



August 13, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 324 (eRAI No. 9256) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 324 (eRAI No. 9256)," dated January 08, 2018

The purpose of this letter is to provide the NuScale Power, LLC (NuScale) response to the referenced NRC Request for Additional Information (RAI).

The Enclosure to this letter contains NuScale's response to the following RAI Questions from NRC eRAI No. 9256:

- 12.02-9
- 12.02-10

This letter and the enclosed response make no new regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions on this response, please contact Carrie Fosaaen at 541-452-7126 or at cfosaaen@nuscalepower.com.

Sincerely,

Zackary W. Rad
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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9256

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9256

Response to Request for Additional Information Docket No. 52-048

eRAI No.: 9256

Date of RAI Issue: 01/08/2018

NRC Question No.: 12.02-9

Regulatory Basis

10 CFR 52.47(a)(5) requires applicants to identify the kinds and quantities of radioactive materials expected to be produced in the operation and the means for controlling and limiting radiation exposures within the limits of 10 CFR Part 20. 10 CFR 20.1101(b) and 10 CFR 20.1003, require the use of engineering controls to maintain exposures to radiation as far below the dose limits in 10 CFR Part 20 as is practical. Appendix A to Part 50—General Design Criteria (GDC) for Nuclear Power Plants, Criterion 61—“Fuel storage and handling and radioactivity control,” requires systems which may contain radioactivity to be designed with suitable shielding for radiation protection and with appropriate containment, confinement, and filtering systems. GDC 4 requires applicants to ensure that structures, systems, and components important to safety are designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation. The DSRS Acceptance Criteria section of NuScale DSRS section 12.2 “Radiation Sources,” states that the applications should contain the methods, models and assumptions used as the bases for all sources described in DCD Section 12.2.

Background

DCD Tier 2 Revision 0 Table 12.2-12, “Liquid Radioactive Waste System Component Source Term Inputs and Assumptions,” states that the dimensions of the Low Concentration Waste (LCW) Granular Activated Carbon (GAC) vessel is 3 feet (ft) diameter by 6 ft high, or 42.4 ft³. DCD Tier 2, Revision 0, Table 11.2-3, “Expected Liquid Waste Inputs,” indicates that the GAC filter is replaced once every 5 years (0.2 sluice events per year). NuScale Technical Report (TR) TR-1116-52065 Revision 0, “Effluent Release (GALE Replacement) Methodology and Results,” Table 2-1, “GALE applicability range,” list the shim bleed flow as 21 lbm/hour.

The radionuclide values listed in DCD subsection 12.2 are the basis of the information used to establish plant source terms. DSRS 12.2 Acceptance Criteria, states that all of the sources of radiation exposure to workers and members of the public (from contained sources) are identified, characterized, and considered in the design and operation of the facility. This section of the DSRS also states that unless described within other sections of the FSAR, source

descriptions should include the methods, models, and assumptions used as the bases for all values provided in FSAR Section 12.2. These acceptance criteria are consistent with the relevant requirements of 10 CFR Part 20 and 10 CFR Part 50 and 10 CFR Part 52.

Key Issue 1: DCD Table 11.1-4, "Primary Coolant Design Basis Source Term," list the concentration of Cobalt 60 (Co60) as $1.0100\text{E-}04 \mu\text{Ci/g}$ ($1.01 \text{ E-}10 \text{ Curies [Ci] /g}$). However, using the information cited above, and the decontamination factor for the GAC units provided in DCD Table 12.2-12, the staff was unable to derive a Co60 activity at or below the $1.09\text{E-}01 \text{ Ci}$ ($1\text{E-}5 \mu\text{Ci}$) of Co60, listed for the LCW GAC media, in DCD Table 12.2-13a, "Liquid Radioactive Waste System Component Source Terms - Radionuclide Content." Based on information made available to the staff during the RPAC Chapter 12 Audit, the staff was not able to understand the methods, models and assumptions that resulted in the noted difference.

Question 1

Explain the apparent discrepancy/error in the aforementioned GAC activity value. To facilitate staff understanding of the application information sufficient to make appropriate regulatory conclusions, the staff requests that the applicant:

- Provide the methods, models and assumptions, used to develop the radionuclide source term in the GAC media, and associated basis of the assumed input stream,
- Revise and update DCD Section 12.2 to reflect the methods, models and assumptions used, and the resultant changes in activity values, as applicable, and
- Identify/explain/correct any other reported activity values that may be affected,

OR

- Provide the specific alternative approaches used and the associated justification.

NuScale Response:

The input process stream that enters the granular activated charcoal (GAC) filters is not primary coolant, but rather the outlet stream from the liquid radioactive waste system (LRWS) low conductivity waste (LCW) collection tank, which receives various waste streams, including the outlet stream from the chemical and volume control system (CVCS), which credits the CVCS mixed bed demineralizer (reference FSAR Table 11.2-3). Therefore, the process stream entering the LCW GAC filter has been partially cleaned and diluted by other processes.



The buildup of radioactivity on the LRWS cleanup components, such as a GAC filter, is calculated assuming that the material is collected at a steady rate instead of processed in batches. This results in a conservatively high buildup of activity, as there is no credit taken for radioactive decay during the time spent collecting a batch volume.

Impact on DCA:

There are no impacts to the DCA as a result of this response.

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Date of RAI Issue: 01/08/2018

NRC Question No.: 12.02-10

Regulatory basis and background are in Question 30979 to this RAI.

Key Issue 2:

DCD Table 12.2-12: "Liquid Radioactive Waste System Component Source Term Inputs and Assumptions," provides decontamination factors (DF) for the liquid radioactive waste granulated activated charcoal (GAC) unit. As stated in the DCD, the source for the stated DFs is International Atomic Energy Agency (IAEA), "Combined Methods for Liquid Radioactive Waste Treatment," IAEA-TECDOC-1336. The DFs referenced were discussed in the paper, "The Volume Reduction of Liquid Radioactive Waste by Combined Treatment Methods," included in IAEA-TECDOC-1336. The specific DF values were stated in an unannotated table following FIG. 9, "The activity of the solid phase after 173L purified liquid volume." These DF values appeared to be from a single experiment that does not appear to represent a configuration used in the NuScale design. Also, it is not clear how the long term performance of the filtration media were assessed. While the assumed DFs may be suitable for estimating the amount of radioactive material retained in the GAC, overstated DFs non-conservatively reduce the amount of radioactive material in downstream components (e.g., dried drums) which could result in understating radiation zones and shielding requirements. Based on information made available to the staff during the RPAC Chapter 12 Audit, the staff was not able to understand the bases for the selection for the stated DFs.

Question 2

To facilitate staff understanding of the application information sufficient to make appropriate regulatory conclusions, the staff requests that the applicant:

- Explain/justify the use of experimental data contained in IAEA-TECDOS-1336 as the basis for the stated DFs,
- Explain/justify how these DFs are representative for the most limiting radiation zone and shielding requirements and
- Describe any process variables that are relevant to determining the claimed DFs and that may need to be controlled to meet the stated DFs.

OR

- Provide the specific alternative approaches used and the associated justification.
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NuScale Response:

The granular activated charcoal (GAC) filter is designed to protect the tubular ultrafiltration (TUF) and reverse osmosis (RO) units from being fouled by the presence of constituents such as organic material. The GAC filter is not designed or intended to collect radionuclides, but because it could, it was conservatively assumed to do so, as opposed to assuming radionuclides were not collected in the GAC filter. In the absence of regulatory guidance for decontamination factors (DFs) for GAC, NuScale located the IAEA document (IAEA-TECDOS-1336) that contained dilution factors (DFs) for a granular activated charcoal filter. Compared to assuming no retention by the GAC filter, these DF values are conservative for estimating the amount of radioactive material retained in the GAC filter. However, to ensure that the amount of radioactive material sent downstream is not underestimated, the radionuclide concentration in the outlet stream from the GAC filter is assumed to not be reduced by the GAC filter. Therefore, the activity calculated as collected in the GAC filter is also available for collection on the downstream components. This effectively double counts these radionuclides to ensure the radiation zones and shielding requirements of the downstream components are also conservatively established. The radionuclide content of the liquid radioactive waste system components have been updated, as reflected in FSAR Table 12.2-13a, Table 12.2-13b, Table 12.2-14a, Table 12.2-14b, and Table 11.2-13. FSAR Section 12.2.1.5 has been revised to describe the assumption that the GAC filter is not credited for reducing the amount of radionuclides in the GAC outlet stream.

Impact on DCA:

FSAR Section 12.2.1.5, FSAR Tables 11.2-13, 12.2-13a, 12.2-13b, 12.2-14a, and 12.2-14b have been revised as described in the response above and as shown in the markup provided in this response.

RAI 11.02-1, RAI 12.02-10

Table 11.2-13: LCW Antimony Bed Radiological Content

Isotope	(Ci)
Sb124	2.70E-14 <u>2.67E-13</u>
Sb125	1.65E-12 <u>8.87E-12</u>
Sb127	3.21E-14 <u>6.59E-13</u>
<u>Sb129</u>	<u>3.82E-14</u>
Te125m	3.49E-13 <u>1.63E-12</u>
Te127m	1.10E-14 <u>1.05E-13</u>
Te127	4.05E-14 <u>5.42E-13</u>
Te129m	4.83E-16 <u>8.63E-15</u>
Te129	3.05E-16 <u>2.95E-14</u>

Reactor Coolant Filters

The reactor coolant filters are cartridge filters located downstream of the ion exchangers that clean the primary coolant in the CVCS, and are assumed to remove crud particulate. The CVCS reactor coolant filters are not explicitly modeled in the shielding model, but are assumed to result in local radiation dose rates that are 10 percent of the CVCS demineralizers. It is also assumed that the CVCS filters do not contribute to the area dose rate outside their shielded cubicles. The assumed filter efficiency is listed in Table 12.2-6. The filter source term and source strengths are listed in Table 12.2-7 and Table 12.2-8, respectively.

12.2.1.4 Reactor Pool Cooling, Spent Fuel Pool Cooling and Pool Cleanup Systems

The reactor pool cooling system (RPCS) is a cooling-water system that removes heat from the reactor pool, while the spent fuel pool cooling system (SFPCS) removes heat by drawing water from the spent fuel pool. The pool cleanup system (PCUS) draws water from either the SFPCS or the RPCS and removes impurities to reduce radiation exposures and to maintain water chemistry and clarity. These systems are further described in Section 9.1.3.

RAI 12.02-7

The RPCS and SFPCS heat exchangers are conservatively assumed to be filled with reactor pool water even though the shell side is normally filled with site cooling water. Because the majority of the radioactivity consists of tritium, these heat exchangers do not represent a significant radiation source that requires radiation shielding. The primary system components considered in designing shielding are the PCUS demineralizers and filters that accumulate activity from radioactive contamination in the reactor pool water. The PCUS demineralizers are assumed to collect the entire inventory of radioactivity in the pool water as reflected in Table 12.2-11. It is also assumed that the PCUS demineralizers operate for two years, resulting in the collection of the entire reactor pool water radionuclide inventory 12 times (assuming a plant with 12 NPMs on a 2 year refueling cycle).

The PCUS filters are not explicitly modeled, but are assumed to result in local radiation dose rates that are 10 percent of the PCUS demineralizer. It is also assumed that the PCUS filters do not contribute to the area dose rate outside their shielded cubicles.

The input assumptions used to develop these source terms are listed in Table 12.2-9. The radionuclide source terms and source strengths for this equipment are provided in Table 12.2-11 and Table 12.2-12, respectively.

12.2.1.5 Liquid Radioactive Waste System

The radionuclide inventory in the liquid radioactive waste system (LRWS) includes fission and activation products originating from the reactor core and the RCS. The radionuclide inventories are listed for the major LRWS components in Table 12.2-14a and Table 12.2-14b which are the basis for the liquid radioactive waste component shielding design.

RAI 12.02-10

The estimated input flows from various sources to the high-conductivity waste (HCW) collection tanks, the low-conductivity waste (LCW) collection tanks, and the detergent collection tank are listed in Table 11.2-3. These inputs are processed in batches by the liquid radioactive waste processing skids and sent to the HCW and LCW sample tanks for final disposition. The assumed values for the LRW processing equipment radionuclide collection efficiencies are listed in Table 12.2-13. The LRWS component source terms are provided in Table 12.2-14a and Table 12.2-14b, and source strengths are provided in Table 12.2-15a and Table 12.2-15b. To establish the shielding design downstream of the GAC filter, the radionuclide concentration in the outlet stream from the GAC filter is assumed to not be reduced by the GAC filter.

12.2.1.6 Gaseous Radioactive Waste System

Radioactive fission gases are produced in the reactor core and assumed to be released to the primary coolant, as discussed in Section 11.1. The radionuclide input to the gaseous radioactive waste system (GRWS) comes primarily from the LRWS degasifier, which strips the dissolved gases from the primary coolant that enters the degasifier from the CVCS. The gases from the degasifier are sent to the GRWS for conditioning and processing. Table 12.2-16 lists the assumed values pertaining to the GRWS source geometries and Table 11.3-1 describes the GRWS processing parameters. The GRWS component source terms are provided in Table 12.2-17 and the source strengths are provided in Table 12.2-18.

