J. Barnie Beasley, Jr., P.E.
Vice President
Vogtle Project

Southern Nuclear
Operating Company, Inc.
40 Inverness Center Parkway
P.O. Box 1295
Birmingham, Alabama 35201

Tel 205.992.7110
Fax 205.992.0403

SOUTHERN COMPANY
*Energy to Serve Your World*™

October 5, 2000

LCV-1473

Docket Nos. 50-424
50-425

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Ladies and Gentlemen:

VOGTLE ELECTRIC GENERATING PLANT
FINAL SAFETY ANALYSIS REPORT CHANGE REQUEST
IODINE SPIKING DUE TO INCREASED LETDOWN FLOW RATE

In accordance with the provisions of 10 CFR 50.90, Southern Nuclear Operating Company (SNC) proposes to revise the Vogtle Electric Generating Plant (VEGP) Updated Final Safety Analysis Report (UFSAR) Chapters 11 and 15. The revision incorporates changes due to revisions to Dose Equivalent Iodine (DEI) analyses. Enclosure 1 contains the safety analysis explaining the technical basis for the change, Enclosure 2 contains the 10 CFR 50.92 Significant Hazards Evaluation, and Enclosure 3 contains markups of the affected UFSAR pages. Additional issues identified in Westinghouse Nuclear Safety Advisory Letter NSAL-00-004, "Nonconservatisms in Iodine Spiking Calculations," are also discussed. The proposed changes to UFSAR Chapters 11 and 15 are provided for your review and approval. Upon approval, these changes will be incorporated into the appropriate UFSAR revision.

SNC is taking the following steps to address this issue:

Impacted accident dose analyses were re-performed and shielding analyses were evaluated for the bounding letdown flow and Technical Specification DEI limits. The existing VEGP dose analyses assume a design flow of 75 GPM, while plant procedures permit operation with a letdown flow rate of 120 gpm. A letdown flow rate of 132 GPM was assumed to accommodate higher letdown flow plus flow measurement uncertainty. Additional assumptions were made to address demineralizer efficiency and allowed RCS leakage as recommended in Westinghouse NSAL-00-004.

There will be a slight increase in the accident initiated iodine spike thyroid doses for a Steam Generator Tube Rupture or a Main Steam Line Break. SNC has determined that this represents an unreviewed safety question as currently defined by 10CFR 50.59.

Sufficient margins in source terms were available to offset any adverse impacts to analyses for shielding. Additionally, source terms for calculated normal releases experienced a reduction at increased letdown such that the doses at the original letdown rate of 75 GPM remain bounding.

A053

Prior to recalculating the affected accident dose analysis, SNC imposed administrative limits on DEI as recommended by NSAL 00-004. These administrative controls ensure that the current accident analysis assumptions and Technical Specifications are met.

If you have any questions, please advise.

Mr. J. B. Beasley, Jr. states that he is a Vice President of Southern Nuclear Operating Company and is authorized to execute this oath on behalf of Southern Nuclear Operating Company and that, to the best of his knowledge and belief, the facts set forth in this letter are true.

SOUTHERN NUCLEAR OPERATING COMPANY

By: _____
J. B. Beasley, Jr.

*Sworn to and subscribed before me this* 5th *day of* October, *2000.*

_____
*Notary Public*

*My commission expires:* 11/10/02

JBB/JPC

Enclosure 1: Safety Analysis
Enclosure 2: Significant Hazards Evaluation
Enclosure 3: Markups of Affected UFSAR Pages

cc: Southern Nuclear Operating Company
Mr. J. T. Gasser
Mr. M. Sheibani
SNC Document Management

U. S. Nuclear Regulatory Commission
Mr. L. A. Reyes, Regional Administrator
Mr. Ramin R. Assa, Vogtle Project Manager, NRR
Mr. J. Zeiler, Senior Resident Inspector, VEGP

ENCLOSURE 1

# VOGTLE ELECTRIC GENERATING PLANT
# FINAL SAFETY ANALYSIS REPORT CHANGE REQUEST
# IODINE SPIKING DUE TO INCREASED LETDOWN FLOW RATE

## SAFETY ANALYSIS

### Introduction and Background

The proposed license amendment request is to revise UFSAR described offsite dose analyses based on changes to the letdown flow rate and iodine spike postulated concurrent with a Main Steam Line Break (MSLB) or a Steam Generator Tube Rupture (SGTR). The proposed UFSAR changes included with this submittal are based on analyses and evaluations of the impact of an increased letdown flow rate on the RCS iodine concentration and normal appearance rate. Other limiting accidents are unaffected because they do not model iodine spikes (Waste Gas Decay Tank Failure or Fuel Handling Accident) or the iodine spike source term is insignificant compared to the fuel damage source term (LOCA, Control Rod Ejection, Locked Rotor).

