Exelon Generation®

Dresden Nuclear Power Station
6500 North Dresden Road
Morris, IL 60450

10 CFR 50.36a (a)(2)

April 21, 2020

SVPLTR: #20-0014

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Dresden Nuclear Power Station, Units 1, 2 and 3
Facility Operating License No. DPR-2
Renewed Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-010, 50-237, and 50-249

Subject: Dresden Nuclear Power Station 2019 Radioactive Effluent Release Report and Offsite Dose Calculation Manual

The Radioactive Effluent Release Report for January through December 2019 for Dresden Nuclear Power Station (DNPS) is submitted in accordance with Sections 6.9.A.4 and 5.6.3, "Radioactive Effluent Release Report," of the DNPS Unit 1 and Units 2 and 3 Technical Specifications, respectively and 10 CFR 50.36a, "Technical specifications on effluents from nuclear power reactors."

Should you have any questions concerning this letter, please contact Ryan Sprengel, Regulatory Assurance Manager, at (815) 416-2800.

Respectfully,

Peter J. Karaba
Site Vice President
Dresden Nuclear Power Station

Attachments: 1) DNPS 2019 Annual Radioactive Effluent Release Report
2) Dresden Station Offsite Dose Calculation Manual, Revision 16

IE48
A009
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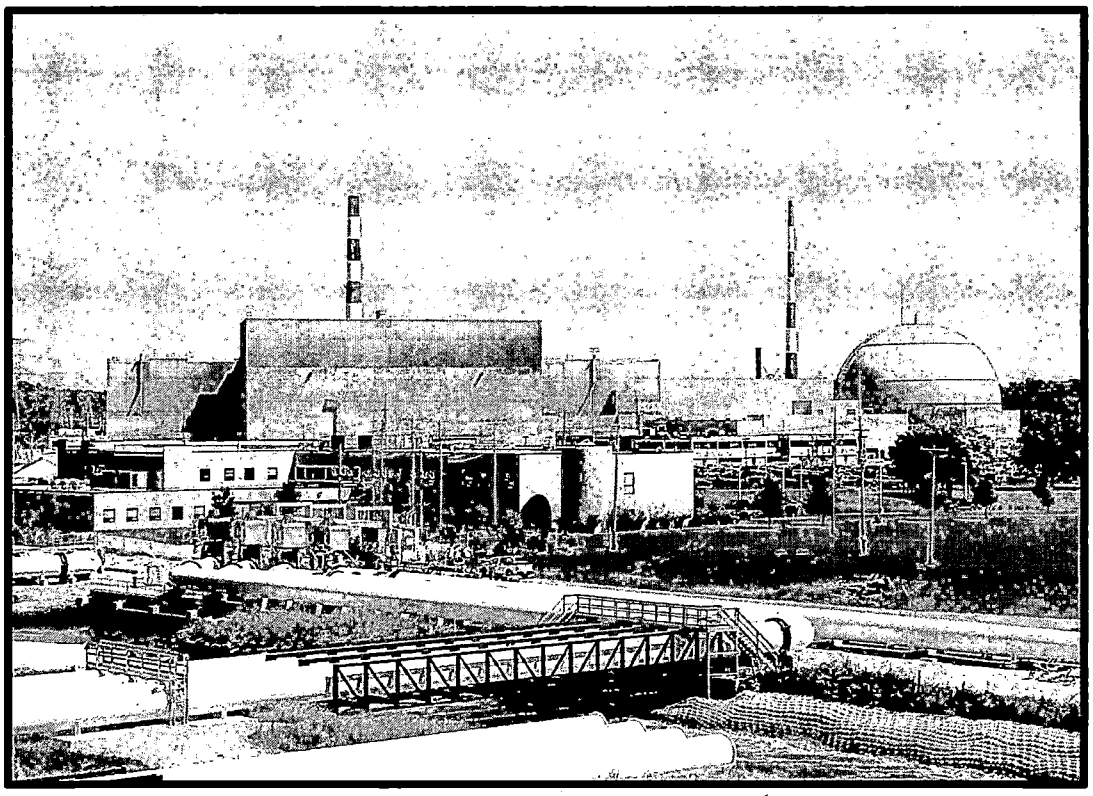
NMSS

Dresden Nuclear Power Station

2019 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

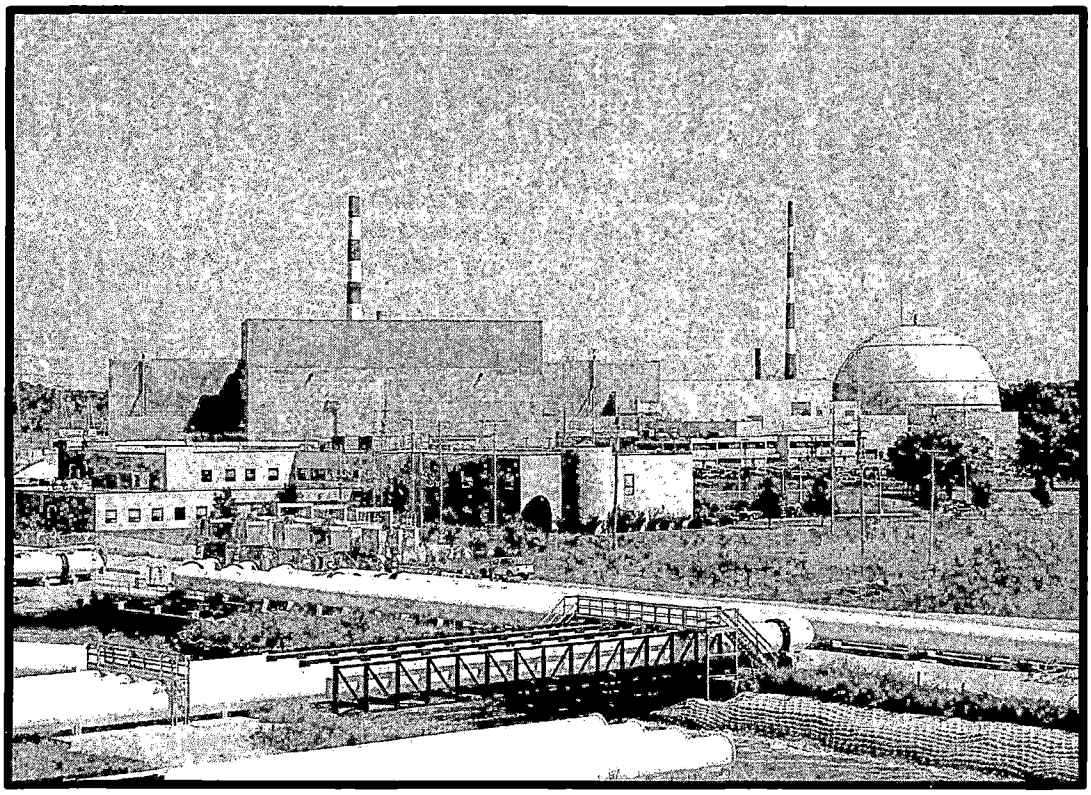


DATA

Dresden Nuclear Power Station

2019 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

(ARERR)



Docket Numbers: 50-010/50-237/50-249
Units 1, 2, 3

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

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Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

EXECUTIVE SUMMARY

The Radiological Effluent Controls (REC) Program monitors and records all radioactive effluents released from the plant for the purpose of calculating a dose to a member of the public. The results are recorded in this report for the Dresden Nuclear Power Station from January 1 through December 31, 2019. The Radiological Environmental Monitoring Program (REMP) is a separate program that serves as a backup or independent verification of the REC Program. The REMP samples are analyzed for radioactivity associated with the operation of Dresden Nuclear Power Station by an outside vendor and the results are compared against historical REMP data as well as the calculations from the REC Program. The REMP results and comparisons are contained within the Annual Radiological Environmental Operating Report (AREOR) for the Site.

There were no regulatory effluent limit exceedances in 2019 and the resultant calculated dose to a member of the public for 2019 due to the uranium fuel cycle was 7.22E+00 mRem/yr, which is 28.8% of the regulatory limit of 25 mRem/year. The annual organ dose from all effluent sources is 3.22E-02 mRem/yr which is 4.29E-03% of the 75 mRem/yr (Thyroid) limit. Additionally, the Annual Radiological Environmental Operating Report (AREOR) supported the effluent dose calculation and indicates that Units 1, 2, and 3 of the Dresden Nuclear Power Station did not result in any adverse environmental impact.

The total dose to the nearest member of the public is a calculation of the sum of the gaseous and liquid effluents, the direct radiological dose from all sources including; IFSFI pad, storage tanks, skyshine, and Carbon-14 based upon effective full power-hours. There are many variables to consider, and in all cases, the most conservative factors were used to ensure there is sufficient margin to ensure regulatory compliance.

Table 1: Summation of Total Dose:

Liquid Effluents (All Units):		
Total Body	2.78E-07	mRem
Noble Gas (All Units):		
Total Body	9.37E-03	mRem
Radioiodines, tritium and Particulate (All units):		
Total Body	2.15E-02	mRem
Direct Radiation		
GE Facility	3.60E-01	mRem
Skyshine	4.29E+00	mRem
ISFSI/ CST	2.54E+00	mRem
C-14	2.48E-03	mRem
Total		
	7.22E+00	**mrem**

BACKGROUND

Dresden Generating Station, located in rural Grundy County in Northern Illinois, is home to the nation's first full-scale, privately financed nuclear power plant, which began operation in 1960. Capable of generating 210 megawatts of electricity before its retirement in 1978, Dresden Unit 1 is designated a Nuclear Historic Landmark by the American Nuclear Society. Dresden Units 2 and 3 began commercial operation in June 1970 and November 1971, respectively. In October of 2004, the Nuclear Regulatory Commission (NRC) renewed the operating licenses for both units for an additional 20 years, extending them to 2029 and 2031. Both units contain boiling water reactors designed by General Electric. The units generate a combined 1,845 net megawatts of electricity (MWe), which is enough power to support the electricity needs of more than 1 million average American homes.

