

**PSEG Site
ESP Application
Part 2, Site Safety Analysis Report**

**CHAPTER 15
TRANSIENT AND ACCIDENT ANALYSIS**

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CHAPTER 15

TRANSIENT AND ACCIDENT ANALYSES

15.1 SELECTION OF ACCIDENTS

This chapter contains an analysis of the radiological consequences of design basis accidents at the new plant. This analysis demonstrates the acceptability of the site with respect to the radiological consequence factors identified in 10 CFR 50.34(a)(1) as related to mitigating the radiological consequences of an accident in accordance with 10 CFR 52.17(a)(1). This analysis is performed to exhibit that the new plant can be located at the PSEG Site without undue risk to the health and safety of the public in compliance with the requirements of 10 CFR Part 100.

PSEG is considering constructing an ABWR, AP1000 (dual unit), U.S. EPR, or US-APWR light water reactor (LWR) at the PSEG Site. Although PSEG is using the plant parameter envelope (PPE) approach discussed in Chapter 1, each technology is evaluated individually within this chapter. The analysis is performed for a broad spectrum of representative postulated design basis accidents (DBA) to determine the bounding radiological consequences that affect the safe design and siting of an advanced light-water reactor. The selected accidents are based on the LWR technologies being considered for development and the regulatory guidance for performing DBA analysis. The following accidents are selected from NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition*, and Regulatory Guide (RG) 1.183, *Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors*, Revision 0, 2000, to cover a spectrum of reactor transients and accidents.

- STEAM SYSTEM PIPING FAILURES INSIDE AND OUTSIDE OF CONTAINMENT (AP1000, U.S. EPR, US-APWR), (SRP 15.1.5)
- REACTOR COOLANT PUMP ROTOR SEIZURE (ABWR, AP1000, U.S. EPR, US-APWR), (SRP 15.3.3)
- SPECTRUM OF ROD EJECTION ACCIDENTS (ABWR, AP1000, U.S. EPR, US-APWR), (SRP 15.4.8)
- SPECTRUM OF ROD DROP ACCIDENTS (ABWR), (SRP 15.4.9)
- RADIOLOGICAL CONSEQUENCES OF THE FAILURE OF SMALL LINES CARRYING PRIMARY COOLANT OUTSIDE CONTAINMENT (ABWR, AP1000, U.S. EPR, US-APWR), (SRP 15.6.2)
- RADIOLOGICAL CONSEQUENCES OF STEAM GENERATOR TUBE FAILURE (AP1000, U.S. EPR, US-APWR), (SRP 15.6.3)
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- LOSS-OF-COOLANT ACCIDENTS RESULTING FROM SPECTRUM OF POSTULATED PIPING BREAKS WITHIN THE REACTOR COOLANT PRESSURE BOUNDARY (ABWR, AP1000, U.S. EPR, US-APWR), (SRP 15.6.5)
- RADIOLOGICAL CONSEQUENCES OF FUEL HANDLING ACCIDENTS (ABWR, AP1000, U.S. EPR, US-APWR), (SRP 15.7.4)

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15.2 EVALUATION METHODOLOGY

Doses for selected accidents involving possible fission product release from a new plant at the PSEG Site are evaluated at the Exclusion Area Boundary (EAB) and at the outer boundary of the low population zone (LPZ) to demonstrate the new plant's capabilities to mitigate the radiological consequences of an accident. Although the emergency safeguard features are expected to prevent core damage and mitigate the release of radioactivity, the bounding Loss of Coolant Accident (LOCA) analysis presumes substantial damage to the core with the release of fission products. Other DBAs of lesser magnitude but greater frequencies of occurrence are not expected to approach the limits of 10 CFR 50.34 or 10 CFR 100 as closely as a LOCA. For these accidents, the more restrictive dose limits in RG 1.183 and NUREG-0800 are invoked to determine that the accidents are acceptable from an overall risk perspective. Accident doses to an individual are evaluated at any point on the EAB and at any point on the outer boundary of the LPZ to meet limits specified in 10 CFR 50.34 and 10 CFR 100. Radiological consequences related to control room personnel will be evaluated as part of the combined license (COL) review.

The dose to an individual located on the EAB or the outer boundary of the LPZ is calculated based on the amount of activity released to the environment, the atmospheric dispersion of the activity during transport from the release point to the dose point, the breathing rate of the individual at the dose point location and the activity-to-dose conversion factors. The atmospheric dispersion factor (χ/Q) is the only site-specific parameter required for determining the dose to an individual. The Design Control Documents (DCDs) have developed χ/Q s that are not expected to be exceeded at most reactor sites. For this evaluation, the accident doses at the EAB and the outer boundary of the LPZ for the new plant at the PSEG Site are obtained using the ratio of the site-specific and design certified χ/Q s for each respective technology and compared to the acceptance criteria in RG 1.183 and NUREG-0800. Site-specific χ/Q values are based on on-site meteorology and developed within Section 2.3. The PSEG Site specific short-term directional dependent χ/Q s are calculated using on-site meteorological data and the methodology of RG 1.145, *Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants*, Revision 1, 1983.

The accident dose evaluations are performed using χ/Q s and activity releases for the following intervals. The zero to two hour χ/Q value is used for the two hour release duration with the greatest dose consequence at the EAB.

EAB
0 to 2 hr.

LPZ
0 to 8 hr.
8 to 24 hr.
24 to 96 hr.
96 to 720 hr.

Accident doses for the ABWR are expressed as whole body and thyroid doses consistent with 10 CFR 100. Accident doses for all other technologies evaluated are expressed in total effective dose equivalent (TEDE) consistent with 10 CFR 50.34.

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15.3 SOURCE TERMS

Dose estimates are calculated using time-dependent activities released to the environment for each DBA. The activities are based on the analyses used to support the reactor standard safety analysis reports. The different reactor technologies use different source terms and approaches in defining the activity releases.

The US-APWR source terms are calculated using the guidance in NUREG-0800 and RG 1.183. Activity releases are calculated for a reactor power level of 4555 MWt (102 percent of rated NSSS power of 4466 MWt). Source terms for the US-APWR are listed in Tables 15.3-1 to 15.3-9.

The ABWR source terms are calculated using the following guidance:

- RG 1.3, *Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors*, Revision 2, 1974
- RG 1.25, *Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors*, Revision 0, 1972
- TID-14844, *Calculation of Distance Factors for Power and Test Reactor Sites*, 1962

The ABWR DCD source terms are given for a reactor power level of 4005 MWt. An uprated, 4300 MWt version of the ABWR is being considered for the PSEG Site. Source terms are calculated for a reactor power level of 4386 MWt (102 percent of the uprated 4300 MWt) by multiplying the source terms in the DCD by a factor of 4386/4005, since activity releases scale directly with power. This is only done for accidents that involved postulated fuel damage (LOCA and fuel handling accidents). The source terms for the ABWR are listed in Tables 15.3-10 to 15.3-14.

There are no radiological consequences for either the control rod drop/rod ejection accident or the reactor internal pump rotor seizure accident for the ABWR. The fine motion control rod drive (FMCRD) system has several new features that are unique compared with locking piston control rod drives. This system removes the basis for the control rod accidents to occur and thus removes the need for any radiological analysis. Further detail on this specific design is provided in ABWR DCD Subsections 15.4.9 and 15.4.10. The reactor internal pump rotor seizure accident does not result in any fuel failures or safety/relief valve (SRV) actuation, and radiological consequences are thus not considered. Further detail on this accident can be found in ABWR DCD Subsection 15.3.3.

The AP1000 source terms and approaches to assessing accidents are based on the Alternate Source Term (AST) methods as described in NUREG-1465, *Accident Source Terms for Light-Water Nuclear Power Plants*, and are in accordance with RG 1.183. Activity releases are calculated at a power level of 3468 MWt (102 percent of rated core power of 3400 MWt). The source terms for the AP1000 are listed in Tables 15.3-15 to 15.3-23.

The U.S. EPR source terms and approaches to assessing accidents are calculated in accordance with NUREG-0800 and RG 1.183. Activity releases are calculated for a reactor power level of 4612 MWt (4590 MWt rated core power + 22 MWt heat balance measurement uncertainty). The source terms for the U.S. EPR are listed in Tables 15.3-24 to 15.3-33.

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**Table 15.3-1 (Sheet 1 of 2)
US-APWR Source Terms
Time Dependent Released Activity during LOCA (Ci)**

Nuclide	0 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Noble Gases					
Kr-85	7.75E+02	1.74E+03	3.92E+03	3.35E+04	3.99E+04
Kr-85m	9.16E+03	4.37E+03	1.99E+02	0.00E+00	1.37E+04
Kr-87	3.54E+03	7.83E+01	0.00E+00	0.00E+00	3.62E+03
Kr-88	1.68E+04	3.68E+03	3.70E+01	0.00E+00	2.05E+04
Xe-133	1.26E+05	2.76E+05	4.93E+05	9.77E+05	1.87E+06
Xe-135	3.79E+04	4.05E+04	9.60E+03	4.41E+01	8.80E+04
Iodines					
I-131	1.42E+03	5.61E+02	1.85E+03	5.60E+03	9.43E+03
I-132	1.50E+03	1.01E+02	2.22E+02	2.48E+02	2.07E+03
I-133	2.67E+03	7.37E+02	8.09E+02	8.07E+01	4.30E+03
I-134	4.22E+02	1.84E-01	0.00E+00	0.00E+00	4.22E+02
I-135	1.95E+03	2.44E+02	4.67E+01	1.20E-01	2.24E+03
Alkali Metals					
Rb-86	1.44E+00	1.60E-02	0.00E+00	0.00E+00	1.45E+00
Cs-134	1.44E+02	1.62E+00	0.00E+00	0.00E+00	1.46E+02
Cs-136	3.90E+01	4.31E-01	0.00E+00	0.00E+00	3.94E+01
Cs-137	8.19E+01	9.21E-01	1.00E-03	0.00E+00	8.28E+01
Tellurium Group					
Sb-127	1.04E+01	1.26E-01	1.00E-05	0.00E+00	1.05E+01
Sb-129	1.99E+01	6.87E-02	0.00E+00	0.00E+00	2.00E+01
Te-127	1.04E+01	1.30E-01	0.00E+00	0.00E+00	1.05E+01
Te-127m	1.39E+00	1.80E-02	0.00E+00	0.00E+00	1.40E+00
Te-129	2.30E+01	1.12E-01	0.00E+00	0.00E+00	2.31E+01
Te-129m	4.75E+00	6.13E-02	0.00E+00	0.00E+00	4.81E+00
Te-131m	1.36E+01	1.44E-01	0.00E+00	0.00E+00	1.37E+01
Te-132	1.41E+02	1.71E+00	1.00E-04	0.00E+00	1.43E+02
Strontium and Barium					
Sr-89	4.74E+01	6.12E-01	0.00E+00	0.00E+00	4.80E+01
Sr-90	3.93E+00	5.10E-02	0.00E+00	0.00E+00	3.98E+00
Sr-91	5.01E+01	3.54E-01	1.00E-03	0.00E+00	5.05E+01
Sr-92	3.11E+01	4.95E-02	0.00E+00	0.00E+00	3.11E+01
Ba-139	1.96E+01	5.04E-03	0.00E+00	0.00E+00	1.96E+01
Ba-140	7.49E+01	9.53E-01	0.00E+00	0.00E+00	7.59E+1

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**Table 15.3-1 (Sheet 2 of 2)
US-APWR Source Terms
Time Dependent Released Activity during LOCA (Ci)**

Nuclide	0 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Noble Metals					
Co-58	3.36E-03	4.50E-08	0.00E+00	0.00E+00	3.36E-03
Co-60	1.59E-02	2.00E-04	1.01E-06	0.00E+00	1.61E-02
Mo-99	9.57E+00	1.11E-01	1.00E-04	0.00E+00	9.68E+00
Tc-99m	8.50E+00	1.04E-01	1.00E-04	0.00E+00	8.60E+00
Ru-103	7.62E+00	9.83E-02	1.01E-04	0.00E+00	7.72E+00
Ru-105	3.14E+00	1.12E-02	0.00E+00	0.00E+00	3.15E+00
Ru-106	2.67E+00	3.46E-02	0.00E+00	0.00E+00	2.70E+00
Rh-105	4.61E+00	5.41E-02	0.00E+00	0.00E+00	4.67E+00
Lanthanides					
Y-90	7.44E-02	5.12E-03	6.06E-06	0.00E+00	7.96E-02
Y-91	6.00E-01	8.54E-03	0.00E+00	0.00E+00	6.09E-01
Y-92	4.13E+00	1.04E-01	0.00E+00	0.00E+00	4.24E+00
Y-93	5.90E-01	4.32E-03	0.00E+00	0.00E+00	5.94E-01
Zr-95	7.55E-01	9.76E-03	0.00E+00	0.00E+00	7.65E-01
Zr-97	6.65E-01	6.12E-03	0.00E+00	0.00E+00	6.71E-01
Nb-95	7.60E-01	9.85E-03	1.01E-05	0.00E+00	7.69E-01
La-140	1.76E+00	1.43E-01	2.02E-04	0.00E+00	1.90E+00
La-141	4.25E-01	1.29E-03	0.00E+00	0.00E+00	4.27E-01
La-142	2.01E-01	7.07E-05	0.00E+00	0.00E+00	2.01E-01
Pr-143	6.74E-01	8.91E-03	1.00E-05	0.00E+00	6.83E-01
Nd-147	2.80E-01	3.55E-03	0.00E+00	0.00E+00	2.83E-01
Am-241	7.51E-05	9.77E-07	0.00E+00	0.00E+00	7.60E-05
Cm-242	1.86E-02	2.41E-04	0.00E+00	0.00E+00	1.88E-02
Cm-244	2.26E-03	2.93E-05	0.00E+00	0.00E+00	2.29E-03
Cerium Group					
Ce-141	1.78E+00	2.29E-02	0.00E+00	0.00E+00	1.80E+00
Ce-143	1.63E+00	1.78E-02	0.00E+00	0.00E+00	1.65E+00
Ce-144	1.35E+00	1.75E-02	0.00E+00	0.00E+00	1.36E+00
Np-239	1.85E+01	2.16E-01	1.00E-05	0.00E+00	1.87E+01
Pu-238	5.30E-03	6.88E-05	0.00E+00	0.00E+00	5.37E-03
Pu-239	4.00E-04	5.19E-06	0.00E+00	0.00E+00	4.05E-04
Pu-240	6.28E-04	8.14E-06	1.01E-08	0.00E+00	6.36E-04
Pu-241	1.39E-01	1.81E-03	0.00E+00	0.00E+00	1.41E-01
Total	2.03E+05	3.28E+05	5.09E+05	1.02E+06	2.06E+06

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**Table 15.3-2
US-APWR Source Terms
Time Dependent Released Activity during Steam System Piping Failure (Ci)
(Transient-Initiated Iodine Spike)**

Nuclide	0 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Noble Gases					
Kr-85	3.21E+01	2.40E+01	0.00E+00	0.00E+00	5.61E+01
Kr-85m	3.56E-01	8.77E-02	0.00E+00	0.00E+00	4.43E-01
Kr-87	9.12E-02	1.13E-03	0.00E+00	0.00E+00	9.23E-02
Kr-88	5.10E-01	6.46E-02	0.00E+00	0.00E+00	5.74E-01
Xe-133	1.08E+02	8.03E+01	0.00E+00	0.00E+00	1.88E+02
Xe-135	7.61E+00	1.33E+01	0.00E+00	0.00E+00	2.09E+01
Iodines					
I-131	5.05E+01	6.50E+01	0.00E+00	0.00E+00	1.16E+02
I-132	9.89E+00	1.49E+00	0.00E+00	0.00E+00	1.14E+01
I-133	7.65E+01	8.09E+01	0.00E+00	0.00E+00	1.57E+02
I-134	3.77E+00	9.11E-03	0.00E+00	0.00E+00	3.78E+00
I-135	3.77E+01	2.45E+01	0.00E+00	0.00E+00	6.21E+01
Alkali Metals					
Rb-86	8.64E-02	1.62E-03	0.00E+00	0.00E+00	8.80E-02
Cs-134	8.80E+00	1.68E-01	0.00E+00	0.00E+00	8.97E+00
Cs-136	2.32E+00	4.33E-02	0.00E+00	0.00E+00	2.37E+00
Cs-137	5.01E+00	9.56E-02	0.00E+00	0.00E+00	5.11E+00
Total	3.43E+02	2.90E+02	0.00E+00	0.00E+00	6.33E+02

