

PORC	YES
SQR	YES
NQA	NO
50.59	YES
RESP MGR	YES

PECO Energy Company  
Nuclear Generation Group

SOLID RADWASTE SYSTEM PROCESS  
CONTROL PROGRAM (PCP)

1.0 PURPOSE

1.1 This program provides guidance and boundary conditions for preparation of specific procedures for processing, sampling, analysis, packaging, storage and shipment of solid radwaste in accordance with State and Federal Regulatory requirements.  
**CM-1**

1.2 This procedure also describes the disposal of certain miscellaneous radwaste at LGS.

2.0 RESPONSIBILITY

NOTE: The station operating organization is outlined in each station's UFSAR.

2.1 PORC reviews all revisions to the PCP.

2.2 PLANT MANAGER approves all revisions to the PCP.

2.3 NUCLEAR QUALITY ASSURANCE performs audits to verify compliance with the Nuclear Quality Assurance Program.

2.4 **MANAGER-RADWASTE**

2.4.1 Ensures compliance with this Process Control Program.

2.4.2 Ensures record keeping and document control of shipping and processing data.

2.4.3 Ensures the Radwaste personnel are appropriately trained and qualified.

2.4.4 Coordinates reviews and revisions to this document and corresponding implementing procedures.

2.4.5 Reviews and revises this PCP and its implementing procedures.

2.4.6 Submits revisions to the PCP for inclusion in the NRC Annual Radioactive Effluent Release Report.

2.5 **SR. MANAGER-OPERATIONS**

- 2.5.1 Provides trained personnel to operate appropriate permanent radwaste process equipment.
- 2.5.2 Defines those Operations positions which require training.

2.6 **DIRECTOR-TRAINING**

- 2.6.1 Develops and implements training for designated personnel in accordance with Nuclear Training Division procedures.

3.0 PREREQUISITES

- 3.1 The solid radioactive waste system shall be used in accordance with the PCP. **CM-1**
- 3.2 Processing of solid radioactive waste shall be performed by qualified and trained personnel. Training records for operators of mobile vendor processing units shall be maintained by the Manager, Radwaste while the vendor is active on-site.
- 3.3 Vendor services may be used for dewatering and solidification of radioactive waste processing provided the services are governed by a Topical Report and referenced in this PCP. Processing of radioactive waste by on-site vendors shall be performed in accordance with applicable Topical Report, procedures and NRC guidance. When providing solidification for stabilization, the vendor shall have an NRC approved topical report.
- 3.4 The Topical Reports of vendor supplied Radwaste Processing Systems shall undergo review by the Manager, Radwaste (or designee). The review shall ensure the vendor supplied system will be compatible with plant operations. The review shall be performed in accordance with RW-C-106.
- 3.5 On-site processing of radioactive waste shall be performed in accordance with approved station procedures.
- 3.6 Quality Assurance shall be maintained as defined in procedure A-C-930.

4.0 PRECAUTIONS

- 4.1 Changes to the PCP shall be submitted to the Nuclear Regulatory Commission in the Annual Radioactive Effluent Release Report for the period in which the change was made.
- 4.2 Changes to resin dewatering implementing procedures or systems shall require verification that the free standing water content of the packaged product is within established regulatory limits.

- 4.3 Prior to revising or deleting a PCP implementing procedure, the preparer shall review the procedure against the PCP to ensure that there is no compromise or conflict.
- 4.4 Prior to modification to an in plant liquid Radwaste Processing System, the individual responsible for the MOD shall review to ensure that it is not in conflict with or compromises the PCP.
- 4.5 When processing does not meet storage requirements or shipping and transportation requirements, processing shall be suspended and the PCP reviewed for adequacy. The implementing procedures and/or the Solid Waste System shall be corrected as necessary to prevent recurrence.

5.0 APPARATUS

None

6.0 PROCEDURE

6.1 PROCESS DESCRIPTIONS

NOTE: Vendor services may be used to process any radioactive waste stream provided the services are performed with an acceptable Process Control Program.

- 6.1.1 Waste Sources (For diagrams of the Solid Radwaste Systems, see UFSAR 11.4 for LGS and 9.2 and 9.3 for PBAPS. Also refer to MOD 1750A for PBAPS).

