ZION STATION

2001

ANNUAL EFLLUENT REPORT
(AER)

and

OFFSITE DOSE CALCULATION MANNUAL
(ODCM)

Exelon Generation
Zion Station
101 Shiloh Boulevard
Zion, IL 60099-2797
Tel 847-746-2084

www.exeloncorp.com

Exelon Nuclear

April 18, 2002

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Zion Nuclear Power Station, Unit 1 and 2
Facility Operating License Nos. DPR-39 and DPR-48
NRC Docket Nos. 50-295 and 50-304

Subject: Radioactive Effluent Release Report for 2001 and Offsite Dose Calculation Manual for 2001

In accordance with 10 CFR 50.36a, "Technical specifications on effluents from nuclear power plants," and pursuant to Technical Specification 5.7.3, "Radioactive Effluent Release Report," for Zion Nuclear Station, Units 1 and 2, this is the submittal of a Radioactive Effluent Release Report for the year 2001. The report is required to be submitted by April 30, 2002, and is provided as Attachment 1 to this letter. A listing of commitments contained in this submittal is provided as Attachment 2.

Pursuant to 10 CFR 50.4, there were no changes made to the Exelon Nuclear Offsite Dose Calculation Manual (ODCM) during the period of January through December 2001. Attachment 3 states that there were no changes made to the ODCM during the calendar year of 2001. Included as part of Attachment 3 is a copy of the new ODCM that is being implemented for the 2002 calendar year.

Technical Specification 5.6.1 for the Zion Nuclear power station requires a copy of the entire ODCM be submitted to the NRC as part of, or concurrent with, the Radioactive Effluent Release Report. This must be submitted prior to May 1. A copy of the entire Exelon ODCM, current as of December 31, 2001, is provided as Attachment 4.

If you have any questions about this submittal please contact Mr. Ron Schuster at (847) 746-2084 extension 2975.

Respectfully,

David A. Bump
Zion Nuclear Station

IE48
A009

Decommissioning Plant Manager

Attachments
1. Radioactive Effluent Release Report
2. List of Regulatory Commitments
3. Summary of Changes to the ODCM
4. Exelon ODCM

Copy to: Regional Administrator- NRC Region III

ZION NUCLEAR POWER STATION
2001 RADIOACTIVE EFFLUENT RELEASE REPORT
UNIT 1 & 2 (DOCKET Numbers 50-295 & 50-304)

EXECUTIVE SUMMARY

A review of 2001 effluent data versus previous years' data showed there were no abnormally high amounts of radioactivity released during 2001. In 2001, there was no radioactive iodine released. The release of noble gas and particulates continued to trend downward. This trend can be attributed to the shutdown of both units.

Airborne

	Yearly Dose Limit per Reactor Unit	Dose to Maximally Exposed Receptor (Child) from Unit 1	Dose to Maximally Exposed Receptor (Teenager) from Unit 2
Gamma Air	10 mrad	5.55E-13mrad	5.55E-13mrad
Beta Air	20 mrad	2.52E-10mrad	2.52E-10mrad
Total Body	5 marad	4.17E-13mrem	4.17E-13mrem
Skin	15 mrad	1.74E-10mrem	1.74E-10mrem
Organ	15 mrad	5.70E-4mrem	1.30E-5 mrem

Aquatic doses were low because both units are no longer operational. Aquatic doses for Unit 1 were higher than the doses for Unit 2 because there are no discharges of radioactive effluents performed using the Unit 2 Discharge Canal. All liquid releases are performed using the Unit 1 Discharge Canal.

Aquatic

	Yearly Dose Limit per Reactor Unit	Dose to Maximally Exposed Receptor (Infant) from Unit 1	Dose to Maximally Exposed Receptor from Unit 2
Total Body	3 mrem	7.78E-4 mrem	0 mrem
Organ	10 mrem	8.37E-3 mrem	0 mrem

The doses to the public, from all Zion Station effluent paths during 2000, were extremely low and far below all regulatory limits.

Attachment 2:

To the Zion Nuclear Power Station, Units 1 and 2, 2001 Radioactive Effluent Release Report.

The following identifies those actions committed to by Exelon Nuclear in this document. Any other actions discussed in this submittal represent intended or planned actions by Exelon Nuclear. They are described to the NRC for the NRC's information, and are not Regulatory Commitments.

Commitment:
None

****
* DELIVER TO HEALTH PHYSICS *
****

05-apr-2002 08:04:00

Total Effective Dose Equivalent - 10CFR20 Listing

STATION: ZION STATION
UNIT: 1
PERIOD: 01/01/01 12/31/01
NAME: ZIRNHELT
REPORT: ANNUAL
MODE: ACTUAL

For ADULT dose calculations, the included pathways are:
INHALATION
MILK
PRODUCE
VEGETABLES
MEAT
GROUND DEPOSITION
FISH
WATER
SKYSHINE
WHOLE BODY

Airborne Effluents are complete from 01/01/01 to 12/31/01
Aquatic Effluents are complete from 01/01/01 to 12/31/01
Skyshine entries are complete from to

ZION STATION UNIT ONE

10 CFR 20 COMPLIANCE ASSESSMENT

PERIOD OF ASSESSMENT 01/01/01 TO 12/31/01

CALCULATED 04/05/02

1. 10 CFR 20.1301 (a)(1) Compliance

Total Effective Dose Eqivalent,	mrem/yr	2.60E-03
10 CFR 20.1301 (a)(1) limit	mrem/yr	100.0
	% of limit	0.00

Compliance Summary - 10CFR20

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	% of Limit
TEDE	2.79E-04	6.92E-04	9.68E-04	6.64E-04	0.00

RESULTS BASED UPON: ODCM ANNEX REVISION 1.1 OCTOBER 1997
ODCM SOFTWARE VERSION 1.1 January 1995
ODCM DATABASE VERSION 1.1 January 1995

ZION STATION UNIT ONE

10 CFR 20 COMPLIANCE ASSESSMENT

PERIOD OF ASSESSMENT 01/01/01 TO 12/31/01

CALCULATED 04/05/02

2. 10 CFR 20.1301 (d)/40 CFR 190 Compliance

		Dose (mrem)	Limit (mrem)	% of Limit
Whole Body (DDE)	Plume	4.17E-13		
	Skyshine	0.00E+00		
	Ground	4.97E-04		
	Total	4.97E-04	25.0	0.00
Organ Dose (CDE)	Thyroid	1.85E-03	75.0	0.00
	Gonads	2.14E-03	25.0	0.01
	Breast	1.85E-03	25.0	0.01
	Lung	1.88E-03	25.0	0.01
	Marrow	1.97E-03	25.0	0.01
	Bone	1.86E-03	25.0	0.01
	Remainder	2.40E-03	25.0	0.01
	CEDE	2.11E-03		
	TEDE	2.60E-03	100.0	0.00

RESULTS BASED UPON: ODCM ANNEX REVISION 1.1 OCTOBER 1997
ODCM SOFTWARE VERSION 1.1 January 1995
ODCM DATABASE VERSION 1.1 January 1995

****
* DELIVER TO HEALTH PHYSICS *
****

05-apr-2002 08:07:34

Total Effective Dose Equivalent - 10CFR20 Listing

STATION: ZION STATION
UNIT: 2
PERIOD: 01/01/01 12/31/01
NAME: ZIRNHELT
REPORT: ANNUAL
MODE: ACTUAL

For ADULT dose calculations, the included pathways are:
INHALATION
MILK
PRODUCE
VEGETABLES
MEAT
GROUND DEPOSITION
FISH
WATER
SKYSHINE
WHOLE BODY

Airborne Effluents are complete from 01/01/01 to 12/31/01
Aquatic Effluents are complete from 01/01/01 to 12/31/01
Skyshine entries are complete from to

ZION STATION UNIT TWO

10 CFR 20 COMPLIANCE ASSESSMENT

PERIOD OF ASSESSMENT 01/01/01 TO 12/31/01

CALCULATED 04/05/02

1. 10 CFR 20.1301 (a)(1) Compliance

Total Effective Dose Eqivalent,	mrem/yr	1.21E-05
10 CFR 20.1301 (a)(1) limit	mrem/yr	100.0
	% of limit	0.00

Compliance Summary - 10CFR20

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	% of Limit
TEDE	1.21E-05	2.13E-09	4.17E-13	0.00E+00	0.00

RESULTS BASED UPON: ODCM ANNEX REVISION 1.1 OCTOBER 1997
ODCM SOFTWARE VERSION 1.1 January 1995
ODCM DATABASE VERSION 1.1 January 1995

ZION STATION UNIT TWO

10 CFR 20 COMPLIANCE ASSESSMENT

PERIOD OF ASSESSMENT 01/01/01 TO 12/31/01

CALCULATED 04/05/02

2. 10 CFR 20.1301 (d)/40 CFR 190 Compliance

		Dose (mrem)	Limit (mrem)	% of Limit
Whole Body (DDE)	Plume	4.17E-13		
	Skyshine	0.00E+00		
	Ground	1.18E-05		
	Total	1.18E-05	25.0	0.00
Organ Dose (CDE)	Thyroid	6.92E-08	75.0	0.00
	Gonads	2.34E-08	25.0	0.00
	Breast	7.85E-08	25.0	0.00
	Lung	1.43E-06	25.0	0.00
	Marrow	7.39E-08	25.0	0.00
	Bone	5.94E-08	25.0	0.00
	Remainder	1.54E-07	25.0	0.00
	CEDE	2.48E-07		
	TEDE	1.21E-05	100.0	0.00

RESULTS BASED UPON: ODCM ANNEX REVISION 1.1 OCTOBER 1997
ODCM SOFTWARE VERSION 1.1 January 1995
ODCM DATABASE VERSION 1.1 January 1995

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
DOSE TO PUBLIC
UNIT 1 (Docket Number 50-295)

INFANT RECEPTOR

A. Airborne

		Maximum Quarterly Dose (mrad, mrem)				Yearly Limit 10CFR50 Appendix I	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
	Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr			
Gamma Air	5.0 mrad	0.00E+00	0.00E+00	5.55E-13	0.00E+00	10.0 mrad	**5.55E-13**	**0.00%**
Beta Air	10.0 mrad	0.00E+00	0.00E+00	2.52E-10	0.00E+00	20.0 mrad	**2.52E-10**	**0.00%**
Total Body	2.5 mrem	0.00E+00	0.00E+00	4.17E-13	0.00E+00	5.0 mrem	**4.17E-13**	**0.00%**
Skin	7.5 mrem	0.00E+00	0.00E+00	1.74E-10	0.00E+00	15.0 mrem	**1.74E-10**	**0.00%**
Organ	7.5 mrem	7.38E-05	1.74E-04	0.00E+00	2.56E-04	15.0 mrem	**5.04E-04**	**0.00%**
Critical Organ		Liver	Lung		Lung		**Liver**	

B. Aquatic

Total Body	1.5 mrem	1.74E-05	2.05E-04	3.85E-04	1.71E-04	3.0 mrem	**7.78E-04**	**0.03%**
Internal Organ	5.0 mrem	1.78E-04	2.52E-03	4.44E-03	1.23E-03	10.0 mrem	**8.37E-03**	**0.08%**
Critical Organ		Liver	Liver	Liver	Liver		**Liver**	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
DOSE TO PUBLIC
UNIT 1 (Docket Number 50-295)

CHILD RECEPTOR

A. Airborne

		Maximum Quarterly Dose (mrad, mrem)				Yearly Limit 10CFR50 Appendix I	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
	Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr			
Gamma Air	5.0 mrad	0.00E+00	0.00E+00	5.55E-13	0.00E+00	10.0 mrad	**5.55E-13**	**0.00%**
Beta Air	10.0 mrad	0.00E+00	0.00E+00	2.52E-10	0.00E+00	20.0 mrad	**2.52E-10**	**0.00%**
Total Body	2.5 mrem	0.00E+00	0.00E+00	4.17E-13	0.00E+00	5.0 mrem	**4.17E-13**	**0.00%**
Skin	7.5 mrem	0.00E+00	0.00E+00	1.74E-10	0.00E+00	15.0 mrem	**1.74E-10**	**0.00%**
Organ	7.5 mrem	7.36E-05	2.38E-04	0.00E+00	2.58E-04	15.0 mrem	**5.70E-04**	**0.00%**
Critical Organ		Bone	Bone	Liver	Lung		**Bone**	

B. Aquatic

Total Body	1.5 mrem	7.55E-05	3.24E-04	5.92E-04	2.23E-04	3.0 mrem	**1.21E-03**	**0.04%**
Internal Organ	5.0 mrem	4.90E-04	2.07E-03	3.65E-03	9.85E-04	10.0 mrem	**7.20E-03**	**0.07%**
Critical Organ		Bone	Bone	Bone	Bone		**Bone**	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
DOSE TO PUBLIC
UNIT 1 (Docket Number 50-295)

TEENAGE RECEPTOR

A. Airborne

		Maximum Quarterly Dose (mrad, mrem)				Yearly Limit 10CFR50 Appendix I	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
	Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr			
Gamma Air	5.0 mrad	0.00E+00	0.00E+00	5.56E-13	0.00E+00	10.0 mrad	**5.56E-13**	**0.00%**
Beta Air	10.0 mrad	0.00E+00	0.00E+00	2.52E-10	0.00E+00	20.0 mrad	**2.52E-10**	**0.00%**
Total Body	2.5 mrem	0.00E+00	0.00E+00	4.17E-13	0.00E+00	5.0 mrem	**4.17E-13**	**0.00%**
Skin	7.5 mrem	0.00E+00	0.00E+00	1.74E-10	0.00E+00	15.0 mrem	**1.74E-10**	**0.00%**
Organ	7.5 mrem	7.34E-05	2.09E-04	0.00E+00	2.59E-04	15.0 mrem	**5.41E-04**	**0.00%**
Critical Organ		Liver	Liver		Lung		**Liver**	

B. Aquatic

Total Body	1.5 mrem	1.54E-04	3.57E-04	6.35E-04	1.97E-04	3.0 mrem	**1.34E-03**	**0.04%**
Internal Organ	5.0 mrem	4.33E-04	9.93E-04	1.74E-03	4.83E-04	10.0 mrem	**3.65E-03**	**0.04%**
Critical Organ		Liver	Live4r	Liver	Liver		**Liver**	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
DOSE TO PUBLIC
UNIT 1 (Docket Number 50-295)

ADULT RECEPTOR

A. Airborne

		Maximum Quarterly Dose (mrad, mrem)				Yearly Limit 10CFR50 Appendix I	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
	Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr			
Gamma Air	5.0 mrad	0.00E+00	0.00E+00	5.55E-13	0.00E+00	10.0 mrad	**5.55E-13**	**0.00%**
Beta Air	10.0 mrad	0.00E+00	0.00E+00	2.52E-10	0.00E+00	20.0 mrad	**2.52E-10**	**0.00%**
Total Body	2.5 mrem	0.00E+00	0.00E+00	4.17E-13	0.00E+00	5.0 mrem	**4.17E-13**	**0.00%**
Skin	7.5 mrem	0.00E+00	0.00E+00	1.74E-10	0.00E+00	15.0 mrem	**1.74E-10**	**0.00%**
Organ	7.5 mrem	7.32E-05	1.96E-04	0.00E+00	2.57E-04	15.0 mrem	**5.26E-04**	**0.00%**
Critical Organ		Liver	Liver		Lung		**Liver**	

B. Aquatic

Total Body	1.5 mrem	2.83E-04	6.92E-04	1.22E-03	3.58E-04	3.0 mrem	**2.55E-03**	**0.09%**
Internal Organ	5.0 mrem	4.28E-04	1.04E-03	1.82E-03	5.07E-04	10.0 mrem	**3.80E-03**	**0.04%**
Critical Organ		Liver	Liver	Liver	Liver		**Liver**	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
DOSE TO PUBLIC
UNIT 2 (Docket Number 50-304)

INFANT RECEPTOR

A. Airborne

		Maximum Quarterly Dose (mrad, mrem)				Yearly Limit 10CFR50 Appendix I	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
	Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr			
Gamma Air	5.0 mrad	0.00E+00	0.00E+00	5.55E-13	0.00E+00	10.0 mrad	**5.55E-13**	**0.00%**
Beta Air	10.0 mrad	0.00E+00	0.00E+00	2.52E-10	0.00E+00	20.0 mrad	**2.52E-10**	**0.00%**
Total Body	2.5 mrem	0.00E+00	0.00E+00	4.17E-13	0.00E+00	5.0 mrem	**4.17E-13**	**0.00%**
Skin	7.5 mrem	0.00E+00	0.00E+00	1.74E-10	0.00E+00	15.0 mrem	**1.74E-10**	**0.00%**
Organ	7.5 mrem	1.24E-05	1.11E-08	0.00E+00	0.00E+00	15.0 mrem	**1.24E-05**	**0.00%**
Critical Organ		Lung	Lung				**Lung**	

B. Aquatic

Total Body	1.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.0 mrem	**0.00E+00**	**0.00%**
Internal Organ	5.0 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00	10.0 mrem	**0.00E+00**	**0.00%**
Critical Organ		N/A	N/A	N/A	N/A		**N/A**	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
DOSE TO PUBLIC
UNIT 2 (Docket Number 50-304)

CHILD RECEPTOR

A. Airborne

		Maximum Quarterly Dose (mrad, mrem)				Yearly Limit 10CFR50 Appendix I	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
	Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr			
Gamma Air	5.0 mrad	0.00E+00	0.00E+00	5.55E-13	0.00E+00	10.0 mrad	**5.55E-13**	**0.00%**
Beta Air	10.0 mrad	0.00E+00	0.00E+00	2.52E-10	0.00E+00	20.0 mrad	**2.52E-10**	**0.00%**
Total Body	2.5 mrem	0.00E+00	0.00E+00	4.17E-13	0.00E+00	5.0 mrem	**4.17E-13**	**0.00%**
Skin	7.5 mrem	0.00E+00	0.00E+00	1.74E-10	0.00E+00	15.0 mrem	**1.74E-10**	**0.00%**
Organ	7.5 mrem	1.28E-05	1.40E-08	0.00E+00	0.00E+00	15.0 mrem	**1.28E-05**	**0.00%**
Critical Organ		Lung	Liver				**Lung**	

B. Aquatic

Total Body	1.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.0 mrem	**0.00E+00**	**0.00%**
Internal Organ	5.0 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00	10.0 mrem	**0.00E+00**	**0.00%**
Critical Organ		N/A	N/A	N/A	N/A		**N/A**	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
DOSE TO PUBLIC
UNIT 2 (Docket Number 50-304)

TEENAGE RECEPTOR

A. Airborne

		Maximum Quarterly Dose (mrad, mrem)				Yearly Limit 10CFR50 Appendix I	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
	Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr			
Gamma Air	5.0 mrad	0.00E+00	0.00E+00	5.55E-13	0.00E+00	10.0 mrad	**5.55E-13**	**0.00%**
Beta Air	10.0 mrad	0.00E+00	0.00E+00	2.52E-10	0.00E+00	20.0 mrad	**2.52E-10**	**0.00%**
Total Body	2.5 mrem	0.00E+00	0.00E+00	4.17E-13	0.00E+00	5.0 mrem	**4.17E-13**	**0.00%**
Skin	7.5 mrem	0.00E+00	0.00E+00	1.74E-10	0.00E+00	15.0 mrem	**1.74E-10**	**0.00%**
Organ	7.5 mrem	1.30E-05	1.69E-08	0.00E+00	0.00E+00	15.0 mrem	**1.30E-05**	**0.00%**
Critical Organ		Lung	Lung				**Lung**	

B. Aquatic

Total Body	1.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.0 mrem	**0.00E+00**	**0.00%**
Internal Organ	5.0 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00	10.0 mrem	**0.00E+00**	**0.00%**
Critical Organ		N/A	N/A	N/A	N/A		**N/A**	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
DOSE TO PUBLIC
UNIT 2 (Docket Number 50-304)

ADULT RECEPTOR

A. Airborne

		Maximum Quarterly Dose (mrad, mrem)				Yearly Limit 10CFR50 Appendix I	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
	Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr			
Gamma Air	5.0 mrad	0.00E+00	0.00E+00	5.55E-13	0.00E+00	10.0 mrad	**5.55E-13**	**0.00%**
Beta Air	10.0 mrad	0.00E+00	0.00E+00	2.52E-10	0.00E+00	20.0 mrad	**2.52E-10**	**0.00%**
Total Body	2.5 mrem	0.00E+00	0.00E+00	4.17E-13	0.00E+00	5.0 mrem	**4.17E-13**	**0.00%**
Skin	7.5 mrem	0.00E+00	0.00E+00	1.74E-10	0.00E+00	15.0 mrem	**1.74E-10**	**0.00%**
Organ	7.5 mrem	1.26E-05	1.16E-08	0.00E+00	0.00E+00	15.0 mrem	**1.26E-05**	**0.00%**
Critical Organ		Lung	Lung				**Lung**	

B. Aquatic

Total Body	1.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.0 mrem	**0.00E+00**	**0.00%**
Internal Organ	5.0 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00	10.0 mrem	**0.00E+00**	**0.00%**
Critical Organ		N/A	N/A	N/A	N/A		**N/A**	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 1 (Docket Number 50-295)
SUMMATION OF ALL RELEASES

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Gases																		
1. Total Release Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	4.07E-07	<LLD	<LLD	**4.07E-07**	<LLD	<LLD	<LLD	**<LLD**	**4.07E-07**
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	1.52E-07	<LLD	<LLD	**5.12E-08**	<LLD	<LLD	<LLD	**<LLD**	**1.29E-08**
B. Iodine																		
1. Total I-131 Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**0.00E+00**
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**0.00E+00**
C. Particulates (half-lives > 8 days)																		
1. Total Release Activity‡	Ci	1.81E-06	<LLD	<LLD	**1.81E-06**	1.77E-06	2.46E-06	<LLD	**4.23E-06**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	6.86E-06	**6.86E-06**	**1.29E-05**
2. Average Release Rate	uCi/sec	6.75E-07	<LLD	<LLD	**2.33E-07**	6.83E-07	9.18E-07	<LLD	**5.38E-07**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	2.56E-06	**8.63E-07**	**4.10E-07**
3. Gross Alpha Activity‡	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
D. Tritium																		
1. Total Release Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**0.00E+00**
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**0.00E+00**
E. Sum of Iodine, Particulate (half-lives > 8 days), and Tritium Releases.																		
1. Total Release Activity	Ci	1.81E-06	0.00E+00	0.00E+00	**1.81E-06**	1.77E-06	2.46E-06	0.00E+00	**4.23E-06**	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	0.00E+00	6.86E-06	**6.86E-06**	**1.29E-05**

‡ Gross Alpha, Sr-89, and Sr-90 Activities are quantified by quarterly composite analyses. The difference between the quarterly Particulates total and the sum of the totals of the three corresponding months equals the total quarterly activities of Sr-89 and Sr-90. The cells for monthly activity values of Gross Alpha on this page and Sr-89 and Sr-90 on the Batch and Continuous Mode data sheets are blank because monthly values are not applicable.

Lower limit of detection (LLD) values are presented in the Gaseous Effluents LLD Values for Gaseous Releases section. The abbreviation "<LLD" indicates the activity concentration of the radionuclide for each individual sample analyzed during the applicable period was less than the LLD value for that nuclide. If the abbreviation "<LLD" is listed for a group of radionuclides, the activity concentration of each radionuclide for each sample during the period was less than the LLD value for the respective radionuclide.

Percent of technical specification limit information is presented in the Gaseous Effluents Supplemental Information and Dose to Public sections of this report.

The abbreviation "No Rel" indicates that no batch releases were performed during the applicable period.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 1 (Docket Number 50-295)
BATCH MODE

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Gases																		
Ar-41	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Kr-85	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Kr-85m	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Kr-87	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Kr-88	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-131	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-131m	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-133	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-133m	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-135	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-135m	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-138	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
B. Iodines																		
Br-82	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-131	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-132	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-133	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-134	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-135	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
C. Particulates																		
Na-24	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Cr-51*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Mn-54*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Co-57*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Co-58*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Co-60*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Zn-65*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Se-75*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Rb-88	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Sr-89*	Ci				No Rel				No Rel				No Rel				No Rel	<LLD
Sr-90*	Ci				No Rel				No Rel				No Rel				No Rel	<LLD
Zr-95*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Nb-95*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Mo-99	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Tc-99m	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Ru-103*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Ag-110m*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Cs-134*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Cs-136*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Cs-137*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Cs-138	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Ba-140*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
La-140	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Ce-144*	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Pr-144	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
W-187	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
D. Tritium																		
1. Total Release Activity	Ci	<LLD	<LLD	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD

* Particulate isotope with half-life greater than 8 days.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 1 (Docket Number 50-295)
CONTINUOUS MODE

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Gases																		
Ar-41	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Kr-85	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	4.07E-07	<LLD	<LLD	**4.07E-07**	<LLD	<LLD	<LLD	**<LLD**	**4.07E-07**
Kr-85m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Kr-87	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Kr-88	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-131	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-131m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-135m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-138	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
B. Iodines																		
Br-82	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-131	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-132	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-134	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
C. Particulates																		
Na-24	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cr-51*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Mn-54*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-57*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-58*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-60*	Ci	1.28E-07	<LLD	<LLD	**1.28E-07**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	2.14E-06	**2.14E-06**	**2.27E-06**
Zn-65*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Se-75*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Rb-88	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sr-89*	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Sr-90*	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Zr-95*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Nb-95*	Ci	<LLD	<LLD	<LLD	**<LLD**	6.65E-08	<LLD	<LLD	**6.65E-08**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**6.65E-08**
Mo-99	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Tc-99m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ru-103*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ag-110m*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-134*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-136*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-137*	Ci	1.68E-06	<LLD	<LLD	**1.68E-06**	1.70E-06	2.46E-06	<LLD	**4.16E-06**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	4.72E-06	**4.72E-06**	**1.06E-05**
Cs-138	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ba-140*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
La-140	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ce-144*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Pr-144	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
W-187	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
D. Tritium																		
1. Total Release Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**

* Particulate isotope with half-life greater than 8 days.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 2 (Docket Number 50-304)
SUMMATION OF ALL RELEASES

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Gases																		
1. Total Release Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	4.07E-07	<LLD	<LLD	**4.07E-07**	<LLD	<LLD	<LLD	**<LLD**	**4.07E-07**
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	1.52E-07	<LLD	<LLD	**5.12E-08**	<LLD	<LLD	<LLD	**<LLD**	**1.29E-08**
B. Iodine																		
1. Total I-131 Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**0.00E+00**
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**0.00E+00**
C. Particulates (half-lives > 8 days)																		
1. Total Release Activity‡	Ci	1.28E-07	<LLD	3.17E-07	**4.45E-07**	6.65E-08	4.54E-06	<LLD	**4.61E-06**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**5.06E-06**
2. Average Release Rate	uCi/sec	4.78E-08	<LLD	1.18E-07	**5.72E-08**	2.57E-08	1.69E-06	<LLD	**5.87E-07**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**1.61E-07**
3. Gross Alpha Activity‡	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
D. Tritium																		
1. Total Release Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**0.00E+00**
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**0.00E+00**
E. Sum of Iodine, Particulate (half-lives > 8 days), and Tritium Releases.																		
1. Total Release Activity	Ci	1.28E-07	0.00E+00	3.17E-07	**4.45E-07**	6.65E-08	4.54E-06	0.00E+00	**4.61E-06**	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	**5.06E-06**

‡ Gross Alpha, Sr-89, and Sr-90 Activities are quantified by quarterly composite analyses. The difference between the quarterly Particulates total and the sum of the totals of the three corresponding months equals the total quarterly activities of Sr-89 and Sr-90. The cells for monthly activity values of Gross Alpha on this page and Sr-89 and Sr-90 on the Batch and Continuous Mode data sheets are blank because monthly values are not applicable.

