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LILCO, March 21, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	
LONG ISLAND LIGHTING COMPANY	)	Docket No. 50-322-OL-3
	)	(Emergency Planning Proceeding)
(Shoreham Nuclear Power Station, Unit 1)	)	

LILCO'S TESTIMONY ON CONTENTION 88 (DOSE CRITERIA AND COST-BENEFIT ANALYSIS FOR REENTRY)

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(Shoreham Nuclear Power Station,	)	Proceeding)
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PURPOSE

Contention 88 states that the LILCO Transition Plan is inadequate because (1) the Plan fails to provide a basis for determining that it is safe for the public to reenter previously evacuated areas, (2) the acceptable surface contamination levels are set forth in disintegrations per minute, rather than in radiation doses to the public, and (3) the Plan does not include provisions explaining how to apply cost-benefit analysis for reentry. This testimony will establish that the radiological criteria in the LILCO Transition Plan for determining whether a previously evacuated area is safe for reentry are adequate. Specifically, (1) the LILCO Transition Plan includes a table of acceptable surface contamination levels for reentry, (2) the table in the LILCO Transition Plan is taken

directly from Table 1 of Regulatory Guide 1.86, and (3) the levels in Table 1 of Regulatory Guide 1.86 are representative of the levels for reentry used throughout the nuclear industry. This testimony will also establish that provisions in the LILCO Transition Plan for cost-benefit analysis of reentry do not apply to reentry by the general public into a previously evacuated area, are not relevant to public health and safety, and are not required by the regulations or NUREG-0654 guidelines.

Attachments

Attachment 1	OPIP 3.10.1, Attachment 1
Attachment 2	Regulatory Guide 1.86, Table 1
Attachments 3-7	Acceptable surface contamination levels for reentry from other emergency response plans
Attachment 8	Draft ANSI 13.12

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LILCO'S TESTIMONY ON CONTENTION 88 (DOSE CRITERIA AND COST-BENEFIT ANALYSIS FOR REENTRY)

1. Q. Please state your names and business addresses.

A. [Cordaro] My name is Matthew C. Cordaro and my business address is Long Island Lighting Company, 175 East Old Country Road, Hicksville, New York, 11801.

[Daverio] My name is Charles A. Daverio and my business address is Long Island Lighting Company, 100 East Old Country Road, Hicksville, New York, 11801.

[Miele] My name is Michael L. Miele and my business address is Long Island Lighting Company, Shoreham Nuclear Power Station, North Country Road, Wading River, New York, 11792.

[Watts] My name is Richard J. Watts and my business address is Impell Corporation, 225 Broad Hollow Road, Melville, New York, 11747.

2. Q. Please summarize your professional qualifications and your role in emergency planning for the Shoreham Nuclear Power Station.

A. [Cordaro] I am Vice President of Engineering for LILCO and have held this position since the spring of 1978. My professional qualifications are being offered into evidence as part of the document entitled "Professional Qualifications of LILCO Witnesses." I am sitting on this panel to provide the LILCO management perspective on emergency planning and to answer any questions pertinent to management. My role in emergency planning for Shoreham is to ensure that the needs and requirements of emergency planning are being met and that the technical direction and content of emergency planning are being conveyed to corporate management.

[Daverio] I am employed by LILCO as Assistant Manager of LILCO's Local Emergency Response Implementing Organization (LERIO). My professional qualifications are being offered into evidence as part of the document entitled "Professional

Qualifications of LILCO Witnesses." In my capacity as Assistant Manager of LERIO, I am responsible for developing and implementing the local emergency response plan for Shoreham.

[Miele] I am employed by LILCO as the Radiation Protection Section Supervisor in the Nuclear Engineering Department. My professional qualifications are being offered into evidence as part of the document entitled "Professional Qualifications of LILCO Witnesses." I am responsible for the overall management and technical direction of all onsite and offsite aspects of radiological protection for Shoreham. As such, I am familiar with the issues surrounding this contention.

[Watts] I am the Health Physics Supervisor for the Radiological Services Section-Northeast of Impell Corporation. My professional qualifications are being offered into evidence as part of the document entitled "Professional Qualifications of LILCO Witnesses." I have been retained by LILCO to serve as a Radiological Health Coordinator for LERIO. As such, I am familiar with the issues surrounding this contention.