1. Condensate Filter/Demineralizer Waste

- a. Condensate Filter/Demineralizer Waste is the waste product generated by the backwash of the condensate filter/demineralizers consisting of: (PBAPS) 1.) contaminated powdered ion exchange resin at varying degrees of exhaustion, fibrous filter media, and small concentrations of solids and corrosion products for the precoatable element system, and (LGS) 2.) Iron oxide and small concentrations of other solids for the precoatless element system. The precoatless filter element can be precoated per Chemistry's request, provided the waste type is reviewed for isotopic concentration considerations.
- b. A condensate filter/demineralizer backwash consists of approximately: (PBAPS) 1.) 9,000 gallons of slurry for the precoatable element system, and (LGS) 2.) 3,000 gallons of slurry for the precoatless element system.

- c. Backwashes are collected and settled in a Condensate Phase Separator. Clarified liquid is decanted until sufficient volume of settled spent resin or iron oxide and crud is obtained for processing.
  - d. Phase separator contents are recirculated prior to transfer to the Dewatering System.
  - e. Slurry input to the Dewatering System is transferred to the system from the phase separators via the sludge mixing pumps.
2. Condensate Deep Bed Demineralizer Waste (Limerick Only)
- a. Condensate Deep Bed Demineralizer waste is the waste product generated by the backwash of the condensate deep bed demineralizers consisting of contaminated ion exchange bead resins at varying degrees of exhaustion and small concentrations of various solids and corrosion products.
  - b. Each condensate deep bed demineralizer backwash consists of approximately 2,800 gallons of slurry.
  - c. Each backwash contains 320 cubic feet of resin and is collected in an empty Spent Resin Receiver Tank.
  - d. During normal operations the Spent Resin Receiver Tank contents will be transferred to the Floor and Equipment Drain deep bed demineralizers for reuse.
  - e. Resins that are determined unacceptable for reuse or excess will be processed from the 1A Spent Resin Receiver Tank using vendor dewatering.
  - f. The 1A Spent Resin Receiver Tank Contents are recirculated for a minimum of 25 minutes to mix contents of the vessel, resulting in a homogeneous resin slurry.
  - g. The solids slurry is then fed to the External Processing Station for dewatering.
3. Waste Sludge Tank Waste
- a. Waste Sludge Tank Waste is the waste product generated by the backwash of the liquid radwaste and fuel pool filters and demineralizers consisting of contaminated powdered ion exchange resins and lead resins at varying degrees of exhaustion, fibrous filter media, carbon overlay material and small concentrations of various solids and corrosion products.

- b. Backwashes from radwaste filter/demineralizers, radwaste deep bed demineralizers, and fuel pool filter/demineralizers are collected in the Waste Sludge Tank.
  - c. A backwash from a radwaste filter consists of approximately 1,925 gallons of slurry (PB) or 1,500 gallons (LGS).
  - d. A backwash from the radwaste deep bed demineralizer consists of approximately 1,500 gallons of slurry.
  - e. At Peach Bottom, the Waste Sludge Tank contents are transferred to a Condensate Phase Separator for processing. From the Condensate Phase Separators, waste is processed using a Dewatering System.
  - f. At LGS, Waste Sludge Tank contents may be processed directly to the Dewatering System or transferred to a condensate phase separator for processing.
  - g. Tank contents are recirculated prior to transfer to the Dewatering System.
4. Reactor Water Cleanup Waste
- a. Reactor Water Cleanup waste is the waste product generated by the backwash of the Reactor Water Cleanup filter demineralizers consisting of contaminated powdered ion exchange resins at varying degrees of exhaustion, fibrous filter media, and small concentrations of various solids and corrosion products.
  - b. A RWCU filter-demineralizer backwash consists of approximately 1,100 gallons of slurry.
  - c. Backwashes are collected and settled in a phase separator. Clarified liquid is decanted until sufficient volume of settled spent resin and crud is obtained for processing.
  - d. Phase separator contents are recirculated prior to transfer to the Dewatering System.
5. Oily Waste
- a. Sludges and oils generated during operation and maintenance are collected in containers in appropriate approved areas throughout the plant. The filled and labeled containers are sealed and moved to available areas for temporary staging.



- b. Sludges/oils may be decontaminated to below station free release limits and processed as non-radioactive waste.
- c. Sludges/oils may be shipped off-site for processing/incineration.
- d. Oils meeting 10CFR20.2004 and PA DEP requirements may be incinerated on-site in the auxiliary boilers.

