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UHRIG,R.E. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
VARGA,S.A. Operating Reactors Branch 1

SUBJECT: Forwards responses to Questions 2,3 & 4 of NRC 801021 request for addl info re disposal alternatives.Response to Question 1 will be submitted in near future.

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October 31, 1980
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Office of Nuclear Reactor Regulation
Attention: Mr. Steven A. Varga, Chief
Operating Reactors Branch #1
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Varga:

Re: Turkey Point Units 3 & 4
Docket Nos. 50-250 & 50-251
Steam Generator Repair

Enclosed you will find Florida Power & Light Company's responses to Questions 2, 3, and 4 of the Request for Additional Information on Disposal Alternatives transmitted with your letter of October 21, 1980. The response to Question 1 is being prepared and will be submitted in the very near future.

Please advise us if you require further information.

Very truly yours,

Robert E. Uhrig

Robert E. Uhrig
Vice President
Advanced Systems & Technology

REU/LFR/ah

Enclosures

cc: Norman A. Coll, Esquire
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Enclosure

REQUEST FOR ADDITIONAL INFORMATION

DISPOSAL ALTERNATIVES

Question

1. Describe the hurricane resisting properties of the proposed storage building for the steam generator lower assemblies.

Answer to be provided in the near future

Question

2. Describe the procedures and methods used to assure that the inside of the steam generators remain dry while in storage.

Answer

Prior to decontamination and cutting, the steam generators will be drained of all primary side water. Because of the geometry of the tube bundle (i.e., gravity drained) there will be no need for special drying provisions.

The secondary side will also be drained. However, some residual secondary side water may remain since it is below the level of the blowdown piping. Additionally, some plugged tubes may also retain some secondary side water. However, since this is secondary side water, it is relatively clean, and need not be completely removed for radiological purposes. Also, results from an oxygen depletion study show that this secondary side water would not be sufficient to support through wall corrosion of the stored steam generators. Therefore, again, no special drying provisions are needed.

Question

3. Describe the transportation impacts of the shipment of the steam generator lower assemblies, including potential accidents along the route.

Answer

See Attachment.

Question

4. Describe the method of "sealing" the steam generator lower assemblies. In particular, the thickness, strength, etc. of the caps for the open ends of the steam generators and pipe cuts, and the geometry and dimensions of the weld joints.

Answer

The various openings in the steam generators will be closed either by steel plates or by steel bar stock as follows:

a) The large channel head and transition cone openings will have steel plates, three inches thick, placed over them and will be welded closed by a $1\frac{1}{2}$ inch fillet weld.

b) The small nozzle connections (i.e., instrument taps, drains, and blowdown nozzles, all 2 inches and smaller) will have bar stock inserted into the openings and will be welded closed by a $1\frac{1}{2}$ inch fillet weld. The bar stock will be a minimum of two inches thick.

c) The handhole openings will have steel inserts welded with a $1\frac{1}{2}$ inch fillet weld to the inside of the opening. The handhole cover plates will also be put back into place over the handholes. These inserts will be a minimum of two inches thick.

Environmental Evaluation of Offsite Shipment of the Turkey Point Steam Generator Lower Assemblies

1.0 Introduction

An alternative for disposal of the Turkey Point Units 3 and 4 steam generator lower assemblies may be shipment to a nuclear waste burial ground at Barnwell, S.C. The following evaluation presents a general description of the plans for and of the estimated environmental impact from offsite shipment. Further relevant details are contained in the Steam Generator Repair Report.

2.0 General Description of Offsite Shipment

Before the lower assemblies are removed from the containment buildings and shipped offsite, each will be completely sealed by welding to prevent the release of radioactive material during shipment.

After removal from the containment, the first lower assembly from each unit will be lifted by a gantry tower and crane and loaded into the lower half of a carbon steel shipping cask which will be attached to a transporter. The lower assembly will then be secured and the upper half of the shipping cask will be bolted to the lower half, completely encasing the lower assembly. The transporter will then move to the barge slip at Turkey Point and will be driven onto a barge and secured.

The barge will then proceed through Biscayne Bay to the Atlantic Ocean, along the coastline, and up the Savannah River. The transporter will disembark from the barge at a barge slip in South Carolina.

