

ZionSolutions, LLC

ZS-2013-0176: Attachment 5 – Meteorology Data

Annual Report
on the
Meteorological Monitoring Program
at the
Zion Nuclear Power Station
2012

prepared for

Zion Solutions, LLC.
Zion, Illinois 60099

by

Murray and Trettel, Incorporated
600 First Bank Drive, Suite A
Palatine, IL 60067
(847) 963-9000
e-mail: mt@weathercommand.com

For Zion Solutions Use Only

Reviewed By: 

Date: 4-9-13

Table of Contents

<u>Section</u>	<u>Description</u>	<u>Page</u>
	List of Tables	ii
1	Introduction	1
2	Summary	2
3	Data Acquisition.....	3
4	Data Analysis.....	5
5	Results.....	10
	Site Calibration logs.....	Appendix

List of Tables

<u>Number</u>	<u>Description</u>	<u>Page</u>
1	Instrument Locations	4
2	Data Loggers	4
3	Wind Direction Classes	7
4	Wind Speed Classes	7
5	Atmospheric Stability Classes	8
6	Data Recovery Summary	11
7	Wind Rose, January-March 2012	14
8	Wind Rose, April-June 2012	16
9	Wind Rose, July-September 2012	18
10	Wind Rose, October-December 2012	20
11	Wind Rose, January-December 2012	22
12	Precipitation Totals	24
13	Maximum Doses Resulting From Airborne Releases	25

1. Introduction

The purpose of the meteorological program being conducted at the Zion Station site is to provide information sufficient to assess the local weather conditions and to determine the degree of atmospheric dispersion of airborne radioactive effluent from the station.

The meteorological tower is 250 ft. high and is instrumented at two levels. Wind speed and direction are measured at 35 ft. and 250 ft. Ambient temperature is measured at 35 ft. Differential temperature, referenced to 35 ft., is measured at 250 ft. Dew point temperature is measured approximately ten feet from the tower at an elevation of 5 ft. Precipitation is measured by a rain gauge located on the roof of the meteorological shelter building.

Joint frequency stability wind rose tables of wind direction, wind speed, and stability are routinely tabulated from hourly measurements. The quarterly and annual tables are included in this report.

Descriptions of the instruments and recorders are given in Section 3 (Data Acquisition) of this report. Data reduction and processing are described in Section 4 (Data Analysis). The results given in Section 5 of this report include modeled maximum whole body doses, skin doses, organ doses based upon airborne releases, and site meteorology.

2. Summary

The Zion Station meteorological monitoring program produced 52,589 hours of valid data out of a possible 52,704 parameter hours during 2012 (366 days x 24 hours/day x 6 measured priority parameters), which represents an overall data recovery rate of 99.8%. Priority parameters are all parameters except dew point temperature and precipitation.

The stability wind rose tables included in this report have been generated using the 35 ft. wind data with the 250-35 ft. differential temperature data.

The maximum annual calculated cumulative doses resulting from airborne releases were as follows.

Zion Generating Station:

Unit 1:

gamma air dose	-	0.000×10^{-0}	mrads
beta air dose	-	0.000×10^{-0}	mrads
whole body dose	-	6.795×10^{-5}	mrem
skin dose	-	6.795×10^{-5}	mrem
organ (child liver)	-	6.795×10^{-5}	mrem

Unit 2:

gamma air dose	-	0.000×10^{-0}	mrads
beta air dose	-	0.000×10^{-0}	mrads
whole body dose	-	6.795×10^{-5}	mrem
skin dose	-	6.795×10^{-5}	mrem
organ (child liver)	-	6.795×10^{-5}	mrem

3. Data Acquisition

Wind speed is measured with Teledyne Geotech model 1564 sensors and wind direction is measured with Teledyne Geotech model 1565 sensors. The wind speed sensors have a starting speed of 0.63 mph (0.28 mps), a range of 0 to 100 mph (0 to 44.7 mps), and a system accuracy of $\pm 1\%$. The wind direction sensors have a threshold speed of 0.7 mph (0.31 mps), a range of 0 to 540°, and a system accuracy of $\pm 5^\circ$.

Ambient and differential temperatures are measured with RDF model 23789-4 sensors, and dew point temperature is measured with a Foxboro model 2781-18-CGN dewcell. Ambient temperature is measured within the range of -40 to 120°F (-40 to 48.9°C) with an accuracy of $\pm 0.5^\circ\text{F}$ ($\pm 0.3^\circ\text{C}$). Differential temperature is measured within the range of -10 to 30°F (-5.6 to 16.7°C) with an accuracy of $\pm 0.18^\circ\text{F}$ ($\pm 0.10^\circ\text{C}$), and dew point temperature is measured within the range of -40 to 120°F (-40 to 48.9°C) with an accuracy of $\pm 2.7^\circ\text{F}$ ($\pm 2.0^\circ\text{C}$). Precipitation is measured with a Climatronics model 100097 rain gauge. Precipitation is measured in increments of one one-hundredth of an inch with a system accuracy of $\pm 0.01"$ ($\pm 0.25\text{mm}$).

Instrument types and locations are summarized in Table 1.

The meteorological data are collected and stored by a Microtel 4.0 data acquisition system. The Microtel measures the analog voltages of the instruments and records the digital equivalent within the range of 0 to +1 volt. The Microtel has the capability of storing 24 hours of minute data and one week of hourly data. Data are obtained from the Microtel by a direct dial telephone hookup to an in-house computer system. Data are sampled every second.

As a backup to the Microtel, data are also recorded with a Johnson Yokogawa Corp. digital recorder (JYC DA100 data acquisition unit and Contec IPC-PT/M300(PC)WOU PC). Data are sampled every 10 seconds.

Data logger information is summarized in Table 2.

Table 1*Instrument Locations*

<u>Measurement</u>	<u>Sensor Type</u>	<u>Location</u>	<u>Elevation</u>
Wind Speed	Teledyne Geotech 1564	Tower	250 ft.
Wind Direction	Teledyne Geotech 1565	Tower	250 ft.
Differential Temperature	RDF 23789-4	Tower	250 ft.
Wind Speed	Teledyne Geotech 1564	Tower	35 ft.
Wind Direction	Teledyne Geotech 1565	Tower	35 ft.
Ambient Temperature	RDF 23789-4	Tower	35 ft.
Precipitation	Climatronics 100097 Tipping Bucket	Meteorological shelter roof	10 ft.
Dew Point Temperature	Foxboro 2781-18-CGN	Instrument Shelter	5 ft.

Table 2*Data Loggers*

<u>Measurement</u>	<u>Logger Type</u>	<u>Sampling Frequency</u>
Winds, Temperatures, and Precipitation	Microtel 4.0 data acquisition system	1 sec.
Winds, Temperatures, and Precipitation	Johnson Yokogawa Corp. Digital Recorder (JYC DA100 and Contec IPC-PT/M300(PC)WOU) digital recorder	10 sec.

4. Data Analysis

The Zion Microtel is routinely interrogated to obtain hourly average data. The data are then stored in the meteorological data-base and listings of the data are generated. The data listings are examined by qualified personnel and any apparent problems are brought to the attention of the Project Manager or Meteorological Technician and the Instrument Maintenance staff.

Hourly values of wind speed, wind direction, ambient temperature, differential temperature, dew point temperature, and precipitation are obtained through measurements taken at the site. The standard deviation of wind direction (sigma) is derived. The wind direction variation is described in terms of the standard deviation of the direction about the mean direction. The Microtel computes an hourly value of wind sigma by taking the Root-Mean-Square (RMS) of the four quarter-hour wind sigma values. The quarter-hour wind sigma values are calculated directly from the one second wind direction samples during the 15 minute period.

The data base files are edited approximately once a week. Missing Microtel values are replaced with recorder values, when available. Invalid data are deleted from the data-base.

When an hourly value is missing or invalid, the numeral 999 is entered into the computer data file in the appropriate location. When the wind direction changes substantially relative to its short term fluctuations, the numeral 888 can be entered into the wind sigma location to indicate shifting winds. When the wind blows with velocities near the sensing threshold of the instrument, the numeral 777 can be entered into the wind direction, wind speed, and wind sigma locations to indicate light and variable winds.

A professional meteorologist reviews the data, calibration findings, equipment maintenance reports, and other information and determines which data are valid. Only the valid data are retained in the data base.

