

December 4, 2008

ULNRC-05570

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Mail Stop P1-137  
Washington, DC 20555-0001

10CFR50.73(a)(2)(iv)(A)



Ladies and Gentlemen:

**DOCKET NUMBER 50-483  
CALLAWAY PLANT UNIT 1  
UNION ELECTRIC CO.  
FACILITY OPERATING LICENSE NPF-30  
LICENSEE EVENT REPORT 2008-003-00  
INADVERTENT P-14 FWIS ACTUATION FOLLOWED BY A REACTOR  
TRIP ACTUATION DUE TO STEAM GENERATOR LOW-LOW WATER  
(NR) TRIP**

The enclosed licensee event report is submitted in accordance with 10CFR50.73(a)(2)(iv)(A) to report a Feedwater Isolation (FWIS) actuation, followed by a Reactor Trip System actuation and an Auxiliary Feedwater Actuation Signal, that subsequently occurred due to a Steam Generator (SG) Low-Low Water Level Narrow Range (NR) Trip. Subsequent to the FWIS actuation, the 'B' Motor Driven Auxiliary Feedwater pump (MDAFP) was started to restore SG water level. Manually starting the 'B' MDAFP is considered an actuation of the Auxiliary Feedwater System.

This letter does not contain new commitments.

Sincerely,

A handwritten signature in black ink, appearing to read "Luke H. Graessle".

Luke H. Graessle  
Director, Operations Support

DET/nls

Enclosure

IE22  
NRR

ULNRC-05570  
December 4, 2008  
Page 2

cc: Mr. Elmo E. Collins, Jr.  
Regional Administrator  
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Mr. Mohan C. Thadani (2 copies)  
Licensing Project Manager, Callaway Plant  
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U. S. Nuclear Regulatory Commission  
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Washington, DC 20555-2738

**Index and send hardcopy to QA File A160.0761**

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[LEREvents@inpo.org](mailto:LEREvents@inpo.org) (must send the **WORD** version of the LER to this address)

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**LICENSEE EVENT REPORT (LER)**

(See reverse for required number of digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

<b>1. FACILITY NAME</b> Callaway Plant Unit 1	<b>2. DOCKET NUMBER</b> 05000 483	<b>3. PAGE</b> 1 OF 6
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**4. TITLE**  
Inadvertent P-14 FWIS Actuation followed by Reactor Trip Actuation due to Steam Generator Low-Low Water (NR)

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
10	11	08	2008	- 003 -	00	12	04	2008	FACILITY NAME	DOCKET NUMBER

<b>9. OPERATING MODE</b> 4	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§:</b> (Check all that apply)									
<b>10. POWER LEVEL</b> 0%	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)						
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)						
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)						
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)						
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)						
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)						
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)						
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER							
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A							

**12. LICENSEE CONTACT FOR THIS LER**

FACILITY NAME Thomas B. Elwood Supervising Engineer Licensing	TELEPHONE NUMBER (Include Area Code) 573-676-6479
--	--

**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	<b>15. EXPECTED SUBMISSION DATE</b> MONTH:      DAY:      YEAR:
--	--

**ABSTRACT** (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

At 0508 CST on 10/11/08, during plant shutdown for a scheduled refueling outage, with the plant in MODE 4, an actuation of the Reactor Trip System (RTS) occurred as the result of a Steam Generator (SG) Low-Low water level trip. Plant operators were in the process of recovering from a Feedwater Isolation (FWIS) actuation that had occurred in response to a SG high water level trip condition. Previously, at 0500, operators had closed the Main Steam Isolation valves (MSIVs). With the MSIVs closed, the cooldown rate ceased. To restore cooling, an attempt to open the 'A' MSIV was made and believed to be unsuccessful, so the 'A' Atmospheric Steam Dump valve (ASD) was then opened. After the ASD was opened, the 'A' MSIV stroked open. With both the MSIV and ASD open, the 'A' SG water level swelled until the P-14 SG Hi Level protective interlock setpoint was reached, resulting in a FWIS actuation. Operators took action to recover from the FWIS actuation in accordance with off-normal operating procedures, and started the 'B' Motor-Driven Auxiliary Feedwater Pump to restore SG water level. However, due to the cold temperature of the auxiliary feedwater, the SG water level lowered rapidly in response to the additional steam and feedwater flow. A Low-Low water level trip signal then occurred on the 'A' SG, resulting in a RTS actuation and an Auxiliary Feedwater Actuation Signal at 0508.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
Callaway Plant Unit 1	05000483	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 6
		2008	- 003	- 00	

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

I. DESCRIPTION OF THE REPORTABLE EVENT

A. REPORTABLE EVENT CLASSIFICATION

10CFR50.73(a)(2)(iv)(A) requires reporting of any event or condition that resulted in a manual or automatic actuation of any of the systems listed in 10CFR50.73(a)(2)(iv)(B). The systems listed below are relevant to this LER:

- (1) Reactor protection system (RPS) including: reactor scram and reactor trip.
- (6) PWR auxiliary or emergency feedwater system.

