapsulation Process Control Program

8.3.1 The waste form will be considered acceptable if it meets the test requirements as outlined in the PCP and the free standing liquid requirements for the disposal site.

9.0 DOCUMENTATION

- 9.1 The data sheets will be included in the file copy of the shipping package, as required by the applicable shipping procedure.

END