



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-8064

MAR 14 2000

Garry L. Randolph, Vice President and
Chief Nuclear Officer
Union Electric Company
P.O. Box 620
Fulton, Missouri 65251

SUBJECT: MEETING TO DISCUSS THE AUGUST 11 - 12, 1999, DEGRADED
SWITCHYARD VOLTAGE EVENT

Dear Mr. Randolph:

This refers to the meeting conducted in the Region IV office on March 13, 2000. This meeting was related to the causes, circumstances, and corrective actions associated with the August 11 - 12, 1999, degraded switchyard voltage event.

During this meeting you provided your perspective on the event, as well as a schedule for the corrective actions to preclude future similar occurrences. Additionally, the NRC provided a regulatory perspective on the potential generic implications and safety significance of the event.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter will be placed in the NRC's Public Document Room.

Should you have any questions concerning this matter, we will be pleased to discuss them with you.

Sincerely,

Handwritten signature of Arthur T. Howell, III in cursive.

Arthur T. Howell, III, Director
Division of Reactor Safety

Docket No.: 50-403
License No.: NPF 30

Enclosures:

1. Attendance List
2. Licensee Presentation

Union Electric Company

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cc:

Professional Nuclear Consulting, Inc.
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John O'Neill, Esq.
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Missouri Public Service Commission
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Ronald A. Kucera, Director
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Otto L. Maynard, President and
Chief Executive Officer
Wolf Creek Nuclear Operating Corporation
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Dan I. Bolef, President
Kay Drey, Representative
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for the Environment
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University City, Missouri 63130

Lee Fritz, Presiding Commissioner
Callaway County Court House
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Fulton, Missouri 65151

Union Electric Company

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Alan C. Passwater, Manager
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bcc to DCD (IE45)

bcc electronic distribution from ADAMS by RIV:

Regional Administrator (**EWM**)

DRP Director (**KEB**)

DRS Director (**ATH**)

Senior Resident Inspector (**VGG**)

Branch Chief, DRP/B (**WDJ**)

Senior Project Engineer, DRP/B (**RAK1**)

Branch Chief, DRP/TSS (**LAY**)

RITS Coordinator (**NBH**)

bcc hard copy:

RIV File Room

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RIV:SRA:DRS	<input checked="" type="checkbox"/>	D:DRS							
JLShackelford/lmb		ATHowell/III							
03/700		03/700							

OFFICIAL RECORD COPY

ATTACHMENT 1
ATTENDANCE LIST

MANAGEMENT MEETING ATTENDANCE

LICENSEE/FACILITY	Callaway / Ameren UE
DATE/TIME	March 13, 2000 1:00 pm
CONFERENCE LOCATION	Region IV Executive Conference Room

LICENSEE REPRESENTATIVES

NAME (PLEASE PRINT)	ORGANIZATION	TITLE
Mark D. Haag	Callaway UENE	Senior Design Engr.
Paul J. Nauert	Ameren Services Transmission Planning	Manager
Garry L. Randolph	Ameren UE	Vice President and Chief Nuclear Officer
MICHAEL E. Taylor	Ameren UE	Manager, Nuclear Engineering
RON AFFOLTER	AMEREN UE	PLANT MANAGER - CALLAWAY
Scott Sandbothe	Ameren UE	Supt., Operations
David Waller	Ameren UE	Supervising Design - Callaway
MARK A. REIDMEIER	Ameren UE	Regional Regulatory Affairs Supervisor
A. K. KRANIK	APS - PAWVERDE	Director - REGULATORY AFFAIRS
W. E. Mookhoek	STP Nuclear Operating Co.	Licensing Engineer.
IJAZ AHMAD	TXU - Electric CPSES.	Design Base Engineering.
DON WOODLAN	TXU - Electric CPSES	Docket Licensing Manager
<i>has</i>		