Beaver Valley Event Notification #35359 identified potentially non-conservative assumptions with respect to letdown flow used in calculating the iodine appearance rate modeled in post-accident radiation dose analyses. Westinghouse issued a Nuclear Safety Advisory Letter, "NSAL-00-04: Nonconservatisms in Iodine Spiking Calculations," discussing this issue and several other potential issues:

- Letdown flow rate - The original analyses were based on a letdown flow rate of 75 gpm. VEGP currently operates with a normal flow rate of approximately 75 gpm and a maximum allowable flow rate of 120 gpm. For any assumed initial RCS dose equivalent iodine (DEI) concentration, a higher letdown flow rate would be balanced by a higher normal appearance rate to maintain the assumed equilibrium DEI concentration. The accident analyses assume that the RCS DEI is at the maximum value allowed by Technical Specifications.

- Letdown demineralizer efficiency - A higher demineralizer efficiency removes more iodine which would be balanced by a higher normal appearance rate to maintain the assumed equilibrium DEI concentration. A maximum demineralizer efficiency of 100 % was assumed.

- Primary coolant leakage - Higher RCS leakage also removes more iodine which would be balanced by a higher normal appearance rate to maintain the assumed equilibrium DEI concentration. The maximum RCS leakage assumed by Technical Specifications (12 gpm) is assumed.

- Letdown flow rate uncertainty - Uncertainty in the flow rate effectively increases the potential removal which would be balanced by a higher normal appearance rate to maintain the assumed equilibrium DEI concentration. A plus 10 % uncertainty is assumed.

- Primary coolant mass - A larger primary coolant mass increases the initial inventory, which increases the normal appearance rate. This is not applicable to VEGP as a conservatively large RCS mass was assumed in the original analyses.

The concurrent iodine spike modeled for the MSLB and SGTR increases relative to the increase in letdown flow rate (from 75 gpm to 132 gpm plus RCS leakage), thereby affecting the radiological analyses in sections 15.1.5 and 15.6.3 of the UFSAR. In addition, the higher

## SAFETY ANALYSIS

letdown flow rate was evaluated for its impact on the RCS activity assumed for radwaste system design and shielding design discussed in chapters 11 and 12 of the UFSAR.

For the RCS activity model discussed in UFSAR section 11.1, an increase in the letdown flow rate will result in a decrease in the RCS activity concentrations. The GALE computer code analysis was re-evaluated, and the resultant liquid and gaseous releases were confirmed to decrease. Therefore, the current descriptions in UFSAR chapter 11 remain bounding.

The source terms for the cumulative radiation dose for 40 years of normal operations described in section 3.11 of the UFSAR and for shielding design described in UFSAR chapter 12 are based on 1% defective fuel. These liquid and gaseous process activities would also decrease with an increasing letdown flow rate. Technical Specifications for the RCS limit the DEI activity to a maximum of 1.0 μCi/gm. Although the process flow rate may increase by approximately 132/75, the input activity (concentration times flow rate) for components which concentrate activity, e.g. filters, demineralizers, and evaporators, originally used to calculate shielding source terms remains bounding. The letdown flow rate does not impact core activity, so the post-LOCA source terms are not affected. Therefore, the radiation protection features and programs described in UFSAR section 3.11 and chapter 12 remain acceptable.

The concurrent iodine spike for the MSLB and SGTR is modeled as 500 times the normal appearance rate. Since the normal appearance rate is in equilibrium with the normal cleanup rate, the increase in letdown flow will result in an increase in the normal appearance rate and hence the concurrent iodine spike. Using the revised iodine spike source terms, the affected offsite doses were recalculated.

