From: <eddie.grant@exeloncorp.com>
To: <jps1@nrc.gov>
Date: Thu, Jul 14, 2005 11:57 AM
Subject: Revised DSER Response

John Segala

Attached is your copy of a revised response to the DSER item regarding chi/Q values.
Please call if you have any questions.

Thanks,
Eddie R. Grant
Early Site Permit Project
850.598.9801 cell

<<2005-07-14 Mundy DSER Response .pdf>>

CC: <thomas.mundy@exeloncorp.com>

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Subject: Revised DSER Response
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52.17

July 14, 2005

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

Early Site Permit (ESP) Application for the Clinton ESP Site
Docket No. 52-007

Subject: Revised Response to Draft Safety Evaluation Report (DSER) Items

Re: Letter, U.S. Nuclear Regulatory Commission (W. D. Beckner) to Exelon Generation Company, LLC, (M. Kray), dated February 10, 2005, Draft Safety Evaluation Report for the Exelon Early Site Permit Application

Enclosed are revised responses to one open item identified in the subject DSER for the Exelon Generation Company, LLC (EGC) ESP and revised responses to associated requests for additional information (RAIs). These revisions are associated with an update of the Westinghouse dispersion coefficients (as utilized in the EGC ESP site safety analysis report) to be consistent with Revision 14 of the AP1000 Design Control Document. As an aid to the reviewer, the revisions are identified by strikeout of the deletions and underline of the added material in the enclosure, and by redline and underline in the attachment providing the changes to the tables in Section 3.3 of the site safety analysis report.

Please contact Eddie Grant of my staff at 610-765-5001 if you have any questions regarding this submittal.

Sincerely yours,

Thomas P. Mundy

Thomas P. Mundy
Director, Project Development

TPM/erg

cc: U.S. NRC Regional Office (w/ enclosures)
Mr. John P. Segala (w/ enclosures)

Enclosures

AFFIDAVIT OF THOMAS P. MUNDY

State of Pennsylvania

County of Chester

The foregoing document was acknowledged before me, in and for the County and State aforesaid, by Thomas P. Mundy, who is Director, Project Development, of Exelon Generation Company, LLC. He has affirmed before me that he is duly authorized to execute and file the foregoing document on behalf of Exelon Generation Company, LLC, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged and affirmed before me this 14th day of July, 2005.

My commission expires 10-6-07.

Vivia V. Gallimore

Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Vivia V. Gallimore, Notary Public
Kennett Square Boro, Chester County
My Commission Expires Oct. 6, 2007
Member, Pennsylvania Association Of Notaries

NRC Letter Dated: 02/10/2005

This letter provides revised response(s) to the following draft safety evaluation report (DSER) Open Items. These revised DSER responses replace the corresponding response(s) provided by EGC letter dated April 4, 2005.

DSER Open Item 3.3-1

This letter also provides revised responses to the following Requests for Additional Information (RAI). These revised RAI responses replace the corresponding response(s) provided by EGC letter dated October 7, 2004.

RAI 3.3-1

RAI 3.3.1-1

RAI 3.3.4-1

RAI 3.3.4-2

RAI 3.3.4-3

NRC Letter Dated: 02/10/2005

NRC DSER Open Item 3.3-1

Use appropriate meteorological data and appropriate distances from postulated release points to the EAB and the LPZ to estimate the site specific χ/Q values used in the radiological consequence evaluations.

EGC RAI ID: SOI1-27

EGC RESPONSE via letter dated April 4, 2005:

Revisions shown by strikeout (of deletions) and underline (of additions).

The NRC indicates, in DSER Section 3.3.3.4, that "the staff concludes that neither appropriate meteorological data nor appropriate distances from postulated release points to the EAB and the LPZ outer boundary have been used by the applicant for estimating the site specific X/Q values used in the radiological consequence evaluations. Therefore, the radiological consequence evaluation for the proposed ESP site is unresolved."

The short-term accident Chi/Q values have been recalculated using a minimum distance of 805 meters to the EAB and three years of hourly meteorological data (January 2000 - December 2002) for distances of 805 meters and 4018 meters. In addition, the revisions made to the Chi/Q values by Westinghouse to support the final AP1000 design certification were incorporated. These Chi/Q values have been used to update the accident radiological evaluation and related information in SSAR Table 1.4-1, Chapter 2 (Section 2.3.4.3 and Table 2.3-51 as shown in the response to DSER Open Item 2.3-3), and SSAR Section 3.3.4 and associated Tables 3.3-2, 3.3-2A, 3.3-2B, 3.3-5, 3.3-6, 3.3-8, 3.3-9, 3.3-11, 3.3-13, 3.3-16, 3.3-17, 3.3-19, 3.3-21, 3.3-22, 3.3-23, 3.3-25, 3.3-26, 3.3-27, 3.3-29, 3.3-31, and 3.3-33.

As requested by NRC during our public meeting of March 31, 2005, the PAVAN input is also attached.

ASSOCIATED EGC ESP APPLICATION REVISIONS:

1. Revise SSAR, Chapter 1, Table 1.4-1, Section 9.1, from:

9.1.1	0-2 hr @ EAB (sec/m^3)	Note 1	1.85E-04(5%) 3.56E-05 (50%)	SSAR ER
9.1.2	0-8 hr @ LPZ (sec/m^3)	Note 1	2.49E-05 (5%) 3.40E-06 (50%)	SSAR ER
9.1.3	8-24 hr @ LPZ (sec/m^3)	Note 1	1.68E-05 (5%) 2.85E-06 (50%)	SSAR ER
9.1.4	1-4 day @ LPZ (sec/m^3)	Note 1	7.18E-06 (5%) 1.85E-06 (50%)	SSAR ER
9.1.5	4-30 day @ LPZ (sec/m^3)	Note 1	2.11E-06 (5%) 1.00E-06 (50%)	SSAR ER

To read:

9.1.1	0-2 hr @ EAB (sec/m^3)	Notes 1,3	2.52E-04 (5%) 3.56E-05 (50%)	SSAR ER
9.1.2	0-8 hr @ LPZ (sec/m^3)	Notes 1,3	3.00E-05 (5%) 3.40E-06 (50%)	SSAR ER

9.1.3	8-24 hr @ LPZ (sec/m^3)	Notes 1,3	2.02E-05 (5%) 2.85E-06 (50%)	SSAR ER
9.1.4	1-4 day @ LPZ (sec/m^3)	Notes 1,3	8.53E-06 (5%) 1.85E-06 (50%)	SSAR ER
9.1.5	4-30 day @ LPZ (sec/m^3)	Notes 1,3	2.48E-06 (5%) 1.00E-06 (50%)	SSAR ER

2 Revise SSAR, Chapter 1, Table 1.4-1, to add new Note 3 which reads:

3. Re-evaluated site accident 5% Chi/Qs using 36 months of data for the period 1-1-2000 to 12-31-2002. Also shown are the 50% Chi/Qs used in the ER accident assessments.

~~3. Revise SSAR, Chapter 3, Section 3.3.4, last sentence of second paragraph (as previously added in response to RAI 3.3.1-1), from:~~

~~The AP1000 representative site X/Q value used in the evaluations are given in Table 3.3-2a.~~

~~To read:~~

~~The AP1000 representative site X/Q value used in the evaluations are given in Tables 3.3-2A and 3.3-2B.~~

~~4. Revise SSAR, Chapter 3, Section 3.3.4, to delete the last paragraph as previously added in response to RAI 3.3.1-1.~~

5. Revise SSAR, Chapter 3, Tables 3.3-2, 3.3-2A, ~~3.3-2B,~~ 3.3-3, 3.3-4, 3.3-5, 3.3-6, 3.3-8, 3.3-9, 3.3-10A, 3.3-10B, 3.3-11A, 3.3-11B, 3.3-12, 3.3-13, 3.3-14, 3.3-15, 3.3-16, 3.3-17, 3.3-18, 3.3-19, 3.3-21, 3.3-22, 3.3-23, 3.3-25, 3.3-26, 3.3-27, 3.3-29, 3.3-30, 3.3-31, and 3.3-33, as shown in Attachment 3.3-1.

ATTACHMENTS:

Attachment 3.3-1A (Revised SSAR Tables)

Attachment 3.3-1B (PAVAN Input) [Note – this attachment did not change and is not included in this revised submittal. The PAVAN input submitted with the letter of April 4, 2005, continues to be the applicable input.]

NRC Letter Dated: 07/27/2004

NRC RAI No. 3.3-1

SSAR Section 3.3, Radiological Consequences of Accidents

In Section 3.3 of the SSAR, you stated:

> "The radioactivity released to the environs for [design-basis accidents] DBAs is provided by the reactor supplier based upon their standard safety analysis reports or as specified in their PPE listing as being representative of the bounding DBA environmental release."

Please clarify what you are referring to as the reactor supplier's "PPE listing."

EGC RAI ID: R11-5

EGC RESPONSE via letter dated October 7, 2004:

Revisions shown by strikeout (of deletions) and underline (of additions).

The reactor supplier PPE listing is the post accident radioactive airborne effluent releases that are referred to in SSAR, Chapter 1, Section 9.5.2 and Table 1.4-1, and given in Section 3.3 Tables for the design basis accidents considered. The specific DBA activity releases were provided in the reactor vendors' certification package or if no certification package has been docketed or the information was not included in the certification package, this information was provided as part of a reactor vendor PPE submittal to the ESP applicants. The Section 3.3 Tables that contain this data are:

3.3-1 Limiting Gas Cooled Reactor Design Basis Event Curies Released to Environment by Interval

3.3-3 AP1000 Main Steam Line Break Curies Released to Environment by Interval - Accident-Initiated Iodine Spike

3.3-4 AP1000 Main Steam Line Break Curies Released to Environment by Interval-Pre-existing Iodine Spike

3.3-7 ABWR Main Steam Line Break Outside Containment Curies Released to Environment

~~3.3-10 AP1000 Locked Rotor Accident Curies Released to Environment Pre-existing Iodine Spike~~

3.3-10A AP1000 Locked Rotor Accident Curies Released to Environment – No Startup Feedwater

3.3-10B AP1000 Locked Rotor Accident Curies Released to Environment – Startup Feedwater Available

3.3-12 AP1000 Control Rod Ejection Accident Curies Released to Environment by Interval-Pre-existing Iodine Spike

3.3-14 AP1000 Steam Generator Tube Rupture Accident Curies Released to Environment by Interval-Accident Initiated Iodine Spike

3.3-15 AP 1000 Steam Generator Tube Rupture Accident Curies Released to Environment by Interval-Pre-existing Iodine Spike

3.3-18	AP1000 Small Line Break Accident Curies Released to Environment Accident Initiated Iodine Spike
3.3-20	ABWR Small Line Break Outside Containment Activity Released to Environment
3.3-22	AP1000 Design Basis Loss of Coolant Accident Curies Released to Environment by Interval
3.3-24	ABWR LOCA Curies Released to Environment by Interval
3.3.26	ESBWR Design Basis Loss of Coolant Accident Curies Released to Environment by Interval
3.3-28	ACR-700 Design Basis Large Loss of Coolant Accident Curies Released to Environment by Interval
3.3-30	AP1000 Fuel Handling Accident Curies Released to Environment
3.3-32	ABWR Fuel Handling Accident Curies Released to Environment by Interval

ASSOCIATED EGC ESP APPLICATION REVISIONS:

None

ATTACHMENTS:

None

NRC Letter Dated: 07/27/2004

NRC RAI No. 3.3.1-1

SSAR Section 3.3.1, Selection of Postulated Accidents

In Section 3.3.1 of the SSAR, you stated that you used the AP1000 design in selecting DBAs for demonstrating site suitability. Westinghouse has revised its χ/Qs in the AP1000 design control document since submittal of the Clinton ESP application. Please use the updated χ/Qs in the Westinghouse AP1000 Design Control Document and revise the site-specific doses and fission product releases for all DBAs in SSAR Section 3.3 accordingly, or please note that the AP1000 values used in the emergency response (ER) have been revised but the applicant has elected not to use the updated values in the accident analyses.

