NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES:

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Nine Mile Point Unit 2	05000410	1 OF 8

TITLE (4)
Engineered Safety Feature Actuations Due to Partial Loss of Offsite Power

EVENT DATE (5)			LER NUMBER (6)					REPORT DATE(7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
03	28	98	98		06		00	04	27	98	N/A	05000
											N/A	05000

OPERATING MODE (9): 1

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check one or more of the following)* (11)

POWER LEVEL (10): 92

☐ 20.2201(b)	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)	☐ 50.73(a)(2)(viii)
☐ 20.2203(a)(1)	☐ 50.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)	☐ 73.71(a)(2)(x)
☐ 20.2203(a)(2)(i)	☐ 50.2203(a)(3)(ii)	☐ 50.73(a)(2)(iii)	☐ 73.71
☐ 20.2203(a)(2)(ii)	☐ 50.2203(a)(4)	☒ 50.73(a)(2)(iv)	☐ OTHER *(Specify in Abstract below and in Text, NRC Form 366A)*
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(1)	☐ 50.73(a)(2)(v)	
☐ 20.2203(a)(2)(iv)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
D. P. Bosnic - Operations Manager NMP2	(315) 349-7952

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS
B	FK	BKR	ABB	Y						

SUPPLEMENTAL REPORT EXPECTED (14)	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
☐ YES *(If yes, complete EXPECTED SUBMISSION DATE)* ☒ NO				

ABSTRACT *(Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines)* (16)

On March 28, 1998 at 1425 hours, Nine Mile Point Unit 2 (NMP2) experienced a partial loss of offsite power. At the time, NMP2 was operating in Mode 1 at approximately 92 percent rated thermal power. As a result of this loss, the Division I and Division III emergency switchgear were deenergized. This activated numerous Engineered Safety Feature (ESF) Systems including: auto start of the Division I and Division III Standby Emergency Diesel Generators; isolation of the Normal Reactor Building Ventilation System (HVR) and auto start of both Trains A and B of the Standby Gas Treatment System (GTS); a partial actuation of the Division I Control Building Special Filter Train; and service water non-essential isolation valve closure and automatic Division I pump restart.

The cause of this event was the failure of a rupture disc in a 345 KV offsite power distribution breaker, which caused a loss of SF_6 (Sulfur Hexaflouride) gas. When the SF_6 gas was lost, a fault occurred in the breaker. The electrical protection scheme functioned to deenergize the Scriba station 345 KV "A" bus and 115 KV Line 5 as designed in response to the fault. The cause of the rupture disc failure was improper installation during manufacturing.

Corrective actions include additional administrative controls and inspection of similar breakers.

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I. DESCRIPTION OF EVENT

On March 28, 1998 at 1425 hours, Nine Mile Point Unit 2 (NMP2) experienced a partial loss of 115 KV offsite power (Line 5). At the time, NMP2 was operating in Mode 1 at approximately 92 percent rated thermal power. As a result of this loss, the Division I and Division III emergency switchgear were deenergized. This activated numerous Engineered Safety Feature (ESF) Systems including: auto start of the Division I and Division III Standby Emergency Diesel Generators; isolation of the Normal Reactor Building Ventilation System (HVR) and auto start of both Trains A and B of the Standby Gas Treatment System (GTS); a partial actuation of the Division I Control Building Special Filter Train; and service water non-essential isolation valve closure and automatic Division I pump restart. Plant response was as expected with the following anomalies:

- The Division I Control Room Special Filter Train fan (2HVC*FN2A) failed to start.
- The Division II H_2O_2 sample pump (2CMS*P2B) stopped and had to be manually restarted.
- The Division II Cable Spreading Area Unit Cooler (2HVC*UC107) stopped and had to be manually restarted.

On March 28, 1998 at 1244 hours, Niagara Mohawk Power Corporation's (NMPC) Central Regional Control Center (CRCC) received a "345 KV Breaker Trouble" alarm from the Scriba station switchyard. This alarm point is a common description for a number of alarms associated with the 345 KV system in the switchyard. Since CRCC personnel did not know what the specific problem was, a Traveling Operator was contacted and directed to the switchyard to investigate. The Traveling Operator is under the control of CRCC and is dispatched to investigate problems with the electrical transmission system. At 1325 hours, the Traveling Operator obtained the key to the switchyard from NMP2 Security with the concurrence of the NMP2 Station Shift Supervisor (SSS). The SSS believed that the Traveling Operator was making a routine entry into the switchyard and was not aware that the Traveling Operator was entering the switchyard due to an alarm condition. The Traveling Operator entered the switchyard at 1330 hours and reported this to the CRCC.

