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Fort Calhoun Station
Unit No. 1

RW-200

RADIOACTIVE MATERIALS CONTROL PROCEDURE

Title: PROCESS CONTROL PROGRAM

Setpoint/Procedure
Form Number (FC-68): 36895

Reason for Change: Reflect change in vendor for Liquid
Radwaste Processing.

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PROCESS CONTROL PROGRAM

1.0 PURPOSE

To provide guidance and boundary conditions for preparation of specific procedures for processing, sampling, analyzing, packaging and shipping solid radioactive waste in accordance with State and Federal regulatory requirements and the Fort Calhoun Station Unit No. 1 Radiological Effluent Technical Specifications.

This program is applicable to the Fort Calhoun Station Unit No. 1 solid radwaste system. Wastes considered in this program are primary and radwaste liquid processing resins, oil and filters. Dry Active Waste is only included as it applies to assurance that packaged waste is suitable for shipment and burial in accordance with applicable State and Federal regulations. Concentrates and aqueous liquids are not considered due to the present decisions not to utilize the waste evaporator as a means for processing liquid wastes.

2.0 RESPONSIBILITIES

2.1 The Radioactive Waste Operations Supervisor is responsible for:

2.1.1 Maintenance of and compliance with this Process Control Program;

2.1.2 Record keeping and document control of shipping and processing data; and

2.1.3 Assuring Radwaste Personnel are appropriately trained and qualified to perform waste processing and packaging activities.

2.2 The Operations Supervisor is responsible for:

2.2.1 Providing trained personnel to operate appropriate radwaste process equipment; and

2.2.2 Defining those Operations positions which require training.

2.3 The Manager Training is responsible for:

2.3.1 Development and implementation of performance-based training for designated personnel in accordance with Training Division procedures.

- 2.4 All OPPD and OPPD contractor personnel are responsible for:
 - 2.4.1 Implementation of procedures and good practices so as to provide Quality Assurance and maintain exposures ALARA.
- 2.5 The Nuclear Quality Assurance Department is responsible for:
 - 2.5.1 Establishment of a Quality Assurance Program addressing Radwaste processing and packaging; and
 - 2.5.2 Performing audits of activities associated with this Process Control Program to assure compliance with the Quality Assurance Plan.
- 2.6 The Plant Review Committee is responsible for:
 - 2.6.1 Reviewing and approving changes to this Process Control Program prior to implementation of the changes; and
 - 2.6.2 Reviewing and approving engineering and safety evaluations performed in support of changes to this Process Control Program.
- 2.7 The Station Engineering Manager is responsible for:
 - 2.7.1 Ensuring engineering and safety evaluations are performed for changes made to this Process Control Program; and
 - 2.7.2 Submitting these evaluations to the Plant Review Committee for review and approval prior to implementation of the changes evaluated.

3.0 DEFINITIONS

- 3.1 Batch - An isolated quantity of feed waste to be processed having essentially constant physical and chemical characteristics. For the purpose of resin type wastes a batch is defined as the volume of resins in the Spent Resin Storage Tank or in a vendor supplied system intended to process a quantity of feed waste.

- 3.2 Operable - A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).
- 3.3 Processing - Changing, modifying, and/or packaging plant generated radioactive waste into a form that is acceptable to a disposal facility.
- 3.4 Quality Assurance/Quality Control - As used in this document, "quality assurance" comprises those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service. Quality assurance includes quality control, which comprises those quality assurance actions related to the physical characteristics of a material, structure, component, or system which provide a means to control the quality of the material, structure, component, or system to predetermined requirements.
- 3.5 Sampling Plan - A sampling program implemented to ensure that representative samples from the feed waste and the final waste form are obtained and tested for conformance with parameters stated in the Process Control Program and waste form acceptance criteria.
- 3.6 Low-Level Radioactive Waste (LLW) - Those low-level radioactive wastes containing source, special nuclear, or by-product material that are acceptable for disposal in a land disposal facility. For the purposes of this definition, low-level radioactive waste has the same meaning as in the Low-Level Waste policy Act, that is radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or by-product material as defined in Section 11e.(2) of the Atomic Energy Act (uranium or thorium tailings and waste).
- 3.7 Waste Container - A vessel of any shape, size, and composition used to contain the final processed waste.
- 3.8 Waste Form - Waste in a waste container acceptable for disposal at a licensed disposal facility.