12.2.1.7 Solid Radioactive Waste System

RAI 12.02-2

The solid radioactive waste system (SRWS) handles solid radioactive waste from various waste streams, as described in Section 11.4. The waste inputs to the SRWS components are collected, resulting in a radionuclide source term for the SRWS components. The assumed values used to develop the SRWS component source terms are listed in Table 12.2-19. Table 12.2-20 lists the radionuclide inventory of the major SRWS components and Table 12.2-21 lists the SRWS component source strengths. As described in Section 11.4, there is storage space provided in the Radioactive Waste Building for processed waste packages that contain spent filters, dewatered resins, and other solid wastes. For shielding design purposes, it is assumed that the Class A/B/C high integrity container storage area contains five high integrity containers loaded with Class B/C dewatered spent resins from the spent resin storage tank, which has been decayed for approximately two years (one fuel cycle). Storage areas are shielded to limit the radiation level to be compliant with the designated radiation zone.

12.2.1.8 Reactor Pool Water

RAI 12.02-6, RAI 12.02-14

The reactor pool is housed within the RXB and contains up to 12 NPMs, which are partially immersed in the reactor pool water. Because the spent fuel pool communicates with the reactor pool through the weir wall, radionuclides are mixed with the spent fuel pool water volume. There are two sources of radioactive material considered for the reactor pool water: primary coolant released during refueling

RAI 12.02-9, RAI 12.02-10

**Table 12.2-13a: Liquid Radioactive Waste System Component Source Terms
- Radionuclide Content**

Isotope	LCW Collection Tank (Ci)	HCW Collection Tank (Ci)	Oil Separator (Ci)	LCW GAC Unit (Ci)	LCW TUF Unit (Ci)	LCW RO Unit (Ci)	LCW Cation Bed (Ci)	LCW Anion Bed (Ci)
Kr83m	-	-	-	-	-	-	1.29E-09	-
Kr85	-	-	-	-	-	-	-	2.06E-12
Xe131m	-	-	-	-	-	-	1.05E-08	7.09E-06
Xe133m	-	-	-	-	-	-	1.62E-10	4.70E-07
Xe133	-	-	-	-	-	-	1.06E-08	3.06E-05
Xe135m	-	-	-	-	-	-	-	7.07E-14
Xe135	-	-	-	-	-	-	1.76E-17	2.67E-10
Br82	2.07E-05	5.48E-05	4.77E-06	-	1.24E-05	7.46E-06	-	2.16E-08
Br83	1.01E-04	2.69E-04	2.34E-05	-	6.08E-05	3.65E-05	-	-
Br84	4.51E-05	1.20E-04	1.04E-05	-	2.70E-05	1.62E-05	-	-
Br85	5.36E-06	1.42E-05	1.24E-06	-	3.22E-06	1.93E-06	-	-
I129	5.43E-10	1.42E-09	1.23E-10	7.19E-16	3.26E-10	1.96E-10	6.32E-13	2.02E-09
I130	1.59E-04	4.22E-04	3.67E-05	-	9.53E-05	5.72E-05	-	1.80E-10
I131	1.14E-02	1.26E-02	1.02E-03	-	6.82E-03	4.09E-03	8.05E-07	4.70E-04
I132	1.77E-03	4.67E-03	4.07E-04	-	1.06E-03	6.35E-04	6.64E-06	-
I133	6.97E-03	1.68E-02	1.45E-03	-	4.18E-03	2.51E-03	1.99E-10	5.51E-07
I134	9.61E-04	2.55E-03	2.22E-04	-	5.77E-04	3.46E-04	-	-
I135	3.70E-03	9.82E-03	8.54E-04	-	2.22E-03	1.33E-03	2.71E-20	4.12E-13
Rb86m	1.50E-07	2.37E-08	9.03E-10	-	8.99E-08	5.39E-08	-	-
Rb86	1.14E-03	1.80E-04	6.87E-06	-	6.85E-04	4.11E-04	1.23E-04	-
Rb88	1.52E-01	2.41E-02	9.17E-04	-	9.14E-02	5.48E-02	-	-
Rb89	6.99E-03	1.10E-03	4.21E-05	-	4.19E-03	2.52E-03	-	-
Cs132	2.17E-05	3.43E-06	1.30E-07	-	1.30E-05	7.80E-06	6.01E-07	-
Cs134	1.99E-01	3.14E-02	1.19E-03	-	1.19E-01	7.15E-02	4.88E-01	-
Cs135m	1.18E-04	1.86E-05	7.10E-07	-	7.07E-05	4.24E-05	-	-
Cs136	4.16E-02	6.58E-03	2.50E-04	-	2.50E-02	1.50E-02	2.96E-03	-
Cs137	1.22E-01	1.92E-02	7.32E-04	-	7.30E-02	4.38E-02	4.02E-01	2.75E-13
Cs138	5.62E-02	8.89E-03	3.39E-04	-	3.37E-02	2.02E-02	-	-
P32	9.55E-10	1.45E-09	1.23E-10	-	5.73E-10	3.44E-10	7.49E-11	-
Co57	7.17E-12	1.09E-11	9.21E-13	-	4.30E-12	2.58E-12	1.09E-11	-
Ni63	3.72E-04	8.60E-05	3.76E-06	-	2.23E-04	1.34E-04	1.25E-03	-
Sr89	6.86E-06	1.04E-05	8.82E-07	-	4.12E-06	2.47E-06	2.66E-06	-
Sr90	1.55E-06	2.34E-06	1.98E-07	-	9.27E-07	5.56E-07	5.10E-06	-
Sr91	3.15E-06	4.83E-06	4.09E-07	-	1.89E-06	1.13E-06	1.92E-13	-
Sr92	1.58E-06	2.42E-06	2.05E-07	-	9.49E-07	5.69E-07	-	-
Y90	4.14E-07	6.17E-07	5.22E-08	-	2.48E-07	1.49E-07	5.10E-06	-
Y91m	1.72E-06	2.64E-06	2.24E-07	-	1.03E-06	6.20E-07	1.23E-13	-
Y91	9.98E-07	1.51E-06	1.28E-07	-	5.99E-07	3.59E-07	3.82E-07	-
Y92	1.43E-06	2.20E-06	1.86E-07	-	8.59E-07	5.15E-07	-	-
Y93	7.23E-07	1.11E-06	9.40E-08	-	4.34E-07	2.60E-07	7.91E-14	-
Zr95	5.37E-04	1.28E-04	5.77E-06	-	3.22E-04	1.93E-04	2.20E-04	-

**Table 12.2-13a: Liquid Radioactive Waste System Component Source Terms
- Radionuclide Content (Continued)**

Isotope	LCW Collection Tank (Ci)	HCW Collection Tank (Ci)	Oil Separator (Ci)	LCW GAC Unit (Ci)	LCW TUF Unit (Ci)	LCW RO Unit (Ci)	LCW Cation Bed (Ci)	LCW Anion Bed (Ci)
Zr97	1.03E-06	1.57E-06	1.33E-07	-	6.16E-07	3.70E-07	1.64E-11	-
Nb95	3.09E-05	6.43E-06	2.48E-07	1.87E-04	2.90E-08	1.74E-08	2.29E-04	-
Mo99	1.95E-03	2.97E-03	2.52E-04	3.79E-13	1.17E-03	7.01E-04	1.15E-05	-
Mo101	5.85E-05	8.97E-05	7.60E-06	-	3.51E-05	2.11E-05	-	-
Tc99m	1.81E-03	2.76E-03	2.34E-04	3.66E-13	1.09E-03	6.52E-04	1.11E-05	-
Ru103	1.92E-06	2.91E-06	2.47E-07	-	1.15E-06	6.91E-07	4.69E-07	-
Ru105	1.88E-05	2.88E-05	2.44E-06	-	1.13E-05	6.76E-06	1.57E-19	-
Ru106	1.25E-06	1.89E-06	1.60E-07	-	7.49E-07	4.49E-07	2.29E-06	-
Rh103m	1.90E-06	2.88E-06	2.44E-07	-	1.14E-06	6.83E-07	4.64E-07	-
Rh105	4.88E-06	7.45E-06	6.31E-07	-	2.93E-06	1.76E-06	7.34E-09	-
Rh106	1.25E-06	1.89E-06	1.60E-07	-	7.49E-07	4.49E-07	2.29E-06	-
Ag110m	1.83E-03	4.48E-04	2.08E-05	8.34E-02	3.39E-07	2.03E-07	8.08E-07	-
Sb124	2.83E-09	4.30E-09	3.64E-10	2.59E-08	2.39E-10	1.44E-10	1.54E-10	-
Sb125	2.50E-08	3.79E-08	3.21E-09	2.87E-06	2.11E-09	1.27E-09	9.36E-09	-
Sb127	1.06E-07	1.61E-07	1.36E-08	2.97E-08	8.93E-09	5.36E-09	1.75E-10	-
Sb129	1.12E-07	1.72E-07	1.45E-08	1.65E-20	9.46E-09	5.67E-09	-	-
Te125m	3.66E-06	5.56E-06	4.71E-07	6.49E-07	2.20E-06	1.32E-06	1.34E-06	-
Te127m	1.18E-05	1.79E-05	1.52E-06	1.06E-08	7.08E-06	4.25E-06	8.30E-06	-
Te127	4.26E-05	6.52E-05	5.52E-06	3.80E-08	2.56E-05	1.53E-05	8.13E-06	-
Te129m	3.38E-05	5.12E-05	4.34E-06	4.59E-10	2.03E-05	1.22E-05	7.01E-06	-
Te129	4.22E-05	6.44E-05	5.46E-06	2.90E-10	2.53E-05	1.52E-05	4.42E-06	-
Te131m	1.04E-04	1.59E-04	1.35E-05	-	6.25E-05	3.75E-05	7.83E-08	-
Te131	4.63E-05	7.10E-05	6.01E-06	-	2.78E-05	1.67E-05	2.05E-08	-
Te132	7.84E-04	1.19E-03	1.01E-04	-	4.70E-04	2.82E-04	6.44E-06	-
Te133m	5.40E-05	8.29E-05	7.02E-06	-	3.24E-05	1.95E-05	-	-
Te134	7.65E-05	1.17E-04	9.93E-06	-	4.59E-05	2.75E-05	-	-
Ba137m	5.44E-03	8.13E-03	6.88E-04	-	3.26E-03	1.96E-03	3.81E-01	2.61E-13
Ba139	2.04E-04	3.13E-04	2.66E-05	-	1.23E-04	7.36E-05	-	-
Ba140	1.05E-05	1.59E-05	1.35E-06	-	6.28E-06	3.77E-06	7.19E-07	-
La140	3.31E-06	4.95E-06	4.18E-07	-	1.99E-06	1.19E-06	8.14E-07	-
La141	6.91E-07	1.06E-06	8.97E-08	-	4.14E-07	2.49E-07	-	-
La142	3.63E-07	5.57E-07	4.72E-08	-	2.18E-07	1.31E-07	-	-
Ce141	1.53E-06	2.32E-06	1.96E-07	-	9.16E-07	5.49E-07	3.05E-07	-
Ce143	1.10E-06	1.68E-06	1.43E-07	-	6.60E-07	3.96E-07	8.06E-10	-
Ce144	1.28E-06	1.95E-06	1.65E-07	-	7.70E-07	4.62E-07	2.01E-06	-
Pr143	1.36E-06	2.06E-06	1.74E-07	-	8.14E-07	4.88E-07	1.09E-07	-
Pr144	1.28E-06	1.95E-06	1.65E-07	-	7.70E-07	4.62E-07	2.01E-06	-
Np239	2.36E-05	3.60E-05	3.05E-06	-	1.41E-05	8.48E-06	9.58E-08	-
Na24	1.23E-02	1.39E-02	1.14E-03	-	7.40E-03	4.44E-03	7.98E-08	-
Cr51	4.12E-03	9.86E-04	4.47E-05	1.91E-02	9.67E-06	5.80E-06	2.70E-06	-
Mn54	2.24E-03	5.19E-04	2.28E-05	1.25E-01	1.26E-05	7.53E-06	3.47E-05	-
Fe55	1.68E-03	3.89E-04	1.70E-05	-	1.01E-03	6.05E-04	4.45E-03	-
Fe59	4.07E-04	9.61E-05	4.30E-06	-	2.44E-04	1.47E-04	1.14E-04	-
Co58	5.87E-02	7.82E-03	6.57E-05	6.86E-01	2.67E-03	1.60E-03	2.02E-03	-

**Table 12.2-13a: Liquid Radioactive Waste System Component Source Terms
- Radionuclide Content (Continued)**

Isotope	LCW Collection Tank (Ci)	HCW Collection Tank (Ci)	Oil Separator (Ci)	LCW GAC Unit (Ci)	LCW TUF Unit (Ci)	LCW RO Unit (Ci)	LCW Cation Bed (Ci)	LCW Anion Bed (Ci)
Co60	7.45E-04	1.72E-04	7.54E-06	1.09E-01	6.67E-05	4.00E-05	3.30E-04	-
W187	9.49E-04	6.72E-04	5.13E-05	-	5.69E-04	3.42E-04	1.57E-07	-
Zn65	7.12E-04	1.65E-04	7.26E-06	-	4.27E-04	2.56E-04	1.00E-03	-
H3	2.56E+01	6.48E+00	3.65E-01	-	-	-	-	-
C14	2.69E-04	4.07E-04	3.45E-05	-	1.61E-04	9.67E-05	9.09E-04	-

Note: Assumes the plant consists of 12 NPMs operating on a two-year refueling cycle.