NRC REPRESENTATIVES

NAME (PLEASE PRINT)	ORGANIZATION	TITLE
VINCENT G. GADDY	NRC	SRI
Jeffrey L. SWACKELFORD	NRC	SRA
Elmo Collins	NRC RIV DRP	Deputy Dir. DRP
Ellis Marshoff	NRC RIV	Regional Administrator
Art Howell	NRC RIV	Director, DES
W.D. Johnson	NRC/RIV/DRP	Chief, Project Branch B

ATTACHMENT 2

LICENSEE PRESENTATION



**DEGRADED SWITCHYARD
VOLTAGE
PRESENTATION**

**NRC SPECIAL INSPECTOR
50-483/99-15**

March 13, 2000



AGENDA

- Introduction **Garry Randolph**
- Transmission System Perspective **Roger Harszy**
- Problem, Corrective Actions
and Significance **Mark Haag**
- Control Room Operator
Perspective **Scott Sandbothe**
- Electrical Distribution System
Calculations **Paul Nauert**
- Callaway/Energy Supply
Operations Interfaces **Mike Taylor**
- Root Cause/Operating Experience **Mark Reidmeyer**
- Conclusion **Garry Randolph**

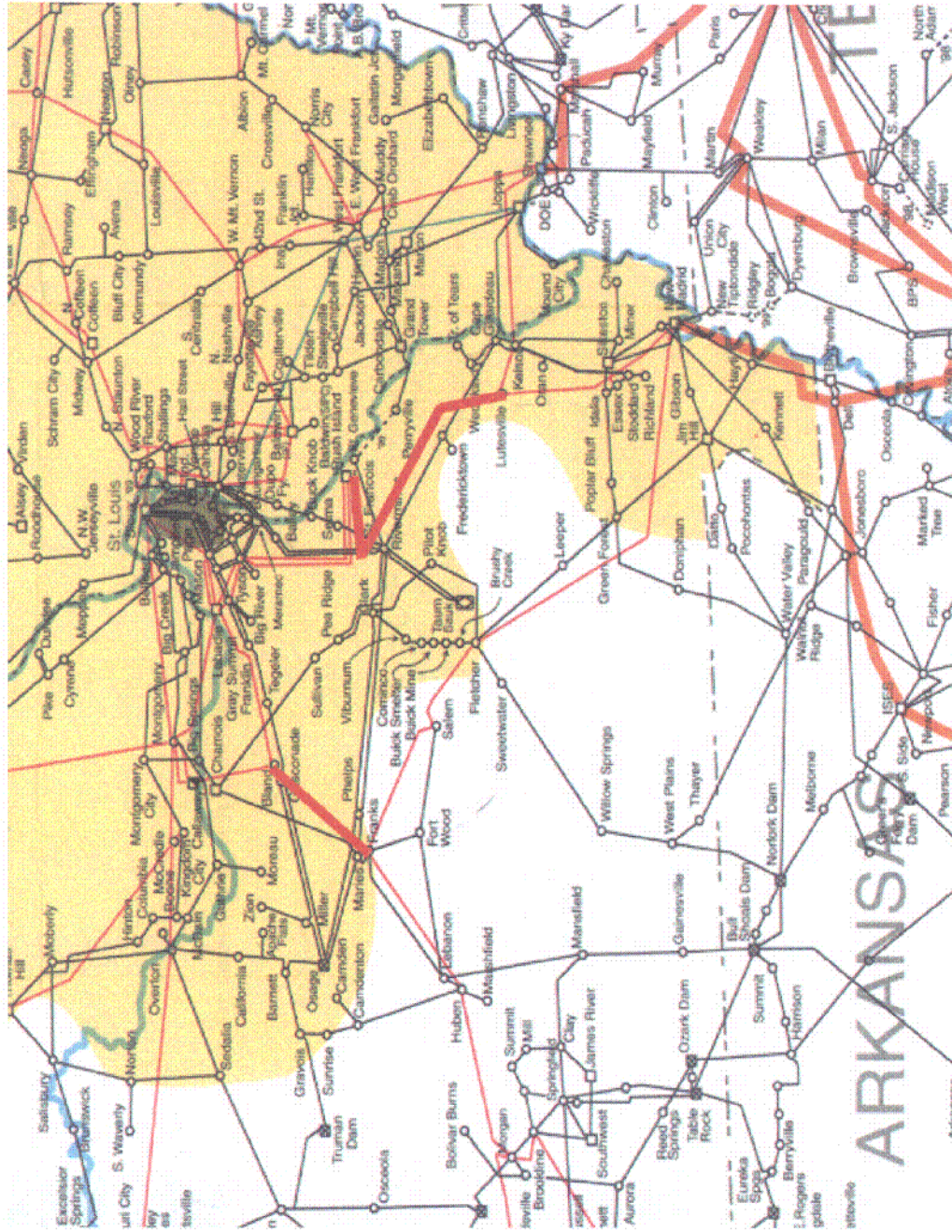


Transmission System Perspective

- **Impact of Open Access**
- **August 1999 Switchyard Voltage Event**
- **Immediate Corrective Actions & Results**



