Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690

June 19, 1980

DOCKET NUMBER
PETITION RULE PRM-51-6 (9)
(45 FR 25557)

Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Sir:

Commonwealth Edison Company ("Commonwealth") submits the following comments in respect of the petition for rulemaking filed by Catherine Quigg, Research Director, Pollution and Environmental Problems, Inc., requesting the preparation of a generic environmental impact statement for high burnup nuclear fuel. 45 Fed. Reg. 25557 (April 15, 1980.) Commonwealth urges that the petition be denied.

The basic premise of the petition is that high burnup fuel may have a "significant effect on the quality of the human environment", which according to NEPA requires a detailed Environmental Impact Statement. With respect to the effect on the environment, NUREG-0575 states the following: (Reference 1 pages ES-12, Item 4) "The Storage of LWR spent fuels in water pools has an insignificant impact on the environment, whether at AR or AFR sites. Primarily this is because [of] the physical form of the material, sintered ceramic oxide fuel pellets heremetically sealed in Zircaloy cladding. Zircaloy is a zirconium-tin alloy which was developed for nuclear power application because of its high resistance to water corrosion in addition to its favorable nuclear properties. Even in cases where defective tubes expose the fuel material to the water environment, there is little attack on the ceramic fuel."

This summary statement applies equally well to high burnup fuel. Because of the stability of the fuel and cladding in the pool environment and because of the less severe conditions in the fuel storage pool compared to the reactor core, high burnup fuel should not present any greater impact on the environment than fuel now in pool storage.

Detailed comments on specific issues raised in Ms. Quigg's petition are given below:

Page 1, Paragraph 1

Ms. Quigg's first paragraph statement that the federal government and utilities "want to use more uranium" is erroneous. As a result of the decision to indefinitely defer fuel reprocessing, the government and the nuclear industry have emphasized the methods to improve uranium utilization (i.e., use less uranium for each unit energy produced). Numerous studies have shown that uranium utilization can be improved by increasing the discharge burnup of the fuel. Thus, for a fixed energy output, the amount of uranium (U308) utilized would be significantly reduced. For example,

Acknowledged by card. 6/23/80. mdv...

Dr. P. Lang of DOE has pointed out that extending burnup from 30,400 MWD/MT to 50,600 MWD/MT would: 1) reduce annual SWU requirements by 4%, and 2) reduce the annual U308 requirements by 17%.

It should be noted that the two DOE programs on pellet-cladding interaction mentioned by Ms. Quigg in paragraph 1 (i.e., the projects with Consumers Power Company and Commonwealth Edison) are directed at nuclear fuel design improvements as well as being part of a long term high burnup development project.

Page 1, Paragraph 2

In the second paragraph Ms. Quigg's statements with respect to a burnup limit in the Zion Technical Specifications require clarification. The Tech. Specs. have an implicit burnup limit in that the curve of $F\Delta H$ penalty versus burnup for rod bow is defined up to a region average burnup of 38,400 MWD/MT for all fuel assemblies. The curve is further defined to an unlimited burnup for the four Region 3 Extended Burnup Assemblies. Edison has submitted information to the NRC which shows that the curve to an unlimited burnup applies to all fuel assemblies.

Ms. Quigg's concern in this paragraph appears to be about a future, extensive high burnup fuel program "that is sure to follow these fairly limited experiments." Since these future high burnup programs have not as yet been defined or proposed to Edison, it is difficult to comment on the statements in this paragraph.

The comments below apply to each numbered section in Ms. Quigg's letter starting on Page 2.

Item 1, First Paragraph

The statement that "greater fission gas releases from nuclear reactors" will occur as a result of high burnup fuel is misleading and requires clarification. It is widely recognized (see, for example, Reference 2) that the fraction of fission gas released from a UO2 pellet to the fuel rod gap and plenum increases with burnups above about 20,000 MWD/MT. This gas is not released from the fuel rod because it is contained by the zirconium cladding. Thus this gas is not released to the environment. The fact that fission gas release from UO2 pellets increases with burnup is adequately taken into account in fuel rod design. The NRC's review of analytical models used in fuel rod design specifically evaluates the effect of enhanced fission gas release at high burnup (Reference 3). Thus, while higher fission gas release from the pellet does occur, it is a widely understood phenomenon, and is accounted for in fuel rod design.

Item 1, Second Paragraph

We agree with the quoted NRC statement that "compliance with technical specifications will maintain concentrations of radioactivity within the allowed limits." This statement is true for normal fuel operation and is also expected to apply to operation with higher burnup fuel. Our experience at Zion 2 with four extended burnup assemblies, which were recently discharged at exposures between 46.1 and 46.9 GWD/MTU, indicates that no additional radioactivity was released from the fuel during the high burnup demonstration cycle than in previous Zion 2 fuel cycles. This experience, although limited to four assemblies, suggests that the release of activity to the environment from high burnup fuel is insignificant. It should also be noted that due to U-235 depletion at high burnup, the duty cycle (power changes and level) of the fuel is lower than in earlier cycles and hence the in-core failure probability is substantially reduced.

