NEI 07-10 [Revision 3]

Generic FSAR Template Guidance for Process Control Program (PCP)

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Nuclear Energy Institute

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NOTICE

EXECUTIVE SUMMARY

NEI 07-10, *Generic FSAR Template Guidance for Process Control Program (PCP)*, Revision 3, provides a complete generic program description for use in developing construction and operating license (COL) applications. The document reflects contemporary Nuclear Regulatory Commission (NRC) guidance, including Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants," and industry-NRC discussions regarding the applicable standard review plan section. A main objective of this program description is to assist in expediting NRC review and issuance of the combined license.

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GENERIC FSAR TEMPLATE GUIDANCE FOR PROCESS CONTROL PROGRAM (PCP)

1 INTRODUCTION

This Process Control Program (PCP) Description identifies the administrative and operational controls for waste processing, process parameters, and surveillance requirements which assure that the final waste product meets the requirements of applicable Federal, State and Disposal Site waste form requirements for burial at a 10 CFR 61 licensed Low Level Waste (LLW) disposal site. The mobile radioactive waste processing system conforms to applicable requirements in Regulatory Guide 1.143 and Generic Letters applicable to wet solid waste. The PCP complies with 10 CFR 61.55 and 10CFR 61.56 for wet solid wastes. The PCP presents the methods by which liquid, and wet waste are processed and disposed in accordance with 10 CFR Part 61 and packaged and transported in accordance with 10 CFR Part 20,10 CFR Part 71 and 49 CFR Parts 171-180.

The PCP implementation of process methods considers the plants efforts to minimize the quantity of radioactive waste produced (volume and/or activity).

The users of this template should review the reference section for additional information related to NRC regulatory requirements and guidance. This template describes the elements of the PCP at the functional level consistent with 10 CFR 52.79 and if these programs are implemented as described, they do not require implementation of inspections, tests, analyses and acceptance criteria in the COL application.

2 APPLICABILITY AND CONTROLS

2.1 PROCESS CONTROL PROGRAM

2.1.1 The Solid Waste Management System shall be operated in accordance with the requirements given in the PCP for the solidification or dewatering and packaging of radioactive wastes in order to comply with the requirements of 10 CFR Part 20 and of 10 CFR Part 71 prior to shipment of radioactive wastes from the site (Reference 5.2.1).

2.1.2 The PCP is applicable to the Solid Waste Management System in the solidification of liquid or wet radioactive wastes or the dewatering of wet radioactive wastes to be shipped for direct burial to a 10 CFR Part 61 licensed disposal site.

Radioactive wastes shipped off-site for processing are not required to be solidified or dewatered to meet disposal requirements and are not subject to the solidification or dewatering requirements of the PCP (Reference 5.2.1).

2.1.3 The above controls of 2.1.1 and 2.1.2 are applicable at all times. If the packaging requirements of 10 CFR Part 20, 10 CFR Part 61 or burial site requirements and/or 10 CFR Part 71 are not satisfied, shipments of defectively packaged solid waste from the site will be suspended. The PCP will include surveillance checks necessary to demonstrate compliance with the above controls (Reference 5.2.21/5.2.22).

2.1.4 The PCP is only applicable to Mixed Waste when it is solidified for disposal at a 10 CFR Part 61 disposal site. Waste streams with the potential for having the presence of hazardous chemicals and radioactive materials, mixed waste, will be identified, processed and disposed in accordance with applicable Federal, State and local regulations (Reference 5.1.1).

2.1.5 The PCP confirms that incidental levels of waste petroleum-based oil contained in radioactive waste meets the disposal site requirement for shipment.

2.1.6 The PCP identifies required implementing procedures for radioactive waste interim storage of liquid or wet waste to meet the current final waste form requirements for free standing liquids.

2.1.7 The interface between plant processing equipment (permanent or non-permanent) and equipment used for solidification and/or dewatering of wet solid radioactive waste will be controlled in site procedures (Reference 5.2.5).

2.1.8 Samples will be obtained and analyzed for a batch of waste in accordance with site procedures for waste to be processed in the PCP. Analysis will be performed to ensure that the waste falls within the acceptable parameters for solidification/dewatering/drying (Reference 5.2.3).

3 PROCESS DESCRIPTION GUIDLINES

3.1 RESPONSIBILITIES

Each licensee will designate a site organization to be the owner, sponsor and administrator for the PCP. Examples of the organization's PCP responsibilities include review and approval of revisions; document administration; PCP technical content; and supporting the site compliance with the PCP.