As a quality control measure, a monthly comparison is made of Microtel and digital recorder data. An investigation is made into the reasons for any significant differences between the sets of values.

Joint frequency stability wind rose tables of hourly data measured at the site are generated. These tables indicate the prevailing wind direction, wind speed, and stability classes measured during the period of observation as well as the joint frequencies of occurrence of the wind direction, wind speed, and stability classes. The values are also used as input to the atmospheric transport and diffusion models. Wind direction, wind speed, and stability classes are given in Tables 3, 4, and 5.

Table 3Wind Direction Classes

IF	348.75°	<	WD	<	11.25°	THEN	Class is	N
IF	11.25°	<	WD	<	33.75°	THEN	Class is	NNE
IF	33.75°	<	WD	<	56.25°	THEN	Class is	NE
IF	56.25°	<	WD	<	78.75°	THEN	Class is	ENE
IF	78.75°	<	WD	<	101.25°	THEN	Class is	E
IF	101.25°	<	WD	<	123.75°	THEN	Class is	ESE
IF	123.75°	<	WD	<	146.25°	THEN	Class is	SE
IF	146.25°	<	WD	<	168.75°	THEN	Class is	SSE
IF	168.75°	<	WD	<	191.25°	THEN	Class is	S
IF	191.25°	<	WD	<	213.75°	THEN	Class is	SSW
IF	213.75°	<	WD	<	236.25°	THEN	Class is	SW
IF	236.25°	<	WD	<	258.75°	THEN	Class is	WSW
IF	258.75°	<	WD	<	281.25°	THEN	Class is	W
IF	281.25°	<	WD	<	303.75°	THEN	Class is	WNW
IF	303.75°	<	WD	<	326.25°	THEN	Class is	NW
IF	326.25°	<	WD	<	348.75°	THEN	Class is	NNW

Table 4Wind Speed Classes

IF	0.0 mph	<	WS	<	0.7 mph	THEN	Class is	1
IF	0.7 mph	<	WS	<	3.5 mph	THEN	Class is	2
IF	3.5 mph	<	WS	<	7.5 mph	THEN	Class is	3
IF	7.5 mph	<	WS	<	12.5 mph	THEN	Class is	4
IF	12.5 mph	<	WS	<	18.5 mph	THEN	Class is	5
IF	18.5 mph	<	WS	<	24.5 mph	THEN	Class is	6
IF	24.5 mph	<	WS			THEN	Class is	7

Table 5

Atmospheric Stability Classes

Class	Differential Temperature Interval (in °C/100m) ⁽¹⁾	Differential Temperature Interval (in °F over the 250-35 ft. interval) ⁽²⁾
Extremely Unstable	$\Delta T \leq -1.9$	$\Delta T \leq -2.3$
Moderately Unstable	$-1.9 < \Delta T \leq -1.7$	$-2.3 < \Delta T \leq -2.1$
Slightly Unstable	$-1.7 < \Delta T \leq -1.5$	$-2.1 < \Delta T \leq -1.8$
Neutral	$-1.5 < \Delta T \leq -0.5$	$-1.8 < \Delta T \leq -0.6$
Slightly Stable	$-0.5 < \Delta T \leq 1.5$	$-0.6 < \Delta T \leq 1.7$
Moderately Stable	$1.5 < \Delta T \leq 4.0$	$1.7 < \Delta T \leq 4.7$
Extremely Stable	$4.0 < \Delta T$	$4.7 < \Delta T$

⁽¹⁾ from ANSI/ANS 2.5

⁽²⁾ ANSI/ANS 2.5 intervals scaled for instrument heights on the Zion meteorological tower

The following two programs were used to calculate doses resulting from radioactive releases:

1. XOQDOQ: Computer Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations (NUREG/CR-2919).

The program is based on the theory that material released to the atmosphere will be normally distributed (Gaussian) about the plume centerline. A straight-line trajectory is assumed between the point of release and all receptors.

The program implements the assumptions outlined in Section C of NRC Regulatory Guide 1.111. In evaluating routine releases from nuclear power plants, it primarily is designed to calculate annual relative effluent concentrations, X/Q values and annual average relative deposition, D/Q values.

Output from the XOQDOQ program is used as input to the GASPAR program.

2. GASPAR II: A Code System for Evaluation of Radiological Impacts Due to the Release of Radioactive Material to the Atmosphere During Normal Operation of Light Water Reactors (NUREG-0597).

GASPAR is a program written for the evaluation of radiological impacts due to the release of radioactive material to the atmosphere during normal operation of reactors. The GASPAR code implements the radiological impact models of NRC Regulatory Guide 1.109, Revision 1, for atmospheric releases. The program is used to estimate the maximum individual doses at selected locations in the vicinity of the plant.

5. Results

5.1 Instrument Maintenance

The maintenance program followed during 2012 was composed of routinely scheduled visits and equipment repairs. Routine site visits were made to inspect the sensing and recording systems for proper operation. In addition, routine maintenance and calibration checks of all tower-mounted and ground level equipment were performed every 4 months. A description of the calibration and field procedures is found in the Murray and Trettel, Inc. "P1009 Procedures Manual" (July 2010).

In January, lower level side lights were replaced. Also in January, a bad heat pad at the 35 ft. level was replaced.

In February, one bad heat lamp and 2 beacon lights were replaced.

In March, the upper side lights were replaced.

In May, the annual tower inspection was performed.

In July, damage from a likely lightning strike was repaired. The 35 ft. and 250 ft. wind direction sensors were replaced, along with the signal conditioning card for the 250 ft. wind direction. Additionally, the Acromag used for the 250 ft. temperature was replaced. A clogged rain gauge was also cleared.

In August, a clogged rain gauge was cleared.

In September, the dew point sensor was re-salted due to low readings. Also in September, the 250 ft. temperature was inspected due to lower than expected readings. The signal conditioning was found to be 0.7 degrees out of tolerance. The system was adjusted. Additionally, the dew point sensor was re-salted again due to high readings.

No other significant problems were encountered with the equipment, and at the end of the year, no problems were evident at the site.

5.2 Data Recovery

The record of data recovery for the year is summarized in Table 6.

Table 6

Zion Site
Data Recovery Summary
2012

<u>Measurement</u>	<u>Elevation</u>	<u>Recovered Hours</u>	<u>Recovered Percent</u>	<u>Lost Hours</u>	<u>Percent Changed</u>
Wind Speed	35 ft.	8768	99.8	16	0.3
Wind Speed	250 ft.	8770	99.8	14	0.1
Wind Direction	35 ft.	8760	99.7	24	0.8
Wind Direction	250 ft.	8760	99.7	24	0.3
Ambient Temperature	35 ft.	8775	99.9	9	0.0
Differential Temperature	250-33 ft.	8756	99.7	28	15.9
Dew Point Temperature	5 ft.	8770	99.8	14	9.9
Precipitation	10 ft.	8720	99.3	64	0.9
AVERAGE *			99.8		

* average of priority parameters (all except dew point temperature and precipitation)

	<u>Valid Hours</u>	<u>Recovered Percent</u>	<u>Lost Hours</u>
Lower Level Joint Frequency %	8748	99.6	36
Upper Level Joint Frequency %	8750	99.6	34

5.3 Summary of Billings for Equipment Repairs, Replacement Parts, and Other Work not Included in Fixed-Cost Maintenance Agreement - 2012

<u>Description - Zion</u>	<u>Cost</u>
<u>January</u>	
Meteorological parts, materials, and contractor services	\$ 235.07
Meteorological equipment maintenance	284.70
<u>February</u>	
Meteorological parts, materials, and contractor services	235.07
Meteorological equipment maintenance	60.00
<u>March</u>	
Meteorological equipment maintenance	444.70
Meteorological parts, materials, and contractor services	0.00
<u>April</u>	
Meteorological equipment maintenance	0.00
Meteorological parts, materials, and contractor services	134.20
Special Request	255.00
<u>May</u>	
Meteorological parts, materials, and contractor services	0.00
Meteorological equipment maintenance	356.27
Special Request	297.50
<u>June</u>	
-none-	0.00
<u>July</u>	
Meteorological parts, materials, and contractor services	2,819.85
Meteorological equipment maintenance	1,344.70
<u>August</u>	
Meteorological parts, materials, and contractor services	503.92
<u>September</u>	
Meteorological parts, materials, and contractor services	1,104.70
Meteorological equipment maintenance	0.00
<u>October</u>	
Meteorological equipment maintenance	120.00
Meteorological parts, materials, and contractor services	49.29
<u>November</u>	
-none-	0.00
<u>December</u>	
-none-	0.00
Annual Total: \$	8,244.97

5.4 Stability Wind Rose Data

The quarterly and annual stability wind roses are given in Tables 7 through 11. Wind speed classes have been altered to reflect the wind sensor threshold.