B. PLANT OPERATING CONDITIONS PRIOR TO THE EVENT

Prior to the event, the plant was being cooled down for a scheduled refueling shutdown. The plant was in MODE 4, and RCS temperature was less than 350°F. Operators had reached the step in the procedure that allowed closing the MSIVs and opening the MSIV bypass valves.

C. STATUS OF STRUCTURES, SYSTEMS OR COMPONENTS THAT WERE INOPERABLE AT THE START OF THE EVENT AND THAT CONTRIBUTED TO THE EVENT

During the event the Plant Process Computer's alarm manager task had failed. This may have hindered the crew's ability to identify various alarms that are not provided by the annunciators.

D. NARRATIVE SUMMARY OF THE EVENT, INCLUDING DATES AND APPROXIMATE TIMES

At 0500 CST on 10/11/08, plant operators had reached the step in performance of their procedures for plant shutdown to Refuel 16 when they were allowed to close and bypass steam flow around the Main Steam Isolation valves (MSIVs) [EIIS system: SB component ISV]. Once the MSIVs were closed, the reactor coolant system (RCS) [EIIS system: AB] cooldown rate stopped and a slight heatup started. In order to restore cooling and prevent re-entry into MODE 3, an attempt to open the 'A' MSIV was made by the Balance of Plant (BOP) operator. The BOP operator then proceeded to open the 'A' Atmospheric Steam Dump (ASD) [EIIS system; SB component RV] to restore cooling. The BOP operator did not inform the crew of the actions he had taken to open the 'A' MSIV prior to opening the 'A' ASD.

It is important to recognize that during the previous plant refueling outage (Refuel 15), the hydraulic type MSIV actuators installed in the plant were replaced with a newer process fluid type of actuator. The motive force is different in the newer actuators, such that at lower pressures a longer response time is required for the valve to open. The operators were trained on the operation of the new valves. The operator expected a slow response. When the valve did not respond in 20 to 30 seconds, the operator assumed that the system pressure was too low to operate the valve.

Shortly after the 'A' ASD was opened, the 'A' MSIV stroked open. The crew was unaware that the 'A' MSIV had opened. This caused the 'A' Steam Generator (SG) level to swell, resulting in a P-14 FWIS (Feedwater Isolation) actuation [EIIS system; JE / BA] at 0505. The P-14 FWIS isolated feed water to the SGs. Plant operators then took action to recover from the FWIS in accordance with off-normal operating procedures. The 'B' Motor Driven Auxiliary Feedwater Pump (MDAFP) [EIIS

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
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		2008	- 003	- 00	

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

system: SJ] was started to restore SG levels. However, the level in the 'A' SG could not be restored due to steam rate and cold Auxiliary Feedwater addition. The level lowered to the Narrow Range (NR) SG level Low-Low setpoint of 17%, which resulted in a Reactor Trip signal [EIIS system: JC] and an Auxiliary Feedwater Actuation Signal (AFAS)[EIIS system JE] at 0508. All control rods had been previously inserted into the core as part of the shutdown sequence. 'A' SG water level was restored and 'A' Residual Heat Removal (RHR) [EIIS system BP] cooling was placed into service.

E. METHOD OF DISCOVERY OF EACH COMPONENT, SYSTEM FAILURE, OR PROCEDURAL ERROR

As noted previously, events began as the plant was being cooled down for shutdown into a refueling outage. There were no Safety System failures or procedural errors that lead to this event. OTG-ZZ-00006, Plant Cooldown Hot Standby to Cold Shutdown, is the only procedure utilized for the cooldown of the plant from Normal Operating Temperature and Pressure (NOP/NOT). This procedure did not contain a provision to ensure that another heat sink (e.g. ASDs or RHR) is in service prior to closing the MSIVs.

II. EVENT DRIVEN INFORMATION

A. SAFETY SYSTEMS THAT RESPONDED

All safety systems functioned per design.