Part of the regulatory requirements of nuclear operation is to maintain a Radiological Effluent Control (REC) Program to track and record all radioactive effluent releases to the environment and calculate a dose to the public from all uranium fuel sources to include direct doses from storage tanks and off-site facilities. This requires a knowledge not only of plant operation but of plant design and potential sources of radioactive effluent releases. There are two forms of releases; gaseous and liquid and these can be released continuously or by a batch process. Particulate and iodine monitors are installed in plant ventilation effluents and are monitored continuously and analyzed weekly. The normal gaseous effluent release points are the 2/3 Chimney (a 300' elevated stack) and the 2/3 Reactor Building Ventilation Stack (150' mixed mode stack). These are an example of a continuous gaseous release point. A discrete volume that is released over a specific time period with a defined start and stop time is an example of a batch release. Effluent releases that are not typical or expected are categorized as "abnormal". These are documented in a Dresden Abnormal Release (DAR) report.

REGULTORY LIMITS

The NRC sets a Total Effective Dose Equivalent (TEDE) in 10CFR Part 20 Subpart D—Radiation Dose Limits for the Individual Members of the Public of 100 mRem/year. In 1977 the Environmental Protection Agency enacted 40 CFR Part 190 "Environmental Radiation Protection Standards for Nuclear Power Operations" which sets the annual dose equivalent to any member of the public at 25 millirem (0.25 millisievert (mSv)) to the whole body, 75 millirem (0.75 mSv) to the thyroid and 25 millirem (0.25 mSv) to any other organ.

These limits are incorporated into the site's Offsite Dose Calculation Manual (ODCM) which sets limits of:

Fission and activation gases:

A. Dose Rate (site)
   (1) Less than 500 mRem/year to the whole body.
   (2) Less than 3000 mRem/year to the skin

B. Gamma Air Dose (each unit)
(1) Less than or equal to 5 mrad/quarter.
(2) Less than or equal to 10 mrad/year.

C. Beta Air Dose (each unit)
(1) Less than or equal to 10 mrad/quarter.
(2) Less than or equal to 20 mrad/year.

Iodine-131, Iodine-133, and all radionuclides in particulate form with half-lives greater than 8 days:

A. Dose Rate (site)
(1) Less than 1500 mRem/year to any organ.

B. Dose (each unit)
(1) Less than or equal to 7.5 mRem/quarter to any organ.
(2) Less than or equal to 15 mRem/year to any organ.

Liquid effluents (each unit):

(1) Less than or equal to 1.5 mRem to the whole body during any calendar quarter.
(2) Less than or equal to 5 mRem to any organ during any calendar quarter.
(3) Less than or equal to 3 mRem to the whole body during any calendar year.
(4) Less than or equal to 10 mRem to any organ during any calendar year.

40CFR190 and 10CFR72 (all uranium fuel cycle operations in the region):

(1) Less than or equal to 25 mRem annual whole body dose.
(2) Less than or equal to 75 mRem annual thyroid dose.
(3) Less than or equal to 25 mRem annual dose to any other critical organ.

EFFLUENT CONCENTRATION LIMITS

Dose rates, rather than effluent concentrations, are used to calculate permissible release rates for gaseous effluents. The maximum permissible dose rates for gaseous releases are defined in Dresden Offsite Dose Calculation Manual (ODCM) Radiological Effluent Control (REC) Section 12.4.1.

Liquid effluent concentrations are limited per ODCM REC Section12.3.1 to 10 times the concentration specified in 10CFR20 Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases and 2.00E-04 µCi/mL total activity for all dissolved or entrained noble gases.

The ODCM limits dose rates at or beyond the site boundary due to the release of noble gases to less than or equal to 500 mRem per year to the total body and less than or equal to 3,000 mRem per year to the skin, and average energy is not used to determine dose to the public. Compliance with these limits is

demonstrated based on dose calculations using measured isotopic concentrations of effluent streams and not based on gross count rate measuring systems. Therefore, the average beta and gamma energies ($\bar{E}$) for gaseous effluents as described in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," are not applicable.

EFFLUENT MONITORING

The 2/3 Chimney (elevated), 2/3 Reactor Building Vent (mixed mode), and the Unit 1 Chemical Cleaning Building (mixed mode) effluents are continuously sampled for iodine and particulates. These samples are changed weekly and analyzed by gamma spectroscopy. The particulate filters are composited and sent to a vendor for gross alpha, Sr-89, Sr-90, and Fe-55 analysis quarterly. Noble gas grab samples of the 2/3 Chimney and 2/3 Reactor Building Vent are obtained weekly and analyzed by gamma spectroscopy. Contributing streams of the 2/3 Chimney and 2/3 Reactor Building Vent are also sampled and analyzed by gamma spectroscopy. Tritium samples of the 2/3 Chimney and 2/3 Reactor Building Vent are obtained monthly and analyzed by liquid scintillation.

For the 2/3 Chimney and 2/3 Reactor Building Vent effluents, the resultant activity concentration and measured flowrate at the release points is used to calculate the curies released. For the Chemical Cleaning Building effluent, the design basis flows are used to calculate curies released.

Carbon-14

Carbon-14 activity released is determined using Electric Power Research Institute Report 1021106 Boiling Water Reactor proxy value of 5.1 Ci per GWth year, gaseous release fraction of 0.99%, a carbon dioxide fraction of 0.95, a reactor power rating of 2957 MWt for Units 2 and 3. The resultant dose is calculated using the approved dose calculation software OpenEMS. The activity for C-14 was entered into the approved dose calculation software, OpenEMS monthly and is included into the total gaseous dose and activity for Units 2 and 3. An estimated 5.33E+00 Ci of C-14 was produced in 2019 for a calculated dose of: 2.48E-03 mRem/yr.

Liquid Effluents

The river discharge tank is analyzed for gamma-emitting nuclides by gamma spectroscopy and for tritium by liquid scintillation prior to discharge. A representative portion of this sample is saved and composited with other discharges that occur during the calendar month. The composite is sent to a vendor for analyses of gross alpha, Sr-89, Sr-90, and Fe-55. The tank volumes and activities are used to calculate the diluted activity released at the discharge point from batch discharges. There were no discharges from the river discharge tank in 2019. Batch release data can be found in Table 4 of this report.

Estimated Total Errors

The estimated total errors were calculated as the square root of the sum of the squares of significant errors present in the sampling and analysis process.

Less than the Lower Limit of Detection (<LLD)

Samples are analyzed such that the ODCM LLD requirements are met. When a nuclide is not detected, then "<LLD" is reported.

Abnormal Releases

Containment Cooling Service Water (CCSW) is sampled from the Low-Pressure Coolant Injection (LPCI) heat exchangers monthly and analyzed for gamma-emitting nuclides by gamma spectroscopy. These samples are composited quarterly and analyzed for tritium, gross alpha, Sr-89, Sr-90, Fe-55, and Ni-63. Results from the quarter are conservatively applied for each month of the quarter. Batch release volume is based on LPCI heat exchanger volume. There were no releases from this system in 2019.

On-site storm sewers are sampled and analyzed for tritium content. The CBG well tritium concentration measured during each month of 2019 was used to calculate the released activity for each month via the storm sewers. The total activity released to the environment is based on an average of 10 gallons per minute due to annual rain fall. Low level tritium was detected throughout the 2019 year, and the total estimated tritium activity released via the storm sewers in 2019 was 3.767E-02 Ci.

Water in the Sewage Treatment Plant (STP) effluent is routinely sampled and analyzed for tritium, gross alpha, Sr-89, Sr-90, Fe-55, and Ni-63. Tritium was sampled monthly and was below the lower limit of detection of 1.69E-06 µCi/mL every month in the 2019 year.

The Unit 1 Main Turbine Floor is used as an area to work on contaminated equipment. The Unit 1 Fuel Building is used as a storage area and potentially as a work area. The ventilation systems to these areas are no longer operational and the areas are at ambient pressure with the outside environment. The potential exists for airborne activity to be released to the environment through various points. Based on the work normally performed in these areas, an estimated 7.20E-05 Ci of Cs-137 was released via this path during 2019.

The Chemistry Laboratory exhausts directly into the environment via its ventilation system and is not monitored. Based on an evaluation of activities performed in the area, the estimated activity released to the environment from the laboratory in 2019 is 1.31E-04 Ci.

The Unit 2/3 Heating Steam System has been contaminated in the past and continues to contain low-level contamination. During normal operation, the condensate is converted to steam, a portion of which gets vented to the atmosphere. Tritium was the only nuclide detected in 2019. An estimated 1.45E-03 Ci of activity was released to the environment during 2019.

The East Turbine Building Ventilation System exhausts directly into the environment. This release path is not monitored. Low-level removable contamination has been detected in the system in the past. An estimated 2.27E-04 Ci of Co-60 was released to the environment during 2019.

Beginning in September 2019, groundwater from the west tritium remediation well was monitored via the

2/3 discharge tunnel. Although this is a planned continuous liquid release it is being mentioned here due to its relatively short duration over the life of the plant. An estimated 6.01E+06 Ci of tritium was released via this source in 2019. More information is found in the Radioactive Groundwater Protection Plan section of this report.

The estimated calculated dose from all of these releases was well below the regulatory limit of 25 mRem/yr for the whole body/ 75 mRem/yr Thyroid as well as all quarterly dose limits.

Changes to the ODCM

The Off-site Dose Calculation Manual (ODCM) Revision 15 was approved in July 2019. Changes are as follows:

Table 12.6-1

(9) If milking animals are not found in the designated indicator locations, or if the owners decline to participate in the REMP, all milk sampling may be discontinued. If no indicator milk sample is available, then vegetation samples, as described in 4.d Vegetation; must be obtained per the approved REMP collection schedule.

(10) Collect broadleaf vegetation during growing season, when available.

These changes were added to ensure broad leaf vegetation was performed in the absence of a milking animal within 5 Km.

Table 6-1 Radiological Environmental Monitoring Program Locations

b. Ground Well

Sampling distances were updated

The Off-site Dose Calculation Manual (ODCM) Revision 16 was approved in December 2019. Changes are as follows:

REC 12.4.6 a. iii, added new verbage "iii. Verify projected dose due to VENTING and PURGING is within the limits of REC 12.4.1, REC 12.4.2, and REC 12.4.3 prior to venting."

REC B 12.4.6 added "Appendix I, 10 CFR 50" to the end of the first sentence

12.9.4.2. added "In lieu of submission with the Annual Radioactive Effluent Release Report, the licensee has the option of retaining this summary of required meteorological data on site in a file that shall be provided to the NRC upon request."