3.2 ADMINISTRATION OF THE PCP AND SUPPORT DOCUMENTS

Any changes to the PCP or implementing procedures require a review to assure that the requirements of the SRP Sections 11.4 and 11.5, BTP 11-3, 10 CFR 20, 61, and 71, 49 CFR 171-180, state regulations, disposal and process facility waste acceptance criteria, and other requirements governing the disposal of solid radioactive waste (contained in the

references to this plan), are met. PCP changes will be sent to the NRC in the site's Annual Radioactive Effluent Report for the period in which the changes were implemented.

Implementing procedures are developed, approved, and maintained for performing the activities in support of the PCP. Examples of functions included in site specific implementation procedures are:

- Sampling, analysis, scaling of difficult to measure radionuclides, and waste classification of waste type and waste form,
- Process controls and parameters for processing "wet wastes" for land disposal and for processing Waste Class B and C wastes,
- Processing and disposal of "mixed waste" which is a waste containing both radioactive material and hazardous material,
- Control and acceptance of vendor waste processing equipment and processes for site and offsite processing of radioactive waste,
- Verification of compliance with disposal and processor site acceptance criteria,
- Mobile system conformance to Regulatory Guide 1.143 and Generic Letters 80-009 and 81-039.

In addition to the implementing procedures for PCP activities, site procedures will be developed that describe the following activities associated with packaging and shipping radioactive wastes:

- Preparing radioactive material for shipment, preparation of the uniform radioactive waste manifests, preparation of shipping papers, notifications, and shipment security,
- Container specifications and inspections, vehicle inspections, proper loading and shoring of shipments,
- Radioactive survey requirements and limitations for radioactive material shipments,
- Maintaining waste disposal records as required by 10 CFR 20.2108 and reporting information on radioactive waste disposal.

3.3 APPROVAL PROCESS FOR QA APPROVED SUPPLIERS

Any supplier providing PCP services will be reviewed and approved prior to providing those services. The site identifies the criteria that the waste processor will meet for the services provided. Examples of criteria include the vendor PCP Topical Reports or equivalent, radioactive material license, state licensing, compliance with DOT regulations for packaging, shipment, packages, transportation, and 10 CFR Part 61 disposal requirements.

3.4 PCP REQUIREMENTS FOR VENDOR PROCESSES AND SERVICES

The vendor-supplied processes for solidification or dewatering will have a Topical Report or other certification documenting appropriate approval of the process and associated containers used. The vendor approved for solidification or dewatering services will have NRC or appropriate regulatory certification documenting compliance with waste form

requirements of the final product. The vendor Topical Report or equivalent certifies that the final product conforms to the appropriate waste form for Class A, B, or C waste.

Any vendor-supplied high integrity containers (HIC's) will have an NRC or appropriate regulatory approved report documenting compliance with waste form requirements.

Each container of processed waste will be classified as Class A, B or C waste using a site specific 10 CFR Part 61 Waste Form, Waste Classification and Waste Characterization Implementation Program(Reference 5.3).

Vendors providing PCP services on-site will meet the applicable requirements of the PCP and quality assurance requirements identified by the site contract. The vendor equipment will meet the design, construction, operation and quality assurance provisions of NRC BTP 11-3 (Reference 5.2.3) and Regulatory Guide 1.143 (Reference 5.2.5).

Vendors providing PCP services offsite will meet the requirements of their PCP process and applicable quality assurance requirements.

3.5 WASTE TYPES

There are various types of radioactive waste expected to be generated at the plant site that will require processing, including solidification, or dewatering, or drying, or offsite processing prior to burial. These radwaste types can be categorized based on their chemical and physical properties. Typical waste types generated at a plant site may include but are not limited to; bead resin, powdered resin, demineralizer sludge/slurries, filter cartridges, oily waste, and dry active waste.

Dry wastes do not normally require stabilization processing and are treated as radioactively contaminated solids and packaged for disposal or offsite processing in accordance with applicable Federal/ State regulations and burial site criteria.

3.6 PCP SOLIDIFICATION PROCESS DESCRIPTION

Waste solidification will be performed to approved procedures that ensure all applicable regulatory and disposal site criteria are met. The specific waste processing technology and method and process parameters used to process waste are described in site procedures. The parameters should include (depending on the type of waste):

- waste pH;
- water content;
- oil content;
- waste density;
- content of chelating agents;
- ratio of stabilization agent to chemical additives by types of wastes;
- waste form;
- mixer speed; mixing time; curing time;

- pre-solidification hazardous waste characterization;
- specific activity and gamma analysis.

