October 2, 1987

Docket No. 50-483

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Mr. D. F. Schnell
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Dear Mr. Schnell:

Enclosed for your information is a copy of an "Environmental Assessment and Finding of No Significant Impact" related to your March 31, 1987 application for reload license amendment. The Environmental Assessment has been forwarded to the Office of the Federal Register for publication.

Sincerely,

/S/

Thomas W. Alexion, Project Manager
Project Directorate III-3
Division of Reactor Projects

Enclosure:
As stated

cc: See next page

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Date: 09/18/87	09/18/87	10/2/87	9/22/87

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UNITED STATES NUCLEAR REGULATORY COMMISSION

UNION ELECTRIC COMPANY

DOCKET NO. 50-483

ENVIRONMENTAL ASSESSMENT AND

FINDING OF NO SIGNIFICANT IMPACT

The U. S. Nuclear Regulatory Commission (the Commission) is considering issuance of an amendment which involves a core reload and would permit operation of the Callaway Plant, located at the licensee's site in Callaway County, Missouri, with high burnup fuel. The proposed amendment would be in response to the licensee's application for Cycle 3 operation, dated March 31, 1987.

ENVIRONMENTAL ASSESSMENT

Identification of Proposed Action: The amendment would allow the licensee to use extended burnup fuel during the Cycle 3 and subsequent reloads. The highest region average burnup at the end of the cycle is expected to be 48,000 megawatt days per metric ton of uranium (MWD/MTU). The current generic assessment (including Tables S-3 and S-4) of the environmental impact of the nuclear fuel cycle contained in the Code of Federal Regulations and other NRC reports was prepared for discharge fuel burnups of 33,000 MWD/MTU.

The Need for the Proposed Action: The proposed amendment is needed to permit the licensee to operate the plant with extended burnup fuel.

Environmental Impacts of the Proposed Action:

1.0 Impacts On General Public

In the Final Environmental Statement Related to the Operation of the Callaway Plant (FES) dated January 1982, the staff calculated the

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dose commitments to individuals and the population residing around Callaway Unit 1 to assess the impacts on people from radioactive material released as part of the normal operation of the plant. Although the concentrations of some of the radionuclides in the primary coolant may increase due to the use of the higher burnup fuel, it is expected that the quantities of radioactive effluents that were previously estimated to be released (see Tables C.1 and C.2 on pp. C-3 and C-4 of the FES) contain a sufficient amount of conservatism to offset this increase. These values were based on a reactor power level of 3565 megawatts thermal (see Tables 11.1 through 11.3 on pages 11-2 through 11-4 of the Safety Evaluation Report Related to Operation of Callaway Plant, NUREG-0830). Since the previously estimated quantities of radioactive effluents remain valid, the radiological impact analysis in the FES for members of the public remains valid. The staff concludes that doses to members of the public would remain below the dose design objectives of 10 CFR Part 50, Appendix I, and would not be significant.

In Chapter 5.9.4 of the FES, the staff evaluated the environmental impacts of two types of accidents: (1) "design basis accidents" and (2) "severe accidents." "Design basis accidents" were postulated to occur to determine whether specific safety features (e.g., containment sprays, filters for the containment and fuel handling building) of the Callaway Plant met acceptable design and performance criteria. These safety features are described more thoroughly in the Final Safety Analysis Report (FSAR) for Callaway. "Severe accidents" are accidents with more severe sequences than the design basis accidents

and they lead to a severely damaged reactor core or core melt.

Estimated doses were listed in the FES (Table 5.6 on page 5-46; and Table 15.1 on page 15-12 of NUREG-0830) for six design basis accidents: (1) rod ejection; (2) steam generator tube rupture; (3) fuel handling accident; (4) main steam line break; (5) failure of a letdown line; and (6) large break loss-of-coolant-accident (LOCA). The staff's methodology for evaluating each of these accidents is described in the Standard Review Plan, NUREG-0800, and the references therein. The doses to the thyroid and whole body are primarily due to exposure of individuals to radioiodines and noble gases, respectively. These radionuclides quickly reach an equilibrium in the core of the reactor because their halflives are much less than one year.