Lower limit of detection (LLD) values are presented in the Gaseous Effluents LLD Values for Gaseous Releases section. The abbreviation "<LLD" indicates the activity concentration of the radionuclide for each individual sample analyzed during the applicable period was less than the LLD value for that nuclide. If the abbreviation "<LLD" is listed for a group of radionuclides, the activity concentration of each radionuclide for each sample during the period was less than the LLD value for the respective radionuclide.

Percent of technical specification limit information is presented in the Gaseous Effluents Supplemental Information and Dose to Public sections of this report.

The abbreviation "No Rel" indicates that no batch releases were performed during the applicable period.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFL[illegible]T RELEASE REPORT FOR 2001
GASEOUS EFFLUENTS - ALL[illegible]ASES ARE AT GROUND LEVEL
UNIT 2 (Docket Number 50-304)
BATCH MODE

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Gases																		
Ar-41	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Kr-85	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Kr-85m	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Kr-87	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Kr-88	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Xe-131	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Xe-131m	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Xe-133	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Xe-133m	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Xe-135	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Xe-135m	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Xe-138	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
B. Iodines																		
Br-82	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
I-131	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
I-132	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
I-133	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
I-134	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
I-135	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
C. Particulates																		
Na-24	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Cr-51*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Mn-54*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Co-57*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Co-58*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Co-60*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Zn-65*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Se-75*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Rb-88	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Sr-89*	Ci	No Rel			**No Rel**				**No Rel**				**No Rel**				**No Rel**	<LLD
Sr-90*	Ci	No Rel			**No Rel**				**No Rel**				**No Rel**				**No Rel**	<LLD
Zr-95*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Nb-95*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Mo-99	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Tc-99m	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Ru-103*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Ag-110m*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Cs-134*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Cs-136*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Cs-137*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Cs-138	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Ba-140*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
La-140	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Ce-144*	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
Pr-144	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
W-187	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD
D. Tritium																		
1. Total Release Activity	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	<LLD

* Particulate isotope with half-life greater than 8 days.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 2 (Docket Number 50-304)
CONTINUOUS MODE

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Gases																		
Ar-41	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Kr-85	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	4.07E-07	<LLD	<LLD	**4.07E-07**	<LLD	<LLD	<LLD	**<LLD**	**4.07E-07**
Kr-85m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Kr-87	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Kr-88	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-131	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-131m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-135m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-138	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
B. Iodines																		
Br-82	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-131	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-132	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-134	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
C. Particulates																		
Na-24	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cr-51*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Mn-54*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-57*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-58*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-60*	Ci	1.28E-07	<LLD	3.17E-07	**4.45E-07**	<LLD	3.38E-06	<LLD	**3.38E-06**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**3.83E-06**
Zn-65*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Se-75*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Rb-88	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sr-89*	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Sr-90*	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Zr-95*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Nb-95*	Ci	<LLD	<LLD	<LLD	**<LLD**	6.65E-08	<LLD	<LLD	**6.65E-08**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**6.65E-08**
Mo-99	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Tc-99m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ru-103*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ag-110m*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-134*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-136*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-137*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	1.16E-06	<LLD	**1.16E-06**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**1.16E-06**
Cs-138	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ba-140*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
La-140	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ce-144*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Pr-144	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
W-187	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
D. Tritium																		
1. Total Release Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**

* Particulate isotope with half-life greater than 8 days.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)
SUMMATION OF ALL RELEASES

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Gases																		
1. Total Release Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	8.14E-07	<LLD	<LLD	**8.14E-07**	<LLD	<LLD	<LLD	**<LLD**	**8.14E-07**
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	3.04E-07	<LLD	<LLD	**1.02E-07**	<LLD	<LLD	<LLD	**<LLD**	**2.58E-08**
B. Iodine																		
1. Total I-131 Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**0.00E+00**
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**0.00E+00**
C. Particulates (half-life > 8 days)																		
1. Total Release Activity‡	Ci	1.94E-06	<LLD	3.17E-07	**2.26E-06**	1.83E-06	<LLD	<LLD	**1.83E-06**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	6.86E-06	**6.86E-06**	**1.10E-05**
2. Average Release Rate	uCi/sec	7.24E-07	<LLD	1.18E-07	**2.90E-07**	7.07E-07	<LLD	<LLD	**2.33E-07**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	2.56E-06	**8.63E-07**	**3.49E-07**
3. Gross Alpha Activity‡	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
D. Tritium																		
1. Total Release Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**0.00E+00**
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**0.00E+00**
E. Sum of Iodine, Particulate (half-lives > 8 days), and Tritium Releases.																		
1. Total Release Activity	Ci	1.94E-06	0.00E+00	3.17E-07	**2.26E-06**	1.83E-06	0.00E+00	0.00E+00	**1.83E-06**	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	0.00E+00	6.86E-06	**6.86E-06**	**1.10E-05**

‡ Gross Alpha, Sr-89, and Sr-90 Activities are quantified by quarterly composite analyses. The difference between the quarterly Particulates total and the sum of the totals of the three corresponding months equals the total quarterly activities of Sr-89 and Sr-90. The cells for monthly activity values of Gross Alpha on this page and Sr-89 and Sr-90 on the Batch and Continuous Mode data sheets are blank because monthly values are not applicable.

Lower limit of detection (LLD) values are presented in the Gaseous Effluents LLD Values for Gaseous Releases section. The abbreviation "<LLD" indicates the activity concentration of the radionuclide for each individual sample analyzed during the applicable period was less than the LLD value for that nuclide. If the abbreviation "<LLD" is listed for a group of radionuclides, the activity concentration of each radionuclide for each sample during the period was less than the LLD value for the respective radionuclide.

Percent of technical specification limit information is presented in the Gaseous Effluents Supplemental Information and Dose to Public sections of this report.

The abbreviation "No Rel" indicates that no batch releases were performed during the applicable period.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)
BATCH MODE

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Gases																		
Ar-41	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Kr-85	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Kr-85m	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Kr-87	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Kr-88	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Xe-131	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Xe-131m	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Xe-133	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Xe-133m	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Xe-135	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Xe-135m	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Xe-138	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
B. Iodines																		
Br-82	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
I-131	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
I-132	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
I-133	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
I-134	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
I-135	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
C. Particulates																		
Na-24	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Cr-51*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Mn-54*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Co-57*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Co-58*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Co-60*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Zn-65*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Se-75*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Rb-88	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Sr-89*	Ci				No Rel				No Rel				No Rel				No Rel	<LLD
Sr-90*	Ci				No Rel				No Rel				No Rel				No Rel	<LLD
Zr-95*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Nb-95*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Tc-99m	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Ru-103*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Ag-110m*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Cs-134*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Cs-136*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Cs-137*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Cs-138	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Ba-140*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
La-140	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Ce-144*	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
Pr-144	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
W-187	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD
D. Tritium																		
1. Total Release Activity	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	No Rel	<LLD	No Rel	No Rel	<LLD

* Particulate isotope with half-life greater than 8 days.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFL[illegible]T RELEASE REPORT FOR 2001
GASEOUS EFFLUENTS - ALL[illegible]ASES ARE AT GROUND LEVEL
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)
CONTINUOUS MODE

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Gases																		
Ar-41	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Kr-85	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	8.14E-07	<LLD	<LLD	**8.14E-07**	<LLD	<LLD	<LLD	**<LLD**	**8.14E-07**
Kr-85m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Kr-87	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Kr-88	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-131	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-131m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-135m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-138	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
B. Iodines																		
Br-82	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-131	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-132	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-134	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
C. Particulates																		
Na-24	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cr-51*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Mn-54*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-57*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-58*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-60*	Ci	2.56E-07	<LLD	3.17E-07	**5.73E-07**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	2.14E-06	**2.14E-06**	**2.71E-06**
Zn-65*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Se-75*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Rb-88	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sr-89*	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Sr-90*	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Zr-95*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Nb-95*	Ci	<LLD	<LLD	<LLD	**<LLD**	1.33E-07	<LLD	<LLD	**1.33E-07**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**1.33E-07**
Mo-99	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Tc-99m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ru-103*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ag-110m*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-134*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-136*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-137*	Ci	1.68E-06	<LLD	<LLD	**1.68E-06**	1.70E-06	<LLD	<LLD	**1.70E-06**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	4.72E-06	**4.72E-06**	**8.10E-06**
Cs-138	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ba-140*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
La-140	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ce-144*	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Pr-144	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
W-187	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
D. Tritium																		
1. Total Release Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**

* Particulate isotope with half-life greater than 8 days.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 1 (Docket Number 50-295)

GASEOUS EFFLUENTS
SUPPLEMENTAL INFORMATION

1. Regulatory Limits

   See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

2. Maximum Permissible Concentrations

   See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

3. Average Energy

   See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

4. Measurements and Approximations of Total Radioactivity

   See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

5. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	2001
a. Total Number of Batch Releases	0	0	0	0	**0**
b. Total Time Period for Batch Releases (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
c. Maximum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
d. Average Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**#DIV/0!**
e. Minimum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

6. Abnormal Releases					
a. Number of Releases	0	0	0	0	**0**
b. Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 2 (Docket Number 50-304)

GASEOUS EFFLUENTS
SUPPLEMENTAL INFORMATION

1. Regulatory Limits

   See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

2. Maximum Permissible Concentrations

   See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

3. Average Energy

   See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

4. Measurements and Approximations of Total Radioactivity

   See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

5. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	**2001**
a. Total Number of Batch Releases	0	0	0	0	**0**
b. Total Time Period for Batch Releases (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
c. Maximum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
d. Average Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
e. Minimum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
6. Abnormal Releases					
a. Number of Releases	0	0	0	0	**0**
b. Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

GASEOUS EFFLUENTS
SUPPLEMENTAL INFORMATION

1. Regulatory Limits

The calculated annual total quantity of all radioactive material above background released from each unit at Zion Station to the atmosphere is limited by off-site dose restrictions stated in the station technical specifications, Off-site Dose Calculation Manual (ODCM), and 10CFR50 Appendix I. The off-site dose limits per reactor unit are listed below.

	Quarterly (mrem)	Yearly (mrem)
Gamma Air	5	10
Beta Air	10	20
Total Body	2.5	5
Skin	7.5	15
Organ	7.5	15

2. Maximum Permissible Concentrations

Zion Station gaseous effluent release-rate limits were not calculated using maximum permissible concentrations of activity. Gaseous effluent activity release rates are limited by off-site dose-rate restrictions stated in station technical specifications and the ODCM. The release-rate limits were determined by using the ODCM computer code to calculate release rates which would produce a specified instantaneous dose rate at the site boundary. The off-site dose-rate limits are listed below.

Noble Gases	500	mrem/year Total Body
Noble Gases	3000	mrem/year Skin
I-131, I-133, H-3, and particulates with half-lives greater than 8 days	1500	mrem/year Organ

3. Average Energy

There was very little noble gas releases during 2001. Due to permanent cessation of operation and radioactive decay, the only gas available for release is Kr-85 present in spent fuel rods.

Isotope	Percent of Effluent
Kr-85	100

Average Gamma Energy per Decay of the Mixture (keV)	5.0
Average Beta Energy per Decay of the Mixture (keV)	269.0

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

GASEOUS EFFLUENTS
SUPPLEMENTAL INFORMATION

4. Measurements and Approximations of Total Radioactivity

a.	Fission and Activation Gases	Gamma Spectroscopy
b.	Iodines	Gamma Spectroscopy
c.	Particulates	Gamma Spectroscopy, Liquid Scintillation Gas Flow Proportional Counting
d.	Tritium	Liquid Scintillation

Composite sample analyses for gross alpha, Sr-89, and Sr-90 are performed by off-site vendor.

5. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	**2001**
a. Total Number of Batch Releases	0	0	0	0	**0**
b. Total Time Period for Batch Releases (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
c. Maximum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
d. Average Time Period for a Batch Release (minutes)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**
e. Minimum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

6. Abnormal Releases

a. Number of Releases	0	0	0	0	**0**
b. Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

GASEOUS EFFLUENTS
LOWER LIMIT OF DETECTION (LLD) VALUES FOR GASEOUS RELEASES

Isotope	LLD (uCi/cc)
Alpha	2.00E-12
H-3	8.09E-07
Kr-85	2.94E-07
Mn-54	9.13E-14
Co-58	1.02E-13
Co-60	7.01E-14
Zn-65	2.18E-13
Sr-89	1.10E-12
Sr-90	1.07E-12
Mo-99	8.69E-14
Cs-134	1.05E-13
Cs-137	4.62E-14
Ce-141	1.69E-13
Ce-144	6.28E-13

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

ADDENDUM

1. Offsite Dose Calculation Manual (ODCM)

   Changes to the ODCM are required by Zion Station Permanently Defueled Technical Specification 5.6.1. and ODCM Section 12.6.3 to be submitted as part of, or concurrent with, the Annual Radioactive Effluent Release Report.

   There were no changes to the ODCM during the year 2001.

2. Gaseous and Liquid Waste Treatment Systems and Process Control Program

   Zion Station ODCM Section 12.6.4 requires major changes to the Gaseous and Liquid Waste Treatment Systems to be reported in the Annual Radioactive Effluent Release Report.

   The Waste Gas Hold-up System was permanently vented. In Zion's defueled configuration this system is no longer applicable.
   In Zion's defueled configuration, the charcoal iodine removal system is no longer applicable.
   Due to radioactive decay and no means of production, radioactive iodine is not a concern at Zion.

3. Limiting Conditions of Operation (LCOs)

   Zion Station ODCM Section 12.7.2 requires explanation as to why the inoperablility of liquid or gaseous monitoring instrumentation was not corrected within the time specified in the ODCM to be submitted with the Annual Radioactive Effluent Release Report.

   During 2001 there were 3 monitors that were not returned to service within the 30 day period.

   ORTPR30A March 22, 2001
   1RIAPR49 July 3, 2001
   1LP-084 September 7, 2001

   Please refer to the attached return to service plan provided

4. Liquid Holdup Tanks and Gas Storage Tanks

   Zion Station ODCM Section 12.7.2 requires a description of events leading to liquid holdup tanks or gas storage tanks exceeding technical specification limits to be included in the Annual Radioactive Effluent Release Report.

   There was no activity present in any gas decay tanks during 2001.
   No liquid holdup tanks exceeded the limits of Permanently Defueled Technical Specifications 5.6.3. during 2001.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

ADDENDUM

5. Estimates of Total Error

The following is an estimate of the total error associated with certain total values in the Annual Radioactive Effluent Release Report. The total error is determined by calculating the square root of the sum of the squares of the individual errors.

a. Gaseous Effluents

Sampling Error	5%
Calibration Error	10%
Counting Statistics Error	17%
Sample Volume Error	10%
Total Error	23%

b. Liquid Effluents

Sampling Error	5%
Calibration Error	10%
Counting Statistics Error	16%
Sample Volume Error	2%
Total Error	20%

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
LIQUID RELEASES
UNIT 1 (Docket Numbers 50-295)
SUMMATION OF ALL RELEASES

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Products (not incl. tritium, gases, alpha)																		
1. Total Activity Released §	Ci	2.39E-02	No Rel	2.21E-02	**4.60E-02**	2.25E-03	1.11E-03	3.28E-03	**6.64E-03**	1.37E-03	3.34E-03	4.37E-03	**9.08E-03**	3.34E-03	1.36E-03	No Rel	**4.71E-03**	**6.64E-02**
2. Average Conc. Released	uCi/ml	1.70E-07	No Rel	5.25E-08	**8.20E-08**	3.03E-09	3.74E-08	8.90E-08	**8.20E-09**	7.60E-08	4.95E-08	7.67E-08	**6.37E-08**	5.53E-08	6.50E-08	No Rel	**5.78E-08**	**4.16E-08**
3. % of Value (9E-7 uCi/ml)	%	1.89E+01	No Rel	5.84E+00	**9.11E+00**	3.37E-01	4.15E+00	9.89E+00	**9.11E-01**	8.44E+00	5.50E+00	8.52E+00	**7.08E+00**	6.14E+00	7.22E+00	No Rel	**6.42E+00**	**4.63E+00**
B. Tritium																		
1. Total Activity Released	Ci	3.85E-01	No Rel	1.67E-01	**5.52E-01**	2.82E-02	1.63E-02	2.47E-02	**6.92E-02**	6.81E-03	1.65E-02	1.93E-02	**4.26E-02**	1.76E-02	6.64E-03	No Rel	**2.42E-02**	**6.88E-01**
2. Average Conc. Released	uCi/ml	2.74E-06	No Rel	3.97E-07	**9.84E-07**	3.80E-08	5.50E-07	6.71E-07	**8.55E-08**	3.77E-07	2.45E-07	3.38E-07	**2.99E-07**	2.91E-07	3.17E-07	No Rel	**2.98E-07**	**4.31E-07**
3. % of Value (1E-3 uCi/ml)	%	2.74E-01	No Rel	3.97E-02	**9.84E-02**	3.80E-03	5.50E-02	6.71E-02	**8.55E-03**	3.77E-02	2.45E-02	3.38E-02	**2.99E-02**	2.91E-02	3.17E-02	No Rel	**2.98E-02**	**4.31E-02**
C. Dissolved and Entrained Gases																		
1. Total Activity Released	Ci	<LLD	No Rel	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	No Rel	**<LLD**	**0.00E+00**
2. Average Conc. Released	uCi/ml	<LLD	No Rel	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	No Rel	**<LLD**	**0.00E+00**
3. % of Value (7E-5 uCi/ml)	%	<LLD	No Rel	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	No Rel	**<LLD**	**0.00E+00**
D. Gross Alpha																		
1. Total Activity Released	Ci	<LLD	No Rel	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	No Rel	**<LLD**	**<LLD**
2. Average Conc. Released	uCi/ml	<LLD	No Rel	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	No Rel	**<LLD**	**<LLD**
3. % of Value (2E-9 uCi/ml)	%	<LLD	No Rel	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	No Rel	**<LLD**	**#VALUE!**
E. Volume of Releases																		
1. Volume of Waste Released‡	liters	6.61E+05	0.00E+00	3.99E+05	**1.06E+06**	6.11E+04	5.40E+04	1.18E+05	**2.33E+05**	5.46E+04	1.14E+05	1.72E+05	**3.40E+05**	1.77E+05	6.14E+04	0.00E+00	**2.38E+05**	**1.87E+06**
2. Volume of Dilution Water‡	liters	1.40E+08	0.00E+00	4.20E+08	**5.60E+08**	7.43E+08	2.96E+07	3.67E+07	**8.09E+08**	1.80E+07	6.73E+07	5.69E+07	**1.42E+08**	6.03E+07	2.09E+07	0.00E+00	**8.12E+07**	**1.59E+09**

§ Fe-55, Sr-89, and Sr-90 Activities are quantified by quarterly composite analyses. Therefore, the difference between the Fission and Activation Products total quarterly activity and the sum of the total activities of the three corresponding months equals the total quarterly activities of Fe-55, Sr-89, and Sr-90. The cells for monthly activity values of Fe-55, Sr-89, and Sr-90 on the Batch and Continuous Mode data sheets are blank because monthly values are not applicable.

‡ These data include only information for batch releases from Lake Discharge Tanks.

Lower limit of detection (LLD) values are presented in the Liquid Effluents LLD Values for Liquid Releases section. The abbreviation "<LLD" indicates the activity concentration of the radionuclide for each individual sample analyzed during the applicable period was less than the LLD value for that nuclide. If the abbreviation "<LLD" is listed for a group of radionuclides, the activity concentration of each radionuclide for each sample during the period was less than the LLD value for the respective radionuclide.

The abbreviation "No Rel" indicates that no releases were performed during the applicable period.

"% of Value" means percent of concentration values in Appendix B, Table 2, Column 2 to 10CFR20. The % of Value for Fission and Activation Products and Dissolved and Entrained Gases provides a comparison of the total concentration of the group to the lowest isotopic concentration value of the particular group. The concentration of Fission and Activation Products and Dissolved and Entrained Gases are compared to the concentration limits for Cs-134 (9E-7 uCi/ml) and Ar-41 (7E-5 uCi/ml), respectively. Concentration limits for Dissolved and Entrained Gases are listed in ODCM Table 12.3-1.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
LIQUID RELEASES
UNIT 1 (Docket Numbers 50-295)
BATCH MODE

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Products																	
Na-24	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cr-51	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	,LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Mn-54	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-57	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Fe-55	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Fe-59	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-58	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-60	Ci	7.39E-03	<LLD	5.01E-03	**1.24E-02**	1.18E-03	1.92E-04	2.22E-04	**1.59E-03**	1.27E-04	3.67E-04	1.45E-03	**1.94E-03**	1.77E-03	9.58E-04	<LLD	**2.73E-03**	**1.87E-02**
Zn-65	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sr-85	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Rb-88	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sr-89	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Sr-90	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Sr-92	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Nb-95	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Zr-95	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Zr-97	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Mo-99	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Tc-99m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ru-103	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ag-110m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sn-113	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sn-117m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-122	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-124	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-125	Ci	2.14E-03	<LLD	3.29E-03	**5.43E-03**	2.85E-04	1.28E-04	1.85E-04	**5.98E-04**	7.53E-05	1.24E-04	1.51E-04	**3.50E-04**	1.77E-04	6.69E-05	<LLD	**2.44E-04**	**6.62E-03**
Sb-126	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Te-123m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Te-132	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-134	Ci	3.65E-04	<LLD	1.88E-04	**5.53E-04**	1.17E-05	1.07E-05	5.97E-05	**8.21E-05**	1.95E-05	5.58E-05	4.36E-05	**1.19E-04**	2.74E-05	<LLD	<LLD	**2.74E-05**	**7.81E-04**
Cs-137	Ci	1.40E-02	<LLD	1.36E-02	**2.76E-02**	7.75E-04	7.78E-04	2.81E-03	**4.36E-03**	1.15E-03	2.79E-03	2.73E-03	**6.67E-03**	1.37E-03	3.38E-04	<LLD	**1.71E-03**	**4.03E-02**
Cs-138	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ba-140	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
La-140	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ce-141	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ce-144	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Pr-144	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
B. Iodines																		
I-131	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-132	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-134	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
C. Tritium																		
1. Total Release Activity	Ci	3.85E-01	<LLD	1.67E-01	**5.52E-01**	2.82E-02	1.63E-02	2.47E-02	**6.92E-02**	6.81E-03	1.65E-02	1.93E-02	**4.26E-02**	1.76E-02	6.64E-03	<LLD	**2.42E-02**	**6.88E-01**
D. Dissolved and Entrained Gases																		
Ar-41	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Kr-85	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-131m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
LIQUID RELEASES
UNIT 1 (Docket Numbers 50-295)
CONTINUOUS MODE

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Products																		
Na-24	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cr-51	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Mn-54	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-57	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Fe-55	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Fe-59	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-58	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-60	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Zn-65	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sr-85	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Rb-88	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sr-89	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Sr-90	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Sr-92	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Nb-95	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Zr-95	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Zr-97	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Mo-99	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Tc-99m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ru-103	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ag-110m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sn-113	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sn-117m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-122	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-124	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-125	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-126	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Te-123m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Te-132	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-134	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-137	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-138	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ba-140	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
La-140	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ce-141	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ce-144	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Pr-144	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
B. Iodines																		
I-131	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-132	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-134	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
C. Tritium																		
1. Total Release Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
D. Dissolved and Entrained Gases																		
Ar-41	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Kr-85	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-131m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLU RELEASE REPORT FOR 2001
LIQUI EASES
UNIT 2 (Docket Numbers 50-304)
SUMMATION OF ALL RELEASES

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Products (not incl. tritium, gases, alpha)																		
1. Total Activity Released §	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	**0.00E+00**
2. Average Conc. Released	uCi/ml	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	**#DIV/0!**
3. % of Value (9E-7 uCi/ml)	%	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	**#DIV/0!**
B. Tritium																		
1. Total Activity Released	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	**0.00E+00**
2. Average Conc. Released	uCi/ml	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	**#DIV/0!**
3. % of Value (1E-3 uCi/ml)	%	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	**#DIV/0!**
C. Dissolved and Entrained Gases																		
1. Total Activity Released	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	**0.00E+00**
2. Average Conc. Released	uCi/ml	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	**#DIV/0!**
3. % of Value (7E-5 uCi/ml)	%	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	**#DIV/0!**
D. Gross Alpha																		
1. Total Activity Released	Ci	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	**<LLD**
2. Average Conc. Released	uCi/ml	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	**<LLD**
3. % of Value (2E-9 uCi/ml)	%	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	No Rel	No Rel	No Rel	**No Rel**	**#VALUE!**
E. Volume of Releases																		
1. Volume of Waste Released‡	liters	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	**0.00E+00**
2. Volume of Dilution Water‡	liters	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	**0.00E+00**

§ Fe-55, Sr-89, and Sr-90 Activities are quantified by quarterly composite analyses. Therefore, the difference between the Fission and Activation Products total quarterly activity and the sum of the total activities of the three corresponding months equals the total quarterly activities of Fe-55, Sr-89, and Sr-90. The cells for monthly activity values of Fe-55, Sr-89, and Sr-90 on the Batch and Continuous Mode data sheets are blank because monthly values are not applicable.