3.9 Stability - As used in this program, STABILITY means structural stability. Stability requires that the waste form maintain its structural integrity under the expected disposal conditions.

3.10 Chelating Agent - For the purpose of this program CHELATING AGENTS are amine polycarboxylic acids (e.g., EDTA, DTPA), hydroxy-carboxylic acids, and polycarboxylic acids (e.g., citric acid, carbolic acid, picolanic acid and gluconic acid) as defined in 10CFR61.2.

4.0 APPARATUS

4.1 None.

5.0 PREREQUISITES

5.1 All personnel performing activities under the control of and described by this Process Control Program shall have been successfully trained and qualified to perform the described activities before actually performing the activities.

5.2 Procedures shall have been developed for implementation of this Process Control Program and shall be reviewed and approved by the Plant Review Committee prior to performing activities described and required by this Process Control Program.

SEE ATTACHMENTS 1 & 2 →

6.0 PRECAUTIONS

6.1 None.

7.0 PROCEDURE

7.1 WASTE TYPES

7.1.1 Primary Resin

- A. The contaminated waste product generated as a result of reactor water purification and demineralization, cation ion exchange, deborating ion exchange and spent fuel pool demineralization.
- B. Waste consists of contaminated bead ion exchange resins at varying degrees of exhaustion, small concentrations of various solids, activated and non-activated corrosion products and fission products.

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- 5.3 The equipment or subsystem(s) of the solid radwaste system shall be operated to provide for the solidification of wet solid wastes and the compaction of compressible wastes. Waste solidification will be verified by the requirements of the appropriate section in this procedure. If solidified radwaste fails to meet the acceptance criteria contained in this procedure or in any Federal Regulation, no offsite shipments shall be made of nonconforming materials.

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- 5.4 Solidification of wet radioactive waste (e.g., evaporator concentrates) shall be verified by confirmation of least one representative test specimen (drum) from at least every twelfth batch of wet radioactive waste (e.g., evaporator concentrates).
- 5.4.1 If any test specimen fails to verify solidification, the following actions shall be taken:
- A. Verify solidification of all other drums from the batch under test.
 - B. Review the adequacy of the solidification parameters and develop/verify alternative solidification parameters, if required.
- 5.4.2 If the solidification parameters are altered, the following actions shall be taken:
- A. Select one representative drum from each consecutive batch to verify solidification until at least 3 consecutive drums verify solidification. The sampling requirements of section 5.4 may be resumed after 3 consecutive drums verify solidification.
 - B. Modify the appropriate procedure as required and report the changes to the NRC in accordance with Technical Specification 5.18

7.1.2 Radwaste Liquid Processing Resin

- A. The contaminated waste product generated as a result of processing radwaste liquids using a demineralization system. This system may be vendor supplied.
- B. Waste consists of contaminated bead ion exchange resins at varying degrees of exhaustion, small concentrations of various solids, activated and non-activated corrosion products and fission products.

7.1.3 Filters

- A. The contaminated waste product generated as a result of liquid or secondary system processing activities and the removal of cartridge elements from the processing systems.
- B. Waste consists of contaminated mechanical filtration cartridges containing various amounts of particulate solids, corrosion products, activation and fission products.

7.1.4 Oil

- A. The contaminated waste product generated as a result of leakage or intentional drainage and replacement of various plant component lubricating and/or control fluids.
- B. Waste consists of contaminated oils and greases of various grades both synthetic and natural, in free form or containing various amounts of solid material.

7.1.5 Dry Active Waste

- A. The contaminated waste product generated as a result of plant maintenance and repair and routine plant operations.