The minimum solidification acceptance criteria will include free standing liquid criteria; physical criteria and chemical criteria based on the disposal site. A representative sample of the waste to be solidified will be obtained for bench scale testing based on a frequency identified by the disposal site. The process parameters should include any of the above parameters that are applicable.

3.7 PCP DEWATERING PROCESS DESCRIPTION

The methods used for removal of liquid from wet waste for final disposal will comply with the specific disposal site requirements where the waste is being disposed. Dewatering/drying of wet wastes will be performed in a manner equivalent to the process guidelines described below using approved procedures with enough detail to implement applicable requirements. Examples of dewatering/drying process parameters include:

- Settling time
- Drain time
- Pumping time
- Dewatering pump suction vacuum (inches Hg)
- Drying time
- Additional dewatering/drying cycles

Mechanical filters (e.g., cartridge, bag, membrane) are dewatered so that accumulation of free standing liquid in the disposal container does not exceed disposal site limits. The method of dewatering is in accordance with a previously defined, evaluated and documented process.

Dewatering of "slurried" wet wastes (e.g., resin, carbon, Zeolite, filter precoat, filter backwash, sludge) removes the interstitial liquid from solids such that the disposal container meets the applicable regulatory and burial free standing liquid criteria for disposal.

Wet wastes may also be dewatered using a drying process that adds an absorber material resulting in a product with no free standing liquid (e.g. a monolithic salt block in a storage drum). This method of dewatering by drying will be in accordance with a previously defined, evaluated and documented process.

3.8 ACCEPTABILITY

The solidification and dewatering/drying process product is verified and documented to meet the PCP Acceptance Criteria requirements for that process. Verification may include bench scale test, full scale test, verification of PCP process compliance, or verification that the amount of free-standing liquid is within disposal site criteria for the container and the standing water requirements of 10 CFR Part 61.

Product verification failures will be documented, reported if required, investigated and remedial actions taken. Any misuse, mishaps, or failure of a waste form or container will be reported to responsible site personnel for action.

3.9 WASTE CLASSIFICATION, CHARACTERIZATION AND MANIFEST

All waste will be classified in accordance with the requirements of 10 CFR 61.55 as implemented by site procedures. Analysis will be performed on the waste streams at least annually (biannually for Class A waste), to determine the isotopic abundance of non-gamma emitting isotopes in the waste streams. Scaling factors, for the non-gamma emitting and transuranic constituents, will be developed from these analyses (Reference 5.2.8 and 5.2.18).

All wastes shall meet the waste characteristics requirements of 10 CFR 61.56 as applicable and waste packages will be marked to identify the waste-class as required by 10 CFR 61.57. The manifesting requirements of 10 CFR 20.2006 and Appendix G to 10 CFR Part 20 will be implemented by site shipping instructions (Reference 5.2.23).

3.10 QUALITY ASSURANCE

Quality related activities for the PCP will be implemented as described in site procedures to meet the applicable requirements of Regulatory Guide 1.143 and/or ANSI 55.6 (Reference 5.2.5 and 5.2.9). The activities include verification that all solid radioactive waste meets applicable State and Federal regulations and burial site criteria.

4 DEFINITIONS

4.1 FREE STANDING LIQUID (FSL)

Liquid that is in a disposal container but is not bound by the waste in the container is called a free-standing liquid (FSL). FSL is the liquid available for release if disposal container integrity is lost. The amount of FSL in a radioactive waste disposal container is less than a specified amount to meet 10 CFR Part 61, state regulations, and disposal site criteria.

4.2 SOLIDIFICATION

Solidification is a process that converts radioactive waste into a product meeting 10 CFR Part 61, state, and disposal site requirements for waste-form stability and FSL. Solidification is accomplished by mixing measured amounts of liquid or wet radioactive waste, binder and required additives that, after sufficient curing time, produce a solid homogeneous, freestanding monolith. At the end of the curing period, the absence of

excessive FSL is verified by confirmation that the PCP was followed or by physical verification/testing.

4.3 DEWATERING

Dewatering removes the loosely bound liquid from a wet radioactive waste such that accumulation of Free Standing Liquid in disposal container is unlikely to approach the disposal limit threshold values defined by applicable regulations and disposal site criteria. NRC regulations require that the process used to dewater radioactive wastes to meet disposal criteria shall be governed by a PCP.

4.4 PROCESS PARAMETERS

Those conditions measured or observed during a solidification or dewatering process to ensure an acceptable product are the process parameters. These are determined for each waste type and are specific to the process method used.