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**Table 15.3-3
US-APWR Source Terms
Time Dependent Released Activity during Steam System Piping Failure (Ci)
(Pre-Transient Iodine Spike)**

Nuclide	0 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Noble Gases					
Kr-85	3.21E+01	2.40E+01	0.00E+00	0.00E+00	5.61E+01
Kr-85m	3.56E-01	8.77E-02	0.00E+00	0.00E+00	4.43E-01
Kr-87	9.12E-02	1.13E-03	0.00E+00	0.00E+00	9.23E-02
Kr-88	5.10E-01	6.46E-02	0.00E+00	0.00E+00	5.74E-01
Xe-133	1.07E+02	7.75E+01	0.00E+00	0.00E+00	1.85E+02
Xe-135	4.38E+00	3.39E+00	0.00E+00	0.00E+00	7.78E+00
Iodines					
I-131	1.72E+01	7.25E+00	0.00E+00	0.00E+00	2.44E+01
I-132	6.18E+00	1.66E-01	0.00E+00	0.00E+00	6.35E+00
I-133	2.79E+01	9.03E+00	0.00E+00	0.00E+00	3.69E+01
I-134	3.49E+00	1.01E-03	0.00E+00	0.00E+00	3.49E+00
I-135	1.62E+01	2.73E+00	0.00E+00	0.00E+00	1.89E+01
Alkali Metals					
Rb-86	8.64E-02	1.62E-03	0.00E+00	0.00E+00	8.80E-02
Cs-134	8.80E+00	1.68E-01	0.00E+00	0.00E+00	8.97E+00
Cs-136	2.32E+00	4.33E-02	0.00E+00	0.00E+00	2.37E+00
Cs-137	5.01E+00	9.56E-02	0.00E+00	0.00E+00	5.11E+00
Total	2.32E+02	1.25E+02	0.00E+00	0.00E+00	3.56E+02

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**Table 15.3-4
US-APWR Source Terms
Time Dependent Released Activity during Steam Generator Tube Rupture (Ci)
(Transient-Initiated Iodine Spike)**

Nuclide	0 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Noble Gases					
Kr-85	3.43E+03	4.64E+01	2.06E+02	1.59E+03	5.27E+03
Kr-85m	6.17E+01	9.70E-02	8.00E-03	0.00E+00	6.18E+01
Kr-87	3.40E+01	0.00E+00	0.00E+00	0.00E+00	3.40E+01
Kr-88	1.11E+02	6.00E-02	1.00E-02	0.00E+00	1.11E+02
Xe-133	1.16E+04	1.45E+02	5.06E+02	9.44E+02	1.32E+04
Xe-135	3.70E+02	3.82E+00	6.70E-01	0.00E+00	3.74E+02
Iodines					
I-131	1.10E+02	1.03E+01	0.00E+00	0.00E+00	1.20E+02
I-132	5.24E+01	2.12E-01	0.00E+00	0.00E+00	5.26E+01
I-133	1.87E+02	1.27E+01	0.00E+00	0.00E+00	2.00E+02
I-134	3.05E+01	1.06E-03	0.00E+00	0.00E+00	3.05E+01
I-135	1.19E+02	3.74E+00	0.00E+00	0.00E+00	1.23E+02
Alkali Metals					
Rb-86	4.54E-03	5.44E-04	0.00E+00	0.00E+00	5.09E-03
Cs-134	4.63E-01	5.63E-02	0.00E+00	0.00E+00	5.19E-01
Cs-136	1.22E-01	1.45E-02	0.00E+00	0.00E+00	1.37E-01
Cs-137	2.64E-01	3.21E-02	0.00E+00	0.00E+00	2.96E-01
Total	1.61E+04	2.22E+02	7.12 E+02	2.53E+03	1.96E+04

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**Table 15.3-5
US-APWR Source Terms
Time Dependent Released Activity during Steam Generator Tube Rupture (Ci)
(Pre-Transient Iodine Spike)**

Nuclide	0 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Noble Gases					
Kr-85	3.43E+03	4.64E+01	2.06E+02	1.59E+03	5.27E+03
Kr-85m	6.17E+01	9.70E-02	8.00E-03	0.00E+00	6.18E+01
Kr-87	3.40E+01	0.00E+00	0.00E+00	0.00E+00	3.40E+01
Kr-88	1.11E+02	6.00E-02	1.00E-02	0.00E+00	1.11E+02
Xe-133	1.16E+04	1.44E+02	5.06E+02	9.44E+02	1.32E+04
Xe-135	3.75E+02	2.18E+00	6.70E-01	0.00E+00	3.78E+02
Iodines					
I-131	4.18E+02	1.81E+00	0.00E+00	0.00E+00	4.20E+02
I-132	2.09E+02	3.92E-02	0.00E+00	0.00E+00	2.09E+02
I-133	7.16E+02	2.24E+00	0.00E+00	0.00E+00	7.18E+02
I-134	1.28E+02	6.00E-05	0.00E+00	0.00E+00	1.28E+02
I-135	4.61E+02	6.70E-01	0.00E+00	0.00E+00	4.62E+02
Alkali Metals					
Rb-86	4.54E-03	5.44E-04	0.00E+00	0.00E+00	5.09E-03
Cs-134	4.63E-01	5.63E-02	0.00E+00	0.00E+00	5.19E-01
Cs-136	1.22E-01	1.45E-02	0.00E+00	0.00E+00	1.37E-01
Cs-137	2.64E-01	3.21E-02	0.00E+00	0.00E+00	2.96E-01
Total	1.76E+04	1.98E+02	7.12E+02	2.53E+03	2.10E+04

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**Table 15.3-6
US-APWR Source Terms
Time Dependent Released Activity during RCP Rotor Seizure (Ci)**

Nuclide	0 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Noble Gases					
Kr-85	1.12E+02	8.40E+01	0.00E+00	0.00E+00	1.96E+02
Kr-85m	6.40E+02	1.58E+02	0.00E+00	0.00E+00	7.98E+02
Kr-87	5.02E+02	6.21E+00	0.00E+00	0.00E+00	5.08E+02
Kr-88	1.37E+03	1.74E+02	0.00E+00	0.00E+00	1.55E+03
Xe-133	6.87E+03	4.96E+03	0.00E+00	0.00E+00	1.18E+04
Xe-135	1.61E+03	7.67E+02	0.00E+00	0.00E+00	2.37E+03
Iodines					
I-131	8.81E+01	2.32E+02	0.00E+00	0.00E+00	3.20E+02
I-132	1.94E+01	8.35E+00	0.00E+00	0.00E+00	2.77E+01
I-133	9.85E+01	2.17E+02	0.00E+00	0.00E+00	3.15E+02
I-134	6.46E+00	1.10E-01	0.00E+00	0.00E+00	6.57E+00
I-135	6.38E+01	9.16E+01	0.00E+00	0.00E+00	1.55E+02
Alkali Metals					
Rb-86	3.23E-02	8.66E-02	0.00E+00	0.00E+00	1.19E-01
Cs-134	3.24E+00	8.78E+00	0.00E+00	0.00E+00	1.20E+01
Cs-136	8.72E-01	2.33E+00	0.00E+00	0.00E+00	3.21E+00
Cs-137	1.84E+00	5.00E+00	0.00E+00	0.00E+00	6.84E+00
Total	1.14E+04	6.71E+03	0.00E+00	0.00E+00	1.81E+04

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**Table 15.3-7
US-APWR Source Terms
Time Dependent Released Activity during Rod Ejection Accident (Ci)**

Nuclide	0 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Noble Gases					
Kr-85	2.63E+02	2.50E+02	1.90E+02	1.63E+03	2.33E+03
Kr-85m	3.59E+03	9.58E+02	9.86E+00	0.00E+00	4.56E+03
Kr-87	2.81E+03	3.50E+01	0.00E+00	0.00E+00	2.85E+03
Kr-88	7.70E+03	1.02E+03	2.05E+00	0.00E+00	8.72E+03
Xe-133	3.81E+04	3.46E+04	2.11E+04	4.22E+04	1.36E+05
Xe-135	9.31E+03	5.32E+03	5.40E+02	2.81E+00	1.52E+04
Iodines					
I-131	5.82E+02	7.17E+02	2.58E+02	7.79E+02	2.34E+03
I-132	4.62E+02	3.93E+01	1.40E-02	0.00E+00	5.01E+02
I-133	1.12E+03	1.06E+03	1.13E+02	1.13E+01	2.30E+03
I-134	4.95E+02	5.15E-01	0.00E+00	0.00E+00	4.95E+02
I-135	8.75E+02	4.39E+02	6.60E+00	4.00E-03	1.32E+03
Alkali Metals					
Rb-86	4.16E-01	9.65E-02	0.00E+00	0.00E+00	5.13E-01
Cs-134	4.15E+01	9.79E+00	1.01E-03	0.00E+00	5.13E+01
Cs-136	1.13E+01	2.60E+00	1.00E-06	0.00E+00	1.39E+01
Cs-137	2.36E+01	5.57E+00	0.00E+00	0.00E+00	2.92E+01
Total	6.53E+04	4.45E+04	2.22E+04	4.46E+04	1.77E+05

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**Table 15.3-8
US-APWR Source Terms
Time Dependent Released Activity during Fuel Handling Accident (Ci)**

Nuclide	0 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Noble Gases					
Kr-85	1.20E+03	0.00E+00	0.00E+00	0.00E+00	1.20E+03
Kr-85m	3.90E+02	0.00E+00	0.00E+00	0.00E+00	3.90E+02
Kr-87	5.98E-02	0.00E+00	0.00E+00	0.00E+00	5.98E-02
Kr-88	1.25E+02	0.00E+00	0.00E+00	0.00E+00	1.25E+02
Xe-133	9.90E+04	0.00E+00	0.00E+00	0.00E+00	9.90E+04
Xe-135	2.21E+04	0.00E+00	0.00E+00	0.00E+00	2.21E+04
Iodines					
I-131	3.67E+02	0.00E+00	0.00E+00	0.00E+00	3.67E+02
I-132	2.75E+02	0.00E+00	0.00E+00	0.00E+00	2.75E+02
I-133	2.31E+02	0.00E+00	0.00E+00	0.00E+00	2.31E+02
I-134	2.71E-06	0.00E+00	0.00E+00	0.00E+00	2.71E-06
I-135	3.80E+01	0.00E+00	0.00E+00	0.00E+00	3.80E+01
Total	1.24E+05	0.00E+00	0.00E+00	0.00E+00	1.24E+05

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**Table 15.3-9
US-APWR Source Terms
Time Dependent Released Activity during Failure of Small Lines Carrying Primary
Coolant Outside Containment (Ci)^(a)**

Nuclide	0 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Noble Gases					
Kr-85	6.84E+02	0.00E+00	0.00E+00	0.00E+00	6.84E+02
Kr-85m	1.25E+01	0.00E+00	0.00E+00	0.00E+00	1.25E+01
Kr-87	7.05E+00	0.00E+00	0.00E+00	0.00E+00	7.05E+00
Kr-88	2.26E+01	0.00E+00	0.00E+00	0.00E+00	2.26E+01
Xe-133	2.32E+03	0.00E+00	0.00E+00	0.00E+00	2.32E+03
Xe-135	7.70E+01	0.00E+00	0.00E+00	0.00E+00	7.70E+01
Iodines					
I-131	1.72E+02	0.00E+00	0.00E+00	0.00E+00	1.72E+02
I-132	7.98E+01	0.00E+00	0.00E+00	0.00E+00	7.98E+01
I-133	2.93E+02	0.00E+00	0.00E+00	0.00E+00	2.93E+02
I-134	4.33E+01	0.00E+00	0.00E+00	0.00E+00	4.33E+01
I-135	1.85E+02	0.00E+00	0.00E+00	0.00E+00	1.85E+02
Total	3.90E+03	0.00E+00	0.00E+00	0.00E+00	3.90E+03

a) Source terms are calculated for 4540 MWt (102 percent of core thermal power 4451 MWt)

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**Table 15.3-10 (Sheet 1 of 2)
ABWR Source Terms
Iodine Activity Release to the Environment during a LOCA**

Isotope	1 min.	10 min.	1 hr.	2 hr.	4 hr.
A. Release from Reactor Building to Environment (megabecquerel)					
I-131	3.2E+04	2.9E+06	1.1E+07	1.1E+07	1.1E+07
I-132	4.5E+04	4.1E+06	1.4E+07	1.4E+07	1.5E+07
I-133	6.5E+04	6.1E+06	2.2E+07	2.2E+07	2.3E+07
I-134	7.3E+04	6.1E+06	2.1E+07	2.1E+07	2.1E+07
I-135	6.1E+04	5.7E+06	2.1E+07	2.1E+07	2.2E+07
Total	2.8E+05	2.5E+07	8.9E+07	8.9E+07	9.2E+07
B.1 MSIV Pathway Release to Environment—Elemental (megabecquerel)					
I-131	0.0E+00	0.0E+00	6.1E+01	1.0E+03	1.0E+04
I-132	0.0E+00	0.0E+00	6.9E+01	9.3E+02	6.1E+03
I-133	0.0E+00	0.0E+00	1.2E+02	2.1E+03	1.9E+04
I-134	0.0E+00	0.0E+00	6.9E+01	6.9E+02	2.5E+03
I-135	0.0E+00	0.0E+00	1.1E+02	1.8E+03	1.4E+04
Total	0.0E+00	0.0E+00	4.3E+02	6.5E+03	5.2E+04
B.2 MSIV Pathway Release to Environment—Organic (megabecquerel)					
I-131	0.0E+00	0.0E+00	7.3E+02	1.2E+04	1.2E+05
I-132	0.0E+00	0.0E+00	8.1E+02	1.1E+04	7.3E+04
I-133	0.0E+00	0.0E+00	1.4E+03	2.5E+04	2.3E+05
I-134	0.0E+00	0.0E+00	8.5E+02	8.5E+03	3.1E+04
I-135	0.0E+00	0.0E+00	1.3E+03	2.1E+04	1.8E+05
Total	0.0E+00	0.0E+00	5.1E+03	7.8E+04	6.3E+05
B.3 MSIV Pathway Release to Environment—Resuspended Organic (megabecquerel)					
I-131	0.0E+00	0.0E+00	7.3E+00	3.0E+01	2.4E+02
I-132	0.0E+00	0.0E+00	6.1E+00	2.3E+01	8.9E+01
I-133	0.0E+00	0.0E+00	1.4E+01	5.7E+01	4.5E+02
I-134	0.0E+00	0.0E+00	4.5E+00	1.4E+01	3.1E+01
I-135	0.0E+00	0.0E+00	1.2E+01	4.5E+01	2.9E+02
Total	0.0E+00	0.0E+00	4.4E+01	1.7E+02	1.1E+03
B.4 Release from Condenser to Environment—Sum of B.1+B.2+B.3 (megabecquerel)					
I-131	0.0E+00	0.0E+00	7.7E+02	1.3E+04	1.3E+05
I-132	0.0E+00	0.0E+00	8.9E+02	1.2E+04	7.7E+04
I-133	0.0E+00	0.0E+00	1.6E+03	2.6E+04	2.5E+05
I-134	0.0E+00	0.0E+00	9.3E+02	9.3E+03	3.3E+04
I-135	0.0E+00	0.0E+00	1.4E+03	2.3E+04	1.9E+05
Total	0.0E+00	0.0E+00	5.6E+03	8.3E+04	6.8E+05

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**Table 15.3-10 (Sheet 2 of 2)
ABWR Source Terms
Iodine Activity Release to the Environment during a LOCA**

