CRANE COLLAPSE – STATOR DROP
Arkansas Nuclear One

DRP Counterpart Meeting
Alfred Sanchez
May 14, 2013
Agenda

- Background
- Event Description
- Site Priorities
- Resident Inspector Response
- Augmented Inspection Team
- Parting Thoughts
- Pictures
Background

- ANO Unit 1 Stator Replacement Project
- To Rewind (1R23) or Not to Rewind (1R24)
- Began Loading Crane in Turbine Building Late February 2013
- Construction Complete March 31, 2013
- ----Animation Video here----
ANO Plant Status – March 31

Unit 1
- 1R24, Mode 6
- **Green** Risk
- RCS > 23’ in Cavity
- Ready to Offload
- Ready for Green Train Maintenance Window
- A3/A4 Power Supplied via A1

Unit 2
- Mode 1, 100%
- **Green** Risk

Protecting People and the Environment
Crane Collapse – Stator Drop
March 31, 2013

- Structural Failure of Crane Support and Stator is Dropped
- Immediate Loss of Offsite Power to Unit 1
- Immediate Unit 2 Reactor Trip
- Breaker Explosion & Partial Loss of Offsite AC Power on Unit 2 (1.5 Hours After Trip)
- Notice of Unusual Event
Structural Failure of Crane

- Collapse Occurs with NO WARNING!
- Offsite Responders Notified (Fire and Ambulance)
- 1 Fatality and 8 Injured
- Emergency Response Organization Activated
- Loss of Blackout Diesel to Both Units
- Crushed and Severed 8” Fire Header
- 3 - B.5.b Pumps and London Fire Fire Truck in PA
Unit 1 Loss of Offsite Power

- A1/A2 Busses Located Directly Beneath Turbine Deck and Impact Area—A1 Locks Out/ A2 Bus was De-energized Previously
- Loss of Decay Heat Removal
- EDGs Function as Designed
- Loss of Instrument Air
- Loss of Spent Fuel Pool Cooling

Protecting People and the Environment
Unit 2 Reactor Trip – Partial LOOP

- Trip of RCP B Breaker due to Vibration
- Reactor Protection System Trip
- Feeder Breaker Explosion and SU#3 Lockout
- 2A1 Bus Fast Transfer to SU#2
- 2A2 Bus De-energizes and EDG-2 Functions as Designed to load 2A4
- NOUE Declared for Explosion in PA
Unit 2 Reactor Trip – Partial LOOP

- Electrical Power Arrangement Results in Degraded Instrument Air Pressure
- Water Hammer In Feedwater Heaters
- Loss of Letdown, SDBCS, and Pressurizer Spray
- Natural Circulation Cool Down (First Time)
Licensee Priorities

UNIT 1

- Restore Offsite Power to Unit 1 Safety Busses from SU#1 Transformer via a Temporary Modification
  - SU#1 to Temporary Field Breaker to Blackout Diesel Electrical Feeder Lines
  - Required Complete De-energization of A3 Vital Bus...Only 1 EDG from Station Blackout
- Establish Temporary Modifications to Restore Non-Safety Related Power via Mobile Diesel Generators

Protecting People and the Environment
Licensee Priorities

Unit 1 (cont.)

- Reestablish Fire Suppression System
- Establish Redundant Offsite Power via Temporary Switchgear Powered by SU#2
- Defuel Unit 1 and Complete Portions of 1R24 in Reactor Building
Licensee Priorities

Unit 2

- Assess Physical Damage
- Repair & Replace Damaged Components
- Review Post Transient Report
- Forced Outage List
- Re-Start Checklist Items (On-Line April 28)
- Plant Start-Up Monitoring Plans
Residents Inspector Response

- Responded to the Site in Approx 1 Hour
- Control Room is Small & Very Crowded
- Ongoing Events in Control Room Made it Difficult to Break Away to Call Region
- Understanding Roles
- "Eyes-In-The-Field"
- Follow-Up Inspection (Temporary Modifications and Unit 2 Start-up)
Augmented Inspection Team

- Onsite Week of April 8th
- 10 Unresolved Items
- Most Significant Items
  - Risk Assessment for Stator Move
  - Evaluation of Vendor Engineering Products
  - Timeliness of Securing Temporary Fire Pump (SU#3 Transformer Lockout and Flooding)
Augmented Inspection Team

- Compensatory Measures for Fire Suppression System (Truck-B.5.b)
- Unit 1 Nozzle Dams
Bradley, Dan  

**From:** Miller, Geoffrey  
**Sent:** Monday, May 13, 2013 8:49 AM  
**To:** Bradley, Dan  
**Subject:** RE: Reminder to send the AIT slides  
**Attachments:** AIT_pres_ANO.ppt  

Dan,  

Attached is the slide show we used at the meeting. Please let me know if you need more info.  