For the year, winds measured at 35 ft. most frequently came from the West (9.93%) and fell into the 3.6-7.5 mph wind speed class (41.64%). Calms (wind speeds at or below the sensor threshold) were measured 0.05% of the time and speeds greater than 24.5 mph were measured 0.09% of the time.

Stability based on the 250-35 ft. differential temperature most frequently fell into the neutral classification (38.32%).

TABLE 7

-14-

Zion Nuclear Station
35 ft. Wind Speed and Direction

January-March, 2012
250ft-33ft Delta-T (F)

Number of Observations = 2171
Values are Percent Occurrence

SPEED		WIND DIRECTION CLASSES														STABILITY CLASSES								TOTAL	
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							
	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	0.05					0.05			
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		
	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	0.05							0.05	
																									0.09
	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							
	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	0.09	0.14	0.05	0.09	0.05	0.14	0.09	0.05	0.18	0.14	0.09	0.32	0.18	0.00	0.09	1.75				1.75				
3	SS	0.14	0.18	0.14	0.09	0.14	0.18	0.00	0.14	0.28	0.55	0.23	0.18	0.55	0.51	0.18	0.18	3.68					3.68		
	MS	0.09	0.05	0.00	0.00	0.05	0.05	0.00	0.05	0.14	0.14	0.37	0.37	0.46	0.14	0.05	0.09	2.03						2.03	
	ES	0.00	0.05	0.09	0.05	0.05	0.09	0.00	0.05	0.32	0.32	0.09	0.05	0.23	0.09	0.14	0.05	1.66							1.66
																									9.12
	EU	0.00	0.00	0.05	0.05	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.18							
	MU	0.00	0.05	0.00	0.00	0.09	0.23	0.05	0.00	0.00	0.05	0.00	0.05	0.05	0.09	0.05	0.00	0.69		0.69					
4	SU	0.00	0.09	0.23	0.05	0.05	0.14	0.09	0.00	0.05	0.00	0.09	0.23	0.09	0.28	0.00	0.05	1.43			1.43				
-	N	0.51	0.88	0.37	0.23	0.28	0.18	0.37	0.28	0.97	1.20	1.01	1.47	1.75	2.40	1.52	0.88	14.28				14.28			
7	SS	0.55	0.69	0.32	0.28	0.18	0.05	0.23	0.14	0.64	0.51	1.34	1.61	2.53	0.55	0.51	0.23	10.36					10.36		
	MS	0.28	0.23	0.05	0.05	0.05	0.00	0.05	0.05	0.88	0.55	0.14	0.28	0.32	0.37	0.05	0.00	3.32						3.32	
	ES	0.14	0.18	0.00	0.00	0.00	0.05	0.00	0.23	2.63	0.32	0.00	0.00	0.46	0.23	0.00	0.00	4.24							4.24
																									34.50
	EU	0.00	0.23	0.69	0.09	0.00	0.00	0.09	0.00	0.00	0.28	0.32	0.14	0.32	0.32	0.00	2.49	2.49							
	MU	0.00	0.09	0.05	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.14	0.18	0.28	0.51	0.28	0.00	1.61		1.61					
8	SU	0.05	0.05	0.09	0.00	0.05	0.00	0.05	0.05	0.05	0.23	0.32	0.46	0.41	0.51	0.23	0.00	2.53			2.53				
-	N	0.55	0.60	1.24	0.78	0.41	0.14	0.37	0.64	1.47	1.20	1.75	1.93	2.90	2.26	1.70	0.60	18.56				18.56			
1	SS	0.46	0.46	0.09	0.14	0.05	0.14	0.37	0.51	0.78	0.51	0.92	1.47	1.29	0.28	0.14	0.05	7.65					7.65		
2	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88						0.88	
	ES	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.46	1.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40							2.40
																									36.11
	EU	0.00	0.05	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.14	0.18	0.41	0.05	0.00	1.20	1.20							
1	MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.09	0.00	0.18	0.41	0.09	0.00	0.97		0.97						
3	SU	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.14	0.23	0.14	0.14	0.09	0.09	0.00	0.97			0.97				
-	N	0.46	1.01	0.32	0.14	0.28	0.09	0.18	1.34	0.64	0.83	0.97	1.34	1.66	1.11	1.57	0.60	12.53				12.53			
1	SS	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.05	0.05	0.14	0.41	0.14	0.18	0.00	0.05	0.00	1.15					1.15		
8	MS	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	
	ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14							0.14	
																									17.00

TABLE 7
continued

-15-

Zion Nuclear Station
35 ft. Wind Speed and Direction

January-March, 2012
250Ft-33Ft Delta-T (F)

SPEED ----- 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	0.05	0.09	0.00	0.00	0.00	0.00	0.00	0.14	0.14							
1 MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.09	0.00	0.00	0.00	0.00	0.00	0.18		0.18						
9 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.05	0.00	0.00	0.00	0.00	0.00	0.23			0.23					
- N	0.09	0.00	0.00	0.00	0.00	0.00	0.00	1.15	0.00	0.74	0.09	0.00	0.00	0.09	0.00	0.00	2.16				2.16				
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	
																									2.72
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							
6 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						
7 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	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37				0.37				
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	
																									0.37
TOT	3.41	5.11	3.96	2.07	1.70	1.61	2.03	5.76	11.79	8.11	9.03	10.46	14.14	10.82	7.00	2.81	99.91	4.01	3.45	5.16	49.65	22.89	6.26	8.48	99.91

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
0.00	0.28	0.92	0.14	0.00	0.09	0.09	0.00	0.00	0.05	0.55	0.46	0.32	0.74	0.37	0.00	4.01	Extremely Unstable
0.00	0.14	0.05	0.05	0.09	0.23	0.05	0.05	0.00	0.32	0.32	0.23	0.51	1.01	0.41	0.00	3.45	Moderately Unstable
0.05	0.23	0.32	0.05	0.09	0.14	0.14	0.09	0.09	0.55	0.69	0.83	0.64	0.88	0.32	0.05	5.16	Slightly Unstable
1.70	2.63	1.98	1.24	1.01	0.46	1.06	3.87	3.13	4.15	3.96	4.84	6.63	6.03	4.79	2.16	49.65	Neutral
1.15	1.34	0.55	0.51	0.37	0.51	0.60	0.83	1.75	1.70	2.90	3.41	4.56	1.34	0.88	0.46	22.89	Slightly Stable
0.37	0.28	0.05	0.05	0.09	0.05	0.05	0.18	1.84	0.69	0.51	0.64	0.78	0.51	0.09	0.09	6.26	Moderately Stable
0.14	0.23	0.09	0.05	0.05	0.14	0.05	0.74	4.97	0.64	0.09	0.05	0.69	0.32	0.14	0.05	8.48	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	0.09	C A L M
0.32	0.41	0.28	0.23	0.28	0.37	0.14	0.32	0.78	1.20	0.83	0.69	1.57	0.92	0.37	0.41	9.12	< 3.5 mph
1.47	2.12	1.01	0.64	0.64	0.74	0.78	0.69	5.16	2.63	2.58	3.64	5.20	3.92	2.12	1.15	34.50	3.6 - 7.5 mph
1.06	1.43	2.16	1.06	0.51	0.28	0.92	1.75	5.02	1.93	3.41	4.38	5.02	3.87	2.67	0.64	36.11	7.6 - 12.5 mph
0.46	1.15	0.51	0.14	0.28	0.23	0.18	1.47	0.83	1.29	1.89	1.75	2.35	2.03	1.84	0.60	17.00	12.6 - 18.5 mph
0.09	0.00	0.00	0.00	0.00	0.00	0.00	1.15	0.00	1.06	0.32	0.00	0.00	0.09	0.00	0.00	2.72	18.6 - 24.5 mph
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	> 24.5 mph