Isotope	8 hr.	12 hr.	1 day	4 days	30 days
A. Release from Reactor Building to Environment (megabecquerel)					
I-131	1.4E+07	1.9E+07	3.9E+07	2.1E+08	7.3E+08
I-132	1.5E+07	1.6E+07	1.6E+07	1.6E+07	1.6E+07
I-133	2.9E+07	3.6E+07	6.1E+07	1.3E+08	1.4E+08
I-134	2.1E+07	2.1E+07	2.1E+07	2.1E+07	2.1E+07
I-135	2.5E+07	2.9E+07	3.4E+07	3.8E+07	3.8E+07
Total	1.0E+08	1.2E+08	1.7E+08	7.7E+08	9.5E+08
B.1 MSIV Pathway Release to Environment—Elemental (megabecquerel)					
I-131	6.9E+04	2.0E+05	9.8E+05	1.1E+07	3.3E+07
I-132	2.0E+04	3.0E+04	3.6E+04	3.7E+04	3.7E+04
I-133	1.2E+05	3.3E+05	1.2E+06	5.3E+06	6.1E+06
I-134	3.9E+03	4.1E+03	4.1E+03	1.4E+02	4.1E+03
I-135	7.7E+04	1.8E+05	4.1E+05	6.1E+05	6.1E+05
Total	2.9E+05	7.4E+05	2.6E+06	1.7E+07	4.0E+07
B.2 MSIV Pathway Release to Environment—Organic (megabecquerel)					
I-131	8.5E+05	2.4E+06	1.2E+07	1.8E+08	1.5E+09
I-132	2.4E+05	3.6E+05	4.5E+05	4.5E+05	4.5E+05
I-133	1.5E+06	3.9E+06	1.5E+07	7.7E+07	8.9E+07
I-134	4.8E+04	4.8E+04	4.8E+04	4.8E+04	4.8E+04
I-135	9.3E+05	2.1E+06	4.8E+06	7.7E+06	7.7E+06
Total	3.6E+06	8.8E+06	3.2E+07	2.7E+08	1.6E+09
B.3 MSIV Pathway Release to Environment—Resuspended Organic (megabecquerel)					
I-131	1.5E+03	5.3E+03	4.1E+04	6.9E+06	5.7E+08
I-132	3.2E+02	4.8E+02	7.3E+02	7.7E+02	7.7E+02
I-133	2.6E+03	8.1E+03	4.8E+04	1.5E+06	3.6E+06
I-134	5.3E+01	6.1E+01	6.1E+01	6.1E+01	6.1E+01
I-135	1.5E+03	3.5E+03	1.2E+04	3.7E+04	3.8E+04
Total	6.0E+03	1.7E+04	1.0E+05	8.4E+06	5.7E+08
B.4 Release from Condenser to Environment—Sum of B.1+B.2+B.3 (megabecquerel)					
I-131	9.3E+05	2.6E+06	1.3E+07	2.0E+08	2.2E+09
I-132	2.6E+05	3.8E+05	4.8E+05	4.8E+05	4.8E+05
I-133	1.6E+06	4.1E+06	1.6E+07	8.1E+07	9.8E+07
I-134	5.3E+04	5.3E+04	5.3E+04	5.3E+04	5.3E+04
I-135	1.0E+06	2.2E+06	5.7E+06	8.1E+06	8.1E+06
Total	3.8E+06	9.3E+06	3.5E+07	2.9E+08	2.3E+09

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**Table 15.3-11 (Sheet 1 of 2)
ABWR Source Terms
Noble Gas Activity Release to the Environment during a LOCA**

Isotope	1 min.	10 min.	1 hr.	2 hr.	4 hr.
A. Reactor Building Release to Environment (megabecquerel)					
Kr-83m	3.0E+04	2.5E+06	1.0E+07	1.3E+07	2.1E+07
Kr-85	2.8E+03	2.5E+05	1.1E+06	1.6E+06	3.9E+06
Kr-85m	6.1E+04	5.7E+06	2.3E+07	3.4E+07	6.5E+07
Kr-87	1.2E+05	1.0E+07	3.9E+07	4.8E+07	6.9E+07
Kr-88	1.8E+05	1.5E+07	6.1E+07	8.5E+07	1.5E+08
Kr-89	1.9E+05	5.3E+06	7.3E+06	7.3E+06	7.3E+06
Xe-131m	1.4E+03	1.3E+05	5.7E+05	8.5E+05	2.1E+06
Xe-133	5.3E+05	4.5E+07	2.0E+08	3.1E+08	7.3E+08
Xe-133m	2.2E+04	2.0E+06	8.1E+06	1.2E+07	3.0E+07
Xe-135	6.5E+04	6.1E+06	2.5E+07	3.7E+07	8.1E+07
Xe-135m	9.3E+04	6.5E+06	1.9E+07	2.0E+07	2.0E+07
Xe-137	4.1E+05	1.4E+07	2.1E+07	2.1E+07	2.1E+07
Xe-138	4.1E+05	2.8E+07	8.1E+07	8.1E+07	8.1E+07
Total	2.1E+06	1.4E+08	4.7E+08	6.2E+08	1.3E+09
B. Condenser Release to Environment (megabecquerel)					
Kr-83m	0.0E+00	0.0E+00	6.5E+03	8.5E+04	4.8E+05
Kr-85	0.0E+00	0.0E+00	8.1E+02	1.4E+04	1.4E+05
Kr-85m	0.0E+00	0.0E+00	1.6E+04	2.5E+05	2.0E+06
Kr-87	0.0E+00	0.0E+00	2.2E+04	2.6E+05	1.2E+06
Kr-88	0.0E+00	0.0E+00	4.1E+04	6.1E+05	4.1E+06
Kr-89	0.0E+00	0.0E+00	4.5E+00	4.5E+00	4.5E+00
Xe-131m	0.0E+00	0.0E+00	4.5E+02	7.3E+03	7.3E+04
Xe-133	0.0E+00	0.0E+00	1.5E+05	2.6E+06	2.5E+07
Xe-133m	0.0E+00	0.0E+00	6.1E+03	1.1E+05	1.0E+06
Xe-135	0.0E+00	0.0E+00	1.9E+04	3.0E+05	2.6E+06
Xe-135m	0.0E+00	0.0E+00	3.2E+03	1.1E+04	1.4E+04
Xe-137	0.0E+00	0.0E+00	3.7E+01	3.8E+01	3.8E+01
Xe-138	0.0E+00	0.0E+00	1.1E+04	3.5E+04	4.1E+04
Total	0.0E+00	0.0E+00	2.7E+05	4.3E+06	3.7E+07

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**Table 15.3-11 (Sheet 2 of 2)
ABWR Source Terms
Noble Gas Activity Release to the Environment during a LOCA**

Isotope	8 hr.	12 hr.	1 day	4 days	30 days
A. Reactor Building Release to Environment (megabecquerel)					
Kr-83m	3.1E+07	3.5E+07	3.6E+07	3.6E+07	3.6E+07
Kr-85	1.3E+07	2.6E+07	8.9E+07	7.3E+08	6.1E+09
Kr-85m	1.4E+08	2.1E+08	3.0E+08	3.2E+08	3.2E+08
Kr-87	8.5E+07	8.9E+07	8.9E+07	8.9E+07	8.9E+07
Kr-88	2.7E+08	3.4E+08	3.9E+08	4.1E+08	4.1E+08
Kr-89	7.3E+06	7.3E+06	7.3E+06	7.3E+06	7.3E+06
Xe-131m	6.5E+06	1.4E+07	4.5E+07	3.3E+08	1.5E+09
Xe-133	2.3E+09	4.8E+09	1.5E+10	9.7E+10	2.7E+11
Xe-133m	9.3E+07	1.9E+08	5.7E+08	2.8E+09	4.5E+09
Xe-135	2.1E+08	3.6E+08	7.3E+08	1.1E+09	1.1E+09
Xe-135m	2.0E+07	2.0E+07	2.0E+07	2.0E+07	2.0E+07
Xe-137	2.1E+07	2.1E+07	2.1E+07	2.1E+07	2.1E+07
Xe-138	8.1E+07	8.1E+07	8.1E+07	8.1E+07	8.1E+07
Total	3.3E+09	6.2E+09	1.8E+10	1.0E+11	2.8E+11
B. Condenser Release to Environment (megabecquerel)					
Kr-83m	1.4E+06	1.9E+06	2.1E+06	2.1E+06	2.1E+06
Kr-85	1.0E+06	2.8E+06	1.4E+07	2.5E+08	6.5E+09
Kr-85m	9.3E+06	1.8E+07	3.3E+07	3.9E+07	3.9E+07
Kr-87	2.6E+06	3.0E+06	3.1E+06	3.1E+06	3.1E+06
Kr-88	1.5E+07	2.5E+07	3.4E+07	3.5E+07	3.5E+07
Kr-89	4.5E+00	4.5E+00	4.5E+00	4.5E+00	4.5E+00
Xe-131m	5.3E+05	1.4E+06	7.3E+06	1.1E+08	1.4E+09
Xe-133	1.8E+08	4.8E+08	2.4E+09	3.3E+10	2.0E+11
Xe-133m	7.3E+06	2.0E+07	8.9E+07	8.9E+08	2.2E+09
Xe-135	1.5E+07	3.6E+07	1.1E+08	2.2E+08	2.2E+08
Xe-135m	1.4E+04	1.4E+04	1.4E+04	1.4E+04	1.4E+04
Xe-137	3.8E+01	3.8E+01	3.8E+01	3.8E+01	3.8E+01
Xe-138	4.1E+04	4.1E+04	4.1E+04	4.1E+04	4.1E+04
Total	2.3E+08	5.9E+08	2.7E+09	3.5E+10	2.1E+11

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**Table 15.3-12
ABWR Source Terms
Activity Released to Environment during a Main Steamline Break Accident
(megabecquerel)**

Isotope	Case 1^(a)	Case 2^(a)
I-131	7.29E+04	1.46E+06
I-132	7.10E+05	1.42E+07
I-133	5.00E+05	9.99E+06
I-134	1.40E+06	2.79E+07
I-135	7.29E+05	1.46E+07
Total Halogens	3.41E+06	6.81E+07
Kr-83m	4.07E+02	2.44E+03
Kr-85m	7.18E+02	4.29E+03
Kr-85	2.26E+00	1.36E+01
Kr-87	2.44E+03	1.47E+04
Kr-88	2.46E+03	1.48E+04
Kr-89	9.88E+03	5.92E+04
Kr-90	2.55E+03	1.55E+04
Xe-131m	1.76E+00	1.06E+01
Xe-133m	3.39E+01	2.04E+02
Xe-133	9.47E+02	5.70E+03
Xe-135m	2.89E+03	1.74E+04
Xe-135	2.70E+03	1.62E+04
Xe-137	1.23E+04	7.40E+04
Xe-138	9.44E+03	5.66E+04
Xe-139	4.33E+03	2.59E+04
Total Noble Gases	5.11E+04	3.07E+05

- a) The level of activity is consistent with an offgas release rate of 3.7 GBq/s for Case 1 and 14.8 GBq/s for Case 2 referenced to a 30 minute decay. The iodine concentrations in the reactor coolant are tabulated below for each case.

Isotope	MBq/g	
	Case 1	Case 2
I-131	0.001739	0.03515
I-132	0.01536	0.30747
I-133	0.01206	0.24161
I-134	0.02634	0.52688
I-135	0.01647	0.3293

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**Table 15.3-13
ABWR Source Terms
Isotopic Releases during an Instrument Line Break Accident
(megabecquerel)**

Isotope	1 min.	10 min.	1 hr.	2 hr.	4 hr.	8 hr.
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Reactor Building Inventory

I-131	3.77E+01	3.27E+02	2.60E+04	1.73E+04	1.38E+04	4.59E+00
I-132	3.68E+02	3.11E+03	2.31E+05	1.44E+05	1.17E+05	1.17E+01
I-133	2.59E+02	2.24E+03	1.75E+05	1.16E+05	9.29E+04	2.72E+01
I-134	7.22E+02	5.92E+03	3.89E+05	2.26E+05	1.86E+05	2.65E+00
I-135	3.77E+02	3.25E+03	2.52E+05	1.64E+05	1.32E+05	2.90E+01

Total	1.76E+03	1.48E+04	1.07E+06	6.68E+05	5.41E+05	7.52E+01
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Isotopic Releases to Environment

I-131	6.36E-01	5.77E+01	2.77E+04	6.81E+04	1.27E+05	1.41E+05
I-132	6.18E+00	5.51E+02	2.52E+05	5.96E+05	1.09E+06	1.19E+06
I-133	4.37E+00	3.96E+02	1.87E+05	4.59E+05	8.51E+05	9.44E+05
I-134	1.21E+01	1.06E+03	4.44E+05	9.92E+05	1.76E+06	1.90E+06
I-135	6.36E+00	5.74E+02	2.71E+05	6.59E+05	1.21E+06	1.34E+06

Total	2.97E+01	2.64E+03	1.18E+06	2.77E+06	5.04E+06	5.51E+06
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**Table 15.3-14
ABWR Source Terms
Isotopic Release to Environment during a Fuel Handling Accident
(megabecquerel)**

Isotope	1 min.	10 min.	1 hr.	2 hr.
I-131	3.12E+05	2.80E+06	4.98E+06	4.98E+06
I-132	4.02E+05	3.53E+06	6.15E+06	6.15E+06
I-133	3.23E+05	2.89E+06	5.15E+06	5.15E+06
I-134	1.75E-02	1.49E-01	2.50E-01	2.50E-01
I-135	5.31E+04	4.70E+05	8.34E+05	8.34E+05
Total	1.09E+06	9.69E+06	1.71E+07	1.71E+07
Kr-83m	1.66E+04	1.45E+05	2.55E+05	2.61E+05
Kr-85m	2.12E+05	1.88E+06	3.37E+06	3.46E+06
Kr-85	1.15E+06	1.04E+07	1.88E+07	1.94E+07
Kr-87	3.29E+01	2.84E+02	4.94E+02	4.98E+02
Kr-88	6.15E+04	5.39E+05	9.65E+05	9.85E+05
Kr-89	7.17E-07	3.03E-06	3.30E-06	3.30E-06
Xe-131m	2.02E+05	1.81E+06	3.29E+06	3.38E+06
Xe-133m	2.67E+06	2.39E+07	4.34E+07	4.46E+07
Xe-133	6.81E+07	6.12E+08	1.11E+09	1.14E+09
Xe-135m	7.94E+05	5.96E+06	8.96E+06	8.96E+06
Xe-135	1.56E+07	1.39E+08	2.51E+08	2.58E+08
Xe-137	1.59E-06	7.41E-06	8.39E-06	8.39E-06
Xe-138	1.60E-06	1.17E-05	1.74E-05	1.74E-05
Total	8.88E+07	7.95E+08	1.45E+09	1.48E+09

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**Table 15.3-15
AP1000 Source Terms
Activity Releases for Steam System Piping Failure
with Pre-Existing Iodine Spike (Ci)**

Isotope	0 to 2 hr.	2 to 8 hr.	8 to 24 hr.	24 to 72 hr.	Total
Kr-85m	6.86E-02	1.14E-01	6.80E-02	6.18E-03	2.57E-01
Kr-85	2.82E-01	8.46E-01	2.25E+00	6.69E+00	1.01E+01
Kr-87	2.76E-02	1.34E-02	5.29E-04	8.60E-08	4.15E-02
Kr-88	1.12E-01	1.37E-01	4.04E-02	8.27E-04	2.91E-01
Xe-131m	1.28E-01	3.79E-01	9.81E-01	2.70E+00	4.19E+00
Xe-133m	1.59E-01	4.51E-01	1.04E+00	2.05E+00	3.70E+00
Xe-133	1.18E+01	3.45E+01	8.64E+01	2.16E+02	3.49E+02
Xe-135m	3.04E-03	1.33E-05	0.00E+00	0.00E+00	3.06E-03
Xe-135	3.10E-01	6.90E-01	8.35E-01	3.38E-01	2.17E+00
Xe-138	3.99E-03	1.14E-05	0.00E+00	0.00E+00	4.00E-03
I-130	3.59E-01	1.42E-01	2.09E-01	1.33E-01	8.44E-01
I-131	2.40E+01	1.21E+01	3.10E+01	8.22E+01	1.49E+02
I-132	3.05E+01	4.14E+00	8.06E-01	6.55E-03	3.55E+01
I-133	4.34E+01	1.90E+01	3.53E+01	3.98E+01	1.37E+02
I-134	6.74E+00	1.63E-01	1.43E-03	4.54E-09	6.91E+00
I-135	2.60E+01	8.16E+00	7.54E+00	1.71E+00	4.34E+01
Cs-134	1.90E+01	1.95E-01	5.19E-01	1.54E+00	2.12E+01
Cs-136	2.82E+01	2.86E-01	7.43E-01	2.06E+00	3.13E+01
Cs-137	1.37E+01	1.41E-01	3.74E-01	1.11E+00	1.53E+01
Cs-138	1.01E+01	1.02E-03	4.42E-07	0.00E+00	1.01E+01
Total	2.15E+02	8.15E+01	1.68E+02	3.56E+02	8.21E+02

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**Table 15.3-16
AP1000 Source Terms
Activity Releases for Steam System Piping Failure
with Accident-Initiated Iodine Spike (Ci)**