- 7.1.5 B. Waste generally consists of contaminated trash in the form of plastics, papers, wood, steel and cloth items with varying concentrations of corrosion, activation and fission products.

7.1.6 Non-Standard Wastes

- A. The contaminated waste product generated as a result of non-routine plant operation, maintenance and or repair activities.
- B. Waste consists of plant components, irradiated hardware and other specialty items contaminated with varying concentrations of corrosion, activation and fission products. The waste may also be those items which have become activated with contamination being a minimal fraction of the total radioactivity.

7.2 PROCESS DESCRIPTION

7.2.1 Primary Resin

- A. Primary resins are obtained from the demineralizer filtration system, purification ion exchangers, the cation ion exchanger, the deborating ion exchanger and the spent fuel storage pool demineralizer.
- B. The resins from the demineralizer filtration system are sluiced into a container for processing and shipment from the plant.
- C. The resins from other sources and their sluice water are collected in the spent resin storage tank.
- D. The contents of the spent resin storage tank are recirculated with sufficient liquid to keep resin flowing. Nitrogen gas is used to break up solid chunks during this recirculation process.
- E. The contents of the tank are pumped into a disposable container within a shielded shipping cask or process shield after which the contents are processed and shipped from the plant.

- 7.2.1 F. Due to the infrequent need to dispose of spent primary resins (approximately every 2-3 years) the most efficient method of disposal is to use a vendor supplied processing system. A NRC approved container (e.g. high Integrity Container or HIC) or solidification process shall provide the required stability.

7.2.2 Radwaste Liquid Processing Resin

- A. Radwaste liquids are processed using a demineralization system in lieu of using the installed plant evaporator system.
- B. Radioactive liquids are normally transferred from the waste holdup tanks to the demineralization system using the waste holdup transfer pumps. Specific maintenance and/or decontamination activities may require the use of portable transfer pumps and hoses.
- C. The processed liquids are directed to the monitor tanks to be analyzed and discharged to the Missouri River through the overboard discharge piping.
- D. The depleted resins in the demineralization system vessels are sluiced from the demineralizer vessels into a container which will provide the required stability either through design (HIC) or by solidification.
- E. Multiple sluices may be performed to fill the container.
- F. Once the container is filled, processed and stabilized; the waste will be shipped for disposal.

7.2.3 Filters

- A. Used filter baskets originate from the purification filters, the waste filters, the spent fuel pool cooling system filter, ultrasonic cleaning unit, laundry machines and various other decontamination equipment.

- 7.2.3
- B. Filters are removed from their respective system and permitted to drain excess liquids from the elements.
 - C. The filters are then transferred in a container for disposal.
 - (1) When stabilization is not required, (i.e. Class A Waste) a Type A Container may be used providing sufficient, approved absorbent is added as necessary to absorb twice the volume of liquid anticipated.
 - (2) When stabilization is required, (i.e. Class B or C) the filters shall be disposed of in a HIC or shall be solidified.

7.2.4 Oil

- A. Oil generated during operation and maintenance is collected in containers in appropriate approved areas of the plant.
- B. The filled and labeled containers are sealed and moved to available areas for temporary storage.
- C. Oils may be decontaminated using a vendor provided filtration process, or shipped off site to a contracted and licensed vendor for processing and release or disposal.

7.2.5 Dry Active Waste

- A. Dry Active Wastes are collected from radiologically controlled areas throughout the plant.
- B. The waste is sorted to remove reusable and wet items and then can be further segregated to remove non-contaminated material from the collected waste.
- C. The contaminated waste material is then either compacted into metal 55 gallon drums in the waste baler or packaged in metal boxes. Contaminated waste will be disposed of by an approved burial site or processed (e.g. incinerated, etc.) by an approved vendor.

7.2.6 Non-Standard Waste

- A. Reactor components and irradiated hardware are waste which are not routinely generated.
- B. These types of non-standard waste will be handled on a case-by-case basis through the implementation of special procedures approved by the Plant Review Committee.