3. Q. What is the "Preamble to Contentions 84-91"?

A. The "Preamble to Contentions 84-91" reads as follows:

> Preamble to Contentions 84-91. The LILCO Plan proposes that short-term and long-term recovery and reentry operations will be performed by LILCO personnel following a radiological emergency at Shoreham (Plan, at 3.10-1 and 3.10-2; OPIP 3.10.1). For the reasons specified in Contentions 84-91, Intervenors contend that contrary to the emergency planning standards of 10 CFR Secti n 50.47(b)(13) and NUREG 0654, Section II.M, the LILCO Plan fails to include general plans for recovery and reentry, including the development of necessary procedures and methods that are capable of being implemented.

4. Q. What is Contention 88?

A. Contention 88 reads as follows:

> Contention 88. OPIP 3.10.1 sets forth "Acceptable Surface Contamination Levels" in units of disintegrations per minute. The Plan does not include a method for converting such information into radiation doses to the public (e.g., persons-rems). The Plan also fails to state the dose criteria that will provide the basis for a determination that it is safe for the public to reenter previously evacuated areas. The Plan calls for a cost benefit analysis based on a $1,000/person-rem during temporary reentry (OPIP 3.10.1 at 5), but provides no guidance on how to analyze a situation in order to apply this criterion. Thus the Plan fails to comply with 10 CFR Section 50.47(b)(13) and NUREG-0654, Sections II.I.10, and II.M.1.

5. Q. What are the legal standards cited in Contention 88?

A. The legal standards cited in Contention 88 are the following:

> <u>10 C.F.R. § 50.47(b)(13)</u>
>
> General plans for recovery and reentry are developed.
>
> <u>NUREG-0654, II.I.10</u>
>
> Each organization shall establish means for relating the various measured parameters (e.g., contamination levels, water and air activity levels) to dose rates for key isotopes (i.e., those given in Table 3, page 18) and gross radioactivity measurements. Provisions shall be made for estimating integrated dose from the projected and actual dose rates and for comparing these estimates with the protective action guides. The detailed provisions shall be described in separate procedures.
>
> <u>NUREG-0654, II.M.I</u>
>
> Each organization, as appropriate, shall develop general plans and procedures for reentry and recovery and describe the means by which decisions to relax protective measures (e.g., allow reentry into an evacuated area) are reached. This process should consider both existing and potential conditions.

I. <u>Acceptable Surface Contamination Levels</u>

6. Q. Does the LILCO Transition Plan provide radiological criteria that will serve as a basis for a determination that it is safe for the public to reenter previously evacuated areas?

A. Yes. Included in Attachment 1 of OPIP 3.10.1 (Recovery/Reentry) is a table of "Acceptable Surface Contamination Levels." Although the table is not expressly labeled "Acceptable Surface Contamination Levels for Reentry," it is included as Attachment 1 to the recovery and reentry section of the implementing procedures of the LILCO Transition Plan and is intended to be used in determining whether surface contamination levels within a previously evacuated area are reduced sufficiently to allow for reentry. The table is appended to this testimony as Attachment 1.

7. Q. Contention 88 alleges that the "Acceptable Surface Contamination Levels" contained in OPIP 3.10.1 are inadequate because they are set forth in disintegrations per minute (dpm) rather than in millirems per hour (mR/hr). Why have you set forth the acceptable surface reentry levels in disintegrations per minute rather than in millirems per hour?

A. The acceptable surface reentry levels in OPIP 3.10.1 are set forth in disintegrations per minute primarily because (1) the only NRC standards or guidelines used to determine acceptable reentry levels are set forth in disintegrations per minute,

and (2) the NRC guidelines set forth in disintegrations per minute are representative of the ones used throughout the nuclear industry.

The NRC guidelines regarding contamination levels for reentry are found in Table 1 of NRC Regulatory Guide 1.86, which is appended to this testimony as part of Attachment 2. As can be seen from Table 1, the acceptable surface levels for reentry are set forth in disintegrations per minute. The "Acceptable Surface Contamination Levels" in OPIP 3.10.1 are taken directly from Table 1 of NRC Regulatory Guide 1.86.

The acceptable surface contamination levels in Table 1 are set forth in disintegrations per minute for different groupings of radionuclides. The specific unit, used to describe surface contamination, disintegrations per minute per 100 cm^2, refers correctly to the quantity of radioactive material present per unit area and, as such, is not dependent on the particular type of radiation detector used to measure contamination.

