

Fuel Pool Cooling and Clean-up System Instructor Notes

ACADs (08-006) Covered

1.1.6.1.3 2.1.11.1 2.1.11.3 5.2.1.5d

Keywords

Spent fuel, decay heat, cooling pumps, heat exchanger, piping and valves, filters, strainers, flowpath, ion exchangers.

Description

This document provides instructor notes and references to materials which can be used to create a lesson on fuel pool cooling and cleanup.

Supporting Material

Systems Training Manual Volume 32 "Spent Fuel Pool Cooling and Clean-up System"

Headquartered at Indian River State College | 3209 Virginia Avenue Fort Pierce, FL 34981 | 772-462-7172



www.gonuke.org

This material is based upon work supported by the National Science Foundation under Grant No. 1104238. Any opinions, findings, conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

**PALO VERDE
NUCLEAR GENERATING STATION**

Instrumentation & Controls Training

Classroom Lesson

I&C Program		Date:
LP Number: NIA9902XC016	Rev. :	Rev Author: Norman R. Cooley
Title: Fuel Pool Cooling and Clean-up		Technical Review:Robin T. Meredith
Duration : 1 Hour		
		Teaching Approval:

INITIATING DOCUMENTS:

Site Maintenance Training Program Description

PROCEDURES

NONE

REQUIRED TOPICS

NONE

CONTENT REFERENCES

Systems Training Manual Volume 32 "Spent Fuel Pool Cooling and Clean-up System"

Tasks Covered

The following tasks are covered in Fuel Pool Cooling and Clean-up:

Task Number*	Task Statement
--------------	----------------

Total tasks: 0

TERMINAL OBJECTIVE:

- 1.0 Given the appropriate references,, the participant will be able to recognize the components, functions and operation of the Fuel Pool Cooling and Cleanup System.
- 1.1 Identify the functions of the Fuel Pool Cooling and Cleanup System.
- 1.2 Identify the components Fuel Pool Cooling and Cleanup System.
- 1.3 Recognize the operation of the Fuel Pool Cooling and Cleanup System.

Lesson Introduction:Fuel Pool Cooling and Clean-up

CLASSROOM GUIDELINES

- If applicable, remind students of class guidelines as posted in the classroom.
- Attendance Sheet
- Pass the attendance sheet around and have it signed in black ink.
- Materials
- Ensure that student materials needed for the class are available for each student. (For materials required, refer to the list of materials on the cover page.)
- Questions and Participation
- Emphasize student participation and remind them of your philosophy on asking and answering questions, if applicable.

ATTENTION STEP

- Give a brief statement or story to get student concentration focused on the lesson subject matter.

LESSON INTRODUCTION

- Give a brief statement which introduces the specific lesson topic. Should be limited to a single statement.

MOTIVATION

- Focus students attention on the benefits they derive from the training. At Instructors discretion. The need for remotivation in each succeeding lesson must be analyzed by the Instructor and presented as necessary.
- Instructor should include how the STAR process can be used to improve or enhance Operator Performance, if applicable.
- Lesson Terminal Objective
- Read and discuss lesson terminal objective and review lesson enabling objectives, if desired.
- Topic
- If applicable, briefly preview the lesson topic outline and introduce the major points to be covered. The objectives review may have been sufficient.
- REINFORCE the following PVNGS management expectations as opportunities become available
- Nuclear Safety
- Industrial Safety Practices
- STAR and Self-Checking
- Procedure Compliance
- Communication Standards
- ALARA
- Prevent Events

Course Terminal Objective

Given the appropriate references, the participant will be able to recognize the components, purposes and capabilities of the Plant Systems and Components as demonstrate by 80% overall proficiency on a series of three written examinations.

T.Obj 1.0	Given the appropriate references,, the participant will be able to recognize the components, functions and operation of the Fuel Pool Cooling and Cleanup System.
------------------	--

EO 1.1	Identify the functions of the Fuel Pool Cooling and Cleanup System.
---------------	--

1.1.1 Main Idea

- A. Fuel Pool Cooling System.

