United States Department of the Interior

FISH AND WILDLIFE SERVICE
P. O. Drawer 1190
Daphne, Alabama 36526

IN REPLY REFER TO.

04-0397

February 6, 2004

Mr. Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
United States Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Kuo:

Thank you for your letter of November 26, 2004, requesting comments for the NEPA review of re-licensing of the Joseph M. Farley Nuclear Plant Units 1 and 2 (FNP), located in Houston County, Alabama, on the west bank of the Chattahoochee River. We have reviewed the information you enclosed and are providing the following comments in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. et seq.) and the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

Federally Listed Species

Historical data for the Chattahoochee River, Houston County, Alabama and Early County, Georgia are poor. One threatened species, purple bankclimber (*Elliptoideus sloatianus*), and three endangered species, shinyrayed pocketbook (*Lampsilis subangulata*), Gulf moccasinshell (*Medionidus penicillatus*), and oval pigtoe (*Pleurobema pyriforme*) are known from the mainstem of the Chattahoochee above Houston and Early counties, and are considered to have occurred throughout the mainstem, in appropriate habitats (Brim Box, and Williams, 2000). The latter three species are known in Tributaries that feed into the mainstem in Early County, Georgia, currently support populations of three endangered species: Shinerayed pocketbook (*Lampsilis subangulata*), Gulf moccasinshell and oval pigtoe (*Pleurobema pyriforme*). Sawhatchee Creek, Early County, Georgia supports reproducing populations of Gulf moccasinshell (*Medionidus penicillatus*) and oval pigtoe (*Pleurobema pyriforme*) (Brim Box and Williams, 2000). There is archeological record of *E. sloatianus* in the mainstem of the Chattahootchee River, Houston County, Alabama (Williams and Fradkin 1999 in US FWS 2003).

No recent survey data are available for the mainstem Chattahoochee in this location. However, a single specimen of *E. sloatianus* was collected in upstream of the project area in Goat Rock Lake by Stringfellow (pers. comm.. 2003 in US FWS 2003), located on the mainstem of the Chattahootchee River, Lee County, Alabama. Since historical data within this reach of the

Chattahoochee River are poor and recent data are lacking, it is possible that the Chattahoochee River may still support some of these listed species in Houston County, Alabama and Early County, Georgia, and as such this reach may represent areas important to recovery of these species (pers. conv. with Ms. Holly Blalock-Herod, malacologist, US FWS, Panama City FO 2004).

The Service recommends that a survey be conducted for the Federally mussel species listed above. Further information on conducting the survey is provided under "**Recommendations**" below.

Species and habitat descriptions for the listed mussel species are provided in the recovery plan (USFWS 2003, http://endangered.fws.gov/). Enter the species name in the search box for information on each species.

We concur with the survey results for terrestrial species, but have remaining concerns listed below under "Maintenance of Transmission Line Rights-of-Way."

Concerns

We have the following concerns regarding the project:

- Release of radionuclides in the Chattahoochee River and long-term exposure of Federally protected mussels and other aquatic organisms
- Effects of plant operation on health and reproduction of fish and other aquatic organisms in the Chattahoochee River, especially effects on potential host fish of listed mussels
- Release of thermal heated water, chlorine, copper, and hydrazine into the Chattahoochee River in concentrations harmful to Federally protected mussels and other aquatic organisms
- Entrainment and subsequent mortality of aquatic organisms in intake cooling water due to exposure to intense heat, chlorine, and hydrazine
- Maintenance practices for existing transmission lines rights-of-way

Long-term Exposure of Aquatic Organism to Low Level Radiation

We are concerned about the effects of long-term, low-level radiation on Federally protected mussels, if present, as well as other aquatic organisms, communities, populations, and fishery resources in the project area. Freshwater mussels in the discharge of nuclear power plant effluent can accumulate radionuclides in soft tissues and shell at levels several orders higher than surrounding waters (Lutz, et al. 1980). Radionuclides do not concentrate consistently throughout the food chain, but vary in concentration depending on the system, species, and other variables (Lutz, et al. 1980). Radionuclide concentrations in biota vary depending on the organism's age, size, sex, tissue, season of collection, and other variables--and these have to be acknowledged

when integrating radiological analyses (Eisler 1994). In general, lower trophic levels of aquatic organisms have greater concentrations of radionuclides than higher trophic levels (Bowen et al. 1971).

