ENVIRONMENTAL AND COST/BENEFIT ASSESSMENT FOR THE CRYSTAL RIVER UNIT 3 HIGH DENSITY SPENT FUEL STORAGE RACKS

FLORIDA POWER CORPORATION

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ENVIRONMENTAL AND COST/BENEFIT ASSESSMENT

I. Cost/Benefit Assessment

A. The following are specific needs that require increased storage capacity in the spent fuel pool (SFP) at CR#3:

1. Florida Power Corporation presently has a contract with Allied General Nuclear Services for spent fuel transportation and reprocessing at their plant in Barnwell, South Carolina. However, NRC approval for operation of this reprocessing facility has not been granted and therefore eliminates FPC's ability to ship and reprocess the spent fuel from CR#3.

2. The first refueling outage is presently scheduled for November, 1978 at which time 56 fuel assemblies will be stored in the SFP. The next three refueling outages are scheduled for the fall of 1979, 1980 and 1981 at which time 60, 61 and 56 spent fuel assemblies will be stored in SFP, respectively. At the present time, there are no spent fuel or control rod assemblies stored in the SFP at CR#3.

3. The present SFP will be filled after the fourth refueling outage in the fall of 1981. If spent fuel pool A is expanded as requested, it will not be filled until 1988-1989. If both Pool A&B are expanded, they will not be filled until 1998-2000. The proposed SFP expansion will enable FPC to continue to operate CR#3 and store spent fuel for an additional 19 years.

B. The total cost associated with the proposed modification to the SFP is as follows:

1.	Engineering Cost	$200,000
2.	Capital Costs - Pool A	1,300,000
	Pool B	1,450,000 (1978 dollars)
3.	Construction - Pool A	400,000
	(Installation)- Pool B	300,000 (1978 dollars)
	Cost	

C. The following four alternatives to increasing the storage capacity of the SFP at CR#3 have been considered.

1. Shipment to a reprocessing facility--As discussed earlier, this is not a viable alternative at the present time.

2. Shipment to an independent spent fuel storage facility--Proposal from two independent storage facilities were evaluated against the cost of expanding the SFP at CR#3.

A summary of this estimated cost comparison is as follows:

Johnson and Merrill Lynch - ~$1768/yr./space (1974 dollars)
plus $445/space decommissioning
plus shipping

Nuclear Fuel Services - ~$3800/yr./space (1975 dollars)
plus shipping

Crystal River #3 Pool - ~$3500/space one-time (1977 dollars)
no shipping

Independent spent fuel storage facilities are not available at the present time and are more costly than expansion of the SFP at CR#3.

3. Shipment to another reactor site -- Due to the lack of available reprocessing and independent storage facilities, all utilities which own and operate nuclear power plants are facing the same spent fuel storage problems as Florida Power Corporation. Therefore, shipment of our fuel to another utility's nuclear plant is not a viable alternative.

4. Shutting down the reactor--If Crystal River Unit 3 was shut down, Florida Power Corporation would have to replace the capacity immediately. There are several possible sources of capacity.

From outside Florida Power's generating system, there would be limited capacity available on an emergency basis. This capacity is priced at about $44/MWH in 1978 dollars with no demand charge associated. There is some potential for obtaining economy interchange on an as available basis during off-peak periods at a cost of anywhere from $15 to $40/MWH with no demand charge associated. Neither of these sources can be considered as reliable sources of power, however; and there will be numerous shortages.

From inside Florida Power's generating system, some energy would be available during off-peak periods from oil fired steam units at about $20 to $30/MWH in 1978 dollars. For peak periods, additional combustion turbine units would have to be installed to make up the capacity deficit until a base load nuclear or coal unit could be installed to replace Crystal River 3. Combustion turbines could be added in two to three years, a coal unit in seven to eight years, or a nuclear unit in ten to twelve years.

Costs for these units are estimated in 1978 dollars to be:

	Capital Cost	Operating Cost
Combustion turbine	$ 180-190/KW	$35-40/MWH
Coal	$ 500-600/KW	$15-20/MWH
Nuclear	$1000-1200/KW	$ 3-6 /MWH

Using the emergency cost of $44/MWH, the replacement cost of Crystal River 3's energy on an annual basis at 80% capacity factor is:

$44/MWH x 8760 hrs/yr x .80 x 731 MW = $225,405,312/year

This does not include the capital cost that would be required to replace this unit's capacity and does not include the cost impact on Florida Power Corporation's customers of the numerous capacity shortages and load interruptions that would result until Crystal River 3's capacity could be replaced.

D. The material used in the construction of the storage racks will be 300 series stainless steel. The bolting material for the leveling pad screws will be 17-4 PH stainless steel. The poison material will be a B_4C/Polymer Composite manufactured by Carborundum Company. The commitment of these material resources will in no way impact the alternative of expansion of the CR#3 SFP from the standpoint of resource availability.

E. Detailed discussion of the additional heat load and the anticipated maximum temperature of the water in the SFP which will result from the proposed expansion, is contained in Section 4.3.6 of the GAI Report No. 1949 "Investigation on the Structural Safety of the Spent Fuel Pool Due to Installation of High Density Racks." It is expected that there will be no significant increase in the amount of heat released to the environment as a result of the SFP expansion at CR #3.