At 1350 hours, the Traveling Operator again contacted the CRCC and identified the specific alarms to be Drop 41 and Drop 48 on Panel 1-1F in Control House #1. The alarms were as follows:

41 - Accelerate BBU Low SF_6 R250 Blocked
48 - Loss of SF_6 R250

The Traveling Operator also informed the CRCC that the SF_6 (Sulfur Hexaflouride) gas pressure readings on breaker R250 were 87 psig on phase 1, 87 psig on phase 2 and -3 psig on phase 3. In the applicable operating instructions, these alarms are assigned a code of "N/C", meaning no code assigned (no affect on NMP2 or insufficient time to take remedial action). Drop 48, Loss of SF_6 R250, alarms at 76 psig lowering SF_6 gas pressure. This would be indicative of an insulation/arc suppression gas leak. Drop 41, Accelerate BBU Low SF_6 R250 Blocked, alarms at 72 psig lowering, which actuates a blocking scheme preventing R250 operation.

I. DESCRIPTION OF EVENT (cont'd)

Both Drop 41 and 48 were "validated" by the low pressure reading on R250 phase 3. When a fault was detected by the electrical protection system at 1425 hours, 345 KV Bus "A", which supplies NMP2 Line 5, was automatically de-energized by the breaker backup protection scheme that opened the adjacent 345 KV breakers. The NMP2 control room operators were unaware of the alarm at the Scriba switchyard or the potential for loss of Line 5.

The plant staff took the necessary actions for a partial loss of offsite power and entered the required Technical Specification Limiting Conditions for Operation (LCO). Upon notification by the CRCC that the cause of the problem was low SF_6 gas in R250 and that the breaker was isolated, restoration of the 115 KV Line 5 was initiated. By 1740 hours, a normal 115 KV offsite supply lineup was reestablished and the Divisional Emergency Diesel Generators were secured.

II. CAUSE OF EVENT

Breaker R250 is a 345 KV Gas Puffer Circuit Breaker (GPCB) installed in 1994 when Line 25 was tied into the Scriba switchyard from the Sithe Independence Station (a nearby generating facility). Each phase of R250 is filled with SF_6 gas which acts as an insulator and arc suppressor for breaker actuation. The normal SF_6 gas pressure in each phase is approximately 87 pounds. This pressure is logged weekly, and when the last readings were taken, each phase was at 87 pounds. After the alarm was received on March 28, 1998, and the Traveling Operator inspected the breaker, phase 1 and 2 were at 87 psig and phase 3 was at -3 psig. The abnormal reading on phase 3 was due to a failure of a rupture disc (overpressure protection) which allowed the SF_6 gas to escape to the atmosphere. There were no signs of a fault in the breaker which would lead to an overpressure condition. The rupture disk was provided to the breaker vendor to perform an evaluation of the cause of failure. The vendor determined that the cause of failure was improper installation of the rupture disc during the manufacturing process.

Contributing to this event was that interactions associated with a previous change were not adequately assessed. Although alarms related to the 345 KV portion of the switchyard were reviewed as part of LER 92-23 corrective actions, a sudden failure causing loss of SF_6 gas was not considered credible. It was believed there was enough time to respond to the initial low gas pressure alarm before a fault condition occurred. As a result, the associated alarms for the 345 KV breakers were classified as not requiring notification to the NMP2 SSS or immediate actions by NMP2. This resulted in missing an opportunity to take actions in preparation for a potential faulted condition.

It has been determined that the Control Room Special Filter Train fan (2HVC*FN2A) operated as designed. The cause of the fan not starting was a thermal style flow switch (2HVC*FS51B), which began to cool down

II. CAUSE OF EVENT (cont'd)

with the loss of power. This cooldown provided an indication of system flow in the Division II special filter train. Flow switch 2HVC*FS51B is a wheatstone bridge design which has a portion of the bridge heated. The heated portion of the circuit provides a differential resistance as an indication of a no flow condition. Upon the loss of power, the flow switch cooled and indicated a flow signal which did not permit 2HVC*FN2A to immediately restart. Once power is restored and the wheatstone bridge circuit is reheated, the proper flow signal is sensed and if an initiation signal is present, 2HVC*FN2A will restart as designed. In this case, the radiation monitor failure signal due to loss of power had cleared prior to the bridge circuit reheating, and therefore, the fan did not start. Thus, the fan functioned as designed.

