Containment Integrated Leak Rate Testing (ILRT) Frequency

Nuclear Regulatory Commission

Public Meeting

July 12, 2001

NEI

Containment ILRT - Topics

- Background
- Benefits of Generic Change
- Technical Approach -
  - Operational Experience Assessment
  - Risk Assessment
- Revised Industry Guidance

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Containment ILRT - Background

- 10CFR50, Appendix J, Option B, Performance-Based Requirements
- NRC Reg Guide 1.163
- NEI 94-01, Rev 0, "Industry Guidelines for Implementing Performance-Based Option of 10CFR50, Appendix J"

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Containment ILRT - Current Test Intervals

- NEI 94-01 Specifies:
  - Preoperational Type A Test
  - First Periodic Type A Test Within 48 months
  - Type A Test at Least Once Every 10 Years Based On Acceptable Performance History
- Acceptable Performance History is two consecutive periodic Type A tests with leakage rate < $1.0L_a$

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Containment ILRT - Other Tests and Inspections

- Appendix J, Type B and C Tests - Not Affected
- ASME B&PV Code, Section XI [10CFR50.55a(b)(2)]
  - IWE - Requires Periodic Examination of Class MC and Liners of Class CC Components
  - IWL - Requires Periodic Examination of Class CC Components
- Maintenance Rule [10CFR50.65]
  - Requires Performance or Condition Monitoring of Containment Structure

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Containment ILRT - Current Industry Trends

- Individual Licensing Actions for Tech Spec Change to Permit Type A Test Once per 15 (or 16) Years
  - Indian Point 3 (Approved by NRC), Crystal River, Peach Bottom 3
- Other Individual Requests Planned
  - Hatch, Seabrook, Diablo Canyon, South Texas Project, et. al.

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Containment ILRT - Benefits of Generic Change

- Consistent With NRC Strategies To:
  - "…develop and incrementally use risk-informed and, where appropriate, less prescriptive performance-based regulatory approaches to maintain safety."
  - "…utilize risk information and performance-based approaches to reduce unnecessary regulatory burden."

  Ref: U.S. NRC Strategic Plan

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Containment ILRT - Benefits of Generic Change

- Reduces
  - Cost
  - Outage Duration
  - Radiation exposure
- Generic Change Reduces NRC and Licensee Workload for Individual Licensing Actions
- Change in Applicable Risk Metric (population person-rem) Remains Inconsequential

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Containment ILRT - Generic Change Approach

- Revise NEI 94-01 to Specify Type A Test at Least Once Every 20 Years Based On Acceptable Performance History
- NRC Endorsement via Revision to Reg Guide 1.163

Containment ILRT - Operating Experience

- Risk associated with extending containment ILRT surveillance intervals is primarily associated with:
  - Leakage paths detectable only by ILRTs, and
  - The length of time which a potential leak path is not detected.
- Experience prior to 1994 indicated that:
  - Only about 3% of leak paths were identified by ILTRs only, and
  - The average time that a leak detectable only by ILRT went undetected was 18 months

Containment ILRT - Operating Experience (cont)

- The purpose of the experience update is to determine on an industry-wide basis if the frequency of occurrences of identification of leakage paths identifiable only by ILRT have changed.
  - Review Industry ILRT Experience Subsequent to 1994
  - Determine if Previous Results Remain Valid
  - Document Results in an Update to EPRI Report TR-104285

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Containment ILRT - Interval Extension Methodology

- Risk Impact Bases for NRC Approval of Current Option B Requirements
  - Extending the ILRT surveillance interval from three to ten years would result in an increase in the average time a leak would go undetected from 18 to 60 months and an corresponding 10% increase in the overall probability of leakage, with an attendant increase in the risk metric, population dose of 0.04 person-rem (NUREG-1493), or ~0.03% of integrated value (EPRI TR-104285).
- Risk Impact of Proposed Change
  - Increasing the surveillance interval from three to twenty years would result in an increase of the population dose of 0.05 person-rem (NUREG-1493).

