Union Electric
Callaway Plant

PO Box 620
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April 17, 2000

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

ULNRC-4220

Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
FACILITY OPERATING LICENSE NPF-30
LICENSEE EVENT REPORT 1999-005-02
OPERATING CONDITIONS EXCEEDING PREVIOUSLY ANALYZED VALUES RESULTS IN INOPERABILITY OF BOTH OFFSITE SOURCES
(Reference: ULNRC-4107, dated September 13, 1999
ULNRC-4150, dated November 19, 1999)

The enclosed licensee event report is submitted in accordance with 10CFR50.73(a)(2)(ii)(B) to report an event that resulted in the facility being in a condition outside the design basis of the plant. This revised licensee event report is submitted to provide updated information regarding the corrective actions which were taken as a result of this event.

R. D. Affolter
Manager, Callaway Plant

RDA/mdhu

Enclosure

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Callaway Plant Unit 1	0 5 0 0 0 4 8 3	1 OF 0 4

TITLE (4) **Operating Conditions Exceeding Previously Analyzed Values Results in Inoperability of Both Offsite Sources**

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)		
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	Rev No.	MONTH	DAY	YEAR
0 8	1 2	1 9 9 9	1 9 9 9	- 0 0 5	- 0 2	0 4	1 7	2 0 0 0

OTHER FACILITIES INVOLVED (8)

FACILITY NAMES	DOCKET NUMBER(S)
	0 5 0 0 0
	0 5 0 0 0

OPERATING MODE (9)	3	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR : *(Check one or more of the following)* (11)			
POWER LEVEL (10)	0 0 0	20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
		20.2203(a)(1)	20.2203(a)(3)(i)	X 50.73(a)(2)(ii)	50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER *(Specify in*
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	*Abstract below or in*
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	*Text, NRC Form 366A)*

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
J. D. Schnack, Supervising Engineer, QA Corrective Action	AREA CODE 5 7 3 6 7 6 - 4 3 1 9

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 EPIX

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

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

On August 12, 1999, with the plant in Mode 3 (Hot Standby), switchyard voltage was observed to decrease below the minimum operability limit established in station procedures. During investigations, it became apparent that large amounts of power were being transported across the United States grid. The magnitude of power being transported had not been previously observed concurrent with near peak service territory loads, and it was far in excess of typical levels. This resulted in system conditions above previously analyzed design basis values. It was determined that inadequate administrative controls existed to ensure the station's design analysis encompassed these conditions. Corrective actions taken include: 1) Load flow analyses were reperformed, 2) Plant electrical lineup restrictions were implemented, 3) An online computer program, which models grid conditions given a loss of plant generation, was implemented to monitor offsite source operability, 4) Programs were established to evaluate the grid load flow analysis prior to each peak loading season, and 5) Administrative controls were established between onsite and offsite organizations to maintain grid voltages within design basis requirements. Modifications are under development to install capacitor banks and load tap changing transformers to improve voltage regulation to each of the plant's safety related 4.16 kV buses.

DESCRIPTION OF EVENT:

On August 12, 1999, with the plant in Mode 3 (Hot Standby), the switchyard voltage supplied from the grid was observed to decrease below the minimum operability limit established in station procedures. The Technical Specification action statement for inoperability of both offsite sources was entered and the Control Area Operator within the Energy Supply Operations Department was contacted to initiate actions to increase switchyard voltage. The Control Area Operator's actions, combined with a decreasing system demand, restored switchyard voltages above the minimum operability limitation, and the Technical Specification action statement was exited. Both offsite power sources were inoperable for approximately 12 hours.
(Note: Grid refers to the North American Eastern Interconnection of which Ameren's Control Area is a part.)

Due to high ambient temperatures, service territory loading was near peak levels. Even at these peak levels, it was predicted that switchyard voltage would remain above the established operability limits based on previous load flow analyses. During investigations to establish the cause for this unanticipated switchyard voltage, engineering reviews determined that large amounts of power were being transported across the grid on the day of this occurrence. This power was being transported from northern utilities to the southern portion of the United States due to a shortfall in generation in that area and a significant weather diversity. The magnitude of the power being transported across the grid had not been previously observed and was far in excess of typical levels. The deregulated wholesale power market contributes to conditions where higher grid power flows are likely to occur. These large flows were observed at this time. Since load flow analyses had not analyzed this level of system loading, the minimum voltage previously established was not valid for verifying that the offsite source would have adequate capability to supply station loads during a design basis accident.