The levels in Table 1 of Regulatory Guide 1.86 are representative of the ones used throughout the nuclear industry. Similar tables from other

emergency plans, including emergency plans from (1) the Campbell County, Kentucky Plan (Wm. H. Zimmer Nuclear Power Station -- Ohio), (2) the Delaware State Plan (Salem Generating Station -- New Jersey), (3) the Maryland State Plan (Calvert Cliffs Nuclear Power Plant -- Maryland), (4) the New Jersey State Plan (Salem Generating Station -- New Jersey), and (5) the New Jersey State Plan (Oyster Creek Nuclear Generating Station -- New Jersey), are appended to this testimony as Attachments 3-7.

8. Q. But Regulatory Guide 1.86 has to do with "Termination of Operating Licenses for Nuclear Reactors." How does this relate to radiological levels for reentry?

A. Both involve releasing areas for unrestricted use once the area has been decontaminated or the radioactivity has decayed to less than prescribed limits. NRC Regulatory Guide 1.86 at page 1.86-2, which is appended to this testimony as part of Attachment 2, states that "[b]efore areas may be released for unrestricted use, they must have been decontaminated or the radioactivity must have decayed to less than prescribed limits (Table 1)."

Table 1 of Regulatory Guide 1.86, like Attachment 1 of OPIP 3.10.1, is labeled "Acceptable Surface Contamination Levels." The figures in Table 1 have come to be recognized in the nuclear industry as the prescribed radiological criteria for reentry. See response to question 7 above.

9. Q. Do the NRC regulations or NUREG-0654 guidelines specify acceptable radiation levels for reentry?

A. There are no NRC regulations or NUREG-0654 guidelines that address acceptable offsite radiological levels for reentry. NUREG-0654, K.6.C., however, states that "Each licensee shall provide onsite contamination control measures including: criteria for permitting return of areas and items to normal use. See Draft ANSI 13.12." The draft ANSI is appended to this testimony as Attachment 8. While this document, which applies to the release of materials for uncontrolled use, is still in draft form, it is significant that the surface radioactivity guides are set forth in disintegrations per minute and are either equal to or greater than the acceptable surface contamination levels found in Attachment 1 of OPIP 3.10.1.

II. Cost-Benefit Analysis of Reentry

10. Q. Does the LILCO Transition Plan provide for cost-benefit analysis in determining whether a previously restricted area can be released for public reentry?

A. No. The only provisions in the LILCO Transition Plan for cost-benefit analysis are found in Section 5.5 of OPIP 3.10.1. Section 5.5 of OPIP 3.10.1 does not address reentry of a previously evacuated area by the general public. Rather, it addresses the situation in which it is necessary for an individual to reenter an evacuated zone temporarily to deal with a "pressing matter," such as the need to turn utilities off or on or to attend to livestock. The person reentering the evacuated area would be, in effect, acting as an emergency worker.

11. Q. Do either the NRC regulations or NUREG-0654 guidelines cited in Contention 88 require estimation of the cost of reentry?

A. No. The cited NRC regulations and NUREG-0654 guidelines do not mention anything about the costs of reentry. Moreover, we do not believe that

provisions about possible costs of reentry need be included in an emergency plan.

12. Q. Why do you believe that possible costs of reentry need not be included in an emergency plan?

A. As emergency planners, we are familiar with NRC licensing standards, and we take into account emergency plans for other nuclear facilities and guidance from NRC licensing boards. In the licensing proceeding for the Diablo Canyon Nuclear Power Plant, Units 1 and 2, In re Pacific Gas and Electric Company, LBP-82-70, 16 NRC 756, 788 (1982), the intervenors objected that neither the applicant nor the State had estimated or provided for possible costs of reentry and recovery in their emergency plans. The licensing board stated that "[n]o such estimates or provisions are required in either NRC regulations or NUREG-0654. No such requirement should be imposed since such cost estimates would not be relevant to public health and safety." Moreover, we note again that the provisions in OPIP 3.10.1 relating to cost-benefit analysis do not apply to reentry by the general public of a previously evacuated area. Thus, the issue of public health and safety is of even less concern than in the Diablo Canyon proceeding.

13. Q. Are the provisions in the LILCO Transition Plan for cost-benefit analysis of temporary reentry relevant to public health and safety?

A. No. As stated previously, the provisions in OPIP 3.10.1 for cost-benefit analysis do not apply to reentry of the general public into a previously evacuated area. See response to question 10 above.