‡ These data include only information for batch releases from Lake Discharge Tanks.

Lower limit of detection (LLD) values are presented in the Liquid Effluents LLD Values for Liquid Releases section. The abbreviation "<LLD" indicates the activity concentration of the radionuclide for each individual sample analyzed during the applicable period was less than the LLD value for that nuclide. If the abbreviation "<LLD" is listed for a group of radionuclides, the activity concentration of each radionuclide for each sample during the period was less than the LLD value for the respective radionuclide.

The abbreviation "No Rel" indicates that no releases were performed during the applicable period.

"% of Value" means percent of concentration values in Appendix B, Table 2, Column 2 to 10CFR20. The % of Value for Fission and Activation Products and Dissolved and Entrained Gases provides a comparison of the total concentration of the group to the lowest isotopic concentration value of the particular group. The concentration of Fission and Activation Products and Dissolved and Entrained Gases are compared to the concentration limits for Cs-134 (9E-7 uCi/ml) and Ar-41 (7E-5 uCi/ml), respectively. Concentration limits for Dissolved and Entrained Gases are listed in ODCM Table 12.3-1.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
LIQUID RELEASES
UNIT 2 (Docket Numbers 50-304)
BATCH MODE

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Products																		
Na-24	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cr-51	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Mn-54	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Co-57	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Fe-55	Ci				No Rel				No Rel				No Rel				No Rel	No Rel
Fe-59	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Co-58	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Co-60	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Zn-65	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sr-85	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Rb-88	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sr-89	Ci				No Rel				No Rel				No Rel				No Rel	No Rel
Sr-90	Ci				No Rel				No Rel				No Rel				No Rel	No Rel
Sr-92	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Nb-95	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Zr-95	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Zr-97	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Mo-99	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Tc-99m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ru-103	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ag-110m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sn-113	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sn-117m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sb-122	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sb-124	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sb-125	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sb-126	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Te-123m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Te-132	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-134	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-137	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-138	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ba-140	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
La-140	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ce-141	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ce-144	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Pr-144	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
B. Iodines																		
I-131	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
I-132	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
I-133	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
I-134	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
I-135	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
C. Tritium																		
1. Total Release Activity	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
D. Dissolved and Entrained Gases																		
Ar-41	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Kr-85	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-131m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-133	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-133m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-135	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
LIQUID RELEASES
UNIT 2 (Docket Numbers 50-304)
CONTINUOUS MODE

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Products																		
Na-24	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cr-51	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Mn-54	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Co-57	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Fe-55	Ci				No Rel				No Rel				No Rel				No Rel	No Rel
Fe-59	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Co-58	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Co-60	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Zn-65	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sr-85	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Rb-88	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sr-89	Ci				No Rel				No Rel				No Rel				No Rel	No Rel
Sr-90	Ci				No Rel				No Rel				No Rel				No Rel	No Rel
Sr-92	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Nb-95	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Zr-95	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Zr-97	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Mo-99	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Tc-99m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ru-103	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ag-110m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sn-113	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sn-117m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sb-122	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sb-124	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sb-125	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sb-126	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Te-123m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Te-132	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-134	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-137	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-138	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ba-140	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
La-140	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ce-141	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ce-144	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Pr-144	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
B. Iodines																		
I-131	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
I-132	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
I-133	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
I-134	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
I-135	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
C. Tritium																		
1. Total Release Activity	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
D. Dissolved and Entrained Gases																		
Ar-41	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Kr-85	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-131m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-133	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-133m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-135	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLU[illegible] RELEASE REPORT FOR 2001
LIQUI[illegible] EASES
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)
SUMMATION OF ALL RELEASES

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Products (not incl. tritium, gases, alpha)																		
1. Total Activity Released §	Ci	2.39E-02	No Rel	2.21E-02	**4.60E-02**	2.25E-03	1.11E-03	3.28E-03	**6.64E-03**	1.37E-03	3.34E-03	4.37E-03	**9.08E-03**	3.34E-03	1.36E-03	No Rel	**4.71E-03**	**6.64E-02**
2. Average Conc. Released	uCi/ml	1.70E-07	No Rel	5.25E-08	**8.20E-08**	3.03E-09	3.74E-08	8.90E-08	**8.20E-09**	7.60E-08	4.95E-08	7.67E-08	**6.37E-08**	5.53E-08	6.50E-08	No Rel	**5.78E-08**	**4.16E-08**
3. % of Value (9E-7 uCi/ml)	%	1.89E+01	No Rel	5.84E+00	**9.11E+00**	3.37E-01	4.15E+00	9.89E+00	**9.11E-01**	8.44E+00	5.50E+00	8.52E+00	**7.08E+00**	6.14E+00	7.22E+00	No Rel	**6.42E+00**	**4.63E+00**
B. Tritium																		
1. Total Activity Released	Ci	3.85E-01	No Rel	1.67E-01	**5.52E-01**	2.82E-02	1.63E-02	2.47E-02	**6.92E-02**	6.81E-03	1.65E-02	1.93E-02	**4.26E-02**	1.76E-02	6.64E-03	No Rel	**2.42E-02**	**6.88E-01**
2. Average Conc. Released	uCi/ml	2.74E-06	No Rel	3.97E-07	**9.84E-07**	3.80E-08	5.50E-07	6.71E-07	**8.55E-08**	3.77E-07	2.45E-07	3.38E-07	**2.99E-07**	2.91E-07	3.17E-07	No Rel	**2.98E-07**	**4.31E-07**
3. % of Value (1E-3 uCi/ml)	%	2.74E-01	No Rel	3.97E-02	**9.84E-02**	3.80E-03	5.50E-02	6.71E-02	**8.55E-03**	3.77E-02	2.45E-02	3.38E-02	**2.99E-02**	2.91E-02	3.17E-02	No Rel	**2.98E-02**	**4.31E-02**
C. Dissolved and Entrained Gases																		
1. Total Activity Released	Ci	<LLD	No Rel	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	No Rel	**<LLD**	**0.00E+00**
2. Average Conc. Released	uCi/ml	<LLD	No Rel	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	No Rel	**<LLD**	**0.00E+00**
3. % of Value (7E-5 uCi/ml)	%	<LLD	No Rel	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	No Rel	**<LLD**	**0.00E+00**
D. Gross Alpha																		
1. Total Activity Released	Ci	<LLD	No Rel	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	No Rel	**<LLD**	**<LLD**
2. Average Conc. Released	uCi/ml	<LLD	No Rel	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	No Rel	**<LLD**	**<LLD**
3. % of Value (2E-9 uCi/ml)	%	<LLD	No Rel	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	No Rel	**<LLD**	**#VALUE!**
E. Volume of Releases																		
1. Volume of Waste Released‡	liters	6.61E+05	0.00E+00	3.99E+05	**1.06E+06**	6.11E+04	5.40E+04	1.18E+05	**2.33E+05**	5.46E+04	1.14E+05	1.72E+05	**3.40E+05**	1.77E+05	6.14E+04	0.00E+00	**2.38E+05**	**1.87E+06**
2. Volume of Dilution Water‡	liters	1.40E+08	0.00E+00	4.20E+08	**5.60E+08**	7.43E+08	2.96E+07	3.67E+07	**8.09E+08**	1.80E+07	6.73E+07	5.69E+07	**1.42E+08**	6.03E+07	2.09E+07	0.00E+00	**8.12E+07**	**1.59E+09**

§ Fe-55, Sr-89, and Sr-90 Activities are quantified by quarterly composite analyses. Therefore, the difference between the Fission and Activation Products total quarterly activity and the sum of the total activities of the three corresponding months equals the total quarterly activities of Fe-55, Sr-89, and Sr-90. The cells for monthly activity values of Fe-55, Sr-89, and Sr-90 on the Batch and Continuous Mode data sheets are blank because monthly values are not applicable.

‡ These data include only information for batch releases from Lake Discharge Tanks.

Lower limit of detection (LLD) values are presented in the Liquid Effluents LLD Values for Liquid Releases section. The abbreviation "<LLD" indicates the activity concentration of the radionuclide for each individual sample analyzed during the applicable period was less than the LLD value for that nuclide. If the abbreviation "<LLD" is listed for a group of radionuclides, the activity concentration of each radionuclide for each sample during the period was less than the LLD value for the respective radionuclide.

The abbreviation "No Rel" indicates that no releases were performed during the applicable period.

"% of Value" means percent of concentration values in Appendix B, Table 2, Column 2 to 10CFR20. The % of Value for Fission and Activation Products and Dissolved and Entrained Gases provides a comparison of the total concentration of the group to the lowest isotopic concentration value of the particular group. The concentration of Fission and Activation Products and Dissolved and Entrained Gases are compared to the concentration limits for Cs-134 (9E-7 uCi/ml) and Ar-41 (7E-5 uCi/ml), respectively. Concentration limits for Dissolved and Entrained Gases are listed in ODCM Table 12.3-1.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLU[illegible] RELEASE REPORT FOR 2001
LIQUI[illegible] EASES
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)
BATCH MODE

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Products																		
Na-24	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cr-51	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Mn-54	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-57	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Fe-55	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Fe-59	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-58	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-60	Ci	7.39E-03	<LLD	5.01E-03	**1.24E-02**	1.18E-03	1.92E-04	2.22E-04	**1.59E-03**	1.27E-04	3.67E-04	1.45E-03	**1.94E-03**	1.77E-03	9.58E-04	<LLD	**2.73E-03**	**1.87E-02**
Zn-65	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sr-85	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Rb-88	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sr-89	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Sr-90	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Sr-92	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Nb-95	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Zr-95	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Zr-97	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Mo-99	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Tc-99m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ru-103	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ag-110m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sn-113	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sn-117m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-122	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-124	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-125	Ci	2.14E-03	<LLD	3.29E-03	**5.43E-03**	2.85E-04	1.28E-04	1.85E-04	**5.98E-04**	7.53E-05	1.24E-04	1.51E-04	**3.50E-04**	1.77E-04	6.69E-05	<LLD	**2.44E-04**	**6.62E-03**
Sb-126	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Te-123m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Te-132	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-134	Ci	3.65E-04	<LLD	1.88E-04	**5.53E-04**	1.17E-05	1.07E-05	5.97E-05	**8.21E-05**	1.95E-05	5.58E-05	4.36E-05	**1.19E-04**	2.74E-05	<LLD	<LLD	**2.74E-05**	**7.81E-04**
Cs-137	Ci	1.40E-02	<LLD	1.36E-02	**2.76E-02**	7.75E-04	7.78E-04	2.81E-03	**4.36E-03**	1.15E-03	2.79E-03	2.73E-03	**6.67E-03**	1.37E-03	3.38E-04	<LLD	**1.71E-03**	**4.03E-02**
Cs-138	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ba-140	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
La-140	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ce-141	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ce-144	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Pr-144	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
B. Iodines																		
I-131	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-132	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-134	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
C. Tritium																		
1. Total Release Activity	Ci	3.85E-01	<LLD	1.67E-01	**5.52E-01**	2.82E-02	1.63E-02	2.47E-02	**6.92E-02**	6.81E-03	1.65E-02	1.93E-02	**4.26E-02**	1.76E-02	6.64E-03	<LLD	**2.42E-02**	**6.88E-01**
D. Dissolved and Entrained Gases																		
Ar-41	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Kr-85	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-131m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
LIQUID RELEASES
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)
CONTINUOUS MODE

	Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
A. Fission and Activation Products																		
Na-24	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cr-51	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Mn-54	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-57	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Fe-55	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Fe-59	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-58	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Co-60	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Zn-65	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sr-85	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Rb-88	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sr-89	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Sr-90	Ci				**<LLD**				**<LLD**				**<LLD**				**<LLD**	**<LLD**
Sr-92	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Nb-95	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Zr-95	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Zr-97	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Mo-99	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Tc-99m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ru-103	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ag-110m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sn-113	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sn-117m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-122	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-124	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-125	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Sb-126	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Te-123m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Te-132	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-134	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-137	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Cs-138	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ba-140	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
La-140	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ce-141	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Ce-144	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Pr-144	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
B. Iodines																		
I-131	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-132	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-134	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
I-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
C. Tritium																		
1. Total Release Activity	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
D. Dissolved and Entrained Gases																		
Ar-41	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Kr-85	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-131m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-133m	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**
Xe-135	Ci	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	<LLD	<LLD	<LLD	**<LLD**	**<LLD**

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 1 (Docket Number 50-295)

LIQUID EFFLUENTS
SUPPLEMENTAL RELEASE INFORMATION

1. Regulatory Limits

   See "Unit 1 & 2 LIQUID EFFLUENTS SUPPLEMENTAL INFORMATION"

2. Maximum Permissible Concentrations

   See "Unit 1 & 2 LIQUID EFFLUENTS SUPPLEMENTAL INFORMATION"

3. Measurements and Approximations of Total Radioactivity

   See "Unit 1 & 2 LIQUID EFFLUENTS SUPPLEMENTAL INFORMATION"

4. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	**2001**
a. Total Number of Batch Releases	10	4	6	4	**24**
b. Total Time Period for Batch Releases (minutes)	5.29E+02	7.75E+03	1.50E+04	8.58E+03	**3.19E+04**
c. Maximum Time Period for a Batch Release (minutes)	6.50E+01	3.13E+03	7.12E+03	2.21E+03	**7.12E+03**
d. Average Time Period for a Batch Release (minutes)	5.20E+01	1.94E+03	2.51E+03	2.14E+03	**1.33E+03**
e. Minimum Time Period for a Batch Release (minutes)	2.90E+01	7.18E+02	1.90E+03	2.10E+03	**2.90E+01**
f. Average Stream Flow During Periods of Release of Effluent into a Flowing Stream (liters/min)	N/A	N/A	N/A	N/A	**N/A**

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 2 (Docket Number 50-304)

LIQUID EFFLUENTS
SUPPLEMENTAL RELEASE INFORMATION

1. Regulatory Limits

   See "Unit 1 & 2 LIQUID EFFLUENTS SUPPLEMENTAL INFORMATION"

2. Maximum Permissible Concentrations

   See "Unit 1 & 2 LIQUID EFFLUENTS SUPPLEMENTAL INFORMATION"

3. Measurements and Approximations of Total Radioactivity

   See "Unit 1 & 2 LIQUID EFFLUENTS SUPPLEMENTAL INFORMATION"

4. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	2001
a. Total Number of Batch Releases	0	0	0	0	**0**
b. Total Time Period for Batch Releases (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
c. Maximum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
d. Average Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**#DIV/0!**
e. Minimum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
f. Average Stream Flow During Periods of Release of Effluent into a Flowing Stream (liters/min)	N/A	N/A	N/A	N/A	**N/A**

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

LIQUID EFFLUENTS
SUPPLEMENTAL RELEASE INFORMATION

1. Regulatory Limits

The calculated annual total quantity of all radioactive material above background released from each unit at Zion Station to unrestricted areas is limited by off-site dose restrictions stated in the station technical specifications, Off-site Dose Calculation Manual (ODCM), and 10CFR50 Appendix I. The off-site dose limits per reactor unit are listed below.

	Quarterly (mrem)	Yearly (mrem)
Total Body	1.5	3
Organ	5	10

2. Maximum Permissible Concentrations

Zion Station technical specifications limit concentrations of radioactive material released in liquid effluents to unrestricted areas to ten times the concentration values in Appendix B, Table 2, Column 2 to 10CFR20.

3. Measurements and Approximations of Total Radioactivity

a. Fission and Activation Products	Gamma Spectroscopy, Liquid Scintillation Low-energy Photon Spectroscopy (LEPS, for Fe-55)
b. Tritium	Liquid Scintillation
c. Noble Gases	Gamma Spectroscopy
d. Gross Alpha	Gas Flow Proportional Counting

Composite sample analyses for Fe-55, Sr-89, and Sr-90 are performed by off-site vendor.

4. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	**2001**
a. Total Number of Batch Releases	10	4	6	4	**24**
b. Total Time Period for Batch Releases (minutes)	5.29E+02	7.75E+03	1.50E+04	8.58E+03	**3.19E+04**
c. Maximum Time Period for a Batch Release (minutes)	6.50E+01	3.13E+03	7.12E+03	2.21E+03	**7.12E+03**
d. Average Time Period for a Batch Release (minutes)	5.29E+01	1.94E+03	2.51E+03	2.15E+03	**1.33E+03**
e. Minimum Time Period for a Batch Release (minutes)	2.90E+01	7.18E+02	1.90E+03	2.10E+03	**2.90E+01**
f. Average Stream Flow During Periods of Release of Effluent into a Flowing Stream (liters/min)	N/A	N/A	N/A	N/A	**N/A**

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

LIQUID EFFLUENTS
LOWER LIMIT OF DETECTION (LLD) VALUES FOR LIQUID RELEASES

Isotope	LLD (uCi/ml)
Alpha	1.00E-07
H-3	8.09E-07
Kr-85	4.32E-06
Mn-54	1.79E-08
Fe-55	2.08E-07
Co-58	1.24E-08
Co-60	4.95E-08
Zn-65	3.19E-08
Sr-89	8.31E-09
Sr-90	2.70E-09
Mo-99	2.19E-08
Cs-134	1.23E-08
Cs-137	2.76E-08
Ce-141	3.69E-08
Ce-144	1.42E-07

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

Radioactive Waste Shipments for 2001

Shipment Date	Shipment Number	Media	Receiver	Waste Class	Container Type	Solidification Agent	Activity (Ci)	Volume (m^3)	Volume (ft^3)
1st Quarter:									
Sub totals:	**0**						**0.0000000**	**0.000**	**0.00**
2nd Quarter:									
Sub totals:	**0**						**0.0000000**	**0.000**	**0.00**
3rd Quarter:									
08/29/2001	ZRW01-001	DAW	Duratek, Inc.	A	Six B-25 Boxes & One Seavan	None	0.0158020	40.790	1440.00
Sub totals:	**1**						**0.0158020**	**40.790**	**1440.00**
4th Quarter:									
10/03/2001	ZRW01-002	DAW	Duratek, Inc.	A	Seavan	None	0.0024917	50.980	1800.00
12/05/2001	ZRW01-003	DAW	Duratek, Inc.	A	Seavan	None	0.0003396	6.798	240.00
Sub totals:	**2**						**0.0028313**	**57.778**	**2040.00**
Totals:	**3**						**0.0186333**	**98.568**	**3480.00**

	Class A	Class B	Class C
Number of Shipments	3	0	0
Activity (Ci)	1.86E-02	0.00E+00	0.00E+00
Volume (m^3)	9.86E+01	0.00E+00	0.00E+00

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)
1. Type of waste and 2. Estimate of major nuclide composition
a. Spent resins, filter sludges, evaporator bottoms, etc.

Waste Class	Volume (m^3)	Activity (Ci)	Estim. Error in Activity
A	0.00E+00	0.00E+00	2.50E+01%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
Cs-134	0.00E+00%	0.00E+00
Cs-137	0.00E+00%	0.00E+00
Ce-144	0.00E+00%	0.00E+00
Pu-238	0.00E+00%	0.00E+00
Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

Waste Class	Volume (m^3)	Activity (Ci)	Estim. Error in Activity
B	0.00E+00	0.00E+00	2.50E+01%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
Cs-134	0.00E+00%	0.00E+00
Cs-137	0.00E+00%	0.00E+00
Ce-144	0.00E+00%	0.00E+00
Pu-238	0.00E+00%	0.00E+00
Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

Waste Class	Volume (m^3)	Activity (Ci)	Estim. Error in Activity
C	0.00E+00	0.00E+00	2.50E+01%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
Cs-134	0.00E+00%	0.00E+00
Cs-137	0.00E+00%	0.00E+00
Ce-144	0.00E+00%	0.00E+00
Pu-238	0.00E+00%	0.00E+00
Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

Waste Class	Volume (m^3)	Activity (Ci)	Estim. Error in Activity
All	0.00E+00	0.00E+00	2.50E+01%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
Cs-134	0.00E+00%	0.00E+00
Cs-137	0.00E+00%	0.00E+00
Ce-144	0.00E+00%	0.00E+00
Pu-238	0.00E+00%	0.00E+00
Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2001
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

1. Type of waste and 2. Estimate of major nuclide composition

b. Dry compressible waste, contaminated equipment, etc.

Waste Class	Volume (m^3)	Activity (Ci)	Estim. Error in Activity
A	9.86E+01	1.86E-02	2.50E+01%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	5.11E-02%	9.53E-06
C-14	1.06E+01%	1.97E-03
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	1.00E+01%	1.87E-03
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	6.37E+01%	1.19E-02
Ni-59	0.00E+00%	0.00E+00
Ni-63	1.36E+01%	2.53E-03
Sr-89	0.00E+00%	0.00E+00
Sr-90	8.91E-02%	1.66E-05
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	5.37E-04%	1.00E-07
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	4.28E-01%	7.98E-05
I-129	1.07E-03%	2.00E-07
Cs-134	1.17E-01%	2.18E-05
Cs-137	9.25E-01%	1.72E-04
Ce-144	2.04E-01%	3.81E-05
Pu-238	0.00E+00%	1.51E-06
Pu-239	3.22E-03%	6.00E-07
Pu-241	2.63E-01%	4.89E-05
Pu-242	0.00E+00%	0.00E+00
Am-241	6.44E-03%	1.20E-06
Cm-242	0.00E+00%	0.00E+00
Cm-243	5.94E-03%	1.11E-06
Zn-95	0.00E+00%	0.00E+00

Waste Class	Volume (m^3)	Activity (Ci)	Estim. Error in Activity
B	0.00E+00	0.00E+00	0.00E+00%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
Cs-134	0.00E+00%	0.00E+00
Cs-137	0.00E+00%	0.00E+00
Ce-144	0.00E+00%	0.00E+00
Pu-238	0.00E+00%	0.00E+00
Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

Waste Class	Volume (m^3)	Activity (Ci)	Estim. Error in Activity
C	0.00E+00	0.00E+00	0.00E+00%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
Cs-134	0.00E+00%	0.00E+00
Cs-137	0.00E+00%	0.00E+00
Ce-144	0.00E+00%	0.00E+00
Pu-238	0.00E+00%	0.00E+00
Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

Waste Class	Volume (m^3)	Activity (Ci)	Estim. Error in Activity
All	9.86E+01	1.86E-02	2.50E+01%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	5.11E-02%	9.53E-06
C-14	1.06E+01%	1.97E-03
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	1.00E+01%	1.87E-03
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	6.37E+01%	1.19E-02
Ni-59	0.00E+00%	0.00E+00
Ni-63	1.36E+01%	2.53E-03
Sr-89	0.00E+00%	0.00E+00
Sr-90	8.91E-02%	1.66E-05
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	5.37E-04%	1.00E-07
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	4.28E-01%	7.98E-05
I-129	1.07E-03%	2.00E-07
Cs-134	1.17E-01%	2.18E-05
Cs-137	9.25E-01%	1.72E-04
Ce-144	2.04E-01%	3.81E-05
Pu-238	8.10E-03%	1.51E-06
Pu-239	3.22E-03%	6.00E-07
Pu-241	2.63E-01%	4.89E-05
Pu-242	0.00E+00%	0.00E+00
Am-241	6.44E-03%	1.20E-06
Cm-242	0.00E+00%	0.00E+00
Cm-243	5.94E-03%	1.11E-06
Zn-95	0.00E+00%	0.00E+00

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT REPORT FOR 2001
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

1. Type of waste and 2. Estimate of major nuclide composition

c. Irradiated components, control rods, etc.

No irradiated component shipments were performed during 2001.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT REPORT FOR 2001
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
2	Exclusive Use Vehicle	Oak Ridge, Tennessee (Duratek, Inc.)
1	Exclusive Use Vehicle	Kinston, Tennessee(Duratek, Inc.)

B. IRRADIATED FUEL SHIPMENTS

No irradiated fuel shipments were performed during 2001.

