ADDITIONAL CORRESPONDENCE

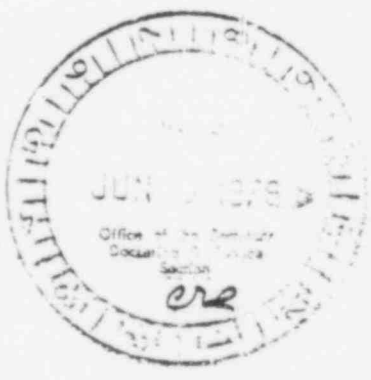
UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In The Matter Of	)	
	)	
DUKE POWER COMPANY	)	Dkt. No. 70-2623
	)	
(Amendment to Operating License SNM-1773 for Oconee Spent Fuel Transportation and Storage at McGuire Nuclear Station)	)	

AFFIDAVIT OF THOMAS B. COCHRAN, Ph.D.

City of Washington)
) ss:
District of Columbia)

I, Thomas B. Cochran, Ph.D., being first duly sworn, do hereby depose and say:



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The economic and technical uncertainties which now surround nuclear waste management are legitimate uncertainties which flow directly from the anomaly created by beginning a nuclear power program without having any reasonable notion of how to solve the most serious and irreversible problem created by nuclear reactors -- nuclear waste. It is fair and essential that decisions on whether to build more nuclear plants and whether to continue to build and operate those to which commitments have already been made should be influenced by the real uncertainties created by this anomalous situation.

In October 1977, without the benefit of an environmental impact statement, and without compliance with any procedure for soliciting and considering public opinion, the Department of Energy (DoE) announced a spent fuel storage policy.

The DoE spent fuel policy as it relates to domestic reactors if implemented would involve a massive new subsidy by the Federal government for nuclear power. The DoE proposes to build and operate temporary spent fuel storage facilities away from the reactor (AFRs); it proposes to take possession of and title to all spent fuel shipped to these repositories and will enable the utility to pay a one-time fixed fee for this government service and for all permanent waste disposal, thus shifting to the government the economic risk that waste handling and disposal will be substantially more expensive and shifting from the utility the need to consider the nuclear waste problem in deciding whether to build and operate nuclear reactors. As spelled out in a separate affidavit by Mr. Dimitri Rotow, the policy of Duke Power Co. and other utilities of transshipping (juggling) of

spent fuel, e.g., Duke's cascade program, among its own reactor pools directly influences DoE plans and creates an artificial need for the Government AFR. The dangerous financial and policy implications of this program are enormous. It is our position that the Government should devote its full attention to finding a permanent solution to the nuclear waste problem, that it should neither build nor allow to be built any AFRs except under very strict guidelines and that it should begin now to collect from utilities the cost of disposing of nuclear wastes but should set the fee at the upper end of the cost estimates and should reserve the right to collect further fees if the costs attributable to the utility exceed the amounts previously collected.

It is significant that the juggling of spent fuel -- Duke's cascade program, and use of AFRs to store spent fuel is the direct consequence of mismanagement of our nuclear waste program and the nuclear industry's apparently irresistible urge to conduct its business on the basis of unrealistically generous interpretations of the likelihood that its problems will be solved. A study completed by NRDC (copy attached) demonstrates that nuclear power plants now operating (including Oconee) have ample space at the reactor site to accommodate the nuclear wastes generated by their lifetime operation (only 1/8 to 1/4 of an acre is required).

Sound prior planning and prudent management decisions would have dictated that for the small additional cost involved the utility provide on-site storage to accomodate the lifetime production of spent fuel to cover the contingency that facilities for permanent disposal of the nuclear wastes would not be available on schedule. Having already made a planning blunder with existing reactors, it would be reasonable to assume that the nuclear industry would be more prudent in the future. Regrettably this has not occurred. We are not aware of a single nuclear reactor now under construction or planned for which adequate (i.e., lifetime) spent fuel storage capacity is being built.

Even reactors now under operation can take steps to attempt to cope with their spent fuel storage problems without government subsidies, without AFRs. A recent DOE Report on the cost of spent fuel storage (DOE/ET-0055) concluded that (p. 3):

> It is assumed that there would be economic and other advantages to the utilities of keeping their spent fuel at their own reactor sites rather than shipping it to interim AFR storage basins.

