OCT 19 1973

Dockets Nos. 50-254 and 50-265

Commonwealth Edison Company
ATTN: Mr. Byron Lee, Jr.
Vice President
Post Office Box 767
Chicago, Illinois 60690

Gentlemen:

On October 11, 1973, we issued Change No. 9 to Facility Operating Licenses Nos. DPR-29 and DPR-30 which inadvertently did not include the required findings pursuant to Section 50.59 of 10 CFR Part 50. Therefore, a new first page of Change No. 9 with the appropriate findings is enclosed for substitution in your copy. Our records are being revised accordingly.

Sincerely,

Donald J. Skovholt
Assistant Director
for Operating Reactors
Directorate of Licensing

Enclosure:
First Page of Change No. 9

cc w/enclosure:
Mr. Charles Whitmore
President and Chairman
Iowa-Illinois Gas and
Electric Company
206 East Second Avenue
Davenport, Iowa 52801

John W. Rowe, Esquire
Isham, Lincoln & Beale
Counselors at Law
One First National Plaza
Chicago, Illinois 60670

Moline Public Library

Mr. Hans L. Hamester
ATTN: Joan Sause
Office of Radiation Programs
Environmental Protection Agency
647A East Towers, Waterside Mall
401 M Street, S. W.
Washington, D. C. 20460

Mr. Gary Williams
Federal Activities Branch
Environmental Protection Agency
1 N. Wacker Drive
Chicago, Illinois 60606

Mr. Ed Vest
EPA, 1735 Baltimore Avenue
Kansas City, Missouri

Distribution
Docket File
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Branch Reading
RP Reading
JRBuchanan, ORNL
TBAbernathy, DTIE
VMoore, L:BWR
DJSkovholt, L:OR
TJCarter, L:OR
ACRS (16) MJinks (8)
RO (3) PCollins, L:OLB
OGC
RVollmer, L:QA
DLZiemann, L:ORB #2
JIRiesland, L:ORB #2
FDAnderson, L:ORB #2
RMDiggs, L:ORB #2
NDube, L:OPS
BScharf (15)

OFFICE ▶	L:ORB #2	L:ORB #2		L:ORB	L:OR
SURNAME ▶	RMDiggs:rwg	FDAnderson JIRiesland		DLZiemann	DJSkovholt
DATE ▶	10/18/73	10/18/73		10/18/73	10/18/73

Form AEC-318 (Rev. 9-53) AECM 0240 GPO 643—16—81465-1 445-678

October 11, 1973

Docket Nos. 50-254 and 50-265

Commonwealth Edison Company
ATTN: Mr. Byron Lee, Jr.
Vice President
Post Office Box 767
Chicago, Illinois 60690

Change No. 9
Licenses Nos. DPR-29
and DPR-30

Gentlemen:

Since Change No. 4 dated December 14, 1972, to the Technical Specifications of Facility Licenses Nos. DPR-29 and DPR-30 for Quad-Cities Units 1 and 2, the Regulatory staff has developed a computer program for determining the annual average relative concentrations from the meteorological data provided by the respective licensees and applicants. The meteorological data provided in Amendment 18 to the FSAR for the Quad-Cities Units 1 and 2 have been reevaluated using this computer program to determine the annual average concentrations in the most critical sectors for radioiodines (I-131) and radioactive particulates with half lives greater than 8 days.

As a result of our reanalysis, the technical specification for I-131, particulate radioactivity and noble gas limits has been changed as indicated in the enclosed revised pages 178 through 181 and pages 194 and 195 of the Technical Specifications for Quad-Cities Units 1 and 2. This change separates the release limits of I-131 and radioactive particulates with half lives greater than 8 days. The annual average relative concentrations in air include the effect of vertical building wake on cloud dispersion for ground level releases. The vertical building wake effect is limited to a maximum value of the square root of 3. The reanalysis results do not change the limits on noble gas releases from the plant chimney but do change those from the vent stack. The most critical sector for the plant chimney is the north sector for noble gas releases and the northeast and southeast sectors for radioiodine and radioactive particulate releases. The most critical sector for the vent stack is the north sector for noble gas, radioiodine and radioactive particulate releases. The resulting annual average Chi/Q values are for plant chimney releases 2.3×10^{-8} sec/m^3 for both units operating and 3.3×10^{-8} sec/m^3 for either unit operating and for vent stack releases 9.2×10^{-6} sec/m^3.