EGC RAI ID: R11-6

EGC RESPONSE via letter dated October 7, 2004:

Revisions shown by strikeout (of deletions) and underline (of additions).

The original EGC ESP Application used the χ/Qs from Revision 2 of the Westinghouse AP1000 Design Control Document. This was the most recent completed revision of the document at the time the Application was submitted.

Since the submittal of the ~~Exelon~~ EGC ESP Application, the AP1000 design certification review process has been completed and resulted in Westinghouse changing the standard χ/Q values used in their design basis accident analyses. ~~EGC has elected not to update the Application to reflect the more recent values because the specific impact of the AP1000 Design Certification change in χ/Q values has been assessed and found to have a minor effect on the design basis accident EAB and LPZ doses presented in the EGC ESP Application. Based upon the changes made by Westinghouse the EAB and LPZ doses will increase or decrease in proportion to the change in the ESP site to design certification χ/Q ratios as noted in the following Table.~~ The EGC submittal has been updated to use the χ/Qs in Westinghouse AP1000 Design Control Document, Revision 14, which is the basis for the design certification's approval of the AP1000 accident analyses. SSAR Table 3.3-2A, "Ratio of EGC ESP Site Short Term χ/Q Values to AP1000 Design Certification (DC) χ/Q Values," will be revised to identify the AP1000 and EGC ESP site χ/Qs. See also RAI 3.3.4-2.

~~Ratios of 5% Accident Site χ/Q Values to AP1000 Design Certification (DC) χ/Q Values~~

	~~χ/Q (sec/m³)~~	~~χ/Q (sec/m³)~~	~~χ/Q (sec/m³)~~	~~χ/Q Ratio (Site/DC)~~		~~Ratio~~
~~Time Period (hr)~~	~~EGC ESP Site~~	~~AP1000 (PPE values)~~	~~New AP1000*~~	~~Old AP1000~~	~~New AP1000~~	~~New to Old~~
~~EAB 0—2~~	~~1.85E-04~~	~~6.00E-04~~	~~5.8E-04~~	~~3.08E-01~~	~~3.19E-01~~	~~1.036~~
~~LPZ~~						
~~0—8~~	~~2.49E-05~~	~~1.35E-04~~	~~2.7E-04~~	~~1.84E-01~~	~~9.22E-02~~	~~0.501~~
~~8-24~~	~~1.68E-05~~	~~1.00E-04~~	~~2.0E-04~~	~~1.68E-01~~	~~8.40E-02~~	~~0.500~~
~~24-96~~	~~7.18E-06~~	~~5.40E-05~~	~~1.0E-04~~	~~1.33E-01~~	~~7.18E-02~~	~~0.534~~

~~06–720~~	~~2.11E-06~~	~~2.20E-05~~	~~8.0E-05~~	~~0.59E-02~~	~~2.64E-02~~	~~0.275~~

~~* DSER Open Item Response 15.3.1-R4 page 17 dated 4/21/04~~

~~Based on the above, the EAB doses for the AP1000 design basis accidents would increase by 3.6 % and the LPZ doses would decrease by about 50% on average depending upon the specific accident. Adequate margin exists in the ESP site calculated DBA doses to accommodate this change and maintain compliance with the applicable 10 CFR 50.34 regulatory criteria.~~

The fission product releases presented in EGC ESP Application are unaffected by the changes in χ/Q values. However, Westinghouse made changes to design basis accident analysis parameters and models subsequent to the information provided in Revision 2 of the Westinghouse AP1000 Design Control Document used for the original EGC ESP SSAR submittal. Because of the model changes, the activity releases have changed. Therefore, the following AP1000 activity release EGC ESP SSAR tables have been revised: Tables 3.3-3, 3.3-4, 3.3-10A, 3.3-10B, 3.3-12, 3.3-14, 3.3-15, 3.3-18, 3.3-22, and 3.3-30. In addition, the accident model descriptions for the AP1000 in SSAR Chapter 3.3 have been revised. The accident descriptions and table revisions are consistent with the information in Revision 14 of the Westinghouse AP1000 Design Control Document.

ASSOCIATED EGC ESP APPLICATION REVISIONS:

Revise SSAR, Chapter 3, Section 3.3.1, sixth paragraph, first bullet, first sentence, from:

AP1000: The AP1000 Design Control Document (Westinghouse, 2002) provides descriptions of the accidents and the technical data used to determine the radiological consequences for DBAs at a generic site. DBAs identified in Regulatory Guide 1.183 and NUREG-1555 (USNRC, 2001). This information is part of the design certification licensing submittal for the AP1000, and is similar to the required analyses previously submitted for the certified AP600 reactor. The DBA assessments are evaluated to demonstrate EGC ESP Site suitability.

To read:

AP1000: The AP1000 Design Control Document (Westinghouse, 2004) provides descriptions of the accidents and the technical data used to determine the radiological consequences for DBAs at a generic site. DBAs identified in Regulatory Guide 1.183 and NUREG-1555 (USNRC, 2001). The DBA assessments are evaluated to demonstrate EGC ESP Site suitability.

Revise SSAR, Chapter 3, Section 3.3.4, from:

This section identifies the postulated accidents, the resultant activity release paths, the important accident parameters and assumptions, and the credited mitigation features used in the EGC ESP Site dose consequence assessments. An overall summary of the results of the evaluated accident doses appears in Table 3.3-2. This table also compares the site safety analysis doses to the recommended limits based on Regulatory Guide 1.183 and NUREG-0800. Table 3.3-2 shows that the evaluated dose consequences meet the accident-specific acceptance criteria invoked in Section 3.3.2.

To read (adds 2nd paragraph):

This section identifies the postulated accidents, the resultant activity release paths, the important accident parameters and assumptions, and the credited mitigation features used in the EGC ESP Site dose consequence assessments. An overall summary of the results of the evaluated accident doses appears in Table 3.3-2. This table also compares the site safety analysis doses to the recommended limits based on Regulatory Guide 1.183 and NUREG-0800. Table 3.3-2 shows that the evaluated dose consequences meet the accident-specific acceptance criteria invoked in Section 3.3.2.

The analysis approach for evaluating the AP1000 design basis accidents discussed in the following subsections is based upon the EAB and LPZ doses provided by Westinghouse and given in Chapter 15 of the AP1000 Design Control Document, Tier 2, Revision ~~2~~14~~ and the ratio of the ESP Site X/Q value to the AP1000 representative site X/Q value for each post accident time period. The AP1000 representative site X/Q value used in the evaluations are given in Table 3.3-2a~~. These doses were evaluated by the USNRC as part of the AP1000's design certification process. The generic site dispersion characteristics assumed by Westinghouse are shown in Table 3.3-2A. The breathing rates, dose conversion factors, and time intervals used for the AP1000 follow USNRC protocol for analyzing offsite doses and are consistent with Regulatory Guide 1.183. Therefore, the EGC ESP doses can be obtained by ratioing the AP1000 interval doses using the EGC ESP and AP1000 generic site dispersion characteristics. Both sets of dispersion characteristics are shown in Table 3.3-2A. The table shows that the EGC ESP site meteorology is less restrictive than the AP1000 conditions and that lower doses are predicted for the EGC ESP site based on inspection of the dispersion ratios in the last column of the table.

~~Based upon the revisions made to the X/Q values by Westinghouse to support the final AP1000 design certification, the EAB doses presented in Tables 3.3-2, 3.3-5, 3.3-6, 3.3-11, 3.3-13, 3.3-16, 3.3-17, 3.3-19, 3.3-23 and 3.3-31 will increase by 3.6% and the LPZ doses will remain bounding.~~

Revise SSAR, Chapter 3, Section 3.3.4.1, last sentence of first paragraph, from:

The secondary side inventory of the faulted steam generator is released to the environs along with the entire amount of iodine and alkali metals retained in the secondary side coolant.

To read:

The secondary side inventory of the faulted steam generator is released to the environs along with the entire amount of iodine and alkali metals leaked from the primary side into the faulted steam generator.

Revise SSAR, Chapter 3, Section 3.3.4.1, last sentence of second paragraph, from:

During the event, primary to secondary side leakage is assumed to increase from the technical specification limit of 150 gpd per steam generator to 500 gpd (175 lbm/hr) per steam generator for the intact and faulted steam generators.

To read:

During the event, primary to secondary side leakage is assumed to be at the technical specification limit of 150 gpd per steam generator for the intact and faulted steam generators.

Revise SSAR, Chapter 3, Section 3.3.4.1, third bullet of third paragraph, from:

Primary to secondary leak rate - 175 lb/hr in each steam generator

To read:

Primary to secondary leak rate – 52.1 lb/hr (150 gpd) in each steam generator

Revise SSAR, Chapter 3, Section 3.3.4.3, second sentence of second paragraph, from:

In addition primary side activity carried over due to leakage in the steam generators mixes in the secondary side and becomes available for release.

To read:

In addition primary side activity carried over due to leakage in the steam generators becomes available for release.

Revise SSAR, Chapter 3, Section 3.3.4.3, second paragraph, to delete the first two bullets which read:

Duration of accident – 1.5 hr

Steam released – 6.48E+05 lbm

Revise SSAR, Chapter 3, Section 3.3.4.3, second paragraph, fourth bullet, from:

Primary to secondary side leak rate – 350 lbm/hr

To read:

Primary to secondary side total leak rate – 104 lbm/hr (300 gpd)

Revise SSAR, Chapter 3, Section 3.3.4.3, second paragraph, tenth bullet, from:

Fraction of fuel gap activity released – 0.16

To read:

Fraction of fuel gap activity released – 0.10

Revise SSAR, Chapter 3, Section 3.3.4.3, second paragraph, eleventh bullet, from:

Partition coefficients in steam generators – 0.01 for iodines and alkali metals

To read:

Partition coefficients in steam generators – 0.01 for iodines and 0.001 for alkali metals

Revise SSAR, Chapter 3, Section 3.3.4.3, second paragraph, to add two new bullets at the end of the list, to read:

- No startup feedwater scenario
  - -Duration of accident - 1.5 hr
  - -Steam released – 6.48E+05 lbm
  - -Leak flashing fraction – 0.04 for first hour
  - -Flashed iodine partitioning – none credited
  - -Flashed alkali partitioning – 0.1
- Startup feedwater available scenario
  - -Duration of accident - 8 hr
  - -Steam release rate – 60 lbm/s
  - -Leak flashing fraction – none

Revise SSAR, Chapter 3, Section 3.3.4.3, third paragraph, last sentence, from:

The activities released to the environment are shown in Table 3.3-10.

To read:

The activities released to the environment are shown in Tables 3.3-10A and 3.3-10B.

Revise SSAR, Chapter 3, Section 3.3.4.3, last paragraph, last two sentences, from:

The TEDE doses for the locked rotor accident are shown in Table 3.3-11. The doses at the EAB and LPZ are a small fraction of the 25 rem TEDE identified in 10 CFR 50.34.

To read:

The TEDE doses for the locked rotor accident are shown in Tables 3.3-11A and 3.3-11B. The doses for both scenarios at the EAB and LPZ are small fractions of the 25 rem TEDE identified in 10 CFR 50.34.

Revise SSAR, Chapter 3, Section 3.3.4.3, to insert new second and third paragraphs, which read:

Two scenarios are considered. The first scenario assumes that the non-safety feedwater system is unavailable following reactor trip. The steam generators are

steamed down, secondary side water level decreases, and the tubes uncover. Primary side coolant leaking into the generators is assumed to flash (without mixing in the coolant) and activity release occurs via the relieve valves. Activity releases terminate after 1.5 hours when the capacity of the passive residual heat removal system is sufficient to cool down the reactor core's residual heat.

The second scenario assumes the feedwater system is available. The steam generator tubes remain covered through out the event as the reactor is cooled by steaming down the steam generators. There primary coolant leakage is mixed with the secondary side steam generator water inventory. For the feedwater available scenario, the cool down takes longer since the passive residual heat removal system does not actuate.