The most economic route may not be favored by utilities (who are allowed to pass all costs on to their customers) because the availability of an AFR would allow them to transfer a messy waste problem away from the reactor (afar from site, afar from mind) and to make it appear that further generation of nuclear power was unrelated to the nuclear waste problem because title to and responsibility for nuclear wastes had been transferred to the federal government.

Another danger of the utility transshipment and the Government's AFR program is the impact on permanent waste disposal that will occur as the result of decoupling nuclear reactor operation and nuclear wastes. Even without Congressional action formally linking the further use of nuclear power to progress on solving the nuclear waste problem, there is in fact such a linkage. Four states, California, Wisconsin, Iowa and Maine, have taken legal steps to limit or prevent further nuclear plant licensing without a solution to the nuclear waste problem. Both the President's Council on Environmental Quality and the General Accounting Office have called for a limitation on the use of nuclear power unless progress is made toward solving the nuclear waste problem. The public awareness of this problem is very much influenced by the buildup of nuclear wastes at reactor sites. Once those wastes leave the reactor sites, the public most concerned with the reactors may be less concerned with the wastes -- afar from site, afar from mind. On the other hand, efforts to expand spent fuel capacity at an existing reactor site or for new reactors forces those who benefit from the nuclear power to face up to the risk that further use of nuclear power at their reactor without any solution to the nuclear waste problem could make their reactor site a large de facto permanent waste disposal site. That places the choice and the considerations relevant to it precisely where they belong.

With an AFR program, the natural control on further generation of nuclear wastes will be gone and AFR capacity will

expand to the point where any solution to the nuclear waste problem will be virtually impossible. In an NRDC report entitled "Nuclear Waste: Too Much Too Soon," Dr. Arthur Tamplin and I point out that the proposed DoE level of nuclear reactors by the year 2000 (380 GWe) would generate 17,400 spent fuel assemblies every year requiring 1,200 truck shipments and 1,200 rail shipments of nuclear wastes each year and would produce an accumulation of 177,000 spent fuel assemblies by the year 2000. Using assumptions for the capacity of a permanent waste repository developed by the California Energy Commission, this rate of producing nuclear wastes would require opening a new permanent waste repository every four to five years. After 35 years of nuclear power plant operation, the United States has yet to find even one acceptable site for waste disposal, much less the numbers required by the DOE planned use of nuclear power. The DOE AFR policy is admittedly an attempt by DOE to make it easier to obtain approval to build and operate nuclear power plants. Like any medicine that treats only symptoms (the spent fuel backlog) and not causes (the absence of a permanent waste disposal solution), it can seriously damage the patient in the long run. After so many disastrous waste management programs, it would be the height of folly to buy yet another interim solution to a real and permanent problem.

All statements above are true and correct to the best of my personal knowledge.

Thomas B. Cochran, Ph.D.

Signed and sworn to before me this 25th day of May 1979.

Notary Public

My Commission Expires September 30, 1982

Analysis of Space Available for Storage of Spent Fuel at Existing Operating Reactor Sites

Natural Resources Defense Council
917 15th Street, N.W.
Washington, D.C. 20005

July, 1978

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Introduction

Although the Department of Energy has announced a spent fuel policy dependent upon use of away-from-reactor-storage (AFRs) for accumulated spent fuel, there is no evidence that DOE has investigated the potential for expansion of spent fuel capacity at reactors (ARs) by building new spent fuel pools. Because of numerous environmental and political problems inherent in the use of AFRs,*/ their use should be avoided if at all possible. The attached analyses attempt, on the basis of readily available data, to explore the potential for ARs. The most significant finding is that a storage pool large enough to accommodate 40 years of spent fuel from a reactor could be installed on less than 1/4 of an acre. The smallest reactor site for any operating reactor is 83.63 acres and the average reactor site is over 1,000 acres.

Before further effort is expanded on development and appr[illegible] of AFRs, we believe DOE should thoroughly analyze the relevant data and determine definitively whether there is any technological reason why the use of expanded ARs cannot meet any legitimate need for spent fuel storage space.

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*/ See two NRDC analyses of these problems, "Away From Reactor Storage Facilities: Our Next Nuclear Waste Blunder?," June 6, 1978, and "Nuclear Waste, Too Much Too Soon," June 1, 1978.