Based on the above considerations, we have concluded that this change does not involve a significant hazards consideration and that there is reasonable assurance that the health and safety of the public will not be endangered.

OFFICE ▶						
SURNAME ▶						
DATE ▶						

Form AEC-318 (Rev. 9-53) AECM 0240 GPO c43—16—81465-1 445-678

Docket Files

OCT 1 1 1973

Docket Nos. 50-254 and 50-265

Commonwealth Edison Company
ATTN: Mr. Byron Lee, Jr.
Vice President
Post Office Box 767
Chicago, Illinois 60690

Change No. 9
Licenses Nos. DPR-29
and DPR-30

Gentlemen:

Since Change No. 4 dated December 14, 1972, to the Technical Specifications of Facility Licenses Nos. DPR-29 and DPR-30 for Quad-Cities Units 1 and 2, the Regulatory staff has developed a computer program for determining the annual average relative concentrations from the meteorological data provided by the respective licensees and applicants. The meteorological data provided in Amendment 18 to the FSAR for the Quad-Cities Units 1 and 2 have been reevaluated using this computer program to determine the annual average concentrations in the most critical sectors for radioiodines (I-131) and radioactive particulates with half lives greater than 8 days.

As a result of our reanalysis, the technical specification for I-131, particulate radioactivity and noble gas limits has been changed as indicated in the enclosed revised pages 178 through 181 and pages 194 and 195 of the Technical Specifications for Quad-Cities Units 1 and 2. This change separates the release limits of I-131 and radioactive particulates with half lives greater than 8 days. The annual average relative concentrations in air include the effect of vertical building wake on cloud dispersion for ground level releases. The vertical building wake effect is limited to a maximum value of the square root of 3. The reanalysis results do not change the limits on noble gas releases from the plant chimney but do change those from the vent stack. The most critical sector for the plant chimney is the north sector for noble gas releases and the northeast and southeast sectors for radioiodine and radioactive particulate releases. The most critical sector for the vent stack is the north sector for noble gas, radioiodine and radioactive particulate releases. The resulting annual average Chi/Q values are for plant chimney releases 2.3×10^{-8} sec/m^3 for both units operating and 3.3×10^{-8} sec/m^3 for either unit operating and for vent stack releases 9.2×10^{-6} sec/m^3.

Accordingly, pursuant to Section 50.59 of 10 CFR Part 50, the Technical Specifications appended to Facility Licenses Nos. DPR-29 and DPR-30 are hereby changed as set forth in the enclosed revised pages 178 through 181 and pages 194 and 195.

Sincerely,

Original signed by
Robert J. Schemel

Donald J. Skovholt
Assistant Director
for Operating Reactors
Directorate of Licensing

Enclosures:
Revised pages 178 through
181 and pages 194 and 195

cc w/enclosures:
Mr. Charles Whitmore
President and Chairman
Iowa-Illinois Gas and
Electric Company
206 East Second Avenue
Davenport, Iowa 52801

John W. Rowe, Esquire
Isham, Lincoln & Beale
Counselors at Law
One First National Plaza
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Moline Public Library
504 - 17th Street
Moline, Illinois 61265

Mr. Hans L. Hamester
ATTN: Joan Sause
Office of Radiation Programs
Environmental Protection Agency
647A East Towers, Waterside Mall
401 M Street, S. W.
Washington, D. C. 20460

Mr. Gary Williams
Federal Activities Branch
Environmental Protection Agency
1 N. Wacker Drive
Chicago, Illinois 60606

Mr. Ed Vest
Environmental Protection Agency
1735 Baltimore Avenue
Kansas City, Missouri 64108

bcc:

Docket File	TJCarter, L:OR	RMDiggs, L:ORB #2
AEC PDR	ACRS (16)	NDube, L:OPS
Branch Reading	RO (3)	BScharf (15)
RP Reading	OGC	MJinks (8)
JRBuchanan, ORNL	RVollmer, L:QA	SKari, L:RP
TBAbernathy, DTIE	DLZiemann, L:ORB #2	PCollins, L:OLB
VMoore, L:BWR	JIRiesland, L:ORB #2	
DJSkovholt, L:OR	FDAnderson, L:ORB #2	

OFFICE ▶	L:ORB #2	L:ORB #2	L:ORB #2	L:ORB #2	L:SS	L:OR
SURNAME ▶	X7403 FDAnderson:rg	RMDiggs	JIRiesland	DLZiemann	HDenton	DJSkovholt
DATE ▶	10/3/73	10/3/73	10/3/73	10/3/73	10/5	10/11/73