Bivalves contain strontium in their shells at much higher rates than fish bone, making them good monitors of low-level radionuclide contamination of the environment (Smith 1974). Also, bivalves accumulate cesium and other metals in soft tissue. This is due to: (1) strontium replacement of calcium in the shells, (2) longer half-life of radionuclides in mussels than in fish, and (3) enhanced physical absorption by filter-feeding bivalves, and (4) consumption of particulate and phytoplankton, both rich sources of radionuclides, by bivalves. Concentrations in phytoplankton are 2,500 to 6,200 times that of surrounding water, whereas, the concentrations in fish are only 25 to 50 times that of surrounding water (Smith 1974). Since radionuclides are deposited in mollusk growth rings, their shells provide a record of the radionuclide contamination in their environment (Nelson 1962).

According to Mr. Jim Davis, Senior Engineer and Environmental Lead for Relicensing, FNP used to sample mussels as biomonitors of radionuclides contamination 1977-1981, but had difficulty finding mussels, therefore discontinued sampling. They searched all the way downstream from FNP plant to Lake Seminole for mussels. According to Mr. Davis, no habitat occurred within 10-15 miles of the plant. We are concerned if the lack of mussels is due to unsuitable habitat created by the powerplant and/or effluent exposures.

Results of fish tissue sampling provided in FNP's 2000, 2001, and 2002 Annual Radiological Environmental Operating Reports and 2001 and 2002 Annual Radiological Effluent Release Reports indicated low levels of radiation present for fish fillets. This information is applicable for evaluating human health concerns, but not for assessing aquatic organisms health.

Large populations of local filter feeders may drastically increase the rate of sedimentation of added trace elements and radionuclides, thus increasing their accumulation in the sediments (Hoffman, J.H., et al. 2003). Thus, large populations of *Corbicula* could cause increases in radionuclide concentrations in the sediments. *Corbicula* population growth could be stimulated by FNP's thermal discharge into the Chattahoochee River, resulting in this impact.

Reproduction of Fish and Other Aquatic Organisms

The Cooling Water Intake Study (316b) Demonstration by FNP (APC 1983) states that reproduction was observed for clupeids (herring and shad), but not other fish species. We are concerned that the release of radionuclides, contaminants, and/or thermal discharges from FNP plant may be having an adverse effect on resident fish populations and other groups of aquatic organisms. Mussels are dependent on fish as the host organism for glochidial attachment. Therefore, adverse effects to the host fish could indirectly cause adverse effects on listed mussel reproduction and recruitment.

NPDES Permit Limits

We believe the NPDES permit limits for temperature (111° F Daily Maximum and 100 ° F Monthly Average, April 1- Nov. 30; Daily Maximum = Monitor and Monthly Average 81.7 ° F, Dec. 1- March 31) may not be protective of listed mussels (if present) or of other aquatic life. A segment of Chattahoochee River below the Walter F. George Dam and upstream of the project area is on Georgia's 303(d) List due to violation of State standards for dissolved oxygen (D.O.) and fecal coliform bacteria. The cited causes are Walter F. George Dam release and non-point source runoff. The beneficial use classification of the Chattahoochee River is Fish and Wildlife. A minimum dissolved oxygen (D.O) concentration of 5.0 mg/l has been established by ADEM as minimum numeric standard for supporting aquatic life and healthy warmwater fish populations. Limited or periodic (monthly) sampling by Georgia Department of Natural Resources, Water Protection Branch (Periodic Water-Quality Records, Apalachicola River Basin, 2000 Calendar Year) in Chattahoochee River at a station located 2.3 miles south of Columbia (river mile mark 46.5), yielded D.O. concentrations as low as 4.0 mg/L. A D.O. of 5.7 mg/L was recorded downstream at Alaga, Alabama. Water temperatures during that period ranged from 28.6 – 30.3 °C. We are concerned that a discharge limit of 100-111 °F (within ZID) may result in temperature outside the ZID exceeding State water quality standard for temperature (90 °F, not to exceed ambient by 5 °F) and D.O. concentrations lethal to freshwater mussels and other aquatic life within and outside the ZID. A significant amount of habitat including the ZID (878 feet) may be adversely affected. FNP does not have ample water temperature monitoring data to fully evaluate temperature and DO impacts on listed mussels (if present), fish, and other aquatic life in the Chattahoochee River.

