UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CONSUMERS POWER COMPANY	)	Docket Nos. 50-155
	)	
(Big Rock Point Plant)	)	(Spent Fuel Pool Modification)

TESTIMONY OF SEYMOUR BLOCK CONCERNING CHRISTA-MARIA CONTENTION NUMBER 2 AND O'NEILL CONTENTION NUMBER II.A

Q.1 Please state your name and your position with the Nuclear Regulatory Commission.

A.1 My name is Seymour Block. I am employed as a Senior Health Physicist, Division of Systems Integration, Office of Nuclear Reactor Regulation.

Q.2 Have you prepared a statement of professional qualifications?

A.2 I have prepared the statement of professional qualifications attached to this testimony.

Q.3 Describe your responsibilities as they pertain to this proceeding.

A.3 I am responsible for the review of inplant occupational exposure during the pool modification to ensure that the exposures will be kept ALARA.

Q.4 What is the scope of your testimony?

A.4 My testimony addresses the issues of fact identified by the Licensing Board in its February 19, 1982 Memorandum and Order (pp. 32-33) which concern Christa-Maria Contention Number 2 and O'Neill Contention Number II.A.

Q.5 Please respond in order to the Licensing Board's Questions pertaining to the issues of fact.

A.5 (a) What caused the discrepancy between staff and applicant statements about the relevant dimensions of the south wall of the spent fuel pool and what effect, if any, has this discrepancy had on radiation calculations.?

Staff statements about the shield thickness of the south wall of the spent fuel pool are in error, per se, since the statements were intended to indicate the order of magnitude of the taper of the shield (i.e. from 6' to 3') without regard to radiation dosimetric calculations that might bear upon the true value of thickness. Consequently, our designation of the tapered end of the south wall shield, as being 3', is a misstatement of actual fact. The wall thickness in question is as stated by the applicant, 3.5' thick. Therefore, calculations of dose rate through the thinnest section of the south wall should be based on a 3.5' concrete shield. We have reviewed the applicants' calculations of dose rate at the south boundary using this thickness and find them to be acceptable.

(b) What is the combined radiation from the pool and filter sock tank?

In accordance with the applicant (or licensees) (i.e. Axtell) response to Christa - Marias Contention 2, there are two dose rates that the staff has noted. A theoretical maximum and probable actual dose

rate. The theoretical dose rate of 38 mrem/hr from the pool is based on NUS calculations for one year old fuel stored directly behind the thinnest section of the south wall shield where the shield thickness is 3.5 feet. The probable actual dose rate from the pool is estimated by the licensee to be 2 mr/hr based on the fact that fuel cannot be stored along the rows of the rack closest to the thinnest section of the south wall shield. This is due to the physical dimensions of the fuel bundles and the channel rack, which is presently located at the thin portion of the south shield, and into which the fuel bundles would set. The licensee states that the dimensions of the bundles and rack are incompatible and, therefore, there is no possibility of storing fuel there. Thus, the pool theoretical dose rate of 38 mrem/hr, and the probable actual dose rate of 2 mr/hr when combined with the spent fuel pool filter sock tank dose rate of from 30 to 40 mrem/hr would provide a bound of 68 to 78 mrem/hr to 32 to 42 mrem/hr respectively.

(c) What point in the south wall was used as a reference point for calculating dose estimates.?

NUS, consultants to Consumers Power Company, used the <u>surface</u> of the thinnest section of concrete shielding of the south wall, in their QAD computer code calculation, to calculate the dose rate (i.e. 38 mrem/hr) from spent fuel stored in the spent fuel pool. This point on the concrete surface is 4.1 feet from the center of the nearest fuel bundle that has decayed 1 year. Thus, the distance 4.1 feet was used as the reference point in calculating dose estimates at the site boundary by the $1/R^2$ relationship.

(d) What is the reason that applicant stated that it used "mass absorption coefficients" in radiation estimates, when it apparently used linear absorption coefficients.?

In shielding calculations, to determine the effects of a shield on the attenuation of radiation, either mass absorption coefficient (μ/ρ in cm^2/gm) or linear absorption coefficient (μ in cm^{-1}) may be used in the basic shielding equation $I=I_o e^{-\mu x}$. Absorber thickness (x in the equation) should be in units of gms/cm^2, if mass absorption coefficient is used. This is so that the expotential μx is unitless (i.e. $cm^2/gm \times gm/cm^2$). If the linear absorption coefficient is used, then x must be in units of cm (i.e., $\frac{1}{cm} \times cm$), to make the expoential unitless. The applicant did use the mass absorption coefficient (as can be noted in his memo Banburg to Sunderman dated August 24, 1981) in his equation, but it was necessary to convert it into a linear absorption coefficient since the x value used in the equation was in cm. Therefore, he multiplied the value of the mass absorption coefficient by the density of the absorber material (e.g. iron = 7.86 gms/cm^3, and air 0.001293 gms/cm^3) to effect this conversion. Note that the mass absorption coefficient (cm^2/gm) times the density $\frac{gm}{cm^3}$ yields the linear absorption coefficient $\frac{1}{cm}$ or (cm^{-1}). The staff review of the conversion shows it to be proper and accurate. The use of $\mu c t c$ in the Sunderman Affidavit (at 3) where μc is the mass absorption coefficient and tc is a linear dimension is incorrect unless modified in the calculation as stated above.

(e) What was the location and reference level to which staff applied the inverse square rule to calculate offsite dose.?