TABLE 8

-16-

Zion Nuclear Station
35 ft. Wind Speed and Direction

April-June, 2012
250Ft-33Ft Delta-I (F)

Number of Observations = 2182
Values are Percent Occurrence

SPEED		WIND DIRECTION CLASSES														STABILITY CLASSES								TOTAL	
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							
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	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	0.05					0.05			
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	
																									0.05
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	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	0.09	0.14	0.23	0.09	0.09	0.23	0.05	0.09	0.05	0.00	0.00	0.00	0.09	0.05	0.00	0.09	1.28				1.28				
3 SS	0.14	0.27	0.14	0.14	0.18	0.14	0.32	0.27	0.18	0.55	0.27	0.09	0.05	0.18	0.14	0.23	3.30					3.30			
MS	0.18	0.09	0.09	0.09	0.18	0.18	0.05	0.18	0.32	0.50	0.50	0.46	0.27	0.27	0.37	0.14	3.90						3.90		
ES	0.18	0.00	0.00	0.00	0.00	0.00	0.14	0.14	0.23	0.60	0.23	0.60	0.55	0.09	0.14	0.18	3.07							3.07	
																									11.55
EU	0.05	0.23	0.14	0.09	0.32	0.50	0.46	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.00	1.88	1.88							
MU	0.09	0.23	0.18	0.09	0.09	0.09	0.05	0.00	0.00	0.00	0.05	0.05	0.00	0.14	0.05	0.00	1.10		1.10						
4 SU	0.05	0.37	0.55	0.09	0.09	0.18	0.18	0.14	0.00	0.00	0.14	0.09	0.09	0.14	0.09	0.05	2.25			2.25					
- N	0.55	1.24	0.78	0.60	0.50	0.87	0.82	0.96	0.55	0.32	0.41	0.27	0.60	0.41	0.41	0.41	9.72				9.72				
7 SS	1.65	1.51	0.37	0.32	0.64	0.60	0.69	1.10	1.70	1.15	0.55	0.64	1.15	0.87	0.82	0.69	14.44					14.44			
MS	0.14	0.23	0.23	0.14	0.27	0.27	0.46	0.55	1.37	1.33	0.55	0.55	0.32	0.37	0.46	0.05	7.29						7.29		
ES	0.05	0.00	0.09	0.00	0.00	0.09	0.09	0.14	1.24	0.46	0.41	0.27	0.46	0.18	0.00	0.00	3.48							3.48	
																									40.15
EU	0.05	2.34	0.73	0.60	0.14	0.41	0.05	0.14	0.05	0.05	0.37	0.60	1.01	0.09	0.18	0.00	6.78	6.78							
MU	0.09	0.50	0.00	0.05	0.00	0.05	0.00	0.05	0.14	0.14	0.23	0.05	0.23	0.14	0.23	0.00	1.88		1.88						
8 SU	0.37	0.87	0.18	0.05	0.05	0.00	0.00	0.27	0.09	0.09	0.23	0.14	0.09	0.05	0.27	0.09	2.84			2.84					
- N	2.06	2.34	0.69	0.69	0.46	0.27	0.09	0.69	0.87	0.92	1.47	0.18	0.64	0.92	0.50	0.69	13.47				13.47				
1 SS	0.73	0.82	0.23	0.09	0.09	0.14	0.09	1.24	1.47	0.60	0.27	0.14	0.37	0.14	0.32	0.14	6.87					6.87			
2 MS	0.00	0.00	0.00	0.14	0.00	0.05	0.14	1.47	0.92	0.09	0.05	0.05	0.00	0.05	0.00	0.00	2.93						2.93		
ES	0.00	0.00	0.00	0.05	0.09	0.00	0.09	0.27	1.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.51							1.51	
																									36.30
EU	0.09	0.87	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.50	0.37	0.14	0.32	0.09	0.00	2.80	2.80							
1 MU	0.09	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.09	0.18	0.00	0.14	0.09	0.00	0.00	0.69		0.69						
3 SU	0.32	0.14	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.23	0.14	0.00	0.14	0.05	0.05	0.00	1.19			1.19					
- N	1.01	1.24	0.09	0.27	0.41	0.18	0.00	0.27	0.09	0.46	0.60	0.05	0.09	0.00	0.05	0.05	4.86				4.86				
1 SS	0.18	0.09	0.00	0.00	0.14	0.00	0.00	0.09	0.23	0.05	0.05	0.00	0.05	0.00	0.00	0.00	0.87					0.87			
8 MS	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.18	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41						0.41		
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	
																									10.82

TABLE 8
continued

-17-

Zion Nuclear Station
35 ft. Wind Speed and Direction

April-June, 2012
250Ft-33Ft Delta-T (F)

SPEED		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	0.05	0.00	0.00	0.00	0.05	0.05							
1 MU	0.00	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	0.14		0.14						
9 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.14	0.05	0.05	0.00	0.00	0.00	0.27			0.27					
- N	0.27	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.50				0.50				
2 SS	0.00	0.00	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	0.09					0.09			
4 MS	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		
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	
																									1.10
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							
G 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						
T 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	8.43	13.52	4.90	3.76	3.85	4.26	3.76	8.34	10.72	7.93	7.61	4.67	6.60	4.58	4.17	2.80	99.95	11.50	3.80	6.55	29.84	25.62	14.57	8.07	99.95

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
0.18	3.44	1.01	0.69	0.46	0.92	0.50	0.14	0.05	0.32	0.87	0.96	1.24	0.46	0.27	0.00	11.50	Extremely Unstable
0.27	0.73	0.23	0.18	0.09	0.14	0.05	0.05	0.14	0.23	0.55	0.14	0.37	0.37	0.27	0.00	3.80	Moderately Unstable
0.73	1.37	0.73	0.27	0.14	0.18	0.18	0.41	0.09	0.37	0.64	0.27	0.37	0.23	0.41	0.14	6.55	Slightly Unstable
3.99	4.95	1.79	1.65	1.51	1.56	0.96	2.02	1.56	1.70	2.66	0.50	1.42	1.37	0.96	1.24	29.84	Neutral
2.70	2.70	0.73	0.55	1.05	0.87	1.10	2.75	3.62	2.34	1.15	0.87	1.60	1.19	1.28	1.05	25.62	Slightly Stable
0.32	0.32	0.32	0.37	0.50	0.50	0.64	2.43	2.80	1.92	1.10	1.05	0.60	0.69	0.82	0.18	14.57	Moderately Stable
0.23	0.00	0.09	0.05	0.09	0.09	0.32	0.55	2.47	1.05	0.64	0.87	1.01	0.27	0.14	0.18	8.07	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	0.05	C A L M
0.60	0.50	0.46	0.32	0.46	0.55	0.55	0.69	0.78	1.65	1.01	1.15	0.96	0.60	0.64	0.64	11.55	< 3.5 mph
2.57	3.80	2.34	1.33	1.92	2.61	2.75	2.89	4.86	3.25	2.11	1.88	2.66	2.15	1.83	1.19	40.15	3.6 - 7.5 mph
3.30	6.87	1.83	1.65	0.82	0.92	0.46	4.12	4.54	1.88	2.61	1.15	2.34	1.37	1.51	0.92	36.30	7.6 - 12.5 mph
1.70	2.34	0.27	0.46	0.60	0.18	0.00	0.55	0.50	1.10	1.47	0.41	0.55	0.46	0.18	0.05	10.82	12.6 - 18.5 mph
0.27	0.00	0.00	0.00	0.05	0.00	0.00	0.09	0.05	0.05	0.41	0.09	0.09	0.00	0.00	0.00	1.10	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 9

-18-

Zion Nuclear Station
35 ft. Wind Speed and Direction

July-September, 2012
250Ft-33Ft Delta-T (F)