Errata

None

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

RELEASE SUMMARY

Table 2.1(1): Gaseous Effluents- Summation of All Effluent Releases — Unit 1

		Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
A. Fission & Activation Gases							
1	Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.31E+01
2	Average release rate for period	µCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
3	Percent of ODCM Quarterly dose limit (site)	% Gamma[1]	N/A	N/A	N/A	N/A	
		% Beta[2]	N/A	N/A	N/A	N/A	
B. Iodine-131							
1	Total release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.60E+01
2	Average release rate for period	µCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
3	Percent of ODCM Quarterly dose limit (*)	%	N/A	N/A	N/A	N/A	
C. Particulates							
1	Particulates with half-life >8 days	Ci	2.02E-05	1.88E-05	2.07E-05	1.80E-05	2.94E+01
2	Average release rate for period	µCi/sec	2.57E-06	2.38E-06	2.63E-06	2.28E-06	
3	Percent of ODCM Quarterly dose limit (*)	%	9.00E-03	9.00E-03	9.00E-03	9.00E-03	
D. Tritium							
1	Total release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.56E+00
2	Average release rate for period	µCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
3	Percent of ODCM Quarterly dose limit (*)	%	N/A	N/A	N/A	N/A	
E. Gross Alpha							
1	Total release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.94E+01
2	Average release rate for period	µCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
F. Carbon14							
1	Total release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
2	Average release rate for period	µCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

1. Based upon a quarterly dose limit of 5.00 mRad/yr for the Site
2. Based upon a quarterly dose limit of 10.00 mRad/yr for the Site

* "Percent of ODCM annual dose limit" indicates combined total of Iodine-131, Particulates, and Tritium

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 2.1(2): Gaseous Effluents- Summation of All Effluent Releases — Unit 2

		Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
A. Fission & Activation Gases							
1	Total Release	Ci	3.15E+02	2.13E+01	4.15E+01	1.65E+01	1.31E+01
2	Average release rate for period	µCi/sec	4.00E+01	2.70E+00	5.26E+00	2.09E+00	
3	Percent of ODCM Quarterly dose limit (site)	% Gamma[1]	1.99E-01	1.31E-02	2.70E-02	1.41E-02	
		% Beta[2]	4.85E-03	3.15E-04	6.03E-04	3.76E-04	
B. Iodine-131							
1	Total release	Ci	3.36E-04	9.44E-04	1.50E-03	1.08E-03	2.60E+01
2	Average release rate for period	µCi/sec	4.26E-05	1.20E-04	1.91E-04	1.37E-04	
3	Percent of ODCM Quarterly dose limit (*)	%	2.19E-01	2.89E-01	3.92E-01	2.88E-01	
C. Particulates							
1	Particulates with half-life >8 days	Ci	6.65E-04	3.78E-04	4.57E-04	5.28E-04	2.94E+01
2	Average release rate for period	µCi/sec	8.43E-05	4.80E-05	5.79E-05	6.70E-05	
3	Percent of ODCM Quarterly dose limit (*)	%	2.19E-01	2.89E-01	3.92E-01	2.88E-01	
D. Tritium							
1	Total release	Ci	3.60E+00	1.49E+01	1.38E+01	6.54E+00	7.56E+00
2	Average release rate for period	µCi/sec	4.56E-01	1.89E+00	1.75E+00	8.29E-01	
3	Percent of ODCM Quarterly dose limit (*)	%	2.19E-01	2.89E-01	3.92E-01	2.88E-01	
E. Gross Alpha							
1	Total release	Ci	N/A	N/A	N/A	N/A	2.94E+01
2	Average release rate for period	µCi/sec	N/A	N/A	N/A	N/A	
F. Carbon14							
1	Total release	Ci	3.69E+00	3.73E+00	4.38E+00	2.79E+00	
2	Average release rate for period	µCi/sec	4.68E-01	4.73E-01	5.56E-01	3.54E-01	

1. Based upon a quarterly dose limit of 5.00 mRad/yr for the Site
2. Based upon a quarterly dose limit of 10.00 mRad/yr for the Site

* "Percent of ODCM annual dose limit" indicates combined total of Iodine-131, Particulates, and Tritium

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 2.1(3): Gaseous Effluents- Summation of All Effluent Releases **Unit 3**

		Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
A. Fission & Activation Gases							
1	Total Release	Ci	3.01E+01	3.77E+00	3.00E+00	3.13E+00	1.31E+01
2	Average release rate for period	µCi/sec	3.82E+00	4.78E-01	3.81E-01	3.97E-01	
3	Percent of ODCM Quarterly dose limit (site)	% Gamma[1]	2.02E-02	2.88E-03	3.02E-03	3.24E-03	
		% Beta[2]	5.41E-04	6.28E-05	6.04E-05	7.17E-05	
B. Iodine-131							
1	Total release	Ci	1.11E-04	2.59E-04	2.77E-04	2.21E-04	2.60E+01
2	Average release rate for period	µCi/sec	1.40E-05	3.29E-05	3.51E-05	2.81E-05	
3	Percent of ODCM Quarterly dose limit (*)	%	1.63E-01	1.48E-01	1.74E-01	1.01E-01	
C. Particulates							
1	Particulates with half-life >8 days	Ci	1.66E-04	1.04E-04	8.56E-05	1.11E-04	2.94E+01
2	Average release rate for period	µCi/sec	2.10E-05	1.31E-05	1.09E-05	1.41E-05	
3	Percent of ODCM Quarterly dose limit (*)	%	1.63E-01	1.48E-01	1.74E-01	1.01E-01	
D. Tritium							
1	Total release	Ci	1.23E+00	4.96E+00	3.02E+00	1.35E+00	7.56E+00
2	Average release rate for period	µCi/sec	1.56E-01	6.29E-01	3.83E-01	1.72E-01	
3	Percent of ODCM Quarterly dose limit (*)	%	1.63E-01	1.48E-01	1.74E-01	1.01E-01	
E. Gross Alpha							
1	Total release	Ci	N/A	N/A	N/A	N/A	2.94E+01
2	Average release rate for period	µCi/sec	N/A	N/A	N/A	N/A	
F. Carbon14							
1	Total release	Ci	3.69E+00	3.73E+00	4.38E+00	2.54E+00	
2	Average release rate for period	µCi/sec	4.68E-01	4.73E-01	5.56E-01	3.22E-01	

1. Based upon a quarterly dose limit of 5.00 mRad/yr for the Site
2. Based upon a quarterly dose limit of 10.00 mRad/yr for the Site

* "Percent of ODCM annual dose limit" indicates combined total of Iodine-131, Particulates, and Tritium

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Lower Limits of Detectability for Gaseous Effluents

Fisstion / Activation Gases	**µCi/cc**
Kr-87	1.00E-04
Kr-88	1.00E-04
Xe-133	1.00E-04
Xe-133m	1.00E-04
Xe-135	1.00E-04
Xe-138	1.00E-04
Iodines	
I-131	1.00E-12
I-133	1.00E-10
Particulates	
Sr-89	1.00E-11
Sr-90	1.00E-11
Mn-54	1.00E-11
Co-58	1.00E-11
Fe-59	1.00E-11
Co-60	1.00E-11
Zn-65	1.00E-11
Mo-99	1.00E-11
Cs-134	1.00E-11
Cs-137	1.00E-11
Ce-141	1.00E-11
Ce-144	1.00E-11
Other	
H-3	1.00E-06
Gross Alpha	1.00E-11

The above limits are the ODCM required Lower Limits of Detection (LLD).

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 2.2.A(1) Gaseous Effluents Release Point **Unit 1 Ground Level**

Nuclides Released		Continuous Mode				Batch Mode			
	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. Fission gases									
Kr-85	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-87	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-88	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-138	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ar-41	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
2. Iodines									
I-131	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
3. Particulates									
Sr-89	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	1.80E-05	1.80E-05	1.80E-05	1.80E-05	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
cr-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-144	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	1.80E-05	1.80E-05	1.80E-05	1.80E-05	<LLD	<LLD	<LLD	<LLD
4. Tritium									
H-3 Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
5. Gross Alpha									
Gross Alpha Total	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
6. Carbon 14									
C-14 Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 2.2.A (2) Gaseous Effluents Release Point **Unit 2 Ground Level**

Nuclides Released		Continuous Mode				Batch Mode			
	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. Fission gases									
Kr-85	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85m	Ci	<LLD	<LLD	<LLD	3.11E-06	<LLD	<LLD	<LLD	<LLD
Kr-87	Ci	<LLD	<LLD	<LLD	1.30E-05	<LLD	<LLD	<LLD	<LLD
Kr-88	Ci	<LLD	<LLD	<LLD	1.07E-05	<LLD	<LLD	<LLD	<LLD
Xe-131m	Ci	<LLD	<LLD	<LLD	1.85E-08	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	<LLD	<LLD	<LLD	3.87E-06	<LLD	<LLD	<LLD	<LLD
Xe-133m	Ci	<LLD	<LLD	<LLD	3.17E-08	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	<LLD	<LLD	<LLD	1.24E-05	<LLD	<LLD	<LLD	<LLD
Xe-135m	Ci	<LLD	<LLD	<LLD	1.63E-05	<LLD	<LLD	<LLD	<LLD
Xe-138	Ci	<LLD	<LLD	<LLD	5.07E-05	<LLD	<LLD	<LLD	<LLD
Ar-41	Ci	<LLD	<LLD	<LLD	2.99E-07	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	1.10E-04	<LLD	<LLD	<LLD	<LLD
2. Iodines									
I-131	Ci	<LLD	<LLD	<LLD	1.41E-08	<LLD	<LLD	<LLD	<LLD
I-132	Ci	<LLD	<LLD	<LLD	1.41E-10	<LLD	<LLD	<LLD	<LLD
I-133	Ci	<LLD	<LLD	<LLD	5.41E-09	<LLD	<LLD	<LLD	<LLD
I-134	Ci	<LLD	<LLD	<LLD	6.62E-07	<LLD	<LLD	<LLD	<LLD
I-135	Ci	<LLD	<LLD	<LLD	9.47E-11	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	6.82E-07	<LLD	<LLD	<LLD	<LLD
3. Particulates									
Br-82	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-89	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	<LLD	<LLD	<LLD	3.49E-09	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	<LLD	<LLD	1.85E-06	<LLD	<LLD	<LLD	<LLD
Co-57	Ci	<LLD	<LLD	<LLD	2.73E-09	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	<LLD	<LLD	<LLD	8.27E-07	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	2.27E-04	<LLD	<LLD	3.40E-06	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	<LLD	<LLD	3.32E-08	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	4.11E-11	<LLD	<LLD	<LLD	<LLD
Ce-144	Ci	<LLD	<LLD	<LLD	1.93E-08	<LLD	<LLD	<LLD	<LLD
Te-123m	Ci	<LLD	<LLD	<LLD	2.15E-07	<LLD	<LLD	<LLD	<LLD
Hf-181	Ci	<LLD	<LLD	<LLD	3.13E-09	<LLD	<LLD	<LLD	<LLD
Fe-59	Ci	<LLD	<LLD	<LLD	5.75E-07	<LLD	<LLD	<LLD	<LLD
Zn-65	Ci	<LLD	<LLD	<LLD	6.09E-07	<LLD	<LLD	<LLD	<LLD
Zr-95	Ci	<LLD	<LLD	<LLD	2.31E-08	<LLD	<LLD	<LLD	<LLD
Nb-95	Ci	<LLD	<LLD	<LLD	3.65E-08	<LLD	<LLD	<LLD	<LLD
Sn-117m	Ci	<LLD	<LLD	<LLD	2.08E-07	<LLD	<LLD	<LLD	<LLD
Sb-124	Ci	<LLD	<LLD	<LLD	1.17E-07	<LLD	<LLD	<LLD	<LLD

