Rev. 2 4/20/78

REFUELING PROCEDURE

FP-1001

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

SPENT FUEL HANDLING

REVIEWED BY: Plant Review Committee

Paul F. McGee

Date 4/20/78

Meeting No. 78-16

APPROVED BY: Nuclear Plant Manager

Guy P. Beatty Jr.

Date 5/15/78

1.0 PURPOSE

To describe the procedure to be used in the receiving, loading, and preparing for shipment of spent fuel casks.

Mode	Section
Prior to Arrival of Spent Fuel Cask	6.0
Receipt and Placement of Single Assembly Cask	7.0
Loading Fuel in Cask	8.0
Preparation of Single Assembly Cask for Shipment	9.0

2.0 DESCRIPTION

2.1 The fuel handling system is designed to provide a safe, effective means of transporting and handling fuel from the time it is removed from the spent fuel pool to the time it is removed from the plant site in spent fuel casks.

2.2 This document will describe in check list form the procedures to be followed before, during, and after loading the spent fuel assemblies into the spent fuel casks.

3.0 REFERENCES

3.1 Refer to RP-101, Radiation Protection Manual, Section 6, for control and accountability of radioactive materials.

3.2 Crystal River Unit 3 FSAR, Section 9.6, Fuel Handling System, pages 9-24 through 9-29

3.3 Plant Operating Quality Assurance Manual, Volume VII, Refueling Operations

3.4 CR-3 Plant Operating Quality Assurance Manual, Volume XII, Special Nuclear Materials (SNM) Handling and Accountability

4.0 LIMITS AND PRECAUTIONS

4.1 Spent fuel must be cooled for at least 120 days before loading into casks.

4.2 Spent fuel casks must be washed down to remove any foreign materials before being placed into the spent fuel pool.

4.3 Radiation protection requirements as specified on work permits must be complied with when working with the casks or spent fuel assemblies.

4.4 Radiation and contamination levels must comply with the Code of Federal Regulations, Title 49, Chapter 1, prior to shipment from the plant.

4.5 Smear tests shall be performed on the casks before unloading to insure compliance with Section 6.1 of RP-101, Radiation Protection Manual.

4.6 If casks are to be shipped to areas where outside temperatures may reach freezing, suitable antifreeze such as silver nitrate will be added to the coolant. The amount will be specified by the Chemistry and Radiation Protection Department.

(TS) 4.7 No spent fuel shall be stored in spent fuel pool "B" (east) and the gate between pools "A" (west) and "B" (east) must be in place whenever a spent fuel cask is being handled over spent fuel pool "B" (east) or the cask loading area.

(TS) 4.8 No spent fuel cask shall be handled over spent fuel pool "A" (west).

4.9 Cranes to be used operate satisfactorily in accordance with applicable portions of FP-301, Preparation for Refueling.

5.0 SET POINTS

5.1 Spent Fuel Storage Pool Level: Normal

5.2 Purification Flow: 180 gpm

5.3 Filter Differential Pressure: < 25 psi

5.4 Spent Fuel Pump Discharge Pressure: $\geq$ 40 psig

5.5 Spent Fuel Pool Temperature: $\leq$ 105°F

5.6 Spent Fuel Storage Pool Discharge Flow: 1500 gpm > 2300 gpm

PROCEDURE

6.0 PRIOR TO ARRIVAL OF SPENT FUEL CASK

6.1 Notify Nuclear Plant Manager of date and time of arrival of spent fuel cask.

6.2 Notify Radwaste Management Supervisor of arrival of spent fuel cask.

6.3 Notify Plant Reactor Engineer of arrival time and date, and assure that Spent Fuel Shipping Cask Loading Form (CR-3 Form SPSCL, No. 912-010) will be filled out and available at that time.

(TS) 6.4 Insert gates in track to separate spent fuel cask loading area from main spent fuel pool and between pools "A" and "B".

6.5 Lower water level in spent fuel cask area using installed suction line and a portable pump.

6.6 When water level gets to bottom of installed suction line, valve off line so pump will not cavitate.

6.7 Continue lowering water level with portable pump until pit contains less than 15 feet of water, then secure portable pump.

6.8 Remove fuel building hatch with building crane and place in storage area.

7.0 RECEIPT AND PLACEMENT OF SINGLE ASSEMBLY CASK

7.1 INITIAL CONDITIONS

Section 6.0 has been completed.

7.2 Upon arrival of spent fuel shipping cask, complete Check List "A", Receiving and Unloading Single Assembly Spent Fuel Cask.

8.0 LOADING FUEL IN CASK

8.1 Reflood cask loading area using installed line.

8.2 Remove gate separating cask area from rest of spent fuel pool and gate separating spent fuel pools "A" and "B".

8.3 Check Spent Fuel Shipping Cask Loading Form (CR-3 Form SFSCL, No. 912-010) to determine which assembly should be loaded.