Br82	2.95E-05	1.22E-04	7.54E-06	-	4.71E-06	2.83E-06	-	3.19E-07
Br83	1.66E-04	6.97E-04	4.31E-05	-	1.85E-06	1.11E-06	-	1.22E-07
Br84	7.73E-05	3.24E-04	2.01E-05	-	1.90E-07	1.14E-07	-	1.25E-08
Br85	9.34E-06	3.92E-05	2.42E-06	-	2.09E-09	1.26E-09	-	1.38E-10
I129	7.48E-10	3.02E-09	1.87E-10	-	4.49E-10	2.69E-10	2.32E-13	1.39E-09
I130	2.35E-04	9.84E-04	6.09E-05	-	1.35E-05	8.09E-06	-	8.90E-07
I131	2.67E-02	2.75E-02	1.57E-03	-	1.17E-02	7.00E-03	1.54E-06	1.57E-03
I132	2.77E-03	1.15E-02	7.14E-04	-	5.25E-04	3.15E-04	3.68E-05	1.94E-06
I133	1.15E-02	3.84E-02	2.36E-03	-	1.11E-03	6.67E-04	3.07E-08	7.34E-05
I134	1.62E-03	6.78E-03	4.20E-04	-	7.23E-06	4.34E-06	4.00E-08	4.33E-07
I135	5.72E-03	2.40E-02	1.49E-03	-	1.74E-04	1.05E-04	-	1.15E-05
Rb86m	4.03E-07	6.40E-08	1.76E-09	-	3.17E-11	1.90E-11	1.90E-12	-
Rb86	2.40E-03	3.80E-04	1.04E-05	-	1.25E-03	7.49E-04	2.98E-04	-
Rb88	4.08E-01	6.48E-02	1.78E-03	-	5.60E-04	3.36E-04	3.36E-05	-
Rb89	1.87E-02	2.97E-03	8.16E-05	-	2.19E-05	1.32E-05	1.31E-06	-
Cs132	4.62E-05	7.33E-06	2.01E-07	-	1.88E-05	1.13E-05	2.00E-06	-
Cs134	4.13E-01	6.56E-02	1.80E-03	-	2.47E-01	1.48E-01	5.93E-01	-
Cs135m	3.13E-04	4.97E-05	1.36E-06	-	1.28E-06	7.68E-07	7.68E-08	-
Cs136	8.76E-02	1.39E-02	3.82E-04	-	4.31E-02	2.59E-02	7.70E-03	-
Cs137	2.53E-01	4.02E-02	1.10E-03	-	1.52E-01	9.12E-02	4.23E-01	-
Cs138	1.50E-01	2.38E-02	6.53E-04	-	3.86E-04	2.32E-04	2.32E-05	-
P32	3.30E-10	4.88E-10	2.98E-11	-	1.65E-10	9.88E-11	3.14E-11	-
Co57	2.46E-12	3.64E-12	2.22E-13	-	1.46E-12	8.77E-13	2.70E-12	-
Sr89	1.47E-05	2.18E-05	1.33E-06	-	1.06E-05	6.35E-06	6.23E-06	-
Sr90	3.31E-06	4.90E-06	2.99E-07	-	1.98E-06	1.19E-06	5.52E-06	-
Sr91	7.54E-06	1.13E-05	6.91E-07	-	3.37E-07	2.02E-07	2.02E-08	-
Sr92	4.03E-06	6.04E-06	3.69E-07	-	4.97E-08	2.98E-08	2.98E-09	-
Y90	8.17E-07	1.19E-06	7.26E-08	-	1.34E-06	8.06E-07	5.48E-06	-
Y91m	4.04E-06	6.06E-06	3.70E-07	-	2.12E-07	1.27E-07	1.27E-08	-
Y91	2.14E-06	3.16E-06	1.93E-07	-	1.24E-06	7.42E-07	8.32E-07	-
Y92	3.42E-06	5.13E-06	3.14E-07	-	1.06E-07	6.35E-08	6.35E-09	-
Y93	1.61E-06	2.41E-06	1.47E-07	-	7.59E-08	4.55E-08	4.55E-09	-
Zr97	2.37E-06	3.55E-06	2.17E-07	-	1.84E-07	1.10E-07	1.10E-08	-
Nb95	2.37E-05	7.33E-06	3.14E-07	1.53E-04	3.82E-05	2.30E-05	2.46E-04	-
Mo99	4.29E-03	6.38E-03	3.90E-04	-	1.13E-03	6.76E-04	7.86E-05	-
Mo101	1.60E-04	2.40E-04	1.47E-05	-	1.81E-07	1.09E-07	1.09E-08	-
Tc99m	3.97E-03	5.90E-03	3.61E-04	-	1.08E-03	6.50E-04	7.56E-05	-
Tc99	1.23E-07	1.83E-07	1.12E-08	-	7.41E-08	4.44E-08	2.09E-07	-

**Table 12.2-13a: Liquid Radioactive Waste System Component Source Terms
- Radionuclide Content (Continued)**

Isotope	LCW Collection Tank (Ci)	HCW Collection Tank (Ci)	Oil Separator (Ci)	LCW GAC Unit (Ci)	LCW TUF Unit (Ci)	LCW RO Unit (Ci)	LCW Cation Bed (Ci)	LCW Anion Bed (Ci)
Ru103	4.12E-06	6.10E-06	3.73E-07	-	2.31E-06	1.39E-06	1.08E-06	-
Ru105	1.34E-06	2.00E-06	1.22E-07	-	2.75E-08	1.65E-08	1.65E-09	-
Ru106	2.67E-06	3.96E-06	2.42E-07	-	1.59E-06	9.56E-07	3.28E-06	-
Rh103m	4.08E-06	6.03E-06	3.68E-07	-	2.28E-06	1.37E-06	1.07E-06	-
Rh105	2.86E-06	4.26E-06	2.60E-07	-	4.83E-07	2.90E-07	2.97E-08	-
Rh106	2.67E-06	3.96E-06	2.42E-07	-	1.59E-06	9.56E-07	3.28E-06	-
Ag110	2.86E-05	7.38E-06	2.82E-07	1.25E-03	1.62E-05	9.71E-06	2.90E-05	-
Sb124	6.08E-09	9.00E-09	5.49E-10	5.83E-08	3.49E-09	2.09E-09	2.41E-09	-
Sb125	5.36E-08	7.93E-08	4.84E-09	6.15E-06	3.21E-08	1.92E-08	8.00E-08	-
Sb127	2.31E-07	3.43E-07	2.10E-08	1.42E-07	7.46E-08	4.48E-08	5.94E-09	-
Sb129	2.81E-07	4.22E-07	2.58E-08	8.21E-09	5.74E-09	3.44E-09	3.44E-10	-
Te125m	7.86E-06	1.16E-05	7.10E-07	1.39E-06	4.50E-06	2.70E-06	2.99E-06	-
Te127m	2.53E-05	3.75E-05	2.29E-06	2.51E-08	1.48E-05	8.89E-06	1.66E-05	-
Te127	9.93E-05	1.48E-04	9.07E-06	1.17E-07	1.78E-05	1.07E-05	1.65E-05	-
Te129m	7.25E-05	1.07E-04	6.56E-06	1.86E-09	4.02E-05	2.41E-05	1.63E-05	-
Te129	1.02E-04	1.52E-04	9.27E-06	6.35E-09	2.57E-05	1.54E-05	1.03E-05	-
Te131m	2.35E-04	3.51E-04	2.14E-05	-	3.22E-05	1.93E-05	1.96E-06	-
Te131	1.15E-04	1.73E-04	1.05E-05	-	7.38E-06	4.43E-06	4.49E-07	-
Te132	1.72E-03	2.56E-03	1.56E-04	-	4.99E-04	2.99E-04	3.68E-05	-
Te133m	1.45E-04	2.18E-04	1.33E-05	-	6.21E-07	3.73E-07	3.73E-08	-
Te134	2.07E-04	3.10E-04	1.89E-05	-	6.67E-07	4.00E-07	4.00E-08	-
Ba137m	1.16E-02	1.70E-02	1.04E-03	-	1.44E-01	8.61E-02	4.00E-01	-
Ba139	3.84E-06	5.77E-06	3.52E-07	-	2.47E-08	1.48E-08	1.48E-09	-
Ba140	2.12E-05	3.15E-05	1.92E-06	-	1.04E-05	6.23E-06	1.81E-06	-
La140	6.28E-06	9.14E-06	5.57E-07	-	8.71E-06	5.22E-06	1.88E-06	-
La141	1.19E-06	1.79E-06	1.09E-07	-	2.17E-08	1.30E-08	1.30E-09	-
La142	5.69E-07	8.54E-07	5.22E-08	-	4.01E-09	2.40E-09	2.40E-10	-
Ce141	3.27E-06	4.85E-06	2.96E-07	-	1.81E-06	1.09E-06	7.11E-07	-
Ce143	2.46E-06	3.67E-06	2.24E-07	-	3.69E-07	2.21E-07	2.26E-08	-
Ce144	2.75E-06	4.07E-06	2.49E-07	-	1.64E-06	9.81E-07	3.08E-06	-
Pr143	2.91E-06	4.31E-06	2.63E-07	-	1.54E-06	9.23E-07	2.86E-07	-
Pr144	2.73E-06	4.03E-06	2.46E-07	-	1.62E-06	9.72E-07	3.05E-06	-
Np239	5.17E-05	7.70E-05	4.70E-06	-	1.22E-05	7.31E-06	8.14E-07	-
Na24	5.39E-03	8.07E-03	4.93E-04	-	3.74E-04	2.24E-04	2.24E-05	-
Cr51	4.61E-03	9.26E-04	2.81E-05	2.36E-02	2.52E-03	1.51E-03	8.53E-04	-
Mn54	2.47E-03	4.87E-04	1.45E-05	1.39E-01	1.47E-03	8.81E-04	2.86E-03	-
Fe55	1.85E-03	3.65E-04	1.08E-05	-	1.11E-03	6.66E-04	2.77E-03	-
Fe59	4.53E-04	9.02E-05	2.71E-06	-	2.56E-04	1.54E-04	1.34E-04	-
Co58	6.60E-02	7.78E-03	4.16E-05	8.02E-01	3.81E-02	2.29E-02	3.03E-02	-
Co60	8.19E-04	1.61E-04	4.78E-06	1.20E-01	4.91E-04	2.95E-04	1.30E-03	-
Ni63	4.09E-04	8.06E-05	2.39E-06	-	2.46E-04	1.47E-04	6.89E-04	-
Zn65	7.85E-04	1.55E-04	4.60E-06	-	4.66E-04	2.80E-04	8.26E-04	-
Zr95	5.93E-04	1.18E-04	3.52E-06	-	3.41E-04	2.05E-04	2.49E-04	-
Ag110m	2.01E-03	3.95E-04	1.17E-05	9.22E-02	1.19E-03	7.14E-04	2.13E-03	-

**Table 12.2-13a: Liquid Radioactive Waste System Component Source Terms
- Radionuclide Content (Continued)**

Isotope	LCW Collection Tank (Ci)	HCW Collection Tank (Ci)	Oil Separator (Ci)	LCW GAC Unit (Ci)	LCW TUF Unit (Ci)	LCW RO Unit (Ci)	LCW Cation Bed (Ci)	LCW Anion Bed (Ci)
<u>W187</u>	<u>1.36E-03</u>	<u>5.29E-04</u>	<u>2.52E-05</u>	=	<u>1.49E-04</u>	<u>8.93E-05</u>	<u>8.97E-06</u>	=
<u>H3</u>	<u>7.08E+01</u>	<u>1.84E+01</u>	<u>9.96E-01</u>	=	=	=	=	=
<u>C14</u>	<u>5.51E-03</u>	<u>6.91E-04</u>	<u>1.21E-05</u>	=	=	=	=	=

Note: Assumes the plant consists of 12 NPMs operating on a two-year refueling cycle.