The resultant offsite thyroid doses are compared to the previously submitted results in Table 1. Control room doses for a LOCA were previously shown to be limiting. The small changes in offsite thyroid doses for MSLB and SGTR would have a similarly small impact on control room doses. The limiting control room thyroid doses for a LOCA remain unchanged and continue to meet GDC 19 limits. The iodine spike has an insignificant affect on the whole body or skin doses. All doses meet the applicable acceptance criteria from the Standard Review Plan, NUREG-0800.

### TABLE 1

### ACCIDENT INITIATED IODINE SPIKE OFFSITE THYROID DOSES (rem)

| | EAB* Revised Letdown | EAB Current FSAR | LPZ** Revised Letdown | LPZ Current FSAR |
|---|---|---|---|---|
| MSLB | 1.1 | 0.9 | 1.1 | 1.0 |
| SGTR | 12.8 | 6.0 | 5.4 | 3.0 |

* Exclusion Area Boundary
** Low Population Zone

ENCLOSURE 2

# VOGTLE ELECTRIC GENERATING PLANT
# FINAL SAFETY ANALYSIS REPORT CHANGE REQUEST
# IODINE SPIKING DUE TO INCREASED LETDOWN FLOW RATE

## SIGNIFICANT HAZARDS EVALUATION

### Introduction and Background

Southern Nuclear Operating Company (SNC) has completed a comprehensive review of the Beaver Valley Event Notification #35359 and Westinghouse Nuclear Safety Advisory Letter, "NSAL-00-04: Nonconservatisms in Iodine Spiking Calculations," which identified potentially non-conservative assumptions with respect to letdown flow used in calculating the iodine appearance rate modeled in post-accident radiation dose analyses. In addition, letdown demineralizer efficiency, letdown flow rate uncertainty, primary coolant leakage, and primary coolant mass assumptions were reviewed.

The values of the parameters used in the original analyses were reviewed, and changes to the letdown flow rate, flow rate uncertainty, demineralizer efficiency and RCS leakage are required to bound current operations. The impacts of the changes on radiological consequences of accidents, offsite doses from normal operation and anticipated operational occurrences, safety-related electrical equipment qualification doses, and plant shielding were examined.

### Proposed Changes

The original FSAR described analyses were based on a letdown flow rate of 75 gpm. VEGP currently operates with a normal letdown flow rate of 75 gpm, but allows a maximum flow rate of approximately 120 gpm. Uncertainty in the flow rate effectively increases the potential removal. The uncertainty for VEGP was assumed to be 10 %, resulting in maximum value of 132 gpm for any measurement/indication loop. The letdown demineralizers were assumed to be 100 % efficient and RCS leakage was assumed to be the maximum value allowed by Technical Specifications. For any assumed initial RCS dose equivalent iodine (DEI) concentration, a higher letdown flow rate would be balanced by a higher normal appearance rate to maintain the assumed equilibrium DEI concentration. An accident initiated iodine spike equal to 500 times the normal appearance rate was used to re-evaluate the offsite doses for a steam generator tube rupture (SGTR) and main steam line break (MSLB). Using the revised iodine spike source terms, the affected offsite doses were recalculated.

For the RCS activity model discussed in UFSAR section 11.1, an increase in the letdown flow rate will result in a decrease in the RCS activity concentrations. The GALE computer code analysis was re-evaluated, and the resultant liquid and gaseous releases were confirmed to decrease as the letdown rate was increased. Therefore, the current descriptions in UFSAR chapter 11 remain bounding.

The source terms for the cumulative radiation dose for 40 years of normal operations described in section 3.11 of the UFSAR and for shielding design described in UFSAR chapter 12 are based on 1% defective fuel. These liquid and gaseous process activities would decrease with an increasing letdown flow rate. Technical Specifications for the RCS limit the DEI activity to a maximum of 1.0 μCi/gm. Although the process flow rate may increase, the input activity (concentration times flow rate) for components which concentrate activity, e.g. filters, demineralizers, and evaporators, originally used to calculate shielding source terms remains bounding. The letdown flow rate does not impact core activity, so the post-LOCA source terms are not affected.