TABLE 7

Zion Nuclear Station
35 ft. Wind Speed and Direction

January-March, 2001
250Ft-33Ft Delta-T (F)

Number of Observations = 2041
Values are Percent Occurrence

SPEED CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	STABILITY CLASSES							
	WIND DIRECTION CLASSES																	EU	MU	SU	N	SS	MS	ES	TOTAL
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
C SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
A N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
L SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
M MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	0.00
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
1 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
- N	0.20	0.05	0.15	0.10	0.05	0.00	0.00	0.00	0.59	0.24	0.24	0.20	0.34	0.34	0.10	0.20	2.79				2.79				
3 SS	0.20	0.20	0.10	0.05	0.05	0.10	0.10	0.05	0.05	0.34	0.29	0.15	0.20	0.20	0.20	0.29	2.55					2.55			
MS	0.20	0.05	0.00	0.00	0.00	0.00	0.05	0.10	0.05	0.20	0.05	0.10	0.20	0.05	0.15	0.20	1.37						1.37		
ES	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.10	0.20	0.10	0.10	0.00	0.05	0.05	0.64							0.64	
																									7.35
EU	0.00	0.00	0.20	0.15	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.05	0.73	0.73							
MU	0.05	0.05	0.29	0.24	0.10	0.00	0.10	0.00	0.00	0.00	0.05	0.15	0.10	0.49	0.15	0.00	1.76		1.76						
4 SU	0.10	0.10	0.29	0.10	0.15	0.15	0.10	0.10	0.05	0.00	0.39	0.39	0.64	0.24	0.10	0.00	2.89			2.89					
- N	0.49	0.49	0.24	0.29	0.34	0.49	0.49	0.54	1.52	1.13	2.01	3.53	2.99	2.65	2.79	1.22	21.22				21.22				
7 SS	1.13	0.49	0.20	0.10	0.10	0.15	0.29	0.54	0.93	0.93	0.54	0.73	0.93	1.62	1.37	0.34	10.39					10.39			
MS	0.24	0.10	0.00	0.00	0.05	0.00	0.00	0.10	0.29	0.05	0.00	0.49	0.69	0.73	0.24	0.05	3.04						3.04		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.05	0.05	0.00	0.49	1.08	0.15	0.00	1.96							1.96	
																									41.99
EU	0.15	0.64	0.10	0.05	0.00	0.10	0.34	0.00	0.10	0.05	0.29	0.54	1.47	1.22	0.49	0.44	5.98	5.98							
MU	0.15	0.10	0.00	0.00	0.00	0.10	0.10	0.10	0.00	0.10	0.34	0.59	0.64	0.20	0.64	0.54	3.58		3.58						
8 SU	0.10	0.10	0.00	0.10	0.00	0.05	0.00	0.00	0.20	0.34	0.69	0.88	0.49	0.49	0.64	0.54	4.61			4.61					
- N	1.18	0.93	0.15	0.39	0.59	0.73	0.93	0.73	0.29	0.78	1.76	4.16	4.65	2.69	3.58	1.81	25.38				25.38				
1 SS	0.05	0.00	0.00	0.00	0.00	0.29	0.15	0.20	0.05	0.15	0.05	0.34	0.29	0.10	0.34	0.00	2.01					2.01			
2 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.15						0.15		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									41.70
EU	0.20	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.24	0.10	0.64	0.00	1.27	1.27							
1 MU	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.15	0.05	0.00	0.10	0.05	0.73		0.73					
3 SU	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.24	0.24	0.20	0.29	0.00	1.42			1.42					
- N	0.44	0.69	0.29	0.00	0.10	0.20	0.15	0.24	0.00	0.69	0.54	0.39	0.20	0.39	0.44	0.00	4.75				4.75				
1 SS	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.15					0.15			
8 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									8.33

TABLE 7
continued

Zion Nuclear Station
35 ft. Wind Speed and Direction

January-March, 2001
250Ft-33Ft Delta-T (F)

	WIND DIRECTION CLASSES																	STABILITY CLASSES							
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MU	SU	N	SS	MS	ES	TOTAL
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
1 MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
9 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.05	0.00	0.00	0.00	0.15			0.15					
N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.15	0.05	0.00	0.00	0.00	0.29				0.29				
2 SS	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05					0.05			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									0.49
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
> N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.00	0.00	0.00	0.00	0.15				0.15				
2 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									0.15
TOT	5.19	4.12	2.01	1.57	1.52	2.60	2.89	2.74	4.26	5.44	7.94	13.52	15.04	12.79	12.59	5.78	100.00	7.99	6.08	9.06	54.58	15.14	4.56	2.60	100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
0.34	0.69	0.29	0.20	0.00	0.20	0.44	0.00	0.10	0.05	0.29	0.59	1.71	1.32	1.27	0.49	7.99	Extremely Unstable
0.44	0.15	0.29	0.24	0.10	0.10	0.20	0.10	0.00	0.15	0.49	0.88	0.78	0.69	0.88	0.59	6.08	Moderately Unstable
0.29	0.29	0.29	0.20	0.15	0.20	0.10	0.10	0.24	0.34	1.32	1.62	1.42	0.93	1.03	0.54	9.06	Slightly Unstable
2.30	2.16	0.83	0.78	1.08	1.42	1.57	1.52	2.40	2.89	4.65	8.53	8.23	6.08	6.91	3.23	54.58	Neutral
1.37	0.69	0.29	0.15	0.15	0.64	0.54	0.78	1.03	1.52	0.88	1.22	1.42	1.91	1.91	0.64	15.14	Slightly Stable
0.44	0.15	0.00	0.00	0.05	0.00	0.05	0.20	0.39	0.34	0.05	0.59	0.88	0.78	0.39	0.24	4.56	Moderately Stable
0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.10	0.15	0.24	0.10	0.59	1.08	0.20	0.05	2.60	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C A L M
0.59	0.29	0.24	0.15	0.10	0.15	0.15	0.15	0.69	0.88	0.78	0.54	0.83	0.59	0.49	0.73	7.35	1.0- 3.5 mph
2.01	1.22	1.22	0.88	0.73	0.88	1.08	1.32	2.89	2.16	3.04	5.29	5.83	6.81	4.95	1.67	41.99	3.6- 7.5 mph
1.62	1.76	0.24	0.54	0.59	1.27	1.52	1.03	0.69	1.52	3.14	6.52	7.55	4.70	5.68	3.33	41.70	7.6-12.5 mph
0.98	0.83	0.29	0.00	0.10	0.24	0.15	0.24	0.00	0.83	0.88	0.83	0.73	0.69	1.47	0.05	8.33	12.6-18.5 mph
0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.05	0.05	0.24	0.10	0.00	0.00	0.00	0.49	18.6-24.5 mph
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.00	0.00	0.00	0.00	0.15	>24.5 mph

TABLE 8

Zion Nuclear Station
35 ft. Wind Speed and Direction

April-June, 2001
250Ft-33Ft Delta-T (F)

Number of Observations = 2137
Values are Percent Occurrence

SPEED CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	STABILITY CLASSES							
	WIND DIRECTION CLASSES																	EU	MU	SU	N	SS	MS	ES	TOTAL
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
C SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
A N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
L SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
M MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									0.00
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
1 SU	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09			0.09					
- N	0.09	0.19	0.28	0.14	0.14	0.33	0.09	0.09	0.14	0.14	0.23	0.05	0.14	0.09	0.05	0.09	2.29				2.29				
3 SS	0.28	0.47	0.09	0.19	0.14	0.23	0.19	0.23	0.23	0.28	0.28	0.23	0.33	0.42	0.19	0.42	4.21					4.21			
MS	0.19	0.14	0.05	0.05	0.05	0.05	0.00	0.05	0.33	0.51	0.42	0.33	0.28	0.47	0.23	0.09	3.23						3.23		
ES	0.09	0.09	0.09	0.00	0.05	0.19	0.09	0.19	0.23	1.12	0.84	0.61	0.51	0.42	0.23	0.14	4.91							4.91	
																									14.74
EU	0.00	0.70	0.61	0.56	0.51	0.09	0.05	0.05	0.00	0.00	0.00	0.14	0.19	0.00	0.00	0.00	2.90	2.90							
MU	0.00	0.14	0.33	0.05	0.05	0.09	0.05	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.80		0.80						
4 SU	0.19	0.61	0.47	0.28	0.23	0.14	0.05	0.09	0.00	0.00	0.05	0.09	0.05	0.05	0.00	0.00	2.29			2.29					
- N	1.87	2.53	1.36	0.75	0.51	0.70	1.08	1.87	0.66	0.19	0.51	0.47	0.42	0.33	0.84	0.42	14.51				14.51				
7 SS	1.68	1.22	0.42	0.42	0.61	0.66	1.40	1.54	3.23	0.84	0.94	1.12	0.37	0.14	0.19	0.14	14.93					14.93			
MS	0.28	0.28	0.37	0.51	0.33	0.19	0.37	1.26	1.59	0.89	0.19	0.98	0.23	0.37	0.09	0.14	8.10						8.10		
ES	0.00	0.00	0.14	0.19	0.33	0.05	0.42	0.66	1.64	0.14	0.19	0.23	0.19	0.14	0.09	0.00	4.40							4.40	
																									47.92
EU	0.89	1.03	0.23	0.05	0.09	0.19	0.19	0.33	0.00	0.14	0.66	0.66	0.19	0.28	0.51	0.00	5.43	5.43							
MU	0.23	0.37	0.09	0.00	0.09	0.00	0.09	0.05	0.05	0.09	0.23	0.14	0.19	0.14	0.00	0.00	1.78		1.78						
8 SU	0.33	0.14	0.09	0.00	0.00	0.00	0.00	0.05	0.09	0.19	0.19	0.33	0.19	0.23	0.05	0.05	1.92			1.92					
- N	1.82	0.80	0.37	0.19	0.14	0.19	0.37	1.17	0.28	0.75	1.26	0.75	0.84	1.31	0.56	0.28	11.09				11.09				
1 SS	0.61	0.37	0.05	0.28	0.09	0.05	0.94	1.17	0.56	0.56	0.28	0.23	0.09	0.00	0.00	0.05	5.33					5.33			
2 MS	0.00	0.00	0.14	0.09	0.05	0.00	0.28	0.42	0.47	0.05	0.00	0.05	0.00	0.00	0.00	0.00	1.54						1.54		
ES	0.00	0.00	0.00	0.05	0.00	0.09	0.00	0.75	0.19	0.05	0.00	0.00	0.00	0.00	0.00	0.00	1.12							1.12	
																									28.22
EU	0.37	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51	0.23	0.14	0.28	0.05	0.00	2.11	2.11							
1 MU	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.19	0.09	0.00	0.05	0.00	0.00	0.51		0.51						
3 SU	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.09	0.19	0.00	0.09	0.00	0.00	0.05	0.70			0.70					
- N	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.75	0.61	0.47	0.42	0.14	0.00	0.19	3.14				3.14				
1 SS	0.05	0.00	0.00	0.00	0.00	0.05	0.09	0.05	0.05	0.33	0.05	0.00	0.00	0.00	0.00	0.05	0.70					0.70			
8 MS	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09						0.09		
ES	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05							0.05	
																									7.30

TABLE 8
continued

Zion Nuclear Station
35 ft. Wind Speed and Direction

April-June, 2001
250Ft-33Ft Delta-T (F)

	WIND DIRECTION CLASSES																	STABILITY CLASSES							
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MU	SU	N	SS	MS	ES	TOTAL
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.28	0.00	0.00	0.00	0.00	0.00	0.37	0.37							
1 MU	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.09	0.00	0.00	0.00	0.00	0.28		0.28						
9 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.28	0.00	0.00	0.00	0.00	0.42			0.42					
- N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.28	0.05	0.05	0.00	0.00	0.00	0.51				0.51				
2 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								1.59
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.09	0.09							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.05		0.05						
SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.05			0.05					
> N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.05				0.05				
2 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								0.23
TOT	9.87	9.59	5.19	3.79	3.46	3.37	5.80	10.06	9.87	7.39	8.89	7.63	4.96	4.91	3.09	2.11	100.00	10.90	3.42	5.47	31.59	25.18	12.96	10.48	100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
1.26	2.25	0.84	0.61	0.61	0.28	0.23	0.37	0.00	0.23	1.54	1.03	0.51	0.56	0.56	0.00	10.90	Extremely Unstable
0.42	0.51	0.42	0.05	0.14	0.09	0.14	0.05	0.05	0.14	0.61	0.33	0.23	0.23	0.00	0.00	3.42	Moderately Unstable
0.75	0.75	0.56	0.28	0.28	0.14	0.05	0.19	0.14	0.28	0.61	0.70	0.33	0.28	0.05	0.09	5.47	Slightly Unstable
4.26	3.51	2.01	1.08	0.80	1.22	1.54	3.14	1.17	1.97	2.95	1.78	1.87	1.87	1.45	0.98	31.59	Neutral
2.62	2.06	0.56	0.89	0.84	0.98	2.62	2.99	4.07	2.01	1.54	1.59	0.80	0.56	0.37	0.66	25.18	Slightly Stable
0.47	0.42	0.56	0.66	0.42	0.28	0.70	1.73	2.39	1.45	0.61	1.36	0.51	0.84	0.33	0.23	12.96	Moderately Stable
0.09	0.09	0.23	0.23	0.37	0.37	0.51	1.59	2.06	1.31	1.03	0.84	0.70	0.56	0.33	0.14	10.48	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C A L M
0.66	0.89	0.51	0.37	0.42	0.80	0.37	0.56	0.98	2.06	1.78	1.22	1.26	1.40	0.70	0.75	14.74	1.0- 3.5 mph
4.02	5.47	3.70	2.76	2.57	1.92	3.42	5.47	7.11	2.06	1.87	3.04	1.50	1.08	1.22	0.70	47.92	3.6- 7.5 mph
3.88	2.71	0.98	0.66	0.47	0.51	1.87	3.93	1.64	1.82	2.62	2.15	1.50	1.97	1.12	0.37	28.22	7.6-12.5 mph
1.26	0.51	0.00	0.00	0.00	0.14	0.14	0.09	0.14	1.22	1.54	0.80	0.66	0.47	0.05	0.28	7.30	12.6-18.5 mph
0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.84	0.42	0.05	0.00	0.00	0.00	1.59	18.6-24.5 mph
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.23	>24.5 mph

TABLE 9

Zion Nuclear Station
35 ft. Wind Speed and Direction

July-September, 2001
250Ft-33Ft Delta-T (F)

Number of Observations = 2156
Values are Percent Occurrence

SPEED CLASS	WIND DIRECTION CLASSES																TOTAL	STABILITY CLASSES							TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		EU	MU	SU	N	SS	MS	ES	
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
C SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
A N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
L SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
M MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								0.00
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
1 SU	0.00	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09			0.09					
- N	0.23	0.37	0.37	0.42	0.23	0.14	0.23	0.19	0.05	0.09	0.19	0.05	0.14	0.14	0.09	0.19	3.11				3.11				
3 SS	0.74	0.23	0.37	0.37	0.32	0.23	0.37	0.23	0.88	0.74	0.97	0.88	0.42	0.23	0.37	0.37	7.75					7.75			
MS	0.09	0.09	0.05	0.00	0.00	0.00	0.00	0.14	0.56	1.53	1.39	0.65	0.79	0.83	0.42	0.56	7.10						7.10		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.28	0.79	0.65	1.44	0.74	0.23	0.09	4.31							4.31	
																									22.36
EU	0.05	0.56	1.62	1.21	1.16	1.07	0.28	0.19	0.00	0.05	0.00	0.19	0.32	0.09	0.05	0.00	6.82	6.82							
MU	0.05	0.28	0.42	0.23	0.28	0.28	0.32	0.14	0.05	0.09	0.09	0.14	0.09	0.05	0.05	0.00	2.55		2.55						
4 SU	0.14	0.19	0.32	0.28	0.32	0.65	0.46	0.19	0.09	0.14	0.05	0.23	0.05	0.00	0.05	0.09	3.25			3.25					
- N	0.60	1.16	1.02	0.42	0.32	0.93	1.62	2.60	0.93	0.70	0.56	0.42	0.79	0.56	0.23	0.32	13.17				13.17				
7 SS	0.83	1.21	0.93	0.70	0.32	0.46	0.79	1.48	2.32	1.39	1.72	2.09	1.67	0.65	0.70	0.70	17.95					17.95			
MS	0.32	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.42	0.56	0.83	0.56	0.83	0.79	0.42	0.32	5.15						5.15		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.23	0.65	0.28	1.02	1.11	0.37	0.00	3.80							3.80	
																									52.69
EU	0.19	1.58	0.70	0.19	0.00	0.32	0.32	0.00	0.00	0.00	0.14	0.60	0.19	0.05	0.00	0.09	4.36	4.36							
MU	0.14	0.14	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.09	0.23	0.00	0.09	0.09	1.16		1.16						
8 SU	0.00	0.19	0.05	0.00	0.00	0.05	0.23	0.42	0.00	0.09	0.37	0.05	0.28	0.37	0.05	0.00	2.13			2.13					
- N	0.32	1.30	0.14	0.32	0.05	0.23	0.97	1.76	0.19	0.42	0.65	0.42	0.46	0.60	0.74	0.88	9.46				9.46				
1 SS	0.51	0.88	0.93	0.42	0.23	0.00	0.60	0.37	0.65	0.23	0.19	0.28	0.23	0.32	0.23	0.09	6.17					6.17			
2 MS	0.00	0.05	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28						0.28		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									23.56
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
1 MU	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.09		0.09						
3 SU	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.14	0.05	0.00	0.00	0.00	0.32			0.32					
- N	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.23	0.65			0.65				
1 SS	0.00	0.00	0.23	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32				0.32			
8 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									1.39

TABLE 9
continued

Zion Nuclear Station
35 ft. Wind Speed and Direction

July-September, 2001
250Ft-33Ft Delta-T (F)

ED CLASS	WIND DIRECTION CLASSES N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	STABILITY CLASSES EU	MU	SU	N	SS	MS	ES	TOTAL
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
1 MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
9 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
- N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
2 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									0.00
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
> N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
2 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									0.00
TOT	4.68	8.30	7.47	4.59	3.34	4.36	6.22	7.79	6.40	6.59	9.04	7.61	8.95	6.54	4.08	4.04	100.00	11.18	3.80	5.80	26.39	32.19	12.52	8.12	100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
0.23	2.13	2.32	1.39	1.16	1.39	0.60	0.19	0.00	0.05	0.14	0.79	0.51	0.14	0.05	0.09	11.18	Extremely Unstable
0.23	0.42	0.51	0.23	0.28	0.28	0.32	0.14	0.05	0.14	0.37	0.23	0.32	0.05	0.14	0.09	3.80	Moderately Unstable
0.23	0.42	0.37	0.28	0.37	0.70	0.70	0.60	0.14	0.23	0.56	0.32	0.32	0.37	0.09	0.09	5.80	Slightly Unstable
1.48	2.83	1.53	1.16	0.60	1.30	2.83	4.59	1.16	1.21	1.44	0.88	1.39	1.30	1.07	1.62	26.39	Neutral
2.09	2.32	2.46	1.53	0.88	0.70	1.76	2.13	3.85	2.37	2.88	3.25	2.32	1.21	1.30	1.16	32.19	Slightly Stable
0.42	0.19	0.28	0.00	0.05	0.00	0.00	0.14	0.97	2.09	2.23	1.21	1.62	1.62	0.83	0.88	12.52	Moderately Stable
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.51	1.44	0.93	2.46	1.86	0.60	0.09	8.12	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C A L M
1.07	0.74	0.79	0.79	0.60	0.37	0.60	0.56	1.58	2.64	3.34	2.23	2.78	1.95	1.11	1.21	22.36	1.0- 3.5 mph
1.99	3.43	4.31	2.83	2.46	3.39	3.48	4.59	3.94	3.15	3.90	3.90	4.78	3.25	1.86	1.44	52.69	3.6- 7.5 mph
1.16	4.13	2.13	0.93	0.28	0.60	2.13	2.55	0.83	0.74	1.62	1.44	1.39	1.35	1.11	1.16	23.56	7.6-12.5 mph
0.46	0.00	0.23	0.05	0.00	0.00	0.00	0.09	0.05	0.05	0.19	0.05	0.00	0.00	0.00	0.23	1.39	12.6-18.5 mph
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.6-24.5 mph
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	>24.5 mph

TABLE 10

Zion Nuclear Station
35 ft. Wind Speed and Direction

October-December, 2001
250Ft-33Ft Delta-T (F)

Number of Observations = 2146
Values are Percent Occurrence

SPEED CLASS	WIND DIRECTION CLASSES																TOTAL	STABILITY CLASSES							TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		EU	MU	SU	N	SS	MS	ES	
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
C SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
A N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
L SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
M MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								0.00
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.05		0.05						
1 SU	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05			0.05					
- N	0.09	0.09	0.00	0.00	0.05	0.00	0.05	0.05	0.09	0.14	0.05	0.00	0.28	0.14	0.14	0.09	1.26				1.26				
3 SS	0.09	0.05	0.00	0.05	0.19	0.19	0.09	0.09	0.33	0.23	0.33	0.23	0.28	0.09	0.14	0.14	2.52					2.52			
MS	0.05	0.05	0.05	0.09	0.00	0.09	0.05	0.05	0.09	0.28	0.23	0.14	0.23	0.14	0.09	0.00	1.63						1.63		
ES	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.14	0.23	0.09	0.14	0.37	0.05	0.09	1.26							1.26	
																									6.76
EU	0.05	0.09	0.09	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.00	0.00	0.00	0.37	0.37							
MU	0.05	0.05	0.09	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.14	0.05	0.00	0.00	0.00	0.47		0.47						
4 SU	0.00	0.00	0.05	0.09	0.00	0.05	0.00	0.23	0.05	0.00	0.00	0.05	0.19	0.00	0.00	0.09	0.79			0.79					
- N	0.33	0.37	0.33	0.23	0.42	0.47	0.47	0.61	0.65	0.65	0.61	1.63	1.91	1.12	1.03	0.89	11.70				11.70				
7 SS	0.28	0.19	0.00	0.09	0.33	0.42	0.89	0.89	1.77	2.24	1.77	2.10	2.10	2.33	1.44	0.19	17.01					17.01			
MS	0.00	0.00	0.00	0.05	0.00	0.05	0.00	0.33	1.16	1.30	0.65	0.65	1.16	0.79	0.28	0.05	6.48						6.48		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.33	0.42	0.28	0.47	1.63	0.14	0.05	0.00	3.54							3.54	
																									40.35
	0.05	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.23	0.28	0.56	0.75	0.47	0.00	0.00	2.47	2.47							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09	0.14	0.14	0.28	0.09	0.00	0.00	0.84		0.84						
8 SU	0.14	0.05	0.00	0.00	0.00	0.05	0.00	0.33	0.05	0.05	0.33	0.28	0.56	0.19	0.14	0.05	2.19			2.19					
- N	0.56	0.56	0.33	0.14	0.23	0.23	0.33	1.44	0.47	1.68	1.91	3.08	3.82	1.26	0.79	0.14	16.96				16.96				
1 SS	0.19	0.79	0.37	0.05	0.00	0.33	0.56	1.68	1.35	2.42	2.89	1.68	1.12	0.56	1.35	0.33	15.66					15.66			
2 MS	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.05	0.14	0.00	0.00	0.00	0.00	0.00	0.33						0.33		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05							0.05	
																									38.49
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.23	0.00	0.00	0.42	0.42							
1 MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.05	0.00	0.00	0.00	0.00	0.00	0.14		0.14						
3 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.19	0.05	0.00	0.00	0.00	0.37			0.37					
- N	0.00	0.00	0.19	0.37	0.14	0.37	0.05	1.58	0.42	1.16	0.93	1.03	0.56	0.51	0.37	0.19	7.88				7.88				
1 SS	0.05	0.00	0.05	0.09	0.09	0.00	0.14	0.33	0.14	1.40	0.56	0.61	0.47	0.19	0.23	0.05	4.38					4.38			
8 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									13.19

TABLE 10
continued

Zion Nuclear Station
35 ft. Wind Speed and Direction

October-December, 2001
250Ft-33Ft Delta-T (F)

	WIND DIRECTION CLASSES																	STABILITY CLASSES							
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MU	SU	N	SS	MS	ES	TOTAL
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
1 MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
9 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
N	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.14	0.00	0.23	0.00	0.47	0.19	0.00	0.00	0.00	1.07				1.07				
2 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.14					0.14			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	1.21
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
> N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
2 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	0.00
TOT	2.00	2.38	1.54	1.35	1.44	2.28	2.61	8.20	7.13	12.95	11.46	13.51	16.12	8.62	6.10	2.28	100.00	3.26	1.49	3.40	38.86	39.70	8.43	4.85	100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
0.09	0.19	0.09	0.05	0.00	0.00	0.00	0.00	0.05	0.23	0.33	0.56	0.98	0.70	0.00	0.00	3.26	Extremely Unstable
0.05	0.05	0.09	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.19	0.23	0.28	0.33	0.09	0.00	0.00	1.49	Moderately Unstable
0.14	0.05	0.05	0.09	0.00	0.14	0.00	0.56	0.09	0.19	0.33	0.51	0.79	0.19	0.14	0.14	3.40	Slightly Unstable
0.98	1.03	0.84	0.79	0.84	1.07	0.89	3.82	1.63	3.87	3.49	6.20	6.76	3.03	2.33	1.30	38.86	Neutral
0.61	1.03	0.42	0.28	0.61	0.93	1.68	2.98	3.59	6.29	5.55	4.61	4.10	3.17	3.17	0.70	39.70	Slightly Stable
0.09	0.05	0.05	0.14	0.00	0.14	0.05	0.37	1.35	1.63	1.03	0.79	1.40	0.93	0.37	0.05	8.43	Moderately Stable
0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.42	0.56	0.51	0.56	1.77	0.51	0.09	0.09	4.85	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C A L M
0.28	0.19	0.05	0.14	0.23	0.33	0.19	0.19	0.61	0.79	0.89	0.47	0.93	0.75	0.42	0.33	6.76	1.0- 3.5 mph
0.70	0.70	0.56	0.51	0.75	0.98	1.35	2.38	3.96	4.61	3.36	5.03	7.08	4.38	2.80	1.21	40.35	3.6- 7.5 mph
0.98	1.49	0.70	0.19	0.23	0.61	0.89	3.59	2.00	4.52	5.68	5.73	6.52	2.56	2.28	0.51	38.49	7.6-12.5 mph
0.05	0.00	0.23	0.47	0.23	0.37	0.19	1.91	0.56	2.80	1.54	1.82	1.26	0.93	0.61	0.23	13.19	12.6-18.5 mph
0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.14	0.00	0.23	0.00	0.47	0.33	0.00	0.00	0.00	1.21	18.6-24.5 mph
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	>24.5 mph