Referring to NUS report on Big Rock Point Fuel Pool Dose Calculations, page 9, which indicates the sketch of Zones and Boundaries in the QAD-SQ computer run, staff used distance from coordinate 0,0,0 to center of fuel assembly which is equal to 124 cm or about 4.1 feet. This distance and 2900 feet to the site boundary were used to determine off-site dose by inverse square rule. It should be noted that attenuation of the containment steel and 2900 feet of air and relevant build-up factors would also be factors used in the calculations to find the offsite dose.

(f) What hiring, training and supervision methods and what health physics safeguards will be used during the installation of the new fuel rack?

In a staff question to the licensee relevant to temporary workers to be used for the modification and plans for hiring and training them, the licensee responded that he expects the modification work to be performed, for the most part, by plant employees who have been trained in radiation protection. If temporary workers are hired, they will be trained to work in radiation areas in accordance to Part 19.12 "Instruction to Workers" and supervised in accordance with routine practices at Big Rock Point which has been going on for 20 years. However, it is expected that Maintenance Department personnel, who have been given detailed training in radiation protection, will complete the major portion of the SFP modification if not the entire task.

Health Physics safeguards to be used during installation of new fuel racks to keep occupational exposures ALARA include: (1) vacuuming the pool walls, floor and existing racks as needed; (2) decontaminating all areas around the pool, (3) cycling the pool water through the radwaste demineralizer to reduce the dose rate in the SFP area by lowering the radionuclide concentration; (4) provide surveillance and monitoring of the work area by health physics personnel.

(g) What has applicant done to correct alleged health physics deficiencies identified by the Institute of Nuclear Power Operations in its August 1981 reporτ?

The staff does not normally follow the status of licensees responses to INPO audits, but in this case we have questioned the licensee concerning his corrective actionş and received an informal response from Big Rock Point on some of the issues raised by INPO that could effect the SFP modification.

(1) With respect to training, a systematic basic and advanced Chemistry and Radiation Protection technician training course has been developed and implemented since the INPO audit. The course is for 12 weeks and is an on-going course which will be repeated several times in 1982. Several technicians have completed the ccurse.

(2) The Health Physics staff has been doubled since early 1980 with several new positions filled such as an ALARA Health Physicist and 6 new technicians for a total of 14 technicians. A new position in the Plant Training Department was created to handle Health Physics Training.

(3) In response to a staff question "Do all health physics technicians meet the experience requirements of ANSI 18.1," the licensee stated that hired contractor technicians are of Sr. Technician grade and are hired based on a review of detailed resumes. They all meet ANSI 18.1 requirements. New Big Rock Point employee technicians are placed "In-Training" technician position until qualified for "Technician" and finally "Sr. Chemical and Radiation Protection" technician position. This progression, takes from 3 to 5 years.

(h) To what extent will the radwaste demineralizer be employed on a continuing basis to attenuate radiation from the spent fuel pool.-

In the staffs Environmental Impact Appraisal dated May 15, 1981, Section 4.4 "Spent Fuel Pool Purification System" it is stated that the spent fuel pool purification system consists of a pool sock filter which is used on a continuing basis. However, during periods of high pool radioactivity, (i.e. when spent fuel is transferred from the reactor to the spent fuel pool) clean-up of the pool will be provided by continuous flow through the demineralizer. During this clean-up process, radiation levels in the spent fuel pool area are significantly reduced. Our conclusion in the EIA is that the spent fuel pool clean-up system as presently adopted is adequate and will keep concentration of radioactivity in the pool water to acceptably low levels when required. The licensee does not plan on a dedicated demineralizer that would provide continuous clean-up, as newer plants have, since installation of such a unit would not be cost effective because occupancy in the spent fuel pool area during normal plant operation is minimal and would not warrent the expenditure.

SEYMOUR BLOCK

PROFESSIONAL QUALIFICATIONS

RADIOLOGICAL ASSESSMENT BRANCH

DIVISION OF SYSTEMS INTEGRATION

I am employed as a member of the staff of the Radiological Assessment Branch, Division of Systems Integration, U.S. Nuclear Regulatory Commission, Washington, D.C. My duties include the determination and evaluation of the design and operation of operating nuclear power plants as well as review of Safety Analysis Reports of applicants for construction permits and operating licenses of nuclear power plants with respect to safety and environmental impact considerations including matters related to Health Physics Radiation Protection Programs.

I first became associated with the atomic energy program in 1944 when I was trained and educated as a Health Physicist at Clinton Laboratories in Oak Ridge, Tennessee, during the Manhattan Engineering Project. I later joined the Brookhaven National Laboratories as a Health Physicist responsible for radiological safety of Chemistry and Reactor operations. In 1953 I transferred to the University of California Radiation Laboratory and set up a small Health Physics program at the Livermore site. When the Livermore Hazards Control Department was formed in 1959, I was made Section Leader of the Special Projects Research and Development Group. For twelve years I engaged in Research and Development in Radiological Instrumentation and Applied Health Physics.

I am a Certified Health Physicist and former Treasurer of the Health Physics Society. I am Past President of the Northern California Chapter of the HPS and a former consultant to Physics International Corporation in San Leandro, California.

From 1938 - 1941 I attended City College in New York. I was inducted into the Army Air Force in 1942 and attended the University of Pennsylvania, Moore School of Electrical Engineering from 1943 - 1944.

I have published numerous articles in technical journals on instrumentation development and radiation dosimetry. I am a member of the Health Physics Society.