RAI 12.02-9, RAI 12.02-10

**Table 12.2-13b: Liquid Radioactive Waste System Component Source Terms
- Radionuclide Content**

Isotope	LCW Mixed Bed (Ci)	LCW Cesium Bed (Ci)	LCW Sample Tank (Ci)	HCW GAC Unit (Ci)	HCW TUF Unit (Ci)	HCW RO Unit (Ci)	HCW Sample Tank (Ci)	Drum Dryer (Ci)
Kr83m	7.15E-11	6.43E-11	-	-	-	-	-	2.54E-08
Kr85	2.06E-14	-	-	-	-	-	-	3.44E-11
Xe131m	7.20E-08	1.05E-11	-	-	-	-	-	3.71E-04
Xe133m	4.72E-09	1.62E-13	-	-	-	-	-	4.20E-05
Xe133	3.07E-07	1.06E-11	-	-	-	-	-	2.65E-03
Xe135m	7.07E-16	-	-	-	-	-	-	1.22E-11
Xe135	2.67E-12	1.76E-20	-	-	-	-	-	3.78E-08
Br82	2.16E-10	-	8.29E-11	-	3.29E-05	1.97E-05	2.19E-06	2.14E-06
Br83	-	-	4.06E-10	-	1.62E-04	9.69E-05	1.08E-05	-
Br84	-	-	1.80E-10	-	7.18E-05	4.31E-05	4.79E-06	-
Br85	-	-	2.15E-11	-	8.55E-06	5.13E-06	5.70E-07	-
I129	2.03E-11	6.32E-16	2.17E-15	1.15E-15	8.49E-10	5.09E-10	5.66E-11	3.15E-08
I130	1.80E-12	-	6.35E-10	-	2.53E-04	1.52E-04	1.69E-05	2.23E-08
I131	4.79E-06	8.05E-10	4.55E-08	-	7.56E-03	4.54E-03	5.04E-04	2.49E-02
I132	7.30E-07	6.64E-09	7.06E-09	-	2.80E-03	1.68E-03	1.87E-04	4.73E-04
I133	5.53E-09	1.99E-13	2.79E-08	-	1.01E-02	6.05E-03	6.72E-04	5.52E-05
I134	-	-	3.84E-09	-	1.53E-03	9.19E-04	1.02E-04	-
I135	4.12E-15	-	1.48E-08	-	5.89E-03	3.54E-03	3.93E-04	7.10E-11
Rb86m	-	-	3.00E-11	-	1.42E-08	8.53E-09	9.48E-10	-
Rb86	6.80E-06	6.11E-06	2.28E-07	-	1.08E-04	6.50E-05	7.22E-06	3.78E-03
Rb88	-	-	3.05E-05	-	1.44E-02	8.67E-03	9.63E-04	-
Rb89	-	-	1.40E-06	-	6.63E-04	3.98E-04	4.42E-05	-
Cs132	3.34E-08	3.01E-08	4.33E-09	-	2.06E-06	1.23E-06	1.37E-07	1.87E-05
Cs134	2.71E-02	2.44E-02	3.97E-05	-	1.88E-02	1.13E-02	1.26E-03	3.36E+00
Cs135m	-	-	2.36E-08	-	1.12E-05	6.71E-06	7.46E-07	-
Cs136	1.64E-04	1.48E-04	8.32E-06	-	3.95E-03	2.37E-03	2.63E-04	9.18E-02
Cs137	2.23E-02	2.01E-02	2.43E-05	-	1.15E-02	6.93E-03	7.70E-04	2.18E+00
Cs138	-	-	1.12E-05	-	5.33E-03	3.20E-03	3.56E-04	-
P32	8.23E-12	7.49E-14	3.82E-15	-	8.71E-10	5.22E-10	5.81E-11	5.17E-09
Co57	1.20E-12	1.09E-14	2.87E-17	-	6.53E-12	3.92E-12	4.35E-13	2.43E-10
Ni63	1.37E-04	1.25E-06	1.49E-09	-	5.16E-05	3.09E-05	3.44E-06	7.11E-03
Sr89	2.68E-07	2.55E-08	2.75E-11	-	6.25E-06	3.75E-06	4.17E-07	1.36E-04
Sr90	5.62E-07	5.13E-09	6.18E-12	-	1.41E-06	8.44E-07	9.38E-08	6.17E-05
Sr91	1.98E-14	1.46E-15	1.26E-11	-	2.90E-06	1.74E-06	1.93E-07	1.73E-11
Sr92	-	-	6.32E-12	-	1.45E-06	8.73E-07	9.70E-08	-
Y90	5.61E-07	5.12E-09	1.66E-12	-	3.70E-07	2.22E-07	2.47E-08	6.12E-05
Y91m	1.27E-14	9.37E-16	6.89E-12	-	1.58E-06	9.50E-07	1.06E-07	1.12E-11
Y91	4.19E-08	4.43E-10	3.99E-12	-	9.09E-07	5.45E-07	6.06E-08	2.04E-05
Y92	-	-	5.73E-12	-	1.32E-06	7.90E-07	8.78E-08	-
Y93	8.70E-15	7.91E-17	2.89E-12	-	6.65E-07	3.99E-07	4.44E-08	7.62E-12
Zr95	2.41E-05	2.20E-07	2.15E-09	-	7.66E-05	4.60E-05	5.11E-06	5.43E-03
Zr97	1.80E-12	1.64E-14	4.11E-12	-	9.44E-07	5.66E-07	6.29E-08	1.36E-09

**Table 12.2-13b: Liquid Radioactive Waste System Component Source Terms
- Radionuclide Content (Continued)**

Isotope	LCW Mixed Bed (Ci)	LCW Cesium Bed (Ci)	LCW Sample Tank (Ci)	HCW GAC Unit (Ci)	HCW TUF Unit (Ci)	HCW RO Unit (Ci)	HCW Sample Tank (Ci)	Drum Dryer (Ci)
Nb95	2.51E-05	2.29E-07	1.93E-13	4.06E-05	6.04E-09	3.62E-09	4.03E-10	4.17E-03
Mo99	1.26E-06	1.15E-08	7.79E-09	6.40E-13	1.78E-03	1.07E-03	1.19E-04	8.21E-04
Mo101	-	-	2.34E-10	-	5.38E-05	3.23E-05	3.59E-06	-
Tc99m	1.22E-06	1.11E-08	7.24E-09	6.19E-13	1.66E-03	9.95E-04	1.11E-04	7.94E-04
Ru103	5.16E-08	4.69E-10	7.68E-12	-	1.75E-06	1.05E-06	1.17E-07	2.89E-05
Ru105	1.73E-20	-	7.51E-11	-	1.73E-05	1.04E-05	1.15E-06	2.62E-17
Ru106	2.52E-07	2.29E-09	4.99E-12	-	1.14E-06	6.81E-07	7.57E-08	4.44E-05
Rh103m	5.11E-08	4.64E-10	7.59E-12	-	1.73E-06	1.04E-06	1.15E-07	2.86E-05
Rh105	8.06E-10	7.34E-12	1.95E-11	-	4.47E-06	2.68E-06	2.98E-07	5.45E-07
Rh106	2.52E-07	2.29E-09	4.99E-12	-	1.14E-06	6.81E-07	7.57E-08	4.44E-05
Ag110m	8.92E-08	8.08E-10	2.26E-12	2.13E-02	8.27E-08	4.96E-08	5.52E-09	9.13E-06
Sb124	1.69E-11	1.54E-13	3.55E-18	4.12E-08	3.63E-10	2.18E-10	2.42E-11	8.09E-09
Sb125	1.02E-09	9.36E-12	3.13E-17	4.55E-06	3.20E-09	1.92E-09	2.14E-10	1.35E-07
Sb127	1.93E-11	1.75E-13	1.32E-16	4.89E-08	1.36E-08	8.17E-09	9.07E-10	1.24E-08
Sb129	-	-	1.40E-16	8.71E-20	1.45E-08	8.70E-09	9.67E-10	1.63E-20
Te125m	1.47E-07	1.34E-09	1.47E-11	1.03E-06	3.34E-06	2.00E-06	2.22E-07	7.23E-05
Te127m	9.13E-07	8.30E-09	4.72E-11	1.69E-08	1.07E-05	6.45E-06	7.16E-07	3.18E-04
Te127	8.94E-07	8.13E-09	1.70E-10	6.20E-08	3.91E-05	2.35E-05	2.61E-06	3.11E-04
Te129m	7.70E-07	7.01E-09	1.35E-10	7.36E-10	3.07E-05	1.84E-05	2.05E-06	4.46E-04
Te129	4.86E-07	4.42E-09	1.69E-10	4.64E-10	3.86E-05	2.32E-05	2.58E-06	2.82E-04
Te131m	8.60E-09	7.83E-11	4.16E-10	-	9.56E-05	5.74E-05	6.37E-06	5.86E-06
Te131	2.26E-09	2.05E-11	1.85E-10	-	4.26E-05	2.55E-05	2.84E-06	1.54E-06
Te132	7.08E-07	6.44E-09	3.13E-09	-	7.17E-04	4.30E-04	4.78E-05	4.59E-04
Te133m	-	-	2.16E-10	-	4.97E-05	2.98E-05	3.31E-06	-
Te134	-	-	3.06E-10	-	7.03E-05	4.22E-05	4.69E-06	-
Ba137m	2.11E-02	1.90E-02	2.18E-08	-	4.88E-03	2.93E-03	3.25E-04	2.06E+00
Ba139	-	-	8.17E-10	-	1.88E-04	1.13E-04	1.25E-05	-
Ba140	7.88E-08	8.13E-10	4.19E-11	-	9.54E-06	5.72E-06	6.36E-07	4.97E-05
La140	8.93E-08	9.20E-10	1.32E-11	-	2.97E-06	1.78E-06	1.98E-07	5.62E-05
La141	-	-	2.76E-12	-	6.35E-07	3.81E-07	4.24E-08	2.53E-20
La142	-	-	1.45E-12	-	3.34E-07	2.00E-07	2.23E-08	-
Ce141	3.36E-08	3.19E-10	6.10E-12	-	1.39E-06	8.34E-07	9.27E-08	1.97E-05
Ce143	8.87E-11	8.06E-13	4.40E-12	-	1.01E-06	6.06E-07	6.73E-08	6.06E-08
Ce144	2.21E-07	2.01E-09	5.13E-12	-	1.17E-06	7.01E-07	7.79E-08	4.39E-05
Pr143	1.20E-08	1.09E-10	5.42E-12	-	1.24E-06	7.41E-07	8.24E-08	7.57E-06
Pr144	2.21E-07	2.01E-09	5.13E-12	-	1.17E-06	7.01E-07	7.79E-08	4.39E-05
Np239	1.05E-08	9.58E-11	9.42E-11	-	2.16E-05	1.29E-05	1.44E-06	6.90E-06
Na24	8.77E-09	7.98E-11	4.93E-08	-	8.35E-03	5.01E-03	5.56E-04	5.59E-06
Cr51	2.97E-07	2.70E-09	6.44E-11	4.79E-03	2.31E-06	1.39E-06	1.54E-07	8.63E-05
Mn54	3.82E-06	3.47E-08	8.37E-11	3.03E-02	2.91E-06	1.74E-06	1.94E-07	3.47E-04
Fe55	4.89E-04	4.45E-06	6.72E-09	-	2.33E-04	1.40E-04	1.55E-05	3.07E-02
Fe59	1.25E-05	1.14E-07	1.63E-09	-	5.76E-05	3.46E-05	3.84E-06	3.24E-03
Co58	2.23E-04	2.02E-06	1.78E-08	9.57E-02	3.55E-04	2.13E-04	2.37E-05	4.34E-02
Co60	3.63E-05	3.30E-07	4.45E-10	2.63E-02	1.54E-05	9.25E-06	1.03E-06	2.08E-03

**Table 12.2-13b: Liquid Radioactive Waste System Component Source Terms
- Radionuclide Content (Continued)**

Isotope	LCW Mixed Bed (Ci)	LCW Cesium Bed (Ci)	LCW Sample Tank (Ci)	HCW GAC Unit (Ci)	HCW TUF Unit (Ci)	HCW RO Unit (Ci)	HCW Sample Tank (Ci)	Drum Dryer (Ci)
W187	1.72E-08	1.57E-10	3.80E-09	-	4.03E-04	2.42E-04	2.69E-05	7.90E-06
Zn65	1.10E-04	1.00E-06	2.85E-09	-	9.91E-05	5.94E-05	6.60E-06	1.14E-02
H3	-	-	2.56E+01	-	-	-	6.48E+00	-
C14	9.96E-05	9.09E-07	1.07E-09	-	2.44E-04	1.47E-04	1.63E-05	1.08E-02

Note: Assumes the plant consists of 12 NPMs operating on a two-year refueling cycle.