T001

1. Function.
 - a. Functions to remove spent fuel and decay heat generated in the fuel pool. NOTE: a minimum of 23 feet of water is maintained above top of assemblies in storage racks.

- B. Fuel Pool Cleanup.

T002

1. Functions.
 - a. Maintain water cleanliness in Fuel Pool, Fuel Transfer Canal and Refueling Pool. NOTE: Designed to remove 99% of failed fuel iodine.
 - b. Dewater the refueling, transfer canal and UGS, upper guide structure, pit following refueling.
 - c. Fill and empty fuel cask pit during cask handling operations.

EO 1.2	Identify the components Fuel Pool Cooling and Cleanup System.
---------------	--

1.2.1 Main Idea

A. Fuel Pool Cooling.

T001

1. Major components.
 - a. Fuel Pool Cooling Pumps.
 - b. Fuel Pool Heat Exchangers.
 - c. Piping and Valves.

B. Fuel Pool Cleanup

T002

1. Major components
 - a. Strainers
 - b. Fuel Pool Cleanup Pumps.
 - c. Filters
 - d. Fuel Pool Ion Exchangers
 - e. Ion Exchanger Strainers
 - f. Piping and Valves.

EO 1.3	Recognize the operation of the Fuel Pool Cooling and Cleanup System.
---------------	---

1.3.1 Main Idea

A. Fuel Pool Cooling

T001

1. Functional flowpath and operational characteristics.
 - a. Operates continuously when spent fuel is in the fuel pool.
 - b. Arranged in (2) independent flow trains each capable of providing adequate heat removal during normal operations.
 - c. Fuel Pool Cooling Pumps take suction on the pool via a common supply header.
 - d. Discharge through related fuel pool cooling heat exchangers to a common return header.
 - 1) Heat exchangers, shell and tube type, have NC water on shell side to absorb heat from fuel pool water in tubes.
 - 2) EW may be manually aligned to provide heat exchange cooling flow if NC not available.
 - e. Common return header flow to fuel pool.
 - f. May be operated with both pumps and heat exchangers.
 - g. Shutdown Cooling System may be aligned to system following:
 - 1) Loss of fuel pool cooling system.
 - 2) Full core off load.

B. Fuel Pool Cleanup

T002

1. Functional Flowpath and Operational Characteristics.
 - a. Operated intermittently as necessary.
 - b. Arranged in (2) separate, identical flow trains.
 - 1) May be simultaneously in service cleaning different water sources.
 - 2) May be aligned to take suction on any of the following:
 - a) Cask Pit.
 - b) Fuel Pool, Three Depths plus Skimmer
 - c) Fuel Transfer Canal
 - d) Refueling Pool and Skimmer

- e) UGS pit
- f) Ref. Water Tank
- 3) Strainer at each pumps suction
 - a) Removes large particulates and debris.
 - b) Prevents pump and downstream filter damage
- 4) Pumps discharge to filters for small particulate removal
- 5) Filter flow then directed to ion exchangers or returned directly to source, dependent on water quality.
 - a) Mechanical Filtration of tiny particulates
 - b) Ion exchange removes dissolved ionic materials
- 6) Y-type strainer installed at each ion exchanger outlet to collect escaping resin.
- 7) Makeup water for fuel pool is normally added from liquid radwaste system recycle monitor tanks

SUMMARY OF MAIN PRINCIPLES

Objectives Review

Review the Lesson Objectives

Topic Review

Restate the main principles or ideas covered in the lesson. Relate key points to the objectives. Use a question and answer session with the objectives.

Questions and Answers

Oral questioning

Ask questions which implement the objectives. Discuss students answers as needed to ensure the objectives are being met.

Problem Areas

Review any problem areas discovered during the oral questioning, quiz, or previous tests, if applicable. Use this opportunity to solicit final questions from the students (last chance).

Concluding Statement

If not done in the previous step, review the motivational points which apply this lesson to students needs. If applicable, end with a statement leading to the next lesson.

You may also use this opportunity to address an impending exam or practical exercise.

Should be used as a transitional function to tie the relationship of this lesson to the next lesson. Should provide a note of finality.