Of the six design basis accidents listed in Table 5-6 of the FES, the doses from the two design basis accidents whose doses could be increased by the use of higher burnup fuel were reevaluated since they involve the release of gap activity. Only the control-rod-ejection accident and the fuel-handling accident result in the release of principally the gap activity. The staff has reestimated the doses for these two accidents, and the potential doses are less than 25% of the guideline values given in 10 CFR Part 100.

It was not necessary to reevaluate the other accidents because the doses from these accidents are not primarily due to the release of gap activity. The technical specifications limit the doses for the steam generator tube rupture, the failure of a letdown line, and the main steamline break by limiting the concentrations of radioiodines in the primary system and secondary system. For the

LOCA analysis, the quantity of radionuclides assumed to be released already exceeded the amount of gap activity estimated to be in the higher burnup fuel.

In regard to "severe accidents," by their very nature they involve releases greater than the gap activity. Although the higher burnup fuel would contain higher quantities of the long-lived nuclides (e.g., Cs-134, Cs-137, Sr-90, and the transuranics), it is the staff's judgement that the Summary of Environmental Impacts and Probabilities presented in Table 5.8, page 5-54, of the FES remains valid given the uncertainties involved in such assessments.

Further, as stated in the FES (page 5-64), "the overall assessment of environmental risk of accidents, assuming protective action, shows that it is less than the risk for normal operational releases, although accidents have a potential for acute fatalities and economic costs that cannot arise from normal operations." The staff concludes that the proposed increase in burnup would not result in a significant increase in the annual risk to members of the public from reactor accidents.

2.0 Occupational Radiation Exposure

Although the doses to nuclear power plant workers varies from reactor to reactor and from year to year, it can be projected for environmental impact purposes by using previous experience. Exposure of workers was assessed in the FES (Chapter 5.9.3, pages 5-25 through 5-28), and a range of values was presented. The FES discussion is still applicable.

3.0 Uranium Fuel Cycle and Transportation

In addition to the impacts associated with the operation of the reactor, there are impacts associated with the uranium fuel cycle. The uranium fuel cycle consists of those facilities (e.g., uranium mills, fuel fabrication plants, etc.) that are necessary to support the operation of the reactor. The FES (Chapter 5.10 and Appendix G) described the impacts associated with the uranium fuel cycle. These impacts were based on 30 years of operation of a model light-water reactor for discharge fuel burnups of 33,000 MWD/MTU.

The current generic assessment of the environmental impacts of the fuel cycle are contained in Tables S-3 and S-4 of 10 CFR Part 51. Table S-3 presents the environmental impacts of the fuel cycle in terms of natural resource use and chemical and radiological effluents. Table S-4 presents the environmental impacts of the transportation of fuel to and from a reference reactor.

A study was conducted by the Atomic Industrial Forum National Environmental Studies Project, AIF/NESP-032 dated June 1985, entitled, "The Environmental Consequences of Higher Fuel Burn-up." The results of this report are expressed in terms of extended values of Tables S-3 and S-4, extended burnup source terms for Rn-222 and Tc-99, and environmental dose commitment. The study concluded that extending fuel burnup to 60,000 MWD/MTU results in environmental consequences which are either less than or virtually the same as those assumed in the current regulations. The staff considers the AIF/NESP-032 report values acceptable for use in support of higher fuel burnup rates at NRC-licensed facilities.