Form AEC-318 (Rev. 9-53) AECM 0240 GPO c43—16—81465-1 445-678

3.8 LIMITING CONDITION FOR OPERATION	4.8 SURVEILLANCE REQUIREMENT
9 $Q_{RS} \quad \frac{1.3\,\bar{E}_\gamma + \bar{E}_\beta}{0.023} \leq 1.0$ where: Q_{RS} - release rate from Units 1 and 2 reactor building ventilation stack (Ci/sec). 3 $\bar{E}_\beta$ - average beta energy per disintegration (Mev/dis). $\bar{E}_\gamma$ - average gamma energy per disintegration (Mev/dis). b. If Specification 3.8.A.3.a is not met, the reactor building ventilation system shall be isolated and the stand-by gas treatment operated.	3. Measurements of noble gases shall be made continuously in each unit's duct leading to the stack, and station records retained of the monitor readings. 3 Isotoptic analyses will not be performed routinely but it will be assumed that the composition of the gases in the stack is the same as that entering the plant chimney. If quantities of noble gas in the stack become measureable, isotopic analyses shall be performed monthly. Gaseous release of tritium shall be calculated on a quarterly basis from the tritium concentration of the condensate. Vaporous tritium shall be calculated from a representative sample of condensed vapor collected and analyzed for tritium. The sum of these two values shall be 4 reported as the total tritium releases.
4. In addition to any other requirement of these Technical Specifications, the licensee has volunteered: a. During reactor power operation of Unit 1 and/or 2, operating procedures will be implemented to reduce release rates to as low as practical prior to releasing the gross radioactivity at the rate allowed by (b) and (c) below. b. If Q_1 or $_2$ exceeds 0.0375 Ci/sec or Q_1 and $_2$ exceeds 0.0525 Ci/sec of gross radioactivity from the plant chimney, operating procedures will	During periods in which the gross radioactivity release rates are greater than 25 percent of Specification 3.8.A.3.a., hourly measurements of meteorological parameters shall be recorded.

3.8 LIMITING CONDITION FOR OPERATION	4.8 SURVEILLANCE REQUIREMENT
be initiated, to the extent permitted by power demand, to reduce such release rates.	
c. The annual average release rate of gross radioactivity from the plant chimney shall not exceed 0.080 Ci/sec for Q_1 or $_2$ or 0.110 Ci/sec for Q_1 and $_2$ operation.	
3 d. If the limits of Specification 3.8.A.4.b are exceeded for a period of greater than 48 hours, the Deputy Director for Reactor Projects, Directorate of Licensing shall be notified in writing within 48 hours of plans for reducing the radioactive effluent release rate to a level below those limits.	
B. Iodine and Particulate Releases to the Atmosphere	B. Iodine and Particulate Releases to the Atmosphere
3 1. The I-131 and particulates with half lives greater than eight days released from the reactor building stack and plant chimney shall be continously monitored. To accomplish this, particulate filters and charcoal cartridges shall be installed and operable at all times, except as stated in Specification 3.8.G.	3 1. Station records of release of iodine-131 and particulates shall be maintained on the basis of all chimney and stack filters and cartridges counted.
4	2. The chimney filters and cartridges shall be counted weekly when the measured release rate of the sum of iodine-131 and particulates is less than 10 percent of the release rate given in Specification 3.8.B.2.a., otherwise the chimney filters and cartridges shall be removed and counted daily.
9 2. a. The release rate of iodine 131 to the environs as part of the airborne effluents from the plant chimney shall not exceed 4.3 uCi/sec with Unit 1 or 2 operating or 6 uCi/sec with Unit 1 and 2 operating.	