Area Transmission - Orange=500kV Red=345kV Black=161 & 138kV

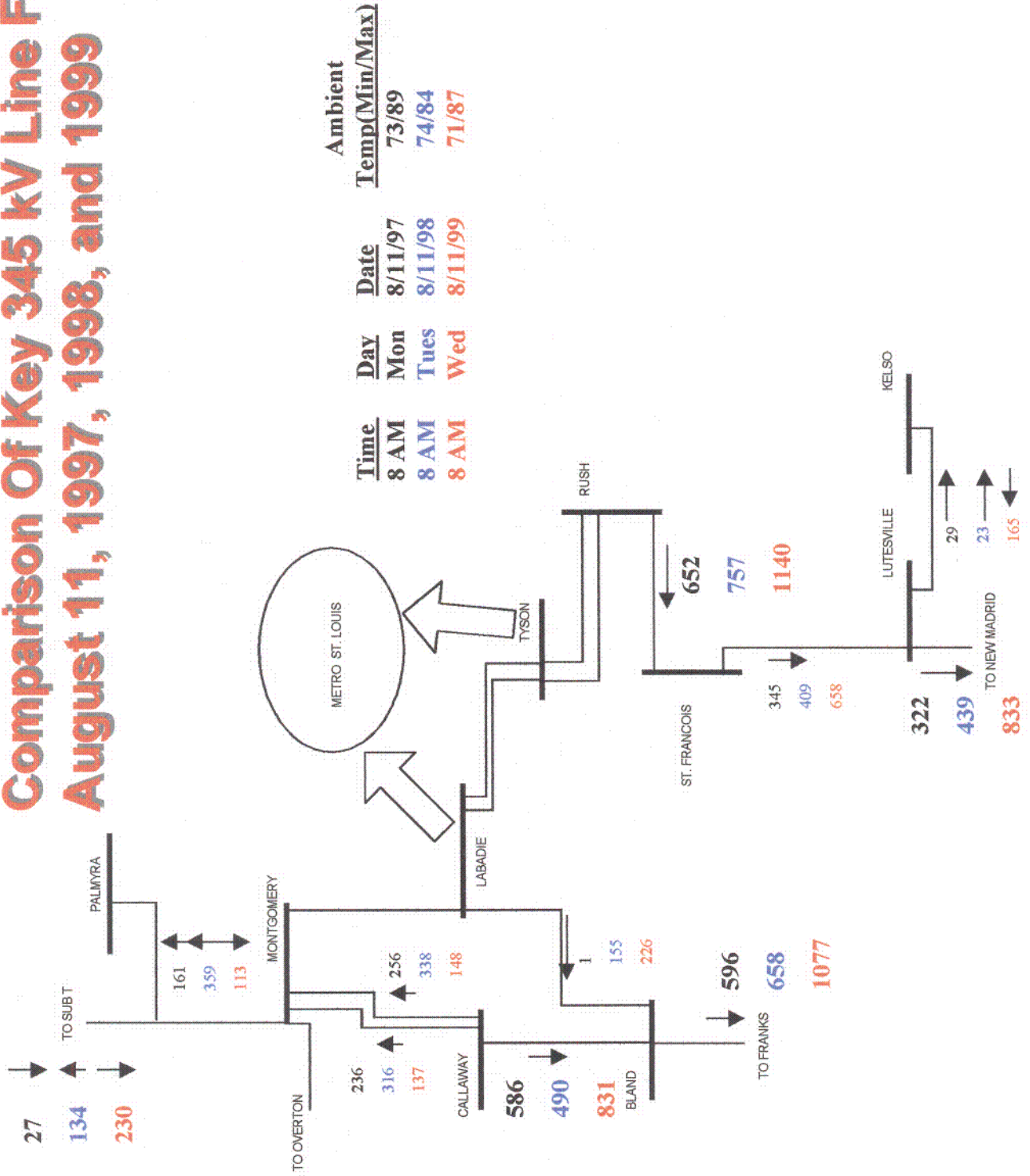


**Bland-
Franks**

**Rush-St-
Francois-