TABLE 11

Zion Nuclear Station
35 ft. Wind Speed and Direction

January-December, 2001
250Ft-33Ft Delta-T (F)

Number of Observations = 8480
Values are Percent Occurrence

SPEED CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	STABILITY CLASSES EU	MU	SU	N	SS	MS	ES	TOTAL
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
C SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
A N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
L SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
M MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									0.00
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01		0.01						
1 SU	0.00	0.01	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06			0.06					
- N	0.15	0.18	0.20	0.17	0.12	0.12	0.09	0.08	0.21	0.15	0.18	0.07	0.22	0.18	0.09	0.14	2.36				2.36				
3 SS	0.33	0.24	0.14	0.17	0.18	0.19	0.19	0.15	0.38	0.40	0.47	0.38	0.31	0.24	0.22	0.31	4.28					4.28			
MS	0.13	0.08	0.04	0.04	0.01	0.04	0.02	0.08	0.26	0.64	0.53	0.31	0.38	0.38	0.22	0.21	3.36						3.36		
ES	0.04	0.02	0.02	0.00	0.01	0.06	0.02	0.05	0.11	0.41	0.52	0.37	0.55	0.39	0.14	0.09	2.81							2.81	
																									12.88
EU	0.02	0.34	0.64	0.50	0.42	0.32	0.11	0.06	0.00	0.01	0.01	0.08	0.14	0.02	0.05	0.01	2.74	2.74							
MU	0.04	0.13	0.28	0.13	0.11	0.09	0.12	0.06	0.01	0.02	0.04	0.11	0.07	0.14	0.05	0.00	1.39		1.39						
4 SU	0.11	0.22	0.28	0.19	0.18	0.25	0.15	0.15	0.05	0.04	0.12	0.19	0.22	0.07	0.04	0.05	2.30			2.30					
- N	0.83	1.14	0.74	0.42	0.40	0.65	0.92	1.42	0.93	0.66	0.91	1.49	1.51	1.14	1.20	0.71	15.07				15.07				
7 SS	0.98	0.78	0.39	0.33	0.34	0.42	0.85	1.12	2.08	1.36	1.25	1.52	1.27	1.18	0.92	0.34	15.13					15.13			
MS	0.21	0.11	0.09	0.14	0.11	0.06	0.09	0.42	0.87	0.71	0.42	0.67	0.73	0.67	0.26	0.14	5.72						5.72		
ES	0.00	0.00	0.04	0.05	0.08	0.01	0.11	0.24	0.55	0.21	0.29	0.25	0.84	0.61	0.17	0.00	3.44							3.44	
																									45.79
EU	0.32	0.84	0.26	0.07	0.02	0.15	0.21	0.08	0.04	0.11	0.34	0.59	0.64	0.50	0.25	0.13	4.54	4.54							
MU	0.13	0.15	0.05	0.00	0.02	0.02	0.05	0.06	0.01	0.07	0.25	0.24	0.33	0.11	0.18	0.15	1.82		1.82						
8 SU	0.14	0.12	0.04	0.02	0.00	0.04	0.06	0.20	0.08	0.17	0.39	0.38	0.38	0.32	0.21	0.15	2.69			2.69					
- N	0.97	0.90	0.25	0.26	0.25	0.34	0.65	1.29	0.31	0.91	1.39	2.08	2.42	1.45	1.39	0.77	15.60				15.60				
1 SS	0.34	0.52	0.34	0.19	0.08	0.17	0.57	0.86	0.66	0.85	0.86	0.64	0.44	0.25	0.48	0.12	7.36					7.36			
2 MS	0.01	0.01	0.09	0.02	0.01	0.00	0.07	0.11	0.15	0.05	0.04	0.01	0.00	0.00	0.00	0.00	0.58						0.58		
ES	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.20	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.29							0.29	
																									32.88
EU	0.14	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.07	0.14	0.15	0.17	0.00	0.94	0.94							
1 MU	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.08	0.06	0.01	0.01	0.02	0.01	0.37		0.37						
3 SU	0.11	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.06	0.14	0.12	0.09	0.05	0.07	0.01	0.70			0.70					
- N	0.31	0.17	0.12	0.09	0.06	0.14	0.05	0.47	0.13	0.65	0.53	0.47	0.29	0.26	0.20	0.15	4.09				4.09				
1 SS	0.02	0.00	0.07	0.04	0.02	0.02	0.06	0.11	0.05	0.46	0.15	0.15	0.12	0.05	0.06	0.02	1.40					1.40			
8 MS	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02						0.02		
ES	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01							0.01	
																									7.54

TABLE 11
continued

Zion Nuclear Station
35 ft. Wind Speed and Direction

January-December, 2001
250Ft-33Ft Delta-T (F)

CLASS	WIND DIRECTION CLASSES																TOTAL	STABILITY CLASSES							TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		EU	MU	SU	N	SS	MS	ES	
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.07	0.00	0.00	0.00	0.00	0.00	0.09	0.09							
1 MU	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.02	0.00	0.00	0.00	0.00	0.07		0.07						
9 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.09	0.01	0.00	0.00	0.00	0.14			0.14					
- N	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.04	0.00	0.11	0.08	0.17	0.07	0.00	0.00	0.00	0.47				0.47				
2 SS	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.05					0.05			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.02							
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01		0.01						
SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01			0.01					
> N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.05				0.05				
2 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.09	
TOT	5.44	6.12	4.08	2.84	2.45	3.16	4.40	7.25	6.95	8.13	9.35	10.53	11.23	8.16	6.39	3.53	100.00	8.34	3.67	5.90	37.64	28.22	9.68	6.56	100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
0.48	1.32	0.90	0.57	0.45	0.47	0.32	0.14	0.04	0.14	0.58	0.74	0.92	0.67	0.46	0.14	8.34	Extremely Unstable
0.28	0.28	0.33	0.13	0.13	0.12	0.17	0.12	0.02	0.15	0.42	0.42	0.41	0.26	0.25	0.17	3.67	Moderately Unstable
0.35	0.38	0.32	0.21	0.20	0.29	0.21	0.37	0.15	0.26	0.70	0.78	0.71	0.44	0.32	0.21	5.90	Slightly Unstable
2.25	2.38	1.31	0.96	0.83	1.25	1.71	3.29	1.58	2.48	3.11	4.29	4.52	3.03	2.89	1.77	37.64	Neutral
1.67	1.53	0.94	0.72	0.63	0.81	1.66	2.24	3.16	3.07	2.74	2.69	2.17	1.71	1.69	0.79	28.22	Slightly Stable
0.35	0.20	0.22	0.20	0.13	0.11	0.20	0.61	1.29	1.39	0.99	0.99	1.11	1.05	0.48	0.35	9.68	Moderately Stable
0.04	0.02	0.06	0.06	0.09	0.11	0.13	0.48	0.71	0.64	0.81	0.61	1.39	1.00	0.31	0.09	6.56	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C A L M
0.65	0.53	0.40	0.37	0.34	0.41	0.33	0.37	0.97	1.60	1.71	1.12	1.46	1.18	0.68	0.75	12.88	1.0- 3.5 mph
2.18	2.72	2.46	1.76	1.64	1.80	2.35	3.47	4.49	3.01	3.04	4.30	4.79	3.84	2.68	1.25	45.79	3.6- 7.5 mph
1.91	2.54	1.03	0.58	0.39	0.74	1.60	2.79	1.30	2.16	3.27	3.93	4.20	2.62	2.51	1.32	32.88	7.6-12.5 mph
0.68	0.33	0.19	0.13	0.08	0.19	0.12	0.59	0.19	1.23	1.04	0.87	0.66	0.52	0.52	0.20	7.54	12.6-18.5 mph
0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.04	0.00	0.13	0.22	0.28	0.12	0.00	0.00	0.00	0.83	18.6-24.5 mph
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.02	0.00	0.00	0.00	0.00	0.09	>24.5 mph

SUMMARY

This document was written to fulfill the requirement stated in the Offsite Dose Calculation Manual 12.7.2 that "The Annual Radioactive Effluent Release report shall also include the following: an explanation as to why the inoperability of liquid or gaseous effluent monitoring instrumentation was not correct and within the time specified in Section 12.2.1 or 12.2.2".

This document details the circumstances that led to the failure to calibrate the radiation monitor 0RT-PR30A. This detector monitors the gaseous effluent from the fuel building. The failure to calibrate the detector was due to the lack of communication during the transition from an operating station to the decommissioning phase. Work at the station is tracked via; the first is to write a work request, which gets the work scheduled. The calibration of ORTPR30A was initially done but the periodic calibration was never added to the schedule. During a procedure review a Rad Tech questioned why the calibration of the radiation monitor was in a Zion Radiation Protection procedure. This prompted an investigation, which revealed the periodic calibration. The instrument was out of its calibration periodicity for 10 months.

INITIATING INCIDENT

On March 22, 2001 it was discovered that the radiation monitor 0RT-PR30A (gas detector for the fuel building) calibration had expired on May 30, 2000. This requirement comes from the Offsite Dose Calculation Manual 12.2.2.B.2 "Each radioactive plant monitoring instrumentation channel shall be demonstrated OPERABLE by performance of a CHANNNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, AND CHANNEL FUNCTIONAL TEST at the frequencies shown in Table 12.2-4". The station did not meet the condition of Channel Calibration frequency stated in Table 12.2-4 of an Annual calibration for that detector.

.

PURPOSE

The purpose of this monitor is to provide a method of monitoring and sampling the gaseous effluent from the fuel building. Section 4.6.1 of the Defuel Station Analysis Report (DSAR) states " The process radiation monitoring system, which includes the effluent monitors, is designed to provide early warning of increasing radiation activity due to a malfunction of plant equipment, and to monitor radioactive discharges to the environment to ensure concentrations do not exceed specific limits."

IMMEDIATE CORRECTIVE ACTIONS

Upon discovery of the condition of the radiation monitor the following action plan was implemented to correct and document the recovery of the gas detector:

1. Removed instrument which was beyond the calibration periodicity and replaced with the calibrated spare monitor.
2. Shipped the original instrument to the vendor for calibration.
3. Required the vendor perform an as found condition on the monitor.
4. Documented this incident using the Station Corrective Action Process.
5. Wrote a pre-define to automatically generate this work in the station schedule at the required periodicity.
6. Compensatory samples were pulled until the calibrated spare instrument was declared operable.
7. Complete documentation as to the events and corrective actions taken to prevent this reoccurrence in the future.

RESULTS OF THE IMMEDIATE ACTIONS TAKEN

1. The gas detector 0RT-PR30A was removed under work request number 990270518-02, which was completed on March 23, 2001.

2. The monitor was shipped to the Eberline Corporation on March 26, 2001.

3. The original calibration on the detector was performed on May 3, 1999. The Beta efficiency at that time was 5.31% which was the corrected value for KR_{85} which is the isotope of interest for Zion Station. On March 28, 2001, the vendor was asked to perform an as found reading on the detector. The Beta efficiency was 5.45% which is 102.6 % of the original reading. Per Zion Radiation Protection Procedure 5821-33 rev.4 step 1.8.1, "If the detector efficiency for Kr_{85} as determined during calibration is approximately 4.7% to 9.0%, Then the nominal sensitivity to Kr_{85} is $3.15e^{-8}$ uCicc/cpm and the detector is functioning properly." Both the calibration and the as found check are within the specification put forth in this procedure.

4. Action Request # 990139327 was written to place this occurrence into the station corrective action tracking system. This item will remain open until station management reviews and is satisfied with the actions taken.

5. Pre-define # 186952 has been written and placed into the station schedule to ensure calibrations are properly maintained in the future.

6. Once the discovery was made, ZRP 5820-12 Rev. 16 was used to initiate the compensatory actions for 0RT-PR30A. There were six samples pulled and analyzed per Table 12.2-3 of the ODCM. Surveillance 10. Of this table states "With the number of OPERABLE channels less than the minimum required, restore the channel to OPERABLE STATUS WITHIN 30 DAYS OR CONDUCT A STATION REVIEW TO DETERMINE A PLAN OF ACTION TO RETURN THE CHANNEL TO operable status. Effluent releases via this pathway may continue provided a grab sample are obtained and analyzed for gross activity at least once per day." During the time it took the station to install the spare calibrated detector, six samples (March 22, 2001 to March 27, 2001) were pulled and analyzed and there was no activity detected.

7. The vendor has recommend that the detector be calibrated on a once a year frequency. Zion Station will follow this recommendation.

8. The writing and approval of this document shall be included as part of the Zion Station Annual Effluent report as required in ODCM 12.7.2. which states, "The Annual Radioactive Effluent Release Report shall also include the following: an explanation as to why the inoperability of liquid or gaseous monitoring instrumentation was not corrected within the time specified in Section 12.2.1 or 12.2.2, respectively; and description of the events leading to liquid holdup tanks exceeding the limits of to the Permanently Defueled Technical Specifications".

Quantifying and Qualifying Gaseous Releases from 0RT-PR30A

The radiation monitor 0RTPR30A became operable September 20, 1999. Since that time weekly samples have pulled to qualify and quantify the amount of radioactive gas discharged from the Fuel Building. A particulate, tritium, and gas sample were pulled and analyzed according to approved procedures. These results along with the total air-flow were put into a computer program to calculate the total Offsite Dose to the public.

During this time there have been 83 samples pulled and analyzed for noble gas. There were 38 samples pulled d analyzed while the radiation monitor 0RT-PR30A was still within its calibration periodicity. No radiological discharges were detected during this time. Forty-five samples were pulled and analyzed while the instrument was out of calibration. These samples indicated that there was no activity released.

Periodic Testing of ORT-PR30A

The station did complete all of the prescribed channel checks daily. The source checks are performed on a weekly periodicity, while the ODCM requires that this test be performed on a Monthly frequency. These actions net or exceeded the criteria stated in the Offsite Dose Calculation Manual 12.2.2.B.2 "Each radioactive plant monitoring instrumentation channel shall be demonstrated OPERABLE by performance of a CHANNNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, AND CHANNEL FUNCTIONAL TEST at the frequencies shown in Table 12.2-4".

On a daily basis the operations department completes PT-0 appendix N, as required for the channel check. On a weekly basis source check is conducted with a qualified Rad Tech and an individual in the Control Room. Zion Radiation Procedure 5821-22, Rev. 2 was used to insure that the parameters that are installed into the monitor are within the limits set forth in this procedure. After this portion of the procedure is completed satisfactorily, a source check of 0RT-PR30A is conducted using the same procedure. At no time did 0RT-PR30A fail the weekly source checks.

Conclusion

The radiation detector 0RT-PR30A was beyond its frequency for approximately 45 weeks. This was due to a lack of communication during the period of transferring from the Zion Decommissioning Organization (ZDO) to the Long Term Decommissioning Organization (LZDO). During the time the detector was past its calibration frequency weekly samples were pulled and analyzed and no radioactivity was detected. During this period of time the radiation detector was source checked on a weekly basis and passed all checks. At the same time as the source check a qualified Rad Technician checked the parameters installed in the monitor to verify the correct settings. There were no discrepancies found. Once the detector was discovered to be beyond its calibration frequency, the detector was replaced with a spare calibrated detector. The detector was sent to the endor and had an as found calibration performed. The results of the as found calibration were within the specifications as stated in ZRP 5821-33, Rev. 4 Step 1.8.1.

Letter to File

Date: July 3, 2001

Subject: Zion Station Plan of action to Return 1RIAPR49 Back to Service.

On June 5, 2001 at 4:30 Unit 1 Vent Stack Radiation Monitor 1RIAPR49 was declared Out of Service. A work request was written for the IM Department to trouble shoot and repair. The problem was linked to the Unit 1 Flow Stack Control Panel.

Zion Radiation Protection Procedure (ZRP) 5820-12 Revision 17, requires that the 1RIAPR49 must be returned to service within 30 days. If the monitor is not returned to service within 30 days the station is to conduct a station review to determine the plan to return the monitor to an operable status. These conditions are also found in the Offsite Dose Calculations Manual Table 12.2-3 Surveillance number 9.

The plan is to obtain the services of the Air Monitor Corporation out of Santa Rosa California to assist the station IM Department in the trouble shooting and calibration of 1LP-084 the Unit 1 Ventilation Stack Flow Control Panel. The Air Monitor Corporation is the company that supplied the flow control panel. The release number for the PO is ZN010018 and is being processed. The schedule for the repair is for the week of July16, '01.

The status of the scheduled dates is contingent on the availability of the vendor and will be monitored 2 times a week by the Maintenance and RadChem Department until the vendor arrives onsite.

_____

Ron Schuster
RadChem Manager

_____

Mark Bittmann
Operating Supervision

_____

Jim Ashley
gulatory Assurance

Letter to File

Date September 7, 2001

Subject: Zion Station Plan for the Return to Service of 1LP-084.

On August 11, 2001 at 8:40 the Unit 1 Vent Stack Flow Control Panel was declared Out of Service. This Control Panel controls the flow for the radiation monitor 1RIA-PR49. A work request was written for the Instrument Maintenance Department to trouble shoot and repair. The problem is identified to be low flow.

Zion Radiation Protection Procedure (ZRP) 5820-12 Revision 17, requires that the 1LP-084 must be returned to service within 30 days. If the monitor is not returned to service within 30 days the station is to conduct a station review to determine the plan to return the monitor to an operable status. The radiation monitor 1RIA-PR49 compensatory measures are to install a temporary blower and monitor the blower once every 24 hours. The other governing procedure is the Offsite Dose Calculation Manual (ODCM) that requires the station to obtain an estimate of the flow from the Operations Department once a day. This requirement comes from ODCM Table 12.2-3 Surveillance number 8.

The plan is to have the Air Monitoring Corporation out of Santa Rosa, California refurbish and reprogram the station's spare controller. Return the controller to Zion Station. The IM Department will install the spare controller and perform the necessary calibrations. This controller is scheduled for return to the station by September 12, 2001. The task of installing and calibrating the panel is tentatively scheduled for September 19, 2001.

The status of the scheduled dates is contingent on the return of the controller to the station. Operations and RadChem will monitor the progress of the schedule, twice a week until the Flow Control Panel is returned to service.

9-7-2001
Ron Schuster
RadChem Manager

9/7/01
Bob Euer
Maintenance Supervisor

9-7-01
Jim Ashley
Regulatory Assurance

Ray Landrum
Operations Manager

August 29, 2001

Letter to File:

Since the shutdown and defueling of the reactors at Zion Station certain equipment used in the normal operations of a working nuclear plant are no longer needed, deplete resources, and finances of the station. It is for these reasons equipment that is no longer used for the designed purpose have been abandon in place. Some of the equipment is currently described in the Offsite Dose Calculation Manual (ODCM) and requires periodic testing, maintenance, or other compensatory measures.

Upon review of the Offsite Dose Calculation Manual (ODCM) station management acknowledges that some of the equipment listed in the ODCM may serve as a system or pathway for the release of radioactive material. The station management has made a conscious determination as to, which will be the primary system or train that radioactive effluents will leave the plant. The station management will leave alternate systems in place in the event that operational configuration would determine the use of these alternate pathways.

The following pieces of equipment have been determined to be in these alternate pathways:

- ORT-PR04
- WD63
- 1RIAPR40
- 2RIAPR40
- Waste Neutralization Tank

Additional administrative controls such as, Out Of Service (OOS) and the PT-14 Process, have been placed on equipment to prevent the inadvertent release of radioactive material through the alternate pathways. OOS # 98009913 is the administrative control for the Waste Neutralization Tank. OOS # 97013826 is the administrative control for the Rad Monitor ORTPR04. The containment purge and vent monitor 1(2)RT-PR40 are covered by OOS # 98007722. PT-14's are in place for the following Rad Monitors ORTPR04, 1RT-PR40, and 2RT-PR40

All requirements for testing, surveillance, or work associated with the above equipment must be completed and meet all the requirements prescribed in the ODCM prior to the use of this equipment or pathway for the release of radioactive material.

Ron Schuster
RadChem Manager

Jim Ashley
Regulatory Assurance

Ray Landrum
Operating Manager

ATTACHMENT 3

Radioactive Effluent Release Report

Summary of Changes to the ODCM

During the calendar year of 2001 there were no changes made to the ODCM. The data processed for 2001 was in accordance with the methodology in this document.

Included in this Annual Report is a copy of the new ODCM that is being implemented in the second quarter of 2002. This document was approved January of 2001 put was not put into effect. Current dose estimations are being completed using the old system (Hummingbird) and the new system (RETDAS). This side by side comparison is being used for familiarization of the new reporting system.

ComEd

Offsite

Dose

Calculation

Manual

Docket Numbers:

Dresden	*50-10, 50-237, 50-249*
Quad Cities	*50-254, 50-265*
Zion	*50-295, 50-304*
LaSalle	*50-373, 50-374*
Byron	*50-454, 50-455*
Braidwood	*50-456, 50-457*

Change Summary
ODCM, Generic Section
Revision 2.0

Note:
The changes to the ODCM Generic section summarized below will maintain the level of radioactive effluent control required by 10CFR20.1302, 40CFR190, 10CFR50.36a, and Appendix I to 10CFR50 and not adversely impact the accuracy of effluent, dose or set point calculations.

Cover Page, Table of Contents

Page or Section	Change Description
Cover Page	Added station names to docket numbers.
	• Updated page numbers in entire T.O.C. Updated changes to section headings, chapters and appendices throughout T.O.C.
	• Removed page and revision summary from T.O.C. Individual pages are no longer updated.
	• Combined the entire generic section Chapters' table of contents.
	• Added a note to the T.O.C. to indicate changes made to chapters and appendices.
	• Clarified in T.O.C. that Chapters 8 and 9 as well as Appendix D and E have intentionally been left blank
	• Deleted list of abbreviations and acronyms

Change Summary
ODCM, Generic Section
Revision 2.0

Page or Section	Change Description
	• Throughout chapter one and all the generic section chapters, the majority of the information that was provided as background and did not specifically address the ComEd offsite dose program was deleted. • Throughout entire generic section, changed CECo to ComEd. • Throughout entire generic section, deleted reference to chapters 8 and 9. • Updated page numbers throughout generic section.

Chapter 1

Page or Section	Change Description
Introduction	Numbered as Section 1.0. Deleted first four paragraphs and last three paragraphs. Reworded parts of the remainder. Added statement indicating that manual calculations may be performed in lieu of computer program Changed reference to Radiological Effluent Technical "Specifications" to "Standards"
1.1, 1.1.1, 1.1.2, 1.1.3	Deleted, this same information is already included in Chapter 4.
1.2.1	Reworded and moved to section 2.1.
1.2.2	Deleted. This information is descriptive/educational but is not required to be included in the manual for the ODCM.
1.2.3	Deleted. This information is descriptive/educational but is not required to be included in the manual for the ODCM.
1.2.4	Deleted. This information is descriptive/educational but is not required to be included in the manual for the ODCM.
1.3	Deleted. This information is descriptive/educational but is not required to be included in the manual for the ODCM.
1.4	Renumbered 1.1. Reworded to reflect changes to chapters and appendices. Added fourth paragraph to address the new ODCM Bases and Reference Document (old Appendix E).
Table 1-1, 1-2, same 1-3, 1-4 & 1-5	These tables were deleted and a new table, Table 2-1 was created to contain the information.
Figure 1-1	Deleted. This information is descriptive/educational but is not required to be included in the manual for the ODCM.
Figure 1-2	Reformatted and renamed Figure 2-1. Footnote 1; deleted first sentence defining monthly.