Number of Observations = 2184
Values are Percent Occurrence

SPEED		WIND DIRECTION CLASSES														STABILITY CLASSES								TOTAL	
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							
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	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	0.05				0.05				
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	
																									0.05
EU	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	0.00	0.05	0.05							
MU	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	0.05	0.14		0.14						
1 SU	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.05	0.00	0.05	0.00	0.05	0.05	0.05	0.05	0.05	0.37			0.37					
- N	0.09	0.14	0.18	0.09	0.27	0.23	0.27	0.09	0.14	0.23	0.41	0.14	0.05	0.23	0.23	0.05	2.84				2.84				
3 SS	0.27	0.23	0.32	0.27	0.32	0.05	0.32	0.23	0.23	0.46	0.41	0.55	0.46	0.50	0.50	0.23	5.36					5.36			
MS	0.09	0.09	0.09	0.05	0.05	0.05	0.00	0.05	0.18	0.55	0.60	0.87	1.60	0.46	0.18	0.18	5.08						5.08		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.09	1.05	1.01	0.23	0.05	0.05	2.66							2.66	
																									16.48
EU	0.05	0.27	1.33	0.96	0.96	0.73	0.92	0.05	0.09	0.00	0.18	0.41	0.14	0.09	0.27	0.00	6.46	6.46							
MU	0.00	0.32	0.46	0.14	0.27	0.09	0.23	0.23	0.09	0.05	0.14	0.32	0.09	0.23	0.18	0.00	2.84		2.84						
4 SU	0.09	0.32	0.55	0.41	0.41	0.09	0.32	0.37	0.32	0.32	0.18	0.32	0.41	0.14	0.23	0.05	4.53			4.53					
- N	0.41	0.92	0.82	0.73	0.64	0.37	0.73	0.87	1.60	0.41	0.78	0.73	0.50	1.19	0.92	0.55	12.18				12.18				
7 SS	0.87	0.87	0.55	0.14	0.18	0.14	0.09	0.09	1.65	3.02	1.37	2.11	1.05	0.96	1.05	0.69	14.84					14.84			
MS	0.05	0.05	0.00	0.00	0.05	0.05	0.05	0.05	0.50	0.87	0.41	0.60	1.01	0.69	0.41	0.09	4.85						4.85		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.41	1.24	1.97	0.92	0.50	0.05	5.13							5.13	
																									50.82
EU	0.09	1.51	1.79	0.55	0.41	0.18	0.60	1.01	0.05	0.14	0.41	0.92	0.60	0.41	0.55	0.09	9.29	9.29							
MU	0.14	0.05	0.18	0.09	0.00	0.00	0.00	0.55	0.00	0.23	0.14	0.27	0.14	0.05	0.37	0.14	2.34		2.34						
8 SU	0.32	0.23	0.55	0.23	0.09	0.00	0.05	1.37	0.27	0.37	0.18	0.27	0.05	0.18	0.09	0.18	4.44			4.44					
- N	1.10	0.92	0.64	0.41	0.14	0.00	0.14	1.51	0.55	0.41	0.82	0.78	0.55	0.18	0.87	0.64	9.66				9.66				
1 SS	0.05	0.37	0.05	0.00	0.00	0.00	0.18	0.50	0.14	0.27	0.78	0.23	0.23	0.05	0.23	0.00	3.07					3.07			
2 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	
																									28.80
EU	0.23	0.37	0.05	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.41	0.05	0.00	0.09	0.00	0.00	1.28	1.28							
1 MU	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.09	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.37		0.37						
3 SU	0.18	0.05	0.09	0.00	0.00	0.00	0.00	0.14	0.00	0.09	0.18	0.00	0.00	0.00	0.00	0.00	0.73			0.73					
- N	0.23	0.05	0.09	0.23	0.09	0.00	0.00	0.18	0.00	0.23	0.09	0.00	0.00	0.09	0.05	0.00	1.33				1.33				
1 SS	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	0.05	0.00	0.00	0.09					0.09			
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	
																									3.80

TABLE 9
continued

-19-

Zion Nuclear Station
35 ft. Wind Speed and Direction

July-September, 2012
250Ft-33Ft Delta-T (F)

SPEED		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								
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							
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						
-	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					
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				
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			
	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								
G	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							
T	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						
	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					
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				
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			
	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	
TOT		4.35	6.78	7.78	4.40	3.94	1.97	3.89	7.42	5.95	8.01	8.06	10.90	9.89	6.78	6.73	3.07	99.95	17.08	5.68	10.07	26.05	23.35	9.94	7.78	99.95

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
0.37	2.15	3.16	1.51	1.42	0.92	1.51	1.05	0.23	0.14	1.01	1.37	0.73	0.60	0.82	0.09	17.08	Extremely Unstable
0.23	0.41	0.69	0.27	0.27	0.09	0.23	0.87	0.14	0.32	0.32	0.60	0.23	0.27	0.55	0.18	5.68	Moderately Unstable
0.60	0.60	1.19	0.69	0.50	0.09	0.37	1.92	0.60	0.82	0.55	0.64	0.50	0.37	0.37	0.27	10.07	Slightly Unstable
1.83	2.01	1.74	1.47	1.14	0.60	1.14	2.66	2.29	1.28	2.11	1.65	1.10	1.69	2.06	1.24	26.05	Neutral
1.19	1.47	0.92	0.41	0.50	0.18	0.60	0.82	2.01	3.80	2.56	2.88	1.74	1.56	1.79	0.92	23.35	Slightly Stable
0.14	0.14	0.09	0.05	0.09	0.09	0.05	0.09	0.69	1.42	1.01	1.47	2.61	1.14	0.60	0.27	9.94	Moderately Stable
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.50	2.29	2.98	1.14	0.55	0.09	7.78	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	0.05	CALM
0.50	0.46	0.60	0.50	0.69	0.32	0.60	0.41	0.55	1.47	1.51	2.66	3.16	1.47	1.01	0.60	16.48	< 3.5 mph
1.47	2.75	3.71	2.38	2.52	1.47	2.34	1.65	4.26	4.72	3.48	5.72	5.17	4.21	3.57	1.42	50.82	3.6 - 7.5 mph
1.69	3.07	3.21	1.28	0.64	0.18	0.96	4.95	1.01	1.42	2.34	2.47	1.56	0.87	2.11	1.05	28.80	7.6 - 12.5 mph
0.69	0.50	0.27	0.23	0.09	0.00	0.00	0.41	0.14	0.41	0.73	0.05	0.00	0.23	0.05	0.00	3.80	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

-20-

Zion Nuclear Station
35 ft. Wind Speed and Direction

October-December, 2012
250Ft-33Ft Delta-T (F)

Number of Observations = 2203
Values are Percent Occurrence

SPEED		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							
	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	
E	S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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	0.00					
1	SU	0.05	0.00	0.00	0.00	0.00	0.14	0.09	0.00	0.05	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.41			0.41				
-	N	0.00	0.23	0.18	0.05	0.09	0.05	0.14	0.00	0.09	0.18	0.32	0.54	0.54	0.50	0.45	0.05	3.40				3.40			
3	SS	0.27	0.14	0.14	0.09	0.14	0.14	0.18	0.09	0.36	0.41	0.45	0.36	0.32	0.32	0.32	0.09	3.81					3.81		
	MS	0.05	0.05	0.00	0.05	0.00	0.05	0.05	0.00	0.14	0.18	0.23	0.18	0.18	0.09	0.14	0.05	1.41						1.41	
	E	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.18	0.18	0.36	0.18	0.27	0.23	0.00	1.59							1.59
																									10.62
	EU	0.00	0.05	0.18	0.09	0.05	0.05	0.18	0.09	0.00	0.00	0.05	0.27	0.27	0.18	0.09	0.00	1.54	1.54						
	MU	0.00	0.09	0.09	0.09	0.05	0.00	0.05	0.18	0.00	0.14	0.05	0.09	0.09	0.09	0.09	0.09	1.18		1.18					
4	SU	0.09	0.09	0.18	0.09	0.23	0.14	0.14	0.32	0.27	0.14	0.09	0.09	0.23	0.05	0.32	0.18	2.63			2.63				
-	N	0.59	0.68	0.73	0.50	0.41	0.50	0.41	0.50	0.86	1.91	1.00	0.77	1.23	1.63	1.91	1.45	15.07				15.07			
7	SS	0.59	0.59	0.05	0.09	0.14	0.09	0.09	0.45	3.04	2.13	1.18	0.68	1.45	1.45	2.18	1.18	15.39					15.39		
	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.09	1.27	0.36	0.68	0.27	0.23	0.00	0.82	0.14	3.95						3.95	
	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.18	0.05	0.54	0.27	0.05	0.05	0.05	0.05	1.27						1.27	
																									41.03
	EU	0.05	1.00	0.18	0.14	0.00	0.00	0.00	0.36	0.18	0.18	0.32	0.18	0.27	0.32	0.32	0.32	3.81	3.81						
	MU	0.00	0.18	0.00	0.09	0.05	0.05	0.00	0.23	0.14	0.14	0.23	0.05	0.09	0.09	0.27	0.05	1.63		1.63					
8	SU	0.27	0.32	0.05	0.00	0.05	0.00	0.00	0.23	0.23	0.23	0.32	0.23	0.36	0.32	0.41	0.27	3.27			3.27				
-	N	0.68	0.77	0.50	0.50	0.45	0.14	0.09	0.91	1.50	1.82	2.27	1.00	2.09	1.68	2.00	2.36	18.75				18.75			
1	SS	0.23	0.09	0.00	0.00	0.00	0.00	0.00	0.36	1.00	1.18	0.54	0.09	0.73	0.45	0.05	0.27	4.99					4.99		
2	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.18	0.59	0.09	0.05	0.00	0.00	0.00	0.00	0.00	0.95						0.95	
	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32						0.32	
																									33.73
	EU	0.27	0.09	0.05	0.00	0.00	0.00	0.00	0.05	0.05	0.64	0.32	0.18	0.14	0.05	0.00	0.05	1.86	1.86						
1	MU	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.09	0.14	0.09	0.09	0.00	0.09	0.00	0.09	0.68		0.68					
3	SU	0.05	0.00	0.05	0.00	0.00	0.00	0.00	0.09	0.05	0.45	0.14	0.05	0.09	0.09	0.05	0.14	1.23			1.23				
-	N	0.36	0.50	0.41	0.23	0.41	0.68	0.05	0.77	0.14	0.95	1.50	0.05	0.59	0.41	0.86	0.95	8.85					8.85		
1	SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.18						0.18	
8	MS	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	0.00	0.05						0.05	
	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00	
																									12.85