Elevated water temperatures at various distances from a studied nuclear generating facility had and adverse effect on the growth, survival and recruitment of mussels (Lutz et.el. 1980).
In a study on effects of drought on freshwater mussels in the lower Flint River, habitat conditions and mussel survival were monitored weekly during the period of the drought. D.O. concentrations were highly correlated to mussel mortality. Unionid mortality increased when dissolved oxygen concentrations fell below 5 mg/L, with high mortality of *L. subangulata*, *M. pencilatus*, and *P. puriforme* experienced high mortality when D.O. fell below 5.0 mg/L (Jones et. el. 2000).

FNP uses chlorine as a biocide for *Corbicula* control. Chlorine is extremely toxic to a wide variety of freshwater organisms (Hunn and Schnick 1990). Safe concentrations (i.e., those that do not produce lethality or sublethal effects) are likely much lower, especially considering the relatively sessile nature and long life span of mussels relative to these short- term test exposures. Under longer-term exposures (>96 hours), lethality to fish and aquatic invertebrates has been documented at chlorine concentrations between 3.4 and 26 ug /L (EPA 1985). Because of chlorine's extreme toxicity, the USEPA established a Federal ambient water quality criterion maximum concentration of 0.019 mg/L and a continuous concentration (CCC) of .011 mg/L for chlorine, respectively, to protect aquatic life (EPA 2002). Studies have shown that mussels are very similar in sensitivity to other sensitive aquatic organisms and that 0.019 mg/ L is likely protective (Ingersoll 2003). FNP should meet this criterion by inclusion of dechlorination unit or

use alternatives such as UV or ozonation. Alternatively, high flow rate velocity flushes, ultrasound, or robotic mechanical cleaning could occur on influent and effluent pipes.

The toxicity of chlorine to aquatic life is a function of total residual chlorine (TRC), which includes both free chlorine and chloramines (Flora et al. 1984). Monitoring of free chlorine does not serve as an adequate indicator of the potential toxicity of facility effluents nor does it provide adequate data to avoid toxic effects to listed mussels. We therefore recommend measurement of TRC rather than free chlorine.

FNP uses hydrazine to scavenge oxygen during blowdowns of its cooling towers. Discharges of this potential toxicant into the Chattahootchee River may cause more than detrimental effects to Federally listed mussels, if present, as well as many other aquatic organisms. The rate of degradation of hydrazine in water is highly dependent on factors such as pH, temperature, oxygen content, alkalinity, hardness, and the presence of organic material and metal ions. The toxicity of hydrazine increased for guppies in soft water (at pH < 7.0) compared with the toxicity in hard water at a pH ≈ 8.0 (Slonim 1977), indicating increased persistence of hydrazine in soft, non-alkaline water. Increased water temperature also enhance the toxicity of the compound for bluegills (Hunt et al., 1981) (http://www.inchem.org/documents/ehc/ehc/ehc68.htm#SectionNumber:5.1). According to modeling data collected by FNP at the point of discharge, the Chattahoochee River has low alkalinity. Instream water temperatures are elevated above ambient due to FNP's thermal discharge. These conditions elevate concerns for the toxicity of hydrazine in the discharge, and potential adverse effects on aquatic biota.