Change Summary
ODCM, Generic Section
Revision 2.0

Chapter 2

Page or Section	Change Description
	Added introduction to Chapter 2
2.1.1	Removed the 10CFR20 effective dates. Deleted Chapter 1 reference and updated table number.
2.1.1.1 - 2.1.1.4	Deleted. This information is descriptive/educational but is not required to be included in the manual for the ODCM.
2.1.1.5	Combined with 2.1.1 and added reference to Table 2-1.
2.1.2	Deleted. This information is descriptive/educational but is not required to be included in the manual for the ODCM.
2.1.2.1	Renumbered 2.1.2, deleted last two paragraphs.
2.1.2.2	Renumbered 2.1.3, deleted last sentence of the second paragraph.
2.1.3	Renumbered 2.1.4.
2.1.4	Renumbered 2.1.5. Deleted the number and the specific stations listed in parenthesis. Deleted last sentence of last paragraph. Added paragraph that references Generic Letter 79-041 which gives the basis for compliance with 40CFR190 requirements.
2.2	Removed 'specifications' from the section heading. Changed RETS to stand for Standards. Reworded; deleted reference to (pending approval), deleted reference to acronym recognition.
2.2.1	Deleted section and paragraphs related to Standard RETS.
2.2.2 and (2.2.2.1 - 2.2.2.5)	Deleted; redundant to station annex.
2.4	Reworded to emphasize the fact that 10CFR50 provides design objectives, not limits. Also combined with the old 2.5 and both numbered as 2.4.
(2.4.1 - 2.4.4)	Deleted. This information is descriptive/educational but is not required to be included in the manual for the ODCM.
2.5	Renumbered 2.4. Reworded first sentence of second paragraph to clarify intent. Updated table references.
2.6	Renumbered 2.5 and renamed section. Changed table references. Reworded to improve grammar.
Table 2-1	Deleted. This information is descriptive/educational but is not required to be included in the manual for the ODCM. Created new Table 2-1 'Regulatory Dose Limit Matrix'. Reformatted footnotes to numbers instead of asterisks; added footnote 3 which relates the fact that 10CFR50 provides design objectives, not limits. Added additional requirement (and limits) to calculate total body and skin dose if air dose is exceeded.
Table 2-2	Deleted. Redundant wording.
Table 2-3	Renamed and Renumbered Table 2-2 Under Reference equation comments, added "Col.2" to the 10CFR20 Appendix B reference.
Table 2-4	Renumbered Table 2-3. Reformatted footnotes to numbers instead of asterisks.
Figure 2-1	Reformatted old Figure 1-2. Footnote 1, deleted first sentence defining yearly and quarterly since they are spelled out now. Footnote e; changed to Table A-3. Added footnotes 3 and 4 for clarification. Exposure pathways example figure is now incorporated into Figure 3.1

Change Summary
ODCM, Generic Section
Revision 2.0

Chapter 3

Page or Section	Change Description
Introduction	Numbered as Section 3.0. Updated figure reference. Reworded first sentence to clarify. Reworded last paragraph to clarify.
3.1	Updated figure number. Replaced the words 'The nuclear power stations' with 'ComEd' in the second to last sentence. Reworded last sentence to clarify.
3.2	Updated figure number. Reworded first bullet to clarify meaning. In bullets changed 'plant' to 'station'. Reworded and changed reference to 'Appendix E' to 'ODCM Bases and Reference Document'. Added new paragraph between last two paragraphs to discuss dredging of the rivers near the nuclear stations. Modified last paragraph to clarify that concentrations for noble gases are contained in station Radiological Effluent Technical Standards (RETS).
3.3	Changed reference from Appendix E to ODCM Bases document. Added statement for an example. Added emphasis that contained radioactive material stored onsite produces doses that are negligible in comparison with applicable limits due to BWR skyshine and potential doses due to radioactive waste storage.
Figures 3-1, 3-2 and 3-3	Combined the three figures into one; numbered as Figure 3-1; bolded pathways in Figure 3-1 that ComEd considers in its calculations; under Liquid Effluents, added a block depicting the pathway of exposure to radioactivity in water from recreational activities.

Chapter 4

Page or Section	Change Description
4.0	Removed reference to Appendix C.
4.1.1	Reworded section to clarify meaning.
4.1.2	Reworded first sentence to clarify intent of this section. Deleted 'drinking' from second to last paragraph, redundant wording.
4.1.3	Renamed the section. Reworded to clarify meaning. Deleted 'On' at beginning of second two bullets. Changed radio-iodine to "radioactive iodine"
4.1.4	Minor rewording to clarify meaning.
4.1.5	Changed Appendix D reference to Appendix C. Deleted Table 4-3 reference. Deleted, this information is descriptive/educational but is not required to be included in the manual for the ODCM. Reworded to clarify meaning.
4.1.6	Reworded to clarify meaning. Deleted equation and parameter definitions, this information is descriptive/educational but is not required to be included in the manual for the ODCM. Deleted the three bullets, unnecessary.
4.1.7	Deleted equation and parameter definitions, this information is descriptive/educational but is not required to be included in the manual for the ODCM. In first paragraph, changed 'and, or' to 'and/or'.
4.1.8	Changed table reference to Table 4-2.
4.2	Deleted text, redundant wording.
4.2.1	Deleted entire section, this information is descriptive/educational but is not required to be included in the manual for the ODCM.
4.2.1.1	Renumbered 4.2.1. Deleted equation and parameter definitions, this information is descriptive/educational but is not required to be included in the manual for the ODCM. Minor wording changes.
4.2.1.2	Renumbered 4.2.2. Deleted equation and parameter definitions, this information is descriptive/educational but is not required to be included in the manual for the ODCM. Changed Appendix D reference to Appendix C. Minor rewording to clarify meaning.
4.2.1.3	Renumbered 4.2.3. In section on 'Dose' deleted the four bullets; redundant. Renamed section on 'Dose' to 'Whole Body Dose' and renamed 'Dose Rate'. Updated section reference. 'Whole Body Dose Rate'. Minor rewording to clarify meaning (clarified the meaning of "whole body dose factor").
4.2.1.4	Renumbered 4.2.4. Renamed 2 paragraph headers 'Dose and Dose Rate' 'Skin Dose and Skin Dose Rate'. Minor rewording to clarify meaning.
4.2.2	Renumbered 4.2.5. Deleted equations and parameter definitions, this information is descriptive/educational but is not required to be included in the manual for the ODCM. Reworded Comment to clarify meaning.
4.2.3	Renumbered 4.2.6. Deleted equation and parameter definitions, this information is descriptive/educational but is not required to be included in the manual for the ODCM. Reworded section on 'the inhalation dose commitment factor' to improve clarity, created two bullets. Deleted 'now' in last sentence of Dose Commitment section, redundant wording. 4.2.4Renumbered 4.2.7. Deleted equations and parameter definitions, this information is descriptive/educational but is not required to be included in the manual for the ODCM. Reworded section to improve clarity.

4.2.4.1, 4.2.4.2 and 4.2.4.3	Deleted sections, redundant to Appendix A.
4.3	Deleted equations and parameter definitions, this information is descriptive/educational but is not required to be included in the manual for the ODCM. Data is also included in the Appendix A. Minor rewording for clarity. Changed Figure 3-3 reference to Figure 3-1. Changed Appendix D reference to Appendix C.
4.4 and 4.4.1	Combined and re-titled 'Contained Sources of Radioactivity". Reworded to improve clarity; added "rad material" to last sentence of second paragraph.
4.4.1.1	Renumbered 4.4.1. Minor rewording for clarity. Added sentence to indicate that the addition of hydrogen can increase the dose rate due to skyshine up to a factor of 10 times expected levels depending on injection rates and power levels. Added reference 39.
4.4.1.2	Renumbered 4.4.2. Minor rewording to clarify management of facilities. Retitled section to "Onsite RadWaste and Rad Material Storage Facilities". Removed site specific information. Added butler buildings/warehouses under DAW Storage Facilities and added bullet for Rad Material Storage Facilities which includes replaced steam generator storage facilities. Site specific details exist in Appendix A.
4.5 (new)	New section heading numbered 4.5 to include information on total dose requirements.
4.4.2	Renumbered 4.5.1. Minor rewording for clarity. Deleted second and third sentences, this information is descriptive/educational but is not required to be included in the manual for the ODCM.
4.4.3	Renumbered 4.5.2; fourth bullet reworded to end, "... if applicable".
Table 4-1	Deleted. This information is descriptive/educational but is not required to be included in the manual for the ODCM.
Table 4-2	Renumbered Table 4-1. Added second footnote 'a' to state that stations are not required to calculate for carbon-14. Old footnote "a" is now footnote "b"
Table 4-3	Renumbered Table 4-2. Changed Table references nomenclature to match renumbering for dose commitment factors.
Figure 4-1	Deleted. This information is descriptive/educational but is not required to be included in the manual for the ODCM.

Change Summary
ODCM, Generic Section
Revision 2.0

Chapter 5

Page or Section	Change Description
5.1	Deleted all but the first paragraph, redundant and informational but is not required to be included in the manual for the ODCM. Minor rewording for clarity.
5.2	Minor rewording for clarity. Deleted last sentence, this information is descriptive/educational but is not required to be included in the manual for the ODCM.
5.3	Minor rewording for clarity. Remainder of section, after the fourth sentence, was deleted, informational and redundant. The information is out-of-date and not appropriate for all stations.
5.3.1	Deleted last two sentences, all ComEd sites are now on UREMP. Minor rewording for clarity. Removed the capitalization from the words "interlaboratory comparison program" to keep the statements generic in nature since the NRC (EPA) no longer provides or requires approval of the program.

Chapter 6

Page or Section	Change Description
6.0	Deleted old Chapter 6 as it was redundant to Site Annex. Previous Chapter 8 was renumbered as Chapter 6.
6.1	Minor rewording.

Chapter 7

Page or Section	Change Description
	• Deleted chapter. Redundant to station annex. • Incorporated References Section into a new Chapter 7 and added reference 103, "U.S. Nuclear Regulatory Commission, Generic Letter 79-041, September 17, 1979.

Chapter 8

Page or Section	Change Description

Chapter 8 was renumbered as Chapter 6.

Introduction	Deleted all but the first paragraph, redundant and informational but is not required to be included in the manual for the ODCM.
8.1	Renumbered 6.1. Deleted last two sentences of the first paragraph, redundant material. Minor rewording to improve clarity. Clarified responsibility for distribution of the AREOR.
8.2	Renumbered 6.2. Minor rewording to clarify responsibilities. Deleted 'optional'.
8.3	Renumbered 6.3 and re-titled 'REMP Contractor'. Updated department nomenclature to references.
8.4	Renumbered 6.4. Updated department nomenclature to references. Minor rewording to clarify responsibilities.

Chapter 9

Change Summary
ODCM, Generic Section
Revision 2.0

Chapter 9 has been deleted. The basic program requirements for each station have been relocated into Chapter 12 (Section 12.5) of each station's annex.

References

Page or Section	Change Description
	• References are no longer a separate section, the references have been reformatted into the new ODCM Chapter 7.
#1	Deleted reference 1. Procedure no longer exists.
#42	Deleted reference 42. Procedure no longer exists.
#80	Added reference 80. Changed CECo to ComEd.
#94	Deleted reference 94. This letter was never issued and is no longer necessary since stations have implemented the improved Technical Specifications.
#101	New reference. This document is the old ODCM Appendix E.
#102	New reference. This document was added to show that increases in the hydrogen injection rates will increase the offsite and onsite doses even higher than current levels.

Change Summary
ODCM, Generic Section
Revision 2.0

Appendix A

Page or Section	Change Description
Updated references to ODCM sections and appendices throughout Appendix A.	
T.O.C.	Revised Table listing.
A.0	Revised Table numbers.
A.1.1	
A.1.2.1	Added the requirement for the determination projected dose contributions in this section as well as sections A.1.2.2, A.1.4 and A.2.1. Changed the word 'symbol' to 'letter'. Revised Table number.
A.1.2.2	Updated section and, or appendix references in parameter L_i , λ_i definitions. Deleted 'of this manual'.
A.1.2.3	Updated section references in parameter S_i V_i G_i definition. Revised Table number.
A.1.2.4	Updated section and, or appendix references in parameter L_i definition.
A.1.3.1	Deleted reference to proposed generic letter (never issued). Minor rewording in last sentence.
A.1.3.2	Deleted reference to proposed generic letter (never issued).
A.1.4	Deleted 'of this manual'.
A.1.4.1	Updated appendix references in parameter DFG_i , t_b , λ_i definitions.
A.1.4.2	Updated appendix references in parameter R_a definitions. Updated Dose Factor references in parameter DFA_{ija} definition.
A.1.4.3	Updated Dose Factor references in parameter DFI_{ija} definition. Corrected Equation A-22 to read ' $i^F_{ia} = U^F_a C^F_i$ '. Updated appendix references in parameter definitions.
A.1.4.3.1	Updated appendix nomenclature references in parameter definitions.
A.1.4.3.2	Updated appendix nomenclature references in parameter definitions.
A.1.4.3.3	Updated appendix nomenclature references in parameter definitions.
A.1.5	Deleted reference to proposed generic letter (never issued).
A.1.6	Added the four age groups after 'member of the public' for clarity.
A.2.1	Updated appendix nomenclature references in parameter definitions. Updated Dose Factor references in parameter DFI_{ija} definition. Deleted 'of this manual'.
A.2.2	Deleted last sentence of 'Requirement' discussion; Tech Specs are approved. Changed acronym **DWC** to **ECL**. Added sentence at end of 'ECL_i' definition to clarify noble gas concentration limits. Changed reference nomenclature from A.5.3 to A.5.1.
A.3	Added 'types of' and (N^{16}) for clarity.
A.3.1	Replaced 'nitrogen-16 (N-16)' with ' N^{16} '. Reworded the second paragraph to improve clarity. Additional minor rewording to improve clarity.
A.3.2	Re-worded A.3.2 to remove site specific information. Deleted date reference. Site specific information is not appropriate for the generic section. Also indicated that waste "may" be stored at the sites since not all sites actually have or store waste in a particular storage facility. Added verbiage to reflect the project that is underway for Byron and Braidwood to have an onsite building to house the old steam generators after they are removed for Byron-1 and Braidwood-1. This information is being added to ensure that the proper dose evaluations be performed once these facilities are constructed and in use.
A.4	Added 'Limits' to section title. Minor rewording to improve clarity.
A.4.2	Updated reference nomenclature in definition of parameter W_T. Updated appendix nomenclature references.
A.4.3	Deleted '$H_d + H_{E,50}$ ' to eliminate appearance of the unnecessary second equation.
A.5.1	Added two paragraphs in the 'Requirement' section to address the 'member of the public' definition change to 10CFR20 in August, 1995.

Appendix A (cont.)

Change Summary
ODCM, Generic Section
Revision 2.0

Page or Section	Change Description
A.5.2	Minor rewording to improve clarity.
A.5.3	Revised Table nomenclature numbers.
A.6.2	Revised Table nomenclature number.
Table A-1	Deleted, redundant to Table 2-3.
Table A-2	Renumbered Table A-1.
Table A-3	Deleted, redundant to Table 2-2.
Table A-4	Renumbered Table A-2.
Table A-5	Renumbered Table A-3.
Table A-6	Renumbered Table A-4.
Figure A-1	Deleted.

Change Summary
ODCM, Generic Section
Revision 2.0

Appendix B

Page or Section	Change Description
This revision to Appendix B was expanded to incorporate Appendix C. Added 'Section 1' and 'Section 2' to separate the appendix into airborne and liquid effluents.	
B.1	Reworded to improve clarity. Updated appendix reference.
B.1.1	Updated appendix nomenclature reference.
B.2	Deleted '(see Figure B-1)' and '(see Figures B-2 through B-4)'.
B.2.1	Deleted '(see Figure B-4)' twice and deleted '(see Figure B-3)'
B.3.1	Updated appendix nomenclature reference.
B.3.2	Updated appendix nomenclature reference.
B.4.1	Deleted reference to figures in Appendix D.
B.4.2	Deleted reference to figure in Appendix D.
B.5.1	Updated appendix nomenclature reference.
B.7	Updated appendix nomenclature reference.
B.8	Updated appendix nomenclature reference.
B.9	Deleted reference to Appendix D.
B.10	Deleted reference to Appendix D.
B.12	Updated appendix nomenclature reference.
B.13	Updated appendix nomenclature reference.

Appendix C

Page or Section	Change Description
Incorporated entire Appendix C into Appendix B as Section 2.	
C.0	Renumbered B.14. Updated section nomenclature references.
C.1	Renumbered B.15.
C.1.1	Renumbered B.15.1. Renumbered equation (A-27) as (A-30). Deleted reference to Figure C-1. In second bullet, added (with $1/M \leq 1$) to show that dilution is a multiplier. Renumbered

Appendix D

Page or Section	Change Description
Renamed Appendix D as Appendix C. Renumbered all sections and tables with the 'C' designation.	
D.1	Renumbered C.1. Added two sentences to improve clarity of scope and content of this appendix.
D.2	Renumbered C.2. Reworded section to incorporate the reference to the R.G.1.109 for the dose commitment factors addressing 10CFR50 compliance calculations.
New Section	Created Section C.3; this section incorporates the reference to FGR#11 for the dose commitment factors addressing 10CFR20 compliance calculations. Also included description to illustrate how the dose factors were derived from FGR#11.
Table D-1 Through D-8	Deleted; table values were directly taken from the R.G.1.109 and FGR#11.
Table D-9	Renumbered Table C-1.
Table D-10	Renumbered Table C-2. Added reference statement after the table. The value of Ra for the teenager in the manual was incorrectly indicated as 3700. The value is being revised to the correct value of 8000 to be consistent with Reg. Guide 1.109 and the ODCM software. Only the value listed in the manual was incorrect, the software database does contain the proper value of 8000.
Table D-11	Renumbered Table C-3.
Table D-12	Renumbered Table C-4. Added reference statement after the table.
Table D-13	Renumbered Table C-5.
Table D-14	Renumbered Table C-6.
Table D-15	Renumbered Table C-7.
Table D-16	Renumbered Table C-8.
Table D-17	Renumbered Table C-9.
Table D-18	Renumbered Table C-10.
Table D-19	Renumbered Table C-11.
Table D-20	Deleted table of intake to dose conversion factors which are found in FGR-11.
Table D-21	Deleted table of intake to dose conversion factors which are found in FGR-11.
Figures D-1 through D-8	Deleted as redundant, direct copies from the R.G. 1.109.

Appendix E

Page or Section	Change Description
Appendix E was deleted from the generic section of the ODCM. The appendix was converted to a generic section bases and reference document which will be treated as a reference and will not be included as part of the ODCM. This information is descriptive/educational but is not required to be included in the manual for the ODCM; it is now reference #101.	

OFFSITE DOSE CALCULATION MANUAL

TABLE OF CONTENTS

Part 1: GENERIC SECTIONS

Part 2: SITE SPECIFIC SECTIONS

Note: Previous Chapter 6 was deleted and previous Chapter 8 was renumbered as Chapter 6.
Previous Chapter 7 was deleted and replaced by the references section.
Previous Chapter 9 was deleted.
Previous Appendix B and C have been combined into Appendix B.
Previous Appendix D has been revised into Appendix C.
Previous Appendix E has been deleted and is Reference 101.

OFFSITE DOSE CALCULATION MANUAL

TABLE OF CONTENTS (Continued)

OFFSITE DOSE CALCULATION MANUAL

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

OFFSITE DOSE CALCULATION MANUAL

LIST OF TABLES FOR THE ODCM GENERIC SECTIONS

LIST OF FIGURES FOR THE ODCM GENERIC SECTIONS

CHAPTER 1

1.0 Introduction

The Offsite Dose Calculation Manual (ODCM) presents a discussion of the following:

- The basic concepts applied in calculating offsite doses from nuclear plant effluents.
- The regulations and requirements for the ODCM and related programs
- The methodology and parameters for the offsite dose calculations used by the nuclear power stations to assess impact on the environment and compliance with regulations.

The methodology detailed in this manual is intended for the calculation of radiation doses during routine (i.e., non-accident) conditions. The calculations are normally performed using a computer program. Manual calculations may be performed in lieu of the computer program.

The dose effects of airborne radioactivity releases predominately depend on meteorological conditions (wind speed, wind direction, and atmospheric stability). For airborne effluents, the dose calculations prescribed in this manual are based on historical average atmospheric conditions. This methodology is appropriate for estimating annual average dose effects and is stipulated in the Bases Section of the Radiological Effluent Technical Standards (RETS) of all ComEd nuclear power stations.

1.1 STRUCTURE OF THIS MANUAL

This manual is the ODCM for all ComEd nuclear power stations. It is divided into two parts. The material in the first part is generic (applicable to more than one station) and consists of Chapters 1 through 7 and Appendices A through C. The material in the second part is station (or site) specific. Therefore, there are six separate sets of station-specific sections each containing three chapters (chapters 10, 11, 12) and an appendix (App. F).

The chapters of the generic section provide a brief introduction to and overview of ComEd's offsite dose calculation methodology and parameters. The generic section appendices, Appendices A and B, provide detailed information on specific aspects of the methodology. Appendix C contains tables of values of the generic parameters used in offsite dose equations.

The station-specific section provides specific requirements for the treatment and monitoring of radioactive effluents, for the contents of the Radiological Environmental Monitoring Program (REMP) and the Radiological Effluent Technical Standards (RETS). These three programs are detailed in ODCM Chapters 10, 11 and 12 respectively. Appendix F contains tables of values for the station-specific parameters used in the offsite dose equations. References are provided as required in each station-specific chapter and appendix.

An ODCM Bases and Reference Document (see Reference 101) provides description of the bases for the methodology and parameters discussed in the generic section of the ODCM. This is a stand-alone document and is not considered to be a part of the ODCM.

CHAPTER 2

REGULATIONS AND GUIDELINES

2.0 INTRODUCTION

This chapter of the ODCM serves to illustrate the regulations and requirements that define and are applicable to the ODCM. Any information provided in the ODCM concerning specific regulations are not a substitute for the regulations as found in the CFR or Technical Specifications.

2.1 CODE OF FEDERAL REGULATIONS

Various sections of the Code of Federal Regulations (CFR) require nuclear power stations to be designed and operated in a manner that limits the radiation exposure to members of the public. These sections specify limits on offsite radiation doses and on effluent radioactivity concentrations and they also require releases of radioactivity to be "As Low As Reasonably Achievable". These requirements are contained in 10CFR20, 10CFR50 and 40CFR190. In addition, 40CFR141 imposes limits on the concentration of radioactivity in drinking water provided by the operators of public water systems.

2.1.1 10CFR20, Standards for Protection Against Radiation

This revision of the ODCM addresses the requirements of 10CFR20. The 10CFR20 dose limits are summarized in Table 2-1.

2.1.2 Design Criteria (Appendix A of 10CFR50)

Section 50.36 of 10CFR50 requires that an application for an operating license include proposed Technical Specifications. Final Technical Specifications for each station are developed through negotiation between the applicant and the NRC. The Technical Specifications are then issued as a part of the operating license, and the licensee is required to operate the facility in accordance with them.

Section 50.34 of 10CFR50 states that an application for a license must state the principal design criteria of the facility. Minimum requirements are contained in Appendix A of 10CFR50.

2.1.3 ALARA Provisions (Appendix I of 10CFR50)

Sections 50.34a and 50.36a of 10CFR50 require that the nuclear plant design and the station RETS have provisions to keep levels of radioactive materials in effluents to unrestricted areas "As Low As Reasonably Achievable" (ALARA). Although 10CFR50 does not impose specific limits on releases, Appendix I of 10CFR50 does provide numerical design objectives and suggested limiting conditions for operation. According to Section I of Appendix I of 10CFR50, design objectives and limiting conditions for operation, conforming to the guidelines of Appendix I "shall be deemed a conclusive showing of compliance with the "As Low As Reasonably Achievable" requirements of 10CFR50.34a and 50.36a."

An applicant must use calculations to demonstrate conformance with the design objective dose limits of Appendix I. The calculations are to be based on models and data such that the actual radiation exposure of an individual is "unlikely to be substantially underestimated" (see 10CFR50 Appendix I, Section III.A.1).

The guidelines in Appendix I call for an investigation, corrective action and a report to the NRC whenever the calculated dose due to the radioactivity released in a calendar quarter exceeds one-half of an annual design objective. The guidelines also require a surveillance program to monitor releases, monitor the environment and identify changes in land use.

2.1.4 40CFR190, Environmental Radiation Protection Standards for Nuclear Power Operations

Under an agreement between the NRC and the EPA, the NRC stipulated to its licensees in Generic Letter 79-041 that "Compliance with Radiological Effluent Technical Specifications (RETS), NUREG-0472 (Rev.2) for PWR's or NUREG-0473 (Rev.2) for BWR's, implements the LWR provisions to meet 40CFR190". (See Reference 103 and 49.)

The regulations of 40CFR190 limit radiation doses received by members of the public as a result of operations that are part of the uranium fuel cycle. Operations must be conducted in such a manner as to provide reasonable assurance that the annual dose equivalent to any member of the public due to radiation and to planned discharges of radioactive materials does not exceed the following limits:

- 25 mrem to the whole body
- 75 mrem to the thyroid
- 25 mrem to any other organ

An important difference between the design objectives of 10CFR50 and the limits of 40CFR190 is that 10CFR50 addresses only doses due to radioactive effluents. 40CFR190 limits doses due to effluents and also to radiation sources maintained on site. See Section 2.4 for further discussion of the differences between the requirements of 10CFR50 Appendix I and 40CFR190.

2.1.5 40CFR141, National Primary Drinking Water Regulations

The following radioactivity limits for community water systems were established in the July, 1976 Edition of 40CFR141:

- Combined Ra-226 and Ra-228: $\leq$ 5 pCi/L.
- Gross alpha (particle activity including Ra-226 but excluding radon and uranium): $\leq$ 15 pCi/L.
- The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water shall not produce an annual dose equivalent to the whole body or any internal organ greater than 4 mrem/yr.

The regulations specify procedures for determining the values of annual average radionuclide concentration which produce an annual dose equivalent of 4 mrem. Radiochemical analysis methods are also specified. The responsibility for monitoring radioactivity in a community water system falls on the supplier of the water. However, some of the ComEd stations have requirements related to 40CFR141 in their specific RETS. For calculational methodology, see Section A.6 of Appendix A.

2.2 RADIOLOGICAL EFFLUENT TECHNICAL STANDARDS

The Radiological Effluent Technical Standards (RETS) were formerly a subset of the Technical Specifications. They implement provisions of the Code of Federal Regulations aimed at limiting offsite radiation dose. The NRC published Standard Radiological Effluent Technical Specifications for PWRs (Reference 2) and for BWRs (Reference 3) as guidance to assist in the development of technical specifications. These documents have undergone frequent minor revisions to reflect changes in plant design and evolving regulatory concerns. The Radiological Effluent Technical Specifications have been removed from the Technical Specifications and placed in the ODCM as the Radiological Effluent Technical Standards (RETS) (see Reference 90). The RETS of each station are similar but not identical to the guidance of the Standard Radiological Effluent Technical Specifications.

