UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
DUKE POWER COMPANY	)	
	)	Docket No. 70-2623
(Amendment to Materials License SNM-1773 for Oconee Nuclear Station Spent Fuel Transportation and Storage at McGuire Nuclear Station)	)	

TESTIMONY OF RALPH W. BOSTIAN

My name is Ralph W. Bostian. I am the Manager of the System Results and Fuel Management Group of the Steam Production Department of Duke Power Company. I graduated from North Carolina State College in 1949 with a Bachelor's Degree in Mechanical Engineering. After a short period of employment in a power plant of the Springs Cotton Mills in Lancaster, South Carolina, I was employed by Duke Power Company in October, 1950 and assigned to the Cliffside Steam Station near Cliffside, North Carolina. In January, 1951 I was transferred to the Buck Steam Station near Spencer, North Carolina. In August, 1951 I was promoted to Tec. Engineer at Buck; this being my first supervisory assignment. It was in this role that I first participated in the construction, check-out and start-up of a new generating unit, Buck No. 5. In December, 1956 I was transferred to the Allen Steam Station, then under construction, near Belmont, just a few miles west of Charlotte. Here, first as Plant Engineer, then as Assistant Superintendent and finally as Superintendent I became involved in all aspects of power plant operation and maintenance.

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5. Utility Waste Management Group

6. Nuclear Transportation Group

It is the contention of several intervenors in this proceeding that the modification of the existing pools at Oconee is preferable to the proposed shipping campaign as a way to handle the spent fuel storage requirements of Oconee. An economic comparison of these alternatives does not show this to be the case. This comparison is set forth in Table 1, Page 4.

TABLE 1

Situation	Cost: Total	Cost: Per Assembly	Time When Oconee Station Will Lose FCR	Time When Oconee Units Will Lose Thermal Output
Shipment of 300 Oconee Spent Fuel Assemblies to McGuire No Rerack	$738,300	$2,461	August 1981	12/82 - 10/83
Reracking Oconee 1, 2 Pool with High Density Non-Poison Racks	$3,514,470	$8,489	September 1982	10/83 - 11/84
Reracking Oconee 1, 2 Pool with Poison Racks *	$4,000,000	$8,000	April 1986	11/87 - 5/88
Reracking Oconee 3 Pool With Poison Racks *	$3,000,000	$11,000	November 1984	3/86 - 8/86
Reracking Both Oconee Pools With Poison Racks *	$7,000,000	$9,000	March 1988	7/89 - 12/90

* Assumes no cost for any required transfers of spent fuel to perform the spent fuel pool modifications. These are preliminary figures; complete engineering cost estimates should be complete by June 15, 1979 and will revise these values accordingly. Also, poison reracking assumes that the Oconee 1, 2 high-density reracking in 1979 has been completed. These dates are based on a February 1979 refueling schedule with Oconee 3 on an annual refueling cycle.

These figures by themselves indicate the value of shipment as opposed to reracking the existing pools in that the cost to the rate payer is much less.

It should be noted that regardless of which of the above alternatives is selected, additional spent fuel storage space for Oconee spent fuel will be necessary. It should also be noted that Oconee fuel could be shipped to other Duke nuclear facilities. Duke has determined that such a course of action would give Oconee, as well as the other stations involved, full core reserve capability until 1991 and would cost $4 - $4.5 million, including the estimated cost of the newly established NRC transportation safeguards program.

A further contention of some of the intervening parties is that the development of an ISFSF at the Oconee site is preferable to shipment. On the basis of cost, this again can be shown to be incorrect. An independent storage facility at Oconee has been estimated to cost $44 million (1976 dollars) and it has recently been estimated that it will take about five years to design, license and construct the facility. In today's economy this type of facility could be expected to cost much more. The cost of shipment has been estimated at $2,000 per transfer (1978 dollars). Even with the new NRC security requirements for spent nuclear fuel shipments, we do not expect this cost to exceed $2,500 per transfer. It is evident that this is the preferred economic method of handling the increasing quantity of spent fuel until reprocessing, government storage, or government disposal facilities are provided. It should also be noted that design, licensing and construction of an ISFSF at Oconee most likely could not be completed prior to the date the station would run out of storage space as presently planned. It would require the installation of poison racks (which would most likely require shipment) at the Oconee pools to provide Duke with sufficient onsite storage to hold all spent fuel generated by the station until the new facility was completed and ready to accept fuel. Mr. Hager's testimony addresses the physical expansion of the pools. Radiation doses resulting from the various alternatives is addressed by Mr. Lewis.

