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Docket No. 50-400

Mr. E. E. Utley
Senior Executive Vice President
Power Supply and Engineering & Construction
Carolina Power & Light Company
Post Office Box 1551
Raleigh, North Carolina 27602

Dear Mr. Utley:

SUBJECT: FACILITY OPERATION WITH HIGHER FUEL ENRICHMENT - SHEARON HARRIS
NUCLEAR POWER PLANT, UNIT 1 (TAC NO. 67089)

Enclosed is a copy of an Environmental Assessment and Finding of No Significant
Impact relative to the Shearon Harris Nuclear Power Plant, Unit 1, for your
information. This assessment relates to plant operation with higher enriched
uranium-235 fuel and extended irradiation.

This assessment has been forwarded to the Office of the Federal Register for
publication.

Sincerely,

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Bart C. Buckley, Sr. Project Manager
Project Directorate II-1
Division of Reactor Projects I/II

Enclosure:
Environmental Assessment

cc w/enclosure:
See next page

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UNITED STATES NUCLEAR REGULATORY COMMISSIONCAROLINA POWER & LIGHT COMPANY, et al.SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1DOCKET NO. 50-400ENVIRONMENTAL ASSESSMENT ANDFINDING OF NO SIGNIFICANT IMPACT

The U.S. Nuclear Regulatory Commission (NRC or the Commission) is considering issuance of an amendment to Facility Operating License No. NPF-63 to the Carolina Power & Light Company (CP&L or the licensee), for the Shearon Harris Nuclear Power Plant, Unit 1, located in Wake and Chatham Counties, North Carolina.

ENVIRONMENTAL ASSESSMENTIdentification of Proposed Action:

The proposed amendment would revise the provisions in the Technical Specifications (TS) relating to fuel enrichment.

The proposed action is in accordance with the licensee's applications dated February 1 and February 8, 1988, and previous submittals dated May 26, and November 2, 1987.

The Need for the Proposed Action:

The proposed changes are needed so that the licensee can use higher enrichment fuel, and provides the flexibility of extending the fuel irradiation and permitting operation of longer fuel cycles.

Environmental Impacts of the Proposed Action:

The Commission has completed its evaluation of the proposed revisions to the Technical Specifications. The proposed revisions would permit use of fuel enriched with Uranium 235 in excess of 4 weight percent and up to 4.2 weight

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percent and the licensee would expect the fuel to be irradiated to levels above 33 gigawatt days per metric ton (GWD/MT) but not to exceed 60 GWD/MT. The safety considerations associated with reactor operation with higher enrichment and extended irradiation have been evaluated by the NRC staff. The staff has concluded that such changes would not adversely affect plant safety. The proposed changes have no adverse effect on the probability of any accident. The increased burnup may slightly change the mix of fission products that might be released in the event of a serious accident but such small changes would not significantly affect the consequences of serious accidents. No changes are being made in the types or amounts of any radiological effluents that may be released offsite. There is no significant increase in the allowable individual or cumulative occupational radiation exposure.

With regard to potential nonradiological impacts of reactor operation with higher enrichment and extended irradiation, the proposed changes to the TS involve systems located within the restricted area, as defined in 10 CFR Part 20. They do not affect nonradiological plant effluents and have no other environmental impact.

The environmental impacts of transportation resulting from the use of higher enrichment fuel and extended irradiation are discussed in the attached staff assessment entitled, "NRC Assessment of the Environmental Effects of Transportation Resulting from Extended Fuel Enrichment and Irradiation," dated July 7, 1988. As indicated therein, the environmental cost contribution of the proposed increase in the fuel enrichment and irradiation limits are either unchanged or may in fact be reduced from those summarized in Table S-4 as set forth in 10 CFR 51.52(c).

Therefore, the Commission concludes that there are no significant radiological or nonradiological environmental impacts associated with the proposed amendment.

Alternative to the Proposed Action:

Since the Commission concluded that there are no significant environmental effects that would result from the proposed action, any alternatives with equal or greater environmental impacts need not be evaluated.

The principal alternative would be to deny the requested amendment. This would not reduce environmental impacts of plant operation and would result in reduced operational flexibility.

Alternative Use of Resources:

This action does not involve the use of any resources not previously considered in the "Final Environmental Statement related to the operation of the Shearon Harris Nuclear Power Plant, Units 1 and 2," dated October 1983.

Agencies and Persons Consulted:

The NRC staff reviewed the licensee's request and did not consult other agencies or persons.

FINDING OF NO SIGNIFICANT IMPACT

The Commission has determined not to prepare an environmental impact statement for the proposed license amendment.

Based upon the foregoing environmental assessment, we conclude that the proposed action will not have a significant effect on the quality of the human environment.