Lutesville**



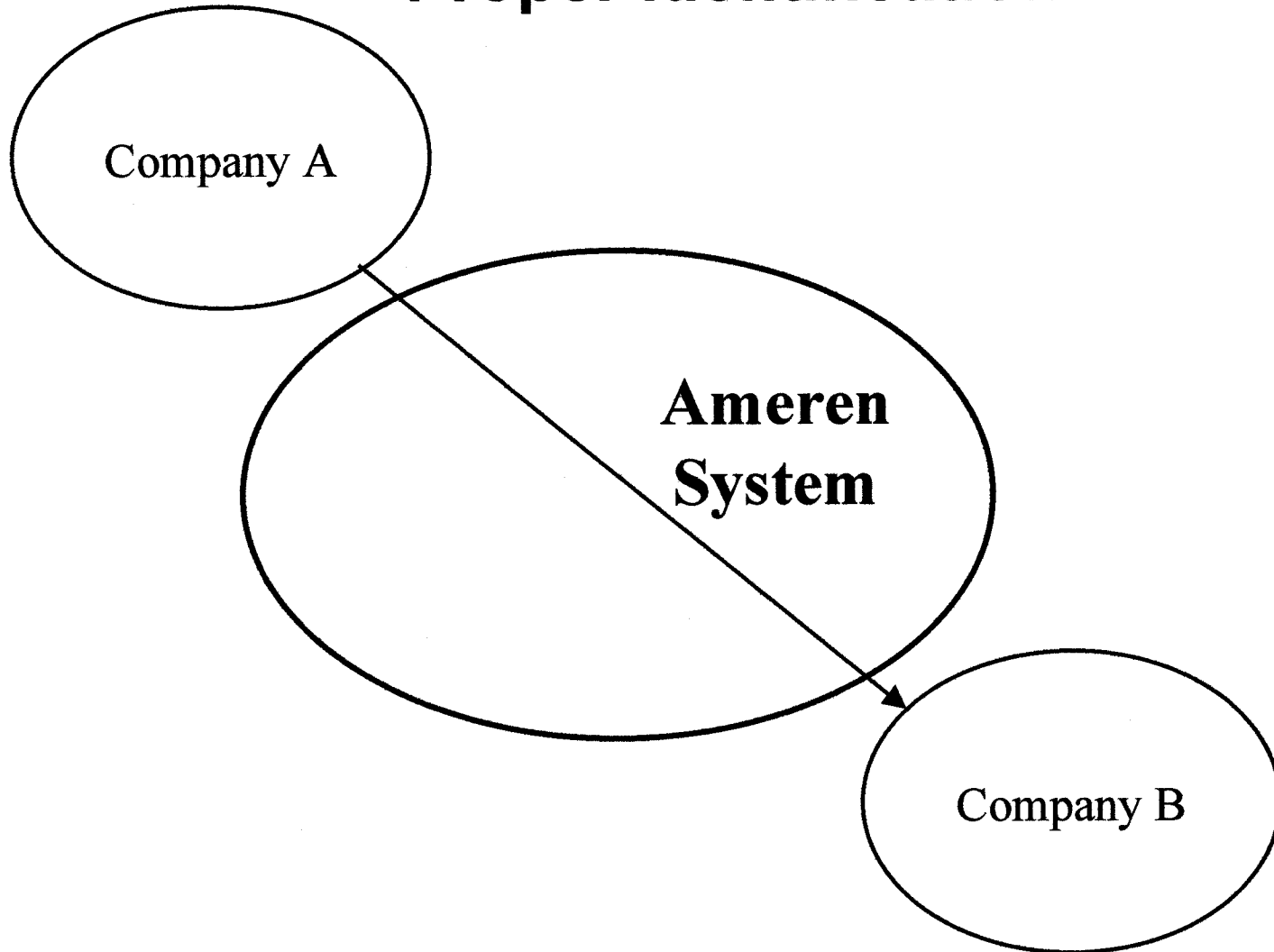
Comparison Of Key 345 kV Line Flows August 11, 1997, 1998, and 1999