8.4 Complete Check List "B", Loading Fuel Into Cask.

9.0 PREPARATION OF SINGLE ASSEMBLY CASK FOR SHIPMENT

Complete Check List "C", Removal of Cask from Spent Fuel Pool and Preparation for Shipment.

ENCLOSURES

Enclosure 1	Check List "A", Receiving and Unloading Single Assembly Spent Fuel Cask
Enclosure 2	Check List "B", Loading Fuel Into Cask
Enclosure 3	Check List "C", Removal of Cask From Spent Fuel Pool and Preparation for Shipment

CHECK LIST "A"

RECEIVING AND UNLOADING SINGLE ASSEMBLY SPENT FUEL CASK

Date _____ Initials

1. Health Physics has surveyed trailer and personnel barrier. _____
2. Inspect trailer and personnel barrier for damage. Report any damage to Plant Reactor Engineer. _____
3. Position trailer under fuel building hatch. Set brakes and block wheels against movement in either direction. _____
4. Remove access panel by hand from personnel barrier. _____
5. Close water jacket vent valve and expansion tank valve. Relieve water pressure in line connecting water jacket expansion tank by opening draincock located in line. Disconnect water jacket expansion line from water jacket. _____
6. Attach special slings to main hook. Attach slings to personnel barrier. Remove personnel barrier and set aside. _____
7. Health Physics has smeared test cask for surface contamination and adjacent surfaces of trailer. _____
8. Inspect cask and trailer for damage. Complete receiving inspection portion of shipping document. _____
9. Wash off road dirt only if smear shows no contamination. If trailer is contaminated, then trailer must be washed with controlled effluent of wash water. If cask is contaminated, then road dirt and contamination will be removed once cask is placed in the decontamination area. _____

CHECK LIST "A" (Cont'd)
RECEIVING AND UNLOADING SINGLE ASSEMBLY
SPENT FUEL CASK

Date _____ Initials

10. Remove lockwire and bolts from front tiedown. _____

11. Remove top and bottom impact structures and store on trailer bed. _____

12. Using cask lifting yokes, engage trunnions on front end of cask. Raise cask to a vertical position on rear support, moving crane as required to keep crane cable vertical. When cask is fully vertical, remove cask from trailer. _____

13. Place cask in decontamination area. Disengage lifting yoke. Clean cask surfaces as required for entry into spent fuel pool. _____

14. Back off outer closure head bolts. Remove protective cover plates from valve boxes. Remove valve lead seals and dust covers. Remove threaded plugs from top of outer closure head and replace with threaded eyebolts. Check to see that closure head cavity drain valves are closed. _____

15. Using shackles, attach lifting slings to eyebolts on top of closure head. Remove outer closure head and set it on supports which are suitable for radiological control and for maintaining the cleanliness of closure head. Carefully inspect O-ring seal in underside of closure head. If O-ring shows any damage, replace O-ring. Be certain that replacement O-ring is properly installed and seated. Note any damage or repairs on shipping document. _____

CHECK LIST "A" (Cont'd)
RECEIVING AND UNLOADING SINGLE ASSEMBLY
SPENT FUEL CASK

Date _____ Initials

16. Remove inner container closure head nuts. Using main crane hook, attach lifting slings to two welded lugs on inner container closure head. Remove inner container closure head and set down on a clean surface. _____

17. Check to see closure head valves are closed. Remove dust covers from closure head drain valve and fill valve. Open closure head cavity drain valves which are located on the side of the cask. _____

18. Remove fuel assembly holddown by means of a special long rod with hook end and set down on supports which are suitable for radiological control and for maintaining the cleanliness of holddown.

19. Survey cask internals. Visually inspect cask(s) inner container cavity for foreign material damages, etc. Also inspect gasket in suction drain line flange. Note any discrepancy on shipping documents. Replace fuel assembly holddown. _____

20. Check water level in water jacket. If necessary, connect water jacket drain valve to a supply of demineralized water by means of a hose. Open water jacket drain and vent valves. Open water supply valve and wait until solid stream of water exits from water jacket vent valve. Close both valves and disconnect hose from water jacket and replace water jacket valve box cover gaskets and cover

CHECK LIST "A" (Cont'd)
RECEIVING AND UNLOADING SINGLE ASSEMBLY
SPENT FUEL CASK

Date _____ Initials

plates. Fill cask cavity with demineralized water up to level of inner container flange. _____

21. Engage cask lifting yoke with cask trunnions and pick up cask. Lift cask to clear all appurtenances on the way to the fuel pool. _____