3.8 LIMITING CONDITION FOR OPERATION	4.8 SURVEILLANCE REQUIREMENT
b. The release rate of particulates with half lives longer than eight days released to the environs as part of the airborne effluents from the plant chimney shall not exceed: $\frac{Q1 \text{ or } 2}{4.3 \times 10^4 \ \overline{MPC_a}}$ or $\frac{Q1 \ \& \ 2}{6 \times 10^4 \ \overline{MPC_a}} \leq 1.0$ where Q is measured in curies/sec. $\overline{MPC_a}$ is the composite maximum permissible concentration in air as defined in Appendix B, 10 CFR 20.	3 If the results of surveillance required by Specification 4.6.C.1.c or d for the primary coolant after reactor startup exceed 10% of Specification 3.6.C.1, the charcoal cartridge shall be removed and analyzed for radioactive iodines of I-131, I-133 and I-135. When chimney monitors indicate an increase in radioactive gaseous effluents of 25 percent or 5000 µCi/sec, whichever is greater during steady state operation, the chimney filter and cartridge shall be removed and counted. A determination shall be made of the total of I-131 and particulates with half lives greater than eight days released weekly. An analysis shall also be performed of a sample at least quarterly for the radionuclides I-133 and I-135. For release of radioactive material in particulate form, a sample shall be drawn continuously through a particulate filter. Measurements shall be made on these filters to determine the quantities of nuclides with half lives greater than eight days in particulate form that are released to the environment. The particulate filters shall be changed and analyzed at least weekly for gross beta-particulate radioactivity with half lives greater than eight days. Monthly, a composite of those filters used during the month shall be prepared. This composite shall be analyzed for the principle gamma emitting nuclides. Analysis for Sr-89 and Sr-90 shall be made quarterly. Gross alpha radioactivity shall be determined quarterly.
c. If Specification 3.8.B.2.a or 3.8.B.2.b is not met, an orderly shutdown shall be initiated and the reactor shall be in a cold shutdown within 24 hours.	

9

4

3.8 LIMITING CONDITION FOR OPERATION	4.8 SURVEILLANCE REQUIREMENT
3. a. The release rate of iodine 131 to the environs as part of the airborne effluents from the reactor building ventilation stack shall not exceed 1.5×10^{-2} uCi/sec.	3. The ventilation stack filters and cartridges shall be counted weekly when the measured release rate of the sum of iodine-131 and particulates is less than 25 percent of the release rate given in Specification 3.8.B.3.a; otherwise the ventilation stack filters and cartridges shall be removed and counted daily.
b. The release rate of particulates with half lives longer than eight days released to the environs as part of the airborne effluents from the reactor building ventilation stack shall not exceed: $\frac{QRS}{1.5 \times 10^{2} MPC_a} \leq 1.0$	A determination shall be made of the total I-131 and particulates with half lives greater than eight days released weekly. An analysis sample at least quarterly for the radionuclides I-133 and I-135.
c. If Specification 3.8.B.3.a or 3.8.B.3.b is not met, the reactor building ventilation system shall be isolated and the standby gas treatment operated.	For release of radioactive material in particulate form, a sample shall be drawn continuously through a particulate filter. Measurements shall be made on these filters to determine the quantities of nuclides with half lives greater than eight days in particulate form that are released to the environment.
	The particulate filters shall be changed and analyzed at least weekly for gross beta-particulate radioactivity with half lives greater than eight days. Monthly, a composite of these filters used during the month shall be prepared. This composite shall be analyzed for principle gamma emitting nuclides.
	Analyses for Sr-89 and Sr-90 shall be made quarterly. Gross alpha radioactivity shall be determined quarterly.

beta dose as well as the gamma dose. The staff assumed that such releases would be equivalent to ground level releases which could result in a beta dose from cloud submersion. The methods utilized are the same as used for the plant chimney releases to determine the gamma dose contribution while the beta dose contribution was determined using the method described in Section 7.4 of "Meteorology and Atomic Energy - 1968," equation 7.21 being used. Therefore, the gamma dose contribution was determined on the basis of a finite cloud passage and the beta dose contribution on the basis of a semi-infinite cloud submersion both for a ground level release. The beta dose contribution was reduced from an air dose to a depth dose equivalent to 200 mg/cm^2 penetration (depth distance for lens of the eye) by a 4 Mev beta particle (maximum beta energy of noble gas releases) which the staff considers to conservatively represent a whole body dose equivalence for beta particles, i.e., lens of the eye dose. The beta depth dose determination method utilized is described in Section 7.4.1.2 of "Meteorology and Atomic Energy - 1968," equation 7.25 being used. The calculated reduction factor on the beta dose for depth penetration by the staff was 0.3 for the above assumptions which was used in the beta dose equation 7.21. Based on these calculations, a continuous release rate of gross radioactivity in the amount of $0.023/(1.3\ \overline{E}_{\gamma} + \overline{E}_{\beta})$ curie/sec from the Units 1/2 reactor building ventilation stack will not result in offsite annual doses in excess of the limits specified in 10 CFR 20. Because the expected releases from the reactor building ventilation stack will be mainly batch releases during drywell purging or possible equipment degradation and not related to the power operation or fuel performance, the release limit specification has been separated from the limit specified for the plant chimney. The calculated and measured dose contribution from these sources are additive for purposes of meeting the limits specified in 10 CFR 20, but are not required as a basis for operation. Both $\overline{E}\gamma$ and $\overline{E}\beta$ should be determined for the ventilation stack releases.