6. Miscellaneous Waste

- a. Certain wet wastes may be allowed to dry and be treated as dry active waste or filters.
- b. Soils, sediment, and sludge from the site settling basin (hold pond), cooling tower basins, and emergency spray pond may be disposed of on-site in accordance with the 10CFR20.2002 permit granted to Limerick via letter dated July 10, 1996. AR A1038731. (Limerick Only).

6.2 WASTE STREAM PROCESSING

6.2.1 Dewatering

- 1. Resin processing is normally performed using a Dewatering System.
  - a. The Dewatering System shall be operated in accordance with the system's Topical Report and applicable procedures.
  - b. The Dewatering System processes resin by using equipment described by the Topical Report to remove free standing water.
  - c. Dewatered resin is packaged in appropriately selected liners or High Integrity Containers based on waste classification.
  - d. Station to Dewatering System interfacing is addressed by an approved 10 CFR 50.59 Review.

6.2.2 Solidification

- 1. Resins, sludges and oily wastes may be solidified by a Mobile Solidification System.
  - a. The Mobile Solidification System shall be operated in accordance with the system's Topical Report and applicable procedures.
  - b. The Mobile Solidification System processes waste using equipment described by the Topical Report to remove free standing liquid.

- c. Solidified waste is packaged in appropriately selected containers based on waste classification.
- d. Station to Mobile Solidification system interfacing shall be addressed by an approved 10 CFR 50.59 Review.

#### 6.2.3 Decontamination

- 1. Decontamination of oil may be performed on-site using a vendor service. The service shall be performed in accordance with the applicable 10 CFR 50.59 Review.

#### 6.2.4 10CFR20.2002 Disposal (Limerick Only)

- 1. Radwaste Operations shall ensure the conditions of the 10CFR20.2002 permit and PA DEP requirements are met for each batch of material disposed under the permit.
- 2. The isotopic analysis for each batch of material shall be compared to the permit requirements (LM-526, Action Request A1038731, referencing ODCM Table I3.2-3, Radioactive Liquid Waste Sampling and Analysis Program) to ensure permit requirements are not exceeded (i.e. The isotopic concentrations in the material shall not exceed ten (10) times the value in ODCM Table I3.2-3.)
- 3. The volume of each batch of the material disposed shall not exceed 70,000 ft<sup>3</sup>. The total of all such volumes in a given calendar year shall not exceed 70,000 ft<sup>3</sup>. The lifetime total of all such volumes shall not exceed 1,120,000 ft<sup>3</sup> over the life of the permit (16 years).
- 4. The material shall meet PA DEP residual waste requirements defined in 25CPA261.
- 5. The results of the above required analyses shall be maintained in a 10CFR50.75(g) file and treated as a quality record for lifetime storage. A working copy of the 10CFR50.75(g) file shall be maintained in the Radwaste Operations Group files.
- 6. The 10CFR50.75(g) file for each batch of material shall be reviewed by the Manager - Radwaste Operations.
- 7. The Manager - Radwaste shall notify the NRC Resident Inspector of the intent to exercise the 10CFR20.2002 permit.
- 8. The Manager - Radwaste Operations shall notify the Facilities Group to deposit the material in the designated area for 10CFR20.2002 disposal.
- 9. The Facilities Group shall grade and seed the area under the direction of Radwaste Operations.

10. Radwaste Operations shall direct the facilities group to post the area as a 10CFR20.2002 disposal area.

6.3 PRODUCT CONTROL

6.3.1 Routine sampling is performed by one of two techniques:

1. Direct sample from each batch. These samples are analyzed for activity and isotopic identity. If radionuclide distributions are shown to be consistent between similar batches, consideration may be given to decreasing the frequency of routine measurements. This constitutes routine sampling OR
2. Dose rate reading taken from a container of waste. Dose rates are converted to activity and isotopic breakdown based on annual samples.

6.3.2 Scaling factors for nuclides which are hard to identify are established for waste by analysis through an off-site vendor. Frequency of sampling is on an annual basis as a minimum.

6.3.3 Tests are performed on-site quarterly, as a minimum, to verify scaling factors. If the tests indicate that the scaling factors obtained through annual samples have changed by more than a factor of ten, consideration shall be given to increased off-site analysis.

6.3.4 When plant parameters affecting waste stream isotopics are altered (ex., fuel failure), consideration shall be given to further waste stream sampling.

6.3.5 Administrative controls for preventing unsatisfactory waste forms from being released for shipment are described in applicable station procedures. If the provisions of the PCP are not satisfied, then suspend shipments of defectively packaged solid radioactive waste from the site. **CM-1**

6.3.6 Liquid wastes or wastes containing liquids shall be converted to a form that contains as little free standing and non-corrosive liquid as is reasonably achievable. The liquid shall not exceed 1% of the volume of the waste, or 0.5% of the waste volume for solidified waste.