Revise SSAR, Chapter 3, Section 3.3.4.4, fourth paragraph, fourth and fifth bullets, from:

- Primary to secondary leak rate – 350 lbm/hr
- Containment leak rate – 0.1 percent per day

To read (also adds new bullet):

- Primary to secondary total leak rate – 104 lbm/hr (300 gpd)
- Flashing fraction of 4 percent with no credit for iodine partitioning of the flashed amount
- Containment leak rate – 0.1 percent per day/0.05 percent per day after 24 hours

Revise SSAR, Chapter 3, Section 3.3.4.4, last paragraph, last sentence, from:

The doses at the EAB and LPZ shown in Table 3.3-13 are well within the 25 rem TEDE identified in 10 CFR 50.34.

To read:

The doses at the EAB and LPZ shown in Table 3.3-13 are small fractions of the 25 rem TEDE identified in 10 CFR 50.34.

Revise SSAR, Chapter 3, Section 3.3.4.6, second paragraph, seventh bullet, from:

- Primary to secondary leak rate – 175 lbm/hr in the intact steam generator

To read:

- Primary to secondary leak rate – 52 lbm/hr (150 gpd) in the intact steam generator

Revise SSAR, Chapter 3, Section 3.3.4.6, second paragraph, thirteenth bullet, from:

- Partition coefficients in the steam generator – 0.01 for iodines and alkali metals

To read:

- Partition coefficients in the steam generator – 0.01 for iodines and 0.001 for alkali metals

Revise SSAR, Chapter 3, Section 3.3.4.6, last paragraph, last sentence, from:

The doses at the EAB and LPZ are a small fraction of the 25 rem TEDE identified in 10 CFR 50.34.

To read:

The doses at the EAB and LPZ are small fractions of the 25 rem TEDE identified in 10 CFR 50.34.

Revise SSAR, Chapter 3, Section 3.3.4.7, last paragraph, last sentence, from:

The resulting doses at the EAB and LPZ a small fraction of the 25 rem TEDE identified in 10 CFR 50.34.

To read:

The resulting doses at the EAB and LPZ are small fractions of the 25 rem TEDE identified in 10 CFR 50.34.

Revise SSAR, Chapter 3, Section 3.3.4.8, last paragraph, last sentence, from:

The doses are a small fraction of the 25 rem TEDE limit in 10 CFR 50.34.

To read:

The doses are small fractions of the 25 rem TEDE limit in 10 CFR 50.34.

Revise SSAR, Chapter 3, Section 3.3.4.9, fourth paragraph, sixth bullet, from:

- Containment leak rate – 0.01 percent per day

To read:

- Containment leak rate – 0.01 percent per day/0.05 percent per day after 24 hours

Revise SSAR, Chapter 3, Section 3.3.4.9, fourth paragraph, tenth bullet, from:

- Containment atmosphere particulate removal rate – 0.43/hr to 0.72/hr during first 24 hr

To read:

- Containment atmosphere particulate removal rate – varies between 0.29/hr and 1.14/hr during first 24 hours

Revise SSAR, Chapter 3, Section 3.3.4.13, fourth paragraph, second bullet, from:

- Decay time after shutdown – 100 hr

To read:

- Decay time after shutdown – 24 hr

Revise SSAR, Chapter 3, Section 3.3.4.14, last paragraph, last sentence, from:

The EAB and LPZ doses are shown to be well within the 25 rem TEDE guidelines in 10 CFR 50.34.

To read:

The EAB and LPZ doses are shown to be small fractions of the 25 rem TEDE limit in 10 CFR 50.34.

Revise SSAR, Chapter 3, References Section 3.3, from:

Westinghouse. AP1000 Design Control Document. Tier 2 Material. April 2002.

To read:

Westinghouse. AP1000 Design Control Document. Tier 2 Material. September 2004.

Revise SSAR, Chapter 3, Section 3.3, to add new Table 3.3-2A as shown in Attachment 3.3-1A.

~~Table 3.3-2a~~
~~Ratio of EGC ESP Site Short Term χ/Q Values to AP1000 Design Certification (DC) χ/Q Values~~

~~Post Accident Time Period (hr)~~	~~EGC ESP Site χ/Q Values (sec/m^3)~~	~~AP1000 DC χ/Q Values (sec/m^3)~~	~~χ/Q Ratio (ESP Site / AP1000 DC)~~
~~EAB[1] 0 – 2~~	~~1.85E-04~~	~~6.00E-04~~	~~3.08E-01~~
~~LPZ 0 – 8~~	~~2.49E-05~~	~~1.35E-04~~	~~1.84E-01~~
~~LPZ 8 – 24~~	~~1.68E-05~~	~~1.00E-04~~	~~1.68E-01~~
~~LPZ 24 – 96~~	~~7.18E-06~~	~~5.40E-05~~	~~1.33E-01~~
~~LPZ 96 – 720~~	~~2.11E-06~~	~~2.20E-05~~	~~9.59E-02~~

~~Note 1. 2 hour period with greatest EAB dose consequences.~~

ATTACHMENTS:

~~None~~

Attachment 3.3-1 (Revised SSAR Tables)

NRC Letter Dated: 07/27/2004

NRC RAI No. 3.3.4-1

SSAR Section 3.3.4, Postulated Accidents

Several tables in Section 3.3 show time-dependent activities released to the environs as the PPE values. Please provide the references and the methodology used to determine the time-dependent activity release values in these tables. Also, please ensure the values in these tables appropriately reflect the AP1000 design χ/Qs as discussed in RAI 3.3.1-1

EGC RAI ID: R11-8

EGC RESPONSE via letter dated October 7, 2004:

Revisions shown by strikeout (of deletions) and underline (of additions).

The approach used for calculating time-dependent activity releases are as generally described in Chapter 3, Section 3.3.3 of the SSAR. For the ABWR and AP1000 designs the specific methodology used to determine the time dependent activity release values are presented in their respective design certification documents as referenced in Section 3.3.

For the non-certified reactors, the vendors have not provided the specific details of the methodology but have provided time dependent activity releases which were presented in their respective tables in Section 3.3. These values are considered by the reactor vendors to be the best estimate of the limiting design basis post accident radioactive releases.

The final time-dependent activity release values for the EGC ESP facility will be design specific and thus are not yet available. The methodology and design specific activity release values will be identified at either the completion of the Design Certification stage or at the Combined License stage. However at this ESP stage, the Application provides a spectrum of design values for use in evaluating offsite radiological consequences and the capability of the site to comply with 10 CFR 100 and 10 CFR 50.34 post accident dose requirements.

The activity releases given in Section 3.3 are not affected by the χ/Q values ~~or the changes discussed in RAI 3.3.1-1~~. However, Westinghouse made changes to design basis accident analysis parameters and models subsequent to the information provided in Revision 2 of the Westinghouse AP1000 Design Control Document used for the original EGC ESP SSAR submittal. See response to RAI 3.3-1 for activity release revisions made to the SSAR in order to capture the latest AP1000 accident analysis information.

ASSOCIATED EGC ESP APPLICATION REVISIONS:

~~None~~See revised response to RAI 3.3-1.

ATTACHMENTS:

None

NRC Letter Dated: 07/27/2004

NRC RAI No. 3.3.4-2

SSAR Table 3.3-2 summarizes the resulting doses at the ESP site for postulated DBAs using the AP1000, the advanced boiling water reactor (ABWR), and the ACR-700 as surrogate reactor designs. Please update the table for each DBA to include (1) AP1000, ABWR, and ACR-700 χ/Q values and doses used for the EAB and LPZ, and (2) the ratios of site-specific χ/Qs to design certification χ/Qs used.

EGC RAI ID: R11-9

EGC RESPONSE via letter dated October 7, 2004:

Revisions shown by strikeout (of deletions) and underline (of additions).

SSAR Table 3.3-2 summarizes the resulting EAB and LPZ doses at the ESP Site for the spectrum of postulated design basis accidents (DBA) that had offsite dose consequences as considered in the AP1000 and ABWR certification documents. In addition, projected EGC ESP Facility offsite doses were provided for the ESBWR and the ACR-700 for the limiting DBA (Loss of Coolant Accident). The ESBWR and ACR-700 offsite doses were projected based on estimated radioactive releases to the environment provided by the vendors and EGC ESP Site X/Q values since no certification documents have been submitted for these design concepts.

~~The bases for the AP1000 results presented in SSAR Table 3.3-2 is presented in the tabulation attached to this RAI response. This table includes the AP1000 EAB and LPZ doses along with the corresponding ratio of ESP Site X/Q to Vendor specified X/Qs as a function of post accident time periods.~~ As noted in the Application, the doses provided for the ABWR design basis accidents were not based on X/Q ratios of certified post accident offsite dose values but were calculated based upon the DBA activity releases as function of the post accident time period, the EGC ESP Site X/Q and Federal Guidance Reports 11 and 12 dose conversion factors. The ABWR doses are presented in terms of TEDE equivalent in lieu of thyroid and whole body doses (refer to the response to RAI 3.3.4-3 for the equivalent thyroid and whole body doses). Certification doses and X/Q ratios are not available for the ACR-700 or the ESBWR and therefore have not been included.

~~The following table provides the basis for the ratios presented in the tabulation attached to this RAI response.~~

Table 3.3-2, "Design Basis Accident Off-site Dose Consequences" has been revised.

Table 3.3-2A, , "Ratio of EGC ESP Site Short Term χ/Q Values to AP1000 Design Certification (DC) χ/Q Values," has been revised to provide the requested information.

~~Table 3.3-2a~~
~~Ratio of EGC ESP Site Short Term χ/Q Values to AP1000 Design Certification (DC) χ/Q Values~~

~~Post Accident Time Period (hr)~~	~~EGC ESP Site χ/Q Values (sec/m^3)~~	~~AP1000 DC χ/Q Values (sec/m^3)~~	~~χ/Q Ratio (ESP Site / AP1000 DC)~~
~~EAB 0 – 2~~	~~1.86E-04~~	~~6.00E-04~~	~~3.08E-01~~

~~LPZ 0 – 8~~	~~2.49E-05~~	~~1.35E-04~~	~~1.84E-01~~
~~LPZ 8 – 24~~	~~1.68E-05~~	~~1.00E-04~~	~~1.68E-01~~
~~LPZ 24 – 96~~	~~7.18E-06~~	~~5.40E-05~~	~~1.33E-01~~
~~LPZ 96 – 720~~	~~2.11E-06~~	~~2.20E-05~~	~~9.59E-02~~

~~Note 1. 2-hour period with greatest EAB dose consequences.~~

ASSOCIATED EGC ESP APPLICATION REVISIONS:

None

ATTACHMENTS:

Attachment 3.3-1 (Revised SSAR Tables)

NRC Letter Dated: 07/27/2004

NRC RAI No. 3.3.4-3

Several tables, including Table 3.3-2 in Section 3.3, present doses for ABWR DBAs in total effective dose equivalent (TEDE) units. Please provide the doses in thyroid and whole body doses in addition to the doses in TEDE units, because the General Electric ABWR design is certified with the thyroid and whole body doses.

EGC RAI ID: R11-10

EGC RESPONSE via letter dated October 7, 2004:

Revisions shown by strikeout (of deletions) and underline (of additions).

The following Tables in Section 3.3 that present doses for the ABWR design basis accidents are provided below with the calculated thyroid, whole body, and TEDE doses. The ABWR DBA doses were calculated using the certified time-dependent activity releases provided in GE's ABWR SAR and the ESP Facility short-term accident X/Qs. Thyroid doses were determined using ICRP 30. Whole body doses were determined using Regulatory Guide 1.109 dose conversion factors. The dose conversion bases is similar to that identified in the ABWR SSAR. TEDE doses were calculated using the dose conversion factors contained in Federal Guidance Reports 11 and 12.