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Containment ILRT - Interval Extension Methodology (cont)

- Based on industry experience information collected to date, the frequency of occurrence of leakage paths detectable only by ILRT is not expected to increase.
- Since the associated expected change in the Risk Metric frcm 0.04 to 0.05 person-rem (NUREG-1493) is considered to be a minimal and inconsequential change, it is planned to document the basis for the assessment, the frequency of occurrence of leakage paths detectable on by ILRT and to then apply this to update the EPRI assessment (EPRI TR-104285).
- The risk assessment update and experience update will be documented in an EPRI report.

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Containment ILRT - Proposed Actions

- Revise NEI 94-01 September 2001
- Seek NRC Endorsement via revision to Reg Guide 1.163
- Submit TSTF to Change Technical Specification Standard Reference
- Use CLIIP for Licensee Implementation

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Reproduction of Crystal River calculation to extend Type A Test Interval
From 1 in 10 Years to 1 in 15 Years

From Table 6 on page 9 of Crystal River's April 25, 2001 submittal

CDF = 1.38E-05
No containment failure frequency = 4.00E-06

Table 1 - Baseline Mean Consequence Measures

Class	Description	Frequency per Rx-yr	Persn-Rem	Persn-Rem per year
1	No Containment Failure	2.81E-06	9.87E+02	2.78E-03
2	Large Cont Isolation Failures (failure to close)	9.24E-08	6.58E+05	6.08E-02
3a	Small Isolation Failure (Type A test)	8.83E-07	9.87E+03	8.72E-03
3b	Large Isolation Failure (Type A test)	2.90E-07	3.45E+04	1.00E-02
6	Other Isolation Failures (dependent failures)	1.38E-08	3.45E+04	4.77E-04
7	Severe Accident Phenomena (Early and Late)	9.06E-06	1.97E+05	1.78E+00
8	Containment Bypassed (SGTR)	6.69E-07	2.02E+05	1.35E-01
CDF		1.38E-05		2.002739

Class 1 frequency = RC9-Class3a-Class3b-Class6 =	2.81E-06
Class 2 frequency =	9.24E-08
Class 3a frequency = .064*CDF=	8.83E-07
Class 3b frequency = .021*CDF =	2.90E-07
Class 6 frequency =	1.38E-08
Class 7 frequency = From Table 6 =	9.06E-06
Class 8 frequency = From Table 6 =	6.69E-07

Class 1 dose = 987 person-rem*La =	9.87E+02
Class 2 dose = CR Level 3 =	6.58E+05
Class 3a dose = 987 person-rem*10La =	9.87E+03
Class 3b dose = 987 person-rem*35La =	3.45E+04
Class 6 dose = 987 person-rem*35La =	3.45E+04
Class 7 dose = CR Level 3 =	1.97E+05
Class 8 dose = CR Level 3 =	2.02E+05

CCFP = 1 minus (Class 1 plus Class 3a/CDF) = 7.326E-01

Table 2 - Mean Consequence Measures for 10 Year Test Interval

Class	Description	Frequency per Rx-yr	Persn-Rem	Persn-Rem per year
1	No Containment Failure	2.70E-06	9.87E+02	2.66E-03
2	Large Cont Isolation Failures (failure to close)	9.24E-08	6.58E+05	6.08E-02
3a	Small Isolation Failure (Type A test)	9.72E-07	9.87E+03	9.59E-03
3b	Large Isolation Failure (Type A test)	3.19E-07	3.45E+04	1.10E-02
6	Other Isolation Failures (dependent failures)	1.38E-08	3.45E+04	4.77E-04
7	Severe Accident Phenomena (Early and Late)	9.06E-06	1.97E+05	1.78E+00

8	Containment Bypassed (SGTR)	6.69E-07	2.02E+05	1.35E-01
CDF		1.38E-05		2.004496

Class 1 frequency = RC9-Class3a-Class3b-Class 6 =	2.70E-06
Class 2 frequency =	9.24E-08
Class 3a frequency = .064*CDF*1.1=	9.72E-07
Class 3b frequency = .021*CDF*1.1 =	3.19E-07
Class 6 frequency =	1.38E-08
Class 7 frequency = From Table 6 =	9.06E-06
Class 8 frequency = From Table 6 =	6.69E-07