Br82	3.19E-09	-	9.27E-12	-	2.01E-05	1.21E-05	3.83E-07	4.09E-05
Br83	1.22E-09	-	-	-	8.05E-06	4.83E-06	1.55E-21	1.58E-05
Br84	1.25E-10	-	-	-	8.27E-07	4.96E-07	-	1.63E-06
Br85	1.38E-12	-	-	-	9.11E-09	5.47E-09	-	1.79E-08
I129	1.39E-11	2.32E-16	2.99E-15	-	1.81E-09	1.09E-09	1.21E-10	1.75E-07
I130	8.90E-09	-	6.57E-13	-	5.85E-05	3.51E-05	2.74E-08	1.15E-04
I131	1.59E-05	1.54E-09	6.70E-08	-	1.22E-02	7.31E-03	6.92E-04	7.90E-02
I132	4.06E-06	3.68E-08	2.20E-09	-	8.81E-04	5.29E-04	3.28E-05	2.75E-03
I133	7.38E-07	3.07E-11	6.15E-10	-	3.84E-03	2.30E-03	2.05E-05	7.93E-03
I134	8.73E-09	4.00E-11	-	-	2.96E-05	1.78E-05	-	5.89E-05
I135	1.15E-07	-	2.64E-14	-	7.59E-04	4.55E-04	1.11E-09	1.49E-03
Rb86m	1.06E-13	9.50E-14	-	-	5.22E-12	3.13E-12	-	5.90E-11
Rb86	1.66E-05	1.49E-05	3.92E-07	-	1.99E-04	1.20E-04	1.25E-05	9.26E-03
Rb88	1.87E-06	1.68E-06	-	-	9.24E-05	5.54E-05	-	1.04E-03
Rb89	7.30E-08	6.57E-08	-	-	3.61E-06	2.17E-06	-	4.08E-05
Cs132	1.11E-07	9.98E-08	5.18E-09	-	3.02E-06	1.81E-06	1.64E-07	6.20E-05
Cs134	3.30E-02	2.97E-02	8.23E-05	-	3.93E-02	2.36E-02	2.61E-03	1.84E+01
Cs135m	4.27E-09	3.84E-09	-	-	2.11E-07	1.27E-07	-	2.39E-06
Cs136	4.28E-04	3.85E-04	1.32E-05	-	6.90E-03	4.14E-03	4.19E-04	2.39E-01
Cs137	2.35E-02	2.12E-02	5.07E-05	-	2.41E-02	1.45E-02	1.61E-03	1.32E+01
Cs138	1.29E-06	1.16E-06	-	-	6.37E-05	3.82E-05	-	7.20E-04
P32	3.45E-12	3.14E-14	1.01E-15	-	2.46E-10	1.47E-10	1.50E-11	2.12E-09
Co57	2.97E-13	2.70E-15	9.71E-18	-	2.16E-12	1.30E-12	1.44E-13	1.83E-10
Sr89	6.15E-07	7.02E-08	7.79E-10	-	1.28E-05	7.66E-06	8.32E-07	3.74E-04
Sr90	6.08E-07	5.52E-09	1.32E-11	-	2.94E-06	1.76E-06	1.96E-07	3.74E-04
Sr91	2.22E-09	2.02E-11	2.68E-15	-	5.24E-07	3.14E-07	4.02E-11	1.38E-06
Sr92	3.28E-10	2.98E-12	-	-	7.74E-08	4.64E-08	5.21E-22	2.03E-07
Y90	6.03E-07	5.48E-09	1.08E-11	-	1.96E-06	1.17E-06	1.59E-07	3.71E-04
Y91m	1.40E-09	1.27E-11	1.71E-15	-	3.29E-07	1.98E-07	2.56E-11	8.65E-07
Y91	9.16E-08	8.32E-10	8.11E-12	-	1.84E-06	1.10E-06	1.20E-07	5.63E-05
Y92	6.98E-10	6.35E-12	5.95E-22	-	1.65E-07	9.89E-08	8.92E-18	4.33E-07
Y93	5.01E-10	4.55E-12	9.46E-16	-	1.18E-07	7.09E-08	1.42E-11	3.10E-07
Zr97	1.22E-09	1.10E-11	4.44E-14	-	2.86E-07	1.72E-07	6.64E-10	7.53E-07
Nb95	2.70E-05	2.46E-07	2.31E-10	4.93E-05	8.89E-06	5.34E-06	4.59E-07	7.92E-03
Mo99	8.65E-06	7.86E-08	4.39E-09	-	1.72E-03	1.03E-03	6.53E-05	5.34E-03
Mo101	1.19E-09	1.09E-11	-	-	2.82E-07	1.69E-07	-	7.40E-07
Tc99m	8.32E-06	7.56E-08	4.24E-09	-	1.65E-03	9.91E-04	6.31E-05	5.13E-03
Tc99	2.29E-08	2.09E-10	4.94E-13	-	1.10E-07	6.58E-08	7.31E-09	1.41E-05
Ru103	1.19E-07	1.08E-09	1.50E-11	-	3.43E-06	2.06E-06	2.22E-07	7.30E-05

**Table 12.2-13b: Liquid Radioactive Waste System Component Source Terms
- Radionuclide Content (Continued)**

Isotope	LCW Mixed Bed (Ci)	LCW Cesium Bed (Ci)	LCW Sample Tank (Ci)	HCW GAC Unit (Ci)	HCW TUF Unit (Ci)	HCW RO Unit (Ci)	HCW Sample Tank (Ci)	Drum Dryer (Ci)
Ru105	1.81E-10	1.65E-12	8.73E-21	-	4.28E-08	2.57E-08	1.31E-16	1.12E-07
Ru106	3.61E-07	3.28E-09	1.06E-11	-	2.36E-06	1.42E-06	1.57E-07	2.22E-04
Rh103m	1.17E-07	1.07E-09	1.48E-11	-	3.39E-06	2.03E-06	2.19E-07	7.21E-05
Rh105	3.27E-09	2.97E-11	9.62E-13	-	7.45E-07	4.47E-07	1.43E-08	2.02E-06
Rh106	3.61E-07	3.28E-09	1.06E-11	-	2.36E-06	1.42E-06	1.57E-07	2.22E-04
Ag110	3.19E-06	2.90E-08	3.31E-14	2.57E-04	3.19E-06	1.92E-06	6.52E-11	9.30E-04
Sb124	2.65E-10	2.41E-12	7.15E-18	8.96E-08	5.17E-09	3.10E-09	4.76E-11	1.63E-07
Sb125	8.80E-09	8.00E-11	6.68E-17	9.45E-06	4.74E-08	2.85E-08	4.45E-10	5.41E-06
Sb127	6.53E-10	5.94E-12	1.09E-16	2.19E-07	1.13E-07	6.79E-08	7.32E-10	4.03E-07
Sb129	3.79E-11	3.44E-13	4.79E-25	1.28E-08	8.94E-09	5.36E-09	3.23E-18	2.35E-08
Te125m	3.29E-07	2.99E-09	2.95E-11	2.13E-06	6.68E-06	4.01E-06	4.36E-07	2.02E-04
Te127m	1.83E-06	1.66E-08	9.78E-11	3.87E-08	2.20E-05	1.32E-05	1.45E-06	1.12E-03
Te127	1.81E-06	1.65E-08	9.58E-11	1.80E-07	2.66E-05	1.60E-05	1.42E-06	1.11E-03
Te129m	1.79E-06	1.63E-08	2.60E-10	2.89E-09	5.97E-05	3.58E-05	3.84E-06	1.10E-03
Te129	1.13E-06	1.03E-08	1.64E-10	9.90E-09	3.82E-05	2.29E-05	2.42E-06	6.95E-04
Te131m	2.16E-07	1.96E-09	4.71E-11	-	4.99E-05	2.99E-05	7.03E-07	1.33E-04
Te131	4.93E-08	4.49E-10	1.06E-11	-	1.14E-05	6.85E-06	1.58E-07	3.05E-05
Te132	4.04E-06	3.68E-08	2.14E-09	-	7.59E-04	4.55E-04	3.18E-05	2.49E-03
Te133m	4.10E-09	3.73E-11	-	-	9.68E-07	5.81E-07	-	2.54E-06
Te134	4.40E-09	4.00E-11	-	-	1.04E-06	6.24E-07	-	2.73E-06
Ba137m	2.22E-02	2.00E-02	4.78E-05	-	2.28E-02	1.37E-02	1.52E-03	1.24E+01
Ba139	1.63E-10	1.48E-12	-	-	3.84E-08	2.31E-08	-	1.01E-07
Ba140	1.99E-07	1.81E-09	6.33E-11	-	1.55E-05	9.30E-06	9.38E-07	1.22E-04
La140	2.07E-07	1.88E-09	6.51E-11	-	1.28E-05	7.71E-06	9.64E-07	1.27E-04
La141	1.43E-10	1.30E-12	5.32E-22	-	3.38E-08	2.03E-08	7.98E-18	8.87E-08
La142	2.64E-11	2.40E-13	-	-	6.24E-09	3.74E-09	-	1.64E-08
Ce141	7.82E-08	7.11E-10	1.17E-11	-	2.69E-06	1.62E-06	1.73E-07	4.81E-05
Ce143	2.48E-09	2.26E-11	6.48E-13	-	5.70E-07	3.42E-07	9.67E-09	1.54E-06
Ce144	3.39E-07	3.08E-09	1.09E-11	-	2.42E-06	1.45E-06	1.61E-07	2.08E-04
Pr143	3.15E-08	2.86E-10	9.61E-12	-	2.29E-06	1.38E-06	1.42E-07	1.94E-05
Pr144	3.36E-07	3.05E-09	1.08E-11	-	2.40E-06	1.44E-06	1.59E-07	2.06E-04
Np239	8.95E-08	8.14E-10	4.23E-11	-	1.87E-05	1.12E-05	6.29E-07	5.52E-05
Na24	2.47E-06	2.24E-08	5.32E-11	-	5.81E-04	3.49E-04	7.96E-07	1.53E-03
Cr51	9.38E-05	8.53E-07	6.30E-11	4.92E-03	5.07E-04	3.04E-04	1.26E-07	2.75E-02
Mn54	3.14E-04	2.86E-06	9.12E-11	2.85E-02	2.90E-04	1.74E-04	1.80E-07	9.18E-02
Fe55	3.05E-04	2.77E-06	7.39E-09	-	2.19E-04	1.31E-04	1.46E-05	8.89E-02
Fe59	1.47E-05	1.34E-07	1.66E-09	-	5.11E-05	3.06E-05	3.32E-06	4.31E-03
Co58	3.34E-03	3.03E-05	1.90E-08	9.81E-02	4.50E-03	2.70E-03	2.24E-05	9.08E-01
Co60	1.43E-04	1.30E-06	4.88E-10	2.45E-02	9.66E-05	5.80E-05	9.61E-07	4.17E-02
Ni63	7.58E-05	6.89E-07	1.64E-09	-	4.83E-05	2.90E-05	3.22E-06	2.21E-02
Zn65	9.08E-05	8.26E-07	3.09E-09	-	9.20E-05	5.52E-05	6.10E-06	2.65E-02
Zr95	2.73E-05	2.49E-07	2.24E-09	-	6.78E-05	4.07E-05	4.44E-06	8.00E-03
Ag110m	2.34E-04	2.13E-06	2.43E-12	1.89E-02	2.35E-04	1.41E-04	4.79E-09	6.84E-02
W187	9.87E-07	8.97E-09	1.23E-10	-	6.01E-05	3.61E-05	4.80E-07	3.36E-04

**Table 12.2-13b: Liquid Radioactive Waste System Component Source Terms
- Radionuclide Content (Continued)**

Isotope	LCW Mixed Bed (Ci)	LCW Cesium Bed (Ci)	LCW Sample Tank (Ci)	HCW GAC Unit (Ci)	HCW TUF Unit (Ci)	HCW RO Unit (Ci)	HCW Sample Tank (Ci)	Drum Dryer (Ci)
H3	=	=	7.07E+01	=	=	=	1.84E+01	=
C14	=	=	5.51E-03	=	=	=	6.91E-04	=

Note: Assumes the plant consists of 12 NPMs operating on a two-year refueling cycle.