Data extracted from AIF/NESP-032 and 10 CFR Part 51 Table S-3 are reproduced in Table 1. The environmental impacts were prorated by the projected fuel cycle requirements at higher burnups. AIF/NESP-032 used the following reference conditions for the development of the front-end requirements: (a) 80% Capacity Factor; (b) 1000 MWe Reference Reactor; (c) 0.25 w/o Tails; (d) Uranium Recycle; (e) 18-month Refueling Cycle; (f) U-236 neutron effect; (g) 0.1% Ore Grade; and (h) 90% Milling Efficiency. These reference conditions are the same as used by the staff in Table S-3 except for the last four items which were updated to reflect current conditions or knowledge more accurately. The 18-month cycle is considered more typical than the 12-month cycle previously used. The neutron poison effect of U-236 was included to maintain the conservative nature of the requirements. The ore grade and milling efficiency were reduced from previous values of 0.2% and 100%, respectively, to reflect expected average conditions over the next 20 years. AIF/NESP-032 also utilized the updated ORIGEN 2 code to determine the isotopics of the back-end of the fuel cycle.

Table 1 shows environmental fuel cycle impacts from the AIF/NESP-032 report at fuel burnup rates of 33,000 and 60,000 MWD/MTU. Also shown are the comparable values from the S-3 Table (33,000 MWD/MTU burnup rate) in 10 CFR 51.51. The reason that the AIF and 10 CFR Part 51 values at 33,000 MWD/MTU are different is because the AIF values reflect the more accurate current conditions and knowledge for refueling cycle, U-236 neutron effect, ore grade, and milling efficiency, as discussed above. The principal influence is the change in ore grade from 0.2% to 0.1%. The differences between the

NESP 33,000 MWD/MTU and NESP 60,000 MWD/MTU columns are due only to changes in fuel burnup rates and are the values that should be compared for the purposes of this assessment.

Table 1
ENVIRONMENTAL FUEL CYCLE IMPACTS
AT EXTENDED BURNUP

NATURAL RESOURCES USE	NESP 33000 MWD/MT	NESP 60000 MWD/MT	10CFR 51 TABLE S-3
Temporarily committed	180	157	100
Undisturbed area	134	114	(79)
Disturbed area	46.5	42.8	(22)
Permanently committed	19.3	17.0	13
Overburden moved (million of MT)	6.69	6.32	2.8
Water (millions of gallons)			
Discharged to air	271	263	160
Discharged to water bodies	12,800	12,900	11,090
Discharged to ground	304	288	127
Total	13,375	13,451	11,377
Fossil Fuel			
Electrical Energy (1000s of MWh)	375	374	323
Equivalent Coal (1000s of MT)	137	136	118
Natural gas (10^6 x scf)	143	121	135
EFFLUENTS - CHEMICAL (MT)			
Gases (including entrainment)			
SO_x	5,140	5,160	4,400
NO_x	1,400	1,390	1,190
Hydrocarbons	18.1	17.7	14
CO	34.4	34.2	29.6
Particulates	1,340	1,350	1,154
Other gases			
F	.753	.727	.67
HCl	.0136	.0075	.014
Liquids			
SO_4	11.2	11.0	9.9
NO_3	26.2	15.9	25.8
Fluoride	13.8	11.4	12.9
Ca	6.24	6.28	5.4
Cl	9.78	9.80	8.5
Na	13.8	13.6	12.1
NH_3	11.6	7.08	10.0
Fe	.462	.466	.4