ENCLOSURE 2

# VOGTLE ELECTRIC GENERATING PLANT
# FINAL SAFETY ANALYSIS REPORT CHANGE REQUEST
# IODINE SPIKING DUE TO INCREASED LETDOWN FLOW RATE

## SIGNIFICANT HAZARDS EVALUATION

### 10 CFR 50.92 Evaluation

The impacts of the proposed UFSAR changes in letdown flow rate on offsite doses from normal operation and anticipated operational occurrences, safety-related electrical equipment qualification doses, and plant shielding were evaluated. Normal operation releases calculated with the GALE computer code decreased, and the source terms used for plant shielding and doses to safety-related electrical equipment are unchanged or decreased. Therefore, it is concluded that no changes to the evaluations and analyses for these topics previously submitted are required.

The changes in letdown rate, demineralizer efficiency, and RCS leakage result in increased accident-induced iodine spike source terms. The MSLB and SGTR offsite dose consequences were reanalyzed for the increased iodine spike source terms. The results of the offsite dose analyses show only slight changes from the current UFSAR, and all results continue to meet the acceptance criteria as described in the safety evaluation reports. The limiting control room thyroid doses for a LOCA remain unchanged and continue to meet GDC 19 limits.

Based on the analyses and evaluations performed for the increase in letdown flow rate, the following conclusions can be reached with respect to 10 CFR 50.92:

1. The proposed changes do not significantly increase the probability or consequences of an accident previously evaluated in the UFSAR. The comprehensive engineering review included evaluations or reanalysis of all accident analyses. The letdown flow rate does not initiate any accident; therefore, the probability of an accident has not been increased. All dose consequences have been analyzed or evaluated with respect to the proposed changes, and all acceptance criteria continue to be met. Therefore, these changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. The proposed changes do not create the possibility of a new or different kind of accident than any accident already evaluated in the UFSAR. No new accident scenarios, failure mechanisms or limiting single failures are introduced as a result of the proposed changes. The changes have no adverse effects on any safety-related system and do not challenge the performance or integrity of any safety-related system. Therefore, all accident analyses criteria continue to be met, and these changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. The proposed changes do not involve a significant reduction in a margin of safety. All analyses and evaluations using these inputs have been revised to reflect the proposed values. The evaluations and analyses results demonstrate that applicable acceptance criteria are met. Therefore, the proposed changes do not involve a significant reduction in the margin of safety.

Based on the previous information and on the analyses and evaluations performed, the proposed changes do not involve a significant hazards consideration as defined in 10 CFR 50.92.

**ENCLOSURE 3**

**VOGTLE ELECTRIC GENERATING PLANT**
**FINAL SAFETY ANALYSIS REPORT CHANGE REQUEST**
**IODINE SPIKING DUE TO INCREASED LETDOWN FLOW RATE**

**MARKUPS OF AFFECTED UFSAR PAGES**

TABLE 11.1-8 (SHEET 1 OF 3)

PARAMETERS SPECIFIED BY REGULATORY GUIDE 1.112 APPENDIX B
(INPUT PARAMETERS FOR THE GALE COMPUTER CODE)

| Description | Value |
|---|---|
| Thermal power level (MWt) | 3565 |
| Mass of primary coolant (lb) | $5.1 \times 10^5$ |
| Primary system letdown rate (gal/min) | 75[a] |
| Letdown cation demineralizer flowrate (gal/min) | 7.5 |
| Number of steam generators | 4 |
| Total steam flow (lb/h) | $15.14 \times 10^6$ |
| Mass of steam in each steam generator (lb) | $6.4 \times 10^3$ |
| Mass of liquid in each steam generator (lb) | $1.11 \times 10^5$ |
| Total mass of secondary coolant | $2.022 \times 10^6$ |
| Total blowdown rate (lb/h) | $1.8 \times 10^5$ |
| Condensate demineralizer regeneration time | 0.0 |
| Condensate demineralizer flow fraction | 0.0 |
| Maximum radwaste dilution flow (gal/min) | $15.5 \times 10^3$ |
| **Shim Bleed** | |
| Shim bleed flowrate (gal/day) | $1.7 \times 10^3$ |
| Decontamination factor for I | $10^6$ |
| Decontamination factor for Cs and Rb | $1.6 \times 10^4$ |
| Decontamination factor for others | $10^8$ |
| Collection time (day) | 22.4 |
| Process and discharge time (day) | 0.31 |
| Fraction discharged | 1.0 |
| **Equipment Drains** | |
| Equipment drains flowrate (gal/day) | 300 |
| Fraction of reactor coolant activity | 1.0 |
| Decontamination factor for I | $10^5$ |
| Decontamination factor for Cs and Rb | $8 \times 10^3$ |
| Decontamination factor for others | $1 \times 10^7$ |
| Collection time (day) | 22.4 |
| Process and discharge time (day) | 2.1 |
| Fraction discharged | 0.25 |
| **Clean Waste** | |
| Clean waste input flowrate (gal/day) | $7.13 \times 10^2$ |
| Fraction of reactor coolant activity | 0.051 |
| Decontamination factor for I | $10^4$ |
| Decontamination factor for Cs and Rb | $4 \times 10^3$ |
| Decontamination factor for others | $1 \times 10^6$ |