2.2.1 Categories

The major categories found in the RETS are the following:

- **Definitions**
  A glossary of terms (not limited to the ODCM).

- **Instrumentation**
  This section states the Operability Requirements (OR) for instrumentation performance as well as the associated Surveillance Requirements. The conservative alarm/trip setpoints ensure regulatory compliance for both liquid and gaseous effluents. Surveillance requirements are listed to ensure ORs are met through testing, calibration, inspection and calculation. Also included are the bases for interpreting the requirements. The Operability Requirement (OR) is the ODCM equivalent of a Limiting Condition for Operation (LCO) as defined in both the NRC published Standard Radiological Effluent Technical Specifications and the stations' Technical Specifications.

- **Liquid Effluents**
  This section addresses the limits, special reports and liquid waste treatment systems required to substantiate the dose due to liquid radioactivity concentrations to unrestricted areas. Surveillance Requirements and Bases are included for liquid effluents.

- **Gaseous Effluents**
  This section addresses the limits, special reports and gaseous radwaste and ventilation exhaust treatment systems necessary for adequate documentation of the instantaneous offsite radiation dose rates and doses to a member of the public. Surveillance Requirements and Bases are included for gaseous effluents.

- **Radiological Environmental Monitoring Program**
  This section details the Radiological Environmental Monitoring Program (REMP) involving sample collection and measurements to verify that the radiation levels released are minimal. This section describes the annual land use census and participation in an interlaboratory comparison program. Surveillance.Requirements and Bases are included for environmental monitoring.

- **Reports and Records**
  This section serves as an administrative guide to maintain an appropriate record tracking system. The management of procedures, record retention, review/audit and reporting are discussed.

2.3 OFFSITE DOSE CALCULATION MANUAL

The NRC in Generic Letter 89-01 defines the ODCM as follows (not verbatim) (see Reference 90):

> The Offsite Dose Calculation Manual (ODCM) shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints, and in the conduct of the Radiological Environmental Monitoring Program. The ODCM shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs and (2) descriptions of the Information that should be included in the Annual Radiological Environmental Operating and Annual Radioactive Effluent Release Reports.

Additional requirements for the content of the ODCM are contained throughout the text of the RETS.

2.4 OVERLAPPING REQUIREMENTS

In 10CFR20, 10CFR50 and 40CFR190, there are overlapping requirements regarding offsite radiation dose and dose commitment to the whole body. In 10CFR20.1301 the total effective dose equivalent to a member of the public is limited to 100 mrem per calendar year. In addition, Appendix I to 10CFR50 establishes design objectives on annual total body dose or dose commitment of 3 mrem per reactor for liquid effluents and 5 mrem per reactor for gaseous effluents (see 10CFR50 Appendix I, Sections II.A and II.B.2(a)). Finally, 40CFR190 limits annual whole body dose or dose commitment to a member of the public to 25 mrem due to all uranium fuel cycle operations.

While these dose limits/design objectives appear to overlap. they are different and each is addressed separately by the RETS. Calculations are made and reports are generated to demonstrate compliance to all regulations. Refer to Tables 2-1, 2-2 and 2-3 for additional information regarding instantaneous effluent limits, design objectives and regulatory compliance.

2.5 Dose Receiver Methodology

Table 2-2 lists the location of the dose recipient and occupancy factors, if applicable. In general, the dose receiver spends time in the locations that result in maximum direct dose exposure and inhales and ingests radioactivity at locations that yield maximum pathway doses. Thus, the dose calculated is very conservative compared to the "average" (or typical) dose recipient who does not go out of the way to maximize radioactivity uptakes and exposure.

Finally Table 2-3 relates the dose component (or pathway) to specific ODCM equations and the appropriate regulation.

Table 2-1

Regulatory Dose Limit Matrix

REGULATION	DOSE TYPE		DOSE LIMIT(s)		ODCM EQUATION
Airborne Releases:			(quarterly)	(annual)	
10CFR50 App. I[3]	Gamma Dose to Air due to Noble Gas Radionuclides (per reactor unit)		5 mrad	10 mrad	A-1
	Beta Dose to Air Due to Noble Gas Radionuclides (per reactor unit)		10 mrad	20 mrad	A-2
	Organ Dose Due to Specified Non-Noble Gas Radionuclides (per reactor unit)		7.5 mrem	15 mrem	A-13
	Total Body and Skin Dose (if air dose is exceeded)	Total Body	2.5 mrem	5 mrem	A-6
		Skin	7.5 mrem	15 mrem	A-7
Technical Specifications	Whole Body Dose Rate Due to Noble Gas Radionuclides (instantaneous limit, per site)		500 mrem/yr		A-8
	Skin Dose Rate Due to Noble Gas Radionuclides (instantaneous limit, per site)		3,000 mrem/yr		A-9
	Organ Dose Rate Due to Specified Non-Noble Gas Radionuclides (instantaneous limit, per site)		1,500 mrem/yr		A-28
Liquid Releases:			(quarterly)	(annual)	
10CFR50 App. I[3]	Whole (Total) Body Dose (per reactor unit)		1.5 mrem	3 mrem	A-29
	Organ Dose (per reactor unit)		5 mrem	10 mrem	A-29
Technical Specifications	The concentration of radioactivity in liquid effluents released to unrestricted areas		Ten (10) times the concentration values listed in 10CFR20 Appendix B; Table 2, Column 2, Table C-6 of Appendix C for Noble Gases		A-32
Total Doses [1]:					
10 CFR 20.1301 (a)(1)	Total Effective Dose Equivalent		100 mrem/yr		A-38
10CFR20.1301 (d) and 40CFR190	Whole Body Dose		25 mrem/yr		A-35
	Thyroid Dose		75 mrem/yr		A-37
	Other Organ Dose		25 mrem/yr		A-37
Other Limits [2]:					
40CFR141	Whole Body Dose Due to Drinking Water From Public Water Systems		4 mrem/yr		A-30
	Organ Dose Due to Drinking Water From Public Water Systems		4 mrem/yr		A-30

[1] These doses are calculated considering all sources of radiation and radioactivity in effluents.

[2] These limits are not directly applicable to nuclear power stations. They are applicable to the owners or operators of public water systems. However, the RETS of some of the ComEd nuclear power stations require assessment of compliance with these limits. For additional information, see Section A.6 of Appendix A.

[3] Note that 10CFR50 provides design objectives not limits.

TABLE 2-2

DOSE ASSESSMENT RECEIVERS

Dose Component or Pathway	Location; Occupancy if Different than 100%
"Instantaneous" dose rates from airborne radioactivity	Unrestricted area boundary location that results in the maximum dose rate
"Instantaneous" concentration limits in liquid effluents	Point where liquid effluents enter the unrestricted area
Annual average concentration limits for liquid effluents	Point where liquid effluents enter the unrestricted area
Direct dose from contained sources	Receiver spends part of this time in the controlled area and the remainder at his residence or fishing nearby; occupancy factor is considered and is site-specific. See Appendix F, Table F-8 for occupancy factors.
Direct dose from airborne plume	Receiver is at the unrestricted area boundary location that results in the maximum dose.
Direct dose from radioactivity deposited on the ground	Receiver is at the unrestricted area boundary location with the highest D/Q.
Inhalation dose from airborne effluents	Receiver is at the unrestricted area boundary location that results in maximum dose.
Ingestion dose from vegetables	Receiver eats vegetables from the garden at the nearest residence with the highest D/Q
Ingestion dose from milk	Receiver drinks milk from the near-site dairy farm with the highest D/Q
Ingestion dose from meat	Receiver eats meat produced at the near-site farm with the highest D/Q
Ingestion dose from drinking water[1]	The drinking water pathway is considered as an additive dose component in this assessment only if the public water supply serves the community immediately adjacent to the plant.
Ingestion dose from eating fish	The receiver eats fish from the receiving body of water (lake or river)
Total Organ Doses	Summation of ingestion/inhalation doses
Total Effective Dose Equivalent	Summation of above data

[1] At present, only the Braidwood and Zion station assessments include the drinking water pathway for 10CFR20 compliance.

TABLE 2-3

DOSE COMPONENT/REGULATION MATRIX

Dose Component or Pathway	Reference equation; Comments	Regulation in which dose component is utilized		
		10CFR20	40CFR190	10CFR50 App. I
"Instantaneous" dose rates from airborne radioactivity	A-8: Whole body A-9: Skin A-28: Organ	X(2)		
"Instantaneous" concentration limits in liquid effluents	Ten times the limits of Table 2, Col. 2,10CFR20, Appendix B to §§20.1001 – 20.2402, Table C-6 of Appendix C for Noble Gases	X(2)		
Annual average concentration limits for liquid effluents	10CFR20, Appendix B to §§20.1001 – 20.2402(2)	X(3)		
Direct dose from contained sources	A-34	X	X	
Direct dose from airborne plume	A-1: Gamma air dose A-2: Beta air dose A-6: Whole body dose A-7: Skin dose	X	X	X X X X
Direct dose from radioactivity deposited on the ground	A-14	X	X	X
nhalation dose from airborne effluents	A-17 (1)	X	X	X
Ingestion dose from vegetables	A-23 and A-18 (1)	X	X	X
Ingestion dose from milk	A-25 and A-18 (1)	X	X	X
Ingestion dose from meat	A-27 and A-18 (1)	X	X	X
Ingestion dose from drinking water	A-30 (1)	X	X	X
Ingestion dose from eating fish	A-31 (1)	X	X	X
Total Organ Doses	A-13		X	X
Total Effective Dose Equivalent	A-38	X		

1 Ingestion/inhalation dose assessment is evaluated for adult/teen/child and infant for 10CFR50 Appendix I compliance and for an adult for 10CFR20/40CFR190 compliance. Ingestion/inhalation dose factors are taken from Reg. Guide 1.109 (Reference 6) for 10CFR50 Appendix I compliance and FGR-11 (Reference 93) for 10CFR20/40CFR190 compliance.

2 Technical Specifications for most stations have been revised to allow 10 times the 10CFR20 value or specifically states the maximum instantaneous dose rate limit.

3 Optional for 10CFR20 compliance.

Figure 2-1

Simplified Chart of Offsite Dose Calculations[2]

Category	Radionuclides	Pathway	Text Section	Receptor	Code and Limits	Frequency of Calculation[1]
Airborne	Releases:					
	Noble Gases:	Plume γ[a]	A.1.3.1	Total Body	RETS: 500 mrem/yr Instantaneous	As Required by Station Procedure
	Noble Gases:	Plume γ[a] and β[b]	A.1.3.2	Skin	RETS: 3000 mrem/yr Instantaneous	
	Noble Gases:	Plume γ[a]	A.1.2.1	Air[4]	10CFR50[3]: 5 mrad/qtr, 10 mrad/yr	Monthly
	Noble Gases:	Plume β[b]	A.1.2.2		10CFR50[3]: 10 mrad/qtr, 20 mrad/yr	
	Non-Noble Gases:	Inhalation[b]	A.1.5	Adult (Any Organ)	RETS: 1500 mrem/yr Instantaneous	As required by Station Procedure
	Non-Noble Gases:	Ground Deposition[c]	A.1.4.1	Whole body	10CFR50[3]: 7.5 mrem/qtr, 15 mrem/yr	Monthly and Annually
		Inhalation	A.1.4.2	4 Age groups (All Organs)		
		Leafy Vegetables[c]	A.1.4.3.1			
		Produce[c]	A.1.4.3.1			
		Milk[d]	A.1.4.3.2			
		Meat[d]	A.1.4.3.3			
Liquid	Releases:					
	All	Water	A.2.2		RETS, 10 times 10CFR20 Appendix B; Table 2; Col. 2, Table C-6 of Appendix C for Noble Gases	As Required by Station Procedure
	Non-Noble Gases	Water[e] and Fish[f]	A.2.1	Whole Body	10CFR50[3]: 1.5 mrem/qtr 3 mrem/yr	Monthly
	Non-Noble Gases	Water[e] and Fish[f]	A.2.1	4 Age Groups (All Organs)	10CFR50[3]: 5 mrem/qtr 10 mrem/yr	
	Non-Noble Gases	Water[e]	A.6	Adult (Whole Body and all Organs)	40CFR141: 4 mrem/yr	When Required by RETS
Uranium Fuel Cycle:	All	All releases plus direct radiation from contained sources	A.3	Whole Body	40CFR190: 25 mrem/yr	Annually
				Thyroid (Adult)	40CFR190: 75 mrem/yr	
				All Other Organs (Adult)	40CFR190: 25 mrem/yr	
TEDE:	All	External (DDE) + Internal (CEDE)	A.4.3	Total Body + organs (Adult)	10CFR20: 100 mrem/yr	Annually

Figure 2-1 (Cont'd)

Notes for Figure 2-1:

1. Definition: Monthly means at least once per 31 days or once per month. See station RETS for exact requirements.

2. Additional Calculations: In addition to the calculations shown in this figure, monthly projections of doses due to radioactive materials are required for gaseous and liquid effluents from ComEd nuclear power stations. See Sections A.1.6 and A.2.5 of Appendix A.

   Also, projections of drinking water doses are required at least once per 92 days for Dresden and Quad Cities. See Section A.7 of Appendix A.

3. 10 CFR 50 prescribes design objectives not limits.

4. If the air dose is exceeded, doses to the total body and skin are calculated. Total body objectives are 2.5 mrem/qtr and 5.0 mrem/year; the skin dose objectives are 7.5 mrem/qtr and 15 mrem/year.

a Evaluated at the unrestricted area boundary.

b Evaluated at the location of maximum offsite X/Q.

c Evaluated at the location of maximum offsite D/Q.

d Evaluated for the nearest producer within 5 miles or if there is none a hypothetical producer at 5 miles.

e Evaluated for the nearest downstream community water supply as specified in Table A-3 of Appendix A. The flow and dilution factors specified in Table F-1 of Appendix F are used.

f Evaluated for fish caught in the near-field region downstream of plant using the flow and dilution factors specified in Table F-1 of Appendix F.

CHAPTER 3

EXPOSURE PATHWAYS

3.0 INTRODUCTION

Figure 3-1 illustrates some of the potential radiation exposure pathways to humans due to routine operation of a nuclear power station. These exposure pathways may be grouped into three categories:

- **Airborne Releases**
  Exposures resulting from radioactive materials released with gaseous effluents to the atmosphere.

- **Liquid Releases**
  Exposures resulting from radioactive materials released with liquid discharges to bodies of water.

- **Radiation from Contained Sources**
  Exposures to radiation from contained radioactive sources.

When performing radiation dose calculations, only exposure pathways that significantly contribute (≥ 10%) to the total dose of interest need to be evaluated. The radiation dose from air and water exposure pathways are routinely evaluated. (see Regulatory Guide 1.109, Reference 6.)

3.1 AIRBORNE RELEASES

For airborne releases of radioactivity (Figure 3-1), the NRC considers the following pathways of radiation exposure of persons:

- Radiation from radioactivity airborne in the effluent plume.
- Radiation from radioactivity deposited by the plume on the ground.
- Ingestion of radioactivity on, or in, edible vegetation (from direct plume deposition or from the transfer of radioactivity deposited on the soil).
- Ingestion of radioactivity that entered an animal food product (milk or meat) because the animal ingested contaminated feed, with the contamination due either to direct deposition on foliage or to uptake from the soil.
- Inhalation of radioactivity in the plume.

ComEd considers these same pathways with the exception that the transfer of radioactivity from soil to vegetation is omitted. This pathway was determined to be of minimal significance in relation to the other airborne exposure pathways.

3.2 LIQUID RELEASES

For liquid releases of radioactivity (Figure 3-1), the NRC considers the following pathways of radiation exposure of persons:

- Direct exposure to radioactivity in water while engaging in recreational activities such as swimming and boating.
- Exposure to radiation from shoreline sediments contaminated by water containing radioactivity from station liquid discharges.
- Ingestion of edible vegetation contaminated by irrigation with water containing radioactivity from station liquid discharges.

- Ingestion of radioactivity from animal food products (milk or meat) resulting from the animal either drinking water contaminated by radioactive liquid effluents or from the animal eating feed or vegetation contaminated by irrigation with such water.
- Ingestion of aquatic food (e.g., fish) obtained from the body of water to which radioactive station effluents are discharged.
- Ingestion (drinking) of potable water contaminated by radioactive liquid effluents discharged from the station.

ComEd considers the latter two of these pathways as significant. For the aquatic food pathway, only fish is considered since it is the only significant locally produced aquatic food consumed by humans.

The stations omit the pathways involving irrigation and animal consumption of contaminated water because these pathways were determined to be insignificant. The stations also omit the pathway of radiation exposure from shoreline sediment because this pathway was also found to be insignificant (see ODCM Bases and Reference Document, Section O.3.2).

The stations have also verified that the dose contribution to people participating in water recreational activities (swimming and boating) is negligible. (See ODCM Bases and Reference Document, Reference 101, Tables O-3 and O-4) This pathway was not addressed explicitly in Regulatory Guide 1.109. Thus, the stations also omit dose assessments for the water recreational activities pathway.

Periodically the Illinois Army Corps of Engineers dredges silt and debris from the river beds near ComEd nuclear stations. As a part of the land use census, ComEd will determine if the Corps performed dredging within one mile of the discharge point. If so, ComEd will obtain spoils samples, through it's REMP vendor, for analysis. The impact to the offsite dose will be evaluated on a case by case basis and added to the station annex of the ODCM when applicable.

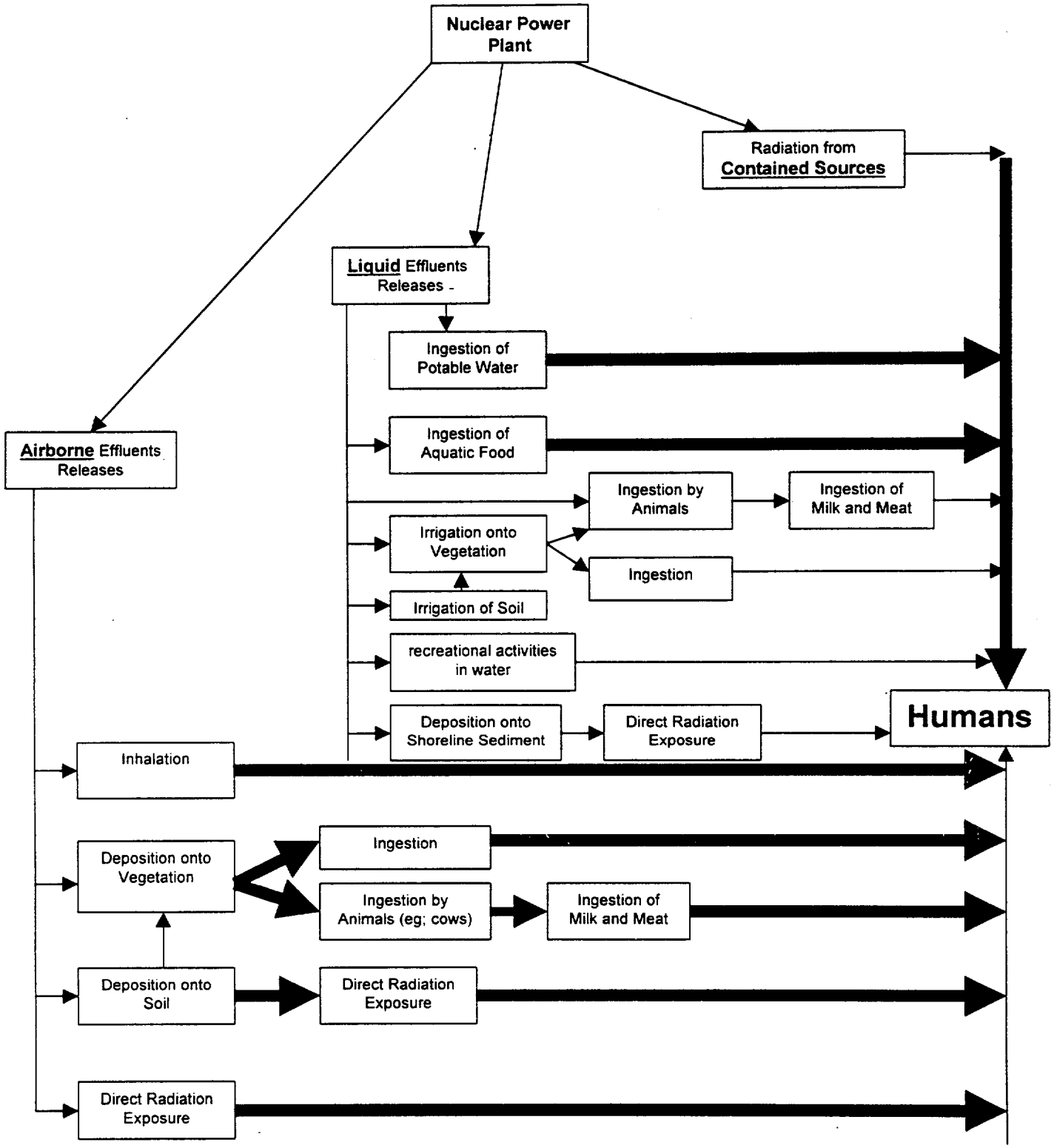
In addition, to assure that doses due to radioactivity in liquid effluents will be ALARA, concentrations will be limited to ten times (10x) the values given in 10CFR20 Appendix B, Table 2; Column 2. Specific limitations for concentrations of entrained noble gases are contained in the stations' Radiological Effluent Technical Standards (RETS).

3.3 RADIATION FROM CONTAINED SOURCES

Radioactivity contained within tanks, pipes or other systems and contained radioactive material or waste stored on site can produce radiation at offsite locations. Annual offsite radiation doses near the stations due to such sources were judged to be negligible in comparison with applicable limits except for doses due to BWR turbine skyshine and potential doses due to radioactive waste storage facilities (excludes radioactive material storage). See ODCM Bases and Reference Document, Reference 101. Changes or modifications to the power station that may impact the offsite dose through increases to the direct radiation levels need to be evaluated on a case by case basis and added to Chapter 12 of the station annex to the ODCM when applicable (e.g.; the Old Steam Generator Storage Facilities).

Figure 3-1

Radiation Exposure Pathways to Humans



CHAPTER 4

METHODOLOGY

4.0 INTRODUCTION

This chapter provides an introduction to the methodology used by ComEd to calculate offsite radiation doses resulting from the operation of nuclear power stations. Additional explanation and details of the methodology are provided in Appendices A and B. Appendix A discusses each dose limit in the RETS and provides the associated assessment equations. Appendix B describes methods used to determine values of parameters included in the equations.

4.1 IMPORTANT CONCEPTS AND PARAMETERS

4.1.1 Dose and Dose Commitment

The dose calculation equations contained in the ODCM are based on two types of exposure to radiation; external and internal exposure. The first type of exposure is that resulting from radioactive sources external to the body (including radiation emanating from an effluent plume, radiation emanating from radioactivity deposited on the ground and radiation emanating from contained sources (also referred to as direct radiation)). Exposure to radiation external to the body only occurs while the source of the radioactivity is present. For example, once a plume containing the airborne radioactivity passes by the individual, the external exposure to radiation ends.

The second type of exposure occurs when the source of radioactivity is inside the body, or internal. Radiation can enter the body by breathing air containing the radioactivity, or by eating food or drinking water containing radioactivity. These latter processes are also referred to as ingesting radioactivity (ingestion). Once radioactivity enters the body and becomes internal radiation, a person will continue to receive radiation dose until the radioactivity has decayed or is eliminated by biological processes. The dose from this type of exposure is also termed dose commitment, meaning that the person will continue to receive dose even-though the plume containing the radioactivity has passed by the individual, or even-though the individual is no longer drinking water containing radioactivity.

The regulations addressed by the ODCM may require assessment of either type of exposure to radiation or of both types in summation.

4.1.2 Exposure Pathways

All of the exposure pathways are discussed in Chapter 3. This section presents the exposure pathways addressed by ComEd nuclear stations in the ODCM and associated software.

For releases of radioactivity in airborne effluents the primary pathways are the following:

- Direct radiation from an effluent plume.
- Direct radiation from radioactivity deposited on the ground by a plume.
- Inhalation of radioactivity in a plume.
- Ingestion of radioactivity that entered the food chain from a plume that deposited the radioactivity on vegetation.

For releases of radioactivity in liquid effluents, the exposure pathways considered are human consumption of water and fish.

When determining total doses, as required by 10CFR20 and 40CFR190, the BWR stations also consider direct radiation due to skyshine from nitrogen-16 (N^{16}) in turbines and associated piping. All nuclear

power stations will consider exposure to radiation emanating from onsite radwaste storage facilities when they are put into operation.

4.1.3 Categories of Radioactivity

Radionuclide content of effluent releases from nuclear power stations can be categorized according to the characteristics of the radionuclides. In evaluating doses associated with a particular pathway, only those categories of radionuclides that significantly contribute to the dose need to be included in the dose calculations (See Section 3.0). The categories of radionuclides considered by the ComEd nuclear power stations for each of the airborne pathways are summarized in Table 4-1. Selection of the significant airborne pathways was based on the following:

- The requirements in the RETS (see discussion in Appendix A)
- Applicable regulatory guidance (References 6 and 14), and
- A study of the potential radiological implications of nuclear facilities in the upper Mississippi River basin (Reference 20).

Calculations were used to determine which radionuclides were significant for a particular pathway. For example, in the case of direct radiation from a plume of airborne radioactivity, it was found that radiation from noble gases is significant and radiation from radioactive iodine was not. The dose rate per unit of airborne radioactivity concentration is about the same for noble gases and radioactive iodine since they emit comparable types and energies of radiation. However, the quantity of noble gas radioactivity (Ci) released in routine nuclear plant operation typically exceeds the quantity of radioactive iodine by a factor of about 10,000.