CCFP = 1 minus (Class 1 plus Class 3a/CDF) = 7.347E-01

Table 3 - Mean Consequence Measures for 15 Year Test Interval

Class	Description	Frequency per Rx-yr	Persn-Rem	Persn-Rem per year
1	No Containment Failure	2.64E-06	9.87E+02	2.60E-03
2	Large Cont Isolation Failures (failure to close)	9.24E-08	6.58E+05	6.08E-02
3a	Small Isolation Failure (Type A test)	1.02E-06	9.87E+03	1.00E-02
3b	Large Isolation Failure (Type A test)	3.33E-07	3.45E+04	1.15E-02
6	Other Isolation Failures (dependent failures)	1.38E-08	3.45E+04	4.77E-04
7	Severe Accident Phenomena (Early and Late)	9.06E-06	1.97E+05	1.78E+00
8	Containment Bypassed (SGTR)	6.69E-07	2.02E+05	1.35E-01
CDF		1.38E-05		2.005374

Class 1 frequency = RC9-Class3a-Class3b-Class6 =	2.64E-06
Class 2 frequency =	9.24E-08
Class 3a frequency = .064*CDF*1.15 =	1.02E-06
Class 3b frequency = .021*CDF*1.15 =	3.33E-07
Class 6 frequency =	1.38E-08
Class 7 frequency = From Table 6 =	9.06E-06
Class 8 frequency = From Table 6 =	6.69E-07

CCFP = 1 minus (Class 1 plus Class 3a/CDF) = 7.357E-01

Table 4 - Mean Consequence Measures for 20 Year Test Interval

Class	Description	Frequency per Rx-yr	Persn-Rem	Persn-Rem per year
1	No Containment Failure	2.58E-06	9.87E+02	2.55E-03
2	Large Cont Isolation Failures (failure to close)	9.24E-08	6.58E+05	6.08E-02
3a	Small Isolation Failure (Type A test)	1.06E-06	9.87E+03	1.05E-02
3b	Large Isolation Failure (Type A test)	3.48E-07	3.45E+04	1.20E-02
6	Other Isolation Failures (dependent failures)	1.38E-08	3.45E+04	4.77E-04
7	Severe Accident Phenomena (Early and Late)	9.06E-06	1.97E+05	1.78E+00
8	Containment Bypassed (SGTR)	6.69E-07	2.02E+05	1.35E-01

CDF	1.38E-05	2.006253

Class 1 frequency = RC9-Class3a-Class3b-Class6 =	2.58E-06
Class 2 frequency =	9.24E-08
Class 3a frequency = .064*CDF*1.2 =	1.06E-06
Class 3b frequency = .021*CDF*1.2 =	3.48E-07
Class 6 frequency =	1.38E-08
Class 7 frequency = From Table 6 =	9.06E-06
Class 8 frequency = From Table 6 =	6.69E-07

Delta LERF going from 3 in 10 year test interval to 1 in 15 year test interval =
Difference in Class 3b frequency = 4.35E-08

Delta LERF going from 3 in 10 year test interval to 1 in 20 year test interval =
Difference in Class 3b frequency = 5.80E-08

Delta LERF going from 3 in 10 year test interval to 1 in 15 year test interval =
Using IP3 Methodolgy = Class3bBase*.12 = 3.48E-08

Delta LERF going from 1 in 10 year test interval to 1 in 15 year test interval =
Difference in Class 3b frequency = 1.45E-08

Delta LERF going from 1 in 10 year test interval to 1 in 15 year test interval =
Using IP3 Methodolgy = Class3b10*.05 = 1.59E-08

Delta person-rem/year going from 3 in 10 year test interval to 1 in 15 year interval = 0.002636
Percentage increase = ((Total15 - Total Base)/Total Base)*100 = 0.13%