TABLE 11.1-8 (SHEET 3 OF 3)

| Description | Value |
|---|---|
| **Gaseous Waste System** | |
| Holdup time for xenon (day) | 90 |
| Holdup time for krypton (day) | 90 |
| Fill time of decay tanks for gas stripper | 0.0 |
| Gas waste system: HEPA? | Yes |
| Auxiliary building: charcoal? | Yes |
| Auxiliary building: HEPA? | Yes |
| Containment volume ($ft^3$) | $2.75 \times 10^6$ |
| Containment atmosphere cleanup rate ($ft^3$/min) | $30 \times 10^3$ |
| Containment shutdown purge: charcoal?, HEPA? | Yes, yes |
| Number purge per year | 4 |
| Containment normal purge rate ($ft^3$/min); charcoal?, HEPA? | 5000; yes, yes |
| Fraction of iodine released from blowdown tank vent | 0 |
| Fraction of iodine released from main condenser air ejector | 1.0 |
| Detergent waste decontamination factor | 1.0 |

(a) The primary system letdown rate of 75 gpm results in effluent releases and doses which bound those for higher letdown rates to the maximum design flow of 120 gpm.

TABLE 15.1.5-2 (SHEET 2 OF 3)

| | |
|---|---|
| II. Atmospheric Dispersion Factors | See table 15A-2. |
| III. Activity Release Data for the Steam Generator in the Faulted Loop | |
| A. Primary-to-secondary leakrate (gal/min)[a] | 0.35 |
| B. Steam released (lb) | |
| 0 to 0.5 h | 167,000 |
| 0.5 to 8.0 h | 945 |
| C. Iodine Partition Factor | 1 |
| IV. Activity Release Data for the Steam Generators in the Intact Loops | |
| A. Primary-to-secondary leakrate (gal/min)[a] | 0.65 |
| B. Steam released (lb) | |
| 0 to 2 h | 424,000 |
| 2 to 8 h | 960,000 |
| C. Iodine partition factor | 0.01 |

V. Activity Released to the Environment

A. Accident initiated spike

| Isotope | 0 to 2 h (Ci) | 2 to 8 h (Ci) |
|---|---|---|
| I-131 | ~~7.0~~ 12.2 | ~~26.5~~ 37.4 |
| I-132 | ~~17.0~~ 20.2 | ~~53.8~~ 34.9 |
| I-133 | ~~12.2~~ 20.4 | ~~50.3~~ 59.2 |
| I-134 | ~~7.0~~ 7.1 | ~~11.5~~ 3.5 |
| I-135 | ~~8.9~~ 13.7 | ~~37.2~~ 33.7 |

a. Based on water at 590°F, 2250 psia.