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Sb-125	Ci	<LLD	<LLD	<LLD	1.83E-08	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	7.94E-06	<LLD	<LLD	<LLD	<LLD
4. Tritium									
H-3 Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
5. Gross Alpha									
Gross Alpha Total	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
6. Carbon 14									
C-14 Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 2.2.A(3) Gaseous Effluents Release Point **Unit 3 Ground Level**

Nuclides Released		Continuous Mode				Batch Mode			
	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. Fission gases									
Kr-85	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85m	Ci	<LLD	<LLD	<LLD	9.81E-08	<LLD	<LLD	<LLD	<LLD
Kr-87	Ci	<LLD	<LLD	<LLD	5.89E-07	<LLD	<LLD	<LLD	<LLD
Kr-88	Ci	<LLD	<LLD	<LLD	3.66E-07	<LLD	<LLD	<LLD	<LLD
Xe-131m	Ci	<LLD	<LLD	<LLD	5.49E-09	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	<LLD	<LLD	<LLD	4.30E-08	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	<LLD	<LLD	<LLD	6.60E-07	<LLD	<LLD	<LLD	<LLD
Xe-135m	Ci	<LLD	<LLD	<LLD	1.44E-06	<LLD	<LLD	<LLD	<LLD
Xe-138	Ci	<LLD	<LLD	<LLD	5.10E-06	<LLD	<LLD	<LLD	<LLD
Ar-41	Ci	<LLD	<LLD	<LLD	1.01E-07	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	8.40E-06	<LLD	<LLD	<LLD	<LLD
2. Iodines									
I-131	Ci	<LLD	<LLD	<LLD	3.24E-11	<LLD	<LLD	<LLD	<LLD
I-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-134	Ci	<LLD	<LLD	<LLD	3.89E-07	<LLD	<LLD	<LLD	<LLD
I-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	3.89E-07	<LLD	<LLD	<LLD	<LLD
3. Particulates									
Sr-89	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	<LLD	<LLD	5.44E-12	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	<LLD	<LLD	<LLD	2.42E-09	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51	Ci	<LLD	<LLD	<LLD	2.60E-06	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	<LLD	<LLD	1.10E-07	<LLD	<LLD	<LLD	<LLD
Co-57	Ci	<LLD	<LLD	<LLD	1.80E-10	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	<LLD	<LLD	<LLD	7.39E-08	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	<LLD	<LLD	<LLD	2.37E-07	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	<LLD	<LLD	8.39E-09	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-144	Ci	<LLD	<LLD	<LLD	4.49E-10	<LLD	<LLD	<LLD	<LLD
Te-123m	Ci	<LLD	<LLD	<LLD	8.21E-09	<LLD	<LLD	<LLD	<LLD
Hf-181	Ci	<LLD	<LLD	<LLD	2.80E-10	<LLD	<LLD	<LLD	<LLD
Fe-59	Ci	<LLD	<LLD	<LLD	3.45E-08	<LLD	<LLD	<LLD	<LLD
Zn-65	Ci	<LLD	<LLD	<LLD	6.82E-08	<LLD	<LLD	<LLD	<LLD
Zr-95	Ci	<LLD	<LLD	<LLD	3.37E-09	<LLD	<LLD	<LLD	<LLD
Nb-95	Ci	<LLD	<LLD	<LLD	3.87E-09	<LLD	<LLD	<LLD	<LLD
Sn-117m	Ci	<LLD	<LLD	<LLD	7.97E-09	<LLD	<LLD	<LLD	<LLD
Sb-124	Ci	<LLD	<LLD	<LLD	7.50E-09	<LLD	<LLD	<LLD	<LLD
Sb-125	Ci	<LLD	<LLD	<LLD	7.88E-10	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	3.17E-06	<LLD	<LLD	<LLD	<LLD

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4. Tritium									
H-3 Total for Period	Ci	1.45E-03	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
5. Gross Alpha									
Gross Alpha Total	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
6. Carbon 14									
C-14 Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 2.2.B(1) Gaseous Effluents Release Point **Unit 1 Elevated**

Nuclides Released		Continuous Mode				Batch Mode			
	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. Fission gases									
Kr-85	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-87	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-88	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-138	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ar-41	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
2. Iodines									
I-131	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
3. Particulates									
Sr-89	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-144	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
4. Tritium									
H-3 Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
5. Gross Alpha									
Gross Alpha Total	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
6. Carbon 14									
C-14 Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 2.2.B(2) Gaseous Effluents Release Point **Unit 2 Elevated**

Nuclides Released		Continuous Mode				Batch Mode			
	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. Fission gases									
Kr-85	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85m	Ci	6.61E-01	5.29E-01	3.34E+00	3.08E-01	<LLD	<LLD	<LLD	<LLD
Kr-87	Ci	2.06E+01	7.54E-01	1.17E+00	6.40E-01	<LLD	<LLD	<LLD	<LLD
Kr-88	Ci	6.07E+01	6.41E-01	2.59E+00	4.55E-01	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	5.07E+01	6.98E+00	1.47E+01	2.30E+00	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	1.67E+02	2.14E+00	1.10E+00	9.15E-01	<LLD	<LLD	<LLD	<LLD
Xe-135m	Ci	2.86E+00	2.71E+00	3.91E+00	2.20E+00	<LLD	<LLD	<LLD	<LLD
Xe-138	Ci	1.03E+01	7.48E+00	1.45E+01	9.26E+00	<LLD	<LLD	<LLD	<LLD
Ar-41	Ci	1.59E+00	5.28E-02	2.03E-01	6.97E-02	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	3.14E+02	2.13E+01	4.15E+01	1.61E+01	<LLD	<LLD	<LLD	<LLD
2. Iodines									
I-131	Ci	1.34E-04	3.63E-04	4.97E-04	2.40E-04	<LLD	<LLD	<LLD	<LLD
I-133	Ci	2.02E-04	5.75E-04	1.00E-03	6.00E-04	<LLD	<LLD	<LLD	<LLD
I-135	Ci	<LLD	<LLD	<LLD	1.64E-04	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	3.36E-04	9.38E-04	1.50E-03	1.00E-03	<LLD	<LLD	<LLD	<LLD
3. Particulates									
Zn-65	Ci	2.26E-04	1.40E-05	2.05E-05	6.24E-06	<LLD	<LLD	<LLD	<LLD
Sr-89	Ci	4.15E-05	2.96E-05	1.36E-04	1.56E-04	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	3.41E-05	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	1.13E-05	2.35E-05	9.57E-05	1.15E-04	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51	Ci	<LLD	5.29E-05	<LLD	1.31E-05	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	1.52E-05	6.70E-06	6.94E-06	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	1.22E-06	1.34E-05	4.82E-06	3.22E-06	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	6.54E-05	1.42E-04	8.57E-05	7.76E-05	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	5.98E-06	4.08E-05	8.19E-06	<LLD	<LLD	<LLD	<LLD
Sn-117m	Ci	4.66E-05	6.73E-05	5.04E-05	2.10E-05	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-144	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	4.26E-04	3.64E-04	4.41E-04	4.08E-04	<LLD	<LLD	<LLD	<LLD
4. Tritium									
H-3 Total for Period	Ci	3.22E+00	1.40E+01	1.25E+01	5.38E+00	<LLD	<LLD	<LLD	<LLD
5. Gross Alpha									
Gross Alpha Total	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
6. Carbon 14									
C-14 Total for Period	Ci	3.69E+00	3.73E+00	4.38E+00	2.79E+00	<LLD	<LLD	<LLD	<LLD

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 2.2.B(3) Gaseous Effluents Release Point **Unit 3 Elevated**