During plant operations, switchyard voltage indications were not adequate for determining operability of the offsite source in the event the plant should trip offline. Similar grid loading conditions were present on August 10, 1999, the day before the plant tripped. Low switchyard voltages were not observed at that time since Callaway generation was locally supporting grid voltage. Therefore, the capability of the offsite source could not be readily verified when the unit was in operation. Offsite source capability is normally confirmed by an analysis that considers the anticipated loading conditions on the grid. With grid loading above these previously analyzed values, the plant was placed in a condition which was outside of its design basis analysis for verifying the offsite source would have adequate capacity to supply station loads during a design basis accident.

BASIS FOR REPORTABILITY:

These events are reportable per 10CFR50.73(a)(2)(ii)(B) as an event or condition that resulted in the facility being in a condition outside the design basis of the plant.

CONDITION AT TIME OF EVENT:

Mode 3, Hot Standby

ROOT CAUSE:

The direct cause of the low switchyard voltage was a high service territory demand combined with large amounts of power being transported across the grid. The root cause attributed to this event was not anticipating the simultaneous occurrence of the aforementioned items. Widespread high temperatures in the South and lower Midwest, unavailability of generation in the South, and cool temperatures in the North combined together to create conditions for large grid power flows to occur. The deregulated power market used these conditions to transport large amounts of power from the north to the south. These high power flows and high native system loads exceeded the anticipated conditions modeled in the load flow analyses.

Another factor associated with this event was attributed to inadequate administrative controls for ensuring that the design analysis encompassed a sufficient range of grid operating conditions.

CORRECTIVE ACTIONS:

1) Conditions within the grid load flow analysis were revised and the analysis was reperformed. Restrictions on plant electrical lineups were subsequently implemented to support switchyard operability. These actions were implemented to support offsite source operability pending completion of plant modifications which will permit the onsite power distribution system to accommodate a wider range of offsite source voltages. (Corrective action item #6)

2) A program has been established to periodically review the grid load flow analysis prior to each peak loading season to ensure that anticipated changes in transmission system operation are incorporated into the analysis. Significant changes in transmission system operating conditions or configuration which occur between review periods are also evaluated to determine potential impacts on the grid load flow analysis.

3) Energy Supply Operations has implemented use of an online computer model for determining the adequacy of the grid to support Callaway operability requirements. The model continuously incorporates real-time measured grid powerflows and voltages, and predicts system conditions for a wide variety of grid contingencies. This model allows for near real time monitoring of the grid to ensure operability requirements of the offsite sources would be satisfied given a loss of Callaway generation.

4) Administrative controls have been established between plant staff departments and Energy Supply Operations in order to formalize the process in which the online computer model is utilized when monitoring offsite source operability. These administrative controls also outline the plant's design basis requirements for

offsite source voltage and the specific responsibilities of these departments in maintaining offsite source voltage within these limitations.

5) Training has been provided to plant staff Operations personnel to enhance operator awareness of offsite source reliability and degraded voltage concerns.

6) Plant modifications are currently under development to install capacitor banks and load tap changing transformers to improve voltage regulation on each of the plant's safety related 4.16 kV buses. These modifications will allow the plant's design basis to be supported by a wider range of offsite source voltages.

SAFETY SIGNIFICANCE:

This event was not significant with respect to public health and safety. Due to bus loading conditions at the time of this event, adequate voltage was maintained on the Class 1E 4.16 kV distribution system such that all safety related components were operated within design parameters. In the event that additional loads would have been in operation at the time of this event, 4.16 kV distribution system voltages may have decreased below the setpoint of the second level undervoltage relays. Had this occurred, these relays would have initiated a bus transfer to the emergency diesel generators, both of which were operable for supplying Class 1E loads during this timeframe.

A historical review was performed to identify previous timeframes in which system loading conditions may have caused switchyard voltage to decrease below the minimum operability limit had the plant been offline. The timeframe chosen for this evaluation was from September 1997 to present, with a previous plant trip in August of 1995 also included within this evaluation. In addition to the 12 hours of inoperability observed on August 12, 1999 and the 1 hour observed on August 11, 1999, this review yielded an additional 23 hours for which these conditions may have been present. Eleven of these hours were observed across two days in July 1998, with the remaining hours observed across 6 days from late July to mid-August 1999. Both trains of emergency AC power (and their associated support systems) were operable for performing their intended safety function during these timeframes. The turbine driven auxiliary feedwater pump was also operable during the above timeframes.

The estimated incremental conditional core damage frequency resulting from these occurrences was 5.46E-05 per year. The total incremental conditional core damage probability resulting from these occurrences was 2.24E-07.

PREVIOUS OCCURRENCES:

This event had not been previously identified at Callaway.

FOOTNOTES:

The system code listed below is from IEEE Standard 805-1984.

System FK