Isotope	0 to 2 hr.	2 to 8 hr.	8 to 24 hr.	24 to 72 hr.	Total
Kr-85m	6.86E-02	1.14E-01	6.80E-02	6.18E-03	2.57E-01
Kr-85	2.82E-01	8.46E-01	2.25E+00	6.69E+00	1.01E+01
Kr-87	2.76E-02	1.34E-02	5.29E-04	8.60E-08	4.15E-02
Kr-88	1.12E-01	1.37E-01	4.04E-02	8.27E-04	2.91E-01
Xe-131m	1.28E-01	3.79E-01	9.81E-01	2.70E+00	4.19E+00
Xe-133m	1.59E-01	4.51E-01	1.04E+00	2.05E+00	3.70E+00
Xe-133	1.18E+01	3.45E+01	8.64E+01	2.16E+02	3.49E+02
Xe-135m	3.04E-03	1.33E-05	0.00E+00	0.00E+00	3.06E-03
Xe-135	3.10E-01	6.90E-01	8.35E-01	3.38E-01	2.17E+00
Xe-138	3.99E-03	1.14E-05	0.00E+00	0.00E+00	4.00E-03
I-130	4.20E-01	9.95E-01	1.58E+00	1.01E+00	4.01E+00
I-131	2.60E+01	5.73E+01	1.56E+02	4.13E+02	6.53E+02
I-132	4.62E+01	9.74E+01	2.24E+01	1.82E-01	1.66E+02
I-133	4.91E+01	1.14E+02	2.27E+02	2.55E+02	6.45E+02
I-134	1.34E+01	1.86E+01	2.65E-01	8.42E-07	3.23E+01
I-135	3.24E+01	7.74E+01	7.83E+01	1.77E+01	2.06E+02
Cs-134	1.90E+01	1.95E-01	5.19E-01	1.54E+00	2.12E+01
Cs-136	2.82E+01	2.86E-01	7.43E-01	2.06E+00	3.13E+01
Cs-137	1.37E+01	1.41E-01	3.74E-01	1.11E+00	1.53E+01
Cs-138	1.01E+01	1.02E-03	4.42E-07	0.00E+00	1.01E+01
Total	2.51E+02	4.03E+02	5.78E+02	9.20E+02	2.15E+03

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**Table 15.3-17
AP1000 Source Terms
Activity Releases for Reactor Coolant Pump Shaft Seizure (Ci)**

	No Feedwater	Feedwater Available			
Isotope	0 to 1.5 hr.	0 to 2 hr.	2 to 8 hr.	6 to 8 hr.	Total
Kr-85m	8.16E+01	1.05E+02	1.74E+02	4.13E+01	2.79E+02
Kr-85	7.58E+00	1.01E+01	3.03E+01	1.01E+01	4.04E+01
Kr-87	1.20E+02	1.43E+02	6.97E+01	5.43E+00	2.13E+02
Kr-88	2.08E+02	2.62E+02	3.20E+02	6.05E+01	5.82E+02
Xe-131m	3.77E+00	5.03E+00	1.49E+01	4.95E+00	1.99E+01
Xe-133m	2.02E+01	2.69E+01	7.64E+01	2.48E+01	1.03E+02
Xe-133	6.66E+02	8.87E+02	2.60E+03	8.57E+02	3.49E+03
Xe-135m	3.24E+01	3.28E+01	1.43E-01	2.68E-06	3.30E+01
Xe-135	1.59E+02	2.08E+02	4.64E+02	1.32E+02	6.72E+02
Xe-138	1.29E+02	1.30E+02	3.72E-01	3.01E-06	1.30E+02
I-130	8.45E-01	1.17E-01	1.33E+00	5.65E-01	1.45E+00
I-131	3.77E+01	5.39E+00	7.51E+01	3.46E+01	8.05E+01
I-132	2.79E+01	3.45E+00	1.48E+01	3.95E+00	1.83E+01
I-133	4.86E+01	6.86E+00	8.29E+01	3.64E+01	8.98E+01
I-134	2.88E+01	2.76E+00	2.98E+00	2.09E-01	5.74E+00
I-135	4.19E+01	5.68E+00	5.22E+01	2.05E+01	5.79E+01
Cs-134	1.29E+00	1.82E-01	2.40E+00	1.11E+00	2.59E+00
Cs-136	5.63E-01	8.45E-02	7.79E-01	3.47E-01	8.63E-01
Cs-137	7.74E-01	1.10E-01	1.41E+00	6.51E-01	1.52E+00
Cs-138	6.08E+00	7.29E-01	3.35E+00	1.13E+00	4.08E+00
Rb-86	1.33E-02	1.83E-03	2.73E-02	1.27E-02	2.91E-02
Total	1.62E+03	1.84E+03	3.99E+03	1.23E+03	5.82E+03

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**Table 15.3-18
AP1000 Source Terms
Activity Releases for Spectrum of Rod Cluster Control Assembly Ejection Accidents (Ci)**

Isotope	0 to hr.	2 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Kr-85m	1.12E+02	6.48E+01	3.87E+01	1.77E+00	2.51E-05	2.18E+02
Kr-85	5.01E+00	5.60E+00	1.49E+01	3.35E+01	2.88E+02	3.47E+02
Kr-87	1.82E+02	2.60E+01	1.03E+00	8.37E-05	0.00E+00	2.09E+02
Kr-88	2.91E+02	1.18E+02	3.49E+01	3.59E-01	8.41E-09	4.45E+02
Xe-131m	4.94E+00	5.46E+00	1.42E+01	2.86E+01	1.16E+02	1.69E+02
Xe-133m	2.67E+01	2.81E+01	6.49E+01	8.45E+01	5.31E+01	2.57E+02
Xe-133	8.79E+02	9.58E+02	2.40E+03	4.27E+03	8.45E+03	1.70E+04
Xe-135m	7.34E+01	5.30E-02	4.33E-09	0.00E+00	0.00E+00	7.35E+01
Xe-135	2.15E+02	1.72E+02	2.09E+02	4.35E+01	1.79E-01	6.39E+02
Xe-138	2.99E+02	1.38E-01	3.19E-09	0.00E+00	0.00E+00	2.99E+02
I-130	4.90E+00	7.28E+00	4.32E+00	2.03E-01	2.95E-04	1.67E+01
I-131	1.36E+02	2.45E+02	2.31E+02	3.10E+01	1.68E+01	6.60E+02
I-132	1.53E+02	9.94E+01	9.85E+00	8.24E-03	0.00E+00	2.62E+02
I-133	2.72E+02	4.40E+02	3.18E+02	2.28E+01	2.41E-01	1.05E+03
I-134	1.66E+02	2.85E+01	1.37E-01	4.48E-08	0.00E+00	1.95E+02
I-135	2.39E+02	2.97E+02	1.19E+02	2.39E+00	7.32E-05	6.57E+02
Cs-134	3.08E+01	6.22E+01	6.03E+01	7.76E+00	5.16E+00	1.66E+02
Cs-136	8.79E+00	1.75E+01	1.67E+01	2.05E+00	6.58E-01	4.57E+01
Cs-137	1.79E+01	3.62E+01	3.51E+01	4.52E+00	3.05E+00	9.68E+01
Cs-138	1.09E+02	7.05E+00	1.68E-03	0.00E+00	0.00E+00	1.16E+02
Rb-86	3.62E-01	7.27E-01	6.96E-01	8.67E-02	3.42E-02	1.91E+00
Total	3.23E+03	2.62E+03	3.58E+03	4.53E+03	8.93E+03	2.29E+04

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**Table 15.3-19
AP1000 Source Terms
Activity Releases for Failure of Small Lines Carrying
Primary Coolant Outside Containment (Ci)**

Isotope	0 to 2 hr.
Kr-85m	1.24E+01
Kr-85	4.40E+01
Kr-87	7.05E+00
Kr-88	2.21E+01
Xe-131m	1.99E+01
Xe-133m	2.50E+01
Xe-133	1.84E+03
Xe-135m	2.59E+00
Xe-135	5.20E+01
Xe-138	3.65E+00
I-130	1.89E+00
I-131	9.26E+01
I-132	3.49E+02
I-133	2.01E+02
I-134	1.58E+02
I-135	1.68E+02
Cs-134	4.16E+00
Cs-136	6.16E+00
Cs-137	3.00E+00
Cs-138	2.21E+00
Total	3.02E+03

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**Table 15.3-20
AP1000 Source Terms
Activity Releases for Steam Generator Tube Rupture with Pre-Existing Iodine Spike (Ci)**

Isotope	0 to 2 hr.	2 to 8 hr.	8 to 24 hr.	Total
Kr-85m	5.53E+01	1.93E+01	7.53E-03	7.46E+01
Kr-85	2.20E+02	1.09E+02	1.34E-01	3.29E+02
Kr-87	2.39E+01	3.61E+00	9.12E-05	2.75E+01
Kr-88	9.22E+01	2.65E+01	5.43E-03	1.19E+02
Xe-131m	9.96E+01	4.88E+01	5.91E-02	1.48E+02
Xe-133m	1.24E+02	5.91E+01	6.61E-02	1.83E+02
Xe-133	9.19E+03	4.47E+03	5.29E+00	1.37E+04
Xe-135m	3.44E+00	5.86E-03	0.00E+00	3.45E+00
Xe-135	2.46E+02	1.02E+02	7.10E-02	3.47E+02
Xe-138	4.56E+00	5.07E-03	0.00E+00	4.57E+00
I-130	1.79E+00	5.39E-02	2.68E-01	2.12E+00
I-131	1.21E+02	5.27E+00	3.06E+01	1.56E+02
I-132	1.42E+02	7.43E-01	1.92E+00	1.44E+02
I-133	2.16E+02	7.63E+00	4.06E+01	2.64E+02
I-134	2.74E+01	4.40E-03	4.23E-03	2.74E+01
I-135	1.27E+02	2.70E+00	1.17E+01	1.42E+02
Cs-134	1.63E+00	6.05E-02	2.16E-01	1.90E+00
Cs-136	2.42E+00	8.86E-02	3.14E-01	2.82E+00
Cs-137	1.17E+00	4.37E-02	1.56E-01	1.37E+00
Cs-138	5.64E-01	2.91E-06	5.73E-07	5.64E-01
Total	1.07E+04	4.85E+03	9.14E+01	1.56E+04

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**Table 15.3-21
AP1000 Source Terms**

Activity Releases for Steam Generator Tube Rupture with Accident-Initiated Iodine Spike (Ci)

Isotope	0 to 2 hr.	2 to 8 hr.	8 to 24 hr.	Total
Kr-85m	5.53E+01	1.93E+01	7.53E-03	7.46E+01
Kr-85	2.20E+02	1.09E+02	1.34E-01	3.29E+02
Kr-87	2.39E+01	3.61E+00	9.12E-05	2.75E+01
Kr-88	9.22E+01	2.65E+01	5.43E-03	1.19E+02
Xe-131m	9.96E+01	4.88E+01	5.91E-02	1.48E+02
Xe-133m	1.24E+02	5.91E+01	6.61E-02	1.83E+02
Xe-133	9.19E+03	4.47E+03	5.29E+00	1.37E+04
Xe-135m	3.44E+00	5.86E-03	0.00E+00	3.45E+00
Xe-135	2.46E+02	1.02E+02	7.10E-02	3.47E+02
Xe-138	4.56E+00	5.07E-03	0.00E+00	4.57E+00
I-130	8.87E-01	1.62E-01	8.24E-01	1.87E+00
I-131	4.36E+01	1.14E+01	6.76E+01	1.23E+02
I-132	1.47E+02	4.86E+00	1.29E+01	1.65E+02
I-133	9.33E+01	2.00E+01	1.08E+02	2.22E+02
I-134	5.59E+01	6.04E-02	5.94E-02	5.60E+01
I-135	7.61E+01	9.88E+00	4.38E+01	1.30E+02
Cs-134	1.63E+00	6.05E-02	2.16E-01	1.90E+00
Cs-136	2.42E+00	8.86E-02	3.14E-01	2.82E+00
Cs-137	1.17E+00	4.37E-02	1.56E-01	1.37E+00
Cs-138	5.64E-01	2.91E-06	5.73E-07	5.64E-01
Total	1.05E+04	4.88E+03	2.40E+02	1.56E+04

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**Table 15.3-22 (Sheet 1 of 2)
AP1000 Source Terms
Activity Releases for LOCA Resulting from a Spectrum of Postulated Piping Breaks
within the Reactor Coolant Pressure Boundary (Ci)**

Isotope	1.4 to 3.4 hr.	0 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
I-130	5.64E+01	1.12E+02	5.37E+00	7.10E-01	1.27E-02	1.18E+02
I-131	1.68E+03	3.49E+03	2.66E+02	2.39E+02	7.19E+02	4.71E+03
I-132	1.23E+03	2.14E+03	1.64E+01	1.46E-02	0.00E+00	2.15E+03
I-133	3.23E+03	6.54E+03	3.83E+02	1.04E+02	1.04E+01	7.04E+03
I-134	6.60E+02	1.14E+03	2.96E-01	6.79E-08	0.00E+00	1.14E+03
I-135	2.56E+03	4.89E+03	1.58E+02	6.09E+00	3.16E-03	5.06E+03
Kr-85m	1.42E+03	3.77E+03	1.87E+03	8.56E+01	1.22E-03	5.73E+03
Kr-85	8.31E+01	2.97E+02	7.06E+02	1.59E+03	1.36E+04	1.62E+04
Kr-87	1.10E+03	1.95E+03	4.97E+01	4.05E-03	0.00E+00	1.99E+03
Kr-88	3.11E+03	7.26E+03	1.70E+03	1.75E+01	4.09E-07	8.97E+03
Xe-131m	8.26E+01	2.94E+02	6.79E+02	1.37E+03	5.57E+03	7.91E+03
Xe-133m	4.43E+02	1.54E+03	3.15E+03	4.11E+03	2.58E+03	1.14E+04
Xe-133	1.47E+04	5.19E+04	1.16E+05	2.06E+05	4.07E+05	7.80E+05
Xe-135m	1.06E+01	3.59E+01	2.14E-07	0.00E+00	0.00E+00	3.59E+01
Xe-135	3.15E+03	9.64E+03	1.01E+04	2.11E+03	8.68E+00	2.19E+04
Xe-138	3.11E+01	1.20E+02	1.58E-07	0.00E+00	0.00E+00	1.20E+02
Rb-86	3.04E+00	6.32E+00	2.99E-01	9.83E-02	5.13E-01	7.23E+00
Cs-134	2.58E+02	5.38E+02	2.57E+01	9.11E+00	7.74E+01	6.50E+02
Cs-136	7.33E+01	1.52E+02	7.16E+00	2.28E+00	9.88E+00	1.72E+02
Cs-137	1.51E+02	3.13E+02	1.50E+01	5.32E+00	4.57E+01	3.79E+02
Cs-138	1.50E+02	3.30E+02	2.18E-03	0.00E+00	0.00E+00	3.30E+02
Sb-127	2.42E+01	4.80E+01	2.29E+00	5.67E-01	7.82E-01	5.16E+01
Sb-129	5.10E+01	8.94E+01	1.51E+00	4.95E-03	4.90E-08	9.09E+01
Te-127m	3.15E+00	6.30E+00	3.16E-01	1.11E-01	8.71E-01	7.60E+00
Te-127	2.05E+01	3.83E+01	1.15E+00	2.75E-02	1.33E-04	3.94E+01
Te-129m	1.07E+01	2.15E+01	1.07E+00	3.65E-01	2.36E+00	2.52E+01
Te-129	1.88E+01	2.83E+01	2.69E-02	3.54E-08	0.00E+00	2.84E+01
Te-131m	3.17E+01	6.20E+01	2.64E+00	3.35E-01	7.81E-02	6.50E+01
Te-132	3.23E+02	6.40E+02	3.02E+01	7.04E+00	7.83E+00	6.85E+02
Sr-89	9.23E+01	1.85E+02	9.24E+00	3.19E+00	2.26E+01	2.20E+02
Sr-90	7.95E+00	1.59E+01	7.99E-01	2.84E-01	2.44E+00	1.94E+01
Sr-91	9.68E+01	1.81E+02	5.46E+00	1.35E-01	7.06E-04	1.87E+02
Sr-92	6.83E+01	1.13E+02	1.01E+00	5.15E-04	0.00E+00	1.14E+02
Ba-139	5.44E+01	8.30E+01	1.49E-01	9.91E-07	0.00E+00	8.32E+01
Ba-140	1.63E+02	3.25E+02	1.61E+01	5.11E+00	2.17E+01	3.68E+02
Mo-99	2.15E+01	4.25E+01	1.98E+00	4.29E-01	3.78E-01	4.53E+01
Tc-99m	1.47E+01	2.66E+01	6.05E-01	5.27E-03	1.33E-06	2.72E+01