Interchange Transactions

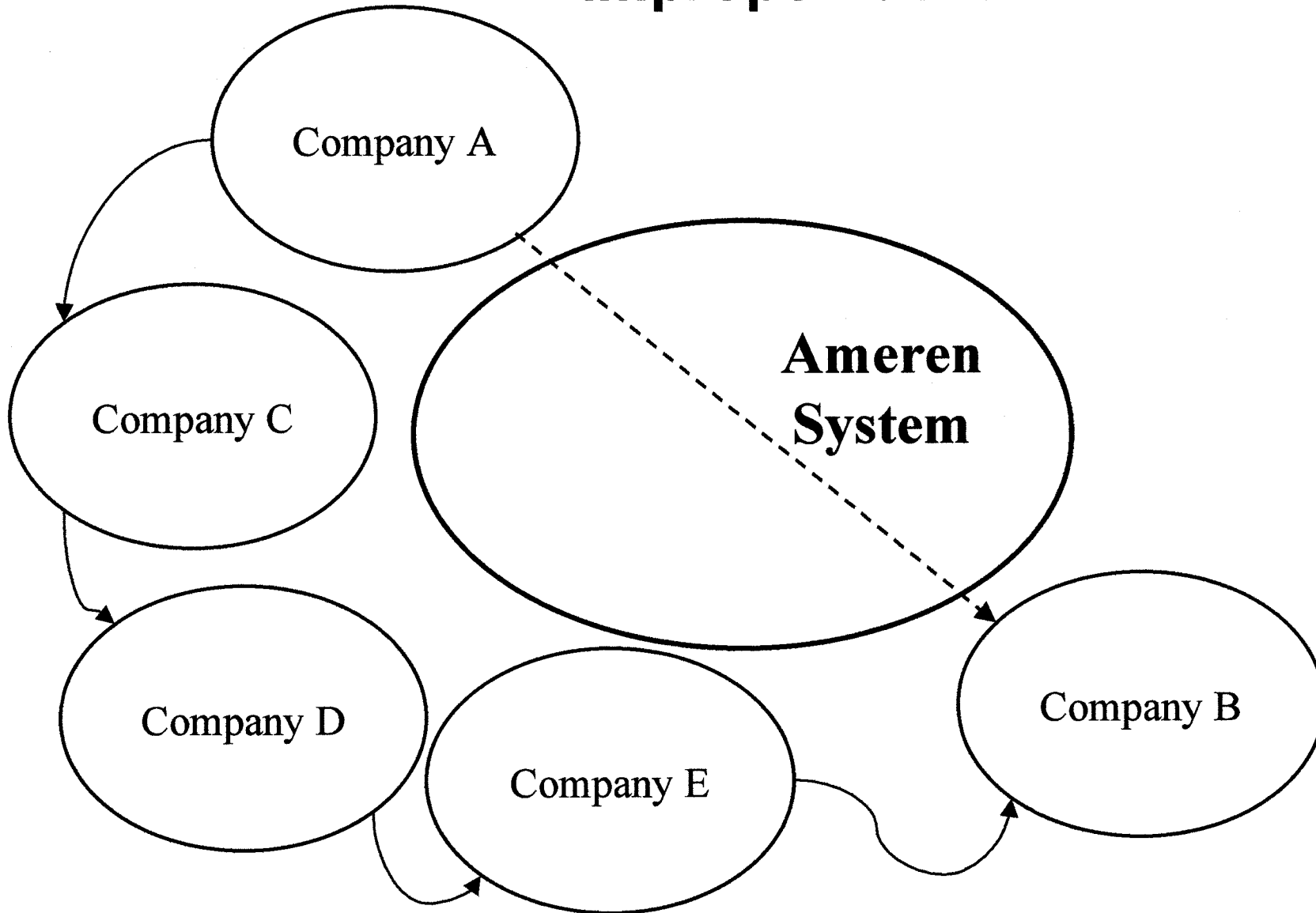
Proper Identification





Interchange Transactions

Improper Identification



PROBLEM

- **Low switchyard voltage on August 11 and 12, 1999**
- **Ameren transmission grid voltage has a greater range**
 - **Open access has caused power wheeling across the Midwest to increase at near peak demand.**
 - **Ameren system demand is increasing**

PROBLEM

-Result:

Reduced grid voltages increase the potential for INOPERABLE offsite power sources.

- Ameren does not have complete control over the causes.**
- Inadequate administrative controls**

CORRECTIVE ACTIONS

- **Ameren identified causes, provided new analysis, and revised procedures to address concern.**
- **Callaway Plant/ESO implemented a process to use an on-line predictive computer analysis program to identify potential INOPERABILITY in the event of a main generator trip.**



CORRECTIVE ACTIONS

- **Internal Transmission Provider / Nuclear Site Agreement**
- **Revised Operations and Energy Supply Operations Procedures to incorporate:**
 - **Full implementation of contingency analysis computer.**
 - **Line-up specific voltage acceptance criteria.**
 - **Instrumentation inaccuracy**



CORRECTIVE ACTIONS

- **Added Switchyard low voltage annunciator.**
- **Added independent review sign-off to computer software changes.**
- **Created training lesson and provided training to all operating crews on degraded voltage issues and use of contingency computer information.**