There is no maximum concentration limit for hydrazine in FNP's NPDES permit, but merely a "de facto" limit of 70 ppb. Standard acute toxicity test were performed for hydrazine on freshwater fish, lower trophic level organisms, and amphibians. The guppy (*Lebistes reticulatus*),fathead minnow (Pimephales promelas) (eggs), bluegill sunfish (*Lepomis macrochirus);* bacteria, *Pseudomonas putida*; protozoa (*Uronema paraduczi*) and (*Chilomenas paramecium)*; the water flea (*Daphnia pulex*); and the amphibia, South African clawed toad (*Xenopus laevis*) (larvae). All experience mortality below 70 ppb.

Entrainment

We are also concerned about uptake of aquatic organisms into the boiler reactor water by Entrainment, including larvae and early life stages of Federally protected Mussels (if present), as well as other mussels, fish, phytoplankton, and zooplankton. FNP withdraws 171 cfs of Chattahoochee River water for cooling of its reactors. The volume of water withdrawn represents 8 % of the 7Q10. Historic stream flow data (1975-2002) taken at the USGS Gauge Station in the Chattahoochee River near Columbia, Alabama, show short term (1-2 days) minimum flow occurrences on a regular frequency due to managed releases from Walter F. George Reservoir. The flow during those periods typically range from 650-1500, well below the 7Q10. During those periods of minimum flow, FNP's withdrawal may be as much as 25% of the instream flow. Pressurized boiler reactor water is subjected to intense pressure, heat, and biocide treatment. Any aquatic organisms taken up by entrainment into the intake pipe and subjected to such environment would be killed.

Maintenance of Transmission Lines Right-of-Way

We are concerned about FNP's practice of controlling vegetation at stream crossings, using mowing and herbicide applications to reduce the cover to herbaceous species. This modification to the natural vegetative cover may lead to erosion and sedimentation of streams. We are particularly conerned about this practice at stream crossings where Federally listed mussels may occur and specifically Sawhatchee Creek, mentioned above, where three Federally listed mussel species are known to occur.

Recommendations:

1.Perform a full characterization of different radionuclides and contaminants in the effluent waste stream on a minimum of 10 different full-strength (100% effluent) samples.

2. Conduct an initial mussel habitat survey extending from two miles upstream of the FNP site downstream to Lake Seminole. A malaecologist with a current collecting permit, familiar with the listed mussels and their habitats should conduct the survey. The habitat should be mapped and a detailed description provided, including substrate type, embeddedness, and velocity. A detailed mussel survey should follow in suitable habitat, with adherence to non-wadable stream protocols. Substrate characteristics and velocity should be recorded for each collection or observation location. A mussel species distribution map should be produced from the survey information. Dominant benthic fauna, including estimated densities should also be recorded.

3. Contingent on positive findings in Recommendation 1, sample surficial sediment (0-7 cm) in the mixing zone and stream reach above and immediately below the mixing zone for the detected radionuclide analytes. At each location, collect composite, triplicate samples consisting of at least five subsamples. In selecting sampling stations, look for pools where there is likelihood of fine sediment and organics in the deposits. Grain size and total organic carbon should be determined on sampled sediment. Depending on levels of targeted analytes found during initial limited sediment sampling, we may recommend more extensive sampling and isocuric mapping of radionuclide analytes in sediments (Churchill et al.1980). Also, if concentrations are significantly elevated above background, we may recommend mapping targeted radionuclide analytes distributions and compare to unionid mussel distributionson a map to determine possible relationships.

4. Collect large adult native unionid mussels and analyze tissue and shell for the radionuclides typically retained in these tissues. Areas and stations to collect unionids should be based on mussels distribution as determined from the survey. Mussels within, or downstream and closest to the mixing zone should be included in the analysis and compared with mussels at various distances upstream downstream. At least three mussels should be collected at each site. (Note: a nonlisted mussels should be collected and <u>not</u> listed species.