A contention similar to the one just described has also been presented. It is the belief of the intervenors that an ISFSF away from the Oconee site is preferable to shipment. Once again, I would disagree with this on economic grounds. The cost of such a facility if built anywhere on the Duke system other than Oconee would be at least $44 million (1976 dollars). This has been shown to greatly exceed the cost of shipment. The dose to the workers would be similar to that presented for the shipment of Oconee fuel offsite or to an AFR at Oconee. The dose to the driver would depend upon the location and distance traveled. The dose to the public for spent fuel shipments, whether they be to an ISFSF away from Oconee or to McGuire, has been found to be very small, thus no matter if the fuel is kept onsite at an ISFSF at its own pool, shipped to an offsite ISFSF, or shipped to a spent fuel pool away from the site where that spent fuel assembly was produced, the incremental does to the public is negligible. It should be noted that this option would require shipment and reracking of the Oconee pools with poison racks to enable Oconee to continue full power operation.

Another contention in this hearing is that transportation of spent fuel will result in an increased radiation dose to the persons living in the vicinity of the transportation routes. Mr. Lewis presents the dose data in his testimony. I would point out that the planned route is as described in the Environmental Impact Appraisal developed by the NRC staff. This route has been chosen to provide the safest avenue for the fuel to travel; it minimizes travel over two lane highways, intersections and railroad grade crossings. The number of people described in the EIA and those located in the factories, schools and hospitals indicated in that report are subjected to an insignificant level of radiation from the shipments in normal, delay, or accident situations. Within the staff's EIA and Mr. Lewis's testimony the dose to persons traveling over the transportation routes concurrently with the spent fuel shipments is evaluated. Once again, the dose is shown to be neglible regardless of the route taken. Finally, the dose to those persons in the vicinity of an accident or exposed to a delay in transit are evaluated in the staff's EIA and in Mr. Lewis's testimony. The probability of the accident case is sufficiently low to label the risk of such an event as small. The case of a delay in transit would produce doses well within those established as safe by the NRC. Alternate routes using two lane non-interstate, non-limited access type roads have been examined and while the net population along the route may be somewhat less than that over the proposed route, the dose in this case is still negligible. Thus, a comparison of shipping on rural two lane roads passing through numerous smaller towns and the associated schools, factories and hospitals versus shipments on the limited access interstate highways would show an insignificant difference in dose to the public. However, I believe that the shipments of spent fuel can be made in a safer manner by transporting them on the limited access interstate highways, I-85 and I-77.

One of the contentions is that the proposed action cannot be approved until completion of various generic environmental impact statements. I would choose not to speak to the legality of this point but I would note out that transportation has been found to be the most cost effective method of providing storage for spent fuel at Duke until reprocessing, government storage, or government disposal is made available. The use of this method of providing storage does not rule out the modification of existing pools or development of interim spent fuel storage facilities (ISFSF) on the Duke system but rather has been found at this point to be the least burdensome method in terms of cost to our rate payers and at a negligible environmental impact to all concerned. The use of the transfer scheme will provide Duke with the flexibility it needs to continue to provide reliable electric service to its customers.