Nuclides Released		Continuous Mode				Batch Mode			
	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. Fission gases									
Kr-85	Ci	<LLD	<LLD	1.87E-04	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85m	Ci	1.97E+00	8.40E-02	3.06E-02	3.62E-02	<LLD	<LLD	<LLD	<LLD
Kr-87	Ci	2.93E+00	6.60E-02	6.97E-02	6.19E-02	<LLD	<LLD	<LLD	<LLD
Kr-88	Ci	5.01E+00	3.71E-02	7.03E-02	3.62E-02	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	1.58E+00	7.93E-01	8.36E-02	8.93E-02	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	1.54E+01	3.70E-01	9.22E-02	1.73E-01	<LLD	<LLD	<LLD	<LLD
Xe-135m	Ci	4.27E-01	4.42E-01	5.16E-01	3.90E-01	<LLD	<LLD	<LLD	<LLD
Xe-138	Ci	1.97E+00	1.80E+00	2.04E+00	1.61E+00	<LLD	<LLD	<LLD	<LLD
Ar-41	Ci	5.90E-01	1.82E-01	1.01E-01	6.81E-01	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	2.99E+01	3.77E+00	3.00E+00	3.08E+00	<LLD	<LLD	<LLD	<LLD
2. Iodines									
I-131	Ci	4.49E-05	9.37E-05	9.15E-05	3.15E-05	<LLD	<LLD	<LLD	<LLD
I-133	Ci	6.57E-05	1.62E-04	1.85E-04	1.12E-04	<LLD	<LLD	<LLD	<LLD
I-135	Ci	<LLD	<LLD	<LLD	5.82E-05	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	1.11E-04	2.56E-04	2.77E-04	2.02E-04	<LLD	<LLD	<LLD	<LLD
3. Particulates									
Zn-65	Ci	8.58E-05	2.53E-06	3.81E-06	1.94E-06	<LLD	<LLD	<LLD	<LLD
Sr-89	Ci	1.40E-05	9.14E-06	2.50E-05	2.69E-05	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	1.29E-05	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	2.81E-06	5.85E-06	1.71E-05	2.41E-05	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51	Ci	<LLD	9.58E-06	<LLD	4.67E-06	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	2.74E-06	1.25E-06	1.18E-06	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	5.51E-07	2.42E-06	8.97E-07	1.08E-06	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	2.16E-05	3.61E-05	1.57E-05	1.45E-05	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	2.83E-06	7.80E-06	2.91E-06	<LLD	<LLD	<LLD	<LLD
Sn-117m	Ci	1.73E-05	2.32E-05	9.39E-06	4.14E-06	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-144	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	1.55E-04	9.43E-05	8.10E-05	8.14E-05	<LLD	<LLD	<LLD	<LLD
4. Tritium									
H-3 Total for Period	Ci	1.10E+00	4.69E+00	2.32E+00	1.04E+00	<LLD	<LLD	<LLD	<LLD
5. Gross Alpha									
Gross Alpha Total	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
6. Carbon 14									
C-14 Total for Period	Ci	3.69E+00	3.73E+00	4.38E+00	2.54E+00	<LLD	<LLD	<LLD	<LLD

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 2.2.C(1) Gaseous Effluents Release Point **Unit 1 Mixed Mode**

Nuclides Released		Continuous Mode				Batch Mode			
	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. Fission gases									
Kr-85	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-87	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-88	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-138	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ar-41	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
2. Iodines									
I-131	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
3. Particulates									
Sr-89	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	2.24E-06	<LLD	2.75E-06	<LLD	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-144	Ci	<LLD	7.51E-07	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	2.24E-06	7.51E-07	2.75E-06	<LLD	<LLD	<LLD	<LLD	<LLD
4. Tritium									
H-3 Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
5. Gross Alpha									
Gross Alpha Total	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
6. Carbon 14									
C-14 Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 2.2.C(2) Gaseous Effluents Release Point **Unit 2 Mixed Mode**

Nuclides Released		Continuous Mode				Batch Mode			
	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. Fission gases									
Kr-85	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-87	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-88	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	9.27E-01	3.86E-06	<LLD	3.13E-06	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	3.51E-01	1.01E-05	<LLD	3.02E-01	<LLD	<LLD	<LLD	<LLD
Xe-135m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-138	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ar-41	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	1.28E+00	1.40E-05	<LLD	3.02E-01	<LLD	<LLD	<LLD	<LLD
2. Iodines									
I-131	Ci	<LLD	1.97E-06	2.12E-06	4.95E-05	<LLD	<LLD	<LLD	<LLD
I-133	Ci	<LLD	4.19E-06	<LLD	2.25E-05	<LLD	<LLD	<LLD	<LLD
I-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	6.16E-06	2.12E-06	7.19E-05	<LLD	<LLD	<LLD	<LLD
3. Particulates									
Sr-89	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51	Ci	<LLD	2.54E-06	<LLD	6.77E-05	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	<LLD	<LLD	6.02E-06	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	<LLD	<LLD	<LLD	3.93E-06	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	1.18E-05	1.16E-05	1.61E-05	3.36E-05	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sn-117m	Ci	<LLD	<LLD	<LLD	1.17E-06	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-144	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	1.18E-05	1.42E-05	1.61E-05	1.12E-04	<LLD	<LLD	<LLD	<LLD
4. Tritium									
H-3 Total for Period	Ci	3.72E-01	9.09E-01	1.21E+00	1.16E+00	<LLD	<LLD	<LLD	<LLD
5. Gross Alpha									
Gross Alpha Total	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
6. Carbon 14									
C-14 Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

Table 2.2.C(3) Gaseous Effluents Release Point **Unit 3 Mixed Mode**

Nuclides Released		Continuous Mode				Batch Mode			
	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. Fission gases									
Kr-85	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-87	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-88	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	1.63E-01	<LLD	<LLD	5.63E-07	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	5.24E-02	1.98E-06	<LLD	5.44E-02	<LLD	<LLD	<LLD	<LLD
Xe-135m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-138	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ar-41	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	2.15E-01	1.98E-06	<LLD	5.44E-02	<LLD	<LLD	<LLD	<LLD
2. Iodines									
I-131	Ci	<LLD	3.92E-06	<LLD	1.33E-05	<LLD	<LLD	<LLD	<LLD
I-133	Ci	<LLD	<LLD	<LLD	5.61E-06	<LLD	<LLD	<LLD	<LLD
I-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	3.92E-06	<LLD	1.89E-05	<LLD	<LLD	<LLD	<LLD
3. Particulates									
Sr-89	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51	Ci	<LLD	<LLD	<LLD	1.57E-05	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	<LLD	<LLD	1.51E-06	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	<LLD	<LLD	<LLD	1.02E-06	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	1.06E-05	8.42E-06	4.64E-06	7.89E-06	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sn-117m	Ci	<LLD	<LLD	<LLD	2.05E-07	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	8.64E-07	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-144	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	1.06E-05	9.28E-06	4.64E-06	2.63E-05	<LLD	<LLD	<LLD	<LLD
4. Tritium									
H-3 Total for Period	Ci	1.31E-01	2.71E-01	6.99E-01	3.14E-01	<LLD	<LLD	<LLD	<LLD
5. Gross Alpha									
Gross Alpha Total	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
6. Carbon 14									
C-14 Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 3.1(1) Liquid Effluents- Summation of All Releases: Unit 1

		Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
A. Fission & Activation Gases							
1	Total Release	Ci	N/A	N/A	N/A	N/A	1.95E+01
2	Average Concentration	µCi/mL	N/A	N/A	N/A	N/A	
3	Percent of ODCM Quarterly dose limit	%	N/A	N/A	N/A	N/A	
B. Tritium							
1	Total release	Ci	N/A	N/A	N/A	N/A	2.37E+00
2	Average Concentration	µCi/mL	N/A	N/A	N/A	N/A	
3	Percent of ODCM Quarterly dose limit	%	N/A	N/A	N/A	N/A	
C. Dissolved and Entrained Gases							
1	Total release	Ci	N/A	N/A	N/A	N/A	2.03E+01
2	Average Concentration	µCi/mL	N/A	N/A	N/A	N/A	
3	Percent of ODCM Quarterly dose limit	%	N/A	N/A	N/A	N/A	
D. Gross Alpha							
1	Total release	Ci	N/A	N/A	N/A	N/A	2.00E+01
2	Average Concentration	µCi/mL	N/A	N/A	N/A	N/A	
E. Liquid Release Volume							
1	Total Release	Liters	N/A	N/A	N/A	N/A	
F. Dilution Volume							
1	Total Release	Liters	N/A	N/A	N/A	N/A	

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 3.1(2) Liquid Effluents- Summation of All Releases: **Unit 2**

		Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
A. Fission & Activation Gases							
1	Total Release	Ci	N/A	N/A	N/A	N/A	1.95E+01
2	Average Concentration	µCi/mL	N/A	N/A	N/A	N/A	
3	Percent of ODCM Quarterly dose limit	%	N/A	N/A	N/A	N/A	
B. Tritium							
1	Total release	Ci	5.71E-03	5.00E-03	5.56E-03	5.57E-03	2.37E+00
2	Average Concentration	µCi/mL	4.83E-12	4.22E-12	2.82E-12	3.53E-12	
3	Percent of ODCM Quarterly dose limit	%	1.39E-06	1.22E-06	1.35E-06	5.30E-06	
C. Dissolved and Entrained Gases							
1	Total release	Ci	N/A	N/A	N/A	N/A	2.03E+01
2	Average Concentration	µCi/mL	N/A	N/A	N/A	N/A	
3	Percent of ODCM Quarterly dose limit	%	N/A	N/A	N/A	N/A	
D. Gross Alpha							
1	Total release	Ci	N/A	N/A	N/A	N/A	2.00E+01
2	Average Concentration	µCi/mL	N/A	N/A	N/A	N/A	
E. Liquid Release Volume							
1	Total Release	Liters	2.45E+06	2.48E+06	2.87E+06	2.84E+06	
F. Dilution Volume							
1	Total Release	Liters	1.18E+12	1.18E+12	1.97E+12	1.58E+12	

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 3.1 (3) Liquid Effluents- Summation of All Releases: Unit 3

		Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
A. Fission & Activation Gases							
1	Total Release	Ci	N/A	N/A	N/A	N/A	1.95E+01
2	Average Concentration	µCi/mL	N/A	N/A	N/A	N/A	
3	Percent of ODCM Quarterly dose limit	%	N/A	N/A	N/A	N/A	
B. Tritium							
1	Total release	Ci	5.71E-03	5.00E-03	5.56E-03	5.57E-03	2.37E+00
2	Average Concentration	µCi/mL	4.83E-12	4.22E-12	2.82E-12	3.53E-12	
3	Percent of ODCM Quarterly dose limit	%	1.39E-06	1.22E-06	1.35E-06	5.30E-06	
C. Dissolved and Entrained Gases							
1	Total release	Ci	N/A	N/A	N/A	N/A	2.03E+01
2	Average Concentration	µCi/mL	N/A	N/A	N/A	N/A	
3	Percent of ODCM Quarterly dose limit	%	N/A	N/A	N/A	N/A	
D. Gross Alpha							
1	Total release	Ci	N/A	N/A	N/A	N/A	2.00E+01
2	Average Concentration	µCi/mL	N/A	N/A	N/A	N/A	
E. Liquid Release Volume							
1	Total Release	Liters	2.45E+06	2.48E+06	2.87E+06	2.84E+06	
F. Dilution Volume							
1	Total Release	Liters	1.18E+12	1.18E+12	1.97E+12	1.58E+12	

Lower Limits of Detection for Liquid Effluents

Fission and Activation Gase	**µCi/mL**
Kr-87	1.00E-05
Kr-88	1.00E-05
Xe-133	1.00E-05
Xe-133m	1.00E-05
Xe-135	1.00E-05
Xe-138	1.00E-05
Iodines	
I-131	1.00E-06
Particulates	
Fe-55	1.00E-06
Sr-89	5.00E-08
Sr-90	5.00E-08
Mn-54	5.00E-07
Co-58	5.00E-07
Fe-59	5.00E-07
Co-60	5.00E-07
Zn-65	5.00E-07
Mo-99	5.00E-07
Cs-134	5.00E-07
Cs-137	5.00E-07
Ce-141	5.00E-07
Ce-144	5.00E-06
Other	
H-3	1.00E-05
Gross Alpha	1.00E-07

The above limits are the ODCM required Lower Limits of Detection (LLD).

