UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of Commonwealth Edison Company (Dresden Station, Units 2 and 3)	)))	Docket Nos. 50-237 50-249

TESTIMONY OF
DON ADAM

Contention 1: Radioactive Waste Treatment System for Spent Fuel Pools

Contention 4: Radiation Monitoring of Spent Fuel Pool

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A. Introduction

1. My name is Don A. Adam. I am employed by Commonwealth Edison Company, Dresden Nuclear Power Station, R.R. #1, Morris, Illinois 60450. I am a 1970 graduate of Northern Illinois University and hold a Bachelor of Science degree in Biological Sciences. From August, 1970 to July, 1974, I held the position of Engineer in the Radiation Protection and Chemistry Department at Dresden. In that position, I had responsibilities in supervision of technicians in both day-to-day Radiation Protection and Chemistry activities. From July, 1974 through November, 1978, I served as Rad-Chem Supervisor at Dresden. In this position, I was responsible for supervising all Health Physics and Chemistry activities at Dresden. Since November, 1978, I have held the position of Waste Systems Engineer at Dresden Station. In this position, I am responsible for the operation of liquid and solid radioactive waste treatment systems.

2. As a result of my experience at Dresden Station, I am personally familiar with the operation of radioactive waste processing systems, Health Physics, and Chemistry activities at the station.

3. Accordingly, I have personal knowledge of the facts relating to Intervenor's Contentions 1 and 4.

B. Contention 1: Radioactive Waste Treatment for Spent Fuel Pools

4. Intervenor's Contention 1 reads:

> The application gives no assurance that the radioactive waste treatment system for the spent fuel pools is adequate for the proposed increase in spent fuel storage capacity.

5. My testimony describes the operation of equipment used in treating spent fuel pool water and the resulting effects on this equipment of storing additional fuel in the pool.

6. The treatment of radioactive waste (radwaste) from the spent fuel pools involves two systems:

a. the Fuel Pool Cooling and Cleanup System, and

b. the plant Radioactive Waste Disposal System.

7. Both Units 2 and 3 have an independent Fuel Pool Cooling & Cleanup Systems. During normal operations, water is pumped in a closed loop from the skimmer surge tanks, adjacent to the pool, through a heat exchanger, then through a filter and a demineralizer, and back to the pool (see Figure 1). Both filter and demineralizer are used in series to remove radioactive and non-radioactive contaminants from the pool water. Additionally, the filter and demineralizer from one unit can be cross-tied to the other unit. This provides redundancy of operation.