The intent of the voluntary limits in Section 3.8.A.4 is not to relieve the licensee of its obligation to exert its best efforts to keep levels of radioactive material in effluents as low as practicable. At the action level specified in Section 3.8.A.4.b, the Commission is to be informed of the licensee's plans for continued operation of the facilities. The limits given in Specification 3.8.A.4.c give the annual average release which represents the limits of permissible operation which reduces the permissible activity released compared with continuing operation at the conditions stated in Section 20.106 of 10 CFR 20.

Specification 3.8.A.4.b and 3.8.A.4.c are interim limits volunteered by the licensee to keep the off-gas emission levels to as low as practicable with the present off-gas handling system until the final modifications to the radioactivity

3.8 Limiting Condition for Operation Bases (Cont'd)

control equipment on the off-gas system proposed by the licensee can be completed and placed in operation. Action will be taken to reduce off-gas radioactivity emissions in accordance with Specification 3.8.A.4.b so
4 that the release will not exceed the release noted in Specification 3.8.A.4.c.

Commonwealth Edison has embarked on a program of selecting, designing, and installing additional equipment to reduce off-gas emissions in Quad-Cities Units 1 and 2. This equipment is expected to reduce substantially the release of radioactive material in the
3 effluent. Commonwealth Edison has submitted Special Report No. 1 for Quad-Cities 1 and 2 concerning a description of its proposed design for this equip-
4 ment. Upon completion of the installation of this equipment, the SAR and technical specifications will be revised to include the design of the system and the effect of operation of the emission reducing equipment.

B. Iodine and Particulate Releases

Detailed calculations of ground level air concentrations of Iodine-131 and particulates with half lives greater than 8 days at several offsite locations have been made as described in Appendix A of the SAR. These calculations consider site meteorology and buoyancy characteristics of the effluent from each unit. The assumptions used by the AEC staff for these calculations were: (1) onsite meteorological data were used for the most critical 22.5 degree section; (2) building wake credit was used; and (3) to consider possible reconcentration effects,

9 a reduction factor of 700 was applied to the I-131 cow-milk-child thyroid and the particulate radioactivity to allow for possible ecological chain effects. Based on the staff analysis, the release rate limits for these isotopes in
3 the equations of Specification 3.8.B are obtained. Use of these equations assures that releases will not result in offsite doses in excess of those specified in 10 CFR 20.

As for the gross radioactivity releases from the plant chimney and from the reactor building ventilation stack, the AEC staff analyzed the releases from these separate points on the basis of an elevated release for the plant chimney and of a ground level release for the reactor building ventilation stack. The same reasoning has been used by the staff for separating the release limits into separate specifications. The most critical sector for the plant chimney is the
9 northeast and southeast sectors while for the reactor building the north sector is most critical for both release points in respect to gross radioactivity releases (whole body dose considerations).

C. Mechanical Vacuum Pump

The purpose of isolating the mechanical vacuum line is to limit release of activity from the

Give this to John with
instructions to call CE
& proceed as discussed
on 7/21 —

MEMO ROUTE SLIP
Form AEC-93* (Rev. May 14, 1947) AECM 0240

See me about this.	For concurrence.	For action.
Note and return.	For signature.	For information.

TO (Name and unit)	INITIALS	REMARKS
D. J. Skovholt	DATE	PROPOSED CHANGE IN QC LIMIT Since the effect of the proposed change would be to authorize an increase in iodine releases equivalent to a 1000 mr/yr
TO (Name and unit)	INITIALS	REMARKS
cc: J. M. Hendrie	DATE	increase in calculated thyroid doses from milk by the nearest cow, I do not concur. Let's discuss.
TO (Name and unit)	INITIALS	REMARKS
	DATE	Harold
FROM (Name and unit)		REMARKS
H. R. Denton		
PHONE NO. 7207	DATE 9/6/73	

USE OTHER SIDE FOR ADDITIONAL REMARKS

GPO : 1971 O - 445-469

MEMO ROUTE SLIP
Form AEC-93 (Rev. May 14, 1947) AECM 0240

See me about this. | For concurrence. | For action.
Note and return. | For signature. | For information.