Subsequent to the original response to this RAI 3.3.4-3, the EGC ESP site short term accident χ/Qs were revised for DSER Open Item 2.3-3. The revised χ/Qs cause changes to the ABWR doses in the original response to this RAI. SSAR Tables 3.3-8, 3.3-9, 3.3-21, 3.3-25 and 3.3-33 are revised to show the resulting revised thyroid, whole body and TEDE doses.

Note that this revised RAI also incorporates the revised EGC ESP site accident X/Qs (see DSER Open Item 2.3-3) into the dose results.

~~**Table 3.3-8 ABWR Main Steam Line Break Outside Containment Maximum Equilibrium Value for Full Power Operation**~~

~~Dose Type~~	~~EAB (rem)~~	~~LPZ (rem)~~
~~Thyroid~~	~~3.45E-01~~	~~4.64E-02~~
~~Whole Body~~	~~7.57E-03~~	~~1.02E-03~~
~~TEDE~~	~~1.78E-02~~	~~2.40E-03~~

~~**Table 3.3-9 ABWR Main Steam Line Break Outside Containment Pre-existing Iodine Spike**~~

~~Dose Type~~	~~EAB (rem)~~	~~LPZ (rem)~~
~~Thyroid~~	~~6.90E+00~~	~~9.29E-01~~
~~Whole Body~~	~~1.50E-01~~	~~2.06E-02~~

~~TEDE~~	~~3.56E-01~~	~~4.70E-02~~

~~Table 3.3-21 ABWR Small Line Break Outside Primary Containment~~

~~Dose Type~~	~~EAB (rem)~~	~~LPZ (rem)~~
~~Thyroid~~	~~3.17E-01~~	~~8.78E-02~~
~~Whole Body~~	~~5.95E-03~~	~~1.58E-03~~
~~TEDE~~	~~1.54E-02~~	~~4.21E-03~~

~~Table 3.3-25 ABWR Design Basis Loss-of-Coolant Accident~~

~~Dose Type~~	~~EAB (rem)~~	~~LPZ (rem)~~
~~Thyroid~~	~~2.58E+01~~	~~5.90E+01~~
~~Whole Body~~	~~5.32E-01~~	~~6.57E-01~~
~~TEDE~~	~~1.22E+00~~	~~2.22E+00~~

~~Table 3.3-33 ABWR Fuel Handling Accident~~

~~Dose Type~~	~~EAB (rem)~~	~~LPZ (rem)~~
~~Thyroid~~	~~1.03E+01~~	~~1.40E+00~~
~~Whole Body~~	~~1.46E-01~~	~~4.07E-02~~
~~TEDE~~	~~4.18E-01~~	~~7.16E-02~~

ASSOCIATED EGC ESP APPLICATION REVISIONS:

Revise SSAR, Chapter 3, Section 3.3, Tables 3.3-8, 3.3-9, 3.3-21, 3.3-25 and 3.3-33 as shown in Attachment 3.3-1A. ~~(to present thyroid and whole body doses in addition to the TEDE) from:~~

~~TABLE 3.3-8~~

~~ABWR Main Steam Line Break Outside Containment~~
~~Maximum Equilibrium Value for Full Power Operation Off Site Dose Consequences~~

~~Time~~	~~EAB Dose TEDE Rem~~	~~LPZ Dose TEDE Rem~~
~~0 to 2 hr~~	~~1.78E-02~~	~~-~~
~~0 to 8 hr~~	~~-~~	~~2.40E-03~~
~~8 to 24 hr~~	~~-~~	~~0~~
~~24 to 96 hr~~	~~-~~	~~0~~
~~96 to 720 hr~~	~~-~~	~~0~~
~~Total~~	~~1.78E-02~~	~~2.40E-03~~

~~To read:~~

~~TABLE 3.3-8~~

~~ABWR Main Steam Line Break Outside Containment~~
~~Maximum Equilibrium Value for Full Power Operation Off Site Dose Consequences~~

~~Dose Type~~	~~EAB Dose Rem~~	~~LPZ Dose Rem~~
~~Thyroid~~	~~3.45E-01~~	~~4.64E-02~~
~~Whole Body~~	~~7.57E-03~~	~~1.02E-03~~
~~TEDE~~	~~1.78E-02~~	~~2.40E-03~~

~~Revise SSAR, Chapter 3, Section 3.3, Table 3.3-9 (to present thyroid and whole body doses in addition to the TEDE) from:~~

~~TABLE 3.3-9~~

~~ABWR Main Steam Line Break Outside Containment~~
~~Pre-existing Iodine Spike Off-Site Dose Consequences~~

~~Time~~	~~EAB Dose TEDE Rem~~	~~LPZ Dose TEDE Rem~~
~~0 to 2 hr~~	~~3.56E-01~~	~~-~~
~~0 to 8 hr~~	~~-~~	~~4.79E-02~~
~~8 to 24 hr~~	~~-~~	~~0~~
~~24 to 96 hr~~	~~-~~	~~0~~
~~96 to 720 hr~~	~~-~~	~~0~~
~~Total~~	~~3.56E-01~~	~~4.79E-02~~

~~To read:~~

~~TABLE 3.3-9~~

~~ABWR Main Steam Line Break Outside Containment~~
~~Pre-existing Iodine Spike Off-Site Dose Consequences~~

~~Dose Type~~	~~EAB Dose Rem~~	~~LPZ Dose Rem~~
~~Thyroid~~	~~6.00E+00~~	~~9.29E-01~~
~~Whole Body~~	~~1.50E-01~~	~~2.06E-02~~
~~TEDE~~	~~3.56E-01~~	~~4.79E-02~~

~~Revise SSAR, Chapter 3, Section 3.3, Table 3.3-21 (to present thyroid and whole body doses in addition to the TEDE) from:~~

~~TABLE 3.3-21~~

~~ABWR Small Line Break Outside Containment Off-Site Dose Consequences~~

~~Time~~	~~EAB Dose TEDE Rem~~	~~LPZ Dose TEDE Rem~~
~~0 to 2 hr~~	~~1.54E-02~~	~~-~~
~~0 to 8 hr~~	~~-~~	~~4.21E-03~~
~~8 to 24 hr~~	~~-~~	~~0~~
~~24 to 96 hr~~	~~-~~	~~0~~
~~96 to 720 hr~~	~~-~~	~~0~~
~~Total~~	~~1.54E-02~~	~~4.21E-03~~

~~To read:~~

~~TABLE 3.3-21~~

~~ABWR Small Line Break Outside Containment Off-Site Dose Consequences~~

~~Dose Type~~	~~EAB Dose Rem~~	~~LPZ Dose Rem~~
~~Thyroid~~	~~3.17E-01~~	~~8.78E-02~~
~~Whole Body~~	~~5.05E-03~~	~~1.58E-03~~
~~TEDE~~	~~1.54E-02~~	~~4.21E-03~~

~~Revise SSAR, Chapter 3, Section 3.3, Table 3.3-25 (to present thyroid and whole body doses in addition to the TEDE) from:~~

~~TABLE 3.3-25~~

~~ABWR Design Basis Loss of Coolant Accident Off-Site Dose Consequences~~

~~Time~~	~~EAB Dose TEDE Rem~~	~~LPZ Dose TEDE Rem~~
~~0 to 2 hr~~	~~1.22E+00~~	~~-~~
~~0 to 8 hr~~	~~-~~	~~2.76E-01~~
~~8 to 24 hr~~	~~-~~	~~1.89E-01~~
~~24 to 96 hr~~	~~-~~	~~6.39E-01~~
~~96 to 720 hr~~	~~-~~	~~1.12E+00~~
~~Total~~	~~1.22E+00~~	~~2.22E+00~~

~~Note: LOCA based on Regulatory Guide 1.3 and TID 14844.~~

~~To read:~~

~~TABLE 3.3-25~~

~~ABWR Design Basis Loss of Coolant Accident Off-Site Dose Consequences~~

~~Dose Type~~	~~EAB Dose Rem~~	~~LPZ Dose Rem~~
~~Thyroid~~	~~2.58E+01~~	~~5.90E+01~~
~~Whole Body~~	~~5.32E-01~~	~~6.57E-01~~
~~TEDE~~	~~1.22E+00~~	~~2.22E+00~~

~~Note: LOCA based on Regulatory Guide 1.3 and TID 14844.~~

~~Revise SSAR, Chapter 3, Section 3.3, Table 3.3-25 (to present thyroid and whole body doses in addition to the TEDE) from:~~

~~TABLE 3.3-33~~

~~ABWR Fuel Handling Accident Off-Site Dose Consequences~~

~~Time~~	~~EAB Dose TEDE Rem~~	~~LPZ Dose TEDE Rem~~
~~0 to 2 hr~~	~~4.18E-01~~	~~-~~
~~0 to 8 hr~~	~~-~~	~~7.16E-02~~
~~8 to 24 hr~~	~~-~~	~~-~~
~~24 to 96 hr~~	~~-~~	~~-~~
~~96 to 720 hr~~	~~-~~	~~-~~
~~Total~~	~~4.18E-01~~	~~7.16E-02~~

~~Note: LPZ dose includes contribution from activity remaining in reactor building. See Section 3.3.4.13.~~

~~To read:~~

~~TABLE 3.3-33~~

~~ABWR Fuel Handling Accident Off-Site Dose Consequences~~

~~Dose Type~~	~~EAB Dose Rem~~	~~LPZ Dose Rem~~
~~Thyroid~~	~~1.03E+01~~	~~1.40E+00~~
~~Whole Body~~	~~1.46E-01~~	~~4.07E-02~~
~~TEDE~~	~~4.18E-01~~	~~7.16E-02~~

~~Note: LPZ dose includes contribution from activity remaining in reactor building. See Section 3.3.4.13.~~

ATTACHMENTS:

~~None~~

Attachment 3.3-1 (Revised SSAR Tables)

ATTACHMENTS

Attachment 3.3-1A (Revised SSAR Tables)
[Note - As an aid to the reviewer, a complete set of tables for Section 3.3 of the site safety analysis report is included. The revisions to these tables associated with this most recent change are shown in red text and underlined.]

Table 3.3-1 (no revisions – same as Rev 0 of the SSAR)
Table 3.3-2 (revised EAB Dose and LPZ Dose values)
Table 3.3-2A (revised ESP X/Q Values and X/Q Ratios)
~~Table 3.3-2B (new Table)~~
Table 3.3-3 (revised release values)
Table 3.3-4 (revised release values)
Table 3.3-5 (revised EAB Dose and LPZ Dose values)
Table 3.3-6 (revised EAB Dose and LPZ Dose values)
Table 3.3-7 (no revisions – same as DSER OI 3.3-1 response)
Table 3.3-8 (no revisions – same as DSER OI 3.3-1 response)
Table 3.3-9 (no revisions – same as DSER OI 3.3-1 response)
Table 3.3-10A (revised release values)
Table 3.3-10B (revised release values)
Table 3.3-11A (revised EAB Dose and LPZ Dose values)
Table 3.3-11B (revised EAB Dose and LPZ Dose values)
Table 3.3-12 (revised release values)
Table 3.3-13 (revised EAB Dose and LPZ Dose values)
Table 3.3-14 (revised release values)
Table 3.3-15 (revised release values)
Table 3.3-16 (revised EAB Dose and LPZ Dose values)
Table 3.3-17 (revised EAB Dose and LPZ Dose values)
Table 3.3-18 (revised release values)
Table 3.3-19 (revised EAB Dose and LPZ Dose values)
Table 3.3-20 (no revisions – same as Rev 0 of the SSAR)
Table 3.3-21 (no revisions – same as DSER OI 3.3-1 response)
Table 3.3-22 (no revisions – same as DSER OI 3.3-1 response)
Table 3.3-23 (no revisions – same as DSER OI 3.3-1 response)
Table 3.3-24 (no revisions – same as DSER OI 3.3-1 response)
Table 3.3-25 (no revisions – same as DSER OI 3.3-1 response)
Table 3.3-26 (no revisions – same as DSER OI 3.3-1 response)
Table 3.3-27 (no revisions – same as DSER OI 3.3-1 response)
Table 3.3-28 (no revisions – same as DSER OI 3.3-1 response)
Table 3.3-29 (no revisions – same as DSER OI 3.3-1 response)
Table 3.3-30 (revised shutdown period and release values)
Table 3.3-31 (revised EAB Dose and LPZ Dose values)
Table 3.3-32 (no revisions – same as DSER OI 3.3-1 response)
Table 3.3-33 (no revisions – same as DSER OI 3.3-1 response)

Attachment 3.3-1B (PAVAN Input) [Note – This attachment is not included in this letter. The attachment provided with the April 4, 2005 letter remains valid and applicable.]