8. The filter is called a pre-coat filter because of its method of operation: it is made up of a tube sheet

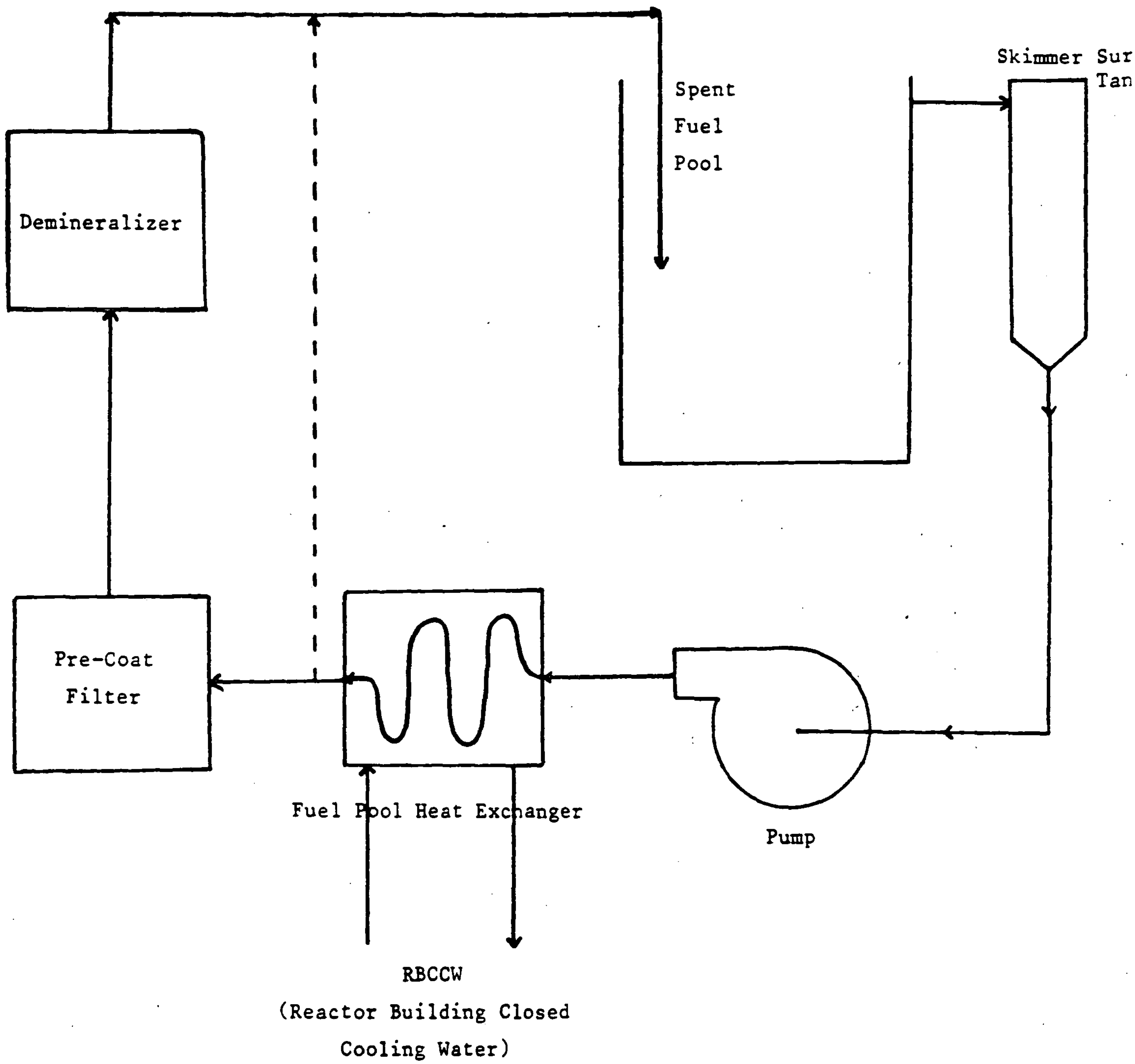

Figure 1: Simplified Flowpath for Fuel Pool Cooling and Cleanup System in a Normal Operation

with support grids at either end, each element consisting of a perforated core tube wrapped with stainless steel wire. A slurry of clay-like filter-aid material is circulated through the filter to form a cake on each element. The particles form a microscopically-fine sieve to remove particles as small as 25 microns in diameter. The filter has a design flow of 800 gpm. As pool water passes through the filter, particulate matter is removed from the water and collected on the filter-aid material. As the particulate matter builds up, the differential pressure across the filter increases. The differential pressure is monitored and recorded in the radwaste control room, and at 30 psid, a high differential pressure alarm will annunciate in the main control room. The filter is then bypassed, backwashed to remove the used filter-aid, then recoated with new filter-aid material.

9. Operating experience has shown that the filter rarely reaches the high differential pressure reading. Normally, other circumstances initiate filter replacement. Because of the filter design, if flow through the filter is lost, the filter-aid material tends to fall off of the filter elements. Loss of flow may occur due to tripping of the fuel pool clean-up system pump because of loss of suction, pump failure, or electrical switching. Filter changes require between 1 and 2 hours for filter replacement. Data compiled from prior years (see Attachment 1) does not indicate that filter change frequency has increased with increased spent fuel storage.

10. The fuel pool demineralizer is used to remove soluble contaminants from the water by ion exchange. The demineralizer is a sealed tank, with internal support plate and screens to hold 180 cubic feet of mixed anion and cation resin beads. The resin absorbs both anion and cation contaminants as the water flows through the demineralizer. The design flow rate is 700 gpm.