Attachment 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

Nuclide (1)	Average (2)(3) 100 cm^2	Maximum (2)(4) 100 cm^2	Removable (2)(5) 100 cm^2
U-nat, U-235 U-238, and associated decay products	5,000 dpm (6) alpha	15,000 dpm alpha	1,000 dpm alpha
Transuranics RA-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm	300 dpm	20 dpm
Th-nat, Th-232 Sr-90, Ra-223 Ra-224, U-232, I-126, I-131, I-133	1,000 dpm	3,000 dpm	200 dpm
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	5,000 dpm beta-gamma	15,000 dpm beta-gamma	1,000 dpm beta-gamma

NOTES:

(1) Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

(2) As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

ACCEPTABLE SURFACE CONTAMINATION LEVELS
(continued)

NOTES: (continue)

(3) Measurments of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

(4) The maximum contamination level applies to an area of not more than 100 cm^2.

(5) The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency.

(6) dpm-Disintegrations per minute

Reference: Regulatory Guide 1.86, Termination of Operating License for Nuclear Reactors, Table 1.

Attachment 2

on the site. Those radioactive materials remaining on the site must be isolated from the public by physical barriers or other means to prevent public access to hazardous levels of radiation. Surveillance is necessary to assure the long term integrity of the barriers. The amount of surveillance required depends upon (1) the potential hazard to the health and safety of the public from radioactive material remaining on the site and (2) the integrity of the physical barriers. Before areas may be released for unrestricted use, they must have been decontaminated or the radioactivity must have decayed to less than prescribed limits (Table I).

The hazard associated with the retired facility is evaluated by considering the amount and type of remaining contamination, the degree of confinement of the remaining radioactive materials, the physical security provided by the confinement, the susceptibility to release of radiation as a result of natural phenomena, and the duration of required surveillance.

C. REGULATORY POSITION

1. APPLICATION FOR A LICENSE TO POSSESS BUT NOT OPERATE (POSSESSION-ONLY LICENSE)

A request to amend an operating license to a possession-only license should be made to the Director of Licensing, U.S. Atomic Energy Commission, Washington, D.C. 20545. The request should include the following information:

a. A description of the current status of the facility.

b. A description of measures that will be taken to prevent criticality or reactivity changes and to minimize releases of radioactivity from the facility.

c. Any proposed changes to the technical specifications that reflect the possession-only facility status and the necessary disassembly/retirement activities to be performed.

d. A safety analysis of both the activities to be accomplished and the proposed changes to the technical specifications.

e. An inventory of activated materials and their location in the facility.

2. ALTERNATIVES FOR REACTOR RETIREMENT

Four alternatives for retirement of nuclear reactor facilities are considered acceptable by the Regulatory staff. These are:

a. **Mothballing.** Mothballing of a nuclear reactor facility consists of putting the facility in a state of protective storage. In general, the facility may be left intact except that all fuel assemblies and the radioactive fluids and waste should be removed from the site. Adequate radiation monitoring, environmental surveillance, and appropriate security procedures should be established under a possession-only license to ensure that the health and safety of the public is not endangered.

b. **In-Place Entombment.** In-place entombment consists of sealing all the remaining highly radioactive or contaminated components (e.g., the pressure vessel and reactor internals) within a structure integral with the biological shield after having all fuel assemblies, radioactive fluids and wastes, and certain selected components shipped offsite. The structure should provide integrity over the period of time in which significant quantities (greater than Table I levels) of radioactivity remain with the material in the entombment. An appropriate and continuing surveillance program should be established under a possession-only license.

c. **Removal of Radioactive Components and Dismantling.** All fuel assemblies, radioactive fluids and waste, and other materials having activities above accepted unrestricted activity levels (Table I) should be removed from the site. The facility owner may then have unrestricted use of the site with no requirement for a license. If the facility owner so desires, the remainder of the reactor facility may be dismantled and all vestiges removed and disposed of.

d. **Conversion to a New Nuclear System or a Fossil Fuel System.** This alternative, which applies only to nuclear power plants, utilizes the existing turbine system with a new steam supply system. The original nuclear steam supply system should be separated from the electric generating system and disposed of in accordance with one of the previous three retirement alternatives.