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 3.2(1) Liquid Effluents Release Point: Unit 1

Nuclides Released		Continuous Mode				Batch Mode			
	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Sr-89	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-131	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Fe-59	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Zn-65	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Zr-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Nb-95	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Tc-99m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Fe-55	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
H-3	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
	Ci								
	Ci								
Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 3.2(2) Liquid Effluents Release Point: Unit 2

Nuclides Released		Continuous Mode				Batch Mode			
	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Sr-89	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-131	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Fe-59	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Zn-65	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Zr-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Nb-95	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Tc-99m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Fe-55	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
H-3	Ci	5.71E-03	5.00E-03	5.56E-03	5.57E-03	<LLD	<LLD	<LLD	<LLD
	Ci								
	Ci								
Total for Period	Ci	5.71E-03	5.00E-03	5.56E-03	5.57E-03	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

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Table 3.2(3) Liquid Effluents Release Point: Unit 3

Nuclides Released		Continuous Mode				Batch Mode			
	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Sr-89	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-131	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Fe-59	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Zn-65	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Zr-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Nb-95	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Tc-99m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Fe-55	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
H-3	Ci	5.71E-03	5.00E-03	5.56E-03	5.57E-03	<LLD	<LLD	<LLD	<LLD
	Ci								
	Ci								
Total for Period	Ci	5.71E-03	5.00E-03	5.56E-03	5.57E-03	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

Table 4 Batch and Abnormal Release Totals Site

Batch Releases

A. Liquid Releases

		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
1. Number of Batch Releases		0	0	0	0	0
2. Total duration of batch releases	min	N/A	N/A	N/A	N/A	N/A
3. Maximum batch release duration	min	N/A	N/A	N/A	N/A	N/A
4. Average batch release duration	min	N/A	N/A	N/A	N/A	N/A
5. Minimum batch release duration	min	N/A	N/A	N/A	N/A	N/A

B. Gaseous Releases

		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
1. Number of Batch Releases		0	0	0	0	0
2. Total duration of batch releases	min	N/A	N/A	N/A	N/A	N/A
3. Maximum batch release duration	min	N/A	N/A	N/A	N/A	N/A
4. Average batch release duration	min	N/A	N/A	N/A	N/A	N/A
5. Minimum batch release duration	min	N/A	N/A	N/A	N/A	N/A

Abnormal Releases

A. Liquid Releases	Units	Annual
1. Number of abnormal Releases		16
2. Total Activity	Ci	2.18E+04

B. Gaseous Releases	Units	Annual
1. Number of abnormal Releases		4
2. Total Activity	Ci	1.81E-03

Dresden Nuclear Power Station Units 1,2, 3 Licensee: Exelon Generation Company, LLC

RADIOLOGICAL IMPACT ON MAN

Table 5 Total Body Dose from Gaseous and Liquid Effluents

		Unit 1	Unit 2	Unit 3	Site
Liquid	mRem	N/A	1.39E-07	1.39E-07	2.78E-07
Gaseous	mRad	N/A	8.39E-03	9.74E-04	9.37E-03
Radioiodines, tritium and Particulates	mRem	1.06E-03	1.25E-02	8.81E-03	2.15E-02

Table 5.1 Organ Dose from Gaseous and Liquid Effluents

		Unit 1	Unit 2	Unit 3	Site
Liquid	mRem	N/A	1.39E-07 (Thyroid)	1.39E-07 (Thyroid)	2.78E-07
Gaseous (Skin)	mRad	N/A	1.43E-02	1.67E-03	1.60E-02
Radioiodines, tritium and Particulates	mRem	2.71E-03 (Liver)	8.18E-02 (Thyroid)	4.40E-02 (Bone)	1.04E-01 (Thyroid)

Table 6 Solid Waste Shipped Offsite for Burial or Disposal (Not irradiated fuel)

1- Types of Waste

Types of Waste	Total Quantity (m^3)	Total Activity (Ci)	Period	Est. Total Error %
a. Spent resins, filter sludges, evaporator bottoms, etc.	1.06E+02	1.69E+02	1/1-12/31	± 25
b. Dry compressible waste, contaminated equip., etc.	5.97E+02	7.77E+00	1/1-12/31	± 25
c. Irradiated components, control rods, etc.	0.00E+00	0.00E+00	1/1-12/31	± 25
d. Other (describe)	7.50E+00	1.38E-02	1/1-12/31	± 25

2- Estimate of major nuclide composition (by waste type)

Major Nuclide Composition	%
a. H-3 (5.06E+01 Ci)	29.98
Mn-54 (1.81E+00 Ci)	1.07
Fe-55 (3.38E+01 Ci)	20.02
Co-60 (6.61E+01 Ci)	39.13
Ni-63 (3.31E+00 Ci)	1.96
Zn-65 (3.01E+00 Ci)	1.78
Cs-137 (8.93E+00 Ci)	5.29
b. Mn-54 (2.84E-01 Ci)	3.65
Fe-55 (5.26E+00 Ci)	67.70
Co-60 (1.87E+00 Ci)	24.10
Zn-65 (1.19E-01 Ci)	1.53

c. N/A	N/A
d. Mn-54 (3.12E-04 Ci)	2.27
Fe-55 (9.60E-03 Ci)	69.76
Co-60 (3.36E-03 Ci)	24.43
Zn-65 (3.18E-04 Ci)	2.32

3- Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
16	Ground	Energy Solutions--Oak Ridge, TN
19	Ground	Energy Solutions--Clive, UT
1	Ground	Energy Solutions--Texas, WCS

CHANGES TO THE PROCESS CONTROL PROGRAM

The Process Control Program procedure (RW-AA-100) Rev 12 was revised last on 8/17/2017. There have been no new changes for the 2019 year.

DIRECT RADIATION

There are five identified sources of direct radiation dose that meets the definition referenced in 10CFR72.104 and must be added to the gaseous and liquid effluents dose. They are:

1. Skyshine
2. West Independent Spent Fuel Storage Installation (ISFSI) Pad
3. East ISFSI Pad
4. Condensate Storage Tanks (CST)
5. General Electric Facility located south west of the plant on Collins Road.

Skyshine

The radioactivity source that results in the most significant offsite radiation dose at the Dresden Station is skyshine resulting from ^{16}N decay inside turbines and steam piping.

The ^{16}N that produces the skyshine effect is formulated through neutron activation of the oxygen atoms in the reactor coolant as the coolant passes through the operating reactor core. The ^{16}N travels with the steam produced in the reactor to the steam-driven turbine. While the ^{16}N is in transport, it radioactively decays with a half-life of about 7 seconds and produces 6-7 MeV gamma rays. Typically, offsite dose points are shielded from a direct view of components containing ^{16}N, but there can be skyshine at offsite locations due to scattering of gamma rays off the mass of air above the steam lines and turbine.

The dose rate due to skyshine has been found to have the following dependencies:

1. The dose rate decreases as distance from the station increases.
2. The dose rate increases non-linearly as the power production level increases.
3. The dose rate increases when hydrogen is added to the reactor coolant, an action taken to improve reactor coolant chemistry characteristics.

To calculate offsite dose due to skyshine in a given time period, Dresden Station must track the following parameters:

1. The total gross energy E_h produced with hydrogen being added.
2. The total gross energy E_o produced without hydrogen being added.

The turbines at the site are sufficiently close to each other that energy generated by the two operating units may be summed. Because the hydrogen addition system is normally in-service during plant operation, the conservative assumption that all power is generated during hydrogen addition can be used.

An initial estimate of skyshine dose is calculated using equation 5-1 on page II.5.4 in the Dresden Offsite Dose Calculation Manual with the following assumptions from Table 5.1 on page II.5-11:

$$D_{sky} = (K)(E_o - M_h E_h)((OF_1 * SF_1 e^{-0.007*R1}) + (OF_2 * SF_2 e^{-0.007*R2}) \quad (5\text{-}1)$$

Table 6.1 Parameters for Calculations of N-16 Skyshine Radiation from Dresden Units 2 and 3

Location Number K	Activity	Occupancy Hours (OH)	Occupancy Factor (OF)	Shielding Factor (SF)	Distance (R)
1	Living at Home	8344	0.95	0.7	800
2	Fishing	416	0.05	1	610

These parameters are used to obtain an initial estimate of skyshine dose to the maximally exposed member of the public using Equation 5-1. If desired, more realistic parameters could be used in place of these to refine the estimate. For example, one could determine whether the nearest resident really fishes the specified number of hours at the specified location.

a. The amount of time in a year that a maximally exposed fisherman would spend fishing near the site is estimated as 12 hours per week for 8 months per year. This yields an estimate of:

   [12 hours/week] x [(8 months/yr)/(12 months/yr)] x [52 weeks/yr] = 416 hours/yr

   The remaining time is assumed to be spent at the nearest residence.

b. Distance to nearest residence (See ODCM Table 4-1).

c. Estimated from a drawing of the site.

d. The OF_k is the quotient of the number of hours a location is occupied and the number of hours in a year. Thus OH_k/8760 hours = OF_k rounded to the 0.01 digit.

A survey of the nearest residents revealed that as they do enjoy fishing, they spend far less time than the above estimate in Table 6.1 above. In addition, because they live on the Kankakee River, they enjoy fishing at their homes rather than the designated 610 meters from the plant. As such, these assumptions have been adjusted in order to calculate a more accurate dose to the nearest resident at 868 meters from the plant with 8000 occupancy hours per year. This yielded a dose from Unit 2 due to skyshine of 2.029 mRem and 2.261 mRem from Unit 3 for a total of 4.29 mRem for the Site.