Another contention, similar to ones discussed above, is that Duke has failed to consider several alternatives to shipment. As previously stated, Duke has examined a number of ways to increase the storage capacity at its pools. These include, but are not limited to, reracking of the existing pools with poison racks, use of pin storage, and design, licensing and construction of an ISFSF at or away from Oconee but on the Duke system. In 1976 Duke decided to utilize high density non-poison racks at each of its spent fuel pools then under construction or design. Scheduling problems have prevented us from using poison racks at Oconee so far but we are evaluating their use for the near future. It should be noted that with poison racks installed at Oconee, full core reserve storage is estimated to be available only until sometime in 1988. Thus, to provide full core reserve storage thereafter would require the design, licensing and construction of an ISFSF or shipment. The cost of an ISFSF has been estimated at $44 million (1976 dollars) with a 1979 dollar cost of $34,500 per space.

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The timing of these alternatives is of importance in planning for spent fuel storage as well. Our planned reracking of Oconee 1, 2 with the high density, non-poison racks is scheduled for completion by late 1979. As the award date for this project was December 1, 1978, the total project time is about one year. This includes an abbreviated licensing review by the NRC. The poison rack option is estimated to require additional time in that a lengthier licensing time is expected, more rack locations must be fabricated, and the production and testing requirements on these extremely close spaced racks are more stringent. We esti - .pproximately 2 years from award date to completion of installation for this option. Finally, the design, licensing and construction of an ISFSF is estimated to take five years to complete. As no facility built specifically for this purpose has been developed in the United States there is scarce experience to draw on.

It is important to analyze the storage capacity afforded by these options. The following Table 2 describes the storage available with the storage options discussed above assuming no transshipment between plants.

TABLE 2 - SPENT FUEL STORAGE

Plant	Rack Description	Rack Spacing	Rack Spaces	Total	Date Plant Loses FCR*
Oconee 1, 2	Original	21"	336	532	10/77**
3	Racks	21"	216		
McGuire 1	High	15.5"	500	1000	1987
2	Density	15.5"	500		
Catawba 1	High	13.5"	1418	2836	2004
2	Density	13.5"	1418		
Oconee 1, 2	High	13.75	750	1224	1982
3	Density	14.09	474		
McGuire 1	Poison	10.50"	~1200	~2400	1999
2	Racks	10.50"	~1200		
Catawba 1	Poison	10.25"	~2800	~5600	past 2005
2	Racks	10.25"	~2800		
Oconee 1, 2	Poison	10.5	~1250	~2000	1988***
3	Racks	10.5	~750		

* No offsite fuel shipments--no transshipment.

** If Oconee 3 had not been reracked in 1976 to 474 spaces, Oconee would have lost station FCR on this date.

*** This indicates that we maintain FCR through 1987 but lose it sometime in 1988.

The storage capacity afforded by these options is important in the analysis of which option is best. The following Table 2 describes the storage available with the storage options discussed above assuming no transshipment between plants.

The technical problems Duke is aware of at this time on alternatives to shipment are varied. Some of the major problems involved in backfittin plants today with additional spent fuel storage space include, but are not limited to, keeping radiation doses to divers in underwater projects low, removal and disposal of the old racks, leveling methods, and backfitting the cooling capacities of the existing pool. Poison racks are being implemented by utilities as some of the problems with earlier designs are corrected. Offgassing hydrogen and the ability of the poison materials to withstand the effects of water and/or radiation are still of some concern, however we feel that in time this "maximum" type capacity will be available at a lower risk. Also, poison racks require a more lengthy technical review which adds some uncertainty to scheduling.

It is also asserted that Duke has not adequately considered utilizing existing space to its maximum capacity and also that the justification provided for not expanding the Unit 1, 2 pool is insufficient. I would once again disagree on these points for several reasons. The scheduling problems were the primary reason for deciding to rerack the Oconee 1, 2 pool with non-poison rather than poison racks. However, it should be noted that when the present reracking is completed, Duke will have spent approximately $6 million in adding 672 spaces to the initial capacity. We are, at this time, once again reviewing the cost and feasibility of re-racking Oconee pools with poison racks. We have evaluated the costs and environmental effects of shipment versus reracking and find shipment to be justified by the lower costs and negligible environmental effects of this method of providing storage on the Duke system.