TABLE 10
continued

-21-

Zion Nuclear Station
35 ft. Wind Speed and Direction

October-December, 2012
250Ft-33Ft Delta-T (F)

SPEED		WIND DIRECTION CLASSES														STABILITY CLASSES								TOTAL	
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	0.05	0.00	0.00	0.05	0.00	0.00	0.09		0.09						
9 SU	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					
- N	0.00	0.00	0.09	0.05	0.27	0.14	0.00	0.32	0.14	0.27	0.00	0.00	0.00	0.00	0.36	0.00	1.63				1.63				
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	
																									1.77
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							
6 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						
7 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	3.63	4.90	2.86	2.04	2.32	2.13	1.59	5.45	10.80	11.76	10.67	5.81	9.12	8.22	10.94	7.76	100.00	7.22	3.59	7.58	47.71	24.38	6.35	3.18	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-
0.32	1.13	0.41	0.23	0.05	0.05	0.18	0.50	0.23	0.82	0.68	0.64	0.68	0.54	0.41	0.36	7.22	Extremely Unstable
0.05	0.27	0.09	0.18	0.09	0.05	0.05	0.45	0.23	0.41	0.41	0.23	0.18	0.32	0.36	0.23	3.59	Moderately Unstable
0.45	0.41	0.27	0.09	0.27	0.27	0.23	0.68	0.59	0.82	0.54	0.36	0.68	0.50	0.82	0.59	7.58	Slightly Unstable
1.63	2.18	1.91	1.32	1.63	1.50	0.68	2.50	2.72	5.13	5.08	2.36	4.45	4.22	5.58	4.81	47.71	Neutral
1.09	0.82	0.18	0.18	0.27	0.23	0.27	0.91	4.49	3.72	2.27	1.13	2.50	2.22	2.54	1.54	24.38	Slightly Stable
0.05	0.05	0.00	0.05	0.00	0.05	0.18	0.27	2.04	0.64	0.95	0.45	0.41	0.09	0.95	0.18	6.35	Moderately Stable
0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.14	0.50	0.23	0.73	0.64	0.23	0.32	0.27	0.05	3.18	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
0.41	0.45	0.32	0.18	0.23	0.36	0.45	0.09	0.73	0.95	1.18	1.45	1.23	1.23	1.18	0.18	10.62	< 3.5 mph
1.27	1.50	1.23	0.86	0.86	0.77	0.95	1.68	5.63	4.72	3.59	2.45	3.54	3.45	5.45	3.09	41.03	3.6 - 7.5 mph
1.23	2.36	0.73	0.73	0.54	0.18	0.14	2.36	3.86	3.63	3.72	1.54	3.54	2.86	3.04	3.27	33.73	7.6 - 12.5 mph
0.73	0.59	0.50	0.23	0.41	0.68	0.05	0.95	0.45	2.18	2.13	0.36	0.82	0.64	0.91	1.23	12.85	12.6 - 18.5 mph
0.00	0.00	0.09	0.05	0.27	0.14	0.00	0.36	0.14	0.27	0.05	0.00	0.00	0.05	0.36	0.00	1.77	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

-22-

Zion Nuclear Station
35 ft. Wind Speed and Direction

January-December, 2012
250Ft-33Ft Delta-T (F)

Number of Observations = 8740
Values are Percent Occurrence

SPEED		WIND DIRECTION CLASSES														STABILITY CLASSES								TOTAL	
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							
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	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	0.01				0.01				
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	0.02					0.02			
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	0.01							0.01	
																									0.05
EU	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	0.00	0.01	0.01							
MU	0.01	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	0.00	0.01	0.03		0.03						
1 SU	0.01	0.00	0.00	0.01	0.00	0.03	0.02	0.01	0.01	0.01	0.00	0.01	0.01	0.02	0.02	0.01	0.19			0.19					
N	0.07	0.16	0.16	0.08	0.13	0.14	0.15	0.07	0.08	0.15	0.22	0.19	0.25	0.24	0.17	0.07	2.32				2.32				
3 SS	0.21	0.21	0.18	0.15	0.19	0.13	0.21	0.18	0.26	0.49	0.34	0.30	0.34	0.38	0.29	0.18	4.04					4.04			
MS	0.10	0.07	0.05	0.05	0.07	0.08	0.02	0.07	0.19	0.34	0.42	0.47	0.63	0.24	0.18	0.11	3.10						3.10		
ES	0.06	0.02	0.02	0.01	0.01	0.02	0.03	0.05	0.16	0.32	0.15	0.51	0.49	0.17	0.14	0.07	2.24							2.24	
																									11.95
EU	0.02	0.14	0.42	0.30	0.33	0.34	0.39	0.03	0.02	0.00	0.06	0.17	0.11	0.08	0.09	0.00	2.52	2.52							
MU	0.02	0.17	0.18	0.08	0.13	0.10	0.09	0.10	0.02	0.06	0.06	0.13	0.06	0.14	0.09	0.02	1.45		1.45						
4 SU	0.06	0.22	0.38	0.16	0.19	0.14	0.18	0.21	0.16	0.11	0.13	0.18	0.21	0.15	0.16	0.08	2.71			2.71					
N	0.51	0.93	0.68	0.51	0.46	0.48	0.58	0.65	1.00	0.96	0.80	0.81	1.02	1.41	1.19	0.82	12.81				12.81				
7 SS	0.92	0.92	0.32	0.21	0.29	0.22	0.27	0.45	1.76	1.70	1.11	1.26	1.54	0.96	1.14	0.70	13.76					13.76			
MS	0.11	0.13	0.07	0.05	0.09	0.08	0.16	0.18	1.01	0.78	0.45	0.42	0.47	0.35	0.43	0.07	4.85						4.85		
ES	0.05	0.05	0.02	0.00	0.00	0.03	0.02	0.10	1.01	0.22	0.34	0.45	0.73	0.34	0.14	0.02	3.52							3.52	
																									41.64
EU	0.05	1.27	0.85	0.34	0.14	0.15	0.18	0.38	0.07	0.09	0.34	0.50	0.50	0.29	0.34	0.10	5.59	5.59							
MU	0.06	0.21	0.06	0.07	0.01	0.02	0.00	0.22	0.07	0.13	0.18	0.14	0.18	0.19	0.29	0.05	1.86		1.86						
8 SU	0.25	0.37	0.22	0.07	0.06	0.00	0.02	0.48	0.16	0.23	0.26	0.27	0.23	0.26	0.25	0.14	3.27			3.27					
N	1.10	1.16	0.77	0.59	0.37	0.14	0.17	0.94	1.10	1.09	1.58	0.97	1.54	1.26	1.27	1.08	15.11				15.11				
1 SS	0.37	0.43	0.09	0.06	0.03	0.07	0.16	0.65	0.85	0.64	0.63	0.48	0.65	0.23	0.18	0.11	5.64					5.64			
2 MS	0.00	0.00	0.00	0.03	0.00	0.01	0.05	0.42	0.58	0.05	0.02	0.01	0.00	0.01	0.00	0.00	1.19						1.19		
ES	0.00	0.00	0.00	0.01	0.02	0.00	0.03	0.21	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.05							1.05	
																									33.73
EU	0.15	0.34	0.10	0.00	0.00	0.00	0.00	0.01	0.03	0.23	0.35	0.18	0.11	0.22	0.03	0.01	1.78	1.78							
1 MU	0.05	0.01	0.02	0.01	0.00	0.00	0.00	0.03	0.03	0.11	0.10	0.02	0.08	0.15	0.02	0.02	0.68		0.68						
3 SU	0.14	0.07	0.03	0.03	0.00	0.00	0.00	0.07	0.01	0.23	0.17	0.05	0.09	0.05	0.05	0.03	1.03			1.03					
N	0.51	0.70	0.23	0.22	0.30	0.24	0.06	0.64	0.22	0.62	0.79	0.35	0.58	0.40	0.63	0.40	6.89				6.89				
1 SS	0.05	0.02	0.00	0.00	0.03	0.03	0.00	0.03	0.09	0.06	0.14	0.03	0.06	0.01	0.01	0.00	0.57					0.57			
8 MS	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13						0.13		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03							0.03	
																									11.11