For further details with respect to this action, see the application for amendment dated February 1, and February 8, 1988, and submittals May 26 and November 2, 1987, which are available for public inspection at the Commission's Public Document Room, 1717 H Street, NW, Washington, DC and at the Richard B. Harrison Library, 1313 New Bern Avenue, Raleigh, North Carolina 27610.

Dated at Rockville, Maryland, this 3rd day of August, 1988.

FOR THE NUCLEAR REGULATORY COMMISSION

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Edward A. Reeves, Acting Director
Project Directorate II-1
Division of Reactor Projects I/II
Office of Nuclear Reactor Regulation

*SEE PREVIOUS CONCURRENCES

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NAME	:PAnderson* :BBuckley:ch*:	*	:EAdensam	:	:
DATE	: 8/02/88	: 7/29/88	: 8/02/88	: 8/2/88	:

NRC ASSESSMENT OF THE ENVIRONMENTAL
EFFECTS OF TRANSPORTATION RESULTING
FROM EXTENDED FUEL ENRICHMENT AND IRRADIATION

INTRODUCTION

Several licensees of light water reactors (LWRs) have submitted proposed license amendments to permit use of enriched fuel in excess of four (4) weight-percent uranium-235 and to extend fuel irradiation from the current limit of 33 Gigawatt Days/Metric Ton (GWD/MT) up to 60 GWD/MT. It is anticipated that, in time, almost all licensees of light water reactors will request approvals to adopt increases in irradiation levels and fuel enrichment. Paragraph (b) of 10 CFR 51.52 states, among other things, that for reactors using fuel enrichment greater than 4 weight-percent uranium-235 or where fuel irradiation exceeds 33 GWD/MT, the licensee shall provide a full description and detailed analysis of the environmental effects of transportation of fuel and wastes to and from the reactor, including values for the environmental impact under normal conditions of transport and for the environmental risk from accidents in transport. The statement shall indicate that the values determined by the analysis represent the contribution of such effects to the environmental costs of licensing the reactor.

With respect to this issue, the staff published a Notice of Environmental Assessment and Finding of No Significant Impact for extended burnup fuel use in Commercial LWRs in the Federal Register (53 FR 6040), dated February 29, 1988. In the above cited notice, the staff concluded that the environmental impacts summarized in Table S-4 of 10 CFR 51.52 for a burnup level of 33 GWD/MT are conservative and bound the corresponding impacts for burnup levels up to 60 GWD/MT and uranium-235 enrichments up to five percent by weight. The staff also concluded that there are no significant adverse radiological or non-radiological impacts associated with the use of extended fuel burnup and/or increased enrichment, and that this use will not significantly affect the quality of the human environment. Moreover, pursuant to 10 CFR 51.31, the Commission determined that an environmental impact statement need not be prepared for this action.

The staff is in the process of revising the regulations at 10 CFR 51.52 to reflect the findings published in the above cited Federal Register Notice. In the interim, in connection with its review of proposed license amendments to permit use of fuel enriched with uranium 235 in excess of 4 percent and up to 5 percent by weight and irradiated to levels above 33 GWD/MT and up to 60 GWD/MT, and pursuant to 10 CFR 51.52(b), the staff proposes to accept the following analysis of the environmental effects of the transportation of such fuel and waste until such time as the revision to the rule is issued.

ENVIRONMENTAL IMPACTS OF TRANSPORTATION

In evaluating the environmental impacts of the use of extended irradiation of high enrichment fuel, the Commission has relied upon the following four studies dealing with the transportation impacts:

- (1) Pacific Northwest Laboratories' report NUREG/CR-5009, "Assessment of the Use of Extended Burnup Fuel in Light Water Power Reactors," dated February 1988, prepared for the Nuclear Regulatory Commission;

- (2) Nuclear Regulatory Commission's report WASH-1238, "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants," dated December 1972;
- (3) Envirosphere Company Report AIF/NESP-032, "The Environmental Consequences of Higher Fuel Burnup," dated June 1985, prepared for National Environmental Studies Project (NESP) and the Atomic Industrial Forum, Inc., with the participation of the Commission's staff; and
- (4) Sandia National Laboratories (SNL) Draft Report NUREG/CR-2325, "The Transportation of Radioactive Material (RAM) To and From U. S. Nuclear Power Plants," dated December 1983.

All four studies present the results of evaluation of transportation impacts for postulated traffic models. The results are presented for traffic density, radiological occupational risks, radiological public risks of normal transportation, and risks of transportation accidents. The Pacific Northwest Laboratories (PNL) report and the Envirosphere Company report present the environmental impacts for fuel irradiation levels extending up to 60 GWD/MT and enrichments up to 5 weight percent uranium-235. The PNL results appear to have been derived from the analysis presented in the NESP report.