The last contention proposed is that Duke should be bound by its full core reserve (FCR) standard or demonstrate that this capability is more valuable than the costs of shipment offsite of one core of spent fuel. Duke is familiar with needing full core reserve space to accommodate the fuel discharge required for a vessel inspection. Oconee 2 required defueling from February 20, 1974 to April 5, 1974 to remove loose parts. All three Oconee units required full core discharges in 1976 for removal of specimen holder tubes. Oconee 1 was down from April 18 to May 31 for its work, Oconee 2 was down from April 7 to July 12, and Oconee 3 was down from September 18 to November 11.

Fortunately, in each of these four (4) defuelings full core storage space was available, thus there was no added cost incurred because of the lack of FCR. In each of these four defuelings there would not have been a hazard to the public health and safety had the FCR not been available. Had the FCR not been available, the fuel would have remained in the core with the unit out of service until the FCR was restored in the pool or sufficient storage space secured elsewhere. Thus, in these four defuelings the question of FCR or lack thereof is simply one of cost, not reactor safety. Indeed, it is difficult to envision FCR as anything other than a question of cost.

From a cost standpoint it becomes one of replacement power cost - what does it cost to generate the power lost from having an Oconee unit idle because of the lack of FCR. This added production cost will depend upon where the replacement power is generated or purchased. Mr. Sterrett will address this in detail. As a general planning tool our Production

Engineers are using $165,000 per day as the replacement power cost of an Oconee unit - when it is available within the Duke system.

As another general rule, an additional 8000 tons of coal will be burned each day an Oconee unit is idle - that is if there is sufficient coal-fired capacity in reserve. If not and purchase power is unavailable, it is then necessary to operate oil-fired combustion turbines. Duke's twenty-four combustion turbines consume 930,000 gallons of No. 2 fuel oil per day when operated at full load. Neither alternative is attractive.

Pickard Lowe and Garrick has recently conducted a Full Core Removal Study for the Edison Electric Institute. The Draft Report, issued May, 1979, reports that a light water reactor has a mean FCR occurrence frequency (occurrences per reactor-year) of .145 - or once every seven years.

Based on our experience, the results of the Pickard Lowe and Garrick study and cost considerations we believe our plan to maintain a single FCR if possible is good operating practice.

On May 22 the Nuclear Regulatory Commission announced it is amending 10 CFR Part 73 providing additional physical protection of spent fuel in transit. The April 18, 1979 memorandum from Mr. William J. Dircks, Director, Office of Nuclear Material Safety and Safeguards, to the Commissioners proposing the amendment notes that implementation guidance will be furnished on a case-by-case basis. Internal planning has already been initiated to assure that Duke can comply with the regulations when shipments commence.

Since the route proposed for the Oconee-McGuire shipments lies within the Duke Power Company service area we forsee no difficulty in assuring that law enforcement agencies are ready to respond to emergencies or calls for assistance.

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Charlotte is identified in the NRC Interim Guidance for implementing these security regulations as a city of over one hundred thousand population which should be avoided by shipments of spent nuclear fuel. The guidelines does indicate that shipments can transit such areas under certain conditions with additional security precautions. We believe the I-85/I-77 route to be the safest and preferred route.

The short distance (170 miles) to be traveled should permit the shipments to be scheduled without overnight stops. Large truck stops are spaced at appropriate intervals along the route which should be appropriate for meal and rest stops. We are investigating safe havens along the route for use in event they are needed.

Tri-State Motor Transit, Inc. of Joplin, Missouri has been selected as the carrier for this initial movement. Tri-State is a nationally known hauler of hazardous materials. Procedures for coping with threats and safeguards emergencies will be developed in conjunction with Tri-State. Tri-State has vehicle immobilization procedures to be followed in the event certain of its shipments are jeopardized.

Driver and escort training is being planned to include route information and emergency procedures. The escort will be provided with a Duke Power Company two-way radio operating on established assigned frequencies. It has been determined that continuous contact over the entire route can be maintained through base stations at Oconee, Spartanburg Operating Center and the Central Operating Center in Charlotte. Overall training of driver and escorts will be coordinated through the Training and Safety Services Group in the Steam Production Department.

We foresee no difficulty in meeting these new security requirements.

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