TO (Name and unit)	INITIALS / DATE	REMARKS
DJSkovholt D Z		f/concurrence and signature Pls request Denton concurrence
TO (Name and unit) H. Denton D. Skovholt	INITIALS / DATE	REMARKS
TO (Name and unit)	INITIALS / DATE	REMARKS
FROM (Name and unit) DLZiemann (JIRiesland)		REMARKS Ltr to Commonwealth Edison as Change No. 9 to Quad-Cities Tech Specs re iodine and particulate radioactivity limits.
PHONE NO. 7380	DATE 8/29	

USE OTHER SIDE FOR ADDITIONAL REMARKS

GPO : 1971 O - 445-469

Docket Nos. 50-254 and 50-265

Commonwealth Edison Company
ATTN: Mr. Byron Lee, Jr.
Vice President
Post Office Box 767
Chicago, Illinois 60690

Change No. 9
Licenses Nos. DPR-29
and DPR-30

Gentlemen:

In June 1973 Regulatory Guide 1.42 pertaining to radioiodine releases from light water-cooled nuclear power reactors was issued. Using the procedures for calculating annual average relative concentrations in air (Appendix B) and calculational model for offsite thyroid doses (Appendix C) of this Regulatory Guide, we have reevaluated the Quad-Cities Station radioiodine and particulate radioactivity release limits to determine their conformance with 10 CFR Part 20 requirements.

As a result of our analysis, the technical specification for the radioiodine and particulate radioactivity limits has been changed as indicated in the enclosed revised pages 179 through 181 and page 195 of the Technical Specifications of Facility Licenses Nos. DPR-29 and DPR-30 for Quad-Cities Unit 1 and 2. This change separates the release limits of radioiodine 131 (I-131) and radioactive particulates with half lives greater than eight days. To be consistent with the referenced Regulatory Guide, the annual average relative concentrations in air have been adjusted to include the effect of vertical building wake effect for ground level releases, and the organ (thyroid) intake ratio for I-131 of 233 has been used rather than 700 as formerly used in the specifications. The guideline value of 233 will yield thyroid doses of 1500 mRem/year to an infant's thyroid via the milk pathway which is equivalent to 10 CFR Part 20 limits rather than the 500 mRem/year dose value determined by the previous organ intake ratio value of 700. The combined effect of these two changes in the calculational model is to increase the technical specification release limits for ground level releases by a factor of 4.2 for the I-131 and a factor of 1.4 for the radioactive particulates and for the elevated releases by a factor of 3 for the I-131 only.

Accordingly, pursuant to Section 50.59 of 10 CFR Part 50, the Technical Specifications appended to Facility Licenses Nos. DPR-29 and DPR-30 are hereby changed as set forth in the enclosed revised pages 179 through 181 and page 195.

Sincerely,

Donald J. Skovholt
Assistant Director for
Operating Reactors
Directorate of Licensing

Enclosures:
Revised pages 179 through
181 and page 195

cc w/enclosures:
Mr. Charles Whitmore
President and Chairman
Iowa-Illinois Gas and
Electric Company
206 East Second Avenue
Davenport, Iowa 52801

John W. Rowe, Esquire
Isham, Lincoln & Beale
Counselors at Law
One First National Plaza
Chicago, Illinois 60670

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RO (3)
OGC
RVollmer, L:QA
DLZiemann, L:ORB #2
JIRiesland, L:ORB #2
RMDiggs, L:ORB #2
NDube, L:OPS
MJinks, DRA (8)
SKari, L:RP

OFFICE ▶	L:ORB #2	L:ORB #2	L:ORB #2	L:ORB #2	L:SS	
SURNAME ▶	X7403 JIRiesland:sjh	RMDiggs	DLZiemann	DJSkovholt	HDenton	
DATE ▶	8/29/73	8/29/73	8/29/73	8/ /73	8/ /73	