Spent Fuel Storage Area for Lifetime Reactor Requirements (based on Morris, Illinois, figures) */

Conversion factors:

1 gal = 231 in^3

1 ft^3 = 1728 in^3

1 gal = 0.13368 ft^3

1 acre = 43,560 ft^2

Morris data:

700 tons fuel

675,000 gal = 90,234 ft^3 of water in the pool

Pool depth = 28.5 ft

Area = $\frac{90,234}{28.5}$ = 3166 ft^2 or 56' x 56'

If spent fuel capacity = 1200 tons fuel (lifetime reactor requirement)

$\frac{1200}{700}$ x 3166 ft^2 = 5428 ft^2 or 73' x 73'

$\frac{5428}{43,560}$ = 0.125 acres

*/ Data based on informal document entitled "Activities at Morris Operation," prepared by E. E. Vipland of General Electric Company, attached to NRC Site Visit Report dated November 28, 1977, NRC Docket No. 70-1308.

Acreage at Operating Reactor Sites

There are presently 68 commercial power reactors licensed to operate in the United States. Sixty-seven of these units are actually in operation.[1/] These generating stations are located at 48 separate sites, which vary greatly in size, ranging from 4,738 acres for the Crystal River facility, to a mere 83.63 acres for San Onofre Unit 1 on the Camp Pendleton Marine Reservation in California. Data on site acreage for 53 reactors at 38 separate locations was obtained from either Preliminary Safety Analysis Reports or the Environmental Reports on file with the NRC. Data was not available for 12 reactors at 8 sites, and material available for 3 reactors at the remaining 2 sites did not specify acreage in site descriptions.[2/] The data obtained from the NRC is set forth in Table I, supplying the names of the 68 reactors, the acreage of the sites on which they are situated, and the names of the companies which own these sites. Taken together, these 38 sites comprise a total of 38,369 acres, averaging 1,010 acres per site.

Each utility listed is assumed to have legal title to the acreage listed, unless specified otherwise. The PSARs and ERs examined varied in the extent of their discussion of site ownership. Most stated that the applicant owned/controlled the reactor site. Others did not. In one instance, joint ownership is described in detail.[3/] In the case of Brown's Ferry, the 840-acre site is owned by the federal government, but is in the custody of the Tennessee Valley Authority.

The information on the various uses to which different parts of the site are put also varies significantly. Most site descriptions list a general acreage figure without further breakdown. Some, however, are quite specific, such as the description supplied for the Edwin I Hatch Nuclear Plant, Unit 1, set forth below:

Plant area	23
Cooling tower area	25
Substation	18
Construction area	18
Railroad yard	22
Visitors center	4
Access road	4
Spoil and borrow area	87
Total acreage	201

An interesting aspect is that from the small amount of evidence available, it appears that acreage requirements for nuclear-related facilities are quite small. Reactors themselves probably require less than 10 acres, as the 7.5 figure for Beaver Valley indicates.[4/] Acreage requirements are dependent to a certain extent upon design parameters, such as whether or not a facility has a once-through or tower cooling system, but the site acreage for San Onofre suggests that as few as 83.61 acres can be required. Even the figure of 201 acres presented above is quite small, being only 8.9% of the 2,244 acre site on which it it situated, and only 20% of the 1,010 acre average for the sites examined. NRC estimates that the land requirement for facilities directly related to the operation of the reactor itself is well under 100 acres and probably less than 50, but the average of land utilized as set forth in the summary

and conclusions of the environmental impact statements issued by the NRC is 100 - 150. This average, however, includes facilities such as parking lots and visitors centers. NRC also indicates that most utilities purchase enough land for a 200-foot radius around the reactor for an exclusion zone, which would be approximately 288 acres.