11. Over time, the ion exchange capability of the resin is slowly depleted. The demineralizer is then bypassed, the depleted resin sluiced to the spent resin tank, and new or regenerated resin from the condensate demineralizer system is transferred to the fuel pool demineralizer. The condensate demineralizer system provides a large bank of 14 tanks from which resin can be transferred when needed. Additional supplies of resin are maintained on-site.

12. There are a number of parameters which indicate the depletion of the demineralizer resin ion exchange capability. These include:

a. High differential pressure across the demineralizer which annunciates in the main control room.

b. High demineralizer outlet conductivity with read-out in the radwaste control room and annunciation in the main control room.

c. Routine weekly sampling of demineralizer inlet and outlet water and laboratory analysis for conductivity, pH, turbidity, chlorides, silica, and gross beta-gamma radioactivity concentration.

Operations and chemistry personnel monitor these parameters and use this data to determine if demineralizer resin replacement is warranted. Acceptable ranges for these parameters are shown below in Table 1.

Table 1: Test Ranges for Fuel Pool Demin Inlet & Outlet

	Acceptable Range	Typical Results[1]
pH	5.6 - 8.6	6 - 7.5
Conductivity	<5 umho	1 umho
Turbidity	No spec.	<5% absorbance
Chlorides	<.1 ppm	.02 ppm
Silica	<.5 ppm	.3 - .4 ppm
gross -	No spec.	10^4 - 10^6 pCi/l for D2
		10^5 - 10^7 pCi/l for D3

1 - Typical results from chemistry records for Units 2 and 3 spent fuel pool water; August - September, 1980.

13. An indication of the capability of the demineralizer is the frequency at which the resin must be replaced. Operating experience has shown that this frequency has remained at between 1 and 2 per year, even though the

number of spent fuel assemblies stored in the pools has increased.

14. Over the last 10 years, while spent fuel storage has increased, the gross radioactivity concentration in the pools has remained fairly constant. There is very little radionuclide leakage from spent fuel after it has been stored for several months and has cooled. The major contaminant loading on the fuel pool clean-up system comes during refueling outages. During refueling, the reactor cavity is flooded, and gates opened to the spent fuel pool to allow fuel movement in and out of the reactor vessel. At this time, fuel pool water is allowed to mix with reactor coolant and increased radioactivity concentrations in pool water are noted. The fuel pool clean-up system adequately handles these increases. It will be adequate for the increased fuel storage because the additional demand placed on it will be negligible.

15. The used filter-aid material discharged from the pre-coat filter, and the spent demineralizer resin, are processed by the plant Radioactive Waste Disposal System. Since there will be little or no increase in the demand on the fuel pool cooling and clean-up system, no additional demands will be passed on to the Radwaste Waste Disposal System. Any increase in the frequency of changing the filter-aid materials and resins in the fuel pool clean-up

system would have a minimal effect on the Radwaste System, since the fuel pool clean-up system supplies only a small part of the total radwaste that it must process. The Radioactive Waste Disposal System is therefore adequate for the increased fuel storage.

C. Contention 4: Radiation Monitoring of Spent Fuel Pool

16. Intervenor's Contention 4 reads:

> Applicant has not provided adequate monitoring equipment in the spent fuel pool water to detect abnormal releases of radioactive materials from the increased numbers of spent fuel bundles. Absence of such monitoring and alarms could result in undue exposure to workers in excess of ALARA, specifically:
>
> a. There is no description of monitoring devices, and therefore, no assurance exists that workers in each pool area will have adequate warning of possible hazardous conditions.
>
> b. The Applicant should demonstrate that the radiation monitoring equipment has adequate range and sensitivity to indicate accurately the rates and magnitudes of radiation releases that could occur in the reracked pools.

17. My testimony describes the monitoring equipment that will warn workers of increased radiation levels in the vicinity of the fuel storage pools.

18. The moderate conditions in the fuel pools, unlike the severe conditions in an operating reactor, are not conducive to fuel cladding failure. Thus, abnormal releases of radioactive material from the fuel into the pool water are not anticipated.