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**Table 15.3-22 (Sheet 2 of 2)
AP1000 Source Terms
Activity Releases for LOCA Resulting from a Spectrum of Postulated Piping Breaks
within the Reactor Coolant Pressure Boundary (Ci)**

Isotope	1.4 to 3.4 hr.	0 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Ru-103	1.73E+01	3.46E+01	1.73E+00	5.93E-01	3.99E+00	4.09E+01
Ru-105	8.18E+00	1.44E+01	2.48E-01	8.86E-04	1.17E-08	1.46E+01
Ru-106	5.70E+00	1.14E+01	5.73E-01	2.03E-01	1.70E+00	1.39E+01
Rh-105	1.03E+01	2.02E+01	8.81E-01	1.29E-01	4.14E-02	2.12E+01
Ce-141	3.89E+00	7.78E+00	3.88E-01	1.32E-01	8.45E-01	9.15E+00
Ce-143	3.46E+00	6.78E+00	2.93E-01	4.05E-02	1.14E-02	7.13E+00
Ce-144	2.94E+00	5.89E+00	2.96E-01	1.05E-01	8.68E-01	7.15E+00
Pu-238	9.16E-03	1.83E-02	9.21E-04	3.27E-04	2.82E-03	2.24E-02
Pu-239	8.06E-04	1.61E-03	8.10E-05	2.88E-05	2.48E-04	1.97E-03
Pu-240	1.18E-03	2.37E-03	1.19E-04	4.22E-05	3.63E-04	2.89E-03
Pu-241	2.66E-01	5.31E-01	2.67E-02	9.48E-03	8.14E-02	6.49E-01
Np-239	4.48E+01	8.87E+01	4.08E+00	8.15E-01	5.70E-01	9.41E+01
Y-90	8.08E-02	1.60E-01	7.44E-03	1.59E-03	1.35E-03	1.70E-01
Y-91	1.19E+00	2.37E+00	1.19E-01	4.12E-02	3.00E-01	2.83E+00
Y-92	7.89E-01	1.35E+00	1.80E-02	2.86E-05	0.00E+00	1.37E+00
Y-93	1.21E+00	2.28E+00	7.08E-02	1.98E-03	1.42E-05	2.35E+00
Nb-95	1.60E+00	3.19E+00	1.59E-01	5.44E-02	3.55E-01	3.76E+00
Zr-95	1.59E+00	3.18E+00	1.59E-01	5.52E-02	4.08E-01	3.80E+00
Zr-97	1.43E+00	2.74E+00	1.03E-01	6.73E-03	3.71E-04	2.85E+00
La-140	1.67E+00	3.29E+00	1.46E-01	2.36E-02	9.62E-03	3.47E+00
La-141	1.03E+00	1.79E+00	2.71E-02	6.41E-05	2.01E-10	1.81E+00
La-142	5.38E-01	8.31E-01	2.09E-03	3.39E-08	0.00E+00	8.33E-01
Nd-147	6.16E-01	1.23E+00	6.06E-02	1.90E-02	7.29E-02	1.38E+00
Pr-143	1.39E+00	2.78E+00	1.37E-01	4.40E-02	1.94E-01	3.15E+00
Am-241	1.20E-04	2.39E-04	1.20E-05	4.27E-06	3.68E-05	2.92E-04
Cm-242	2.82E-02	5.65E-02	2.83E-03	9.98E-04	8.08E-03	6.84E-02
Cm-244	3.46E-03	6.93E-03	3.48E-04	1.24E-04	1.06E-03	8.47E-03
Total	3.53E+04	9.85E+04	1.35E+05	2.15E+05	4.30E+05	8.79E+05

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**Table 15.3-23
AP1000 Source Terms
Activity Releases for Fuel Handling Accident (Ci)**

Isotope	0 to 2 hr.
Kr-85m	3.42E+02
Kr-85	1.11E+03
Kr-87	6.00E-02
Kr-88	1.07E+02
Xe-131m	5.54E+02
Xe-133m	2.80E+03
Xe-133	9.66E+04
Xe-135m	1.26E+03
Xe-135	2.49E+04
I-130	2.51E+00
I-131	3.76E+02
I-132	3.01E+02
I-133	2.40E+02
I-135	3.94E+01
Total	1.29E+05

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**Table 15.3-24
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Main Steamline Break with
Pre-Accident Iodine Spike (Ci)**

Isotope	0 to 2 hr.	2 to 8 hr.	8 to 24 hr.	Total
Kr-83m	2.167E-02	2.145E-02	3.182E-04	4.344E-02
Kr-85m	1.115E-01	1.858E-01	4.350E-03	3.016E-01
Kr-85	1.205E+00	3.613E+00	1.505E-01	4.969E+00
Kr-87	4.505E-02	2.194E-02	9.099E-05	6.709E-02
Kr-88	1.849E-01	2.258E-01	3.674E-03	4.144E-01
Kr-89	2.093E-04	8.419E-16	1.370E-50	2.093E-04
Xe-131m	2.446E-01	7.271E-01	3.027E-02	1.002E+00
Xe-133m	3.042E-01	8.850E-01	3.985E-02	1.229E+00
Xe-133	2.140E+01	6.307E+01	2.646E+00	8.711E+01
Xe-135m	3.843E-01	8.821E-01	8.834E-02	1.355E+00
Xe-135	9.137E-01	3.733E+00	4.540E-01	5.100E+00
Xe-137	4.777E-04	1.767E-13	2.237E-42	4.777E-04
Xe-138	6.324E-03	1.790E-05	9.525E-14	6.341E-03
Br-83	2.522E-01	4.130E-03	7.641E-05	2.564E-01
Br-84	4.771E-02	4.524E-05	7.550E-09	4.775E-02
Br-85	6.133E-04	1.092E-18	1.546E-56	6.133E-04
I-129	7.539E-07	3.757E-08	1.301E-09	7.928E-07
I-130	6.787E-01	2.685E-02	8.749E-04	7.064E-01
I-131	1.516E+01	8.621E+00	1.226E+00	2.501E+01
I-132	4.788E+00	1.069E+00	4.889E-02	5.906E+00
I-133	2.350E+01	1.244E+01	1.602E+00	3.754E+01
I-134	1.620E+00	1.135E-01	5.052E-04	1.734E+00
I-135	1.246E+01	5.510E+00	5.515E-01	1.852E+01
Rb-86m	1.353E-09	1.255E-45	0.000E+00	1.353E-09
Rb-86	1.398E-03	7.207E-04	1.024E-04	2.221E-03
Rb-88	1.915E-01	2.517E-01	4.103E-03	4.474E-01
Rb-89	1.838E-03	3.266E-06	1.619E-13	1.841E-03
Cs-134	1.609E-01	8.300E-02	1.185E-02	2.557E-01
Cs-136	3.808E-02	1.963E-02	2.782E-03	6.048E-02
Cs-137	6.160E-02	3.177E-02	4.536E-03	9.791E-02
Cs-138	2.051E-02	1.254E-03	1.886E-07	2.177E-02
Sr-89	7.189E-07	2.557E-06	3.082E-07	3.584E-06
Ba-137m	5.786E-02	3.006E-02	4.291E-03	9.220E-02
Total	8.386E+01	1.016E+02	6.875E+00	1.923E+02

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**Table 15.3-25
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Main Steamline Break with
Accident-Induced (Coincident) Iodine Spike (Ci)**

Isotope	0 to 2 hr.	2 to 8 hr.	8 to 24 hr.	Total
Kr-83m	2.167E-02	2.145E-02	3.182E-04	4.344E-02
Kr-85m	1.115E-01	1.858E-01	4.350E-03	3.016E-01
Kr-85	1.205E+00	3.613E+00	1.505E-01	4.969E+00
Kr-87	4.505E-02	2.194E-02	9.099E-05	6.709E-02
Kr-88	1.849E-01	2.258E-01	3.674E-03	4.144E-01
Kr-89	2.093E-04	8.419E-16	1.370E-50	2.093E-04
Xe-131m	2.446E-01	7.308E-01	3.188E-02	1.007E+00
Xe-133m	3.045E-01	9.837E-01	8.092E-02	1.369E+00
Xe-133	2.140E+01	6.448E+01	3.237E+00	8.912E+01
Xe-135m	7.205E-01	1.136E+01	2.616E+00	1.470E+01
Xe-135	1.023E+00	1.721E+01	5.434E+00	2.367E+01
Xe-137	4.777E-04	1.767E-13	2.237E-42	4.777E-04
Xe-138	6.324E-03	1.790E-05	9.525E-14	6.341E-03
Br-83	2.522E-01	4.130E-03	7.641E-05	2.564E-01
Br-84	4.771E-02	4.524E-05	7.550E-09	4.775E-02
Br-85	6.133E-04	1.092E-18	1.546E-56	6.133E-04
I-129	7.539E-07	3.757E-08	1.301E-09	7.928E-07
I-130	6.787E-01	2.685E-02	8.749E-04	7.064E-01
I-131	1.627E+01	6.254E+01	1.557E+01	9.438E+01
I-132	8.145E+00	3.962E+01	6.683E+00	5.445E+01
I-133	2.653E+01	1.129E+02	2.685E+01	1.663E+02
I-134	5.642E+00	2.468E+01	2.899E+00	3.322E+01
I-135	1.595E+01	7.814E+01	1.675E+01	1.108E+02
Rb-86m	1.353E-09	1.255E-45	0.000E+00	1.353E-09
Rb-86	1.398E-03	7.207E-04	1.024E-04	2.221E-03
Rb-88	1.915E-01	2.517E-01	4.103E-03	4.474E-01
Rb-89	1.838E-03	3.266E-06	1.619E-13	1.841E-03
Cs-134	1.609E-01	8.300E-02	1.185E-02	2.557E-01
Cs-136	3.808E-02	1.963E-02	2.782E-03	6.048E-02
Cs-137	6.160E-02	3.177E-02	4.536E-03	9.791E-02
Cs-138	2.051E-02	1.254E-03	1.886E-07	2.177E-02
Sr-89	7.189E-07	2.557E-06	3.082E-07	3.584E-06
Ba-137m	5.786E-02	3.006E-02	4.291E-03	9.220E-02
Total	9.932E+01	4.172E+02	8.034E+01	5.968E+02

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**Table 15.3-26A
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Main Steam Line Break with
Accident-Induced 3.3 Percent Clad Failure (Ci)**

Isotope	0 to 2 hr.	2 to 8 hr.	8 to 24 hr.	Total
Kr-83m	3.280E+01	3.559E+01	1.238E+00	6.963E+01
Kr-85m	8.444E+01	1.407E+02	3.320E+00	2.285E+02
Kr-85	1.031E+01	3.093E+01	1.288E+00	4.253E+01
Kr-87	1.192E+02	5.806E+01	2.408E-01	1.775E+02
Kr-88	2.202E+02	2.688E+02	4.376E+00	4.934E+02
Kr-89	1.332E+01	5.359E-11	8.719E-46	1.332E+01
Xe-131m	3.583E+00	1.068E+01	4.523E-01	1.472E+01
Xe-133m	1.946E+01	5.604E+01	2.403E+00	7.790E+01
Xe-133	6.466E+02	1.908E+03	8.055E+01	2.635E+03
Xe-135m	4.150E+01	4.615E+01	4.800E+00	9.245E+01
Xe-135	1.998E+02	5.351E+02	3.532E+01	7.702E+02
Xe-137	2.515E+01	9.302E-09	1.178E-37	2.515E+01
Xe-138	9.017E+01	2.552E-01	1.358E-09	9.042E+01
Br-83	1.094E+01	9.155E+00	4.542E-01	2.055E+01
Br-84	1.069E+01	5.777E-01	1.566E-04	1.126E+01
Br-85	1.663E+00	2.161E-13	3.269E-51	1.663E+00
I-129	6.476E-06	1.488E-05	2.258E-06	2.362E-05
I-130	9.312E+00	1.780E+01	2.217E+00	2.933E+01
I-131	1.643E+02	3.897E+02	5.846E+01	6.125E+02
I-132	1.121E+02	8.941E+01	4.225E+00	2.057E+02
I-133	2.124E+02	4.391E+02	5.933E+01	7.109E+02
I-134	1.242E+02	2.356E+01	1.065E-01	1.479E+02
I-135	1.789E+02	2.877E+02	2.996E+01	4.966E+02
Rb-86m	1.764E-03	2.996E-39	0.000E+00	1.764E-03
Rb-86	9.539E-01	2.456E+00	3.714E-01	3.781E+00
Rb-88	2.406E+02	2.999E+02	4.885E+00	5.454E+02
Rb-89	8.269E+01	2.451E-01	1.281E-08	8.293E+01
Cs-134	1.069E+02	2.768E+02	4.209E+01	4.258E+02
Cs-136	2.650E+01	6.805E+01	1.026E+01	1.048E+02
Cs-137	4.081E+01	1.057E+02	1.607E+01	1.626E+02
Cs-138	2.696E+02	2.276E+01	4.151E-03	2.923E+02
Sr-89	5.497E-02	1.946E-01	2.451E-02	2.741E-01
Ba-137m	3.860E+01	1.000E+02	1.520E+01	1.538E+02
Total	3.138E+03	5.224E+03	3.776E+02	8.739E+03

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**Table 15.3-26B
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Main Steam Line Break with
Accident-Induced 0.58 Percent Fuel Overheat (Ci)**

Isotope	0 to 2 hr.	2 to 8 hr.	8 to 24 hr.	Total
Kr-83m	1.098E+02	1.038E+02	2.549E+00	2.162E+02
Kr-85m	2.957E+02	4.928E+02	1.158E+01	8.001E+02
Kr-85	1.721E+01	5.163E+01	2.150E+00	7.099E+01
Kr-87	4.179E+02	2.035E+02	8.440E-01	6.223E+02
Kr-88	7.737E+02	9.445E+02	1.537E+01	1.733E+03
Kr-89	4.684E+01	1.884E-10	3.065E-45	4.684E+01
Xe-131m	1.197E+01	3.560E+01	1.483E+00	4.905E+01
Xe-133m	6.769E+01	1.938E+02	8.011E+00	2.695E+02
Xe-133	2.213E+03	6.514E+03	2.708E+02	8.997E+03
Xe-135m	1.112E+02	8.124E+01	8.435E+00	2.008E+02
Xe-135	6.807E+02	1.677E+03	8.537E+01	2.443E+03
Xe-137	8.839E+01	3.271E-08	4.140E-37	8.839E+01
Xe-138	3.178E+02	8.992E-01	4.786E-09	3.187E+02
Br-83	1.904E+01	1.609E+01	7.982E-01	3.592E+01
Br-84	1.875E+01	1.015E+00	2.752E-04	1.976E+01
Br-85	2.922E+00	3.798E-13	5.745E-51	2.922E+00
I-129	1.081E-05	2.613E-05	3.967E-06	4.091E-05
I-130	1.585E+01	3.127E+01	3.897E+00	5.102E+01
I-131	1.792E+02	4.277E+02	6.411E+01	6.709E+02
I-132	1.943E+02	1.571E+02	7.425E+00	3.588E+02
I-133	3.595E+02	7.712E+02	1.043E+02	1.235E+03
I-134	2.175E+02	4.141E+01	1.872E-01	2.591E+02
I-135	3.073E+02	5.054E+02	5.265E+01	8.654E+02
Rb-86m	1.290E-03	2.191E-39	0.000E+00	1.290E-03
Rb-86	7.010E-01	1.804E+00	2.727E-01	2.777E+00
Rb-88	6.770E+02	1.053E+03	1.716E+01	1.747E+03
Rb-89	9.740E+01	3.763E-01	1.278E-08	9.778E+01
Cs-134	7.845E+01	2.031E+02	3.087E+01	3.124E+02
Cs-136	1.947E+01	4.995E+01	7.537E+00	7.696E+01
Cs-137	2.990E+01	7.740E+01	1.177E+01	1.191E+02
Cs-138	4.164E+02	5.014E+01	5.701E-03	4.666E+02
Sr-89	7.331E-02	2.692E-01	2.321E-02	3.657E-01
Ba-137m	2.829E+01	7.327E+01	1.113E+01	1.127E+02
Total	7.814E+03	1.376E+04	7.187E+02	2.229E+04

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**Table 15.3-27
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Pump Locked Rotor Accident (LRA)
with Accident-Induced 9.5 Percent Clad Failure (Ci)**