5. Sample the following large adult whole fish (skin on): largemouth bass (*Micropterus salmoides*), flathead catfish (*Pylodcitis olivaris*), and spotted sucker (*Minytrema melanops*) as bio-indicators of radionuclides. Sample six sites – (1) in the mixing zone or ZID, (2)

immediately upstream of Walter F. George Reservoir, (3) two miles upstream of discharge, (4) two miles downstream of the discharge, (5) riverine habitat immediately upstream of Lake Seminole, and (6) Lake Seminole forebay. Collect five fish of each species at each sampling site.

6. If levels of radionuclides in sediments are determined to be elevated in areas where *Corbicula* populations are high, also design and conduct a study to determine if FNP thermal discharge is causing an increase in the *Corbicula* population and whether those populations are affecting radionuclide concentrations in sediments, fish, and/or turtles consuming the *Corbicula*.

7. Design and conduct a study of native resident fish in the ZID, downstream of the ZID, and at least one mile upstream of the project site to determine whether fish abundance, diversity, and fecundity are affected by radionuclides, other contaminants, (e.g., hydrazine, copper, chlorine), thermal shock, or other plant operations.

8. Quantify the diversity and abundance of organisms entrained by water withdrawal at all intake pipes and evaluate screening mesh size, low velocity intake, and other techniques to minimize entrainment. Quantification should occur at least monthly for the year of the study and for the year following screen changes.

9. Monitor temperature, D.O., TRC, copper, and hydrazine at the downstream end of the ZID on a monthly basis to determine if modeling has accurately predicted concentrations. The Walter F. George Reservoir manages its releases such that there are frequently two consecutive days in which flow is well below the 7Q10. That period should be targeted for monitoring. Conduct a formal risk assessment (RA) using EPA methods to assess whether concentrations are protective of sensitive fish and invertebrates, particularly Federally listed mussels, if present. Include low – flow, high-temperature conditions in the RA.

10. If hydrazine is detemined to pose a risk to aquatic species (particularly mussels), eliminate discharge of hydrazine by designing a system for separating and containing hydrazine from all discharges to the Chattahoochee River.

11. Reduce or eliminate discharge of chlorine to the Chattahoochee River through use of a dechlorination unit for removal of chlorine before discharge. If there is a discharge of chlorine, then at least monitor TRC daily. To provide adequate protection of aquatic life, the permit should establish the EPA criterion chronic concentration of 0.011 mg of total residual chlorine per L as a permit limitation for continuous discharges and monitor it daily. If chlorine treatments are intermittent, the criterion for protection of aquatic life from acute toxicity can be substituted.

12. Compare alpha and beta radiation levels found in sediment within and downstream of the ZID to evaluate whether concentrations are protective of aquatic life, especially mussels. Compare concentrations found in fish (whole) and mussels (shell) to background conditions and concentrations considered protective of those organisms. If sediments, mussels, and fish levels are determined not to be protective, determine corrective measures needed.

13. Use mowing or prescribed burns as an alternative to herbicide use for controlling vegetation along transmission right-of-way, particularly near stream crossings and in gopher tortoise habitat. Where gopher tortoise burrows are known to be present, mowing should be restricted to during the winter period when gopher tortoises are hibernating. If herbicides are used, use Roundup Custom or Accord, together with a low toxicity surfactant such as LI 700 (Agri-Dex) or equivalent herbicides and surfactants, in strict adherence to the label. Periodically survey to determine if Federally listed pant species have become established in rights-of-way. If established, please contact our office.

14. At all stream crossings, especially where Federally listed mussels are known to occur, plant and maintain stream riparian areas with native shrub species. It is our understanding that Ms. Sandy Abbot, with the W. Georgia Field Office, USFWS, Ft. Benning, Georgia, will be working with FNP to develop a list of recommended species for the Georgia area where stream crossings are involved. FNP should also contact Panama City, Florida Field Office, as well as our office (Daphne, Alabama) to develop a recommended species list in Florida and Alabama.

Depending on radionuclide results in sediments, we may recommend a histopathological study and stress proteins response analysis study using molecular biomarkers to assess effects of radionuclides on fish physiology and reproduction. Please provide copies of all D.O. monitoring data to this office.