Table I

Nuclear Station/Operator	Acreage
Arkansas Nuclear One, Unit 2 Arkansas Power & Light Co.	1,164
Beaver Valley Power Station Duquesne Light Co.	449
Big Rock Point Reactor Consumers Power Co.	NA
Brown's Ferry Nuclear Plant, Units 1, 2 and 3 Tennessee Valley Authority	840
Brunswick Steam Electric Plant, Units 1 and 2 Carolina Power & Light Co.	NA
Calvert Cliffs Nuclear Power Plant, Units 1 and 2 Baltimore Gas & Electric Co.	1,135
Donald C. Cook Nuclear Power Plant, Units 1 and 2 Indiana-Michigan Electric Co.	650
Cooper Nuclear Station Nebraska Public Power District	1,090
Crystal River Nuclear Station, Unit 3 Florida Power Corporation	4,738
Davis-Besse Nuclear Power Station Toledo Edison Co. and Cleveland Illuminating Co.	950
Dresden Nuclear Power Station, Units 1, 2 and 3 Commonwealth Edison Co.	953
Duane Arnold Energy Center Iowa Electric Light & Power	500
Joseph M. Farley Nuclear Station, Unit 1 Alabama Power Co.	1,350
James A. Fitzpatrick Nuclear Power Plant Power Authority of the State of New York	702
Fort Calhoun Station Omaha Public Power District	382
Fort St. Vrain Reactor Public Service Co.	2,238

Robert Emmet Ginna Nuclear Power Plant Rochester Gas & Electric	336
Haddam Neck Plant, Unit 1, or the Connecticut Yankee Nuclear Power Plant Connecticut Yankee Atomic Power Co.	525
Edwin I. Hatch Nuclear Plant, Unit 1 Georgia Power Co.	2,244
Humboldt Bay Power Plant Pacific Gas & Electric Co.	142.9
Indian Point Nuclear Generating Station, Units 1, 2 and 3 Consolidated Edison Co.	239
Kewaunee Nuclear Power Plant Wisconsin Public Service Corp.	900
Lacrosse Boiling Water Reactor Dairyland Power Cooperative	NA
Maine Yankee Atomic Power Station Maine Yankee Atomic Power Co.	740
Millstone Point Power Reactor, Units 1 and 2 Northeast Nuclear Energy Co.	500
Monticello Nuclear Generating Plant, Unit 1 Northern States Power Co.	1,325
Nine Mile Point Nuclear Station, Unit 1 Niagra Mohawk Power Corp.	900
North Anna Nuclear Station, Unit 1 Virginia Electric & Power Co.	1,075
Oconee Nuclear Station, Units 1, 2 and 3 Duke Power Co.	2,000
Oyster Creek Nuclear Power Plant Public Service Gas & Electric Co.	800
Palisades Plant Consumers Power Co.	487
Peach Bottom Atomic Power Station, Units 1 and 2 Philadelphia Electric Co.	600
Pilgrim Nuclear Power Station Boston Edison Co.	517

Point Beach Nuclear Plant, Units 1 and 2 Wisconsin-Michigan Power Co.	NA
Prairie Island Nuclear Generating Station, Units 1 and 2 Northern States Power Co.	NA
Quad Cities Station, Units 1 and 2 Iowa-Illinois Gas & Electric Co.	560
Rancho Seco Nuclear Generating Station, Unit 1 Sacramento Municipal Utilities District	2,480
H. B. Robinson, Unit 2 Carolina Power & Light Co.	NA
Salem Nuclear Generating Station, Unit 1 Long Island Lighting Co.	NA
San Onofre Nuclear Generating Station, Unit 1 Southern California Edison Co.	83.63
St. Lucie, Unit 1 Florida Power & Light Co.	1,132
Surrey Power Station, Units 1 and 2 Virginia Electric & Power Co.	840
Three-Mile Island Nuclear Station, Units 1 and 2 Metropolitan Edison Co.	NA
Trojan Nuclear Plant Portland General Electric Co.	623
Turkey Point, Units 3 and 4 Florida Power & Light Co.	1,524
Vermont Yankee Nuclear Power Station Vermont Yankee Nuclear Power Corp.	125
Yankee Rowe, Unit 1 Yankee Atomic Power Co.	NA
Zion Station Nuclear Power Plant, Units 1 and 2 Commonwealth Edison Co.	NA

Footnotes

1/ The Indian Point Nuclear Generating Station, Unit 1, is described as not being in commercial operation, but not yet decommissioned.

2/ The three units for which information was available but which did not specify site acreage were the Lacrosse BWR and the Brunswick Steam Electric Plant, Units 1 and 2. Files are not available on the following units: Big Rock Point, Point Beach Units 1 and 2, Prairie Island Units 1 and 2, Robinson Unit 2, Salem, Three-Mile Island Units 1 and 2, Yankee Rowe Unit 1, and Zion Station Units 1 and 2. These files are temporarily unavailable.