22. Slowly lower cask to cask loading area of spent fuel pool. _____

23. Disengage lifting yoke from cask by means of special long service tools. _____

24. Lift main crane hook, lifting yoke, and remove from cask storage area. _____

25. Wash down all (lifting yoke and inner closure head) wetted parts before setting any components aside. _____

Check List Completed _____ _____
Supervisor Date

CHECK LIST "B"

LOADING FUEL INTO CASK

Date _____ Initials

1. Read identification number on top of fuel assembly via binoculars. Record identification number on shipping document. _____

2. Pick up fuel assembly using manipulator crane. _____

3. Position refueling bridge over cask. Center the fuel assembly over cask cavity. Carefully lower fuel assembly into cask. _____

4. Watch assembly as it approaches cask. If assembly is not properly aligned, withdraw assembly to full "Up" position and move bridge as necessary to correct alignment. _____

5. Lower assembly into cask, repeating Step 4 if necessary. _____

6. Release grapple from fuel assembly and raise grapple to full "Up" position. _____

7. Confirm that fuel assembly is fully seated in cask. _____

8. Move refueling bridge clear of cask. _____

Check List Completed _____ _____
Supervisor Date

CHECK LIST "C"

REMOVAL OF CASK FROM SPENT FUEL POOL AND PREPARATION FOR SHIPMENT

Date _____ Initials

1. Install fuel assembly holddown into cask by means of a special long rod with hook end. _____

2. Attach two-legged sling to cask lifting yoke. Position cask lifting yoke over inner container closure head located on a stand at fuel pool ledge. Attach closure head lifting cables to welded lugs on outer surface of inner closure head, using shackles. Open closure head suction and fill valves. _____

3. Position inner head over cask and slowly lower onto cask, making sure that the dowel pins located in the cask flange provide final positive alignment. Visually confirm that inner head is seated by the use of binoculars. _____

4. Lower cask handling yoke to slacken the closure head cables which in turn locate yoke legs relative to cask trunnions. Laterally move yoke legs by means of a positive drive system to engage cask trunnions. Begin lifting cask with main crane. _____

5. Monitor cask continuously for radiation dose as top of cask comes within approximately five feet of pool water surface. Stop crane lift at the direction of Health Physicist below pool water level. Install underwater, all inner container closure head nuts, in pairs, 180° apart,

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND
PREPARATION FOR SHIPMENT

Date _____ Initials

first hand-tight; then torque to given foot-pounds in two equal steps. As all wetted surfaces continue to emerge from surface of pool water, hose with demineralized water those items such as the cask, cask handling yoke, and the crane hook assembly. Monitor radiation levels on all surfaces of cask. _____

6. Continue to raise cask until closure head cavity drain valves are accessible from refueling bridge platform. Open closure head cavity drain valves. After pool water has drained from closure head cavity, close closure head cavity drain valves. _____

7. Connect hose from demineralized water supply to quick-disconnect fitting on inner container fill valve. Connect a hose to inner container suction drain valve with free end of hose to be placed in pool water or contaminated drain. Open demineralized water supply valve and proceed to flush cask inner container for a period of 20 minutes. _____

8. Close demineralized water supply valve. Close inner container fill valve. Disconnect hose from demineralized water supply. Connect T-fitting with pressure gauge and isolation valve to quick-disconnect fitting on inner container fill line. (The discharge side of the suction valve is still connected to a hose with one end placed into the pool water.) _____

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND
PREPARATION FOR SHIPMENT

Date _____ Initials

9. Connect helium bottles (with pressure regulated to 10 psig) to quick-disconnect on isolation valve assembly. Open inner container suction drain valve, fill valve, and isolation valve. Open helium supply valve for a few minutes to allow helium to push out a monitored quantity of water from inner container which represents not more than 25% of the water volume in the inner container. At least 75% of water should remain in inner container until leak-testing operation has been completed. _____

10. Connect discharge end of the hose on the inner container suction valve to a graduated container. Draw off a sample of inner container water by closing inner container fill valve and opening inner container suction valve. After drawing sample, open the inner container fill valve and close inner container suction valve. _____

11. Health Physics has analyzed coolant for radioactive contents and recorded results on shipping document. Close helium supply valve. _____

12. Close suction drain valve and open helium supply valve. Pressurize inner container to 10 psig. Close helium supply and inner container fill valve. Hold pressure for 10 minutes and open inner container fill valve. If there is no pressure drop, the seal and valves are satisfactory. Record results on shipping document. _____

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND
PREPARATION FOR SHIPMENT

Date_____ Initials

13. Open inner container suction drain valve and release pressure on inner container through free end of hose which has been returned to the pool water. Now allow helium flow to push out remaining inner container water until there is no further discharge from the suction drain line, discernible by the appearance of helium bubbles issuing from pool water surface. _____