3. SURVEILLANCE AND SECURITY FOR THE RETIREMENT ALTERNATIVES WHOSE FINAL STATUS REQUIRES A POSSESSION-ONLY LICENSE

A facility which has been licensed under a possession-only license may contain a significant amount of radioactivity in the form of activated and contaminated hardware and structural materials. Surveillance and commensurate security should be provided to assure that the public health and safety are not endangered.

a. Physical security to prevent inadvertent exposure of personnel should be provided by multiple locked barriers. The presence of these barriers should make it extremely difficult for an unauthorized person to gain access to areas where radiation or contamination levels exceed those specified in Regulatory Position C.4. To prevent inadvertent exposure, radiation areas above 5 mR/hr, such as near the activated primary system of a power plant, should be appropriately marked and should not be accessible except by cutting of welded closures or the disassembly and removal of substantial structures

TABLE I

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDE[a]	AVERAGE[b c]	MAXIMUM[b d]	REMOVABLE[b e]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm β-γ/100 cm^2	15,000 dpm β-γ/100 cm^2	1000 dpm β-γ/100 cm^2

[a] Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

Attachment 3

Campbell County, Kentucky, Radiological Emergency Plan (Disaster and Emergency Services), Appendix E, Radiation Exposure Control (Wm. H. Zimmer Nuclear Power Station-Ohio) (June 1982).

APPENDIX E-2

TRANSFERABLE SURFACE CONTAMINATION CRITERIA

Nuclide[1]	Average[2,3]/ 100 cm^2	Maximum[2,4]/ 100 cm^2	Removable[2,5]/ 100 cm^2
U-nat, U-235, U-238, and associated decay products	5,000 dpm alpha	15,000 dpm alpha	1,000 dpm alpha
Transuranics, R-226, Ra-228, Th-230, Pa-231, Ac-227, I-125, I-129	100 dpm	300 dpm	20 dpm
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm	3,000 dpm	200 dpm
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm beta-gamma	15,000 dpm beta-gamma	1,000 dpm beta-gamma

NOTES:

1. Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

2. As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

3. Measurements of average radioactive material per 100 cm^2 of surface area can be determined by scanning the area at a uniform rate with an appropriate instrument of known efficiency. If the average activity is greater than those values shown in the first column the surface should be decontaminated. For objects of less surface area, the average should be derived for each such object.

4. Measurements of maximum radioactive material per 100 cm^2 can be determined by scanning the area for the point of highest radioactivity. If the maximum activity at this point is greater than those values shown in the second column, the surface should be decontaminated.

5. The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. If the removable activity is greater than those values shown in the third column, the surface should be decontaminated. When removal of contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

6. Reference: U.S. Nuclear Regulatory Commission, Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors", June 1974.

Attachment 4

Delaware State Radiological Emergency Plan (Division of Emergency Planning and Operations), Section 3: Concept of Operations (Salem Generating Station-New Jersey)(April 1983).

TABLE 3-4

SURFACE CONTAMINATION LEVELS[1]

Nuclide[1]	Average[2,3]/ 100 cm²	Maximum[2,4]/ 100 cm²	Removable[2,5]/ 100 cm²
U-nat, U-235, U-238, and associated decay products	5,000 dpm alpha	15,000 dpm alpha	1,000 dpm alpha
Transuranics, R-226, Ra-228, Th-230, Pa-231, Ac-227, I-125, I-129	100 dpm	300 dpm	20 dpm
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm	3,000 dpm	200 dpm
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm beta-gamma	15,000 dpm beta-gamma	1,000 dpm beta-gamma

TABLE 3-4 (Cont)

NOTES:

1. Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

2. As used in this table, dpm (disintegrations per [illegible]) means the rate of emission by radioactive material as determined by c[illegible]ing the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

3. Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

4. The maximum contamination level applies to an area of not more than 100 cm^2.

5. The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

Source: U.S. Nuclear Regulatory Commission, Regulatory Guide 1.86, Termination of Operation Licenses for Nuclear Reactors.

Attachment 5

Maryland State Radiological Emergency Plan
(Civil Defense and Disaster Preparedness
Agency), Disaster Assistance Plan Annex Q,
Section 3: Planning Basis
(Calvert Cliffs Nuclear Power Plant-Maryland)(May 1981)

TABLE 3-8

ALLOWABLE SURFACE CONTAMINATION LEVELS

Nuclide [a]	Average [b,c]/ 100 cm^2	Maximum [b,d]/ 100 cm^2	Removable [b,e]/ 100 cm^2
U-nat, U-235, U-238, and associated decay products	5,000 dpm alpha	15,000 dpm alpha	1,000 dpm alpha
Transuranics, R-226, Ra-228, Th-230, Pa-231, Ac-227, I-125, I-129	100 dpm	300 dpm	20 dpm
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm	3,000 dpm	200 dpm
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm beta-gamma	15,000 dpm beta-gamma	1,000 dpm beta-gamma

NOTES:

a. Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuculdes should apply independently.

b. As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

c. Measurements of average contaminant should not be averaged over more than 1 square meter.

d. The maximum contamination level applies to an area of not more than 100 cm^2.