Thank you,  

Geoff  

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**From:** Bradley, Dan  
**Sent:** Monday, May 13, 2013 10:43 AM  
**To:** Miller, Geoffrey  
**Subject:** Reminder to send the AIT slides  

Thank you,  

Dan  

Dan Bradley  
Project Engineer - Division of Reactor Projects Branch E  
U.S. NRC Region IV  
dan.bradley@nrc.gov  
817-200-1506
NRC Augmented Inspection Team Exit Meeting
Arkansas Nuclear One

Nuclear Regulatory Commission - Region IV
Russettville, AR
May 5, 2013

Agenda

- Introduction
- Purpose of an AIT
- Event Description
- Inspection Results
- Licensee Comments
- NRC Closing Remarks
- Question and Answer
Augmented Inspection Team

- Fact-finding inspection
- Identify issues for follow up inspection
- Identify generic safety concerns

March 31 Dropped Stator Event

- Unit 1 RFO Stator Replacement
- Structural Failure of Lifting Rig
- Loss of Offsite Power to Unit 1
- Unit 2 Reactor Trip
- Partial Power Loss/Breaker Failure on Unit 2
- Notice of Unusual Event
• Reactor plant safety systems responded as designed

• Entergy took appropriate actions to recover plant equipment on Units 1 and 2 and has initiated an extensive root cause evaluation effort

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• Event Chronology

• Operator Response
  – Control of Temporary Modification

• Equipment Impact
  – Structural Impact to Units 1 and 2
Summary of Charter Items

- Plant Response to the Event
  - Control of Steam Generator Nozzle Dams
  - Main Feedwater Regulating Valve Maintenance
  - Flood Barrier Effectiveness

- Compensatory Measures
  - Compensatory Actions for Fire Suppression

- Event Classification and Reporting
  - Timeliness of Emergency Declaration

Summary of Charter Items

- Heavy Lift Preparations
  - Shutdown Reactor Equipment Risk
  - Implementation of Material Control Procedure

- Status of Cause Evaluation Efforts
  - Review of Causes/Corrective Actions

- Operating Experience
Contacting the NRC

- Report an emergency
  - (301) 816-5100 (call collect)
- Report a safety concern
  - (800) 695-7403
  - Allegation@nrc.gov
- General information or questions
  - www.nrc.gov; Select “What We Do” for Public Affairs
  - Victor Dricks, (817) 200-1128
Electronic Distribution

• To receive a summary of this meeting and begin receiving other plant-specific e-mail distributions, subscribe to the Operating Reactor Correspondence electronic distribution via http://www.nrc.gov/public-involve/listserver/plants-by-region.html.

• To discontinue receiving electronic distribution, you may unsubscribe at any time by visiting the same web address above.
Good Afternoon,

Please see the attached report. Thank you.

Respectfully,

Rustin "Russ" Lusk
Division of Reactor Projects, Division Admin Assistant
U.S. Nuclear Regulatory Commission, Region IV
Phone: (817) 200-1184
Fax: (817) 200-1278

"Faith is being sure of what we do not see & certain of what we hope for."

***R.I.P. Rick "Rypper" Rypien***
Parting Thoughts

- Real (Human) Risk at Operating Nuclear Power Plants
- Just Because it is a Secondary System, Not Safety-Related, or Shutdown Doesn’t Mean That There is No Risk!
- When Observing Heavy Lifts...Always Consider Failure of Lifting Rig and Ensure You Are Out of Harms Way
- Keep Detailed Notes w/ Dates & Times
- Verify Information
NRC Augmented Inspection Team
Exit Meeting
Arkansas Nuclear One

Nuclear Regulatory Commission - Region IV
Russellville, AR
May 9, 2013
Agenda

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- Operating Experience
Licensee Response and Remarks

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Protecting People and the Environment
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