Delta person-rem/year going from 1 in 10 year test interval to 1 in 15 year interval = 0.000879
Percentage increase = ((Total15 - Total10)/Total10)*100 = 0.04%

Delta increase in CCFP going from 3 in 10 year test interval to 1 in 15 year interval = 0.31%

Delta increase in CCFP going from 1 in 10 year test interval to 1 in 15 year interval = 0.10%

Reproduction of Crystal River calculation to extend Type A Test Interval
From 1 in 10 Years to 1 in 15 Years Using Peach Bottom Plant Specific Data

From Table 5-1 of Peach Bottom's May 30, 2001 submittal

CDF = 4.53E-06
No containment failure frequency = 2.94E-06

Table 1 - Baseline Mean Consequence Measures

Class	Description	Frequency per Rx-yr	Persn-Rem	Persn-Rem per year
1a	No Containment Failure	1.79E-06	8.30E+03	1.49E-02
1b	No Containment Failure (including suc venting)	2.25E-08	3.28E+06	7.38E-02
1c	No Containment Failure (some TW like seqs)	7.38E-07	3.44E+05	2.54E-01
2	Large Cont Isolation Failures (failure to close)	n/a	4.98E+06	0.00E+00
3a	Small Isolation Failure (Type A test)	2.90E-07	8.30E+04	2.41E-02
3b	Large Isolation Failure (Type A test)	9.51E-08	2.91E+05	2.76E-02
6	Other Isolation Failures (dependent failures)	n/a	4.98E+06	0.00E+00
7	Severe Accident Phenomena (Early and Late)	1.59E-06	3.70E+06	5.88E+00
8	Containment Bypassed (Event V)	2.30E-09	3.78E+06	8.69E-03
CDF		4.53E-06		6.285959

Class 1a frequency = D7-Class1a-Class1b-Class3a-Class3b	1.79E-06
Class 1b frequency =	2.25E-08
Class 1c frequency =	7.38E-07
Class 2 frequency = From Table 5-1 =	n/a
Class 3a frequency = .064*CDF=	2.90E-07
Class 3b frequency = .021*CDF =	9.51E-08
Class 6 frequency = From Table 5-1 =	n/a
Class 7 frequency = From Table 5-1 =	1.59E-06
Class 8 frequency = From Table 5-1 =	2.30E-09

Class 1a dose = From Table 5-2 =	8.30E+03
Class 1b dose = From Table 5-2 =	3.28E+06
Class 1c dose = From Table 5-2 =	3.44E+05
Class 2 dose = From Table 5-2 =	4.98E+06
Class 3a dose = 8.30E+03 person-rem*10La =	8.30E+04
Class 3b dose = 8.30E+03 person-rem*35La =	2.91E+05
Class 6 dose = From Table 5-2 =	4.98E+06
Class 7 dose = From Table 5-2 =	3.70E+06
Class 8 dose = From Table 5-2 =	3.78E+06

CCFP = 1 minus (Class 1 plus Class 3a/CDF) = 3.723E-01

Table 2 - Mean Consequence Measures for 10 Year Test Interval

Class	Description	Frequency per Rx-yr	Persn-Rem	Persn-Rem per year

1a	No Containment Failure	1.76E-06	8.30E+03	1.46E-02
1b	No Containment Failure (including suc venting)	2.25E-08	3.28E+06	7.38E-02
1c	No Containment Failure (some TW like seqs)	7.38E-07	3.44E+05	2.54E-01
2	Large Cont Isolation Failures (failure to close)	n/a	4.98E+06	0.00E+00
3a	Small Isolation Failure (Type A test)	3.19E-07	8.30E+04	2.65E-02
3b	Large Isolation Failure (Type A test)	1.05E-07	2.91E+05	3.04E-02
6	Other Isolation Failures (dependent failures)	n/a	4.98E+06	0.00E+00
7	Severe Accident Phenomena (Early and Late)	1.59E-06	3.70E+06	5.88E+00
8	Containment Bypassed (Event V)	2.30E-09	3.78E+06	8.69E-03
CDF		4.53E-06		6.290809