APPENDIX I TO AEC ORDER

CHANGE NO. 8 TO THE TECHNICAL SPECIFICATIONS

LICENSES NOS. DPR-29 AND DPR-30

COMMONWEALTH EDISON COMPANY

DOCKET NOS. 50-254 AND 50-265

August 24, 1973

3.5 LIMITING CONDITIONS FOR OPERATION	4.5 SURVEILLANCE REQUIREMENTS
J. Average Planar LHGR During steady state power operation, the average linear heat generation rate (LHGR) of all the rods in any fuel assembly, as a function of average planar exposure, at any axial location, shall not exceed the maximum average planar shown in Figure 3.5.1.	J. Average Planar LHGR Daily during reactor power operation, the average planar LHGR shall be checked.
K. Local LHGR During steady state power operation, the linear heat generation rate (LHGR) of any rod in any fuel assembly at any axial location shall not exceed the maximum allowable LHGR as calculated by the following equation: $LHGR_{max} \leq LHGR_d \left[1 - \left(\frac{\Delta P}{P}\right) \max \left(\frac{L}{LT}\right)\right]$ $LHGR_d$ = Design LHGR = 17.5 KW/ft $\left(\frac{\Delta P}{P}\right)_{max}$ = Maximum power spiking penalty = 0.038 L_T = Total core length = 12 ft L = Axial position above bottom of core	K. Local LHGR Daily during reactor power operation, the local LHGR shall be checked.