EFFLUENTS - CHEMICAL (MT)	NESP 33000 MWD/MT	NESP 60000 MWD/MT	10 CFR 51 TABLE S-3
Solids	222,000	211,000	91,000
Tailings Solutions (1000)	585	556	240
EFFLUENTS - RADIOLOGICAL (CURIES)			
Gases (including estrainment)			
Rn-222	10,926	10,266	--
Rn-226	.022	.0209	.02
Th-230	.022	.0209	.02
Uranium	.0372	.0354	.034
Tritium (thousands)	18.1	17.7	18.1
C-14	19.6	15.3	24
Kr-85 (thousands)	334	308	400
Ru-106	.136	.106	.14
I-129	1.08	1.05	1.3
I-131	.928	.519	.83
Tc-99	.13	.119	--
Fission Products & Transuranics	.345	.227	.203
Liquids			
Tc-99	1.072	.984	--
Uranium & Daughters	2.29	2.17	2.1
Ra-226	.00374	.00355	.0034
Th-230	.00165	.00157	.0015
Th-234	.01	.00551	.01
Fission & Activation Products	5.9×10^{-6}	5.18×10^{-6}	5.9×10^{-6}
Solids (buried on site)			
Other than high level (shallow)	11,400	11,300	11,300
TRU and HLW	1.1×10^{7}	1.1×10^{7}	1.1×10^{10}
Effluents-thermal (billions BTU)	4,570	4,440	4,063
Transportation (person-rem)			
Exposure of workers and	2.76	1.93	2.5
General Public			
Occupational Exposure	--	12.5	22.6

Table 2 is a comparison of environmental impacts from transportation of radioactive material for extended burnup. The values from the S-4 Table are identical to the values in the NESP 33,000 MWD/MTU column.

Table 2
ENVIRONMENTAL IMPACTS FROM TRANSPORTATION
OF RADIOACTIVE MATERIALS FOR EXTENDED BURNUP

	NESP 1/ 33000 MWD/MT	NESP 60000 MWD/MT
Heat (BTU/hr.)	250,000	250,000
Weight (lbs./truck)	73,000	73,000
Traffic		
Truck (per day)	1	1
Rail (per month)	3	3
Exposure		
Workers (persons)	200	200
Dose (mrem/person)	0 - 300	0 - 300
Total Dose (man-rem)	4	3
Public (onlookers)	1,100	1,100
Dose (mrem/person)	0.003-1.3	0.003-1.3
(along route)	600,000	600,000
Dose (mrem/person)	0.0001-0.06	0.0001-0.06
Total Dose (man-rem)	3	2.1
Accidents		
Radiological Effects	Small	Small
Common Causes		
(years between deaths)	126	202
(years between injury)	7	12
Property Damage per reactor year	$475	$296

1/ These values are the same as Table S-4 in 10 CFR 51.

As can be seen from Tables 1 and 2, when different assumptions are taken into account, extending fuel burnup results in slight changes to the radiological and non-radiological environmental consequences which would not lead to significant changes to the impacts associated with the uranium fuel cycle and transportation.

Alternative to the Proposed Action: Since we have concluded that the environmental effects of the proposed action are negligible, any alternatives with equal or greater environmental impacts need not be evaluated.

The principal alternative would be to deny the amendment request. Such actions would not reduce environmental impacts.

Alternative Use of Resources: This action involved no use of resources not previously considered in the Final Environmental Statements (construction permits and operating license) for the Callaway Plant.

Agencies and Persons Consulted: The NRC staff reviewed the licensee's request that supports the proposed amendment. The NRC staff did not consult other agencies or persons. However, the NRC staff was assisted by a study conducted by the Atomic Industrial Forum National Environmental Studies Project, AIF/NESP-032 dated June 1985, entitled "The Environmental Consequences of Higher Fuel Burnup."

FINDING OF NO SIGNIFICANT IMPACT

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

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

For details with respect to this action, see the request for amendment dated March 31, 1987 and supplemented April 15, June 5, June 18, July 16, July 28, August 7, August 31, and September 9, 1987, which are available for public inspection at the Commission's Public Document Room, 1717 H Street, N. W., Washington, D.C., and at the Callaway County Public

Library, 710 Court Street, Fulton, Missouri 65251 and the John M. Olin Library, Washington University, Skinker and Lindell Boulevards, St. Louis, Missouri 63130.

Dated at Bethesda, Maryland, this 2nday of October 1987.

FOR THE NUCLEAR REGULATORY COMMISSION

David L. Wigginton, Acting Director
Project Directorate III-3
Division of Reactor Projects