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Table 12.2-14a: Liquid Radioactive Waste System Component Source Terms - Source Strengths

Energy Group	Energy Boundary (MeV)	LCW Collection Tank (photon/s)	HCW Collection Tank (photon/s)	Oil Separator (photon/s)	LCW GAC Unit (photon/s)	LCW TUF Unit (photon/s)	LCW RO Unit (photon/s)	LCW Cation Bed (photon/s)	LCW Anion Bed (photon/s)
1	1.00E-02 - 2.00E-02	3.68E+08	8.75E+07	4.84E+06	5.47E+07	2.18E+08	1.31E+08	9.02E+07	5.49E+04
2	2.00E-02 - 3.00E-02	2.41E+08	9.94E+07	6.93E+06	6.35E+07	1.43E+08	8.59E+07	4.71E+07	6.75E+05
3	3.00E-02 - 4.50E-02	4.22E+08	1.09E+08	6.28E+06	2.32E+07	2.52E+08	1.51E+08	1.07E+09	8.57E+05
4	4.50E-02 - 6.00E-02	1.32E+08	3.28E+07	1.86E+06	1.72E+07	7.86E+07	4.71E+07	2.40E+07	1.45E+04
5	6.00E-02 - 7.00E-02	1.45E+08	3.00E+07	1.49E+06	8.10E+06	8.68E+07	5.21E+07	1.62E+07	6.48E+03
6	7.00E-02 - 7.50E-02	3.17E+07	8.95E+06	5.36E+05	3.46E+06	1.89E+07	1.13E+07	4.48E+06	2.70E+03
7	7.50E-02 - 1.00E-01	2.03E+08	4.74E+07	2.58E+06	1.36E+07	1.21E+08	7.28E+07	2.17E+07	8.28E+05
8	1.00E-01 - 1.50E-01	2.61E+08	1.54E+08	1.18E+07	1.68E+07	1.56E+08	9.35E+07	1.46E+07	8.17E+03
9	1.50E-01 - 2.00E-01	3.64E+08	7.56E+07	3.81E+06	9.07E+06	2.18E+08	1.31E+08	2.81E+07	5.68E+04
10	2.00E-01 - 2.60E-01	1.21E+08	6.74E+07	5.08E+06	9.47E+06	7.24E+07	4.34E+07	8.41E+06	3.99E+03
11	2.60E-01 - 3.00E-01	2.33E+08	8.35E+07	5.55E+06	3.47E+06	1.40E+08	8.39E+07	1.32E+07	1.09E+06
12	3.00E-01 - 4.00E-01	1.11E+09	5.39E+08	3.87E+07	7.60E+07	6.59E+08	3.95E+08	4.99E+07	1.48E+07
13	4.00E-01 - 4.50E-01	1.45E+08	6.39E+07	4.55E+06	1.19E+08	8.56E+07	5.13E+07	2.39E+05	9.22E+03
14	4.50E-01 - 5.10E-01	7.86E+08	1.48E+08	6.83E+06	2.25E+06	4.71E+08	2.83E+08	2.65E+08	6.55E+04
15	5.10E-01 - 5.12E-01	6.53E+08	9.92E+07	1.84E+06	7.56E+09	3.32E+07	1.99E+07	2.34E+07	3.75E+02
16	5.12E-01 - 6.00E-01	2.28E+09	9.36E+08	6.54E+07	1.62E+06	1.37E+09	8.21E+08	4.36E+09	1.75E+04
17	6.00E-01 - 7.00E-01	7.16E+09	1.67E+09	9.16E+07	3.58E+09	4.23E+09	2.54E+09	2.93E+10	1.26E+06
18	7.00E-01 - 8.00E-01	7.20E+09	1.35E+09	6.20E+07	1.35E+09	4.29E+09	2.58E+09	1.72E+10	2.98E+05
19	8.00E-01 - 9.00E-01	4.51E+09	9.04E+08	3.84E+07	3.13E+10	1.48E+09	8.85E+08	9.18E+08	1.42E+03
20	9.00E-01 - 1.00E+00	4.78E+08	1.31E+08	7.82E+06	1.04E+09	2.74E+08	1.64E+08	6.54E+04	5.40E+01
21	1.00E+00 - 1.20E+00	2.12E+09	5.12E+08	2.85E+07	4.30E+09	1.26E+09	7.55E+08	6.30E+08	3.71E+02
22	1.20E+00 - 1.33E+00	5.31E+08	2.20E+08	1.54E+07	2.12E+09	3.11E+08	1.87E+08	2.98E+07	1.01E+03
23	1.33E+00 - 1.44E+00	2.44E+09	8.47E+08	5.57E+07	2.71E+09	1.45E+09	8.69E+08	5.42E+08	3.19E+01
24	1.44E+00 - 1.50E+00	4.43E+07	4.36E+07	3.56E+06	1.29E+08	2.49E+07	1.49E+07	7.85E+03	1.33E+02
25	1.50E+00 - 1.57E+00	3.28E+07	1.57E+07	1.12E+06	4.50E+08	1.37E+07	8.24E+06	1.32E+05	4.38E-03
26	1.57E+00 - 1.66E+00	1.08E+07	7.38E+06	5.77E+05	7.51E+05	6.45E+06	3.87E+06	2.87E+04	6.71E+00
27	1.66E+00 - 1.80E+00	7.61E+07	8.87E+07	7.33E+06	1.28E+08	3.97E+07	2.38E+07	3.76E+05	9.20E-01
28	1.80E+00 - 2.00E+00	1.26E+09	2.12E+08	8.71E+06	5.26E+05	7.56E+08	4.53E+08	4.91E+03	6.95E-01

Table 12.2-14a: Liquid Radioactive Waste System Component Source Terms - Source Strengths (Continued)

Energy Group	Energy Boundary (MeV)	LCW Collection Tank (photon/s)	HCW Collection Tank (photon/s)	Oil Separator (photon/s)	LCW GAC Unit (photon/s)	LCW TUF Unit (photon/s)	LCW RO Unit (photon/s)	LCW Cation Bed (photon/s)	LCW Anion Bed (photon/s)
29	2.00E+00 - 2.15E+00	5.52E+07	1.43E+07	8.33E+05	3.23E+04	3.32E+07	1.99E+07	2.05E+03	3.68E-03
30	2.15E+00 - 2.35E+00	3.58E+08	6.02E+07	2.49E+06	4.64E+04	2.15E+08	1.29E+08	1.70E+03	9.73E-05
31	2.35E+00 - 2.50E+00	1.10E+07	6.27E+06	4.74E+05	6.66E+02	6.57E+06	3.94E+06	6.79E+02	1.56E-04
32	2.50E+00 - 2.75E+00	5.84E+08	3.25E+08	2.42E+07	3.85E+01	3.51E+08	2.11E+08	2.71E+03	3.86E-09
33	2.75E+00 - 3.00E+00	2.32E+08	2.48E+08	2.03E+07	2.07E+01	1.39E+08	8.36E+07	1.44E+03	3.24E-09
34	3.00E+00 - 3.50E+00	4.50E+07	7.65E+06	3.18E+05	-	2.70E+07	1.62E+07	9.81E+00	-
35	3.50E+00 - 4.00E+00	1.17E+07	2.52E+06	1.30E+05	-	7.01E+06	4.21E+06	2.25E+00	-
36	4.00E+00 - 4.50E+00	6.56E+06	1.08E+06	4.32E+04	-	3.93E+06	2.36E+06	2.47E-02	-
37	4.50E+00 - 5.00E+00	1.14E+07	1.84E+06	7.15E+04	-	6.83E+06	4.10E+06	1.23E-11	-
38	5.00E+00 - 5.50E+00	4.95E+05	1.06E+05	5.53E+03	-	2.97E+05	1.79E+05	6.18E-12	-
39	5.50E+00 - 6.00E+00	1.16E+04	1.20E+04	9.82E+02	-	6.93E+03	4.16E+03	3.11E-12	-
40	6.00E+00 - 6.50E+00	2.11E+03	5.56E+03	4.82E+02	-	1.26E+03	7.58E+02	1.56E-12	-
41	6.50E+00 - 7.00E+00	1.60E+02	4.26E+02	3.71E+01	-	9.62E+01	5.78E+01	7.85E-13	-
42	7.00E+00 - 7.50E+00	3.34E+01	8.85E+01	7.75E+00	-	2.01E+01	1.20E+01	-	-
43	7.50E+00 - 8.00E+00	4.57E-04	1.21E-03	1.06E-04	-	2.75E-04	1.65E-04	-	-
44	8.00E+00 - 1.00E+01	3.94E-04	1.04E-03	9.13E-05	-	2.37E-04	1.42E-04	-	-
45	1.00E+01 - 1.20E+01	-	-	-	-	-	-	-	-
46	1.20E+01 - 1.40E+01	-	-	-	-	-	-	-	-
47	1.40E+01 - 2.00E+01	-	-	-	-	-	-	-	-
Total		3.47E+10	9.25E+09	5.38E+08	5.51E+10	1.90E+10	1.14E+10	5.47E+10	2.01E+07
Note: Assumes the plant consists of 12 NPMs operating on a two-year refueling cycle.									
1	1.00E-02 - 2.00E-02	9.05E+08	1.99E+08	7.49E+06	6.33E+07	5.42E+07	3.25E+07	1.05E+08	2.01E+05
2	2.00E-02 - 3.00E-02	5.91E+08	2.23E+08	1.08E+07	7.19E+07	5.47E+07	3.28E+07	5.69E+07	1.94E+06
3	3.00E-02 - 4.50E-02	8.62E+08	2.23E+08	9.27E+06	2.70E+07	5.40E+08	3.25E+08	1.16E+09	1.12E+06
4	4.50E-02 - 6.00E-02	3.28E+08	7.41E+07	2.84E+06	1.99E+07	1.63E+07	9.75E+06	2.83E+07	5.46E+04
5	6.00E-02 - 7.00E-02	3.25E+08	5.88E+07	1.86E+06	9.41E+06	8.58E+07	5.16E+07	2.67E+07	2.46E+04
6	7.00E-02 - 7.50E-02	7.43E+07	1.54E+07	5.48E+05	4.02E+06	3.33E+06	2.00E+06	5.32E+06	1.03E+04
7	7.50E-02 - 1.00E-01	4.68E+08	1.06E+08	4.01E+06	1.58E+07	1.01E+08	6.08E+07	3.35E+07	1.43E+06
8	1.00E-01 - 1.50E-01	5.76E+08	3.30E+08	1.80E+07	1.94E+07	5.55E+07	3.34E+07	2.03E+07	3.44E+04
9	1.50E-01 - 2.00E-01	8.11E+08	1.62E+08	5.65E+06	1.06E+07	2.61E+08	1.57E+08	5.39E+07	1.76E+05
10	2.00E-01 - 2.60E-01	2.98E+08	1.53E+08	8.14E+06	1.07E+07	2.28E+07	1.37E+07	1.14E+07	1.95E+04

Table 12.2-14a: Liquid Radioactive Waste System Component Source Terms - Source Strengths (Continued)