OPEN CORRECTIVE ACTIONS

- **Callaway can accommodate a wider range of system voltages by installing voltage correction equipment.**
 - **Initial modification - capacitor banks (Spring 2000)**
 - **Final modification - Load tap changing transformers and capacitor banks (Spring 2001-Refuel 11)**



OPEN CORRECTIVE ACTIONS

- **Expand transmission provider agreement to include other FSAR commitments (due Summer 2000)**
- **Complete and Review Summer 2000 System Study (due May 2000)**

SIGNIFICANCE

- **Risk Significance Low - Incremental core damage probability 2.24×10^{-7} (36 hours of potential inoperability over a 22 month period)**



CONTROL ROOM OPERATOR PERSPECTIVE PAST HISTORY

■ 1995 Reactor Trip

- Switchyard low voltage annunciation not available.**

■ 1998 NRC Engineering Inspection SOS 98-3526

- Created computer points for low Switchyard voltage.**
- Requested a modification for a MCB low switchyard voltage alarm.**



CONTROL ROOM OPERATOR PERSPECTIVE PAST HISTORY

■ 1999 August Extraction Steam Break Reactor Trip SOS 99-1617

8/11/99

- **Loss of the Plant Computer**
- **Computer down logs inadequate.**
- **No alarms when the computer was restored.**

8/12/99

- **Switchyard low voltage computer points alarmed.**
- **Operators did not use plant computer information.**
- **Computer alarms were set non-conservative.**

8/26/99

- **ESO provided single annunciation of Callaway's voltage (category 8 alarm).**
- **Operations procedures not updated for the category 8 alarm.**