TABLE 3.3-1

Limiting Gas Cooled Reactor Design Basis Event Curies Released to Environment by Interval

Isotope	0 to 2 hr	2 to 720 hr
C-14	3.87E+02	0
Br-83	2.00E-02	0
Br-84	8.00E-02	0
Br-85	4.70E-01	0
I-131	0	2.43E+01
I-132	1.10E-01	5.00E-02
I-133	3.00E-02	8.11E+00
I-134	3.80E-01	0
I-135	7.00E-02	7.90E-01
I-136	1.00E-02	0
Kr-83m	2.42E+00	2.00E-02
Kr-85m	7.14E+00	6.40E-01
Kr-85	2.60E+00	1.96E+00
Kr-87	9.84E+00	2.00E-02
Kr-88	1.69E+01	5.60E-01
Kr-89	5.85E+00	0
Kr-90	2.92E+00	0
Kr-91	1.39E+00	2.88E+00
Xe-131m	4.90E-01	8.19E+00
Xe-133m	1.38E+00	4.72E+02
Xe-133	6.01E+01	0
Xe-135m	2.36E+00	1.90E+00
Xe-135	9.28E+00	0
Xe-137	6.17E+00	0
Xe-138	1.13E+01	0
Xe-139	1.78E+00	0
Xe-140	7.90E-01	0
Sr-90	2.00E-05	0
Cs-137	3.00E-04	0

Bounding activities released based on PBMR and GT-MHR.

TABLE 3.3-2
Design Basis Accident Off-Site Dose Consequences

Accident	Reactor Type	EAB Dose TEDE Rem	LPZ Dose TEDE Rem	Guideline TEDE Rem
Main Steam Line Break				
Accident-initiated Iodine Spike	AP1000	4.4E-01	2.3E-01	2.5
Pre-existing Iodine Spike		4.0E-01	9.7E-02	25
Max Equilibrium Iodine Activity	ABWR	2.4E-02	2.9E-03	2.5
Pre-existing Iodine Spike		4.8E-01	5.8E-02	25
Reactor Coolant Pump Locked Rotor	AP1000	~~1.1E-00~~	~~1.3 E-01~~	~~2.5~~
No Startup Feedwater		3.5E-01	5.3E-02	2.5
Startup Feedwater Available		2.5E-01	1.1E-01	2.5
Control Rod Ejection Accident	AP1000	1.4E+00	7.3E-01	6.3
Control Rod Drop Accident	ABWR	N/A	N/A	6.3
Steam Generator Tube Rupture				
Accident-initiated Iodine Spike	AP1000	4.4E-01	1.1E-01	2.5
Pre-existing Iodine Spike		8.9E-01	1.7E-01	25
Small Line Break	AP1000	8.4E-01	1.4E-01	2.5
	ABWR	2.1E-02	5.1E-03	2.5
Loss of Coolant Accident	AP1000	1.2E+01	3.1E+00	25
	ABWR	1.7E+00	2.6E+00	25
	ESBWR	2.2E+00	2.4E+00	25
	ACR-700	2.7E+00	2.2E+00	25
Fuel Handling Accident	AP1000	2.8E+00	4.8E-01	6.3
	ABWR	5.7E-01	8.6E-02	6.3

Note:
1. TEDE guidelines from Regulatory Guide 1.183. Small line break guideline based on NUREG-0800, Chapter 15.6.2.
2. N/A - Not applicable due to design of ABWR, see Section 3.3.4.5.

TABLE 3.3-2A
Ratio of EGC ESP Site Short Term χ/Q Values to AP1000 Design Certification (DC) χ/Q Values

Post Accident Time Period (hr)	EGC ESP Site χ/Q Values (sec/m^3)	AP1000 DC χ/Q Values (sec/m^3)	χ/Q Ratio (ESP Site / AP1000 DC)
EAB[1] 0 – 2	2.52E-04	5.10E-04	4.94E-01
LPZ 0 – 8	3.00E-05	2.20E-04	1.36E-01
LPZ 8 – 24	2.02E-05	1.60E-04	1.25E-01
LPZ 24 – 96	8.53E-06	1.00E-04	8.53E-02
LPZ 96 – 720	2.48E-06	8.00E-05	3.10E-02

Notes
-1. -The 0 to 2-hour χ/Q values are used for the period of time when the with greatest EAB two-hr dose occurs.consequences.
2. EGC ESP site χ/Q values are from Table 2.3-51.
3. AP1000 χ/Q values are from Table 15A-5 of the AP1000 Design Control Document (Westinghouse, 2004)

~~TABLE 3.3-2B~~
~~Ratio of EGC ESP Site Short Term χ/Q Values to AP1000 LOCA Design Certification (DC) χ/Q Values~~

~~Post Accident Time Period (hr)~~	~~EGC ESP Site χ/Q Values (sec/m^3)~~	~~AP1000 DC χ/Q Values (sec/m^3)~~	~~χ/Q Ratio (ESP Site / AP1000 DC)~~
~~EAB[1] 0 – 2~~	~~2.52E-04~~	~~5.10E-04~~	~~4.94E-01~~
~~LPZ 0 – 8~~	~~3.00E-05~~	~~2.20E-04~~	~~1.36E-01~~
~~LPZ 8 – 24~~	~~2.02E-05~~	~~1.60E-04~~	~~1.25E-01~~
~~LPZ 24 – 96~~	~~8.53E-06~~	~~1.00E-04~~	~~8.53E-02~~
~~LPZ 96 – 720~~	~~2.48E-06~~	~~8.00E-05~~	~~3.10E-02~~

~~Note 1. 2-hr period with greatest EAB dose consequences.~~

TABLE 3.3-3
AP1000 Main Steam Line Break Curies Released to Environment by Interval – Accident-Initiated Iodine Spike

Isotope	0 to 2 hr	2 to 8 hr	8 to 24 hr	24 to 96 hr
I-130	4.198E-01	9.950E-01	1.583E+00	1.009E+00
I-131	2.600E+01	5.730E+01	1.558E+02	4.134E+02
I-132	4.617E+01	9.739E+01	2.238E+01	1.819E-01
I-133	4.908E+01	1.137E+02	2.269E+02	2.553E+02
I-134	1.343E+01	1.859E+01	2.651E-01	8.415E-07
I-135	3.235E+01	7.739E+01	7.828E+01	1.772E+01
Kr-85m	6.855E-02	1.141E-01	6.796E-02	6.177E-03
Kr-85	2.824E-01	8.462E-01	2.250E+00	6.686E+00
Kr-87	2.755E-02	1.342E-02	5.291E-04	8.602E-08
Kr-88	1.124E-01	1.372E-01	4.037E-02	8.269E-04
Xe-131m	1.277E-01	3.791E-01	9.810E-01	2.700E+00
Xe-133m	1.585E-01	4.506E-01	1.038E+00	2.054E+00
Xe-133	1.178E+01	3.454E+01	8.644E+01	2.161E+02
Xe-135m	3.043E-03 1.02E-02	1.325E-05 4.44E-05	0	0
Xe-135	3.098E-01	6.896E-01	8.351E-01	3.384E-01
Xe-138	3.985E-03	1.138E-05	0	0
Cs-134	1.899E+01	1.951E-01	5.185E-01	1.540E+00
Cs-136	2.822E+01	2.862E-01	7.428E-01	2.060E+00
Cs-137	1.366E+01	1.407E-01	3.739E-01	1.112E+00
Cs-138	1.012E+01	1.018E-03	4.424E-07	0

TABLE 3.3-4
AP1000 Main Steam Line Break Curies Released to Environment by Interval
Pre-existing Iodine Spike

Isotope	0 to 2 hr	2 to 8 hr	8 to 24 hr	24 to 96 hr
I-130	3.592E-01	1.417E-01	2.093E-01	1.334E-01
I-131	2.402E+01	1.211E+01	3.096E+01	8.216E+01
I-132	3.052E+01	4.142E+00	8.061E-01	6.552E-03
I-133	4.335E+01	1.898E+01	3.534E+01	3.976E+01
I-134	6.742E+00	1.633E-01	1.429E-03	4.535E-09
I-135	2.600E+01	8.156E+00	7.542E+00	1.707E+00
Kr-85m	6.855E-02	1.141E-01	6.796E-02	6.177E-03
Kr-85	2.824E-01	8.462E-01	2.250E+00	6.686E+00
Kr-87	2.755E-02	1.342E-02	5.291E-04	8.602E-08
Kr-88	1.124E-01	1.372E-01	4.037E-02	8.269E-04
Xe-131m	1.277E-01	3.791E-01	9.810E-01	2.700E+00
Xe-133m	1.585E-01	4.506E-01	1.038E+00	2.054E+00
Xe-133	1.178E+01	3.454E+01	8.644E+01	2.161E+02
Xe-135m	3.043E-03	1.325E-05	0	0
Xe-135	3.098E-01	6.896E-01	8.351E-01	3.384E-01
Xe-138	3.985E-03	1.138E-05	0	0
Rb-86	NA	NA	NA	NA
Cs-134	1.899E+01	1.951E-01	5.185E-01	1.540E+00
Cs-136	2.822E+01	2.862E-01	7.428E-01	2.060E+00
Cs-137	1.366E+01	1.407E-01	3.739E-01	1.112E+00
Cs-138	1.012E+01	1.018E-03	4.424E-07	0

NA = Rb-86 contribution considered negligible for this accident.

TABLE 3.3-5
AP1000 Main Steam Line Break
Accident-Initiated Iodine Spike Off-Site Dose Consequences

Time	EAB Dose TEDE Rem	LPZ Dose TEDE Rem
0 to 2 hr	4.45E-01	-
0 to 8 hr	-	1.40E-01
8 to 24 hr	-	4.76E-02
24 to 96 hr	-	4.57E-02
96 to 720 hr	-	0
Total	4.45E-01	2.33E-01

TABLE 3.3-6
AP1000 Main Steam Line Break
Pre-Existing Iodine Spike Off-Site Dose Consequences

Time	EAB Dose TEDE Rem	LPZ Dose TEDE Rem
0 to 2 hr	3.95E-01	-
0 to 8 hr	-	7.92E-02
8 to 24 hr	-	9.07E-03
24 to 96 hr	-	9.17E-03
96 to 720 hr	-	0
Total	3.95E-01	9.74E-02

TABLE 3.3-7
ABWR Main Steam Line Break Outside Containment Curies Released to Environment

Isotope	Maximum Equilibrium Value for Full Power Operation 0 to 2 hr	Pre-existing Iodine Spike 0 to 2 hr
I-131	1.97E+00	3.95E+01
I-132	1.92E+01	3.84E+02
I-133	1.35E+01	2.70E+02
I-134	3.78E+01	7.54E+02
I-135	1.97E+01	3.95E+02
Kr-83m	1.10E-02	6.59E-02
Kr-85m	1.94E-02	1.16E-01
Kr-85	6.11E-05	3.68E-04
Kr-87	6.59E-02	3.97E-01
Kr-88	6.65E-02	4.00E-01
Kr-89	2.67E-01	1.60E+00
Kr-90	6.89E-02	4.19E-01
Xe-131m	4.76E-05	2.86E-04
Xe-133m	9.16E-04	5.51E-03
Xe-133	2.56E-02	1.54E-01
Xe-135m	7.81E-02	4.59E-01
Xe-135	7.30E-02	4.38E-01
Xe-137	3.32E-01	2.00E+00
Xe-138	2.55E-01	1.53E+00
Xe-139	1.17E-01	7.00E-01