Independent Spent Fuel Storage Installation

There are currently two ISFSI pads (east and west) located within the Protected area of the Dresden station. These casks contain the spent fuel from the reactor, and the pad is designed to store the spent fuel until a more suitable location is available. Optically stimulated luminescence dosimeters (OSLD) are placed on the fence around the pads and exchanged semi-annually to measure the direct dose from the ISFSI pad. The dose from each location is summed to acquire an annual dose for that specific location a known distance from the casks.

The equation for a point source is used ($DR_1*D_1^2=DR_2*D_2^2$) to calculate the annual dose to the nearest member of the public. The OSLD with the highest annual reading was used because they have a lesser contribution by percent of background radiation lending to more accuracy in the dose attributable only to the ISFSI pad

Table 7: West ISFSI Pad Dose Calculations

West ISFSI Pad					
Q1 (mRem)	**Q2 (mRem)**	**DR_1 (ft)**	**D_1 (ft)**	**D_2 (ft)**	**DR_2 (mRem)**
161.2	185.3	346.5	136	2640	0.92
420.9	564.2	985.1	91	2640	1.17
600.8	650.3	1251.1	98	2640	1.72
179.6	205	384.6	90	2640	0.45
462.8	468.2	931.0	61	2640	0.50
241.6	279.1	520.7	117	2640	1.02

Figure 1: West ISFSI Pad

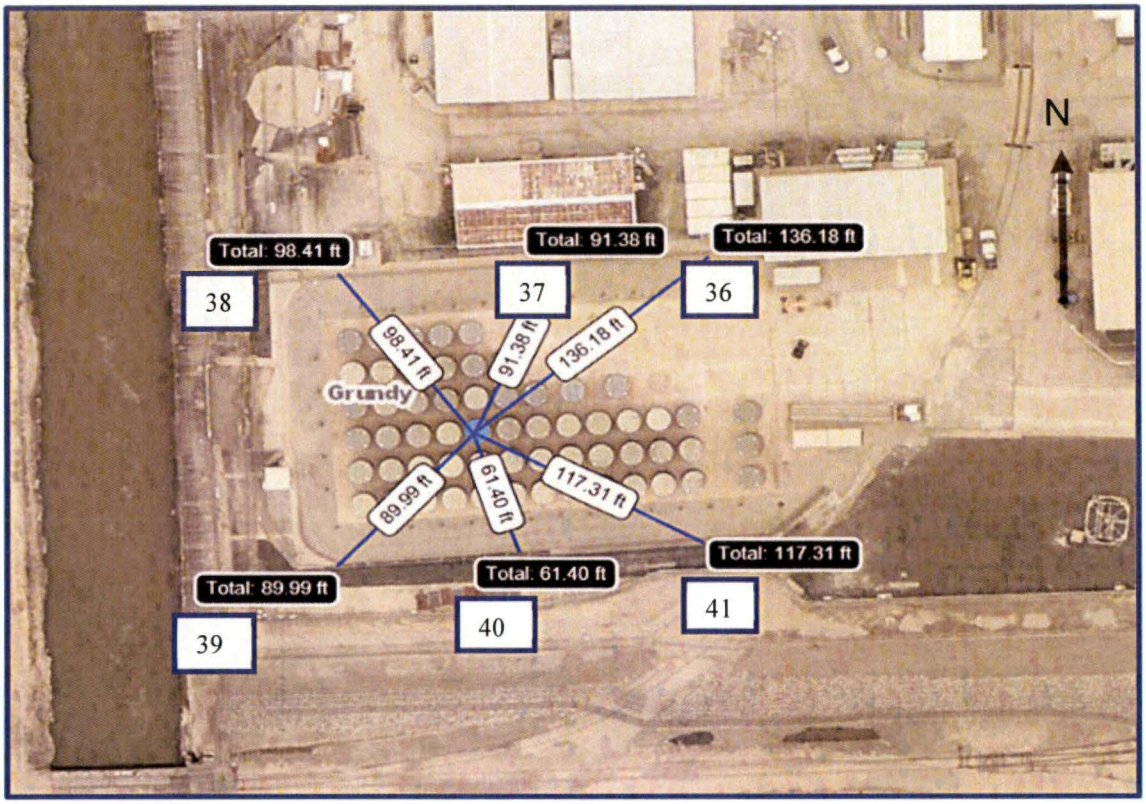
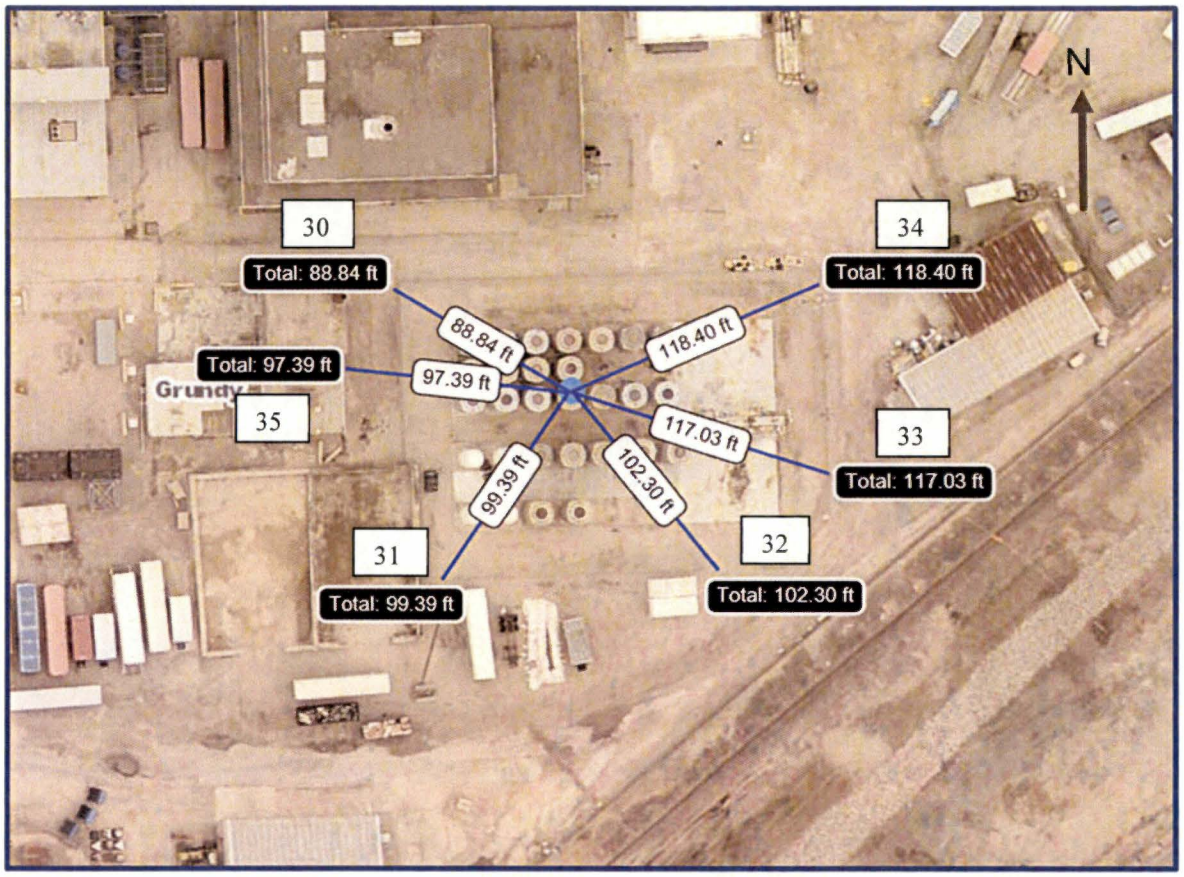


Table 7.1: East ISFSI Pad Dose Calculations

East ISFSI Pad

	Q1 (mRem)	Q2 (mRem)	DR_1 (ft)	D_1 (ft)	D_2 (ft)	DR_2 (mRem)
30	67.8	93.7	161.5	97	2660	0.21
31	82	79.8	161.8	99	2660	0.22
32	59.1	85	144.1	102	2660	0.21
33	59.7	97.7	157.4	117	2660	0.30
34	180.3	229.9	410.2	118	2660	0.81
35	87.1	105.6	192.7	89	2660	0.22

Figure 2: East ISFSI Pad



The highest annual dose received from each pad was location 38 and 34. These results and distances from the center of the pad was used to calculate a dose of 1.72E+00 mRem/yr for the west pad and 8.10E-01 mRem/yr for the east pad. This resulted in a combined annual dose of 2.53E+00 mRem/ yr. due to direct radiation from storage of spent fuel on the IFSFI pads.

Condensate Storage Tank (CST)

The Condensate Storage Tank is a source of make-up water and has become contaminated through the operation of the plant. Although the level of contamination of the water inside the tank isn't at a level to produce a measurable dose rate, tanks are specifically listed in 40CFR190 and a calculation of the annual dose to the nearest resident must be performed.

A direct radiation dosimeter (07), was placed on the northeast perimeter fence of the 2/3 Condensate

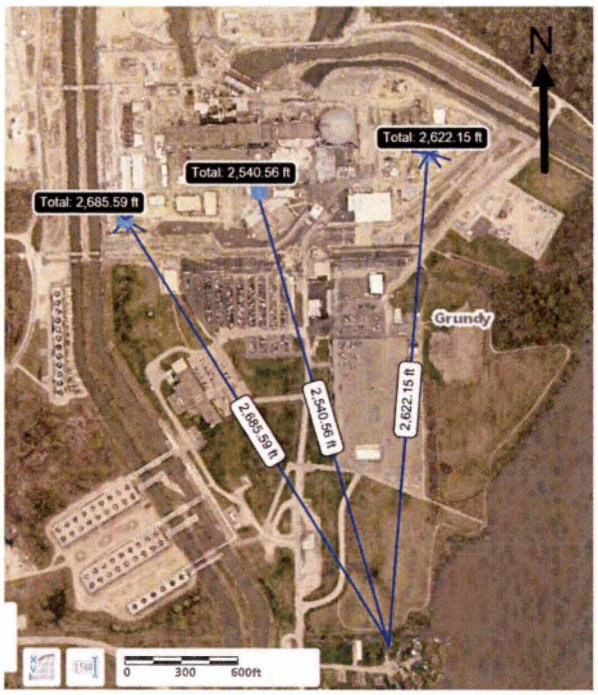
Storage Tank identical to those on the ISFSI pad, and as such will use the same methodology to calculate an annual dose.