The FWIS Actuation occurred as designed in response to the P-14 SG Hi level Protective Interlock Setpoint being reached during MODE 4. The Reactor Trip System Actuation and Auxiliary Feedwater Actuation Signal that subsequently occurred due to SG Low-Low Water Level (NR) Trip also occurred per design. Subsequent to the FWIS actuation, in accordance with Off-Normal Operating Procedures, the 'B' Motor Driven Auxiliary Feedwater pump (MDAFP) was started to restore SG water level. Manually starting the 'B' MDAFP is considered an actuation of the Auxiliary Feedwater System.

B. DURATION OF SAFETY SYSTEM INOPERABILITY

There were no Safety System inoperability concerns during this event. All systems functioned normally.

C. SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT.

The first portion of events described in this LER can be best characterized by comparison with the Loss of Load heatup event analyzed in FSAR Section 15.2. Following closure of the MSIVs, when a slight heat up of the RCS occurred as previously described, the plant was in a configuration comparable to what is analyzed in the Loss of Load event. During this heatup portion of the transient, plant conditions were bounded by the FSAR Section 15.2 Loss of Load transient, which is evaluated during MODE 1, at full power. The events described in this LER occurred during MODE 4 with all control rods fully inserted and the RCS heat loads well below the analyzed condition.

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
Callaway Plant Unit 1	05000483	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 6
		2008	- 003	- 00	

**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

The second transient of the events described in this LER occurred when the MSIV and the ASD were both open at the same time, resulting in a temporary excessive cool down and depressurization of the 'A' SG. This portion of the event is best represented by the analyzed condition of a steamline break (SLB) while the plant is at Hot Zero Power (HZP). The reason for selecting the postulated SLB at HZP accident analysis is because it results in a rapid loss of pressure and an excessive cooldown of the RCS. The postulated SLB at HZP as analyzed in FSAR Section 15.1 represents a much larger cool down than this event produced, and it also assumes that the most reactive control rod is stuck out. The SLB at HZP bounds the transient for this event because the reactor was already shut down with all of the control rods inserted, and temperature (approximately 340°F) was far below the HZP accident analysis value.

The third transient during this event occurred when the SG appeared to overflow because of depressurization of the SG. This caused the FWIS. This portion of the event is best represented by the accident analysis of a feedwater malfunction transient from hot full power (HFP), which is presented in FSAR Section 15.1. This accident analysis bounds the third transient of this event, because the reactor was at zero power with all control rods fully inserted, and the temperature was well below the temperature for HFP.

The last transient of this event occurred when the SG water level reached the low-low level set point and initiated a reactor trip signal. This portion of the event is best represented by the accident analysis of a loss of normal feedwater transient from HFP, which is presented in FSAR Section 15.2. The conditions that existed during the events described in this LER were bounded by the licensing bases analyses because the licensing bases analyses assume HFP.

The events described in this LER occurred at zero power with all of the control rods fully inserted and the RCS temperature below that of HFP. The events described in this LER are therefore bounded by the analyses presented in Sections 15.1 and 15.2 of the Callaway FSAR, and consequently do not represent any unanalyzed conditions, nor were they safety significant.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
Callaway Plant Unit 1	05000483	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 OF 6
		2008	- 003	- 00	

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

III. CAUSE(S) OF THE EVENT AND CORRECTIVE ACTION(S)

Causes of the event were determined to be:

- OTG-ZZ-00006, Plant Cooldown Hot Standby to Cold Shutdown, is the only procedure utilized for the cooldown of the plant from NOP/NOT. This procedure did not contain a provision to ensure that another heat sink (e.g. ASDs or RHR) is in service prior to closing the MSIVs. OTG-ZZ-00006 will be revised to ensure that prior to closing MSIVs another heat sink is in service.
- The BOP operator did not inform the crew prior to opening the MSIV. If crew had known of this action they would have had an opportunity to stop opening of the MSIV by using other cooldown methods as discussed in Pre-Evolution Practice (PREP) training. This is a human performance issue. Individual coaching was performed.
- The Shift Manager and Control Room Supervisor did not provide effective oversight as unplanned activities caused a loss of focus. Remedial actions taken were to discuss the importance of crew teamwork when unplanned activities and distractions occur, and to incorporate the details of this event into future licensed operator training as operating experience.

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
Callaway Plant Unit 1	05000483	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	6 OF 6
		2008	- 003	- 00	

**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

IV. PREVIOUS SIMILAR EVENTS

A search was performed for past applicable events concerning inadvertent P-14 FWIS Actuations followed by a Reactor Trip Signal. Other P-14 FWIS Actuations followed by Reactor Trip Actuations have occurred at Callaway Plant; however, none have occurred in MODE 4 while cooling down or have similar equipment issues. The events have some commonality in that they involve a human performance element.