7.3 PROCESS CONTROL

7.3.1 Radioactive waste processing instrumentation and equipment shall be subject to formal calibration and preventative maintenance programs.

7.3.2 Primary and Radwaste Liquid Processing Resin

- A. Primary resins will be transferred into containers for processing using plant installed and vendor supplied equipment.
- B. Radwaste Liquid Processing will be performed using a vendor supplied system with transfer of depleted resins from the demineralizer vessels into a processing container by means of sluicing.
- C. Primary and Radwaste Liquid Processing Resin dewatering will be performed using an NRC and PRC approved Process Control Program.
- D. Referenced Radwaste Procedures controlling the processing, transfer and dewatering activities shall be observed.
- E. The Process Control Program which specifically controls processing of the waste (i.e. the vendors PCP) shall identify the mechanisms and frequency of test/measurements used to verify stability and free standing liquid requirements are satisfied.

- 7.3.2
- F. Successful completion of applicable portions of the vendor Process Control Program shall serve as an indicator of system operability.
 - G. Containers used for dewatering and packaging for disposal at the Barnwell disposal facility shall be approved for use and disposal by the South Carolina Department of Health and Environmental Control.
 - H. The vendor supplied system shall be operated in accordance with the system operating procedures and applicable station Radwaste Procedures.
 - I. Station to vendor interfacing is addressed in the Safety Evaluation for the processing and dewatering operations.

7.3.3 Filters

- A. Filter processing is controlled by referenced Radwaste Procedures.
- B. Filters requiring stability are packaged as described in Section 7.2.3. The containers and/or process used shall be approved by either the South Carolina Department of Health and Control or the Washington State Department of Radiological Health as appropriate for the disposal site to be used.

7.3.4 Oil

- A. Processing of oil shall be performed in accordance with referenced Radwaste Procedures and applicable vendor procedures and topical reports for the methodology applied to the processing activity.

7.3.5 Dry Active Waste

- A. Dry Active Waste is processed in accordance with referenced Radwaste Procedures.

7.3.6 Non-Standard Waste

- A. Non-Standard Waste is processed in accordance with special Radwaste Procedures germane to the specific non-standard waste being processed.

7.4 PRODUCT CONTROL

- 7.4.1 A sample from each batch of waste shall be analyzed quantitatively for activity and isotopic identity as required in station procedures. If radionuclide distributions are shown to be consistent between similar batches, consideration may be given to decreasing the frequency of routine measurements. Frequency of sampling is as described in Radiation Protection Procedure RW-221, "10CFR61 Sampling". This constitutes the sampling plan.
- 7.4.2 Scaling factors for nuclides which are hard to identify are established for waste streams by using analyses performed and provided by an off-site vendor.
- 7.4.3 This frequency of sampling shall be raised or lowered based upon consideration of waste stream or radionuclide characteristics. Factors which would influence this consideration include the frequency of process vessel changeout or waste shipment, the difficulty (e.g. Costs, occupational exposures) in obtaining a representative sample of a particular waste stream, the variability of the radionuclide distribution within the waste stream over time, and the availability of analytical capability for particular radionuclides. If radionuclide distributions are shown to be consistent between similar batches, consideration may be given to decreasing the frequency of routine measurements. If onsite samples show a variation from presently used scaling factors by more than a factor of 10, samples will be sent offsite for analysis to establish new scaling factors.
- 7.4.4 Radionuclide concentrations and classification of future waste shipments are expected to be similar to those of previous shipments for each specific waste stream. Values are available from shipment manifest forms.