II. Radiological Evaluation

A. Since there is no spent fuel presently stored in the pools, no solid radioactive wastes have been generated by the spent fuel pool purification system. It is anticipated that a slight increase in solid wastes may result from the expansion of the capacity of the spent fuel pool. It is possible that the spent fuel purification system would be shutdown between the last spent fuel shipment and the next refueling outage during each fuel cycle. Because spent fuel is allowed to decay for 120 days before shipment, most of the corrosion and fission products will already be removed from the fuel prior to shipment. Therefore, no additional solid waste will be generated if the fuel would be stored for longer than 120 days. However, the necessity to operate the spent fuel cooling system during the time it normally would be shutdown will lead to the collection and filtration of the dust and debris from the surface of the water. This will result in the filters and demineralizers having to be replaced periodically.

In 1977, Crystal River Unit 3 shipped 15, 291 cubic feet of solidified waste. If the storage of additional spent fuel does increase the amount of solid waste from the purification system by one demineralizer change per year (21 cubic feet) the increase in total waste volume shipped would be less than 1% and would not have any significant additional environmental impact.

B. Because no spent fuel has been stored in the SFP at CR#3, there has been no radioactive releases from the spent fuel storage area ventilation system.

C. The following discussion addresses expected increases in the dose to personnel from radionuclide concentrations in the SFP due to the proposed expansion.

1. There is no data available concerning a gamma isotopic analysis of the SFP water identifying the principal radionuclides as no spent fuel has been stored in the SFP.

2. There is no data available concerning an analysis of the SFP ventilation system to determine principal airborne radionuclides as no spent fuel has been stored in the SFP.

3. Approximately 0.2 man-rem will be received by plant personnel in changing out the one additional spent fuel pool demineralizer resin change per year. This will add less than one percent to the total annual occupational radiation exposure burden at the plant.

4. As stated in paragraph II.A., it is not anticipated that additional crud (corrosion and fission products) will be present besides the amount normally removed in the 120 day decay period. The spent fuel pool is designed to remove the dust and debris from the surface of the water so that it will not build up along the sides. An overflow type skimmer is installed along the north sides of both pools. The cooling water inlet is on the south side of the pools and the outlet is on the north side so the flow of water is toward the skimmer. Additionally, the spent fuel pool ventilation system directs air over the pool from south to north driving the surface of the water in that direction. These design features will minimize the buildup of crud on the sides of the SFP.

2. Safety Evaluation Report and Final Environmental Statement - We have reviewed these documents and have concluded that the determinations reached by the Commission in these documents are not significantly altered as a result of our proposed modifications to the spent fuel storage facilities at CR#3. This conclusion is supported by the information provided within this Environmental and Cost/benefit Assessment as well as within our submittals of January 9, 1978, and March 3, 1978.

IV. CONCLUSION

The alternatives described herein do not offer the operating flexibility of the proposed action nor could they be completed as rapidly as the proposed action. These alternatives, i.e., reprocessing, independent storage facilities, or shipment to another reactor site, are more costly than the proposed action and might preempt storage space needed by another utility. The alternative of ceasing operation of CR#3 is also more expensive than the proposed expansion spent fuel storage capacity because of the need to provide replacement power. In addition to the economic advantages of our proposed action, we have determined that the expansion of the SFP would have negligible environmental impact and not proceeding with the expansion of the SFP at CR#3 would result in substantial harm to the public interest.

5. The additional spent fuel assemblies themselves will contribute a negligible amount to the dose rates in the pool area because of the depth of water that will be shielding them. Therefore, the additional man-rem received by plant personnel will only be from the change of the one addition demineralizer charge and this is addressed in paragraph C.3.

D. The present spent fuel racks will be removed from the spent fuel pool, decontaminated, if necessary, and scrapped. The weight of the present stainless steel racks is approximately 50,000 lbs.

III. ACCIDENT EVALUATION

A. The accident aspects of the environmental review includes the radiological consequences of the cask drop/tip accident and an evaluation of the Safety Evaluation Report and Final Environmental Statement to ensure that none of the conclusions reached in these documents with regard to spent fuel storage have changed significantly.

1. Cask Drop/tip Analysis - The overhead crane used to handle the spent fuel shipping cask is equipped with interlocks and/or physical stops which prevent transferral of the crane and shipping cask over the spent fuel pool. The operability of these interlocks and/or physical stops are demonstrated once per 7 days during cask handling as required by CR#3 Technical Specification 4.9.7.1. In addition, Technical Specifications 4.9.7.2 requires that prior to operating the crane in the cask handling mode, we must verify that no fuel assemblies are in the storage pool adjacent to the cask loading area, and that the watertight gate between the two storage pools is in place and sealed. Maximum loads which can be transported over the spent fuel pools are limited by CR#3 Technical Specifications 3.9.6 and 3.9.7. The design of the spent fuel storage facility for CR#3 has been reviewed with regard to the cask drop/tip event by the NRC and has been found acceptable as described in Section 9.1.2 of the Safety Evaluation Report for CR#3.

Florida Power Corporation plans to initiate in the latter part of 1978 an evaluation/review of the cask drop/tip problem at CR#3 to determine what modifications would be feasible to eliminate this concern and thereby allow cask handling with spent fuel in both storage pools. Upon completion of our evaluation of this concern, we will submit the results to the NRC for review and approval.