TABLE 3.3-8
ABWR Main Steam Line Break Outside Containment
Maximum Equilibrium Value for Full Power Operation Off-Site Dose Consequences

Dose Type	EAB Dose Rem	LPZ Dose Rem
Thyroid	4.70E-01	5.59E-02
Whole Body	1.03E-02	1.23E-03
TEDE	2.43E-02	2.89E-03

TABLE 3.3-9
ABWR Main Steam Line Break Outside Containment
Pre-existing Iodine Spike Off-Site Dose Consequences

Dose Type	EAB Dose Rem	LPZ Dose Rem
Thyroid	9.40E+00	1.12E+00
Whole Body	2.05E-01	2.44E-02
TEDE	4.85E-01	5.77E-02

TABLE 3.3-10A
AP1000 Locked Rotor Accident Curies Released to Environment
No Startup Feedwater~~Pre-existing Iodine Spike~~

Isotope	0 to 1.5 hr
I-130	8.447E-01
I-131	3.774E+01
I-132	2.789E+01
I-133	4.855E+01
I-134	2.884E+01
I-135	4.188E+01
Kr-85m	8.158E+01
Kr-85	7.576E+00
Kr-87	1.204E+02
Kr-88	2.079E+02
Xe-131m	3.772E+00
Xe-133m	2.021E+01
Xe-133	6.664E+02
Xe-135m	3.240E+01
Xe-135	1.591E+02
Xe-138	1.288E+02
Rb-86	1.330E-02
Cs-134	1.290E+00
Cs-136	5.634E-01
Cs-137	7.740E-01
Cs-138	6.080E+00

TABLE 3.3-10B
AP1000 Locked Rotor Accident Curies Released to Environment
Startup Feedwater Available

Isotope	0 to 2 hr	2 to 8 hr
I-130	1.171E-01	1.329E+00
I-131	5.394E+00	7.513E+01
I-132	3.450E+00	1.484E+01
I-133	6.862E+00	8.291E+01
I-134	2.760E+00	2.980E+00
I-135	5.679E+00	5.221E+01
Kr-85m	1.048E+02	1.744E+02
Kr-85	1.010E+01	3.026E+01
Kr-87	1.431E+02	6.965E+01
Kr-88	2.619E+02	3.197E+02
Xe-131m	5.026E+00	1.492E+01
Xe-133m	2.685E+01	7.636E+01
Xe-133	8.874E+02	2.601E+03
Xe-135m	3.282E+01	1.429E-01
Xe-135	2.082E+02	4.635E+02
Xe-138	1.301E+02	3.717E-01
Rb-86	1.828E-03	2.730E-02
Cs-134	1.822E-01	2.403E+00
Cs-136	8.451E-02	7.786E-01
Cs-137	1.099E-01	1.411E+00
Cs-138	7.291E-01	3.349E+00

TABLE 3.3-11A
AP1000 Locked Rotor Accident, 0 to 1.5 Hour Duration
No Startup Feedwater~~Pre-existing Iodine Spike~~ - Off-Site Dose Consequences

Time	EAB Dose TEDE Rem	LPZ Dose TEDE Rem
0 to 2 hr	3.46E-01	-
0 to 8 hr	-	5.31E-02
8 to 24 hr	-	0
24 to 96 hr	-	0
96 to 720 hr	-	0
Total	3.46E-01	5.31E-02

TABLE 3.3-11B
AP1000 Locked Rotor Accident, 0 to 8 Hour Duration
Startup Feedwater Available - Off-Site Dose Consequences

Time	EAB Dose TEDE Rem	LPZ Dose TEDE Rem
0 to 2 hr	2.47E-01	-
0 to 8 hr	-	1.08E-01
8 to 24 hr	-	0
24 to 96 hr	-	0
96 to 720 hr	-	0
Total	2.47E-01	1.08E-01

Notes:
The EAB dose is greatest during the two-hr period between 6 and 8 hours after start of this accident.

TABLE 3.3-12
AP1000 Control Rod Ejection Accident Curies Released to Environment by Interval
Pre-existing Iodine Spike

Isotope	0 to 2 hr	2 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
I-130	4.897E+00	7.276E+00	4.321E+00	2.030E-01	2.946E-04
I-131	1.358E+02	2.452E+02	2.313E+02	3.101E+01	1.675E+01
I-132	1.528E+02	9.936E+01	9.852E+00	8.236E-03	0
I-133	2.722E+02	4.396E+02	3.176E+02	2.280E+01	2.410E-01
I-134	1.663E+02	2.851E+01	1.367E-01	4.478E-08	0
I-135	2.387E+02	2.974E+02	1.186E+02	2.393E+00	7.322E-05
Kr-85m	1.123E+02	6.480E+01	3.868E+01	1.767E+00	2.511E-05
Kr-85	5.012E+00	5.599E+00	1.492E+01	3.353E+01	2.877E+02
Kr-87	1.823E+02	2.596E+01	1.025E+00	8.366E-05	0
Kr-88	2.912E+02	1.184E+02	3.491E+01	3.589E-01	8.407E-09
Xe-131m	4.938E+00	5.457E+00	1.416E+01	2.864E+01	1.162E+02
Xe-133m	2.666E+01	2.809E+01	6.485E+01	8.450E+01	5.311E+01
Xe-133	8.789E+02	9.581E+02	2.404E+03	4.267E+03	8.446E+03
Xe-135m	7.341E+01	5.304E-02	4.333E-09	0	0
Xe-135	2.148E+02	1.720E+02	2.088E+02	4.347E+01	1.793E-01
Xe-138	2.987E+02	1.378E-01	3.194E-09	0	0
Rb-86	3.623E-01	7.272E-01	6.956E-01	8.674E-02	3.417E-02
Cs-134	3.082E+01	6.216E+01	6.030E+01	7.760E+00	5.164E+00
Cs-136	8.787E+00	1.751E+01	1.666E+01	2.049E+00	6.584E-01
Cs-137	1.793E+01	3.616E+01	3.509E+01	4.520E+00	3.051E+00
Cs-138	1.086E+02	7.046E+00	1.682E-03	0	0

TABLE 3.3-13
AP1000 Control Rod Ejection Accident
Pre-existing Iodine Spike Off-Site Dose Consequences

Time	EAB Dose TEDE Rem	LPZ Dose TEDE Rem
0 to 2 hr	1.43E+00	-
0 to 8 hr	-	6.24E-01
8 to 24 hr	-	9.90E-02
24 to 96 hr	-	5.39E-03
96 to 720 hr	-	6.40E-04
Total	1.43E+00	7.29E-01

TABLE 3.3-14
AP1000 Steam Generator Tube Rupture Accident Curies Released to Environment by Interval
Accident Initiated Iodine Spike

Isotope	0 to 2 hr	2 to 8 hr	8 to 24 hr
I-130	8.870E-01	1.619E-01	8.238E-01
I-131	4.363E+01	1.142E+01	6.761E+01
I-132	1.472E+02	4.857E+00	1.291E+01
I-133	9.334E+01	1.996E+01	1.084E+02
I-134	5.587E+01	6.043E-02	5.942E-02
I-135	7.614E+01	9.880E+00	4.378E+01
Kr-85m	5.530E+01	1.929E+01	7.529E-03
Kr-85	2.204E+02	1.085E+02	1.339E-01
Kr-87	2.393E+01	3.612E+00	9.119E-05
Kr-88	9.222E+01	2.651E+01	5.429E-03
Xe-131m	9.961E+01	4.876E+01	5.909E-02
Xe-133m	1.238E+02	5.914E+01	6.609E-02
Xe-133	9.192E+03	4.468E+03	5.291E+00
Xe-135m	3.443E+00	5.862E-03	0
Xe-135	2.455E+02	1.019E+02	7.101E-02
Xe-138	4.560E+00	5.068E-03	0
Rb-86	NA	NA	NA
Cs-134	1.626E+00	6.053E-02	2.163E-01
Cs-136	2.417E+00	8.860E-02	3.144E-01
Cs-137	1.173E+00	4.366E-02	1.560E-01
Cs-138	5.639E-01	2.914E-06	5.730E-07

NA = Rb-86 contribution considered negligible for this accident.

TABLE 3.3-15
AP1000 Steam Generator Tube Rupture Accident Curies Released to Environment by Interval
Pre-existing Iodine Spike

Isotope	0 to 2 hr	2 to 8 hr	8 to 24 hr
I-130	1.794E+00	5.388E-02	2.680E-01
I-131	1.206E+02	5.267E+00	3.064E+01
I-132	1.416E+02	7.428E-01	1.923E+00
I-133	2.160E+02	7.634E+00	4.062E+01
I-134	2.741E+01	4.401E-03	4.227E-03
I-135	1.272E+02	2.696E+00	1.165E+01
Kr-85m	5.530E+01	1.929E+01	7.529E-03
Kr-85	2.204E+02	1.085E+02	1.339E-01
Kr-87	2.393E+01	3.612E+00	9.119E-05
Kr-88	9.222E+01	2.651E+01	5.429E-03
Xe-131m	9.961E+01	4.876E+01	5.909E-02
Xe-133m	1.238E+02	5.914E+01	6.609E-02
Xe-133	9.192E+03	4.468E+03	5.291E+00
Xe-135m	3.443E+00	5.862E-03	0
Xe-135	2.455E+02	1.019E+02	7.101E-02
Xe-138	4.560E+00	5.068E-03	0
Rb-86	NA	NA	NA
Cs-134	1.626E+00	6.053E-02	2.163E-01
Cs-136	2.417E+00	8.860E-02	3.144E-01
Cs-137	1.173E+00	4.366E-02	1.560E-01
Cs-138	5.639E-01	2.914E-06	5.730E-07

NA = Rb-86 contribution considered negligible for this accident.

TABLE 3.3-16
AP1000 Steam Generator Tube Rupture
Accident-Initiated Iodine Spike Off-Site Dose Consequences

Time	EAB Dose TEDE Rem	LPZ Dose TEDE Rem
0 to 2 hr	4.45E-01	-
0 to 8 hr	-	8.56E-02
8 to 24 hr	-	2.14E-02
24 to 96 hr	-	0
96 to 720 hr	-	0
Total	4.45E-01	1.07E-01

TABLE 3.3-17
AP1000 Steam Generator Tube Rupture
Pre-existing Iodine Spike Off-Site Dose Consequences

Time	EAB Dose TEDE Rem	LPZ Dose TEDE Rem
0 to 2 hr	8.89E-01	-
0 to 8 hr	-	1.59E-01
8 to 24 hr	-	9.14E-03
24 to 96 hr	-	0
96 to 720 hr	-	0
Total	8.89E-01	1.68E-01

TABLE 3.3-18
AP1000 Small Line Break Accident Curies Released to Environment Accident-Initiated Iodine Spike

Isotope	0 to 0.5 hr
I-130	1.887E+00
I-131	9.256E+01
I-132	3.494E+02
I-133	2.007E+02
I-134	1.580E+02
I-135	1.680E+02
Kr-85m	1.241E+01
Kr-85	4.398E+01
Kr-87	7.047E+00
Kr-88	2.212E+01
Xe-131m	1.993E+01
Xe-133m	2.500E+01
Xe-133	1.843E+03
Xe-135m	2.588E+00
Xe-135	5.202E+01
Xe-138	3.645E+00
Cs-134	4.157E+00
Cs-136	6.163E+00
Cs-137	2.996E+00
Cs-138	2.214E+00

TABLE 3.3-19
AP1000 Small Line Break Accident, 0 to 0.5 Hour Duration
Accident-Initiated Iodine Spike Off-Site Dose Consequences