4.5 PCP ACCEPTANCE CRITERIA

The PCP acceptance criteria are the bounding numerical values for the solidification process parameters that produce an acceptable product or the bounding numerical values for the dewatering process parameters that ensure free standing liquid requirements are met.

5 REFERENCES

5.1 REGULATORY REQUIREMENTS

5.1.1 10 CFR 20.2006, 20.2007, 20.2108 and Appendix G of 10 CFR Part 20

5.1.2 10 CFR Part 50, Appendix A, General Design Criterion 60, "Control of Releases of Radioactive Materials to the Environment." General Design Criterion 64, "Monitoring Radioactivity Releases."

5.1.3 10 CFR 61.55, 61.56, 61.57, "Licensing Requirements for Land Disposal of Radioactive Waste."

5.1.4 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

5.1.5 40 CFR Part 266" Storage, Treatment, Transportation, and Disposal of Mixed Waste"

5.1.6 49 CFR Parts 171-180 "Hazardous Materials Regulations"

5.1.7 Licensed radioactive waste burial site

5.1.8 State hazardous waste regulations

5.2 REGULATORY GUIDANCE

5.2.1 NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants.

5.2.2 NUREG-0800, SRP 11.4, "Solid Waste Management Systems"

5.2.3 NUREG-0800, Branch Technical Position 11-3 "Design Guidance for Solid Radioactive Waste Management Systems Installed in Light-Water-Cooled Nuclear Power Reactor Plants"

5.2.4 Generic Letter 89-01, "Guidance for the Implementation of Programmatic Controls For RETS in The Administrative Controls Section of Technical Specifications and the Relocation of Procedural Details of Current RETS to the Offsite Dose Calculation Manual or Process Control Program"

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

5.2.6 USNRC, Branch Technical Position, "Technical Position on Waste Form", Rev. 1, January, 1991 and HPPOS-290, "Waste Form Technical Position, Revision 1"

5.2.7 Issuance of Final Technical Position on Concentration Averaging and Encapsulation, Revision in Part to Waste Classification Technical Position January 17, 1995

5.2.8 "Final Waste Classification and Waste Form Technical Position Papers" dated May 11, 1983

5.2.9 ANSI 55.6, "Liquid Radioactive Waste Processing Systems for Pressurized Water Reactor Plants"

5.2.10 ANSI/ANS 40.37-1993, "Mobile Radioactive Waste Processing Systems"

5.2.11 Regulatory Guide 8.8, "Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable."

5.2.12 Generic Letter 80-009, "Low Level Radioactive Waste Disposal."

5.2.13 Generic Letter 81-038, "Storage of Low Level Radioactive Wastes at Power Reactor Sites."

5.2.14 Generic Letter 81-039, "NRC Volume Reduction Policy"

5.2.15 Information Notice 87-07, "Quality Control of Onsite Dewatering / Solidification Operations By Outside Contractors"

5.2.16 IE Bulletin 79-19, "Packaging, Transport and Burial of Low-Level Radioactive Waste"

5.2.17 Information Notice 90-31, "Update on Waste Form and High Integrity Containers Topical Report Review Status, Identification of Problems with Cement Solidification, and Reporting of Waste Mishaps"

5.2.18 Information Notice 86-020, "Low-Level Radioactive Waste Scaling Factors, 10 CFR Part 61"

5.2.19 Information Notice 84-072, "clarification of Conditions For Waste Shipments Subject To Hydrogen Gas Generation"

5.2.20 Information Notice 85-092, "Surveys of Wastes Before Disposal from Nuclear Reactor Facilities"

5.2.21 NUREG-1301 "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors."

5.2.22 NUREG-1302 "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors."

5.2.23 NUREG/BR-0204 "Instructions for Completing NRC's Uniform Low-Level Radioactive Waste Manifest"

5.3 PROGRAMMATIC REFERENCES –SITE SPECIFIC

5.3.1 Technical Specifications 5.0 Administrative Controls

5.3.2 Site Specific Licensee Commitments

5.3.3 Site Specific FSAR

5.3.4 Site Quality Assurance Program

5.3.5 Vendor Quality Assurance Program

5.3.6 Plant PCP Procedures for Specific Waste Processing Methods such as Dewatering, Solidification, or HIC Integrity Verification.

5.3.7 Plant implementation procedures on 10 CFR Part 61 waste form, waste classification and waste characterization.

5.3.8 Plant procedures on the requirements for interim storage for processed waste.