CONTROL ROOM OPERATOR PERSPECTIVE CURRENT STATUS

- **Real Time Contingency Analysis Computer program (category 8 alarm)**
- **Formal agreement between Energy Supply Operations and Callaway Plant**
- **Revised procedures to include the category 8 alarm**
- **Modified Computer Down Logs**
- **Completed MCB annunciator modification**
- **Plant Computer Alarms**
- **Operations training completed**



ELECTRICAL DISTRIBUTION SYSTEM CALCULATIONS: Transmission Planning PAST PRACTICE

- **Load Flow Analysis Performed Upon Request**
- **Regional Summer Peak Load Flow Base Case Used**
- **All System Changes Anticipated for Upcoming Summer Included in Base Case**
- **Scenario Analyzed**
 - **Dual ESF Source Contingency Only**
- **No Sensitivity to System Parameters**



ELECTRICAL DISTRIBUTION SYSTEM CALCULATIONS: Transmission Planning CURRENT PROCEDURE

- **Signed Agreement Specifying Frequency and Content of Analysis**
- **Load Flow Analysis Performed Prior to Each Peak Season**
- **All System Changes Anticipated for Upcoming Season Included in Base Case**
- **Analysis to be Reviewed for All Subsequent Significant System Changes**



ELECTRICAL DISTRIBUTION SYSTEM CALCULATIONS: Transmission Planning CURRENT PROCEDURE

■ Scenarios Analyzed

- **Dual ESF Source Contingency Number 1**
 - **Callaway Off with LOCA loads**
 - **Callaway-Bland 345 kV Line Open**
 - **One Callaway-Montgomery 345 kV Line Open**
- **Dual ESF Source Contingency Number 2**
 - **Callaway Off with LOCA loads**
 - **One 600 MW Labadie Unit Out of Service**



ELECTRICAL DISTRIBUTION SYSTEM CALCULATIONS: Transmission Planning CURRENT PROCEDURE

- **Single ESF Source Contingency**
 - **Callaway Off with LOCA Loads**
 - **No Transmission System Contingencies**
- **Sensitivity to Significant Cross System Transfers Included**
- **Results Reported to Callaway and ESO**



CALLAWAY/ENERGY SUPPLY OPERATIONS INTERFACES

- **Transmission provider agreement in place**
- **Callaway will be notified of significant changes to system characteristics**
- **Callaway Control Room notification within 15 minutes of out-of-range voltage**
- **Callaway-initiated Spring/Fall discussions of system characteristics and model updates**



ROOT CAUSE

- **SOS 99-1617 was initiated August 13, 1999 for the post trip degraded voltage condition at Callaway Plant.**
 - **Extensive, immediate response from the plant staff and Energy Supply Operations restored switchyard voltage within limits.**
 - **Resources were redirected from Refuel 10 to pursue permanent remedies to the concern.**
 - **QA supervisor determined a formal root cause was not required because of extensive Engineering root cause evaluation.**



ROOT CAUSE

- **Rapid Redesign implemented a Screening Team for new corrective action documents.**
 - **Screening Team determines priority and need for formal root cause daily.**
 - **Screening Team was instituted late November 1999.**
 - **QA supervisor is member of the Screening Team.**
- **QA Department organization change January 2000 assigned additional personnel to support completion of formal root causes.**



OPERATING EXPERIENCE

- **ISEG initiated SOS 99-2054 September 1999 to address NRC Information Notice 98-07.**
 - **LER 99-005-00 preparation identified Information Notice had been distributed for information only.**
 - **ISEG reviewed all Information Notices that were routed for information only since late 1996.**
 - **Four Information Notices were identified requiring additional review.**



OPERATING EXPERIENCE

- **In January 1999 the responsibility for review of Information Notices was transferred to the ISEG from the Regulatory Operations group.**
 - **ISEG engineers are experienced and typically cross-trained as STAs.**
 - **ISEG is also responsible for INPO Operating Experience Program at Callaway Plant.**
 - **ISEG personnel are located on-site and are familiar with plant programs and processes.**