Energy Group	Energy Boundary (MeV)	LCW Collection Tank (photon/s)	HCW Collection Tank (photon/s)	Oil Separator (photon/s)	LCW GAC Unit (photon/s)	LCW TUF Unit (photon/s)	LCW RO Unit (photon/s)	LCW Cation Bed (photon/s)	LCW Anion Bed (photon/s)
11	<u>2.60E-01</u> - <u>3.00E-01</u>	<u>5.07E+08</u>	<u>1.85E+08</u>	<u>8.81E+06</u>	<u>3.98E+06</u>	<u>2.02E+08</u>	<u>1.21E+08</u>	<u>3.25E+07</u>	<u>3.68E+06</u>
12	<u>3.00E-01</u> - <u>4.00E-01</u>	<u>2.44E+09</u>	<u>1.15E+09</u>	<u>5.82E+07</u>	<u>9.22E+07</u>	<u>1.04E+09</u>	<u>6.26E+08</u>	<u>1.27E+08</u>	<u>4.95E+07</u>
13	<u>4.00E-01</u> - <u>4.50E-01</u>	<u>3.63E+08</u>	<u>1.59E+08</u>	<u>7.98E+06</u>	<u>1.32E+08</u>	<u>4.03E+06</u>	<u>2.42E+06</u>	<u>3.41E+06</u>	<u>8.01E+04</u>
14	<u>4.50E-01</u> - <u>5.10E-01</u>	<u>2.00E+09</u>	<u>3.65E+08</u>	<u>1.17E+07</u>	<u>2.58E+06</u>	<u>1.61E+08</u>	<u>9.62E+07</u>	<u>3.25E+08</u>	<u>2.25E+05</u>
15	<u>5.10E-01</u> - <u>5.12E-01</u>	<u>7.37E+08</u>	<u>1.15E+08</u>	<u>2.27E+06</u>	<u>8.84E+09</u>	<u>4.21E+08</u>	<u>2.53E+08</u>	<u>3.35E+08</u>	<u>5.01E+04</u>
16	<u>5.12E-01</u> - <u>6.00E-01</u>	<u>4.75E+09</u>	<u>2.11E+09</u>	<u>1.06E+08</u>	<u>1.83E+06</u>	<u>2.25E+09</u>	<u>1.35E+09</u>	<u>5.31E+09</u>	<u>2.34E+06</u>
17	<u>6.00E-01</u> - <u>7.00E-01</u>	<u>1.47E+10</u>	<u>3.56E+09</u>	<u>1.43E+08</u>	<u>3.96E+09</u>	<u>1.33E+10</u>	<u>7.95E+09</u>	<u>3.36E+10</u>	<u>4.37E+06</u>
18	<u>7.00E-01</u> - <u>8.00E-01</u>	<u>1.49E+10</u>	<u>2.87E+09</u>	<u>9.69E+07</u>	<u>1.49E+09</u>	<u>8.78E+09</u>	<u>5.26E+09</u>	<u>2.10E+10</u>	<u>1.15E+06</u>
19	<u>8.00E-01</u> - <u>9.00E-01</u>	<u>7.56E+09</u>	<u>1.71E+09</u>	<u>6.27E+07</u>	<u>3.62E+10</u>	<u>3.18E+09</u>	<u>1.91E+09</u>	<u>2.38E+09</u>	<u>2.30E+05</u>
20	<u>9.00E-01</u> - <u>1.00E+00</u>	<u>1.22E+09</u>	<u>3.29E+08</u>	<u>1.39E+07</u>	<u>1.16E+09</u>	<u>2.08E+07</u>	<u>1.25E+07</u>	<u>2.71E+07</u>	<u>3.34E+04</u>
21	<u>1.00E+00</u> - <u>1.20E+00</u>	<u>4.80E+09</u>	<u>1.20E+09</u>	<u>4.86E+07</u>	<u>4.74E+09</u>	<u>1.35E+09</u>	<u>8.11E+08</u>	<u>8.80E+08</u>	<u>1.94E+05</u>
22	<u>1.20E+00</u> - <u>1.33E+00</u>	<u>1.11E+09</u>	<u>5.07E+08</u>	<u>2.58E+07</u>	<u>2.34E+09</u>	<u>3.32E+08</u>	<u>1.99E+08</u>	<u>8.35E+07</u>	<u>2.38E+05</u>
23	<u>1.33E+00</u> - <u>1.44E+00</u>	<u>5.32E+09</u>	<u>1.16E+09</u>	<u>4.36E+07</u>	<u>2.99E+09</u>	<u>3.19E+08</u>	<u>1.91E+08</u>	<u>6.97E+08</u>	<u>1.44E+04</u>
24	<u>1.44E+00</u> - <u>1.50E+00</u>	<u>9.60E+07</u>	<u>1.06E+08</u>	<u>6.19E+06</u>	<u>1.43E+08</u>	<u>2.94E+06</u>	<u>1.76E+06</u>	<u>3.33E+06</u>	<u>4.15E+04</u>
25	<u>1.50E+00</u> - <u>1.57E+00</u>	<u>6.47E+07</u>	<u>3.41E+07</u>	<u>1.79E+06</u>	<u>4.98E+08</u>	<u>8.52E+06</u>	<u>5.12E+06</u>	<u>1.18E+07</u>	<u>1.05E+04</u>
26	<u>1.57E+00</u> - <u>1.66E+00</u>	<u>1.90E+07</u>	<u>1.69E+07</u>	<u>9.62E+05</u>	<u>8.31E+05</u>	<u>3.98E+05</u>	<u>2.39E+05</u>	<u>8.91E+04</u>	<u>1.09E+03</u>
27	<u>1.66E+00</u> - <u>1.80E+00</u>	<u>1.41E+08</u>	<u>2.14E+08</u>	<u>1.27E+07</u>	<u>1.49E+08</u>	<u>8.71E+06</u>	<u>5.24E+06</u>	<u>5.64E+06</u>	<u>9.16E+04</u>
28	<u>1.80E+00</u> - <u>2.00E+00</u>	<u>3.35E+09</u>	<u>5.65E+08</u>	<u>1.67E+07</u>	<u>5.82E+05</u>	<u>5.10E+06</u>	<u>3.06E+06</u>	<u>3.18E+05</u>	<u>6.32E+03</u>
29	<u>2.00E+00</u> - <u>2.15E+00</u>	<u>1.34E+08</u>	<u>3.46E+07</u>	<u>1.43E+06</u>	<u>3.58E+04</u>	<u>4.26E+05</u>	<u>2.56E+05</u>	<u>2.44E+04</u>	<u>4.63E+03</u>
30	<u>2.15E+00</u> - <u>2.35E+00</u>	<u>9.43E+08</u>	<u>1.58E+08</u>	<u>4.65E+06</u>	<u>5.11E+04</u>	<u>2.41E+06</u>	<u>1.45E+06</u>	<u>1.44E+05</u>	<u>3.08E+03</u>
31	<u>2.35E+00</u> - <u>2.50E+00</u>	<u>2.19E+07</u>	<u>1.45E+07</u>	<u>7.96E+05</u>	<u>7.34E+02</u>	<u>1.42E+05</u>	<u>8.54E+04</u>	<u>5.19E+03</u>	<u>4.58E+03</u>
32	<u>2.50E+00</u> - <u>2.75E+00</u>	<u>1.02E+09</u>	<u>3.02E+08</u>	<u>1.36E+07</u>	<u>4.25E+01</u>	<u>9.05E+06</u>	<u>5.42E+06</u>	<u>5.44E+05</u>	<u>6.74E+01</u>
33	<u>2.75E+00</u> - <u>3.00E+00</u>	<u>1.28E+08</u>	<u>1.48E+08</u>	<u>8.88E+06</u>	<u>2.28E+01</u>	<u>6.67E+06</u>	<u>3.99E+06</u>	<u>3.99E+05</u>	<u>1.12E+01</u>
34	<u>3.00E+00</u> - <u>3.50E+00</u>	<u>1.02E+08</u>	<u>1.71E+07</u>	<u>5.01E+05</u>	-	<u>1.73E+05</u>	<u>1.04E+05</u>	<u>1.04E+04</u>	<u>3.49E+01</u>
35	<u>3.50E+00</u> - <u>4.00E+00</u>	<u>1.96E+07</u>	<u>4.13E+06</u>	<u>1.51E+05</u>	-	<u>3.96E+04</u>	<u>2.37E+04</u>	<u>2.34E+03</u>	<u>3.28E+01</u>
36	<u>4.00E+00</u> - <u>4.50E+00</u>	<u>3.91E+06</u>	<u>6.54E+05</u>	<u>1.92E+04</u>	-	<u>6.49E+03</u>	<u>3.89E+03</u>	<u>3.88E+02</u>	<u>1.24E+00</u>
37	<u>4.50E+00</u> - <u>5.00E+00</u>	<u>2.87E+07</u>	<u>4.55E+06</u>	<u>1.25E+05</u>	-	<u>3.94E+04</u>	<u>2.36E+04</u>	<u>2.36E+03</u>	<u>1.24E-06</u>
38	<u>5.00E+00</u> - <u>5.50E+00</u>	<u>5.41E+04</u>	<u>8.59E+03</u>	<u>2.36E+02</u>	-	<u>7.43E+01</u>	<u>4.46E+01</u>	<u>4.46E+00</u>	<u>1.12E-06</u>
39	<u>5.50E+00</u> - <u>6.00E+00</u>	-	-	-	-	-	-	-	-
40	<u>6.00E+00</u> - <u>6.50E+00</u>	-	-	-	-	-	-	-	-
41	<u>6.50E+00</u> - <u>7.00E+00</u>	-	-	-	-	-	-	-	-

Table 12.2-14a: Liquid Radioactive Waste System Component Source Terms - Source Strengths (Continued)

Energy Group	Energy Boundary (MeV)	LCW Collection Tank (photon/s)	HCW Collection Tank (photon/s)	Oil Separator (photon/s)	LCW GAC Unit (photon/s)	LCW TUF Unit (photon/s)	LCW RO Unit (photon/s)	LCW Cation Bed (photon/s)	LCW Anion Bed (photon/s)
<u>42</u>	<u>7.00E+00</u> - <u>7.50E+00</u>	-	-	-	-	-	-	-	-
<u>43</u>	<u>7.50E+00</u> - <u>8.00E+00</u>	-	-	-	-	-	-	-	-
<u>44</u>	<u>8.00E+00</u> - <u>1.00E+01</u>	-	-	-	-	-	-	-	-
<u>45</u>	<u>1.00E+01</u> - <u>1.20E+01</u>	-	-	-	-	-	-	-	-
<u>46</u>	<u>1.20E+01</u> - <u>1.40E+01</u>	-	-	-	-	-	-	-	-
<u>47</u>	<u>1.40E+01</u> - <u>2.00E+01</u>	-	-	-	-	-	-	-	-
Total	- - -	<u>7.17E+10</u>	<u>1.86E+10</u>	<u>7.66E+08</u>	<u>6.30E+10</u>	<u>3.26E+10</u>	<u>1.95E+10</u>	<u>6.62E+10</u>	<u>6.73E+07</u>

Note: Assumes the plant consists of 12 NPMs operating on a two-year refueling cycle.

RAI 12.02-10

Table 12.2-14b: Liquid Radioactive Waste System Component Source Terms - Source Strengths

Energy Group	Energy Boundary (MeV)	LCW Mixed Bed (photon/s)	LCW Cesium Bed (photon/s)	LCW Sample Tank (photon/s)	HCW GAC Unit (photon/s)	HCW TUF Unit (photon/s)	HCW RO Unit (photon/s)	HCW Sample Tank (photon/s)	Drum Dryer (photon/s)
1	1.00E-02 - 2.00E-02	5.03E+06	4.49E+06	8.23E+05	8.71E+06	5.20E+07	3.12E+07	3.66E+06	5.75E+08
2	2.00E-02 - 3.00E-02	2.65E+06	2.33E+06	3.87E+04	1.34E+07	5.93E+07	3.56E+07	3.96E+06	3.56E+08
3	3.00E-02 - 4.50E-02	5.95E+07	5.36E+07	7.79E+04	3.65E+06	6.49E+07	3.90E+07	4.33E+06	6.37E+09
4	4.50E-02 - 6.00E-02	1.34E+06	1.19E+06	2.43E+04	2.65E+06	1.95E+07	1.17E+07	1.30E+06	1.54E+08
5	6.00E-02 - 7.00E-02	8.98E+05	8.06E+05	2.70E+04	1.24E+06	1.79E+07	1.08E+07	1.19E+06	2.36E+08
6	7.00E-02 - 7.50E-02	2.50E+05	2.23E+05	5.14E+03	5.28E+05	5.34E+06	3.21E+06	3.57E+05	2.85E+07
7	7.50E-02 - 1.00E-01	1.21E+06	1.08E+06	3.77E+04	2.05E+06	2.83E+07	1.70E+07	1.89E+06	3.33E+08
8	1.00E-01 - 1.50E-01	8.42E+05	7.03E+05	3.56E+04	2.84E+06	9.27E+07	5.56E+07	6.19E+06	1.29E+08
9	1.50E-01 - 2.00E-01	1.57E+06	1.39E+06	7.00E+04	1.34E+06	4.53E+07	2.72E+07	3.02E+06	7.02E+08
10	2.00E-01 - 2.60E-01	4.81E+05	4.08E+05	1.78E+04	1.98E+06	4.04E+07	2.42E+07	2.69E+06	7.30E+07
11	2.60E-01 - 3.00E-01	7.44E+05	6.59E+05	3.95E+04	6.36E+05	5.00E+07	3.00E+07	3.33E+06	4.35E+08
12	3.00E-01 - 4.00E-01	2.92E+06	2.49E+06	1.47E+05	1.90E+07	3.21E+08	1.93E+08	2.14E+07	2.23E+09
13	4.00E-01 - 4.50E-01	1.42E+04	1.12E+04	2.51E+04	3.04E+07	3.79E+07	2.28E+07	2.53E+06	2.61E+06
14	4.50E-01 - 5.10E-01	1.47E+07	1.32E+07	1.53E+05	4.47E+05	8.86E+07	5.32E+07	5.92E+06	1.86E+09
15	5.10E-01 - 5.12E-01	2.57E+06	2.35E+04	2.27E+02	1.05E+09	1.17E+07	7.03E+06	7.82E+05	4.91E+08
16	5.12E-01 - 6.00E-01	2.42E+08	2.18E+08	4.06E+05	3.70E+05	5.62E+08	3.37E+08	3.75E+07	3.01E+10
17	6.00E-01 - 7.00E-01	1.63E+09	1.46E+09	1.35E+06	9.16E+08	9.91E+08	5.95E+08	6.63E+07	1.83E+11
18	7.00E-01 - 8.00E-01	9.57E+08	8.59E+08	1.41E+06	3.44E+08	8.03E+08	4.82E+08	5.38E+07	1.19E+11
19	8.00E-01 - 9.00E-01	5.49E+07	4.23E+07	4.42E+05	5.13E+09	3.69E+08	2.22E+08	2.46E+07	9.91E+09
20	9.00E-01 - 1.00E+00	7.05E+03	2.00E+02	8.69E+04	2.67E+08	7.51E+07	4.52E+07	5.02E+06	3.85E+06
21	1.00E+00 - 1.20E+00	3.68E+07	2.98E+07	4.00E+05	1.04E+09	3.04E+08	1.82E+08	2.03E+07	6.48E+09
22	1.20E+00 - 1.33E+00	2.11E+06	1.08E+06	9.12E+04	5.12E+08	1.31E+08	7.84E+07	8.71E+06	7.61E+08
23	1.33E+00 - 1.44E+00	3.04E+07	2.68E+07	3.92E+05	6.65E+08	5.04E+08	3.03E+08	3.36E+07	3.73E+09
24	1.44E+00 - 1.50E+00	8.64E+02	8.07E+00	5.42E+03	3.30E+07	2.57E+07	1.55E+07	1.72E+06	3.78E+05
25	1.50E+00 - 1.57E+00	7.61E+03	6.38E+03	3.78E+03	1.15E+08	7.98E+06	4.79E+06	5.32E+05	4.03E+06
26	1.57E+00 - 1.66E+00	3.15E+03	3.25E+01	1.65E+03	1.92E+05	4.41E+06	2.65E+06	2.94E+05	1.98E+06
27	1.66E+00 - 1.80E+00	4.14E+04	3.76E+02	6.98E+03	1.79E+07	5.24E+07	3.15E+07	3.50E+06	8.15E+06
28	1.80E+00 - 2.00E+00	5.37E+02	6.75E+00	2.51E+05	1.35E+05	1.27E+08	7.62E+07	8.46E+06	3.44E+05
29	2.00E+00 - 2.15E+00	2.25E+02	2.05E+00	1.06E+04	8.33E+03	8.54E+06	5.14E+06	5.71E+05	1.44E+05
30	2.15E+00 - 2.35E+00	1.87E+02	1.72E+00	7.11E+04	1.12E+04	3.61E+07	2.17E+07	2.41E+06	8.61E+04