19. The design basis accident for the spent fuel pools is the rupture of all the fuel pins in the equivalent of a single fuel assembly, and the subsequent release of the radioactive inventory within the gap of each fuel pin. The fuel is protected from accidental damage by seismically designing the racks and by procedures and crane interlocks to prevent the dropping of heavy objects onto the fuel.

20. The overhead crane has a restricted mode of operation which is used for casks or objects defined by the operating engineer as restricted loads. During the restricted mode, electrical interlocks prevent overhead crane movement over fuel storage locations, the reactor cavities, and the dryer/separator pits. A fail-safe radiation monitor on the bottom of the crane protects personnel from inadvertent withdrawal of dangerously radioactive objects from the pool by disabling the crane on a high-rad alarm. A copy of procedure DFP 800-20 governing operation of the overhead crane is included as Attachment 2.

21. When the restricted mode on the overhead crane is bypassed during installation of the new high density spent fuel racks, transport of new or old racks over stored fuel will be procedurally prohibited.

22. The two fuel grapples used for rearranging fuel in the spent fuel pools and moving fuel between the

reactors and fuel pools cannot lift an assembly more than about 1 foot over the top of the stored fuel. At this point, the telescoping arm is fully retracted.

23. However, in the event of a sudden release of radioactive material into the pool water, a number of radiation monitoring systems would warn workers of any significant increase in radiation levels. These include:

a. Area Radiation Monitors,

b. Continuous Air Monitors, and

c. Reactor Building Ventilation System Monitors.

Ten separate area radiation monitors are located throughout the refueling floor which houses the spent fuel pools. The detectors for these monitors are of the Geiger-Mueller type. Their location, range, current trip setting, and alarm and meter readout locations are listed in Table 2. Since normal readings on these monitors range between 1 and 5 mr/hr., this extensive monitoring and alarm system would quickly and adequately warn workers of any increase in direct radiation levels. Also, these monitors would respond to increases in gaseous radioactive contaminants released from the pool water.

24. A portable Continous Air Monitor (CAM) is always located on the refueling floor. It contains a scintilation type detector (range 50 to 50,000 cpm), local meter,

TABLE 2: REFUELING FLOOR AREA RADIATION MONITORS

	LOCATION	RANGE	TRIP POINT	ALARM
1. Unit 2 Refueling Floor Low Range	Unit 2 North Wall	0.1 - 10^3 MR/hr.	8 MR/hr.	Local & Control Room Meter & Alarm
2. Unit 3 Refueling Floor Low Range	Unit 3 North Wall	0.1 - 10^3 MR/hr.	8 MR/hr.	Local & Control Room Meter & Alarm
3. Unit 2 Refuel Floor High Range	Unit 2 North Wall	10 - 10^6 MR/hr.	100 MR/hr.	Control Room Read Out & Alarm
4. Unit 3 Refuel Floor High Range	Unit 3 North Wall	10 - 10^6 MR/hr.	100 MR/hr.	Control Room Read Out & Alarm
5. Unit 2 Refuel Floor Equipment Hatch	Unit 2 South Wall	.01 - 10^2 MR/hr.	10 MR/hr.	Local & Control Room Meter & Alarm
6. Unit 3 Refuel Floor Equipment Hatch	Unit 3 South Wall	.01 - 10^2 MR/hr.	10 MR/hr.	Local & Control Room Meter & Alarm
7. Unit 2 Fuel Pool (A)	Unit 2 Southeast Overlooking Pool	1 - 10^6 MR/hr.	95 MR/hr.	Control Room Meter & Alarm
8. Unit 2 Fuel Pool (B)	Unit 2 Northeast Overlooking Pool	1 - 10^6 MR/hr.	95 MR/hr.	Control Room Meter & Alarm
9. Unit 3 Fuel Pool (A)	Unit 3 Southwest Overlooking Pool	1 - 10^6 MR/hr.	95 MR/hr.	Control Room Meter & Alarm
10. Unit 3 Fuel Pool (B)	Unit 3 Northwest Overlooking Pool	1 - 10^6 MR/hr.	95 MR/hr.	Control Room Meter & Alarm

recorder, and alarm. As the name implies, it draws a continuous air sample from the refueling floor and if airborne particulate or gaseous radioactivity concentrations increase to a present level, the local alarm would sound, warning workers of higher than normal airborne radioactivity levels. In addition, the monitor is used to collect both particulate and iodine samples which are removed to a counting room for daily analysis. During refueling outages, additional CAM's may be placed on the refueling floor as recommended by the Rad-Chem Department.