TABLE 15.1.5-2 (SHEET 3 OF 3)

B. Preaccident spike

| Isotope | 0 to 2 h (Ci) | 2 to 8 h (Ci) |
|---|---|---|
| I-131 | ~~9.1~~ 11.7 | ~~16.0~~ 24.1 |
| I-132 | ~~7.4~~ 1.0 | ~~4.0~~ 0.6 |
| I-133 | ~~13.3~~ 17.2 | ~~21.0~~ 31.1 |
| I-134 | ~~1.4~~ 1.5 | ~~0.2~~ 0.2 |
| I-135 | ~~7.0~~ 9.0 | ~~8.0~~ 12.2 |

C. Noble gases (both cases)

| Isotope | 0 to 2 h (Ci) | 2 to 8 h (Ci) |
|---|---|---|
| Xe-131m | ~~0.5~~ 0.9 | ~~2.1~~ 3.0 |
| Xe-133m | ~~5.5~~ 7.1 | ~~16.0~~ 22.1 |
| Xe-133 | ~~67.0~~ 113 | ~~254.0~~ 364 |
| Xe-135m | 0.03 | $1.0 \times 10^{-4}$ |
| Xe-135 | ~~2.0~~ 2.8 | ~~5.0~~ 6.9 |
| Xe-138 | ~~0.04~~ 0.05 | $3.0 \times 10^{-4}$ |
| Kr-85m | ~~0.4~~ 0.7 | ~~0.9~~ 1.3 |
| Kr-85 | ~~1.8~~ 3.1 | ~~7.0~~ 10.1 |
| Kr-87 | ~~0.2~~ 0.3 | ~~0.1~~ 0.2 |
| Kr-88 | ~~0.6~~ 1.2 | ~~1.1~~ 1.6 |

TABLE 15.1.5-3

RADIOLOGICAL CONSEQUENCES OF A MAIN STEAM LINE BREAK

| | Doses (rem) |
|---|---|
| **Case 1 - Accident Initiated Iodine Spike** | |
| Exclusion area boundary (0 to 2 h) Thyroid | ~~0.9~~ 1.1 |
| Low population zone outer boundary (8 h) Thyroid | ~~1.0~~ 1.1 |
| **Case 2 - Preaccident Iodine Spike** | |
| Exclusion area boundary (0 to 2 h) Thyroid | ~~1.1~~ 1.02 |
| Low population zone outer boundary (8 h) Thyroid | ~~0.79~~ 0.78 |
| **Both Cases - Whole-Body Gamma** | |
| Exclusion area boundary (0 to 2 h) | ~~$2.7 \times 10^{-4}$~~ <0.01 |
| Low population zone outer boundary (8 h) | ~~$2.2 \times 10^{-4}$~~ <0.01 |

TABLE 15.6.3-5

IODINE SPECIFIC ACTIVITIES
IN THE PRIMARY AND SECONDARY COOLANT
BASED ON 1, 60, AND 0.1 μCi/gram OF D.E. I-131

| | Specific Activity (μ Ci/gm) | | |
|---|---|---|---|
| | Primary Coolant | | Secondary Coolant |
| Nuclide | 1 μCi/gm | 60 μCi/gm | 0.1 μCi/gm |
| I-131 | ~~0.78~~ 0.79 | ~~46.8~~ 47.1 | ~~0.078~~ 0.079 |
| I-132 | ~~0.78~~ 0.79 | ~~46.8~~ 47.1 | ~~0.078~~ 0.079 |
| I-133 | ~~1.17~~ 1.18 | ~~70.2~~ 70.6 | ~~0.012~~ 0.118 |
| I-134 | 0.16 | 9.6 | 0.016 |
| I-135 | 0.64 | ~~38.4~~ 38.7 | 0.064 |

TABLE 15.6.3-6

IODINE SPIKE APPEARANCE RATES[a]
(CURIES/SECOND)

| I-131 | I-132 | I-133 | I-134 | I-135 |
|---|---|---|---|---|
| ~~1.7~~ 3.7 | ~~9.2~~ 11.0 | ~~3.7~~ 6.6 | ~~4.4~~ 4.8 | ~~3.5~~ 5.1 |

a. Based on RCS leakage of 12 gpm and letdown flow of 132 gpm (120 gpm design letdown flow plus 10%).