An external operating experience search was also performed. None of the event results from that search had similar equipment issues; therefore, they are not considered to be relevant.

V. ADDITIONAL INFORMATION

None

December 4, 2008

ULNRC-05569

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Mail Stop P1-137  
Washington, DC 20555-0001



Ladies and Gentlemen:

**DOCKET NUMBER 50-483  
CALLAWAY PLANT UNIT 1  
UNION ELECTRIC CO.  
FACILITY OPERATING LICENSE NPF-30  
2007 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT ERRATA**

Reference: ULNRC-05508, dated April 30, 2008

An omission has been identified and corrected in the 2007 Annual Radioactive Effluent Release Report. The referenced letter transmitted this report in accordance with Sections 5.6.3 and 5.5.1 of the Technical Specifications. The missing information involved on-site meteorological data for the 60 meter tower elevation. The attachment provides the 60 meter wind speed and direction data for Table 4 of the report.

If there are any questions, please contact us.

Sincerely,

A handwritten signature in black ink that reads "Keith A. Mills 04 Dec 08".

Keith A. Mills  
Manager, Plant Engineering

DJW/nls

Attachment

ULNRC-05569  
December 4, 2008  
Page 2

cc: U.S. Nuclear Regulatory Commission (Original and 1 copy)  
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Mr. Wayne Harrison (STPNOC)  
Mr. John O'Neill (Pillsbury Winthrop Shaw Pittman LLP)  
Missouri Public Service Commission

Meteorological Data  
Totals of Hours at Each Wind Speed & Direction

1-JAN-2007 00:00:00.00 to 31-DEC-2007 23:59:59.00

Stability Class: A

	Wind Speed at 60.00 Meter Level (MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	0	0	1	0	0	0	1
NNE	1	0	7	3	0	0	11
NE	0	1	1	0	0	0	2
ENE	0	2	4	0	0	0	6
E	0	2	1	0	0	0	3
ESE	0	2	1	3	1	0	7
SE	0	0	13	8	0	0	21
SSE	0	3	14	5	2	2	26
S	0	4	38	14	2	0	58
SSW	0	7	40	18	3	0	68
SW	0	2	29	28	6	0	65
WSW	0	1	11	3	3	3	21
W	0	4	18	15	2	4	43
WNW	0	2	17	28	4	0	51
NW	0	1	8	17	13	1	40
NNW	0	0	7	4	0	0	11
TOT	1	31	210	146	36	10	434

Hours of Calm Data: 0  
Hours of Invalid Data: 46

Meteorological Data  
Totals of Hours at Each Wind Speed & Direction

1-JAN-2007 00:00:00.00 to 31-DEC-2007 23:59:59.00

Stability Class: B

	Wind Speed at 60.00 Meter Level (MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	0	1	5	8	0	0	14
NNE	0	3	14	6	1	0	24
NE	0	0	7	0	0	0	7
ENE	0	1	5	0	0	0	6
E	0	3	7	0	0	0	10
ESE	0	0	3	5	2	0	10
SE	1	11	19	7	1	0	39
SSE	0	7	18	8	1	0	34
S	1	17	17	12	2	1	50
SSW	0	14	37	15	4	0	70
SW	0	8	25	12	3	0	48
WSW	1	5	12	4	2	1	25
W	0	4	17	7	0	2	30
WNW	0	3	10	14	6	0	33
NW	0	4	15	11	6	0	36
NNW	0	1	12	4	2	0	19
TOT	3	82	223	113	30	4	455

Hours of Calm Data: 0  
Hours of Invalid Data: 41

Meteorological Data  
Totals of Hours at Each Wind Speed & Direction

1-JAN-2007 00:00:00.00 to 31-DEC-2007 23:59:59.00

Stability Class: C

	Wind Speed at 60.00 Meter Level (MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	1	5	5	4	0	0	15
NNE	0	4	15	7	0	0	26
NE	0	6	3	1	1	0	11
ENE	1	17	9	0	0	0	27
E	0	12	5	0	0	0	17
ESE	0	3	10	8	1	0	22
SE	1	12	25	4	1	0	43
SSE	1	21	15	11	1	0	49
S	1	13	11	8	6	1	40
SSW	0	15	21	11	5	2	54
SW	0	15	27	14	1	0	57
WSW	1	11	10	2	2	1	27
W	0	12	9	8	0	2	31
WNW	1	11	8	12	4	0	36
NW	0	1	7	9	5	1	23
NNW	0	5	18	4	1	0	28
TOT	7	163	198	103	28	7	506