Class 1a frequency = D7-Class1a-Class1b-Class3a-Class3b	1.76E-06
Class 1b frequency =	2.25E-08
Class 1c frequency =	7.38E-07
Class 2 frequency = From Table 5-1 =	n/a
Class 3a frequency = .064*CDF*1.1=	3.19E-07
Class 3b frequency = .021*CDF*1.1 =	1.05E-07
Class 6 frequency = From Table 5-1 =	n/a
Class 7 frequency = From Table 5-1 =	1.59E-06
Class 8 frequency = From Table 5-1 =	2.30E-09

CCFP = 1 minus (Class 1 plus Class 3a/CDF) = 3.744E-01

Table 3 - Mean Consequence Measures for 15 Year Test Interval

Class	Description	Frequency per Rx-yr	Persn-Rem	Persn-Rem Per Year
1a	No Containment Failure	1.74E-06	8.30E+03	1.44E-02
1b	No Containment Failure (including suc venting)	2.25E-08	3.28E+06	7.38E-02
1c	No Containment Failure (some TW like seqs)	7.38E-07	3.44E+05	2.54E-01
2	Large Cont Isolation Failures (failure to close)	n/a	4.98E+06	0.00E+00
3a	Small Isolation Failure (Type A test)	3.33E-07	8.30E+04	2.77E-02
3b	Large Isolation Failure (Type A test)	1.09E-07	2.91E+05	3.18E-02
6	Other Isolation Failures (dependent failures)	n/a	4.98E+06	0.00E+00
7	Severe Accident Phenomena (Early and Late)	1.59E-06	3.70E+06	5.88E+00
8	Containment Bypassed (Event V)	2.30E-09	3.78E+06	8.69E-03
CDF		4.53E-06		6.293234

Class 1a frequency = D7-Class1a-Class1b-Class3a-Class3b	1.74E-06
Class 1b frequency =	2.25E-08
Class 1c frequency =	7.38E-07
Class 2 frequency = From Table 5-1 =	n/a
Class 3a frequency = .064*CDF*1.15 =	3.33E-07
Class 3b frequency = .021*CDF*1.15 =	1.09E-07
Class 6 frequency = From Table 5-1 =	n/a
Class 7 frequency = From Table 5-1 =	1.59E-06
Class 8 frequency = From Table 5-1 =	2.30E-09

CCFP = 1 minus (Class 1 plus Class 3a/CDF) = 3.755E-01

Delta LERF going from 3 in 10 year test interval to 1 in 15 year test interval =
Difference in Class 3b frequency = 1.43E-08

Delta LERF going from 3 in 10 year test interval to 1 in 15 year test interval =
Using IP3 Methodolgy = Class3bBase*.12 = 1.14E-08

Delta LERF going from 1 in 10 year test interval to 1 in 15 year test interval =
Difference in Class 3b frequency = 4.76E-09

Delta LERF going from 1 in 10 year test interval to 1 in 15 year test interval =
Using IP3 Methodolgy = Class3b10*.05 = 5.23E-09

Delta person-rem/year going from 3 in 10 year test interval to 1 in 15 year interval = 0.007275
Percentage increase = ((Total15 - Total Base)/Total Base)*100 = 0.12%

Delta person-rem/year going from 1 in 10 year test interval to 1 in 15 year interval = 0.002425
Percentage increase = ((Total15 - Total10)/Total10)*100 = 0.04%

Delta increase in CCFP going from 3 in 10 year test interval to 1 in 15 year interval = 0.31%

Delta increase in CCFP going from 1 in 10 year test interval to 1 in 15 year interval = 0.10%

IP3 calculation to extend Type A Test Interval
From 1 in 10 Years to 1 in 15 Years
Removing Class 3A and 3B from the No Containment Failure Bin