6.3.7 Processed resin is tested annually as a minimum to verify the free standing water content of the packaged product is within applicable regulatory limits. In addition to the annual verification, the free standing water content is determined whenever process changes occur that may significantly alter system performance. Tests are performed to verify operability and for ensuring the waste form is similar to that indicated in prequalification testing.



- 6.3.8 To prevent accumulation of radiolytically generated combustible gas in greater than Type A radioactive waste packages containing water and/or organic substances, one or more of the following measures are taken:
1. The container is equipped with a vent to prevent accumulation of such gas.
  2. A determination by calculation, test, or measurement is performed to ensure that hydrogen generation is limited to a molar quantity that would be no more than 5% by volume of the secondary container gas void at standard temperature and pressure (STP) over a period of time that is twice the expected shipment time.
  3. The cask cavity will be inerted.

6.3.9 Sufficient analyses shall be performed to verify that the quality of waste forms prepared for disposal by vendor's on-site processing shall be similar to vendor's test results.

6.3.10 At LGS, polymers may be injected into condensate phase separators to enhance settling of iron oxides, provided the end product is evaluated for disposal. (Limerick Only)

#### 6.4 WASTE CHARACTERISTICS FOR LAND DISPOSAL

The following are minimum requirements for all classes of waste and are intended to facilitate handling at the disposal site, provide protection of health and safety of personnel at the disposal site, and ensure that wet radioactive wastes are processed to meet shipping and burial ground requirements:  
**CM-1**

- 6.4.1 Waste shall not be packaged for disposal in cardboard or fiberboard containers.
- 6.4.2 Waste shall not be readily capable of detonation or of explosive decomposition or reaction at normal pressure and temperatures, or of explosive reaction with water.
- 6.4.3 Waste shall not contain, or be capable of generating, quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling, or disposing of the waste.
- 6.4.4 Waste shall not be pyrophoric. Pyrophoric materials contained in the waste shall be treated, prepared, and packaged to be nonflammable.
- 6.4.5 Waste containing hazardous, biological, pathogenic or infectious material shall be handled in a manner that minimizes the potential hazard from the non-radiological materials.

6.4.6 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.

#### 6.5 WASTE STABILITY

The following requirements are intended to provide stability and are applicable to Class B and Class C wastes:

6.5.1 Waste shall have structural stability which can be provided by the waste form itself, processing the waste to a stable form, or placing the waste in a disposal container or structure that provides stability.

6.5.2 Void spaces within the waste and its package should be reduced to the extent practicable.

6.5.3 Waste requiring stabilization is normally packaged in approved High Integrity Containers (HIC). The HICs are handled and stored in accordance with the applicable Certificate of Conformance (C of C). Upon arrival at the burial site, Class B and C wastes are placed in concrete overpacks for structural stability.

#### 6.6 SURVEILLANCE REQUIREMENTS FOR SOLIDIFICATION

Perform the following prior to the shipment of solidified radioactive waste from the site: **CM-1**

6.6.1 At least one representative test specimen from at least every tenth batch of waste shall be solidified.

6.6.2 If any test specimen fails to verify solidification, the solidification of the batch under test shall be suspended until additional test specimens can be obtained, alternative solidification parameters can be determined and a subsequent test verifies solidification.

6.6.3 If the initial test specimen from a batch of waste fails to verify solidification, representative test specimens from consecutive batches shall be tested until at least three consecutive test specimens demonstrate solidification. The solidification process control program shall be modified as required to assure solidification of subsequent batches.

#### 6.7 QUALITY ASSURANCE PROGRAM

6.7.1 Quality Assurance shall be maintained as defined in procedure A-C-930.

6.7.2 Audits by personnel independent of the activities are performed and reviewed by appropriate management personnel.

6.7.3 Administrative controls for preventing unsatisfactory waste forms from being released for shipment are described in applicable station procedures.

- 6.7.4 Procedures are reviewed to ensure compliance with the requirements and process parameters of this PCP.
- 6.7.5 Radioactive wastes not described within this document shall be evaluated for inclusion in this PCP or in a vendor Process Control Program prior to processing.