Hours of Calm Data: 0  
Hours of Invalid Data: 105

Meteorological Data  
Totals of Hours at Each Wind Speed & Direction

1-JAN-2007 00:00:00.00 to 31-DEC-2007 23:59:59.00

Stability Class: D

	Wind Speed at 60.00 Meter Level (MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	6	49	71	42	5	0	173
NNE	9	54	73	19	4	0	159
NE	7	65	61	6	0	0	139
ENE	3	69	64	3	0	0	139
E	9	41	57	13	1	0	121
ESE	9	40	88	30	10	0	177
SE	8	51	65	41	2	0	167
SSE	11	45	62	31	5	0	154
S	7	39	56	44	28	5	179
SSW	10	29	74	46	22	6	187
SW	13	42	54	55	16	1	181
WSW	10	27	50	25	9	6	127
W	6	30	44	43	32	18	173
WNW	6	29	63	39	38	6	181
NW	8	28	78	77	50	5	246
NNW	4	23	68	50	14	3	162
TOT	126	661	1028	564	236	50	2665

Hours of Calm Data: 2  
Hours of Invalid Data: 587

Meteorological Data  
Totals of Hours at Each Wind Speed & Direction

1-JAN-2007 00:00:00.00 to 31-DEC-2007 23:59:59.00

Stability Class: E

	Wind Speed at 60.00 Meter Level (MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	3	16	43	21	2	0	85
NNE	2	18	44	10	0	0	74
NE	3	20	39	1	0	0	63
ENE	1	11	43	8	0	0	63
E	4	8	64	4	0	0	80
ESE	4	14	87	22	1	0	128
SE	4	22	97	68	3	0	194
SSE	1	23	101	74	14	0	213
S	2	13	88	111	46	1	261
SSW	1	15	77	96	18	0	207
SW	2	17	60	65	12	1	157
WSW	3	14	41	40	2	1	101
W	4	22	47	63	4	0	140
WNW	2	18	60	41	3	0	124
NW	0	5	40	40	6	0	91
NNW	3	6	51	13	1	1	75
TOT	39	242	982	677	112	4	2056

Hours of Calm Data: 3  
Hours of Invalid Data: 199

Meteorological Data  
Totals of Hours at Each Wind Speed & Direction

1-JAN-2007 00:00:00.00 to 31-DEC-2007 23:59:59.00

Stability Class: F

Wind Speed at 60.00 Meter Level (MPH)							
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	2	6	16	12	0	0	36
NNE	2	12	24	11	0	0	49
NE	2	8	23	3	0	0	36
ENE	0	5	25	8	0	0	38
E	1	7	32	6	0	0	46
ESE	3	6	43	4	0	0	56
SE	2	12	63	5	0	0	82
SSE	2	15	63	75	0	0	155
S	5	10	59	37	0	0	111
SSW	1	11	58	60	0	0	130
SW	2	6	49	64	1	0	122
WSW	2	8	19	25	1	0	55
W	1	8	16	12	0	0	37
WNW	2	9	16	20	0	0	47
NW	3	6	28	9	1	0	47
NNW	4	8	20	14	0	0	46
TOT	34	137	554	365	3	0	1093

Hours of Calm Data: 0  
Hours of Invalid Data: 44

Meteorological Data  
Totals of Hours at Each Wind Speed & Direction

1-JAN-2007 00:00:00.00 to 31-DEC-2007 23:59:59.00

Stability Class: G

	Wind Speed at 60.00 Meter Level (MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	0	3	6	7	0	0	16
NNE	1	4	17	5	0	0	27
NE	2	7	22	4	0	0	35
ENE	2	4	11	6	0	0	23
E	1	6	20	5	0	0	32
ESE	2	7	27	3	0	0	39
SE	3	14	16	4	0	0	37
SSE	3	12	19	7	0	0	41
S	1	9	39	22	0	0	71
SSW	5	5	34	17	3	0	64
SW	3	8	20	19	0	0	50
WSW	3	2	13	9	0	0	27
W	2	5	0	0	0	0	7
WNW	4	2	5	5	0	0	16
NW	3	5	4	1	0	0	13
NNW	4	4	5	2	0	0	15
TOT	39	97	258	116	3	0	513

Hours of Calm Data: 4  
Hours of Invalid Data: 0  
Hours of Good Data: 7731 = 88.3% of Total Hours