Isotope	0 to 2 hr.	2 to 8 hr.	Total
Kr-83m	6.864E+01	5.405E+01	1.227E+02
Kr-85m	1.905E+02	3.030E+02	4.935E+02
Kr-85	2.146E+01	6.173E+01	8.319E+01
Kr-87	2.742E+02	1.254E+02	3.996E+02
Kr-88	5.001E+02	5.806E+02	1.081E+03
Kr-89	3.803E+01	1.158E-10	3.803E+01
Xe-131m	7.701E+00	2.195E+01	2.966E+01
Xe-133m	4.324E+01	1.182E+02	1.615E+02
Xe-133	1.423E+03	4.010E+03	5.433E+03
Xe-135m	5.836E+01	1.167E+01	7.003E+01
Xe-135	4.279E+02	9.442E+02	1.372E+03
Xe-137	7.127E+01	2.011E-08	7.127E+01
Xe-138	2.288E+02	5.516E-01	2.293E+02
Br-83	4.263E+00	2.041E+00	6.304E+00
Br-84	6.306E+00	8.774E-02	6.394E+00
Br-85	2.332E+00	2.497E-14	2.332E+00
I-129	2.293E-06	3.969E-06	6.262E-06
I-130	3.307E+00	4.570E+00	7.877E+00
I-131	5.682E+01	1.029E+02	1.597E+02
I-132	4.404E+01	1.982E+01	6.386E+01
I-133	7.514E+01	1.144E+02	1.896E+02
I-134	6.060E+01	4.122E+00	6.472E+01
I-135	6.439E+01	7.163E+01	1.360E+02
Rb-86m	2.540E-03	3.391E-40	2.540E-03
Rb-86	3.151E-01	6.410E-01	9.561E-01
Rb-88	4.415E+02	6.471E+02	1.089E+03
Rb-89	8.974E+01	1.757E-01	8.992E+01
Cs-134	3.527E+01	7.231E+01	1.076E+02
Cs-136	8.757E+00	1.775E+01	2.651E+01
Cs-137	1.347E+01	2.761E+01	4.108E+01
Cs-138	2.872E+02	2.755E+01	3.147E+02
Sr-89	3.289E-02	1.374E-01	1.702E-01
Ba-137m	1.008E+01	2.612E+01	3.620E+01
Total	4.557E+03	7.371E+03	1.193E+04

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**Table 15.3-28
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Design Basis Small Line Break (Ci)**

Isotope	0 to 2 hr.
Kr-83m	1.653E+00
Kr-85m	7.066E+00
Kr-85	6.827E+01
Kr-87	3.672E+00
Kr-88	1.247E+01
Kr-89	4.810E-02
Xe-131m	1.389E+01
Xe-133m	1.750E+01
Xe-133	1.219E+03
Xe-135m	1.652E+02
Xe-135	6.941E+01
Xe-137	1.093E-01
Xe-138	1.111E+00
Br-83	1.514E-01
Br-84	6.319E-02
Br-85	1.447E-03
I-129	2.360E-07
I-130	2.521E-01
I-131	9.400E+01
I-132	1.132E+02
I-133	1.828E+02
I-134	1.347E+02
I-135	1.502E+02
Rb-86	1.881E-02
Rb-88	5.174E+00
Rb-89	1.458E-01
Cs-134	2.150E+00
Cs-136	5.140E-01
Cs-137	8.228E-01
Cs-138	1.032E+00
Sr-89	2.485E-05
Ba-137m	7.775E-01
Total	2.27E+03

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**Table 15.3-29
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Steam Generator Tube Rupture
with Pre-Accident Spike (Ci)**

Isotope	0 to 2 hr.	2 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Kr-83m	5.579E+01	5.208E+01	1.113E+01	1.110E-01	1.024E-10	1.191E+02
Kr-85m	2.745E+01	9.737E-02	5.647E-02	5.168E-03	7.391E-08	2.761E+01
Kr-85	2.693E+02	1.875E+00	4.878E+00	2.172E+01	1.734E+02	4.711E+02
Kr-87	1.365E+01	1.170E-02	4.390E-04	7.132E-08	6.326E-25	1.366E+01
Kr-88	4.786E+01	1.186E-01	3.368E-02	6.881E-04	1.565E-11	4.801E+01
Kr-89	1.260E-01	4.744E-16	2.768E-50	0.000E+00	0.000E+00	1.260E-01
Xe-131m	5.483E+01	7.018E-01	1.810E+00	7.458E+00	3.116E+01	9.596E+01
Xe-133m	7.072E+01	7.102E+00	1.379E+01	2.108E+01	4.983E+00	1.177E+02
Xe-133	4.829E+03	1.262E+02	2.600E+02	5.499E+02	6.459E+02	6.411E+03
Xe-135m	1.530E+03	3.263E+03	3.062E+03	7.187E+02	4.064E-01	8.574E+03
Xe-135	4.299E+02	5.069E+02	4.845E+02	1.206E+02	1.232E-01	1.542E+03
Xe-137	2.887E-01	9.932E-14	4.492E-42	0.000E+00	0.000E+00	2.887E-01
Xe-138	3.434E+00	9.959E-06	2.041E-13	8.199E-34	0.000E+00	3.434E+00
Br-83	2.004E+00	2.840E-03	7.849E-04	1.620E-05	4.395E-14	2.008E+00
Br-84	5.904E-01	4.270E-05	1.939E-08	4.027E-17	1.788E-57	5.904E-01
Br-85	6.852E-04	1.190E-18	2.448E-56	0.000E+00	0.000E+00	6.852E-04
I-129	3.454E-06	1.964E-08	8.140E-08	1.077E-06	4.192E-05	4.655E-05
I-130	3.616E+00	1.503E-02	3.374E-02	5.191E-02	2.304E-03	3.719E+00
I-131	5.578E+01	3.103E-01	1.236E+00	1.376E+01	1.542E+02	2.253E+02
I-132	2.339E+01	3.417E-02	8.312E-03	1.407E-04	1.667E-13	2.343E+01
I-133	9.220E+01	4.337E-01	1.242E+00	3.997E+00	9.448E-01	9.882E+01
I-134	1.140E+01	3.079E-03	3.155E-05	2.442E-10	1.584E-34	1.140E+01
I-135	5.584E+01	1.805E-01	2.463E-01	1.167E-01	1.685E-04	5.639E+01
Rb-86	4.589E-03	2.766E-05	1.086E-04	1.305E-03	2.814E-02	3.417E-02
Rb-88	1.105E+00	1.286E-03	6.410E-04	2.976E-05	2.261E-12	1.107E+00
Rb-89	1.257E-02	4.677E-08	4.331E-15	1.140E-33	0.000E+00	1.257E-02
Cs-134	5.246E-01	3.196E-03	1.275E-02	1.648E-01	6.259E+00	6.964E+00
Cs-136	1.253E-01	7.520E-04	2.931E-03	3.415E-02	5.875E-01	7.507E-01
Cs-137	2.008E-01	1.224E-03	4.884E-03	6.322E-02	2.436E+00	2.706E+00
Cs-138	1.397E-01	9.813E-06	5.129E-09	1.405E-17	2.046E-57	1.397E-01
Ba-137m	1.883E-01	1.148E-03	4.579E-03	5.927E-02	2.284E+00	2.537E+00
Total	7.580E+03	3.959E+03	3.841E+03	1.458E+03	1.023E+03	1.786E+04

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**Table 15.3-30
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Steam Generator Tube Rupture
with Accident-Induced (Coincident) Iodine Spike (Ci)**

Isotope	0 to 2 hr.	2 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Kr-83m	5.286E+01	6.506E+01	2.614E+01	5.395E-01	1.229E-09	1.446E+02
Kr-85m	2.938E+01	2.475E-01	2.560E-01	2.342E-02	3.350E-07	2.990E+01
Kr-85	2.693E+02	1.875E+00	4.878E+00	2.172E+01	1.734E+02	4.711E+02
Kr-87	1.365E+01	1.170E-02	4.390E-04	7.132E-08	6.326E-25	1.366E+01
Kr-88	4.786E+01	1.186E-01	3.368E-02	6.881E-04	1.565E-11	4.801E+01
Kr-89	1.260E-01	4.744E-16	2.768E-50	0.000E+00	0.000E+00	1.260E-01
Xe-131m	5.476E+01	5.269E-01	1.550E+00	9.473E+00	8.667E+01	1.530E+02
Xe-133m	6.924E+01	4.025E+00	1.188E+01	4.107E+01	2.417E+01	1.504E+02
Xe-133	4.808E+03	8.294E+01	2.349E+02	9.134E+02	1.558E+03	7.597E+03
Xe-135m	9.009E+02	2.273E+03	2.859E+03	1.054E+03	1.262E+00	7.088E+03
Xe-135	3.154E+02	3.712E+02	6.204E+02	3.471E+02	1.427E+00	1.655E+03
Xe-137	2.887E-01	9.932E-14	4.492E-42	0.000E+00	0.000E+00	2.887E-01
Xe-138	3.434E+00	9.959E-06	2.041E-13	8.199E-34	0.000E+00	3.434E+00
Br-83	3.105E+00	2.064E-02	3.304E-02	1.187E-03	4.062E-12	3.159E+00
Br-84	3.844E+00	4.306E-03	7.921E-04	7.298E-12	4.404E-52	3.849E+00
Br-85	7.119E-01	4.381E-05	6.904E-07	0.000E+00	0.000E+00	7.120E-01
I-129	1.942E-06	3.838E-08	4.662E-07	9.049E-06	3.973E-04	4.088E-04
I-130	2.679E+00	3.998E-02	3.041E-01	6.765E-01	3.436E-02	3.734E+00
I-131	3.199E+01	6.194E-01	7.305E+00	1.192E+02	1.500E+03	1.659E+03
I-132	3.721E+01	2.421E-01	3.626E-01	1.103E-02	1.671E-11	3.782E+01
I-133	6.155E+01	1.022E+00	9.383E+00	4.389E+01	1.163E+01	1.275E+02
I-134	4.170E+01	9.438E-02	3.336E-02	7.756E-07	6.711E-31	4.183E+01
I-135	5.032E+01	6.126E-01	3.161E+00	2.185E+00	3.747E-03	5.629E+01
Rb-86	4.589E-03	2.766E-05	1.086E-04	1.305E-03	2.814E-02	3.417E-02
Rb-88	1.105E+00	1.286E-03	6.410E-04	2.976E-05	2.261E-12	1.107E+00
Rb-89	1.257E-02	4.677E-08	4.331E-15	1.140E-33	0.000E+00	1.257E-02
Cs-134	5.246E-01	3.196E-03	1.275E-02	1.648E-01	6.259E+00	6.964E+00
Cs-136	1.253E-01	7.520E-04	2.931E-03	3.415E-02	5.875E-01	7.507E-01
Cs-137	2.008E-01	1.224E-03	4.884E-03	6.322E-02	2.436E+00	2.706E+00
Cs-138	1.397E-01	9.813E-06	5.129E-09	1.405E-17	2.046E-57	1.397E-01
Ba-137m	1.883E-01	1.148E-03	4.579E-03	5.927E-02	2.284E+00	2.537E+00
Total	6.801E+03	2.802E+03	3.780E+03	2.554E+03	3.368E+03	1.930E+04

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**Table 15.3-31 (Sheet 1 of 6)
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Design Basis LOCA (Ci)**

Isotope	0 to 1.5 hr.	1.5 to 3.5 hr.	3.5 to 8 hr.
Kr-83m	7.297E+02	2.751E+03	4.641E+03
Kr-85m	1.709E+03	6.303E+03	8.876E+03
Kr-85	1.126E+02	4.307E+02	9.847E+02
Kr-87	2.224E+03	4.925E+03	2.337E+03
Kr-88	4.382E+03	1.434E+04	1.548E+04
Kr-89	9.523E+00	3.044E-06	1.461E-17
Xe-131m	7.277E+01	3.151E+02	7.225E+02
Xe-133m	4.023E+02	1.806E+03	4.148E+03
Xe-133	1.326E+04	5.898E+04	1.353E+05
Xe-135m	1.676E+03	1.283E+04	5.187E+04
Xe-135	4.390E+03	2.130E+04	5.958E+04
Xe-137	2.238E+01	1.730E-04	7.545E-14
Xe-138	6.229E+02	9.854E+01	3.005E-01
Br-83	3.714E+00	7.476E+00	5.922E+00
Br-84	3.206E+00	1.399E+00	1.010E-01
Br-85	7.005E-01	3.783E-10	1.011E-22
I-129	2.143E-06	6.460E-06	1.204E-05
I-130	3.160E+00	8.910E+00	1.395E+01
I-131	3.558E+01	1.070E+02	1.971E+02
I-132	3.928E+01	8.453E+01	8.515E+01
I-133	7.134E+01	2.071E+02	3.479E+02
I-134	4.192E+01	4.308E+01	1.043E+01
I-135	6.120E+01	1.615E+02	2.183E+02
Rb-86m	2.457E-04	8.331E-31	2.805E-66
Rb-86	1.268E-01	3.249E-01	5.175E-01
Rb-88	6.288E+01	1.545E+02	1.636E+02
Rb-89	1.126E+01	5.235E-01	1.960E-03
Cs-134	1.418E+01	3.636E+01	5.818E+01
Cs-136	3.511E+00	9.004E+00	1.431E+01
Cs-137	5.419E+00	1.389E+01	2.223E+01
Cs-138	4.511E+01	2.603E+01	1.839E+00
Sb-125	7.674E-02	3.605E-01	5.787E-01

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**Table 15.3-31 (Sheet 2 of 6)
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Design Basis LOCA (Ci)**

Isotope	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Kr-83m	4.187E+03	1.072E+02	3.150E-07	1.242E+04
Kr-85m	8.074E+03	3.703E+02	5.366E-03	2.533E+04
Kr-85	3.497E+03	7.845E+03	6.661E+04	7.948E+04
Kr-87	2.199E+02	1.791E-02	1.613E-19	9.706E+03
Kr-88	7.580E+03	7.766E+01	1.794E-06	4.186E+04
Kr-89	3.346E-43	0.000E+00	0.000E+00	9.523E+00
Xe-131m	2.650E+03	8.448E+03	8.304E+04	9.525E+04
Xe-133m	1.551E+04	3.840E+04	2.689E+04	8.716E+04
Xe-133	4.923E+05	1.172E+06	2.331E+06	4.202E+06
Xe-135m	1.495E+05	6.371E+04	8.257E+01	2.797E+05
Xe-135	2.402E+05	1.708E+05	9.095E+02	4.971E+05
Xe-137	4.529E-35	0.000E+00	0.000E+00	2.238E+01
Xe-138	5.518E-07	1.111E-27	0.000E+00	7.217E+02
Br-83	1.578E+00	9.943E-03	7.939E-12	1.870E+01
Br-84	2.106E-04	1.010E-13	1.200E-54	4.706E+00
Br-85	3.330E-51	0.000E+00	0.000E+00	7.005E-01
I-129	2.778E-05	8.971E-05	6.739E-04	8.120E-04
I-130	1.919E+01	9.181E+00	1.557E-01	5.455E+01
I-131	4.395E+02	1.216E+03	3.310E+03	5.305E+03
I-132	8.672E+01	1.646E+02	1.700E+02	6.303E+02
I-133	5.859E+02	5.389E+02	5.089E+01	1.802E+03
I-134	2.466E-01	4.949E-07	8.736E-32	9.568E+01
I-135	2.005E+02	3.195E+01	1.584E-02	6.735E+02
Rb-86m	0.000E+00	0.000E+00	0.000E+00	2.457E-04
Rb-86	6.158E-01	1.784E-01	3.473E-02	1.798E+00
Rb-88	8.009E+01	8.460E-01	1.980E-08	4.619E+02
Rb-89	4.966E-09	5.198E-29	0.000E+00	1.178E+01
Cs-134	7.012E+01	2.128E+01	5.202E+00	2.053E+02
Cs-136	1.694E+01	4.810E+00	8.548E-01	4.943E+01
Cs-137	2.679E+01	8.142E+00	2.002E+00	7.848E+01
Cs-138	3.106E-03	3.645E-13	3.186E-55	7.298E+01
Sb-125	6.973E-01	2.117E-01	5.185E-02	1.977E+00

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U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Design Basis LOCA (Ci)**