Table 12.2-14b: Liquid Radioactive Waste System Component Source Terms - Source Strengths (Continued)

Energy Group	Energy Boundary (MeV)	LCW Mixed Bed (photon/s)	LCW Cesium Bed (photon/s)	LCW Sample Tank (photon/s)	HCW GAC Unit (photon/s)	HCW TUF Unit (photon/s)	HCW RO Unit (photon/s)	HCW Sample Tank (photon/s)	Drum Dryer (photon/s)
31	2.35E+00 - 2.50E+00	7.46E+01	6.95E-01	1.83E+03	1.70E+02	3.75E+06	2.26E+06	2.51E+05	4.55E+04
32	2.50E+00 - 2.75E+00	2.98E+02	2.85E+00	7.00E+04	9.35E+00	1.95E+08	1.17E+08	1.30E+07	1.88E+05
33	2.75E+00 - 3.00E+00	1.58E+02	1.44E+00	3.65E+03	5.31E+00	1.49E+08	8.95E+07	9.93E+06	1.00E+05
34	3.00E+00 - 3.50E+00	1.08E+00	1.09E-02	8.95E+03	7.75E-15	4.58E+06	2.75E+06	3.06E+05	6.05E+02
35	3.50E+00 - 4.00E+00	2.48E-01	2.25E-03	2.24E+03	-	1.51E+06	9.06E+05	1.01E+05	1.58E+02
36	4.00E+00 - 4.50E+00	2.72E-03	2.47E-05	1.31E+03	-	6.47E+05	3.88E+05	4.31E+04	1.73E+00
37	4.50E+00 - 5.00E+00	1.35E-12	-	2.28E+03	-	1.10E+06	6.60E+05	7.33E+04	1.46E-10
38	5.00E+00 - 5.50E+00	6.74E-13	-	9.66E+01	-	6.39E+04	3.83E+04	4.26E+03	7.31E-11
39	5.50E+00 - 6.00E+00	-	-	1.51E+00	-	7.17E+03	4.30E+03	4.78E+02	3.67E-11
40	6.00E+00 - 6.50E+00	-	-	1.14E-02	-	3.33E+03	2.00E+03	2.22E+02	1.85E-11
41	6.50E+00 - 7.00E+00	-	-	6.42E-04	-	2.56E+02	1.53E+02	1.71E+01	9.28E-12
42	7.00E+00 - 7.50E+00	-	-	1.34E-04	-	5.32E+01	3.19E+01	3.55E+00	4.67E-12
43	7.50E+00 - 8.00E+00	-	-	1.83E-09	-	7.29E-04	4.37E-04	4.86E-05	2.35E-12
44	8.00E+00 - 1.00E+01	-	-	1.58E-09	-	6.28E-04	3.77E-04	4.19E-05	2.14E-12
45	1.00E+01 - 1.20E+01	-	-	-	-	-	-	-	-
46	1.20E+01 - 1.40E+01	-	-	-	-	-	-	-	-
47	1.40E+01 - 2.00E+01	-	-	-	-	-	-	-	-
Total		3.04E+09	2.72E+09	6.54E+06	1.02E+10	5.29E+09	3.18E+09	3.54E+08	3.67E+11

Note: Assumes the plant consists of 12 NPMs operating on a two-year refueling cycle.

1	1.00E-02 - 2.00E-02	6.00E+06	5.15E+06	2.21E+06	8.61E+06	1.85E+07	1.11E+07	1.41E+06	3.30E+09
2	2.00E-02 - 3.00E-02	3.38E+06	2.67E+06	5.46E+04	1.25E+07	4.28E+07	2.57E+07	2.05E+06	1.93E+09
3	3.00E-02 - 4.50E-02	6.45E+07	5.80E+07	1.99E+05	3.65E+06	9.85E+07	5.91E+07	6.18E+06	3.60E+10
4	4.50E-02 - 6.00E-02	1.62E+06	1.37E+06	1.62E+04	2.64E+06	7.18E+06	4.30E+06	3.23E+05	8.90E+08
5	6.00E-02 - 7.00E-02	1.51E+06	1.32E+06	2.97E+04	1.24E+06	1.45E+07	8.69E+06	8.37E+05	8.32E+08
6	7.00E-02 - 7.50E-02	3.06E+05	2.57E+05	2.07E+03	5.27E+05	9.14E+05	5.49E+05	3.15E+04	1.66E+08
7	7.50E-02 - 1.00E-01	1.91E+06	1.65E+06	3.00E+04	2.05E+06	2.62E+07	1.57E+07	1.51E+06	1.12E+09
8	1.00E-01 - 1.50E-01	1.34E+06	8.27E+05	3.68E+03	2.76E+06	6.91E+07	4.15E+07	2.65E+06	7.45E+08
9	1.50E-01 - 2.00E-01	3.04E+06	2.66E+06	7.84E+04	1.36E+06	4.74E+07	2.84E+07	2.74E+06	1.69E+09
10	2.00E-01 - 2.60E-01	7.20E+05	4.96E+05	1.80E+03	1.75E+06	2.69E+07	1.61E+07	1.10E+06	4.01E+08
11	2.60E-01 - 3.00E-01	1.86E+06	1.62E+06	5.33E+04	6.05E+05	5.87E+07	3.52E+07	3.33E+06	1.20E+09
12	3.00E-01 - 4.00E-01	7.73E+06	6.17E+06	2.06E+05	1.87E+07	4.96E+08	2.97E+08	2.84E+07	6.43E+09
13	4.00E-01 - 4.50E-01	3.59E+05	1.83E+04	4.22E+01	2.70E+07	4.40E+06	2.64E+06	4.41E+04	1.18E+08

Table 12.2-14b: Liquid Radioactive Waste System Component Source Terms - Source Strengths (Continued)

Energy Group	Energy Boundary (MeV)	LCW Mixed Bed (photon/s)	LCW Cesium Bed (photon/s)	LCW Sample Tank (photon/s)	HCW GAC Unit (photon/s)	HCW TUF Unit (photon/s)	HCW RO Unit (photon/s)	HCW Sample Tank (photon/s)	Drum Dryer (photon/s)
14	4.50E-01 - 5.10E-01	1.81E+07	1.63E+07	5.00E+04	4.42E+05	2.99E+07	1.79E+07	1.80E+06	1.01E+10
15	5.10E-01 - 5.12E-01	3.69E+07	3.35E+05	2.15E+02	1.08E+09	5.24E+07	3.14E+07	2.69E+05	1.00E+10
16	5.12E-01 - 6.00E-01	2.95E+08	2.66E+08	7.36E+05	3.58E+05	4.80E+08	2.88E+08	2.42E+07	1.65E+11
17	6.00E-01 - 7.00E-01	1.87E+09	1.68E+09	4.38E+06	8.12E+08	2.18E+09	1.31E+09	1.43E+08	1.04E+12
18	7.00E-01 - 8.00E-01	1.17E+09	1.05E+09	2.90E+06	3.05E+08	1.44E+09	8.65E+08	9.42E+07	6.51E+11
19	8.00E-01 - 9.00E-01	2.00E+08	5.85E+07	5.43E+05	5.08E+09	4.71E+08	2.83E+08	1.82E+07	7.30E+10
20	9.00E-01 - 1.00E+00	2.97E+06	3.19E+04	1.79E+01	2.37E+08	1.11E+07	6.64E+06	2.49E+05	8.84E+08
21	1.00E+00 - 1.20E+00	5.27E+07	4.06E+07	4.08E+05	9.67E+08	2.31E+08	1.39E+08	1.33E+07	2.74E+10
22	1.20E+00 - 1.33E+00	6.15E+06	2.82E+06	9.59E+04	4.78E+08	6.86E+07	4.11E+07	3.20E+06	2.65E+09
23	1.33E+00 - 1.44E+00	4.12E+07	3.28E+07	9.06E+04	6.11E+08	7.38E+07	4.43E+07	3.04E+06	2.17E+10
24	1.44E+00 - 1.50E+00	3.66E+05	3.84E+03	1.39E+00	2.93E+07	3.57E+06	2.14E+06	2.14E+04	1.13E+08
25	1.50E+00 - 1.57E+00	1.28E+06	2.81E+04	5.62E+02	1.02E+08	2.30E+06	1.38E+06	1.90E+04	3.81E+08
26	1.57E+00 - 1.66E+00	9.72E+03	1.78E+02	2.39E+00	1.70E+05	5.80E+05	3.49E+05	3.54E+04	5.41E+06
27	1.66E+00 - 1.80E+00	6.22E+05	6.05E+03	4.04E+00	1.83E+07	7.08E+06	4.25E+06	1.20E+04	1.81E+08
28	1.80E+00 - 2.00E+00	2.00E+04	1.39E+04	1.75E+00	1.19E+05	1.76E+06	1.06E+06	2.39E+04	1.17E+07
29	2.00E+00 - 2.15E+00	2.09E+03	5.99E+02	6.73E-01	7.50E+03	5.82E+05	3.49E+05	1.00E+04	1.79E+06
30	2.15E+00 - 2.35E+00	8.44E+03	6.87E+03	3.20E-01	1.04E+04	6.96E+05	4.18E+05	4.76E+03	5.12E+06
31	2.35E+00 - 2.50E+00	5.06E+02	1.04E+02	1.77E-01	1.51E+02	3.67E+05	2.20E+05	2.63E+03	8.70E+05
32	2.50E+00 - 2.75E+00	5.41E+04	5.77E+03	1.15E+00	8.81E+00	1.16E+07	6.96E+06	1.73E+04	3.32E+07
33	2.75E+00 - 3.00E+00	4.39E+04	5.52E+02	9.43E-01	4.73E+00	1.03E+07	6.18E+06	1.41E+04	2.72E+07
34	3.00E+00 - 3.50E+00	5.79E+02	5.17E+02	6.74E-04	-	3.10E+04	1.86E+04	9.98E+00	3.27E+05
35	3.50E+00 - 4.00E+00	1.65E+02	8.62E+01	1.50E-03	-	2.33E+04	1.40E+04	2.25E+01	1.01E+05
36	4.00E+00 - 4.50E+00	2.20E+01	1.91E+01	1.65E-05	-	1.31E+03	7.86E+02	2.47E-01	1.25E+04
37	4.50E+00 - 5.00E+00	1.31E+02	1.18E+02	-	-	6.49E+03	3.89E+03	-	7.31E+04
38	5.00E+00 - 5.50E+00	2.48E-01	2.23E-01	-	-	1.23E+01	7.35E+00	-	1.38E+02
39	5.50E+00 - 6.00E+00	-	-	-	-	-	-	-	-
40	6.00E+00 - 6.50E+00	-	-	-	-	-	-	-	-
41	6.50E+00 - 7.00E+00	-	-	-	-	-	-	-	-
42	7.00E+00 - 7.50E+00	-	-	-	-	-	-	-	-
43	7.50E+00 - 8.00E+00	-	-	-	-	-	-	-	-
44	8.00E+00 - 1.00E+01	-	-	-	-	-	-	-	-
45	1.00E+01 - 1.20E+01	-	-	-	-	-	-	-	-

Table 12.2-14b: Liquid Radioactive Waste System Component Source Terms - Source Strengths (Continued)

Energy Group	Energy Boundary (MeV)	LCW Mixed Bed (photon/s)	LCW Cesium Bed (photon/s)	LCW Sample Tank (photon/s)	HCW GAC Unit (photon/s)	HCW TUF Unit (photon/s)	HCW RO Unit (photon/s)	HCW Sample Tank (photon/s)	Drum Dryer (photon/s)
<u>46</u>	<u>1.20E+01</u> - <u>1.40E+01</u>	-	-	-	-	-	-	-	-
<u>47</u>	<u>1.40E+01</u> - <u>2.00E+01</u>	-	-	-	-	-	-	-	-
Total	- - -	<u>3.79E+09</u>	<u>3.22E+09</u>	<u>1.21E+07</u>	<u>9.81E+09</u>	<u>5.99E+09</u>	<u>3.59E+09</u>	<u>3.52E+08</u>	<u>2.06E+12</u>

Note: Assumes the plant consists of 12 NPMs operating on a two-year refueling cycle.