Table I summarizes the results of traffic densities for transportation of fresh fuel, spent fuel, and other solid waste by truck, rail, and barge used in the four studies.

TABLE I - TRAFFIC DENSITIES
SHIPMENTS PER REACTOR YEAR

Trans- portation Mode	<u>NUREG/CR-5009</u> (PNL)		<u>NESP-032</u>		<u>WASH-1238</u>	<u>SNL</u> *
	33 GWD/MT	60 GWD/MT	33 GWD/MT	60 GWD/MT	33 GWD/MT	33 GWD/MT
TRUCK	112	92	112	92	112	122
RAIL	10	6	10	6	10	2.3
BARGE	5	3	5	3		

The comparison of the results of traffic density analysis shows that there is a reasonably good correlation between the total number of shipments shown in SNL results and that shown in other reports for 33 GWD/MT. Both the PNL study and the NESP study show that there will be a reduction in the total

* The report does not clearly state the assumptions regarding fuel enrichment and irradiation levels. However, since Table S-4 in 10 CFR 51.52 is based on 33 GWD/MT, the staff has assumed that SNL analysis must be based on the assumptions contained in 10 CFR 51.52, Table S-4.

number of shipments (fresh fuel, spent fuel, and low level wastes) when higher levels of irradiation (60 GWD/MT) are assumed. Such high irradiation levels may require that fuel enrichment be increased up to a maximum of 5 weight percent. The reduction in the shipments is due to the fact that there will be fewer outages for fuel reloads resulting in reduced fuel shipments to the reactor and reduced spent fuel shipments from the reactor. However, there will be an increase in the shipment of low level solid wastes. Even when this increase in low level waste shipment is included with the shipment of fresh fuel and spent fuel, the total shipments for higher irradiation (60 GWD/MT) are still somewhat reduced from those at 33 GWD/MT. As a result of the reduction in number of shipments there should be some reduction in the estimated number of persons exposed. There should also be no significant change in heat generated per irradiated fuel cask and the weight restriction for transporting vehicle.

The discharged spent fuel at higher irradiation (60 GWD/MT) will have more long lived radionuclides per unit mass compared with the spent fuel irradiated at 33 GWD/MT. However, there is a smaller amount of annual spent fuel discharged. Since each spent fuel package will meet the surface radiation level limits imposed by the transportation regulations and there are fewer packages being shipped, there will be an overall reduction in the impacts of normal transportation of spent fuel at higher irradiation levels. However, the normal transportation impacts of low level wastes will increase with increased irradiation level. This is due to the fact that slight increases in cooling water activity could occur through increased inventory and gap release fraction. Because this activity would need to be removed to keep cooling water activity within licensed technical specification limits, a small increase in the quantity of low level wastes is estimated to occur. Both NUREG/CR-5009 and NESP-0032 conservatively assume a 20% increase in solid waste at 60 GWD/MT irradiation. Table II summarizes the combined environmental impacts of normal transportation of spent fuel, low level waste and new fuel activities at 33 GWD/MT and 60 GWD/MT as presented in NUREG/CR-5009 and NESP-032.

TABLE II - NORMAL TRANSPORTATION RADIOLOGICAL EXPOSURE RISK
PERSON REM/REACTOR YEAR

<u>Exposure Type</u>	<u>NUREG/CR-5009 (PNL)</u>		<u>NESP-032</u>	
	<u>33 GWD/MT</u>	<u>60 GWD/MT</u>	<u>33 GWD/MT</u>	<u>60 GWD/MT</u>
Occupational	4.2*	3	4.2	3
General Public	<u>3.2*</u>	<u>2.5</u>	<u>3.2</u>	<u>2.0</u>
TOTAL (Normal Transportation Exposures)	7.4	5.5	7.4	5.0

* These values are identical to the rounded off values reported in Table S-4 of 10 CFR 51.52, and form the basis of the Commission's determination of no significant adverse environmental impacts of transportation of fuel and wastes to and from nuclear reactor sites.

The above results show that there is in fact an overall reduction in the radiological impacts of normal transportation (the calculated impacts are lower than the values reported in Table S-4).

Environmental impacts also result from transportation accidents. The extended irradiation of fuel will result in an increase in the actinide and fission product inventory in the fuel. Since the spent fuel is transported after an extended storage at the site (5 years), only the long lived fission products and actinides would remain to contribute to the risk. The PNL analysis shows that the overall effect of a higher inventory of actinides and long lived fission products would be to increase the projected dose in the event of an accident involving spent fuel by a factor of about 2.7, when irradiation is increased from 33 GWD/MT to 60 GWD/MT. However, because the increased irradiation will correspondingly decrease the amount of the spent fuel discharged, the probability of a transportation accident will be reduced by an amount roughly equal to the ratio of irradiation levels. The overall effect of the increase in irradiation to 60 GWD/MT would be to increase the radiological risk of spent fuel transportation accidents by about 50%.