Isotope	0 to 1.5 hr.	1.5 to 3.5 hr.	3.5 to 8 hr.
Sb-127	3.566E-01	1.658E+00	2.602E+00
Sb-129	8.062E-01	3.074E+00	3.076E+00
Te-127m	5.087E-02	2.290E-01	3.677E-01
Te-127	3.679E-01	1.678E+00	2.678E+00
Te-129m	1.475E-01	6.643E-01	1.065E+00
Te-129	9.137E-01	3.758E+00	4.244E+00
Te-131m	4.117E-01	1.808E+00	2.706E+00
Te-131	4.731E-01	6.764E-01	6.180E-01
Te-132	4.076E+00	1.819E+01	2.841E+01
Te-134	1.637E+00	2.306E+00	2.992E-01
Sr-89	1.295E+00	6.070E+00	9.727E+00
Sr-90	1.352E-01	6.346E-01	1.019E+00
Sr-91	1.523E+00	6.489E+00	8.369E+00
Sr-92	1.273E+00	4.299E+00	3.300E+00
Ba-137m	4.246E+00	1.310E+01	2.103E+01
Ba-139	1.252E+00	2.933E+00	1.185E+00
Ba-140	2.011E+00	9.409E+00	1.500E+01
Mo-99	6.680E-01	1.185E+00	1.843E+00
Tc-99m	4.054E-01	1.062E+00	1.685E+00
Ru-103	2.419E-01	1.134E+00	1.816E+00
Ru-105	1.639E-01	6.263E-01	6.347E-01
Ru-106	1.433E-01	6.720E-01	1.079E+00
Rh-103m	2.180E-01	1.022E+00	1.637E+00
Rh-105	1.753E-01	8.191E-01	1.284E+00
Rh-106	1.433E-01	6.720E-01	1.079E+00
Ce-141	4.504E-02	2.100E-01	3.363E-01
Ce-143	4.473E-02	2.032E-01	3.060E-01
Ce-144	3.421E-02	1.595E-01	2.560E-01
Np-239	7.573E-01	3.479E+00	5.379E+00
Pu-238	2.937E-04	1.371E-03	2.200E-03
Pu-239	1.236E-05	5.767E-05	9.263E-05
Pu-240	2.817E-05	1.315E-04	2.110E-04

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**Table 15.3-31 (Sheet 4 of 6)
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Design Basis LOCA (Ci)**

Isotope	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Sb-127	2.947E+00	7.152E-01	6.814E-02	8.347E+00
Sb-129	1.172E+00	1.262E-02	9.903E-09	8.142E+00
Te-127m	4.432E-01	1.345E-01	3.221E-02	1.257E+00
Te-127	3.139E+00	8.103E-01	9.679E-02	8.769E+00
Te-129m	1.276E+00	3.779E-01	8.132E-02	3.612E+00
Te-129	2.219E+00	2.610E-01	5.294E-02	1.145E+01
Te-131m	2.700E+00	4.296E-01	9.844E-03	8.066E+00
Te-131	6.079E-01	9.670E-02	2.216E-03	2.474E+00
Te-132	3.181E+01	7.423E+00	6.147E-01	9.053E+01
Te-134	1.926E-03	2.642E-11	1.491E-43	4.244E+00
Sr-89	1.167E+01	3.484E+00	7.831E-01	3.303E+01
Sr-90	1.228E+00	3.731E-01	9.176E-02	3.481E+00
Sr-91	5.720E+00	3.029E-01	1.462E-04	2.240E+01
Sr-92	7.207E-01	1.556E-03	1.220E-12	9.594E+00
Ba-137m	2.535E+01	7.702E+00	1.894E+00	7.332E+01
Ba-139	7.377E-02	2.809E-06	3.953E-23	5.444E+00
Ba-140	1.775E+01	5.031E+00	8.876E-01	5.008E+01
Mo-99	2.036E+00	4.535E-01	3.193E-02	6.218E+00
Tc-99m	1.916E+00	4.358E-01	3.075E-02	5.535E+00
Ru-103	2.175E+00	6.463E-01	1.417E-01	6.155E+00
Ru-105	2.485E-01	2.881E-03	3.096E-09	1.676E+00
Ru-106	1.299E+00	3.939E-01	9.568E-02	3.683E+00
Rh-103m	1.961E+00	5.827E-01	1.277E-01	5.549E+00
Rh-105	1.375E+00	2.453E-01	7.574E-03	3.907E+00
Rh-106	1.299E+00	3.939E-01	9.568E-02	3.683E+00
Ce-141	4.027E-01	1.191E-01	2.551E-02	1.139E+00
Ce-143	3.105E-01	5.212E-02	1.426E-03	9.179E-01
Ce-144	3.085E-01	9.342E-02	2.261E-02	8.743E-01
Np-239	5.860E+00	1.242E+00	7.389E-02	1.679E+01
Pu-238	2.652E-03	8.060E-04	1.984E-04	7.522E-03
Pu-239	1.118E-04	3.413E-05	8.458E-06	3.171E-04
Pu-240	2.543E-04	7.729E-05	1.901E-05	7.212E-04

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**Table 15.3-31 (Sheet 5 of 6)
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Design Basis LOCA (Ci)**

Isotope	0 to 1.5 hr.	1.5 to 3.5 hr.	3.5 to 8 hr.
Pu-241	5.110E-03	2.385E-02	3.828E-02
Y-90	3.140E-03	2.339E-02	6.936E-02
Y-91m	5.663E-01	3.441E+00	5.191E+00
Y-91	1.652E-02	8.019E-02	1.426E-01
Y-92	3.112E-01	2.236E+00	3.968E+00
Y-93	1.749E-02	7.414E-02	9.685E-02
Zr-95	1.861E-02	8.589E-02	1.377E-01
Zr-97	1.877E-02	8.243E-02	1.169E-01
Nb-95	1.862E-02	8.599E-02	1.380E-01
La-140	6.044E-02	4.868E-01	1.509E+00
La-141	1.590E-02	5.866E-02	5.613E-02
La-142	1.132E-02	2.986E-02	1.382E-02
Pr-143	1.844E-02	8.551E-02	1.384E-01
Pr-144	3.272E-02	1.590E-01	2.560E-01
Nd-147	7.658E-03	3.525E-02	5.615E-02
Am-241	2.343E-06	1.083E-05	1.740E-05
Cm-242	1.065E-03	4.917E-03	7.889E-03
Cm-244	5.651E-04	2.610E-03	4.190E-03
Total	3.005E+04	1.250E+05	2.852E+05

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U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Design Basis LOCA (Ci)**

Isotope	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Pu-241	4.613E-02	1.402E-02	3.446E-03	1.308E-01
Y-90	1.818E-01	1.423E-01	7.603E-02	4.961E-01
Y-91m	3.634E+00	1.924E-01	9.288E-05	1.302E+01
Y-91	2.021E-01	7.064E-02	1.656E-02	5.286E-01
Y-92	2.181E+00	2.160E-02	1.599E-09	8.719E+00
Y-93	6.832E-02	3.943E-03	2.631E-06	2.607E-01
Zr-95	1.654E-01	4.955E-02	1.135E-02	4.685E-01
Zr-97	1.014E-01	1.051E-02	5.726E-05	3.300E-01
Nb-95	1.664E-01	5.053E-02	1.232E-02	4.719E-01
La-140	3.941E+00	2.736E+00	9.057E-01	9.639E+00
La-141	1.940E-02	1.590E-04	3.935E-11	1.502E-01
La-142	1.118E-03	1.026E-07	7.220E-23	5.612E-02
Pr-143	1.698E-01	5.241E-02	1.030E-02	4.748E-01
Pr-144	3.085E-01	9.343E-02	2.261E-02	8.722E-01
Nd-147	6.621E-02	1.857E-02	3.127E-03	1.870E-01
Am-241	2.105E-05	6.475E-06	1.695E-06	5.978E-05
Cm-242	9.495E-03	2.870E-03	6.862E-04	2.692E-02
Cm-244	5.049E-03	1.534E-03	3.772E-04	1.432E-02
Total	9.254E+05	1.463E+06	2.512E+06	5.341E+06

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**Table 15.3-32
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Fuel Handling Accident (Ci)**

Isotope	0 to 2 hr.	2 to 8 hr.	8 to 24 hr.	24 to 96 hr.	96 to 720 hr.	Total
Kr-83m	1.437E+00	2.129E-01	4.404E-02	4.294E-04	3.665E-13	1.694E+00
Kr-85m	7.810E+01	3.881E-01	4.693E-08	1.678E-26	0.000E+00	7.849E+01
Kr-85	1.471E+03	9.977E+00	3.052E-06	1.296E-23	0.000E+00	1.481E+03
Kr-87	2.330E-04	5.290E-07	6.148E-15	4.260E-36	0.000E+00	2.335E-04
Kr-88	1.016E+01	4.220E-02	2.983E-09	2.549E-28	0.000E+00	1.020E+01
Xe-131m	5.637E+02	1.475E+01	2.813E+01	1.084E+02	3.282E+02	1.043E+03
Xe-133m	2.609E+03	8.098E+01	1.193E+02	1.540E+02	1.538E+01	2.979E+03
Xe-133	9.442E+04	1.533E+03	1.684E+03	2.174E+03	2.171E+02	1.000E+05
Xe-135m	1.089E+03	1.975E+03	1.834E+03	4.211E+02	2.219E-01	5.319E+03
Xe-135	1.407E+04	7.705E+02	6.412E+02	1.472E+02	7.759E-02	1.563E+04
Xe-138	1.825E-39	3.471E-44	2.388E-58	4.092E-96	0.000E+00	1.825E-39
Br-83	1.610E-03	6.097E-06	3.273E-13	1.343E-32	0.000E+00	1.616E-03
Br-84	2.046E-18	1.009E-21	1.206E-31	4.188E-58	0.000E+00	2.047E-18
I-129	1.459E-05	9.898E-08	3.028E-14	1.286E-31	0.000E+00	1.469E-05
I-130	3.363E+00	2.038E-02	4.453E-09	7.713E-27	0.000E+00	3.383E+00
I-131	3.443E+02	2.319E+00	6.942E-07	2.784E-24	0.000E+00	3.466E+02
I-132	1.118E-02	4.139E-05	2.076E-12	7.100E-32	0.000E+00	1.122E-02
I-133	1.615E+02	1.025E+00	2.567E-07	6.398E-25	0.000E+00	1.625E+02
I-134	8.997E-10	1.249E-12	3.325E-21	4.528E-44	0.000E+00	9.009E-10
I-135	1.282E+01	7.041E-02	1.148E-08	9.113E-27	0.000E+00	1.289E+01
Rb-88	4.884E+00	4.672E-02	3.332E-09	2.846E-28	0.000E+00	4.931E+00
Cs-138	6.206E-40	1.019E-42	1.379E-52	6.210E-79	0.000E+00	6.216E-40
Total	1.148E+05	4.388E+03	4.307E+03	3.005E+03	5.610E+02	1.271E+05

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**Table 15.3-33
U.S. EPR Source Terms
Radionuclide Releases to Atmosphere for Rod Ejection (REA)
with Accident-Induced 36.7 Percent Clad Failure (Ci)**

Isotope	0 to 2 hr.	2 to 8 hr.	Total
Kr-83m	6.655E+02	5.477E+02	1.213E+03
Kr-85m	1.872E+03	3.118E+03	4.990E+03
Kr-85	1.026E+02	3.074E+02	4.100E+02
Kr-87	2.651E+03	1.290E+03	3.941E+03
Kr-88	4.894E+03	5.970E+03	1.086E+04
Kr-89	2.967E+02	1.193E-09	2.967E+02
Xe-131m	7.443E+01	2.209E+02	2.953E+02
Xe-133m	4.246E+02	1.209E+03	1.633E+03
Xe-133	1.390E+04	4.078E+04	5.467E+04
Xe-135m	4.932E+02	8.973E+01	5.829E+02
Xe-135	4.202E+03	9.607E+03	1.381E+04
Xe-137	5.606E+02	2.073E-07	5.606E+02
Xe-138	2.009E+03	5.684E+00	2.015E+03
Br-83	3.270E+00	1.566E+01	1.893E+01
Br-84	1.892E+00	6.754E-01	2.567E+00
Br-85	2.564E-02	1.917E-13	2.564E-02
I-129	2.042E-06	3.009E-05	3.213E-05
I-130	2.985E+00	3.487E+01	3.786E+01
I-131	3.385E+01	4.915E+02	5.254E+02
I-132	3.305E+01	1.520E+02	1.851E+02
I-133	6.775E+01	8.692E+02	9.369E+02
I-134	2.896E+01	3.175E+01	6.071E+01
I-135	5.703E+01	5.471E+02	6.042E+02
Rb-86m	4.849E-06	1.306E-39	4.849E-06
Rb-86	1.683E-01	2.480E+00	2.648E+00
Rb-88	4.004E+03	6.652E+03	1.066E+04
Rb-89	2.983E+02	1.662E+00	2.999E+02
Cs-134	1.887E+01	2.796E+02	2.985E+02
Cs-136	4.672E+00	6.863E+01	7.330E+01
Cs-137	7.195E+00	1.067E+02	1.139E+02
Cs-138	1.765E+03	2.733E+02	2.038E+03
Sr-89	2.739E-01	1.163E+00	1.437E+00
Ba-137m	6.794E+00	1.009E+02	1.077E+02
Total	3.848E+04	7.277E+04	1.113E+05

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15.4 RADIOLOGICAL CONSEQUENCES

PSEG Site specific radiation doses at EAB and LPZ are calculated for the applicable postulated design basis accidents for the four reactor technologies. These PSEG Site specific doses are calculated by multiplying the reactor DCD dose by the ratio of the site χ/Q value to the DCD χ/Q value. All PSEG Site specific χ/Q values are bounded by the DCD χ/Q values. All site-specific doses are bounded by DCD doses. The results of the site-specific analysis demonstrate that all accident doses for the US-APWR, AP1000, and U.S. EPR meet the site acceptance criteria of 10 CFR 50.34. The results also demonstrate that all accident doses for the ABWR meet the site acceptance criteria of 10 CFR 100.

The ABWR DCD doses are calculated for a reactor power level of 4005 MWt. An uprated, 4300 MWt version of the ABWR is being considered at the PSEG Site. The power uprate only affects doses for accidents that involve fuel damage (LOCA and fuel handling accidents). Doses for these two accidents are calculated for a reactor power level of 4386 MWt (102 percent of the uprated 4300 MWt) by multiplying the site-specific doses by a factor of 4386/4005, since activity releases and thus doses are proportional to power. There are no radiological consequences for either the control rod drop/rod ejection accident or the reactor internal pump rotor seizure accident of the ABWR as discussed in Section 15.3.

Atmospheric dispersion factors for the US-APWR are given in Table 15.4-1. Doses for the US-APWR are listed in Table 15.4-2. Atmospheric dispersion factors for the ABWR are listed in Table 15.4-3. Doses are summarized for the ABWR in Table 15.4-4, and are calculated in Tables 15.4-5 to 15.4-8. Atmospheric dispersion factors for the AP1000 are given in Table 15.4-9. Doses are listed for the AP1000 in Table 15.4-10, and are calculated in Tables 15.4-11 to 15.4-17. Atmospheric dispersion factors for the U.S. EPR are listed in Table 15.4-18. Doses are listed for the U.S. EPR in Table 15.4-19.

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**Table 15.4-1
US-APWR Radiological Consequences
Atmospheric Dispersion Factors**

Location	Time (hr.)	DCD χ/Q (s/m³)	Site χ/Q (s/m³)	χ/Q Ratio (Site/DCD)
EAB	0 to 2	5.00E-04	4.71E-04	0.942
LPZ	0 to 8	2.10E-04	8.47E-06	0.040
	8 to 24	1.30E-04	5.50E-06	0.042
	24 to 96	6.90E-05	2.15E-06	0.031
	96 to 720	2.80E-05	5.60E-07	0.020

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**Table 15.4-2
US-APWR Radiological Consequences
Dose Summary**

Accident	DCD Dose (rem TEDE)		χ/Q ratio (Site/DCD)		Site Dose (rem TEDE)		Limit
	EAB	LPZ	EAB	LPZ^(a)	EAB	LPZ	
Steam System Piping Failure - Pre-Existing Iodine Spike	0.19	0.11	0.942	0.042	0.18	0.00	25
Steam System Piping Failure - Accident-Initiated Iodine Spike	0.32	0.28	0.942	0.042	0.30	0.01	2.5
Reactor Coolant Pump Rotor Seizure	0.49	0.7	0.942	0.042	0.46	0.03	2.5
Spectrum of Rod Cluster Control Assembly Ejection Accidents	5.1	4.5	0.942	0.042	4.80	0.19	6.3
Failure of Small Lines Carrying Primary Coolant Outside Containment	1.5	0.6	0.942	0.042	1.41	0.03	2.5
Steam Generator Tube Rupture - Pre-Existing Iodine Spike	3.6	1.5	0.942	0.042	3.39	0.06	25
Steam Generator Tube Rupture - Accident-Initiated Iodine Spike	0.96	0.43	0.942	0.042	0.90	0.02	2.5
LOCA	13	13	0.942	0.042	12.25	0.55	25
Fuel Handling Accident	3.3	1.4	0.942	0.042	3.11	0.06	6.3

a) As LPZ doses are not given in time-dependent form, the most conservative Site/DCD χ/Q ratio (from the 8-24 hour interval) is used.