Item 1, Third Paragraph

As indicated above, our experience with four extended burnup assemblies indicates that there was no increase in radioactivity released from four assemblies irradiated to 46 GWD/MT.

Item 2

Item 2 appears to be concerned with corrosion of fuel at high burnups. Cladding corrosion (like enhanced fission gas release at high burnup) is considered in detail in the design of fuel rods. For example, see the NRC Safety Evaluation Report on the Westinghouse Fuel Rod Design Model (Reference 3). In summary, additional cladding corrosion does occur at high burnup but is a small fraction (less than 5%) of the clad thickness and the effect is considered in detail in fuel rod design.

Item 3, First Paragraph

The statement that NUREG-0404 ". . . is useless in predicting pool storage behavior of high burnup fuel," borders on being ridiculous. The experience summarized in NUREG-0404 indicates that fuel can be safely stored without any significant impact on the environment. No new phenomena are associated with higher burnup fuel than occur and have been analyzed for standard fuel. Thus, the existing pool storage experience with standard fuel is a valuable reference for use in projecting the storage behavior of high burnup fuel.

Item 3, Third Paragraph

As discussed above, experience with fuel to burnups of 33,200 MWD/MTU forms an appropriate experience base to predict the behavior of higher burnup fuel. The data base cited by Ms. Quigg (i.e., maximum burnup of 33,200 MWD/MTU) is out of date. Edison has a substantial number of assemblies in the Zion pool with burnups greater than 36,000 MWD/MTU and at the end of Cycle 3 of Zion Unit 2 (March, 1979), 20 assemblies were discharged with burnups greater than 38,000 MWD/MT. It should also be noted that A. B. Johnson, Jr. has an active program to continue and update his earlier studies on fuel pool storage.

Item 3, Fifth Paragraph

The statement that NUREG-0404 "should be declared null and void as a document on which to base spent fuel safety and environmental consideration" is, as explained above, totally unfounded.

Item 4, Second Paragraph

Estimates of fission gas release at high burnup are available to the public as mentioned above (See Reference 2).

Item 5, First Paragraph

Since no nuclear fuel reprocessing is now being done, the issues raised in Item 5 seem premature.

Conclusion, Page 5

With respect to Ms. Quigg's conclusion, we understand her petition to relate to an update of the existing generic environmental impact statements on spent fuel storage (NUREG-0575) and the documents underlying the environmental survey of the uranium fuel cycle found in Table S-3 (WASH-1248, as supplemented by NUREG-0116.) In our opinion, it is not necessary to update NUREG-0575 because of the current or future high burnup demonstration programs. With respect to the Zion high burnup demonstration program, this judgment is confirmed not only by the NRC Staff's March 7, 1979, safety evaluation and environmental assessment of that program, but also by the independent review by the Licensing Board in the recent Zion spent fuel pool storage capacity expansion case. See, Commonwealth Edison Company (Zion Station, Units 1 and 2) 11 NRC 245, 291-2 (1980). (We note that Ms. Quigg attended the Zion hearings and has filed a petition with the Staff attacking the result reached. Commonwealth forwarded that petition to the Appeal Board which is presently reviewing the Licensing Board's decision in that case.)

Since the Commission has already announced its intention to update Table S-3 periodically, Commonwealth suggests that the results of high burnup demonstration programs be factored into this periodic environmental review, although the demonstration programs themselves would certainly not compel such updating.

With respect to future proposals for the widescale use of high burnup fuel cycles following the current demonstration programs, Commonwealth believes they are unlikely to present any significant environmental impacts requiring preparation of a generic environmental impact statement. However, if such a generic environmental impact statement is to be required, it should be begun as soon as possible after a concrete proposal which can be reviewed takes shape. See, Kleppe V. Sierra Club, 427 U.S. 390 (1976). If a generic environmental impact statement is to be done, it should not be allowed to become a "critical path" item delaying the realization of the energy savings which would be the reason for implementation of such high burnup cycles.

Respectfully submitted,

D. L. Peoples / RRB

D. L. Peoples
Director of Nuclear
Licensing

REFERENCES

1) Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel," August, 1979, NUREG-0575.

2) "Fission Gas Release from Fuel at High Burnup," R. O. Meyer, C. E. Beyer, J. C. Vglewede, March, 1978, NUREG-0418.

3) "Safety Evaluation of the Westinghouse Electric Corporation Topical Report, WCAP-8720, Improved Analytical Models used in Westinghouse Fuel Rod Design Computations," NRC Core Performance Branch, December, 1978.