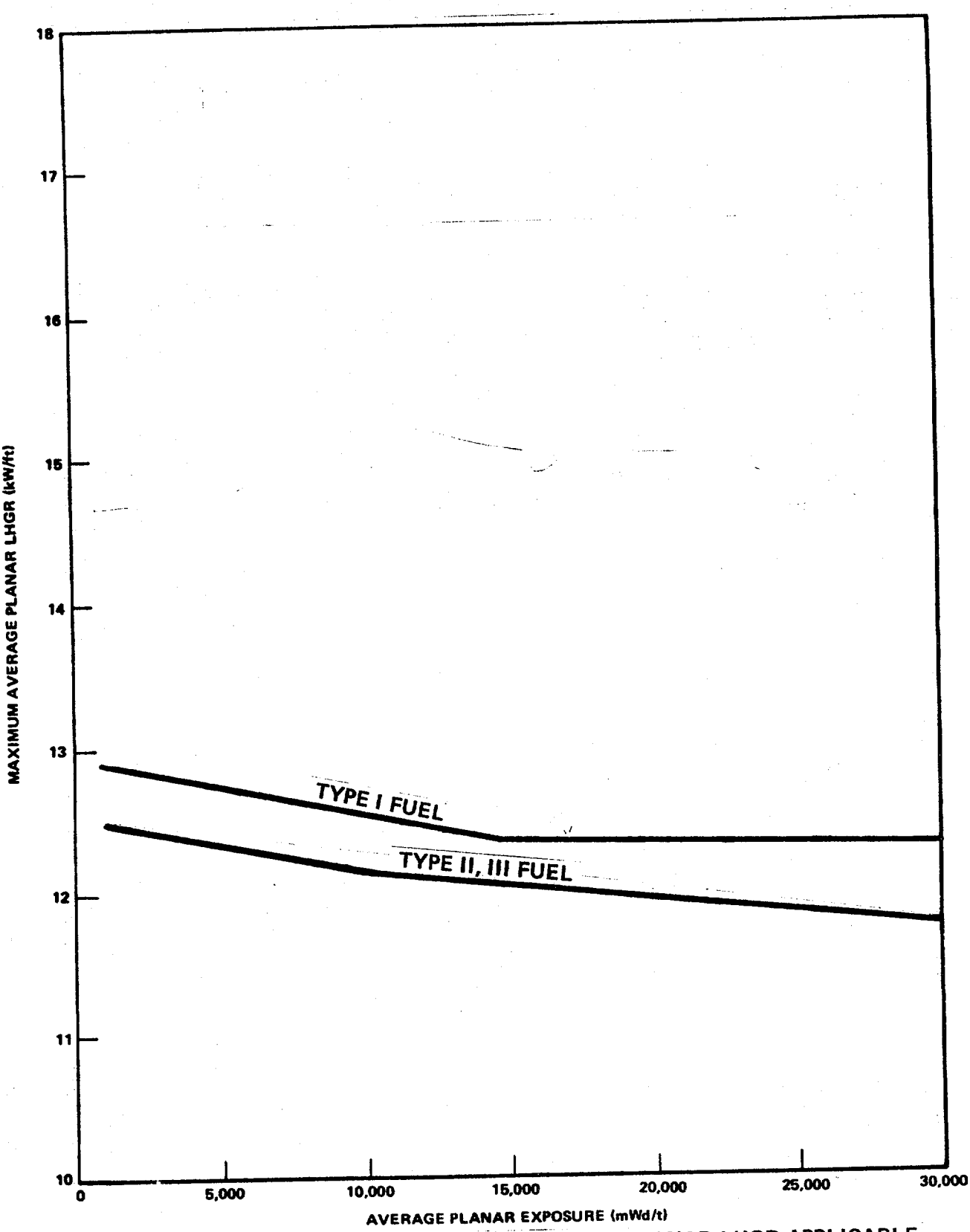

FIGURE 3.5.1 MAXIMUM ALLOWABLE AVERAGE PLANAR LHGR APPLICABLE TO FUEL TYPE INITIAL CORE, TYPE I, II, III.

3.5 Limiting Conditions for Operation Bases

J. Average Planar LHGR

This specification assures that the peak cladding temperature following the postulated design basis loss-of-coolant accident will not exceed the 2300°F limit specified in the Interim Acceptance Criteria (IAC) issued in June 1971 considering the postulated effects of fuel pellet densification.

The peak cladding temperature following a postulated loss-of-coolant accident is primarily a function of the average heat generation rate of all the rods of a fuel assembly at any axial location and is only dependent secondarily on the rod to rod power distribution within an assembly. Since expected local variations in power distribution within a fuel assembly affect the calculated peak clad temperature by less than ±20°F relative to the peak temperature for a typical fuel design, the limit on the average linear heat generation rate is sufficient to assure that calculated temperatures are below the IAC limit.

The maximum average planar LHGR shown in Figure 3.5.1 is the same as that shown on the curve labeled "γ" (gamma) on Figures 4-9K1, 4-9K2, 4-9L1 and 4-9L2 of the GE topical report "Fuel Densification Effects on General Electric Boiling Water Reactor Fuel," NEDM-10735, Supplement 6, August 1973 and is the result of the calculations presented in Section 4.3.4 of the same report. These calculations were made to determine the effect of densification on peak clad temperature and were performed in accordance with the AEC Fuel Densification Model for BWR's which is attached to NEDM-10735, Supplement 6 as Appendix B.

The possible effects of fuel pellet densification were: (1) creep collapse of the cladding due to axial gap formation; (2) increase in the LHGR because of pellet column shortening; (3) power spikes due to axial gap formation; and (4) changes in stored energy due to increased radial gap size. Calculations show that clad collapse is conservatively predicted not to occur currently or prior to September 1974. Therefore, clad collapse is not considered in the analyses. Since axial thermal expansion of the fuel pellets is greater than axial shrinkage due to densification the analyses of peak clad temperature do not consider any change in LHGR due to pellet column shortening. Although the formation of axial gaps might produce a local power spike at one location on any one rod in a fuel assembly, the increase in local power density would be on the order of only 2% at the axial midplane. Since small local variations in power distribution have a small effect on peak clad temperature, power spikes were not considered in the analysis of loss-of-coolant accidents.

3.5 Limiting Conditions for Operation Bases (cont)

Changes in gap size affect the peak clad temperature by their effect on pellet clad thermal conductance and fuel pellet stored energy. The pellet-clad thermal conductance assumed for each rod is dependent on the steady state operating linear heat generation rate and the gap size. As specified in the AEC Fuel Densification Model for BWRs, the gap size was calculated assuming that the pellet densified from the measured pellet density to 96.5% of theoretical density. For the most critical rod, the two standard deviation lower bound on initial pellet density was assumed. For the other 48 rods the two standard deviation lower bound on the initial mean "boat" pellet density was assumed.

The curves used to determine pellet-clad thermal conductance as a function of linear heat generation are based on experimental data and predict with a 95% confidence that 90% of the population exceed the predictions.

K. Local LHGR

This specification assures that the linear heat generation rate in any rod is less than the design linear heat generation even if fuel pellet densification is postulated. The power spike penalty specified is based on the analysis presented in Section 3.2.1 of the GE topical report NEDM-10735 Supplement 6, and assumes a linearly increasing variation in axial gaps between core bottom and top, and assures with a 95% confidence, that no more than one fuel rod exceeds the design linear heat generation rate due to power spiking.

4.5.J&K Surveillance Requirements Bases

Average and Local LHGR

The LHGR shall be checked daily to determine if fuel burnup or control rod movement has caused changes in power distribution. Since changes due to burnup are slow and only a few control rods are moved daily, a daily check of power distribution is adequate.