As stated earlier, the amount of low level waste is conservatively assumed to increase by about 20% when irradiation levels are increased to 60 GWD/MT. No significant change in composition of low level wastes is expected. Therefore, the transportation accident risks of low level waste shipment would increase by 20%. The transportation risk associated with new fuel shipments would decrease as shipments decreased due to extended burnup.

Although Table S-4 indicates that the radiological risk of accidents is small and not capable of quantification, the radiological risks of transportation accidents were calculated in NUREG/CR-2325. For the 1985 transportation model, the SNL calculated radiological risk of 1.8 person-rem/reactor year. The staff has conservatively assumed from the PNL analyses that the higher irradiation (60 GWD/MT) would result in a 50 percent increase in radiological risks due to transportation of all kinds of radioactive waste (even though for low level waste the increase is expected to be 20% or less and for new fuel the risk would decrease with this assumption). SNL calculated risk of 1.8 person-rem/reactor year could increase to 2.7 person-rem/reactor year at 60 GWD/MT irradiation level. When accident risks at 33 GWD/MT (SNL value) and 60 GWD/MT (Scaled SNL value) are added to normal impacts (PNL and NESP-032 values in Table II), the overall radiological risks at higher irradiation levels are still lower than the risks at 33 GWD/MT irradiation levels. This is shown on Table III.

The analyses presented in NESP-032 show that the radiological environmental impacts of transportation accidents are small at 33 GWD/MT and remain small at 60 GWD/MT. The NESP-032 finding is consistent with finding in WASH-1238 and the results summarized in Table S-4 of 10 CFR 51.52.

TABLE III - TRANSPORTATION RADIOLOGICAL EXPOSURE RISK
PERSON REM/REACTOR YEAR

	NUREG/CR-5009 (PNL)		NESP-032	
	33 GWD/MT	60 GWD/MT	33 GWD/MT	60 GWD/MT
Normal Transportation Exposures	7.4	5.5	7.4	5.0
Accident Exposures (from SNL)	<u>1.8</u>	<u>2.7</u>	<u>1.8</u>	<u>2.7</u>
	9.2	8.2	9.2	7.7

The non-radiological impacts of transportation accidents are presented in Table S-4 as follows.

- (a) 1 fatality in 100 reactor years
- (b) 1 non-fatal injury in 10 reactor years
- (c) \$475 property damage per reactor year

As seen in Table I, the overall shipments of fresh fuel, spent fuel, and low level waste are slightly reduced. Therefore, the likelihood of an accident would decrease with the decreased number of shipments, while the non-radiological consequences of transportation accidents would remain unchanged.

In summary, the environmental impacts of extended irradiation up to 60 GWD/MT and increased enrichment up to 5 weight percent are bounded by the impacts reported in Table S-4 of 10 CFR Part 51. Table IV shows the summary of the comparison of impacts. Table IV also supports the staff's conclusions concerning transportation impacts in the Federal Register Notice 53 FR 6040.

TABLE IV - SUMMARY COMPARISON OF
TRANSPORTATION IMPACTS

	Table S-4	60 GWD/MT and up to 5 percent enrichment
<hr/>		
Traffic Density		
Truck	Less than 1 per day	No increase
Rail	Less than 3 per month	No increase
<hr/>		
Radiological Risk - Person REM per year		
Normal Transportation	7	5.0 - 5.5
Accidents	<u>1.8</u>	<u>2.7</u>
Total	<u>8.8</u>	<u>7.7 - 8.2</u>
<hr/>		
Non-Radiological Risk	1 Fatality/100 Reactor Years	No increase
	1 Non-Fatal Injury/ 10 Reactor Years	No increase
	\$475 Property Damage/ Reactor Year	No increase
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The above evaluation sets forth the changes resulting from increased enrichment (up to 5 weight percent) and extended irradiation (up to 60 GWD/MT), in the environmental impacts of transportation of fuel and wastes to and from the light water reactors set forth in Table S-4, 10 CFR 51. The values set forth in this detailed analysis represent the contribution of the environmental effects of transportation of fuel enriched with uranium 235 above 4 weight percent and up to 5 weight percent, and irradiated to levels above 33 GWD/MT and up to 60 GWD/MT to the environmental costs of operating the reactors. As shown above, the environmental cost contributions of the stated increases in fuel enrichment and irradiation limits are either unchanged or may in fact be reduced from those summarized in Table S-4, as set out in 10 CFR 51.52(c).

Dated: July 7, 1988