25. The Reactor Building Ventilation Monitoring System utilizes four of the previously noted area radiation monitors (those overlooking the fuel pools described in Table 2) and four additional monitors; two located in each of the Units 2 and 3 reactor building ventilation ductworks. Its purpose is to prevent abnormal releases into the environment by switching the ventilation exhaust to the Standby Gas Treatment System on alarms by either the area or ventilation duct monitors. The vent duct monitors have a range of .01-100 mr/hr., an alarm point of 10 mr/hr., and annunciate in the main control room. These monitors also notify control room personnel of increased radiation in the fuel pool area.

26. The area radiation monitors are calibrated every six months, with the exception of the four area monitors

utilized by the Standby Gas Treatment System, which, along with the four vent duct monitors, are calibrated quarterly and functionally tested monthly. The CAM on the refueling floor is calibrated for air flow quarterly; filters are removed and counted in the lab daily.

27. I believe these monitoring systems have adequate range, sensitivity, and alarm functions to warn workers in the event of abnormal releases of radioactive materials into the pool water. A copy of applicable station emergency procedures is included as Attachment 3.

ATTACHMENT 1

I. Number of Assemblies Stored in Fuel Pools

	SHUTDOWN	DATE	# ASSEMBLIES DISCHARGED	# ASSEMBLIES SHIPPED	TOTAL ASSEMBLIES IN POOL
D2:	EOC 1	6-05-70	29		29
	EOC 1A	2-26-71	215		244
	EOC 2	2-19-72	509		753
	EOC 3	11-02-74	156		909
		9-05-75 to 9-17-75		64	845
	EOC 4	3-14-76	160		1005
		6-09-76 to 3-31-77		689	316
	EOC 5	9-10-77	192		508
	EOC 6	3-17-79	160		668
D3:	EOC 1	3-05-73	52		52
	EOC 2	3-12-74	44		96
	EOC 3	4-16-75	140		236
	EOC 4	9-19-76	148		384
	EOC 5	3-05-78	176		560
	EOC 6	2-02-80	200		760

II. Dates That Fuel Pool Filters Were Changed Out

This data was taken from the microfilm records of the Radwaste Foremen's Log. Dates are approximate for each filter-aid change, since the backwashing, pre-coating, and return to service did not always occur on the same day.

Data was retrieved and compiled for two time periods, in between which the fuel storage had changed markedly, so that the effect of an increase in fuel storage on the frequency of filter-aid change might be noted.

7-24-74 to 8-25-75:

D2	
DATE OF BW/PC	# ASSEMBLIES IN POOL
10-08-74	753
11-12-74	909
11-30-74	"
12-11-74	"
1-12-75	"
2-26-75	"
5-16-75	"
5-24-75	"
7-03-75	"
Total = 9 Times	

D3	
DATE OF BW/PC	# ASSEMBLIES IN POOL
1-03-75	96
1-23-75	"
2-23-75	"
3-25-75	"
3-31-75	"
4-14-75	"
5-15-75	236
5-27-75	"
6-05-75	"
8-25-75	"
Total =10 Times	

7-17-77 to 8-31-78:

D2	
7-20-77	316
9-16-77	508
9-18-77	"
9-26-77	"
9-27-77	"
10-25-77	"
12-08-77	"
12-09-77	"
7-27-78	"
8-28-78	"
Total =10 Times	

D3	
9-27-77	384
10-25-77	"
12-21-77	"
3-24-78	560
4-05-78	"
4-13-78	"
4-15-78	"
4-25-78	"
5-17-78	"
Total = 9 Times	