We welcome the opportunity to assist in the design of monitoring plans. Upon receipt of recommended survey and study reports, we will provide our final comments and consultation under section 7 of the Endangered Species Act. Initiation of formal consultation with the Nuclear Regulatory Commission may be necessary after our review of the requested information.

If you have any questions or need additional information, please contact Mr. Bill Young at (251) 441-5842. In correspondence, please refer to the reference number above.

Sincerely,

Elaine Snyder-Conn

Acting for Larry E. Goldman
Field Supervisor

cc: EPA
ADEM

Enclosure

References:

Brim Box, J. and J.D. Williams 2000. Unionid mollusks of the Apalachicola Basin in Alabama, Florida, and Georgia. Bull. Alabama Mus. of Natl His. 21:1-143.

Churchill, J.H., Hess, C.T. and Smith, C.W. 1980. Measurement and computer modeling of radionuclide uptake by marine sediments near a nuclear power reactor. *Health Physics.* 38. pg. 327-340.

Eisler, R. 1994. Radiation hazards to fish, wildlife, and invertebrates: A synoptic review, U.S. Natl. Biological Service, Biol. Rep. 26 pp.

Flora, M.D., T.E. Ricketts, J. Wilson, and S. Kunkle. 1984. Water quality criteria: an overview for park natural resource specialists. Water Resources Field Support Laboratory, National Park Service, Colorado State University, Fort Collins, CO. 46 pp. WRFSL Report No. 84-4.

Goudreau, S. E., R. J. Neves, and , R. J. Sheehan. 1993. Effects of wastewater treatment plant effluents on freshwater mollusks in the upper Clinch River, Virginia, USA. Hydrobiologia 252:211-230.

Hoffman, J.H., A.R Barnett, G.A. Burton Jr., and J. Cairns Jr., 2003. Handbook of Ecotoxicology. Lewis Publishers, New York. 1290 pp.

Hunn, J.B. and R.A. Schnick 1990. Toxic substances. pp 19 to 40 In F.P. Meyer and L.E. Barclay (eds.), Field manual for the investigation of fish kills. U.S. Fish and Wildlife Service Resource Publication 177. Washington, DC.

Ingersoll C.G. 2003. Developing water quality standards for recovery or imperiled freshwater mussels (family unionidae). U.S. Geol. Surv., Columbia, MO. 11 pp.

Johnson, P.M., A.E. Liner, S.W. Golladay, and W.K. Michner. 2000. Effects of drought on freshwater mussels and instream habitat in coastal plain tributaries of the Flint River, southwest Georgia. Joseph W. Jones Ecological Research Center.

Lutz, R.A., L.S. Incze, and C.T Hess 1980. Mussel culture in heated effluents: Biological and radiological implications. In: *Mussel culture and harvest: A North American perspective* (ed. R.A. Lutz). Elsevier, Amsterdam.

Nelson, D.J. 1962. Clams as indicators of strontium-90. Science 138: 38-39.

Smith, R.L. 1974. Ecology and Field Biology. Harper & Row Publishers, New York. 850 pp

U.S. EPA 1985. Ambient water quality criteria for chlorine. Office of Water Criteria and Standards Division, Washington, DC. U.S. EPA 440/5-84-030.

U.S. E.P.A. 2002. National recommended water quality criteria: 2002. U.S. Environmental Protection Agency, Office of Water and Office of Science and Technology. EPA-822-R-02-047. 33 pp.

U.S. F.W.S. 2003. Recovery plan for endangered fat threeridge (*Amblema neislerii*), shinyrayed pocketbook (*Lampsilis subangulata*), gulf moccasinshell (*Medionidus penicillatus*), ochlockonee moccasinshell (*Medionidus simpsonianus*), oval pigtoe (*Pleurobema pyriforme*), threatened chipola slabshell (*Elliptio chipolaensis*), and purple bankclimber (*Elliptoideus sloatianus*). Atlanta, Georgia. 142 pp.