From Table 1 on page 11 of IP3's January 18, 2001 submittal

CDF = 4.40E-05
No containment failure frequency = 2.79E-05

Table 1 - Baseline Mean Consequence Measures

Class	Description	Frequency Per Rx-yr	Person-Rem	Person-Rem per year
1	No Containment Failure	2.42E-05	1.41E+06	3.41E+01
2	Large Cont Isolation Failures (failure to close)	5.15E-09	4.94E+07	2.54E-01
3a	Small Isolation Failure (Type A test)	2.82E-06	1.41E+07	3.97E+01
3b	Large Isolation Failure (Type A test)	9.24E-07	4.94E+07	4.56E+01
6	Other Isolation Failures (dependent failures)	8.94E-09	4.94E+07	4.41E-01
7	Severe Accident Phenomena (Early and Late)	1.36E-05	1.41E+08	1.92E+03
8	Containment Bypassed (SGTR)	2.43E-06	5.33E+09	1.30E+04
CDF		4.39E-05		14989.57

Class 1 frequency = D8-Class3a-Class3b =	2.42E-05
Class 2 frequency = From Table 1=	5.15E-09
Class 3a frequency = .064*CDF=	2.82E-06
Class 3b frequency = .021*CDF =	9.24E-07
Class 6 frequency = From Table 1 =	8.94E-09
Class 7 frequency = With Class 3A and 3B =	1.36E-05
Class 8 frequency = From Table 1 =	2.43E-06

Class 1 dose = From Table 2 =	1.41E+06
Class 2 dose = From Table 2 =	4.94E+07
Class 3a dose = From Table 2 =	1.41E+07
Class 3b dose = From Table 2 =	4.94E+07
Class 6 dose = From Table 2 =	4.94E+07
Class 7 dose = From Table 2 =	1.41E+08
Class 8 dose = From Table 2 =	5.33E+09

CCFP = 1 minus (Class 1 plus Class 3a/CDF) = 3.861E-01

Table 2 - Mean Consequence Measures for 10 Year Test Interval

Class	Description	Frequency Per Rx-yr	Person-Rem	Person-Rem per year
1	No Containment Failure	2.38E-05	1.41E+06	3.35E+01
2	Large Cont Isolation Failures (failure to close)	5.15E-09	4.94E+07	2.54E-01
3a	Small Isolation Failure (Type A test)	3.10E-06	1.41E+07	4.37E+01
3b	Large Isolation Failure (Type A test)	1.02E-06	4.94E+07	5.02E+01
6	Other Isolation Failures (dependent failures)	8.94E-09	4.94E+07	4.41E-01

7	Severe Accident Phenomena (Early and Late)	1.36E-05	1.41E+08	1.92E+03
8	Containment Bypassed (SGTR)	2.43E-06	5.33E+09	1.30E+04
CDF		4.39E-05		14997.57

Class 1 frequency = D8-Class3a-Class3b =	2.38E-05
Class 2 frequency = From Table 1=	5.15E-09
Class 3a frequency = .064*CDF*1.1=	3.10E-06
Class 3b frequency = .021*CDF*1.1 =	1.02E-06
Class 6 frequency = From Table 1 =	8.94E-09
Class 7 frequency = With Class 3A and 3B =	1.36E-05
Class 8 frequency = From Table 1 =	2.43E-06

CCFP = 1 minus (Class 1 plus Class 3a/CDF) = 3.882E-01

Table 3 - Mean Consequence Measures for 15 Year Test Interval

Class	Description	Frequency Per Rx-yr	Person-Rem	Person-Rem Per Year
1	No Containment Failure	2.36E-05	1.41E+06	3.33E+01
2	Large Cont Isolation Failures (failure to close)	5.15E-09	4.94E+07	2.54E-01
3a	Small Isolation Failure (Type A test)	3.24E-06	1.41E+07	4.57E+01
3b	Large Isolation Failure (Type A test)	1.06E-06	4.94E+07	5.24E+01
6	Other Isolation Failures (dependent failures)	8.94E-09	4.94E+07	4.41E-01
7	Severe Accident Phenomena (Early and Late)	1.36E-05	1.41E+08	1.92E+03
8	Containment Bypassed (SGTR)	2.43E-06	5.33E+09	1.30E+04
CDF		4.39E-05		15001.57