Time	EAB Dose TEDE Rem	LPZ Dose TEDE Rem
0 to 2 hr	8.40E-01	-
0 to 8 hr	-	1.40E-01
8 to 24 hr	-	0
24 to 96 hr	-	0
96 to 720 hr	-	0
Total	8.40E-01	1.40E-01

TABLE 3.3-20
ABWR Small Line Break Outside Containment
Activity Released to Environment

Isotope	Curies Released 0 to 2 hr	Curies Released 0 to 8 hr
I-131	1.84E+00	3.81E+00
I-132	1.61E+01	3.22E+01
I-133	1.24E+01	2.55E+01
I-134	2.68E+01	5.14E+01
I-135	1.78E+01	3.62E+01
Total	7.50E+01	1.49E+02

TABLE 3.3-21
ABWR Small Line Break Outside Containment Off-Site Dose Consequences

Dose Type	EAB Dose Rem	LPZ Dose Rem
Thyroid	4.32E-01	1.06E-01
Whole Body	8.10E-03	1.90E-03
TEDE	2.10E-02	5.07E-03

TABLE 3.3-22
AP1000 Design Basis Loss of Coolant Accident Curies Released to Environment by Interval

Isotope	1.4 to 3.4 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
			Halogen Group		
I-130	5.65E+01	1.12E+02	5.37E+00	7.10E-01	1.27E-02
I-131	1.69E+03	3.49E+03	2.66E+02	2.39E+02	7.19E+02
I-132	1.24E+03	2.14E+03	1.64E+01	1.46E-02	0
I-133	3.24E+03	6.54E+03	3.83E+02	1.04E+02	1.04E+01
I-134	6.63E+02	1.14E+03	2.96E-01	6.79E-08	0
I-135	2.56E+03	4.89E+03	1.58E+02	6.09E+00	3.16E-03
Noble Gas Group					
Kr-85m	1.42E+03	3.77E+03	1.87E+03	8.56E+01	1.22E-03
Kr-85	8.32E+01	3.49E+03	7.06E+02	1.59E+03	1.36E+04
Kr-87	1.10E+03	2.14E+03	4.97E+01	4.05E-03	0
Kr-88	3.12E+03	6.54E+03	1.70E+03	1.75E+01	4.09E-07
Xe-131m	8.27E+01	1.14E+03	6.79E+02	1.37E+03	5.57E+03
Xe-133m	4.44E+02	1.54E+03	3.15E+03	4.11E+03	2.58E+03
Xe-133	1.47E+04	5.19E+04	1.16E+05	2.06E+05	4.07E+05
Xe-135m	1.07E+01	3.59E+01	2.14E-07	0	0
Xe-135	3.16E+03	9.64E+03	1.01E+04	2.11E+03	8.68E+00
Xe-138	3.14E+01	1.20E+02	1.58E-07	0	0
Alkali Metal Group					
Rb-86	3.05E+00	6.32E+00	2.99E-01	9.83E-02	5.13E-01
Cs-134	2.59E+02	5.38E+02	2.57E+01	9.11E+00	7.74E+01
Cs-136	7.34E+01	1.52E+02	7.16E+00	2.28E+00	9.88E+00
Cs-137	1.51E+02	3.13E+02	1.50E+01	5.32E+00	4.57E+01
Cs-138	1.51E+02	3.30E+02	2.18E-03	0	0
Tellurium Group					
Sr-89	9.25E+01	1.85E+02	9.24E+00	3.19E+00	2.26E+01
Sr-90	7.96E+00	1.59E+01	7.99E-01	2.84E-01	2.44E+00
Sr-91	9.70E+01	1.81E+02	5.46E+00	1.35E-01	7.06E-04
Sr-92	6.85E+01	1.13E+02	1.01E+00	5.15E-04	0

TABLE 3.3-22 (CONTINUED)
AP1000 Design Basis Loss of Coolant Accident Curies Released to Environment by Interval

Isotope	1.4 to 3.4 hr	1 to 3 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
Tellurium Group (continued)					
Sb-127	2.42E+01	4.80E+01	2.29E+00	5.67E-01	7.82E-01
Sb-129	5.12E+01	8.94E+01	1.51E+00	4.95E-03	4.90E-08
Te-127m	3.16E+00	6.30E+00	3.16E-01	1.11E-01	8.71E-01
Te-127	2.05E+01	3.83E+01	1.15E+00	2.75E-02	1.33E-04
Te-129m	1.07E+01	2.15E+01	1.07E+00	3.65E-01	2.36E+00
Te-129	1.89E+01	2.83E+01	2.69E-02	3.54E-08	0
Te-131m	3.17E+01	6.20E+01	2.64E+00	3.35E-01	7.81E-02
Te-132	3.23E+02	6.40E+02	3.02E+01	7.04E+00	7.83E+00
Ba-139	5.45E+01	8.30E+01	1.49E-01	9.91E-07	0
Ba-140	1.63E+02	3.25E+02	1.61E+01	5.11E+00	2.17E+01
Noble Metals Group					
Mo-99	2.15E+01	4.25E+01	1.98E+00	4.29E-01	3.78E-01
Tc-99m	1.48E+01	2.66E+01	6.05E-01	5.27E-03	1.33E-06
Ru-103	1.73E+01	3.46E+01	1.73E+00	5.93E-01	3.99E+00
Ru-105	8.20E+00	1.44E+01	2.48E-01	8.86E-04	1.17E-08
Ru-106	5.71E+00	1.14E+01	5.73E-01	2.03E-01	1.70E+00
Rh-105	1.03E+01	2.02E+01	8.81E-01	1.29E-01	4.14E-02
Lanthanide Group					
Y-90	8.09E-02	1.60E-01	7.44E-03	1.59E-03	1.35E-03
Y-91	1.19E+00	2.37E+00	1.19E-01	4.12E-02	3.00E-01
Y-92	7.91E-01	1.35E+00	1.80E-02	2.86E-05	0
Y-93	1.22E+00	2.28E+00	7.08E-02	1.98E-03	1.42E-05
Nb-95	1.60E+00	3.19E+00	1.59E-01	5.44E-02	3.55E-01
Zr-95	1.59E+00	3.18E+00	1.59E-01	5.52E-02	4.08E-01
Zr-97	1.43E+00	2.74E+00	1.03E-01	6.73E-03	3.71E-04

TABLE 3.3-22 (CONTINUED)
AP1000 Design Basis Loss of Coolant Accident Curies Released to Environment by Interval

Isotope	1.4 to 3.4 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
Lanthanide Group (continued)					
La-140	1.68E+00	3.29E+00	1.46E-01	2.36E-02	9.62E-03
La-141	1.03E+00	1.79E+00	2.71E-02	6.41E-05	2.01E-10
La-142	5.40E-01	8.31E-01	2.09E-03	3.39E-08	0
Nd-147	6.17E-01	1.23E+00	6.06E-02	1.90E-02	7.29E-02
Pr-143	1.39E+00	2.78E+00	1.37E-01	4.40E-02	1.94E-01
Am-241	1.20E-04	2.39E-04	1.20E-05	4.27E-06	3.68E-05
Cm-242	2.83E-02	5.65E-02	2.83E-03	9.98E-04	8.08E-03
Cm-244	3.47E-03	6.93E-03	3.48E-04	1.24E-04	1.06E-03
Cerium Group					
Ce-141	3.90E+00	7.78E+00	3.88E-01	1.32E-01	8.45E-01
Ce-143	3.47E+00	6.78E+00	2.93E-01	4.05E-02	1.14E-02
Ce-144	2.95E+00	5.89E+00	2.96E-01	1.05E-01	8.68E-01
Pu-238	9.18E-03	1.83E-02	9.21E-04	3.27E-04	2.82E-03
Pu-239	8.08E-04	1.61E-03	8.10E-05	2.88E-05	2.48E-04
Pu-240	1.18E-03	2.37E-03	1.19E-04	4.22E-05	3.63E-04
Pu-241	2.66E-01	5.31E-01	2.67E-02	9.48E-03	8.14E-02
Np-239	4.49E+01	8.87E+01	4.08E+00	8.15E-01	5.70E-01

TABLE 3.3-23
AP1000 Design Basis Loss of Coolant Accident Off-Site Dose Consequences

Time	EAB Dose TEDE Rem	LPZ Dose TEDE Rem
1.4 to 3.4 hr	1.23E+01	-
0 to 8 hr	-	2.96E+00
8 to 24 hr	-	9.71E-02
24 to 96 hr	-	3.17E-02
96 to 720 hr	-	2.70E-02
Total	1.23E+01	3.12E+00

Notes:
1. The EAB dose is greatest during the two-hr period between 1.4 and 3.4 hours after start of this accident.
2. LOCA based on Regulatory Guide 1.183.

TABLE 3.3-24
ABWR LOCA Curies Released to Environment by Interval

Isotope	0 to 2 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
I-131	2.60E+02	3.74E+02	9.23E+02	8.70E+03	6.22E+04
I-132	3.52E+02	3.85E+02	3.24E+01	0	0
I-133	5.41E+02	7.43E+02	1.18E+03	3.32E+03	6.76E+02
I-134	5.14E+02	5.15E+02	0	0	0
I-135	5.14E+02	6.47E+02	3.32E+02	1.68E+02	0
Kr-83m	3.26E+02	9.00E+02	4.32E+01	0	0
Kr-85m	8.44E+02	3.74E+03	4.36E+03	7.03E+02	0
Kr-85	4.09E+01	3.49E+02	2.19E+03	2.18E+04	2.86E+05
Kr-87	1.20E+03	2.17E+03	8.92E+01	2.70E+00	0
Kr-88	2.12E+03	7.14E+03	3.43E+03	2.97E+02	0
Kr-89	1.81E+02	1.81E+02	0	0	0
Xe-131m	2.13E+01	1.72E+02	1.12E+03	9.52E+03	6.22E+04
Xe-133m	3.00E+02	2.48E+03	1.38E+04	7.59E+04	7.27E+04
Xe-133	7.63E+03	6.11E+04	3.77E+05	2.78E+06	8.41E+06
Xe-135m	4.87E+02	4.87E+02	0	0	0
Xe-135	9.26E+02	5.51E+03	1.52E+04	1.17E+04	0
Xe-137	5.14E+02	5.14E+02	0	0	0
Xe-138	2.00E+03	2.00E+03	0	0	0

TABLE 3.3-25
ABWR Design Basis Loss of Coolant Accident Off-Site Dose Consequences

Dose Type	EAB Dose Rem	LPZ Dose Rem
Thyroid	3.51E+01	6.98E+01
Whole Body	7.25E-01	7.83E-01
TEDE	1.66E+00	2.63E+00

Note: LOCA based on Regulatory Guide 1.3 and TID-14844.