TABLE 11
continued

-23-

Zion Nuclear Station
35 ft. Wind Speed and Direction

January-December, 2012
250ft-33ft Delta-T (F)

SPEED ----- 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	0.01	0.02	0.00	0.01	0.00	0.00	0.00	0.05	0.05							
1 MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.06	0.01	0.00	0.01	0.00	0.00	0.10		0.10						
9 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.06	0.05	0.01	0.01	0.00	0.00	0.00	0.14			0.14					
- N	0.09	0.00	0.02	0.01	0.08	0.03	0.00	0.37	0.03	0.25	0.07	0.00	0.00	0.02	0.09	0.00	1.08				1.08				
2 SS	0.00	0.00	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	0.02					0.02			
4 MS	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	0.00	0.00	0.00	0.01						0.01		
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	
																									1.40
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							
G 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						
T 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	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09				0.09				
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	
																									0.09
TOT	4.95	7.57	4.87	3.07	2.95	2.49	2.81	6.74	9.82	8.96	8.84	7.95	9.93	7.60	7.22	4.12	99.95	9.95	4.13	7.35	38.32	24.06	9.28	6.86	99.95

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
0.22	1.75	1.37	0.64	0.48	0.49	0.57	0.42	0.13	0.33	0.78	0.86	0.74	0.58	0.47	0.11	9.95	Extremely Unstable
0.14	0.39	0.26	0.17	0.14	0.13	0.09	0.35	0.13	0.32	0.40	0.30	0.32	0.49	0.40	0.10	4.13	Moderately Unstable
0.46	0.65	0.63	0.27	0.25	0.17	0.23	0.78	0.34	0.64	0.61	0.53	0.55	0.49	0.48	0.26	7.35	Slightly Unstable
2.29	2.94	1.85	1.42	1.33	1.03	0.96	2.76	2.43	3.07	3.46	2.33	3.40	3.33	3.35	2.37	38.32	Neutral
1.53	1.58	0.59	0.41	0.55	0.45	0.64	1.33	2.97	2.89	2.22	2.07	2.60	1.58	1.62	1.00	24.06	Slightly Stable
0.22	0.19	0.11	0.13	0.17	0.17	0.23	0.74	1.84	1.17	0.89	0.90	1.10	0.61	0.62	0.18	9.28	Moderately Stable
0.10	0.07	0.05	0.02	0.03	0.06	0.09	0.35	1.98	0.54	0.49	0.96	1.22	0.51	0.27	0.09	6.86	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	0.05	C A L M
0.46	0.46	0.41	0.31	0.41	0.40	0.43	0.38	0.71	1.32	1.13	1.49	1.73	1.05	0.80	0.46	11.95	< 3.5 mph
1.69	2.54	2.07	1.30	1.49	1.40	1.70	1.73	4.98	3.83	2.94	3.42	4.14	3.43	3.25	1.72	41.64	3.6 - 7.5 mph
1.82	3.43	1.98	1.18	0.63	0.39	0.62	3.30	3.60	2.22	3.02	2.38	3.11	2.24	2.33	1.48	33.73	7.6 - 12.5 mph
0.89	1.14	0.39	0.26	0.34	0.27	0.06	0.85	0.48	1.25	1.56	0.64	0.93	0.84	0.74	0.47	11.11	12.6 - 18.5 mph
0.09	0.00	0.02	0.01	0.08	0.03	0.00	0.40	0.05	0.34	0.19	0.02	0.02	0.03	0.09	0.00	1.40	18.6 - 24.5 mph
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	0.00	0.00	0.00	0.09	> 24.5 mph

5.5 Precipitation

Monthly totals and the maximum 24-hour and maximum 1-hour precipitation amounts are summarized below. The month with the most measured precipitation was April*. The month with the least measured precipitation was November*. The maximum 24-hour total was 2.07" (April*) and the maximum 1-hour total was 1.06"(May).

Table 12
Precipitation Totals (Inches) - 2012
Zion Site

<u>Month</u>	<u>Total</u>	<u>Maximum 24-hour</u>	<u>Maximum 1-hour</u>
January	0.76*	0.29*	0.14*
February	0.74	0.22	0.11
March	2.78*	1.26*	0.51*
April	3.13*	2.01*	0.83*
May	2.60	1.26	1.06
June	0.38*	0.18*	0.10*
July	1.56*	0.64*	0.55*
August	1.79	0.77	0.32
September	2.47	0.87	0.32
October	2.74	0.82	0.27
November	0.32*	0.30*	0.08*
December	2.38*	1.70*	0.31*
 TOTAL:	 21.65*		

* some data are missing – actual precipitation may be under-reported

5.6 Doses Resulting from Airborne Releases

The following are the maximum annual calculated cumulative offsite doses resulting from Zion Generating Station airborne releases.

Zion Generating Station:

Unit 1

<u>Dose</u>	<u>Maximum Value</u>	<u>Sector Affected</u>
gamma air ⁽¹⁾	0.000 x 10 ⁻⁰ mrad	-
beta air ⁽²⁾	0.000 x 10 ⁻⁰ mrad	-
whole body ⁽³⁾	6.795 x 10 ⁻⁵ mrem	East
skin ⁽⁴⁾	6.795 x 10 ⁻⁵ mrem	East
organ ⁽⁵⁾ (child liver)	6.795 x 10 ⁻⁵ mrem	East

Unit 2

<u>Dose</u>	<u>Maximum Value</u>	<u>Sector Affected</u>
gamma air ⁽¹⁾	0.000 x 10 ⁻⁰ mrad	-
beta air ⁽²⁾	0.000 x 10 ⁻⁰ mrad	-
whole body ⁽³⁾	6.795 x 10 ⁻⁵ mrem	East
skin ⁽⁴⁾	6.795 x 10 ⁻⁵ mrem	East
organ ⁽⁵⁾ (child liver)	6.795 x 10 ⁻⁵ mrem	East

-
- (1) Gamma Air Dose - GASPAR II, NUREG-0597
(2) Beta Air Dose - GASPAR II, NUREG-0597
(3) Whole Body Dose - GASPAR II, NUREG-0597
(4) Skin Dose - GASPAR II, NUREG-0597
(5) Inhalation and Food Pathways Dose - GASPAR II, NUREG-0597

Attachment 6 – Errata Data from 2011

Errata for Unmonitored Release/Release Potential 2010-2011

CR-2013-000165 Identified a potential unmonitored release path upstream of both Unit 1 and Unit 2 vent stack radiation monitors via backflow into the Off-Gas system piping into the turbine building. There were two identified paths in Unit 2 and one in Unit 1. During additional walk downs there was an additional path in Unit 1. Applicable valves were shut and a clearance order was generated which danger tagged shut the valves in Unit 2 (see CO108065). The two paths in Unit 1 had no associated valves, as a result, the lines were cut and capped removing them as a release path. (See WO 01614942). Plant modifications were reviewed and it was determined that this condition existed prior to Zion Solutions licensing at Zion Station. The purpose of this erratum is to report the additional dose to a member of the public that was not included in the prior years of 2010 and 2011 due to this unmonitored path. All years prior to 2010 will be evaluated at a later date and any errata data identified will be included in the 2013 reports. Engineering determined the calculated the maximum flow through this potential release path to be $1.90\text{E}+02$ cfm at the maximum designed vent flow of $1.50\text{E}+05$ cfm. A Bounding ratio of $1.27\text{E}-03$ of the ventilation flow was diverted to this unmonitored path and will be used in calculations for correcting dose impact to the public. This bounding flow rate is conservative as no flow was detected from these paths at a vent flow of approximately $8.00\text{E}+04$ cfm through physical observation.