The initial loss of the Division II H_2O_2 sample pump (2CMS*P2B) and the Division II unit cooler (2HVC*UC107) were evaluated. The Division II H_2O_2 analyzer and unit cooler are designed to be started manually when required. Review of design drawings revealed that these components are in full compliance with the design basis. No trip signals were received that would have caused the sample pump or unit cooler to stop. The H_2O_2 analyzer and unit cooler were restarted manually, are operating as designed, and have been operable since the loss of power event.

The electrical perturbation of the offsite transmission system upon the loss of Line 5 was sufficient to cause these components to shutdown. Troubleshooting was performed on the two Division II components to specifically look for any potential component degradation that might have accentuated the perturbation. In the case of the H_2O_2 analyzer sample pump, a loose connection was found on the control transformer that supplies power to the control circuit. It is believed that when voltage dropped on the bus, it caused an increase in current across the loose connection. This resulted in an increased voltage drop across the connection which caused the contactor to momentarily release and break its seal-in circuit. This loose connection did not prevent restart of the H_2O_2 analyzer sample pump. The H_2O_2 analyzer was able to perform its design function.

Troubleshooting of the unit cooler revealed a loose connection in the control circuit between the control switch and the seal-in contact. As described in the paragraph above, it is believed that this loose connection also caused an increased voltage drop across the connection and caused the contactor to momentarily release and break its seal-in circuit. This loose connection did not prevent restart of the unit cooler. The unit cooler was able to perform its design function.

Although loose wiring connections were identified for these two Division II components, their response to the event (i.e., requiring manual restart following a loss of voltage) was consistent with their design and is fully addressed in the applicable special operating procedure.

III. ANALYSIS OF EVENT

This event is reportable in accordance with 10CFR50.73 (a)(2)(iv), "any event or condition that resulted in a manual or automatic actuation of an Engineered Safety Feature (ESF), including the Reactor Protection System (RPS)."

The Normal Reactor Building Ventilation System isolation, the Standby Gas Treatment System auto start, the actuation of the Division I Control Building Special Filter Train, and the service water valve closure and pump restart were conservative actions designed to occur in events of this type.

The Emergency Standby Diesel Generator is designed to provide onsite power to the loads necessary to bring the plant to a safe shutdown condition following a Loss of Coolant Accident (LOCA) and Loss of Offsite Power (LOOP). It also provides power to bring the plant to a safe shutdown condition after an extended LOOP.

NMP2 operated at approximately 92 percent power throughout the event. Actuation of the above systems have no adverse safety consequences to the general public or plant personnel at any reactor power level. The event in no way adversely affected any other safety systems nor the operators' ability to maintain safe reactor plant conditions.

IV. CORRECTIVE ACTIONS

1. The operating staff took the necessary actions following the loss of Line 5, including verification of actions expected and investigation of those that did not occur.

2. Breaker R250 was isolated by opening disconnect switches 251 and 252 in the switchyard. Line 5 was restored to service after CRCC personnel determined that the fault was limited to breaker R250.

3. NMP2 control room operators restored a normal electrical lineup and secured the Division I and Division III Emergency Diesel Generators.

4. The rupture discs on the remaining two phases of breaker R250 and all three phases of breaker R945 (same design breaker) will be verified to be properly installed by June 30, 1998.

5. The Emergency Management System (EMS) computer database was revised so that when specific switchyard alarms are received at the CRCC, a message will appear that says "Call NM2 Shift Supervisor."

IV. CORRECTIVE ACTIONS (cont'd)

6. NMP2 and CRCC personnel will review current switchyard operating instructions and plant response procedures. Those instructions and procedures will be revised as necessary to indicate actions needed to optimize reporting of switchyard alarms and corresponding plant response by September 4, 1998.

7. The motor control center electrical maintenance procedure(s) will be evaluated for potential enhancement prior to their next use, but no later than May 27, 1998.