As another example, consider the inhalation pathway. Here, the calculations showed that the dose commitment due to radioactive iodine was significant but the dose commitment due to radioactive noble gases was not significant and can be excluded from the compliance calculations for the inhalation pathway. This is true despite the fact that a much larger quantity of noble gas radioactivity is released. The reason for this is that the solubility of noble gas in body tissue is very low, where-as the inhaled radioactive iodine does concentrate in specific body organs such as the thyroid (see the discussion on Pages 228 and 231 to 234 of Reference 38).

4.1.4 Release Point Classifications

In the determination of the dose consequence from an airborne release of radioactivity, it is required to know the height of the release of the effluent plume relative to the ground and where the dose recipients are located. This correlation is very important because the radiation dose calculated is greatly impacted by the distance separating the dose recipient and the radioactive plume.

It has been found that the height an effluent plume maintains as it travels above the ground is related to the elevation of the release point and to the height of structures immediately adjacent as follows:

- If the elevation of the release point is sufficiently above the height of any adjacent structures, the plume will remain elevated for considerable distances.
- If the elevation of the release point is at or below the heights of adjacent structures, the plume is likely to be caught in the turbulence of the wakes created by wind passing over the buildings. The plume elevation would then drop to ground level.
- If the elevation of the release point is not significantly above the heights of adjacent structures, then the plume may be elevated or at ground level.

For the calculations of this manual, each established release point has been designated as belonging to one of three release point classifications:

- Stack (or Elevated) Release Points (denoted by the letter S or subscript s)

  These are release points approximately twice the height of adjacent solid structures. Releases are treated as elevated releases unaffected by the presence of the adjacent structures.

- Ground Level Release Points (denoted by the letter G or subscript g)

  These are release points at ground level or lower than adjacent solid structures. Releases are considered drawn into the downwind wake of these structures and are treated as ground level releases.

- Vent (or Mixed Mode) Release Points (denoted by the letter V or subscript v)

  These are release points as high or higher than adjacent solid structures but lower than twice the structure's heights. These releases are treated as a mixture of elevated and ground level releases. The proportion of the release attributed to either elevated or ground level in a vent release is determined by the ratio of stack exit velocity to the wind speed (see Section B.1.2.4 of Appendix B).

The definitions of these classifications are based on Regulatory Guide 1.111 (Reference 7). A list of the classifications of specific airborne release points for each of the ComEd nuclear power stations is contained in Table A-2 in Appendix A.

4.1.5 Historical Average Atmospheric Conditions

The dispersion characteristics of airborne effluents from a nuclear power station are dependent on weather conditions. Meteorological factors that directly affect the concentration of airborne radioactivity in a plume include the following:

- Wind Direction

  The concentration of radioactivity is highest in the direction toward which the wind is blowing.

- Wind Speed

  Greater wind speeds produce more dispersion and consequently lower concentrations of radioactivity.

- Atmospheric Turbulence

  The greater the atmospheric turbulence, the more a plume spreads both vertically and horizontally. For calculations in this manual, the degree of turbulence is classified by use of seven atmospheric stability classes, designated A (extremely unstable) through G (extremely stable). The seven classes and some of their characteristics are listed in Table C-4 of Appendix C.

Meteorological conditions strongly impact the values of various parameters applied in the dose calculations of this manual. These include:

- The Relative Concentration Factor X/Q (Section 4.1.6)
- The Relative Deposition Factor D/Q (Section 4.1.7)

- The Gamma Air Dose Factor (Section 4.2.1)
- The Whole Body Dose Factor (Section 4.2.3)

Some bases sections of both the Standard Radiological Effluent Technical Specifications (guidance document) and the RETS specify that dose calculations be based on "historical average atmospheric conditions". Therefore, this manual provides values for the above parameters that are based on station-specific historical average meteorological conditions. These values were obtained by averaging hourly values of the parameters over a long-term, several-year, period of record. The averaging period was based on calendar years in order to avoid any bias from weather conditions associated with any one season. The period of record is identified in each of the tables providing the values (see Appendix F).

4.1.6 Relative Concentration Factor X/Q

A person immersed in a plume of airborne radioactivity is exposed to radiation from the plume and may also inhale some of the radioactivity from the plume. The concentration of radioactivity in air near the exposed person must be calculated to adequately evaluate doses resulting from any inhalation. The relative concentration factor X/Q (referred to as "chi over Q") is used to simplify these calculations. X/Q is the concentration of radioactivity in air, at a specified location, divided by the radioactivity release rate. X/Q has the following units:

Units of X/Q = (μCi/m^3) / (μCi/sec) = sec/m^3

Station-specific values of X/Q are provided for each nuclear power station in Table F-5 of Appendix F. These values are based on historical average atmospheric conditions (see Section 4.1.5).
For each of the release point classifications (eg. stack, vent and ground level) and for the 16 compass-direction sectors (N, NNE, etc.), Table F-5 provides the maximum value of X/Q for locations at or beyond the unrestricted area boundary.

The value of X/Q for each sector reflects the fraction of time that the wind blew into that sector and the distribution of wind speeds and atmospheric stability classes during that time. Note that the value would be zero if the wind never blew into the sector.

The methodology for determining X/Q is discussed in detail in Section B.3 of Appendix B.

4.1.7 Relative Deposition Factor D/Q

As a plume travels away from its release point, portions of the plume may touch the ground and deposit radioactivity on the ground and/or on vegetation. Occurrences of such deposition are important to model since any radioactivity deposited on the ground or on vegetation may directly expose people and/or may be absorbed into food products which can ultimately be ingested by people. The relative deposition factor is used to simplify the dose calculations for these pathways.

The relative deposition factor D/Q is the rate of deposition of radioactivity on the ground divided by the radioactivity release rate. Its value was determined for specific conditions. In this manual it has the following units:

Units of D/Q = [(pCi/sec)/m^2] / (pCi/sec) = 1/m^2

The values of D/Q are affected by the same parameters that affect the values of X/Q: release characteristics; meteorological conditions and location (see Section 4.1.6). Station-specific values of D/Q are provided for each ComEd nuclear power station in Appendix F Tables F-5 and F-6. These values are based on historical average atmospheric conditions (see Section 4.1.5).

For each release point classification and for each of the 16 compass-direction sectors (N, NNE, etc.), Table F-5 provides the maximum value of D/Q for locations at or beyond the unrestricted area boundary. In Table F-6, values of D/Q are given for the locations of the nearest milk and meat producers within 5 miles of the nuclear power station. The methodology for determining D/Q is discussed in Section B.4 of Appendix B.

4.1.8 Dose Factors

Various dose factors are used in this manual to simplify the calculation of radiation doses. These factors are listed in Table 4-2. Definitions of these factors are given in the remainder of this chapter. Methods of determining their values are addressed in Appendix B.

4.2 AIRBORNE RELEASES

4.2.1 Gamma Air Dose

The term 'gamma air dose' refers to the component of dose absorbed by air resulting from the absorption of energy from photons emitted during nuclear and atomic transformations, including gamma rays, x-rays, annihilation radiation, and Bremsstrahlung radiation (see footnote on page 1.109-19 of Regulatory Guide 1.109).

The Gamma Air Dose Factor

The gamma air dose factor is the gamma air dose rate divided by the radioactivity release rate. The value of the gamma air dose factor is determined by calculating the gamma dose rate to air (at a specific location and corresponding to a given release rate) and dividing that dose rate by the corresponding release rate:

Gamma Air Dose Factor = [(mrad/yr)/(μCi/sec)]

The methodology for this calculation is discussed in Section B.5 of Appendix B. The calculation is complex because the dose rate at any given point is affected by the radioactivity concentration and distance. The value of the gamma air dose factor is also affected by all of the parameters that affect X/Q: release characteristics, meteorological conditions and location (see Section 4.1.6). Additionally, the value is affected by radiological parameters: the distribution of energies and intensities for gamma emissions from each specific radionuclide and the photon attenuation characteristics of air.

In the ODCM, station-specific values of gamma dose factors are provided for each station in Appendix F, Table F-7. These values are based on historical average atmospheric conditions (see Section 4.1.5). For the release point classification and for each of the 16 compass-direction sectors, Table F-7 provides the maximum value of the gamma air dose factor for noble gas radionuclides at the unrestricted area boundary. The value includes a correction for radioactive decay during transport of the radionuclide from the release point to the dose calculation location.

4.2.2 Beta Air Dose

The term 'beta air dose' refers to the component of dose to air dose resulting from the absorption of energy from emissions of beta particles, mono-energetic electrons and positrons during nuclear and atomic transformations (see the footnote on Page 1.109-20 of Regulatory Guide 1.109).

The Beta Air Dose Factor

The beta air dose factor is the beta air dose rate divided by the concentration of radioactivity in air at the dose calculation location. Values of the beta air dose factor are different for each radionuclide because of the differences in electron-emission spectra. Values for the beta air dose factors of 15 noble gas radionuclides are provided in Appendix C Table C-9.

The values of beta air dose factors are independent of nuclear power station because the size of a plume, at or beyond the restricted area boundary, is large compared to the range of the beta particle radiation. Therefore, the radioactivity concentration can be assumed to be constant over the entire volume surrounding a given beta dose calculation point. One can then define the beta air dose factor as the beta dose rate per unit of air radioactivity concentration. This relationship is independent of station-specific parameters. In contrast to this, the gamma air dose may depend on radioactivity concentration hundreds of feet away from the dose calculation point (see Section 4.2.1). Therefore, when determining the value of the gamma air dose factor, the shape of the plume over a large region must be considered. Plume shape does depend on station-specific parameters such as meteorology and release point classification and therefore values of the gamma air dose factor are station-specific.

4.2.3 Whole Body Dose and Dose Rate

Whole Body Dose

Equation A-6 of Appendix A is used to calculate dose to the whole body from noble gas radionuclides released in gaseous effluents. The deep dose equivalent (DDE) (or whole body dose) equation is similar to that used to calculate gamma air dose (Equation A-1 of Appendix A).

Whole Body Dose Rate

Equation A-8 of Appendix A is used to calculate dose rate to the whole body. The assumptions used for this equation are the same as those used in the calculation of whole body dose (Equation A-6 of Appendix A) except that any shielding benefit (dose attenuation) provided by residential structures is not applied. Since the calculation is for the maximum instantaneous dose rate, the dose recipient may be out of doors when exposed and would not be shielded from the exposure by any structural material.

The Whole Body Dose Factor

The whole body dose factor is the whole body dose rate divided by the radioactive release rate. Values for the whole body dose factor depend on the same parameters as those that affect the gamma air dose factor (see Section 4.2.1). The whole body dose factor is a 10CFR50 term that yields a Deep Dose Equivalent when applied to the radioactive release rate.

Station-specific values for the whole body dose factor are provided for each ComEd nuclear power station in Appendix F, Table F-7. These values are based on historical average atmospheric conditions (see Section 4.1.5). For each of 15 noble gas radionuclides, for the release point classifications, and for each of the 16 compass-direction sectors, Table F-7 provides the maximum value of the whole body dose factor at the unrestricted area boundary. These values include a correction for radioactive decay during transport of the radionuclide from the release point to the dose calculation location.

The methodology for determining whole body dose factors is addressed in Section B.6 of Appendix B.

4.2.4 Skin Dose and Dose Rate

Skin Dose

Equation A-7 of Appendix A is used to calculate dose to skin from noble gas radionuclides released in gaseous effluents. The skin dose is also referred to as the 'shallow dose equivalent' (SDE). The SDE is the summation of dose to the skin from beta and gamma radiation.

The equation for beta dose to skin is similar to that used to calculate beta dose to air (Equation A-2 of Appendix A) except that beta skin dose factors are used instead of beta air dose factors. The beta skin dose factor differs from the beta air dose factor by accounting for the attenuation of beta radiation by the dead layer of skin. The dead layer of skin is not susceptible to radiation damage and therefore is not of concern. The beta dose to the skin from non-noble gases is insignificant and is not calculated for the reason described in Section 4.1.3. When calculating the beta contribution to skin dose, no reduction is included in the calculations due to shielding provided by occupancy of residential structures.

The equation for gamma dose to skin is similar to that used to calculate gamma dose to air except for the following:

- Equation A-7 of Appendix A includes a units conversion factor 1.11 rem/rad to convert from units of gamma air dose (rad) to units of tissue dose equivalent (rem).
- Equation A-7 of Appendix A includes a dimensionless factor of 0.7 to account for the shielding due to occupancy of residential structures.

Equation A-7 of Appendix A uses gamma air dose factors not gamma whole body dose factors. When calculating gamma dose to skin, no reduction is applied for the attenuation of radiation due to passage through body tissue (dead layer of skin).

Skin Dose Rate

Equation A-9 of Appendix A is used to calculate dose rate to skin. The assumptions are the same as those used in the calculation of skin dose (Equation A-7 of Appendix A) except that no credit is taken for shielding of gamma radiation by residential structures. The dose recipient may be outdoors when exposed and the maximum instantaneous dose rate is of concern.

The Skin Dose Factor

As with the beta air dose factor, values of the beta skin dose factors are different for different radionuclides but do not vary from station to station. Values of the beta air dose factors and skin dose factors are provided in Table C-9 of Appendix C for 15 noble gas radionuclides.

4.2.5 Ground Radiation

Equations A-14 through A-16 of Appendix A are used to calculate the deep dose equivalent (whole body dose) due to non-noble gas radionuclides released in gaseous effluents and deposited on the ground.

Comment
Note that if there is no release of radionuclide 'i' during a given time period, then the deposition rate is zero, the ground plane concentration is zero and the resulting dose due to ground deposition is zero. If there is a release of radionuclide 'i', the ground concentration is computed as if that release had been occurring at a constant rate for the ground deposition time period.

The Ground Plane Dose Conversion Factor

The ground plane dose conversion factor is the dose rate to the whole body per unit of radioactivity concentration on the ground. Values of the ground plane dose conversion factor that are calculated by assuming constant concentration over an infinite plane are provided for various radionuclides in Table C-10 of Appendix C. The values are the same for all stations. The station-specific aspects of the calculation of ground dose concern the determination of the radioactivity concentration on the ground.

4.2.6 Inhalation

Dose Commitment

Radioactivity from airborne releases of radioactive iodine, particulate, tritium, and carbon-14 can enter the body through inhalation. Equation A-17 of Appendix A is used to calculate dose commitment to the whole body or its organs due to inhalation of non-noble gas radionuclides released in gaseous effluents. This dose component is also referred to as the 'committed dose equivalent' (CDE).

The Inhalation Dose Commitment Factor

Values for the inhalation dose commitment factor are the same for all ComEd stations. The components of this factor are not impacted by station specific parameters. However, the dose commitment factors used for compliance with 10CFR20 and 10CFR50 Appendix I are different as noted below:

- Values of the inhalation dose commitment factor used in the 10CFR50, Appendix I assessment are exactly those listed in Reg. Guide 1.109 (Reference 6) Tables E-7, 8, 9 and 10. These tables include data for four age groups (adult, teenager, child and infant) and seven body organs.

- Values of tne inhalation dose commitment factor used for determining 10CFR20 and 40CFR190 compliance are exactly those listed in Table 2.1 of Federal Guidance Report No. 11 (FGR-11) (Reference 93). These data are for an adult and are given for all significant organs.

Dose Commitment Rate

The inhalation dose commitment rate is the rate at which dose commitment is accrued by an individual breathing contaminated air. Equation A-28 of Appendix A is used to calculate dose commitment rate to an organ due to inhalation of non-noble gas radionuclides. The assumptions are the same as used in the calculation of inhalation dose commitment (Equation A-17 of Appendix A).

4.2.7 Ingestion

Airborne releases of radioactive iodine, particulate, tritium, and carbon-14 can enter the food chain through deposition on, or absorption by, vegetation. The radioactivity can be ingested by humans who consume the vegetation or who consume products (e.g., milk or meat) of animals who have fed on the contaminated vegetation. Each ComEd nuclear power station considers the following four ingestion pathways:

- Leafy vegetables,
- Produce (e.g. non-leafy vegetables, fruit, and grain),
- Milk, and
- Meat.

Equation A-18 of Appendix A is used to calculate the dose commitment due to ingestion of food containing non-noble gas radionuclides released in gaseous effluents.

Values of the ingestion dose commitment factor are the same for each ComEd nuclear power station. The components of this factor are not impacted by station specific parameters. The station-specific aspects of the calculation of ingestion dose only concern the quantity of radioactivity ingested. However, the ingestion dose commitment factors used for 10CFR20 and for 10CFR50 compliance are different as was noted previously in section 4.2.6. These differences are noted below:

- Values of the ingestion dose commitment factor used in the 10CFR50 Appendix I assessment are exactly those listed in Reg. Guide 1.109 Tables E-11, 12, 13 and 14. These tables include data for four age groups and seven organs.

- Values of the ingestion dose commitment factor used in the 10CFR20 assessment are exactly those listed in Table 2.2 of Federal Guidance Report No. 11 (Reference 93). These tables include data for an adult and are given for all organs.

The ingested activity is calculated by use of equations A-19 through A-22 of Appendix A. The food product radioactivity concentration is calculated from measurements of radioactivity in station releases. The different equations used for radioactivity concentration in vegetation, milk, and meat are also discussed in Appendix A.

4.3 LIQUID RELEASES

The evaluation of dose and dose rate due to releases of radioactivity in liquid effluents is required to confirm compliance with the provisions of RETS related to 10CFR50 Appendix I. ODCM Section 3.2 and Figure 3-1 list some of the pathways by which radioactivity in liquid effluents can impact man. The principal pathways used by ComEd to calculate dose from liquid effluents are ingestion by drinking water and by eating fish from the body of water receiving station liquid discharges. The nuclear power stations obtain the dose commitment due to radioactivity in liquid effluent releases by summing the dose commitments from both the drinking water and fish pathways.

Equations A-29, A-30 and A-31 of Appendix A are used to calculate committed dose equivalent (CDE) for the member of the public due to consumption of drinking water and fish.

The radioactivity concentration in water is obtained by dividing the quantity of radioactivity released by the volume of water in which the release is diluted (e.g., the flow is multiplied by the total time of the release in hours). The result is multiplied by the following:

- A factor to represent any additional dilution that might occur.
- A factor to account for radioactive decay from the time of release to the time of consumption.

The radioactivity concentration in fish is the product of the radioactivity concentration in water and a bio-accumulation factor. The dilution and radioactive decay factors for fish may be different from those for water. (The fish may be caught at a location different from where drinking water is drawn and the time period from the release of radioactivity to consumption may be different.)

The bio-accumulation factor accounts for the fact that the quantity of radioactivity in fish can build up with time to a higher value relative to the concentration of the radioactivity in the water they consume. The bio-accumulation factor is the equilibrium ratio of the concentration of radionuclide 'i' in fish to its concentration in water. The same values are used for the bio-accumulation factor at each station. These values are provided in Appendix C, Table C-8.

4.4 CONTAINED SOURCES OF RADIOACTIVITY

In addition to the whole body, skin and single organ dose assessments previously described, an additional assessment is required. The additional assessment addresses radiation dose due to radioactivity contained within the nuclear power station and its structures.

There are presently two types of contained sources of radioactivity which are of concern in offsite radiological dose assessments. The first is that due to gamma rays resulting from nitrogen-16 carry-over to the turbine in BWR steam (skyshine). The second is that due to gamma rays associated with radioactive material contained in onsite radwaste and rad material storage facilities.

4.4.1 BWR Skyshine

The most significant dose component to members of the public produced by "contained sources" is nitrogen-16 (N-16) within the turbine building of BWRs. Although primary side shielding is around the turbine and its piping, N-16 gamma rays scattered by air molecules in the overhead air space above the turbine and piping cause a measurable "skyshine" radiation dose in the local power plant environs.

Equation A-34 of Appendix A is used to evaluate skyshine dose. A complicating factor in the calculation is the practice at some stations of adding hydrogen to reactor coolant to improve coolant chemistry. The addition of hydrogen can increase the dose rate due to skyshine up to a factor of 10 times expected levels depending on injection rates and power levels (Reference 39). Increasing the hydrogen injection rate will increase the dose rates even further. (See Reference 102) The skyshine dose determined by Equation A-34 of Appendix A depends on the following factors:

- The distance of the dose recipient location from the turbine.
- The number of hours per year that the location is occupied by a dose recipient.
- The total energy [MWe-hr] generated by the nuclear power station with hydrogen addition.
- The total energy [MWe-hr] generated by the nuclear power station without hydrogen addition.

4.4.2 Onsite Radwaste and Rad Material Storage Facilities

Low level radioactive waste may be stored at any ComEd nuclear power station in the following types of storage facilities:

- Process Waste Storage Facilities
  - Interim Radwaste Storage Facility (IRSF) structure
  - Concrete vaults containing 48 radwaste liners (Also referred to as "48-pack";)
- DAW Storage Facilities
  - Dry Active Waste (DAW) facilities (may include Butler buildings/warehouses)
- Replaced Steam Generator Storage Facilities

In addition, Rad Material may be stored in facilities on site:

- Rad Material Storage Facilities
  - Contaminated tools and equipment in seavans and/or warehouses

Administrative controls are implemented by each station to ensure compliance to applicable regulations. The impact to the offsite dose will be evaluated on a case by case basis and added to the station annex of the ODCM when applicable. . In addition, a 10CFR50.59 analysis may be required for radwaste storage facilities.

4.5 TOTAL DOSE REQUIREMENTS

4.5.1 Total Effective Dose Equivalent Limits; 10CFR20 and 40CFR190

10CFR20 requires compliance to dose limits expressed as "Total Effective Dose Equivalent" (TEDE). The TEDE is the sum total of the external dose and the sum of the weighted internal doses. (See Appendix A; Sections A.4.3 and A.5.1)

4.5.2 Total Dose For Uranium Fuel Cycle

The nuclear power stations are required to determine the total dose to a member of the public due to all uranium fuel cycle sources in order to assess compliance with 40CFR190 as part of demonstrating compliance with 10CFR20.

The total dose for the uranium fuel cycle is the sum of doses due to radioactivity in airborne and liquid effluents and the doses due to direct radiation from contained sources at the nuclear power station. When evaluation of total dose is required for a station, the following contributions are summed:

- Doses due to airborne and liquid effluents from the station.
- Doses due to liquid effluents from nuclear power stations upstream.
- Doses due to nitrogen-16 (N^{16}) skyshine, if the station is a boiling water reactor.
- Doses due to any onsite radioactive waste storage facilities; if applicable.

Section A.5.2 of Appendix A discusses the details of evaluations.

Table 4-1

Radionuclide Types Considered For Airborne Effluent Exposure Pathways

Category	External Radiation		Internal Radiation	
	Plume	Ground	Inhalation	Ingestion
Noble Gases	X			
Tritium (H-3)			X	X
Carbon-14 (C-14)[a]		X	X	
Iodine[b]		X	X	X
Particulate[b]		X	X	X

---

[a] ComEd stations are not required to calculate dose due to C^{14}. (See ODCM Bases and Reference document, Reference 101; Section O.4.5)

[b] The nuclear power stations are not required to consider all iodine and particulate radionuclides. For details, see Generic Letter 89-01 and the RETS.

Table 4-2
Radiation Dose Factors

Name and Symbol	Units	Definition	Table
Gamma Air Dose Factor S_i, V_i, G_i	mrad/yr per μCi/sec	Gamma air dose rate per unit of radioactivity release rate for radionuclide i for a stack (S_i), vent (V_i), or ground level (G_i) release.	F-7 F-7a
Whole Body Dose Factor: $\bar{S}_i$, $\bar{V}_i$, $\bar{G}_i$	mrad/yr per μCi/sec	Whole body dose rate per unit of radioactivity release rate for radionuclide i for a stack ($\bar{S}_i$), vent ($\bar{V}_i$), or ground ($\bar{G}_i$) level release.	F-7 F-7a
Beta Air Dose Factor L_i	mrad/yr per μCi/m^3	Beta air dose rate per unit of radioactivity concentration for radionuclide i.	C-9
Beta Skin Dose Factor $\bar{L}_i$	mrem/yr per μCi/m^3	Beta skin dose rate per unit of radioactivity concentration for radionuclide i.	C-9
Ground Plane Dose Dose Conversion DFG_i	mrem/hr per pCi/m^2	Dose rate per unit of ground radioactivity concentration for radionuclide i.	C-10
Inhalation Dose Commitment Factor DFA_{ija}	mrem per pCi	Dose commitment to organ j of age group 'a' per unit of radioactivity inhaled for radionuclide i. (see Note 1)	RG 1.109 Tables; E-7, E-8, E-9, E-10
Ingestion Dose Commitment Factor DFI_{ija}	mrem per pCi	Dose commitment to organ j of age group a per unit of radioactivity ingested for radionuclide i. (see Note 1)	RG 1.109 Tables; E-11, E-12, E-13, E-14
Inhalation Dose Commitment Factor DFA_{ija}	Sv/Bq	Dose commitment to organ j of age group a per unit of radioactivity inhaled for radionuclide i (see Note 1).	FGR-11 Table 2.1
Ingestion Dose Commitment Factor DFI_{ija}	Sv/Bq	Dose commitment to organ j of age group a per unit of radioactivity ingested for radionuclide i (see Note 1).	FGR-11 Table 2.2

Table 4-2

Radiation Dose Factors (cont.)

Note 1: Dose assessments for 10CFR20 and 40CFR 190 compliance are made for an adult only using the dose commitment factors of Federal Guidance Report 11 (Reference 93). These are given in units of Sieverts per Becquerel. To convert these data to the conventional units of (mrem/pCi) the data must be multiplied by 3.7×10^3.

Dose assessments for 10CFR50 Appendix I are made using dose factors of Regulatory Guide 1.109 (Reference 6) for all age groups.