- 7.4.5 Administrative controls for preventing unsatisfactory waste forms from being released for shipment are described in referenced station procedures.
- 7.4.6 Referenced Radwaste Procedures ensure wastes shall have no detectable free standing liquids. No detectable free standing liquid is defined as low as practical but not more than 1% of the volume of the waste when the waste is in a disposable container designed to ensure stability or not more than 0.5% of the volume of the waste for waste processed in any other container.
- 7.4.7 Processed resin shall be sampled in accordance with regulatory guidance and referenced station procedures to verify that the free liquid content of the packaged product is within limits established by applicable regulatory agencies. Sampling and measurement of free liquid content shall be performed whenever process changes occur that may significantly alter system performance, until compliance with moisture content limits under these conditions can be demonstrated.
- 7.4.8 Each waste shipment shall be accompanied by a shipping manifest giving a physical description of the waste, the volume, the radionuclide identity and quantity, the total radioactivity, the principal chemical form and waste class, based on 10CFR61.55.
- 7.4.9 Sufficient analysis shall be performed to verify that the quality of waste forms prepared for disposal by vendor's onsite processing shall be similar to vendor's test results.
- 7.5 TRAINING
- 7.5.1 Processing of solid radioactive waste shall be performed by qualified and trained personnel.
- 7.5.2 Training records of processing personnel shall be maintained by the Training Division.

7.5.3 Training and qualification records for operators of mobile vendor processing units shall be maintained by the Radioactive Waste Operations Supervisor while the vendor is active on site. These records shall be sent to the Nuclear Records Management System after the vendor has completed work on site.

7.6 PROCEDURE CONTROL

7.6.1 On site processing of radioactive waste shall be performed in accordance with approved station procedures.

7.6.2 Processing of radioactive waste by onsite vendors shall be performed in accordance with applicable Process Control Programs, procedures and applicable NRC guidance.

7.6.3 Procedures for processing, containerization and transport of wastes shall ensure that specific DOT, 10CFR and burial site requirements are satisfied.

7.6.4 Process Control Programs for specific radwaste systems supplied by vendors for on site processing shall be presented to the Plant Review Committee for review and approval prior to use of the system.

7.7 RECORDS

7.7.1 Waste classification records, waste form records and other records required for the preparation of the Fort Calhoun Station Unit No. 1 Semiannual Radioactive Effluent Release Report shall be prepared and retained in accordance with the requirements of 10CFR20, 10CFR71, 49CFR170-178 and the Fort Calhoun Station Technical Specifications.

7.7.2 Records of processing data, test and analysis results and results of training, inspection and audits are retained in accordance with the Fort Calhoun Station Quality Assurance Plan and applicable station Administrative Procedures.

7.7.3 All certificates of compliance, licenses, criteria and regulations pertaining to processing, packaging, shipment and disposal of radioactive materials controlled under this Process Control Program shall be maintained in the most current status. OPPD, Fort Calhoun Station Unit No. 1 shall be currently registered, as necessary, to use applicable packagings.

7.7.4 Sufficient documentation shall be maintained to demonstrate compliance of solid radwaste processing with this Process Control Program.

7.8 QUALITY ASSURANCE

7.8.1 Quality Assurance shall be maintained as defined by the Fort Calhoun Station Quality Assurance Plan, Section 11.

7.8.2 The QA Plan shall ensure compliance with NRC and burial site criteria for waste classification and waste form.

7.8.3 Audits shall be conducted in accordance with NQA Audit Section Instructions.

7.8.4 The Topical Reports of vendor supplied radwaste processing systems shall undergo review either by the Radioactive Waste Operations Supervisor or the Supervisor-Radiation Protection. The review shall ensure the vendor supplied system will be compatible with plant operations and that the Topical report has been submitted to the NRC for review. The review shall be documented by a memo addressed to file.

7.8.5 Audits of a sampling of implementing procedures shall be performed at least once every 24 months. Procedures should be reviewed to ensure continual compliance with the requirements and process parameters of this Process Control Program.

7.8.6 Radioactive wastes not described within this document must be evaluated and approved for inclusion in this Process Control Program or in a vendor Process Control Program prior to processing.