TABLE 3-8 (Cont)

e. The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

SOURCE:

Termination of Operating Licenses for Nuclear Reactors, Regulatory Guide 1.86, June 1974, U.S. Nuclear Regulatory Commission.

Attachment 6

New Jersey State Radiological Emergency Response Plan
(Office of Emergency Management),
Emergency and Disaster Operations Plan,
Attachment D, Section II: Planning Basis
(Salem Generating Station-New Jersey)(December 1981)

TABLE II-4

ACCEPTABLE SURFACE CONTAMINATION LEVELS FOR EQUIPMENT AND STRUCTURES

NUCLIDE[a]	AVERAGE[b c]	MAXIMUM[b d]	REMOVABLE[b e]
U-nat, U-235, U-238, and associated decay products	5,000 dpm/100 cm^2	15,000 dpm/100 cm^2	1,000 dpm/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm/100 cm^2	15,000 dpm/100 cm^2	1000 dpm/100 cm^2

a Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

b As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

c Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

d The maximum contamination level applies to an area of not more than 100 cm^2.

e The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

Source: U.S. Nuclear Regulatory Commission, Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors, June 1974.

Attachment 7

New Jersey State Radiological Emergency
Response Plan (Office of Emergency
Management), Annex B Ocean County,
Section II: Planning Basis (Oyster Creek
Nuclear Generating Station-New Jersey)(January 1983)

TABLE B-II-4

ALLOWABLE SURFACE CONTAMINATION LIMITS

Nuclide(1)	Average(2,3)/ 100 cm^2	Maximum(2,4)/ 100 cm^2	Removable(2,5)/ 100 cm^2
U-nat, U-235, U-238, and associated decay products	5,000 dpm alpha	15,000 dpm alpha	1,000 dpm alpha
Transuranics, R-226, Ra-228, Th-230, Pa-231, Ac-227, I-125, I-129	100 dpm	300 dpm	20 dpm
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm	3,000 dpm	200 dpm
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm beta-gamma	15,000 dpm beta-gamma	1,000 dpm beta-gamma

NOTES:

1. Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nucludes should apply independently.

2. As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

3. Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

4. The maximum contamination level applies to an area of not more than 100 cm^2.

TABLE B-II-4 (Cont)

5. The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

Source: U.S. Nuclear Regulatory Commission, Regulatory Guide 1.86, Termination of Operation Licenses for Nuclear Reactors, Revision 0, June 1974.

Attachment 8

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TABLE 1. SURFACE RADIOACTIVITY GUIDES[a]

		Activity Guide[b] (dis/min - 100 cm)	
Group	Description	Removable	Fixed plus Removable
1	Alpha emitters except U_{nat} and Th_{nat}, depleted uranium, ^{238}U and ^{232}Th	20	300
2[d]	^{90}Sr, ^{125}I, ^{129}I, ^{131}I, ^{228}Ra[c]	200	5000
3	All radionuclides not in groups 1 or 2 except beta emitters with E_{max} < 150 KeV[d]	1000	5000

a. A rationale for these surface activity guides is presented in Appendix B.

b. The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm^2 is less than three times the guide values. For purposes of averaging, any square meter of surface shall be considered to be above the activity guide G if: (1) from measurements of a representative number n of sections it is determined that 1/n $_n$

$S_i \geq G$, where S_i is the dis/min - 100 cm^2 determined from measurement of section i.

c. These are the radionuclides undergoing beta or electron capture decay that present the greatest hazards as surface radioactivity. ^{228}Ra is included even though it emits beta particles below the 150 keV minimum energy covered by the standard because it is readily detectable through its short-lived decay products.

d. The beta emitters with maximum energy less than 150 keV are excluded because detection by direct methods is not practical and they must be treated on a case-by-case basis. However, radionuclides that are detectable by direct measurement with appropriate instrumentation through emission of low-energy x and gamma rays (as in electron capture) or through the presence of short-lived decay products are included in this category.