At the burial site, the upper half of the shipping cask will be removed, and the lower assembly will be lifted and placed in a burial trench. The transporter will then retrace its steps, be loaded on the barge, and return to Turkey Point for shipment of another lower assembly.

While the first lower assembly of each unit is being transported to the burial site, the second and third lower assemblies will be removed from the containment building and temporarily stored on the laydown area to await transportation. The second lower assembly will rest at the laydown area for approximately three weeks before loading, and the third assembly will rest approximately six weeks before loading. The process described above will be repeated until each of the lower assemblies reaches its destination at the burial site.

3.0 Environmental Impacts of Offsite Shipment

3.1 Non-Radiological Impacts

The non-radiological environmental impacts from offsite shipment are negligible. The pollution emitted by the transporter and the barge is an inconsequential addition to the pollution emitted by ground and water transportation normally travelling on the same route. Similarly, the commitment of resources for offsite shipment (such as fuel for transportation and land for burial of the steam generator lower assemblies) is minimal and insignificant in comparison to national and regional commitments of the same resources. In short, offsite shipment will not produce any significant non-radiological impact.

3.2 <u>Radiological Impact from Routine Shipment</u>

Before removal from the containment building, the exterior surface of the lower assemblies will be decontaminated as necessary to reduce the level of removable contamination to within an insignificant 2200 dpm/100 cm^2. Additionally, since the lower assemblies will be sealed using 2-3 inch steel plates and inserts and 1 1/2 inch fillet welds prior to removal from the containment buildings, no radioactive effluents from within the lower assemblies will be emitted during shipment. Consequently, only direct and scattered radiation which may be emitted from within the sealed lower assemblies need be considered.

Approximately 250 curies of radioactive isotopes are contained within each lower assembly as a layer of metallic corrosion products which tenaciously adheres to the primary side surfaces of the lower assembly. The radioisotopes are encased within the two to three inch thick steel shell of the lower assembly, which in turn is encased within the 2 1/2 - 2 3/4 inch thick steel shipping cask. Dose rates from this activity will be limited to less than 10 mrem/hr six feet from the cask surface. Radiation surveys will be taken periodically before, during, and after transportation to confirm that radiation levels are within acceptable limits.

Cumulative doses to the public from offsite shipment have been calculated. Based upon 600 miles of barge transportation and 40 miles of road transportation per shipment of one lower assembly, and based upon the conservative assumption of a dose rate of 10 mrem/hr at 10 feet from the shipping cask surface, the estimated dose to the public from temporary onsite storage, loading, offloading, and transportation of all six lower assemblies has been determined to be less than 0.1 man-rem.

Occupational exposures associated with offsite shipment have also been evaluated. It is estimated that shipment of all six steam generator lower assemblies, including removal from the containment building, temporary onsite storage, loading, offloading, and transportation, would result in approximately 53-56 man-rem to workers. This is roughly equivalent to the estimated occupational exposure which would be incurred from onsite storage of the lower assemblies, and considerably less than other alternatives.

Exposures to individual workers will be maintained within the limits specified in 10 C.F.R. Part 20. Additionally, a training program will be conducted for all personnel participating in shipment activities whose duties will require them to enter radiation areas or to handle radioactive material. This training program, as well as other administrative controls, will help ensure that occupational exposures will be maintained as low as reasonably achievable.

3.3 Radiological Impacts from Postulated Accidents

3.3.1 Introduction

Shipment of new steam generators and other heavy equipment by barge is not a novel or unusual task. Numerous steam generators have previously been shipped by barge, including six original and six replacement steam generators for both Turkey Point and Virginia Electric and Power Company's Surry Plant. Additionally, one contaminated steam generator lower assembly has been shipped by barge from Surry, Virginia, through the Panama Canal, to Hanford, Washington. Experience indicates that the occurrence of an accident during shipment is extremely unlikely. The most probable accidents are analyzed below.

3.3.2 Drop of a Steam Generator Lower Assembly during Loading or Offloading

During loading and offloading of the shipping cask, it will be necessary to lift the lower assemblies a maximum of twelve feet off the ground. It has been calculated that the probability of dropping a lower assembly during such a lift is of the order of 10^{-6}. Thus, it can be seen that the occurrence of a drop accident is extremely improbable. Nevertheless, if it is assumed that a lower assembly does drop during lifting, it is not expected that it will be breached.