3/ The 449-acre site for the Beaver Valley Station is almost entirely owned by Duquesne Light Co., which controls 441.5 acres. The remaining 7.5 acres on which the reactor itself is located are owned jointly by Duquesne, Ohio Edison and Pennsylvania Power Co. The only other instances of joint ownership discovered occurred at the Kewaunee facility where 1.13 of the 900 acres are owned by the town of Carlton, Wisconsin, the remainder being under the control of the Wisconsin Public Service Corp. Joint ownership is certainly of far greater significance in the instance of Beaver Valley than Kewaunee. Other situations such as these may well exist, but the lack of detail in the PSARs and ERs make this difficult to determine.

4/ See footnote 3.

UNITED STATES OF AMERICA
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DUKE POWER COMPANY	)	Docket No. 70-2623
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(Amendment to Operating License SNM-1773 for Oconee Spent Fuel Transportation and Storage at McGuire Nuclear Station)	)	

AFFIDAVIT OF THOMAS B. COCHRAN, PH.D.

City of Washington)
) ss:
District of Columbia)

I, Thomas B. Cochran, Ph.D., hereby depose and say:

I have examined the NRDC Motion for Summary Disposition with Respect to NRDC Contention #4. The facts contained therein are true and correct to the best of my personal knowledge.

I have examined the following documents to determine the adequacy of the NRC Staff and the Applicant's efforts to meet the "as low as reasonably achievable" (ALARA) requirement as it pertains to consideration of alternative means of managing Oconee spent reactor fuel.

a. March 9, 1978 - Letter to Dr. Clifford V. Smith, Director, Nuclear Material Safety and Safeguards, NRC, from William O. Parker, Jr., Duke Power Co., re: Special Nuclear Material License Number SNM-1773 - Application for License to Store Oconee Nuclear Station Fuel at McGuire Nuclear Station; and attached Information Supporting Storage of Oconee Spent Fuel at McGuire.

b. Environmental Impact Appraisal related to Spent Fuel Storage of Oconee Spent Fuel at McGuire - December 1978.

c. February 2, 1979, letter to Harold R. Denton, Director, Nuclear Reactor Regulation, NRC, from William O. Parker, Jr., Duke Power Co., re: Oconee Nuclear Station Docket Nos. 50-269, 270, and attached Proposed Technical Specification Revision.

d. Applicant's Answer to NRDC Interrogatories to Applicant, March 27, 1979.

e. Applicant's Response to NRDC Request for Admissions, April 17, 1979.

f. NRC Staff Response to NRDC Request to Applicant and Staff for Admissions, April 17, 1979 (with new page 6); and NRC Staff Response to NRDC Request to Applicant and Staff for Admissions 9-12, April 18, 1979.

I will comment briefly on each of these:

a. Application by Duke Power Company to transship and store Oconee spent fuel at McGuire

The attachment, "Information Supporting Storage of Oconee Spent Fuel at McGuire," March 9, 1973, contains a discussion of ALARA at p. 9-1. The essence of this discussion is that (p. 9-1):

> Operational ALARA policy statements are formulated at the corporate staff level in the Steam Production Department through the issuance of the System Health Physics Manual and are implemented at each nuclear plant by means of procedures. These statements and procedures are consistent with the intent of Section C.4 of Regulatory Guides 8.8 and 8.10. Personnel and job exposure trends are reviewed by management at the

> plant and in the general office, and appropriate action is taken as necessary. Summary reports of occupation exposure are provided that: (a) describe problem areas where high radiation doses are encountered; (b) identify which work group is accumulating the highest doses; and (c) make recommendations for changes in operating maintenance, and inspection procedures or (d) make recommendations for modifications to the plant as appropriate to reduce doses.