#### 6.8 REVISIONS

- 6.8.1 Revisions to the PCP shall be approved in accordance with applicable station or Common Nuclear Generation Group Procedures.
- 6.8.2 Any changes to the Solid Radwaste Process Control Program shall be submitted for input to the Annual Radioactive Effluent Release Report.

#### 6.9 DOCUMENTATION

- 6.9.1 Records of all data, tests, analysis results, and records of training, inspection, and audits are maintained in accordance with applicable procedures.
- 6.9.2 Waste classification records, waste form records, and other records required for the preparation of the Annual Radioactive Effluent Release Report shall be prepared and retained in accordance with the requirements of 10CFR20, 10CFR71, 49CFR170-178, and Station Technical Specifications.
- 6.9.3 Sufficient documentation shall be maintained to demonstrate compliance with this PCP.

#### 7.0 REFERENCES

##### 7.1 SOURCE DOCUMENTS

- 7.1.1 Low Level Waste Licensing Branch Technical Position on Waste Form.
- 7.1.2 Low Level Waste Licensing Branch Technical Position on Waste Classification.
- 7.1.3 Limerick Generating Station Unit 1 and 2 Technical Specifications, 6.5.1.6, 6.8.1, 6.13.
- 7.1.4 Updated Final Safety Analysis Report Peach Bottom Atomic Power Station Units 2 and 3, and Limerick Generating Station Units 1 and 2.
- 7.1.5 PBAPS Technical Specifications Section 5.6.3.
- 7.1.6 PBAPS ODCMS 3.9.3.
- 7.1.7 LGS ODCM 2.1.4
- 7.1.8 49 CFR Parts 170 through 178.

- 7.1.9 10 CFR Parts, 20, 50, 61, and 71.
- 7.1.10 Standard Review Plan 11.4, including Branch Technical Position ETSB11-3.
- 7.1.11 General Criteria for High Integrity Containers (SCDHEC).
- 7.1.12 Westinghouse-Hittman Nuclear, Incorporated (SEG) Topical Report STD-R-05-011NP-A for Mobile In Container Dewatering and Solidification System (MDSS).
- 7.1.13 CM-1, Letter from G. A. Hunger, Jr. dated Sept. 29, 1994 transmitting TSCR 93-16 (Reference A/R A0905923, E02)
- 7.1.14 Letter from USNRC to G. A. Hunger dated July 10, 1996 approving 1CFR20.2002 permit for LGS.

7.2 CROSS REFERENCES

- 7.2.1 RW-C-106, Review of Vendor Topical Report for Waste Processing
- 7.2.2 PCP Implementing Procedures

NOTE: PCP Implementing Procedures are those which apply directly to processing, packaging, sampling, analyzing, and shipping radwaste.

- 1. Limerick and Peach Bottom Radwaste Procedures (RW) or Applicable Common Procedure.
  - 2. Limerick and Peach Bottom Surveillance Test Procedures (ST) and Routine Test Procedures (RT).
  - 3. Limerick System (S) and Peach Bottom System Operating (SO) Procedures.
- 7.2.3 A-C-930, Radwaste and Radioactive Material QA Program
  - 7.2.4 Generic Letter 89-01 (Implementation of Programmatic Controls for Radiological Effluent Technical Specifications in the Administrative Controls Section of the Technical Specifications and the Relocation of Procedural Details of RETS to the Off-site Dose Calculation Manual or to the Process Control Program), 1/31/89.
  - 7.2.5 Off Site Dose Calculation Manual.
  - 7.2.6 Limerick and Peach Bottom Chemistry Procedures or Applicable Common Procedures.
  - 7.2.7 Safety Evaluation for Oil Decontamination, MOD 1259A (Peach Bottom only).

- 7.2.8 Safety Evaluation for MOD 1750A, Radwaste Dewatering Facility Peach Bottom Atomic Power Station (Peach Bottom only).
- 7.2.9 NRC Generic Letter 91-02, "Reporting Mishaps Involving LLW Forms Prepared for Disposal.
- 7.2.10 PECO 10CFR50.59 Review for Scientific Ecology Group Dewatering System Operation.
- 7.2.11 I.E. Circular 80-18, 10CFR50.59 Safety Evaluation for Changes to Radioactive Waste Treatment Systems.
- 7.2.12 PA DEP, Title 25, Chapter 215, Article V.
- 7.2.13 EPA, 40 CFR
- 7.2.14 AR A0970339, Calculation LM-526.
- 7.2.15 AR A1038731, NRC 10CFR20.2002 permit.

8.0 EXHIBITS

None