TABLE 3.3-26
ESBWR Design Basis Loss of Coolant Accident Curies Released to Environment by Interval

Isotope	0 to 1.4 hr	1.4 to 3.4 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
Halogen Group						
I-131	9.28E+01	2.85E+02	8.72E+02	1.60E+03	5.09E+03	6.64E+03
I-132	1.21E+02	3.11E+02	7.18E+02	4.42E+02	1.02E+03	4.80E+02
I-133	1.89E+02	5.56E+02	1.62E+03	2.09E+03	2.36E+03	1.50E+02
I-134	1.01E+02	1.09E+02	2.31E+02	0	0	0
I-135	1.66E+02	4.42E+02	1.16E+03	6.90E+02	1.40E+02	0
Noble Gas Group						
Kr-85m	1.09E+02	7.25E+02	2.90E+03	3.83E+03	6.40E+02	0
Kr-85	3.56E+00	2.96E+01	1.75E+02	1.24E+03	1.23E+04	1.99E+05
Kr-87	1.30E+02	5.02E+02	1.09E+03	7.00E+01	0	0
Kr-88	2.43E+02	1.42E+03	4.72E+03	2.82E+03	1.10E+02	0
Xe-133	7.68E+02	6.36E+03	3.70E+04	2.46E+05	1.89E+06	6.68E+06
Xe-135	2.02E+02	1.66E+03	8.14E+03	2.44E+04	1.90E+04	1.00E+02
Alkali Metal Group						
Rb-86	4.50E-02	1.30E-01	4.03E-01	7.37E-01	2.40E+00	2.91E+00
Cs-134	1.36E+01	3.95E+01	1.22E+02	2.28E+02	7.90E+02	1.26E+03
Cs-136	3.64E+00	1.06E+01	3.25E+01	5.90E+01	1.87E+02	2.04E+02
Cs-137	8.14E+00	2.37E+01	7.32E+01	1.37E+02	4.72E+02	7.58E+02
Tellurium Group						
Sr-89	4.70E+00	2.15E+01	6.27E+01	1.19E+02	4.03E+02	5.85E+02
Sr-90	3.33E-01	1.53E+00	4.45E+00	8.55E+00	2.94E+01	4.75E+01
Sr-91	5.62E+00	2.36E+01	6.07E+01	5.03E+01	2.00E+01	0
Sr-92	4.78E+00	1.60E+01	3.30E+01	4.90E+00	1.00E-01	0
Sb-127	9.76E-01	4.43E+00	1.28E+01	2.23E+01	5.73E+01	3.06E+01
Sb-129	2.85E+00	1.08E+01	2.44E+01	8.60E+00	6.00E-01	0
Te-127	9.51E-01	4.36E+00	1.26E+01	2.33E+01	6.51E+01	4.80E+01
Te-127m	1.28E-01	5.89E-01	1.72E+00	3.29E+00	1.14E+01	1.78E+01
Te-129	3.11E+00	1.30E+01	3.19E+01	2.69E+01	6.22E+01	8.50E+01

TABLE 3.3-26 (CONTINUED)
ESBWR Design Basis Loss of Coolant Accident Curies Released to Environment by Interval

Isotope	0 to 1.4 hr	1.4 to 3.4 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
Tellurium Group (continued)						
Te-129m	8.43E-01	3.87E+00	1.13E+01	2.13E+01	7.14E+01	9.80E+01
Te-131m	1.58E+00	7.02E+00	1.97E+01	2.86E+01	4.23E+01	5.30E+00
Te-132	1.57E+01	7.10E+01	2.04E+02	3.51E+02	8.55E+02	4.00E+02
Ba-139	4.82E+00	1.21E+01	2.15E+01	5.00E-01	0	0
Ba-140	8.33E+00	3.81E+01	1.11E+02	2.06E+02	6.49E+02	7.04E+02
Noble Metals Group						
Co-58	3.24E-03	1.49E-02	4.33E-02	8.27E-02	2.80E-01	4.18E-01
Co-60	3.88E-03	1.78E-02	5.19E-02	9.91E-02	3.43E-01	5.56E-01
Mo-99	1.02E+00	4.61E+00	1.32E+01	2.22E+01	5.11E+01	1.95E+01
Tc-99m	8.91E-01	4.09E+00	1.19E+01	2.14E+01	5.21E+01	2.06E+01
Ru-103	7.81E-01	3.58E+00	1.04E+01	1.98E+01	6.64E+01	9.34E+01
Ru-105	4.37E-01	1.65E+00	3.78E+00	1.37E+00	1.10E-01	0
Ru-106	2.12E-01	9.78E-01	2.84E+00	5.42E+00	1.87E+01	2.97E+01
Rh-105	3.91E-01	1.79E+00	5.17E+00	8.43E+00	1.44E+01	2.40E+00
Lanthanide Group						
Y-90	4.85E-03	3.54E-02	1.90E-01	1.35E+00	1.33E+01	4.16E+01
Y-91	5.78E-02	2.69E-01	8.07E-01	1.72E+00	6.26E+00	9.31E+00
Y-92	4.03E-01	3.88E+00	1.58E+01	1.50E+01	1.10E+00	0
Y-93	6.74E-02	2.84E-01	7.36E-01	6.44E-01	2.80E-01	0
Zr-95	7.55E-02	3.47E-01	1.01E+00	1.92E+00	6.51E+00	9.66E+00
Zr-97	7.42E-02	3.24E-01	8.77E-01	1.04E+00	9.00E-01	2.00E-02
Nb-95	7.14E-02	3.28E-01	9.56E-01	1.83E+00	6.33E+00	1.02E+01
La-140	1.37E-01	1.14E+00	6.70E+00	4.90E+01	4.12E+02	7.42E+02
La-141	6.45E-02	2.38E-01	5.32E-01	1.59E-01	9.00E-03	0
La-142	4.57E-02	1.21E-01	2.21E-01	7.00E-03	0	0
Pr-143	7.23E-02	3.33E-01	9.75E-01	1.92E+00	6.67E+00	7.94E+00
Nd-147	3.22E-02	1.47E-01	4.27E-01	7.93E-01	2.46E+00	2.52E+00
Am-241	3.72E-06	1.71E-05	4.98E-05	9.62E-05	3.37E-04	5.87E-04

TABLE 3.3-26 (CONTINUED)
ESBWR Design Basis Loss of Coolant Accident Curies Released to Environment by Interval

Isotope	0 to 1.4 hr	1.4 to 3.4 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
Lanthanide Group (continued)						
Cm-242	9.81E-04	4.50E-03	1.31E-02	2.51E-02	8.58E-02	1.34E-01
Cm-244	5.29E-05	2.43E-04	7.08E-04	1.35E-03	4.69E-03	7.55E-03
Cerium Group						
Ce-141	1.89E-01	8.71E-01	2.53E+00	4.79E+00	1.60E+01	2.18E+01
Ce-143	1.80E-01	8.05E-01	2.26E+00	3.37E+00	5.37E+00	8.00E-01
Ce-144	1.23E-01	5.64E-01	1.64E+00	3.14E+00	1.08E+01	1.71E+01
Pu-238	1.67E-04	7.68E-04	2.24E-03	4.28E-03	1.48E-02	2.39E-02
Pu-239	4.24E-05	1.95E-04	5.68E-04	1.09E-03	3.78E-03	6.16E-03
Pu-240	5.31E-05	2.44E-04	7.10E-04	1.36E-03	4.70E-03	7.53E-03
Pu-241	9.14E-03	4.20E-02	1.22E-01	2.34E-01	8.14E-01	1.30E+00
Np-239	2.37E+00	1.07E+01	3.06E+01	5.05E+01	1.09E+02	3.50E+01

TABLE 3.3-27
ESBWR Design Basis Loss of Coolant Accident Off-Site Dose Consequences

Time	EAB Dose TEDE Rem	LPZ Dose TEDE Rem
1.4 to 3.4 hr	2.19E+00	-
0 to 8 hr	-	7.88E-01
8 to 24 hr	-	5.01E-01
24 to 96 hr	-	7.75E-01
96 to 720 hr	-	3.49E-01
Total	2.19E+00	2.41E+00

Note:
1. 1. The EAB dose is greatest during the two-hr period between 1.4 and 3.4 hours after start of this accident.
2. LOCA based on Regulatory Guide 1.183

TABLE 3.3-28
ACR-700 Design Basis Large Loss of Coolant Accident
Curies Released to Environment by Interval

Isotope	0 to 2 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
I-131	7.76E+01	3.06E+02	5.84E+02	1.56E+04	4.24E+03
I-132	8.55E+01	1.71E+02	1.61E+01	1.42E+01	0
I-133	1.59E+02	5.78E+02	7.75E+02	1.52E+04	6.20E+01
I-134	8.91E+01	1.12E+02	5.10E-02	0	0
I-135	1.37E+02	4.12E+02	2.49E+02	2.36E+03	0
Kr-83m	2.09E+03	3.76E+03	1.91E+02	0	0
Kr-85m	5.70E+03	1.52E+04	5.67E+03	2.60E+02	0
Kr-85	4.50E+01	1.81E+02	3.63E+02	8.13E+02	6.78E+03
Kr-87	7.98E+03	1.18E+04	1.50E+02	0	0
Kr-88	1.45E+04	3.21E+04	5.20E+03	5.30E+01	0
Kr-89	8.64E+02	8.64E+02	0	0	0
Xe-131m	2.52E+02	1.00E+03	1.94E+03	3.91E+03	1.55E+04
Xe-133m	1.40E+03	5.37E+03	9.16E+03	1.19E+04	7.45E+03
Xe-133	4.56E+04	1.79E+05	3.35E+05	5.94E+05	1.16E+06
Xe-135m	1.78E+03	1.79E+03	0	0	0
Xe-135	3.74E+03	1.21E+04	1.01E+04	2.10E+03	9.00E+00
Xe-137	1.89E+03	1.89E+03	0	0	0
Xe-138	6.78E+03	6.79E+03	0	0	0

TABLE 3.3-29
ACR-700 Large Loss of Coolant Accident Off-Site Dose Consequences

Time	EAB Dose TEDE Rem	LPZ Dose TEDE Rem
0 to 2 hr	2.67E+00	-
0 to 8 hr	-	6.91E-01
8 to 24 hr	-	1.81E-01
24 to 96 hr		1.26E+00
96 to 720 hr		9.78E-02
Total	2.67E+00	2.23E+00

TABLE 3.3-30
AP1000 Fuel Handling Accident
Curies Released to Environment

Isotope	0 to 2 hr
I-130	2.512E+00
I-131	3.763E+02
I-132	3.014E+02
I-133	2.401E+02
I-134	0
I-135	3.938E+01
Kr-83m	0
Kr-85m	3.418E+02
Kr-85	1.109E+03
Kr-87	0
Kr-88	0
Kr-89	0
Xe-131m	5.544E+02
Xe-133m	2.801E+03
Xe-133	9.658E+04
Xe-135m	1.262E+03
Xe-135	2.490E+04
Xe-137	0
Xe-138	0

Notes:
1. Activity is based on a 24 hr shutdown period before fuel movement begins.
2. Source term and pool DF based on Regulatory Guide 1.183.

TABLE 3.3-31
AP1000 Fuel Handling Accident Off-Site Dose Consequences

Time	EAB Dose TEDE Rem	LPZ Dose TEDE Rem
0 to 2 hr	2.77E+00	-
0 to 8 hr	-	4.77E-01
8 to 24 hr	-	0
24 to 96 hr	-	0
96 to 720 hr	-	0
Total	2.77E+00	4.77E-01

Notes:
1. Doses are based on a 24 hr shutdown period before fuel movement begins

TABLE 3.3-32
ABWR Fuel Handling Accident
Curies Released to Environment by Interval

Isotope	0 to 2 hr	2 to 8 hr
I-131	1.23E+02	1.82E+00
I-132	1.52E+02	1.29E+00
I-133	1.27E+02	1.77E+00
I-134	6.16E-06	2.13E-08
I-135	2.06E+01	2.52E-01
Kr-83m	6.43E+00	4.57E+00
Kr-85m	8.54E+01	9.14E+01
Kr-85	4.78E+02	6.76E+02
Kr-87	1.23E-02	6.51E-03
Kr-88	2.43E+01	2.21E+01
Kr-89	8.14E-11	1.00E-20
Xe-131m	0	0
Xe-133m	8.35E+01	1.18E+02
Xe-133	1.10E+03	1.52E+03
Xe-135m	2.81E+04	3.95E+04
Xe-135	2.21E+02	2.34E+00
Xe-137	6.38E+03	7.84E+03
Xe-138	2.07E-10	2.81E-19
Xe-138	0	0

Notes:
1. Activity is based on a 24 hr shutdown before fuel movement begins.
2. Source term and pool DF are based on Regulatory Guide 1.25.

TABLE 3.3-33
ABWR Fuel Handling Accident Off-Site Dose Consequences

Dose Type	EAB Dose Rem	LPZ Dose Rem
Thyroid	1.40E+01	1.69E+00
Whole Body	1.99E-01	4.91E-02
TEDE	5.69E-01	8.63E-02

Note: LPZ dose includes contribution from activity remaining in reactor building. See Section 3.3.4.13.