There is obviously nothing in the policy statements or Regulatory Guides 8.8 and 8.10 in the way of comparative assessments of alternative fuel management schemes, e.g., reracking by reducing the spacing, use of poisoned racks, pin packing, use of other reactor pools, to insure that ALARA is met. The discussion here focusses instead on how the management insures that good health physics practices are implemented.

b. Environmental Impact Appraisal, December 1978

This report considers only two methods for expanding the spent fuel storage capacity of Oconee: physical expansion of the pool and reracking with closer spacing. There is no comparative analysis of the costs, including health risks from radiation exposure, of the various fuel management alternatives, only a brief statement that (p. 53):

> The applicant has estimated that the cost of reracking of the spent fuel pool serving Unit 1 and 2 will be $6,000 per fuel assumbly and the radiation dose to the work force to be 150 man-rem.

To insure that ALARA is met, at a minimum one would have to identify the full costs -- economic and social (health risks) -- of each alternative and compare these, with due consideration

given to the sensitivity of the results to uncertainties in the input parameters and assumptions. This is not done in this document.

c. Proposed Technical Specification Revision, February 2, 1979

Attachment 2, "Units 1 and 2 Information in Support of Spent Fuel Pool Modification," contains a Radiological Evaluation of Anticipated Exposures During Re-Racking. Personnel dose rates are given along with one cumulative dose commitment associated with reracking (p. 5-4 and Table 5.2-1), but no comparative analysis with alternative fuel management approaches is given as would be needed if ALARA considerations were properly addressed.

d. Applicant's Answer to NRDC Interrogatories, March 27, 1979.

The response to Interrogatory 10 contains a discussion of the feasibility of expanding the spent fuel storage capacity at Oconee Units 1, 2 and 3. However, there is no reference to ALARA considerations given here.

On page 9 there is reference to neutron absorbing (poison) racks, followed by the statement:

> This type of reracking could not be used at Oconee 3 at this time due to the fact that it is essentially full of spent fuel and would not allow underwater divers room to operate in safety. The neutron absorbing racks were decided against in this latest proposed reracking of the Oconee 1 and 2 pool due to scheduling problems. Duke, in talking with rack manufacturers, discovered that poison racks would require two to five months longer lead times.

> Poison rack usage for the McGuire 1 pool has not been planned because transshipment is considered the best means for handling the spent fuel until either reprocessing and/or government waste storage facilities are made available. McGuire Unit 2's racks have not yet been installed. Additional storage capacity at this pool is under consideration.

There is no comparative analysis referred to here that demonstrates that ALARA was met. At Oconee 1 and 2, for example, there is only the reference to "scheduling problems."

e. Applicant's Response to NRDC Request for Admissions, April 17, 1979.

There is nothing in the way of a detailed comparison of total costs (direct economic and health effects) as would be required for an ALARA determination relative to the spent fuel management alternatives in the Applicant's response, nor is there any reference to such a detailed comparison.

f. NRC Staff Responses to NRDC Request for Admissions, April 17 and 18, 1979.

The Staff in response to NRDC's request for admission 5 addresses the direct economic costs (capital expenditures) of expanding existing spent fuel capacity at Oconee or building new capacity compared to shipping spent fuel from Oconee to McGuire. Without addressing the accuracy of the results reported here, I simply note that there is no consideration given to the social costs (health risks) and the results reported (comparisons of the capital expenditures) are not supported by

any detailed calculations. Such a detailed comparison of the total costs (capital expenditures and health effects) of the spent fuel management alternatives identified in the Motion for Summary Disposition filed herewith would have to be made. Furthermore, consideration would have to be given to the fact that it would be less expensive to modify the McGuire spent fuel pool prior to October 1980 (Staff's Admission 6). Also, with respect to the health effects, the type of specific calculations of total worker exposure comparing the alternative sequences which the Staff admits haven't been done (Admission 7) would have to be done before ALARA could be determined with respect to alternative spent fuel management schemes.

The Staff's response to Admission 8 addresses worker exposure during handling operations and during loading and unloading but fails to consider exposure during transportation, a consideration which would be necessary in an ALARA determination with respect to the alternative spent fuel management schemes.

In summary, in all of the above documents, there is nothing approaching what would be required for a considered ALARA determination relative to the spent fuel management alternatives identified in the NRDC Motion for Summary Disposition With Respect to NRDC Contention #4.

All facts contained in the above statement are true and correct to the best of my knowledge.

Thomas B. Cochran, Ph.D.

Signed and sworn to before me
a 1st day of May 1979.

Notary Public

My Commission Expires September 30, 1982