TABLE 15.6.3-11

OFFSITE RADIATION DOSES

| | Doses (rem) Calculated Value | Allowable Guideline Value |
|---|---|---|
| **1. Accident Initiated Iodine Spike** | | |
| Exclusion Area Boundary (0-2 h) Thyroid Dose | 12.8 ~~6.0~~ | 30 |
| Low Population Zone (0-8 h) Thyroid Dose | 5.4 ~~3.0~~ | 30 |
| **2. Preaccident Iodine Spike** | | |
| Exclusion Area Boundary (0-2 h) Thyroid Dose | 21.0 ~~18.0~~ | 300 |
| Low Population Zone (0-8 h) Thyroid Dose | 8.7 ~~8.0~~ | 300 |
| **3. Whole-Body Gamma and Beta-Skin Dose** | | |
| Exclusion Area Boundary (0-2 h) Whole-Body Gamma Dose | ~~0.15~~ 0.1 | 2.5 |
| Beta-Skin Dose | ~~0.20~~ 0.4 | not specified |
| Low Population Zone (0-8 h) Whole-Body Gamma Dose | 0.05 | 2.5 |
| Beta-Skin Dose | ~~0.10~~ 0.2 | not specified |

TABLE 15A-5

DOSE CONVERSION FACTORS USED IN ACCIDENT ANALYSIS[a]

| Nuclide | Total Body $\frac{rem\text{-}m^3}{Ci\text{-}s}$ | Beta Skin $\frac{rem\text{-}m^3}{Ci\text{-}s}$ | Thyroid (rem/Ci)[b] |
|---|---|---|---|
| I-131 | NA | NA | 1.49E+6 |
| I-132 | NA | NA | 1.43E+4 |
| I-133 | NA | NA | 2.69E+5 |
| I-134 | NA | NA | 3.73E+3 |
| I-135 | NA | NA | 5.60E+4 |
| Kr-85m | 3.71E-2 | 4.63E-2 | NA |
| Kr-85 | 5.11E-4 | 4.25E-2 | NA |
| Kr-87 | 1.88E-1 | 3.09E-1 | NA |
| Kr-88 | 4.67E-1 | 7.52E-2 | NA |
| Xe-131m | 2.91E-3 | 1.51E-2 | NA |
| Xe-133m | 7.97E-3 | 3.15E-2 | NA |
| Xe-133 | 9.33E-3 | 9.70E-3 | NA |
| Xe-135m | 9.91E-2 | 2.25E-2 | NA |
| Xe-135 | 5.75E-2 | 5.90E-2 | NA |
| Xe-138 | 2.80E-1 | 1.31E-1 | NA |

a. Dose conversion factors from International Commission on Radiological Protection (ICRP) 2 have been used in dose calculations performed subsequent to 1995.

b. Dose conversion factors from International Commission on Radiological Protection (ICRP) 30 have been used for SGTR and MSLB calculations. See table 15.6.3-9.

TABLE 15A-6

REACTOR COOLANT IODINE CONCENTRATIONS FOR 1 µCi/g AND 60 µCi/g OF DOSE EQUIVALENT I-131[a]

| Nuclide | Reactor Coolant Concentration (µCi/g) 1 µCi/g Dose Equivalent I-131 | 60 µCi/g Dose EquivalentI-131 |
|---|---|---|
| I-131 | 0.76 | 45.6 |
| I-132 | 0.76 | 45.6 |
| I-133 | 1.14 | 68.4 |
| I-134 | 0.195 | 11.7 |
| I-135 | 0.63 | 37.8 |

a. SGTR and MSLB calulations used values based on International Commission on Radiological Protection (ICRP) 30. See table 15.6.3-5.

TABLE 15A-7

IODINE APPEARANCE RATES IN THE REACTOR COOLANT (Ci/s)[c]

| | Equilibrium Appearance Rates due to Fuel Defects[a] | Appearance Rates Due to an Accident-Initiated Iodine Spike[b] |
|---|---|---|
| I-131 | $3.4 \times 10^{-3}$ | 1.7 |
| I-132 | $1.8 \times 10^{-2}$ | 9.0 |
| I-133 | $7.2 \times 10^{-3}$ | 3.6 |
| I-134 | $1.1 \times 10^{-2}$ | 5.5 |
| I-135 | $6.8 \times 10^{-3}$ | 3.4 |

a. Based on RCS concentration of 1 μCi/g of dose equivalent I-131.

b. 500 x equilibrium appearance rate. These appearance rates are assumed to revert to the above equilibrium appearance rates once the reactor coolant iodine level increases to 100 μCi/g dose equivalent I-131.

c. SGTR and MSLB calculations used values based on International Commission on Radiological Protection (ICRP) 30. See table 15.6.3-6.

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