3.3.3 Accidents during Ground Transportation

Various accidents are theoretically possible during ground transportation, including collapse of the road surface, brake failure, tire blowout, tipping while negotiating a curve, and collision. Accidents such as tire blowouts or the collapse of the road, followed by tipping of the transporter, would not impart sufficient mechanical shock to breach the lower assemblies. During turns, the transporter cannot reach a sufficient speed to induce overturning since turning is manually controlled by an operator walking alongside the transporter. Moreover, it is extremely unlikely that the transporter would reach excessive speeds due to a total brake failure, since the transporter and its tractor have independent braking systems, each of which is adequate to stop both the transporter and the tractor. Finally, there are no bridges off which the transporter could fall, and the roads and crossroads over which the transporter will travel will be blocked to other traffic in order to prevent potential collisions. Thus, the worst case accident (that producing the greatest mechanical shock to the steam generator lower assembly) would be a brake failure on an incline followed by an impact of the shipping cask and lower assembly onto an unyielding surface. In such circumstances, the lower assembly inside of the shipping cask is not expected to be breached, so no radioactive materials would be released to the environment.

3.3.4 Accidents during Water Transportation

Two hypothetical accidents were considered during barge transportation of a lower assembly. The first postulated accident is a ship collision with the barge. The probability of a collision severe enough to sink the barge is of the order of 10^{-7} per barge mile, which is extremely remote. Moreover, it is calculated that the impact of such a broadside collision is not expected to breach the shipping cask or the lower assembly.

The second postulated accident is the sinking of the shipping cask and the lower assembly, either by a collision or by other means. Such a hypothetical sinking could occur in three places: Biscayne Bay, the Atlantic Ocean, or the Savannah River. It is calculated that sinking of the shipping cask and the lower assembly in Biscayne Bay or the Savannah River might breach the shipping cask, but the lower assembly is not expected to be breached and no activity would be released. If the shipping cask and the lower assembly sink in the Atlantic Ocean, the lower assembly could be breached. If it is conservatively assumed that 100 percent of the activity within the lower assembly is immediately released to the ocean, the resulting dose to the maximum exposed individual via the aquatic food pathway would be less than .05 rem whole body and .5 rem to the gastrointestinal tract. Doses to the average individual would be considerably less.

3.3.5 Fires

Accidents involving fires would have lesser consequences than those considered above. The melting point of the lower assemblies is considerably higher than that of the most severe fire which could be reasonably encountered during shipment, and the heat would actually cause the radioisotope layer to become more adherent to the inside of the lower assemblies. Since the increase in internal pressure developed by such a fire would not cause the lower assemblies to rupture, there would be no release of radioactive materials due to fire.

3.3.6 Accidents during Temporary Onsite Storage

The second and third lower assemblies which will be removed from each unit will be temporarily stored on the Turkey Point laydown area prior to transportation to the burial site. The laydown area is not frequented by vehicles or within falling distances of nearby structures or equipment. Additionally, this storage will not occur during the hurricane season. Thus, no accident scenario which could breach the lower assemblies during temporary onsite storage is considered credible.

3.3.7 Prevention and Mitigation of Accidents

Several procedures will be utilized to prevent the occurrence of accidents and to mitigate the consequences of those accidents which do occur.

The gantry and cranes will be inspected and tested before the lower assemblies are loaded or offloaded.

The roads along the transporter route have been selected to minimize grades, sharp curves, and travel through populated areas, and roads that have been inspected will be reinspected before shipment to ensure their ability to withstand the expected load. Moreover, administrative controls will be placed upon the speed of the transporter to reduce the probability of an accident. Finally, an escort will be provided for the transporter to protect the transporter against traffic.

If the shipping cask and the lower assembly sink in the Savannah River or Biscayne Bay, they will be recovered. Such a recovery could be easily accomplished given the relatively shallow depth of these bodies of water.

4.0 Conclusions

The non-radiological impacts associated with offsite shipment are negligible. The primary radiological impacts resulting from routine offsite shipment are approximately 53-56 man-rem occupational exposure and 0.1 man-rem public exposure. These exposures are roughly equivalent to those estimated for onsite storage.

The probability of an occurrence of an accident is extremely remote. Moreover, most of the postulated accidents will not result in breach of the lower assemblies or in a release of any radioactivity to the environment. Even if a breach should occur, the consequences would not be significant.