Class 1 frequency = D8-Class3a-Class3b =	2.36E-05
Class 2 frequency = From Table 1=	5.15E-09
Class 3a frequency = .064*CDF*1.15 =	3.24E-06
Class 3b frequency = .021*CDF*1.15 =	1.06E-06
Class 6 frequency = From Table 1 =	8.94E-09
Class 7 frequency = With Class 3A and 3B =	1.36E-05
Class 8 frequency = From Table 1 =	2.43E-06

CCFP = 1 minus (Class 1 plus Class 3a/CDF) = 3.893E-01

Table 4 - Mean Consequence Measures for 20 Year Test Interval

Class	Description	Frequency Per Rx-yr	Person-Rem	Person-Rem Per Year
1	No Containment Failure	2.34E-05	1.41E+06	3.30E+01
2	Large Cont Isolation Failures (failure to close)	5.15E-09	4.94E+07	2.54E-01
3a	Small Isolation Failure (Type A test)	3.38E-06	1.41E+07	4.76E+01
3b	Large Isolation Failure (Type A test)	1.11E-06	4.94E+07	5.47E+01
6	Other Isolation Failures (dependent failures)	8.94E-09	4.94E+07	4.41E-01
7	Severe Accident Phenomena (Early and Late)	1.36E-05	1.41E+08	1.92E+03

8	Containment Bypassed (SGTR)	2.43E-06	5.33E+09	1.30E+04
CDF		4.39E-05		15005.57

Class 1 frequency = D8-Class3a-Class3b = 2.34E-05
Class 2 frequency = From Table 1= 5.15E-09
Class 3a frequency = .064*CDF*1.2 = 3.38E-06
Class 3b frequency = .021*CDF*1.2 = 1.11E-06
Class 6 frequency = From Table 1 = 8.94E-09
Class 7 frequency = With Class 3A and 3B = 1.36E-05
Class 8 frequency = From Table 1 = 2.43E-06

CCFP = 1 minus (Class 1 plus Class 3a/CDF) = 3.903E-01

Delta LERF going from 3 in 10 year test interval to 1 in 15 year test interval =
Difference in Class 3b frequency = 1.39E-07

Delta LERF going from 3 in 10 year test interval to 1 in 20 year test interval =
Difference in Class 3b frequency = 1.85E-07

Delta LERF going from 3 in 10 year test interval to 1 in 15 year test interval =
Using IP3 Methodolgy = Class3bBase*.12 = 1.11E-07

Delta LERF going from 1 in 10 year test interval to 1 in 15 year test interval =
Difference in Class 3b frequency = 4.62E-08

Delta LERF going from 1 in 10 year test interval to 1 in 15 year test interval =
Using IP3 Methodolgy = Class3b10*.05 = 5.08E-08

Delta person-rem/year going from 3 in 10 year test interval to 1 in 15 year interval = 12.00474
Percentage increase = ((Total15 - Total Base)/Total Base)*100 = 0.08%

Delta person-rem/year going from 1 in 10 year test interval to 1 in 15 year interval = 4.00158
Percentage increase = ((Total15 - Total10)/Total10)*100 = 0.03%

Delta increase in CCFP going from 3 in 10 year test interval to 1 in 15 year interval = 0.32%

Delta increase in CCFP going from 1 in 10 year test interval to 1 in 15 year interval = 0.11%

For a plant with CDF = 1E-04

Class 3b frequency = 0.021*CDF = 2.1E-06

Class 3b frequency for 15 year interval = 0.021*CDF*1.15 = 2.4E-06

Class 3b frequency for 20 year interval = 0.021*CDF*1.2 = 2.5E-06

Delta LERF going from 3 in 10 year test interval to 1 in 15 year test interval =
Difference in Class 3b frequency = 3.15E-07

Delta LERF going from 3 in 10 year test interval to 1 in 20 year test interval =
Difference in Class 3b frequency = 4.20E-07