Method used to calculate new values:

1. Took values reported for 2011: Only Qtr. 4 in Unit 1 had uncalculated dose contribution from Cs-137 and Co-60.
 - a. Qtr. 4 Any organ infant liver $6.32\text{e}-04$ mrem
 - b. Qtr. 4 Total Body Adult TBody $2.26\text{e}-04$ mrem
2. Determined total percent contribution of previously unaccounted for nuclides: Sum the percentage of nuclide contributions. (GMILK) is Goat Milk (GPD) is Ground Plane Deposition.
 - a. Pathway (GMILK) $\text{Cs-137} + \text{Co-60} = 1.71\text{e}+01\% + 7.92\text{e}+01\% = 9.63\text{e}+01\%$
 - b. Pathway (GPD) $\text{Co-60} + \text{Cs-137} = 4.86\text{e}+01\% + 4.33\text{e}+01\% = 9.19\text{e}+01\%$
3. Determined dose contribution for unaccounted for nuclides per each pathway: Multiply Previously reported dose by total percent contribution of unaccounted for nuclides.
 - a. Pathway (GMILK) $6.32\text{e}-04 \text{ mrem} \times 9.63\text{e}-01 = 6.09\text{e}-04 \text{ mrem}$
 - b. Pathway (GPD) $2.26\text{e}-04 \text{ mrem} \times 9.19\text{e}-01 = 2.077\text{e}-04 \text{ mrem}$
4. Determined unaccounted for dose contribution: Multiply pathway dose contribution by bounding ratio of $1.27\text{e}-03$.
 - a. Pathway (GMILK) $6.09\text{e}-04 \text{ mrem} \times 1.27\text{e}-03 = 7.73\text{e}-07 \text{ mrem}$
 - b. Pathway (GPD) $2.077\text{e}-04 \text{ mrem} \times 1.27\text{e}-03 = 2.64\text{e}-07 \text{ mrem}$
5. Determined new total dose for the Quarter: Sum unaccounted for dose contribution to value previously reported.
 - a. Qtr. 4 Any Organ Infant Liver $6.32\text{e}-04 \text{ mrem} + 7.73\text{e}-07 \text{ mrem} = 6.33\text{e}-04 \text{ mrem}$
 - b. Qtr. 4 Total Body Adult TBody $2.26\text{e}-04 \text{ mrem} + 2.64\text{e}-07 \text{ mrem} = 2.26\text{e}-04 \text{ mrem}$
6. Created chart showing new maximum % of Administrative and Technical Specification Limits and show % delta from previous year.

Attachment 6 – Errata Data from 2011(continued)

Unit 1

2010: Ventilation secured, there was no change in release.

2011: Quarter 1-3: All releases accounted for.

2011: Quarter 4:

Pathway: Grs/Goat/Milk (GMILK)							
Qtr.	Limit	Organ	previously	dose add.	new Qtr.	dose	Limit
			reported				
			dose (mrem)	(mrem)		(mrem)	(mrem)
4	Admin Any Organ	infant liver	6.32E-04	7.73E-07	6.33E-04	5.63E+00	
4	T. Spc. Any Organ	infant liver	6.32E-04	7.73E-07	6.33E-04	7.50E+00	
Pathway: Ground Plane Deposition (GPD)							
Qtr.	Limit	Age Group	Organ	previously	dose add.	new Qtr.	Limit
				reported			
				dose (mrem)	(mrem)	(mrem)	(mrem)
4	Admin. Total Body	Adult Tbody		2.26E-04	2.64E-07	2.26E-04	5.25E+00
4	T. Spc. Total Body	Adult Tbody		2.26E-04	2.64E-07	2.26E-04	7.50E+00

Unit 2

2010: All releases accounted for.

2011: All releases accounted for.

Attachment 6 – Errata Data from 2011(continued)

D. Solid Waste Shipped Offsite for Burial or Disposal (Not irradiated fuel)

4. Types of Waste

Types of Waste	Total Quantity (m ³)	Total Activity (Ci)	Period	Est. Total Error %
e. Spent resins, filter sludges, evaporator bottoms, etc.	0.00E+00	0.00E+00	2011	0.00E+00
f. Dry compressible waste, contaminated equip, etc.	1.52E+04	6.30E-01	2011	2.50E+01
g. Irradiated components, control rods, etc.	1.62E+03	5.86E+00	2011	2.50E+01
h. Other (describe)	0.00E+00	0.00E+00	2011	0.00E+00

5. Estimate of major nuclide composition (by waste type)

Major Nuclide Composition	Waste Type a. Resins, sludges bottoms %	Waste Type b. DAW contaminated equipment %	Waste Type c. Irradiated components %	Waste Type d. Other %
Am-241	0.00E+00	7.73E-04	2.41E-03	0.00E+00
C-14	0.00E+00	1.93E-01	2.82E-02	0.00E+00
Ce-144	0.00E+00	1.11E-03	0.00E+00	0.00E+00
Cm-242	0.00E+00	6.00E-02	0.00E+00	0.00E+00
Cm-243	0.00E+00	1.11E-02	8.28E-04	0.00E+00
Cm-244	0.00E+00	3.28E-04	0.00E+00	0.00E+00
Co-60	0.00E+00	8.33E-01	1.89E+01	0.00E+00
Cs-137	0.00E+00	1.20E-01	1.10E+01	0.00E+00
Fe-55	0.00E+00	7.35E-02	5.32E+01	0.00E+00
H-3	0.00E+00	6.43E+01	9.06E-01	0.00E+00
I-129	0.00E+00	9.34E+00	0.00E+00	0.00E+00
I-131	0.00E+00	1.32E-02	0.00E+00	0.00E+00
Mn-54	0.00E+00	0.00E+00	9.78E-04	0.00E+00
Nb-94	0.00E+00	9.29E-02	5.10E-02	0.00E+00
Ni-59	0.00E+00	2.20E-02	5.00E-02	0.00E+00
Ni-63	0.00E+00	2.98E-01	1.53E+01	0.00E+00
Ni-63am	0.00E+00	1.62E-01	0.00E+00	0.00E+00
Pu-238	0.00E+00	1.78E-01	2.30E-03	0.00E+00
Pu-239	0.00E+00	2.25E+01	8.62E-04	0.00E+00
Pu-241	0.00E+00	2.86E-03	0.00E+00	0.00E+00
Pu-242	0.00E+00	2.19E-02	0.00E+00	0.00E+00
Sb-125	0.00E+00	8.69E-03	5.19E-01	0.00E+00
Sr-89	0.00E+00	2.22E-01	0.00E+00	0.00E+00
Sr-90	0.00E+00	1.59E-03	1.66E-02	0.00E+00
Tc-99	0.00E+00	1.47E+00	1.96E-03	0.00E+00
Zn-65	0.00E+00	3.31E-02	0.00E+00	0.00E+00

Attachment 6 – Errata Data from 2011(continued)

6. Solid Waste Disposition

Number of shipments	Mode of Transportation	Destination
16	Truck	Clive BWF
18	Truck	Bear Creek

E. Irradiated Fuel Shipments (disposition)

Number of shipments	Mode of Transportation	Destination
0	N/A	N/A

F. Changes to the Process Control Program 2011:

None