14. Immediately after appearance of helium bubbles issuing from hose, connect discharge end of suction drain hose to an evacuated, calibrated collection vessel. Draw off specified volume of helium gas by closing the petcock on collection vessel and close suction drain valve. Analyze for radioactive contents and record on shipping document. Close inner container fill and suction drain valves. Close helium supply valve. _____

15. Disconnect helium supply bottle, pressure gauge, and isolation valve assembly. Remove suction drain hose. Remove fill valve hose. Decontaminate pressure gauge and isolation valve assembly before further use. _____

16. Connect hose from suction pump to quick-disconnect fittings on cask cavity suction drain line. Allow free end of hose from discharge side of suction pump to be placed into pool water. Pump water from cask cavity (annulus). _____

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND
PREPARATION FOR SHIPMENT

Date _____ Initials

17. Disconnect suction drain line hose and suction pump. Install cap on quick-disconnect fitting. _____

18. Continue hosing cask down with demineralized water. Monitor radiation dose rate as cask emerges from pool. When all cask surfaces have been hosed, install cask drip pan, if desired. Immediately move cask out of fuel pool to decontamination area. Remove cask drip pan and set cask down. Remove lifting yoke and closure head lifting cables. An effort should be made to prevent the cask surface from drying after removal from fuel pool on its way to decontamination area. _____

19. Immediately commence decontamination procedures in decontamination area using demineralized water, steam, detergent and scrub brushes, as required. _____

20. Attach closure head lift cables to eyebolt on outer closure head which is resting on outer closure head stand in decontamination area. Lift outer closure head and position outer closure head on cask flange. Visually confirm that outer closure head is seated. Remove closure head lift cables. _____

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND
PREPARATION FOR SHIPMENT

Date _____ Initials

21. Remove eyebolts from outer closure head and insert metal threaded plugs. Store eyebolts in box. Torque outer closure head bolts, in pairs, 180° apart, first hand-tight; then torque to given foot-pounds, in two steps. _____

22. Connect compressed air supply line to second closure head cavity drain valve. _____

23. Open compressed air supply valve and pressurize cask cavity space between inner and outer closure heads to 10 psig. Close air supply valve and second drain valve. Hold pressure for 10 minutes. If there is no pressure drop, the outer closure seal and closure head cavity drain valves are satisfactory. If pressure drops, correct source of leak and repeat test. Record results on shipping document. _____

24. Open isolation valve and relieve pressure in cavity between cask heads. Close closure head cavity drain valves and remove pressure gauge and isolation valve assembly. _____

25. Lockwire both closure head cavity drain valves closed. Install pressure caps on quick-disconnect fittings on both valves. _____

26. Health Physics has surveyed entire cask for the surface contamination and radiation dose rates. If surface contamination values are higher than those specified for

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND
PREPARATION FOR SHIPMENT

Date _____ Initials

shipment, continue decontamination procedure. During decontamination procedure, be sure to lift cask sufficiently to decontaminate cask bottom surface. Record final values on shipping document. _____

27. Install lead seal between two adjacent cask outer closure bolts. _____

28. Install valve box covers on the closure head cavity drain valve boxes with bolts for each valve box. Verify that water jacket vent valve is "open." Install water jacket vent valve box covers with bolts. _____

29. Attach lifting yoke to cask. Lift and move cask to trailer locations. Position cask to engage cask lugs in bottom end of cask with rear tiedown trunnions. Lower cask to rest on front tiedown saddle, moving cask lifting yoke as required to keep crane cables vertical. Disengage cask lifting yoke in decontamination area. _____

30. Health Physics has surveyed cask closure head areas and valve boxes for surface contamination to assure compliance with DOT Regulation 173.393(a). Record final values on shipping document. _____

31. Install and torque front tiedown bolts to given foot-pounds in two steps. Install top impact structure with bolts and torque to given foot-pounds. Install bottom impact structure with bolts and torque to given foot-pounds. Lockwire all bolts. _____

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND
PREPARATION FOR SHIPMENT

Date _____ Initials

32. Install personnel barrier on trailer and bolt in place with bolts. Connect cask water jacket to expansion tank via access panel by connecting flexible metal hose from expansion tank to quick-fitting on vent valve. Check to see that expansion tank valves (two) are open. Be sure draincock is closed. Install access panel and fasten with bolts. Torque to given foot-pounds. _____

33. Paste shipping placards to outside of personnel barrier as required by 49 CFR 173.399. _____

34. Perform final health physics survey of truck system. _____

35. Return all service equipment decontaminated to normal storage. _____

36. Complete all forms and prepare Bill of Lading for shipment. _____

37. Shift Supervisor has reviewed shipping document for completeness and accuracy. Sign-off as "cask with acceptable limits and ready for shipment." _____

Check List Completed _____ _____
Supervisor Date