7.9 REVISIONS

- 7.9.1 Changes or modifications made to design and/or operation of radioactive waste processing, treatment and/or packaging systems or activities, as described within this Process Control Program, shall require formal engineering evaluation and performance of a safety evaluation in accordance with 10CFR50.59 and USNRC IE Circular No. 88-18.
- 7.9.2 Changes made to this Process Control Program and supporting engineering and safety evaluations shall be reviewed and approved by the Plant review Committee prior to implementing the changes.
- 7.9.3 Changes to the Process Control Program approved by the Plant Review Committee shall be submitted to the Nuclear Engineer-In-Charge of Licensing, for input to the Semi-Annual Radioactive Effluent Release Report.

8.0 REFERENCES

- 8.1 Radiation Protection Procedure RW-201, "Control of Containers"
- 8.2 Radiation Protection Procedure RW-202, "Collection/Sorting/Segregation of Dry Active Waste (DAW)"
- 8.3 Radiation Protection Procedure RW-203, "Compacting Dry Active Waste (DAW)"
- 8.4 Radiation Protection Procedure RW-204, "Packaging Non-Compactable Dry Active Waste"
- 8.5 Radiation Protection Procedure RW-206, "Transfer of Spent Primary Resin to Disposal Containers"
- 8.6 Radiation Protection Procedure RW-207, "Operation of the Fix Radwaste Liquid Processing System"
- 8.7 Radiation Protection Procedure RW-208, "Transfer of Spent Fix System Resin to Disposal Containers"
- 8.8 Radiation Protection Procedure RW-209, "Dewatering Spent Radwaste Liquid Processing Resin and Primary Resin In Disposal Containers"

- 8.9 Radiation Protection Procedure RW-211, "Removal of Filters From Radwaste Systems"
- 8.10 Radiation Protection Procedure RW-212, "Packaging Filters"
- 8.11 Radiation Protection Procedure RW-214, "Collection Of Oils"
- 8.12 Radiation Protection Procedure RW-215, "Processing of Contaminated Oils"
- 8.13 Radiation Protection Procedure RW-216, "Testing of Sorbent Materials"
- 8.14 Radiation Protection Procedure RW-218, "10CFR61 Classification"
- 8.15 Radiation Protection Procedure RW-221, "10CFR61 Sampling"
- 8.16 49CFR Parts 170 through 178
- 8.17 10CFR Parts 20, 50, 61, and 71
- 8.18 USNRC IE Circular No. 80-18
- 8.19 Standard Review plan 11.4, Rev. 2, including Branch Technical Position ETSB 11-3, Rev. 2
- 8.20 USNRC Low Level Waste Licensing Branch; Technical Position on Radioactive Waste Classification, Rev. 0 (5/83)
- 8.21 USNRC Low Level Waste Licensing Branch; Technical Position on Waste Form, Rev. 0 (5/83)
- 8.22 General Criteria for High Integrity Containers (SCDHEC) dated 10/22/80
- 8.23 South Carolina Department of Health and Environmental Control Radioactive Material License No. 097, Amendment no. 44. (Barnwell Facility)
- 8.24 Barnwell Special Nuclear Material License No. 12-13536-01, issued to Chem-Nuclear Systems, Inc.
- 8.25 Barnwell Site Disposal Criteria, (Chem-Nuclear Systems, Inc.) November 1982
- 8.26 State of Washington Radioactive Materials License No. WN-I019-2, Amendment No. 17 (Richland Site)

- 8.27 Hanford Special Nuclear Material License
No. 15-19204-01, issued to U.S. Ecology
- 8.28 Current Vendor Processing Topical Report
- 8.29 Current Vendor Operating Procedures as referenced in
RW-207.
- 8.30 TFC Nuclear Associates, Inc. Procedure No.
"SEALING", "Procedure for Sealing High Integrity
Containers", Rev. 3 (4/9/87)
- 8.31 FCS Quality Assurance Plan, Section 11.1 and 11.2
- 8.32 Fort Calhoun Station Unit No. 1, Updated Safety
Analysis Report
- 8.33 Fort Calhoun Station Unit No. 1 Technical
Specifications Sections 2.9.2, 3.12.2, and 5.9.4

9.0 ATTACHMENTS

None