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**Table 15.4-3
ABWR Radiological Consequences
Atmospheric Dispersion Factors**

Accident	Location	Time (hr.)	DCD χ/Q (s/m³)	Site χ/Q (s/m³)	χ/Q Ratio (Site/DCD)
All Accidents	EAB	0 to 2	1.37E-03	4.71E-04	0.344
	LPZ	0 to 2	4.11E-04	8.47E-06	0.021
LOCA Only		0 to 8	1.56E-04	8.47E-06	0.054
		8 to 24	9.61E-05	5.50E-06	0.057
		24 to 96	3.36E-05	2.15E-06	0.064
		96 to 720	7.42E-06	5.60E-07	0.075

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**Table 15.4-4
ABWR Radiological Consequences
Dose Summary**

Accident	Thyroid Dose (Sv)	Whole Body Dose (Sv)	Thyroid Limit (Sv)	Whole Body Limit (Sv)
Failure of Small Lines Carrying Primary Coolant Outside Containment	1.65E-02	3.23E-04	3.00E-01	2.50E-02
LOCA - EAB	7.15E-01	1.54E-02	3.00E+00	2.50E-01
LOCA - LPZ	1.77E-01	2.61E-03	3.00E+00	2.50E-01
Fuel Handling Accident ^(a)	2.82E-01	4.52E-03	7.50E-01	6.25E-02
Main Steamline Break Case 1 ^{(a)(b)}	8.94E-03	2.13E-04	3.00E-01	2.50E-02
Main Steamline Break Case 2 ^{(a)(b)}	1.75E-01	4.47E-03	3.00E+00	2.50E-01

- a) The dose is calculated for the maximum 2-hour EAB meteorology, only, based on the DCD.
- b) The level of activity is consistent with an offgas release rate of 3.7 GBq/s for Case 1 and 14.8 GBq/s for Case 2 referenced to a 30 minute decay. The iodine concentrations in the reactor coolant are tabulated below for each case.

Isotope	MBq/g	
	Case 1	Case 2
I-131	0.001739	0.03515
I-132	0.01536	0.30747
I-133	0.01206	0.24161
I-134	0.02634	0.52688
I-135	0.01647	0.3293

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**Table 15.4-5
ABWR Radiological Consequences
Doses for an Instrument Line Break Accident**

DCD			Site	
Thyroid Dose (Sv)	Whole Body Dose (Sv)	χ/Q Ratio (Site/DCD)	Thyroid Dose (Sv)	Whole Body Dose (Sv)
4.80E-02	9.40E-04	0.344	1.65E-02	3.23E-04

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**Table 15.4-6
ABWR Radiological Consequences
Doses for a Fuel Handling Accident**

DCD				Site	
Thyroid Dose (Sv)	Whole Body Dose (Sv)	χ/Q Ratio (Site/DCD)	Uprate Ratio	Thyroid Dose (Sv)	Whole Body Dose (Sv)
7.50E-01	1.20E-02	0.344	1.095	2.82E-01	4.52E-03

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**Table 15.4-7
ABWR Radiological Consequences
Doses for a LOCA**

Location	Time (hr.)	DCD		χ /Q Ratio (Site/DCD)	Uprate Ratio	Site	
		Thyroid Dose (Sv)	Whole Body Dose (Sv)			Thyroid Dose (Sv)	Whole Body Dose (Sv)
EAB	0 to 2	1.90E+00	4.10E-02	0.344	1.095	7.15E-01	1.54E-02
LPZ	0 to 8	3.10E-01	1.00E-02	0.054	1.095	1.84E-02	5.95E-04
	0 to 24	5.10E-01	1.80E-02	0.057	1.095	3.10E-02	1.10E-03
	0 to 96	1.30E+00	2.90E-02	0.064	1.095	8.63E-02	1.87E-03
	0 to 720	2.40E+00	3.80E-02	0.075	1.095	1.77E-01	2.61E-03

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**Table 15.4-8
ABWR Radiological Consequences
Doses for a Main Steamline Break**

	DCD			Site	
	Thyroid Dose (Sv)	Whole Body Dose (Sv)	χ/Q Ratio (Site/DCD)	Thyroid Dose (Sv)	Whole Body Dose (Sv)
Case 1	2.60E-02	6.20E-04	0.344	8.94E-03	2.13E-04
Case 2	5.10E-01	1.30E-02	0.344	1.75E-01	4.47E-03

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**Table 15.4-9
AP1000 Radiological Consequences
Atmospheric Dispersion Factors**

Accident	Location	Time (hr.)	DCD χ/Q (s/m³)	Site χ/Q (s/m³)	χ/Q Ratio (Site/DCD)
LOCA	EAB	0 to 2	5.10E-04	4.71E-04	0.924
	LPZ	0 to 8	2.20E-04	8.47E-06	0.039
		8 to 24	1.60E-04	5.50E-06	0.034
		24 to 96	1.00E-04	2.15E-06	0.022
		96 to 720	8.00E-05	5.60E-07	0.007
Other Accidents	EAB	0 to 2	8.00E-04	4.71E-04	0.589
	LPZ	0 to 8	5.00E-04	8.47E-06	0.017
		8 to 24	3.00E-04	5.50E-06	0.018
		24 to 96	1.50E-04	2.15E-06	0.014
		96 to 720	8.00E-05	5.60E-07	0.007

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**Table 15.4-10
AP1000 Radiological Consequences
Dose Summary**

Subcategory	Site Dose (rem TEDE)		
	EAB	LPZ	Limit
Steam System Piping Failure - Pre-Existing Iodine Spike	0.59	0.01	25
Steam System Piping Failure - Accident-Initiated Iodine Spike	0.65	0.03	2.5
Reactor Coolant Pump Shaft Seizure - No Feedwater	0.47	0.01	2.5
Reactor Coolant Pump Shaft Seizure - Feedwater Available	0.35	0.01	2.5
Spectrum of Rod Cluster Control Assembly Ejection Accidents	2.12	0.09	6.3
Failure of Small Lines Carrying Primary Coolant Outside Containment	1.24	0.02	2.5
Steam Generator Tube Rupture - Pre-Existing Iodine Spike	1.30	0.02	25
Steam Generator Tube Rupture - Accident-Initiated Iodine Spike	0.65	0.01	2.5
LOCA	22.44	0.88	25
Fuel Handling Accident	3.06	0.06	6.3

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**Table 15.4-11
AP1000 Radiological Consequences
Doses for a Steam System Piping Failure**

Doses for Steam System Piping Failure with Pre-Existing Iodine Spike

Time (hr.)	DCD Dose (rem TEDE)		χ/Q Ratio (Site/DCD)	Site Dose (rem TEDE)	
	EAB	LPZ		EAB	LPZ
0 to 2	1.00E+00		0.589	5.89E-01	
0 to 8		5.81E-01	0.017		9.84E-03
8 to 24		7.18E-02	0.018		1.32E-03
24 to 96		1.08E-01	0.014		1.55E-03
96 to 720		0.00E+00	0.007		0.00E+00
Total	1.00E+00	7.61E-01		5.89E-01	1.27E-02
Limit				25	25

Doses for Steam System Piping Failure with Accident-Initiated Iodine Spike

Time (hr.)	DCD Dose (rem TEDE)		χ/Q Ratio (Site/DCD)	Site Dose (rem TEDE)	
	EAB	LPZ		EAB	LPZ
0 to 2	1.10E+00		0.589	6.48E-01	
0 to 8		1.02E+00	0.017		1.73E-02
8 to 24		3.77E-01	0.018		6.91E-03
24 to 96		5.36E-01	0.014		7.68E-03
96 to 720		0.00E+00	0.007		0.00E+00
Total	1.10E+00	1.93E+00		6.48E-01	3.19E-02
Limit				2.5	2.5

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**Table 15.4-12
AP1000 Radiological Consequences
Doses for a Reactor Coolant Pump Shaft Seizure Accident**

Doses for Reactor Coolant Pump Shaft Seizure with No Feedwater

Time (hr.)	DCD Dose (rem TEDE)		χ/Q Ratio (Site/DCD)	Site Dose (rem TEDE)	
	EAB	LPZ		EAB	LPZ
0 to 2	8.00E-01		0.589	4.71E-01	
0 to 8		3.89E-01	0.017		6.59E-03
8 to 24		0.00E+00	0.018		0.00E+00
24 to 96		0.00E+00	0.014		0.00E+00
96 to 720		0.00E+00	0.007		0.00E+00
Total	8.00E-01	3.89E-01		4.71E-01	6.59E-03
Limit				2.5	2.5

Doses for Reactor Coolant Pump Shaft Seizure with Feedwater Available

Time (hr.)	DCD Dose (rem TEDE)		χ/Q Ratio (Site/DCD)	Site Dose (rem TEDE)	
	EAB	LPZ		EAB	LPZ
0 to 2	6.00E-01		0.589	3.53E-01	
0 to 8		7.94E-01	0.017		1.35E-02
8 to 24		0.00E+00	0.018		0.00E+00
24 to 96		0.00E+00	0.014		0.00E+00
96 to 720		0.00E+00	0.007		0.00E+00
Total	6.00E-01	7.94E-01		3.53E-01	1.35E-02
Limit				2.5	2.5

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**Table 15.4-13
AP1000 Radiological Consequences
Doses for Spectrum of Rod Cluster Control Assembly Ejection Accidents**

Time (hr.)	DCD Dose (rem TEDE)		χ/Q Ratio (Site/DCD)	Site Dose (rem TEDE)	
	EAB	LPZ		EAB	LPZ
0 to 2	3.60E+00		0.589	2.12E+00	
0 to 8		4.58E+00	0.017		7.76E-02
8 to 24		7.84E-01	0.018		1.44E-02
24 to 96		6.32E-02	0.014		9.06E-04
96 to 720		2.06E-02	0.007		1.44E-04
Total	3.60E+00	5.45E+00		2.12E+00	9.30E-02
Limit				6.3	6.3

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**Table 15.4-14
AP1000 Radiological Consequences
Doses for Failure of Small Lines Carrying Primary Coolant Outside Containment**

Time (hr.)	DCD Dose (rem TEDE)		χ/Q Ratio (Site/DCD)	Site Dose (rem TEDE)	
	EAB	LPZ		EAB	LPZ
0 to 2	2.10E+00		0.589	1.24E+00	
0 to 8		1.02E+00	0.017		1.73E-02
8 to 24		0.00E+00	0.018		0.00E+00
24 to 96		0.00E+00	0.014		0.00E+00
96 to 720		0.00E+00	0.007		0.00E+00
Total	2.10E+00	1.02E+00		1.24E+00	1.73E-02
Limit				2.5	2.5

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**Table 15.4-15
AP1000 Radiological Consequences
Doses for Steam Generator Tube Rupture**

Doses for Steam Generator Tube Rupture with Pre-Existing Iodine Spike

Time (hr.)	DCD Dose (rem TEDE)		χ/Q Ratio (Site/DCD)	Site Dose (rem TEDE)	
	EAB	LPZ		EAB	LPZ
0 to 2	2.20E+00		0.589	1.30E+00	
0 to 8		1.16E+00	0.017		1.97E-02
8 to 24		7.24E-02	0.018		1.33E-03
24 to 96		0.00E+00	0.014		0.00E+00
96 to 720		0.00E+00	0.007		0.00E+00
Total	2.20E+00	1.23E+00		1.30E+00	2.10E-02
Limit				25	25

Doses for Steam Generator Tube Rupture with Accident-Initiated Iodine Spike

Time (hr.)	DCD Dose (rem TEDE)		χ/Q Ratio (Site/DCD)	Site Dose (rem TEDE)	
	EAB	LPZ		EAB	LPZ
0 to 2	1.10E+00		0.589	6.48E-01	
0 to 8		6.27E-01	0.017		1.06E-02
8 to 24		1.69E-01	0.018		3.10E-03
24 to 96		0.00E+00	0.014		0.00E+00
96 to 720		0.00E+00	0.007		0.00E+00
Total	1.10E+00	7.96E-01		6.48E-01	1.37E-02
Limit				2.5	2.5

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**Table 15.4-16
AP1000 Radiological Consequences
Doses for LOCA**

Time (hr.)	DCD Dose (rem TEDE)		χ/Q Ratio (Site/DCD)	Site Dose (rem TEDE)	
	EAB	LPZ		EAB	LPZ
0 to 2	2.43E+01		0.924	2.24E+01	
0 to 8		2.17E+01	0.039		8.35E-01
8 to 24		7.69E-01	0.034		2.64E-02
24 to 96		3.71E-01	0.022		7.98E-03
96 to 720		8.70E-01	0.007		6.09E-03
Total	2.43E+01	2.37E+01		2.24E+01	8.76E-01
Limit				25	25

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**Table 15.4-17
AP1000 Radiological Consequences
Doses for a Fuel Handling Accident**

Time (hr.)	DCD Dose (rem TEDE)		χ/Q Ratio (Site/DCD)	Site Dose (rem TEDE)	
	EAB	LPZ		EAB	LPZ
0 to 2	5.20E+00		0.589	3.06E+00	
0 to 8		3.44E+00	0.017		5.83E-02
8 to 24		0.00E+00	0.018		0.00E+00
24 to 96		0.00E+00	0.014		0.00E+00
96 to 720		0.00E+00	0.007		0.00E+00
Total	5.20E+00	3.44E+00		3.06E+00	5.83E-02
Limit				25	25

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**Table 15.4-18
U.S. EPR Radiological Consequences
Atmospheric Dispersion Factors**

Location	Time (hr.)	DCD χ/Q (s/m³)	Site χ/Q (s/m³)	χ/Q Ratio (Site/DCD)
EAB	0 to 2	1.00E-03	4.71E-04	0.471
LPZ	0 to 8	1.35E-04	8.47E-06	0.063
	8 to 24	1.00E-04	5.50E-06	0.055
	24 to 96	5.40E-05	2.15E-06	0.040
	96 to 720	2.20E-05	5.60E-07	0.025

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**Table 15.4-19
U.S. EPR Radiological Consequences
Dose Summary**

Accident	DCD Dose (rem TEDE)		χ/Q ratio (Site/DCD)		Site Dose (rem TEDE)		Max
	EAB	LPZ	EAB	LPZ^(a)	EAB	LPZ	
Main Steam Line Break - Pre-Existing Iodine Spike	0.2	0.1	0.471	0.063	9.42E-02	5.50E-03	25
Main Steam Line Break - Accident-Initiated Iodine Spike	0.3	0.2	0.471	0.063	1.41E-01	1.10E-02	2.5
Main Steam Line Break - Fuel Rod Clad Failure	5.3	2.6	0.471	0.063	2.50E+00	1.43E-01	25
Main Steam Line Break - Fuel Overheat	5.8	2.8	0.471	0.063	2.73E+00	1.54E-01	25
Reactor Coolant Pump Shaft Seizure	2.3	0.9	0.471	0.063	1.08E+00	4.95E-02	2.5
Spectrum of Rod Cluster Control Assembly Ejection Accidents	5.7	3.5	0.471	0.063	2.68E+00	1.93E-01	6.3
Failure of Small Lines Carrying Primary Coolant Outside Containment	1.8	0.3	0.471	0.063	8.48E-01	1.65E-02	2.5
Steam Generator Tube Rupture - Pre-Existing Iodine Spike	1.1	0.3	0.471	0.063	5.18E-01	1.65E-02	25
Steam Generator Tube Rupture - Accident-Initiated Iodine Spike	0.7	0.5	0.471	0.063	3.30E-01	2.75E-02	2.5
LOCA	12.2	11.1	0.471	0.063	5.75E+00	6.11E-01	25
Fuel Handling Accident	5.6	1	0.471	0.063	2.64E+00	5.50E-02	6.3

a) As LPZ doses are not given in time-dependent form, the most conservative Site/DCD χ/Q ratio (from the 0-8 hour interval) is used.