Table 7.2: CST Dose Calculations

	Q1 (mRem)	Q2 (mRem)	DR_1 (ft)	D_1 (ft)	D_2 (ft)	DR_2 (mRem)
7	140.5	150.6	291.1	17	2540	0.013

Figure 3: 2/3 Condensate Storage Tank

Figure 4: Distance to Nearest Resident



The approximate distance from the dosimeter on the fence to the edge of the tank is 17 ft. Using the same equation and the distance to the nearest residence (2543 ft.) $DR_1*D_1^2=DR_2*D_2^2$ it yields an annual dose of 1.30E-02 mRem/year. These calculations are very conservative because the measured dose is almost entirely from background and not from the plant or storage tanks.

GE Hitachi Nuclear Energy Facility

This facility is located southwest of the Dresden Nuclear Power Station on Collins Rd and is the location of a de facto high-level radioactive waste storage site that holds 772 tons of spent nuclear fuel. The used fuel from various nuclear generating sites across the country are stored in a spent fuel pool. The following table was taken from the NRC Technical Specifications for Safety Renewed License SNM-2500 for the GE Hitachi Energy Americas LLC Appendix A:

Since the source of radiation from the site is from the Uranium fuel cycle, the site is also required to ensure that the requirements of 40CFR190 and 10CFR72 are met. Therefore, an Annual Operating Report is generated and submitted to the NRC to demonstrate that the regulatory limits are not exceeded to members of the public.

40CFR190 states that the annual whole-body dose to a member of the public shall not exceed 25 mRem/yr from all sources of the uranium fuel cycle. This distinction dictates that the sum of the dose from the operation of the Dresden Nuclear Power Station and the GE Hitachi Nuclear Energy site cannot cause a member of the public to exceed a whole-body dose of 25 mRem/year. As a result, communication from the two sites is necessary to exchange the calculated dose contributions to ensure this requirement is met. The dose contribution from the GE Hitachi site for the 2019 year was: 3.60E-01 mRem/yr.

RADIOACTIVE GROUNDWATER PROTECTION PLAN (RGPP)

Background

On May10 & June 8, 1994 tritium was found in groundwater (GW) and storm sewer lines in the vicinity of Condensate Storage Tanks (CSTs) at Dresden. Upon pressure testing, a leak from the floor of the 2/3 A Condensate Storage Tank was confirmed, as a result from galvanic corrosion. Just prior to this event, the 2/3 B CST was also found to be leaking at the floor also due to galvanic corrosion. In July, tritium from the event was reported in groundwater/storm drains near A and B CST tanks in the concentration of 446,000 pCi/L, which eventually discharged into U1 intake canal (37,000 pCi/L) as a result of groundwater flowing northeast. During this event, the groundwater flow direction evaluation was performed by Dresden, and later confirmed by RETEC in August 2004. The regional flow of the unconfined aquifer is from the west, southwest to the east and northeast.

Later, during further research of the aforementioned leak, a major leak was found on the HPCI return line (2/3-2342-18), and a clean demineralized water line (2/3-4324-4), due to galvanic corrosion in September 2004. During this investigation, tritiated water was also discovered in the trenches under the excavation. A 10CFR50.59 Technical Evaluation and a Special procedure was written to release this water to the environment via the storm drain system into the U 2/3 discharge canal starting October 3, 1994 to Nov. 14, 1994. This was reported in the July-Dec semi-annual effluent report as a "Planned Event."

A non-REMP (Radiological Environmental Monitoring Program) tritium monitoring program was setup to monitor numerous on-site sample points, including newly installed monitoring wells, storm sewers, and cooling water canals. The monitoring performed under this program was beyond the requirements of the Radiological Environmental Monitoring Program (REMP), and the Dresden Off-site Dose Calculation Manual (ODCM) at the time. The new sampling points consisted of Power Block wells (shallow and intermediate), storm sewers, and special samples, including REMP sampling locations. Storm sewers provided a release path for ground water inside the Protected Area directly to the Unit 1 intake canal, east of the U 2/3 interlock, and into the 2/3 Discharge Canal via oil water separators west of U 2/3 interlock.

The original sampling of wells and storm water drains (DCP 2107-01) was issued in 1996. Select storm sewers were sampled monthly until February 1998 and then sampled quarterly until April 2002.

On Aug. 30, 2004, a leak was identified evidenced by elevated tritium results due to a leak in the U 2/3 HPCI Suction Line seen in on-site wells and storm drains (U1 DSP-132 at 79,351 pCi/L) located just outside the Unit 2/3 interlock. Upon pressure testing, the cause was identified to be through-wall leak on the HPCI suction line located under the Nitrogen tank pad west of the interlock due to degradation of the moisture barrier wrapping. The leak was identified in the pipe leading from the CST to the reactor building.

An "Integrated Issue Management Report" titled "Dresden Identification of Elevated Tritium Activity in Onsite Wells and Strom Drains" was generated by RETEC in late 2004. The report identified elevated tritium results both in the immediate area of the pipe leak and on the East side of the plant. RETEC confirmed (2004) that GW flows east along the turbine building foundation, around U1 and out towards U1 intake canal. Sewer elevations taken against the water levels in the monitoring wells supported the theory that storm sewers act as the groundwater basin drain in the area bounded by canal system (vicinity of wells 124 and 124 /FLEX and MUDs bldg. areas) as this area showed high GW elevations (mounding effect per Harza map).

After tritium was identified in late August 2004 in GW wells and storm sewers (from samples collected on July 31, 2004), sampling of the non-REMP monitoring locations was restored to meet or exceed the frequency required per DCP 2107-01. Assignment CA 0248494-03 was completed to put a monitoring plan in-place, in addition to immediate and ongoing sampling of wells, storm sewers and release points (effluent).

In October 1996, an Incident Report (IR) was generated for the discontinuation of sampling put in-place for the 1994 event (DCP 2107-01 issued in 1996 for sampling wells, storm sewers and non-REMP sampling locations). Assignments 00261390-02, -03 and -09 references the sampling plan put in place in 1996 to sample MWs and storm sewers for monitoring purpose. An annual surveillance was added to Revision 6 of the ODCM to perform groundwater and storm sewer tritium monitoring officially adding it to the REMP.

In 2006, Conestoga-Rovers & Associates (CRA) was retained by Exelon Nuclear to perform a hydrogeologic investigation at the Dresden Generating Station to evaluate whether groundwater at or near the Station has been impacted by releases of radionuclides. Prior to performing the investigation, CRA evaluated available information concerning historic releases, as well as components, structures, and areas of the facility that have the potential to release radioactive liquid to the environment.

The results of the 2006 investigation for groundwater samples collected within the protected area identified that almost half of the 39 wells showed measurable concentrations of tritium. This tritium comes from historic spills from above ground tanks and leaks of underground lines within the protected area. Groundwater samples collected outside the protected area showed no detectable tritium for 24 of the 26 wells. The two exceptions for the wells outside the protected area include wells DSP 149(R) and DSP-159-I (M).

On June 8, 2014 elevated Tritium results were found at the Sewage Treatment Plant effluent which resulted in a reportable event and triggered an investigation. Upon investigation, a leak in the "B" CST tank floor was identified to be the cause of the leak. An "Individual Plume Monitoring Plan" (IPMP) was established to monitor the plume at MD-11, surrounding wells, and storm drains. The IPMP plan is in effect to-date. Storm drains Catch Basin E (CBE) and Catch Basin G (CBG) were included in the monitoring plan due to historical evidence of being contaminated as they are in the path of the groundwater flow direction (NE), as evident by a preliminary study done by Dresden during the 1994 event, and a more drastic study conducted by RETEC in 2004 which incorporated information from Harza maps, and elevations taken from monitoring wells and storm drains/sewers.

Statement of Cause

The cause of storm sewers being contaminated with tritium is due to groundwater in-leakage from historical to the most recent June 2014 spills. The normal construction of the storm drains at the Dresden Nuclear Power Station consists of a precast reinforced concrete pipe manhole that is set on top of a reinforced concrete base. The joints of each segment of the storm drain structure is grouted to create a structural bond and joint between each segment. The grouted joint and joints between the different precast sections are intended to transfer structural loads and configured with keyed joints to minimize leakage out of the storm drain and reduce soil filtration into the system. However, the storm drain structures were not designed to be leak tight and due to this may allow for groundwater to infiltrate into the storm drain structure through the concrete joints. Based on this, the contamination of storm sewers is a result of groundwater in-leakage into the storm sewers.

Storm drains from the east side of the station emptying into the U1 intake canal, and most of the storm drains from the north and west releasing into U2/3 discharge canal (via Oil Water Separators / Waste Water Treatment Plant) established the need to integrate storm drains into the RGPP program, for monitoring purposes. A detailed sampling report of the RGPP and storm water is contained within the Annual Radiological Environmental Operating Report (AREOR) including monitoring well maps and results.

Current Status

The highest monthly storm sewer isotopic results along with the average annual rain fall is used to calculate a monthly effluent liquid release. This release is entered monthly as an abnormal release into the dose calculation.

Currently, there are 96 sampling points in the RGPP:

47 are developed groundwater monitoring wells within the Protected Area (PA). Some of these wells form a ring just inside the security fence and the remaining wells were installed near underground plant system piping that contains radioactive water.

30 are developed groundwater monitoring wells outside the PA the majority of which form a ring just within the perimeter of the property.

12 are surface water monitoring locations on the owner-controlled area sampled as part of the Dresden RGPP. Three of these locations are monitored for level only and have no analyses in the accompanying tables.

4 are precipitation water monitoring locations sampled as part of the tritium recapture study.

An additional 8 locations were studied in 2011 through 2012, but only 4 locations are currently permanently a part of the RGPP program.

Dresden has 1 sentinel well and A, B, and C CST leak detection valves. These sampling points are idle and only used for qualitative troubleshooting.

In September 2019, groundwater from the west remediation well began to be processed through the 2/3 discharge tunnel. A composite sampler was placed in the MUDS room and sampling and analyzed monthly. Operators take integer readings on the West Remediation Well daily in order to track the release. This analysis results contribute to the liquid radiological release for the Dresden Nuclear Power Station and is tracked as an abnormal release. At the end of 2019, this location has processed 6.01E+06 Ci of tritium via this source in approximately 371,000 gallons of water. The groundwater tritium levels in Well MD-11 has decreased from 40,000 pCi/ml in September 2019 to approximately 30,000 pCi/ml at the end of December 2019