V. ADDITIONAL INFORMATION

A. Failed components:

Component Description:	345 KV Breaker Rupture Disc
Manufacturer:	Asea Brown Boveri
Model Number:	362 PM50-30; Part No. 366C077-01

B. Previous similar events:

Previous instances of LOOP have occurred at NMP2 as reported in LERs 88-62, 91-12, 92-06, 92-18, 92-20, 92-23 and 95-10. A review of these LERs determined that four of them (88-62, 91-12, 92-18, 92-23) were caused by equipment failures or work related problems in the switchyard. Actions taken in response to those failures included:

- Work in the switchyard to be controlled by NMP2 (LER 91-12)
- Access control for entering the switchyard was developed (LER 91-12)
- Operators were trained on switchyard breakers, their trip schemes and maintenance requirements (LER 92-18)
- Replacement of troublesome breakers (LER 92-23)
- Operators were trained to respond to switchyard alarm and report alarm conditions (LER 92-23)
- All switchyard alarms were categorized and CRCC was to notify NMP2 Control Room of any alarms that could affect NMP2 (LER 92-23)

Additionally, an action of LER 92-23 was for the Independent Safety Engineering Group (ISEG) to perform a review of all LOOP events to identify any common causes and determine the adequacy of corrective actions taken. The ISEG report cited inadequate communications between NMP2 and

V. ADDITIONAL INFORMATION (cont'd)

Electric Supply and Delivery (ES&D) personnel. The communications issue was addressed by implementation of a prioritized annunciator status and accompanying response process as well as a meeting on December 3, 1992 between NMP2's Plant Manager, Operations Manager, Engineering Manager, representatives from NMP2 Operations, Maintenance and Licensing Departments, and representatives from Station Transmission Design, Regional Control, System Protection, Station Maintenance and Meter and Test. The meeting covered past and present problems related to loss of 115 KV to NMP2 as well as the sensitivity of the loss.

A review of LER 92-23, action 7, was performed. This action states "Effective immediately, CRCC will notify NMP2 Control Room upon receipt of any breaker or switchyard alarms that could effect NMP2. In addition, NMP2 operators are being trained to respond to alarms in the offsite switchyard and report conditions. This will minimize response time for concerns in the switchyard." The NMP2 Control Room was not notified of an alarm or problem in the switchyard from receipt of the original alarm at CRCC (1244 hours) to the loss of Line 5 (1425 hours). The first communication between CRCC and NMP2 Control Room was at 1500 hours when the Chief Shift Operator was told the problem was a loss of SF_6 gas in breaker R250. Discussions with CRCC and Operations personnel, and reviews of Deviation/Event Reports (DERs) and LERs related to this issue revealed that the majority of previous problems in the switchyard involving a loss of power to NMP2 involved 115 KV busses or breakers. Accordingly, corrective actions were focused on the 115 KV breaker. All alarm drops in both control houses at the switchyard were reviewed and assigned a "code" which indicated the alarm classification as follows:

Code 1 - NMP2 will initiate immediate action

Code 2 - NMP2 will take measures necessary to maximize safety system availability

Code 3 - Information only

Code N/C - No code assigned (evaluated as no effect on NMP2 or insufficient time to take remedial action)

Switchyard operating instructions indicate that all "coded" alarms are related to 115 KV Line 5, 115 KV Line 6, their associated transformers/breakers, the switchyard emergency generator, switchyard batteries or control house alarms. All 345 KV associated alarms were assigned a "N/C" as meaning no effect on NMP2 or insufficient time to take remedial action. Procedure N2-OP-70, Station Electrical Feed and 115 KV Switchyard, subsection H.16.0, Response to Scriba Switchyard Alarms, parallels the switchyard operating instructions regarding the actions to be taken for Line 5 and Line 6

V. ADDITIONAL INFORMATION (cont'd)

related alarms. The CRCC handling of the alarm for breaker R250 was in accordance with the established procedures.

C. Identification of components referred to in this LER:

COMPONENT	IEEE 803 FUNCTION	IEEE 805 SYSTEM ID
Normal Reactor Building Ventilation System	N/A	VA
Standby Gas Treatment System	N/A	BH
Standby Emergency Diesel Generator System	N/A	EK
Switchyard	N/A	FK
Diesel Generator	DG	EK
Unit Cooler	CLR	VA
Emergency Switchgear	SWGR	EB
Circuit Breaker, AC	52	FK
Number 5 and 6 Feeder Lines	FDR	FK
Control Room Special Filter Train Fan	FAN	VI
H2O2 Sample Pump	P	IK
Division II Cable Spreading Area Unit Cooler	CLR	VI