

Crown PZM11 Flush-Mount Boundary Layer Microphone (Ceiling Mics \$120.00)



Crown Audio PZM10LL Miniature Security Microphone with Line- Level Output (Panel Mics \$200.00)



Panasonic WVSC384 High Definition Dome Network Camera \$850.00



WHEN PLANT DATA COMPARISONS GO ROGUE

**Scott Cupp
Arkansas Nuclear One**

**Assumptions are made and
most assumptions are wrong**

- Albert Einstein

Arkansas Nuclear One

ANO1 – B&W, 880 MW (1973)

ANO2 – CE, 1020 MW (1980)

December 2015:

Column IV, Recovery

Policy Note 14 Imminent

Biennial QA Training Audit

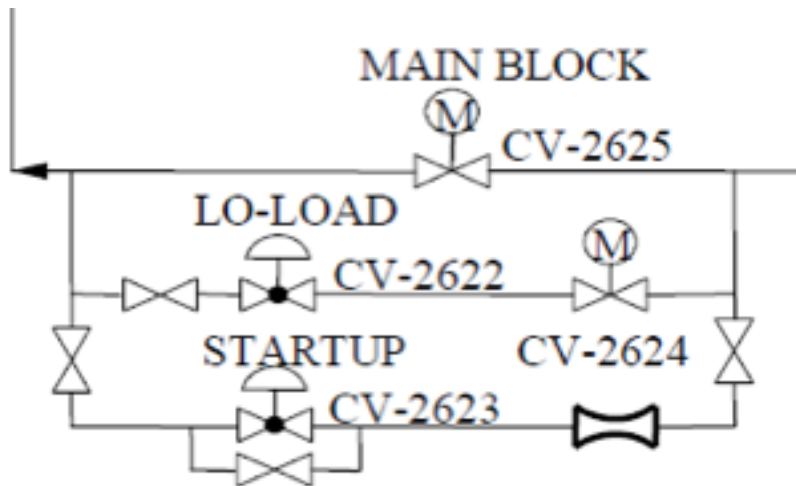
INPO OPS Accreditation Team Visit



Arkansas Nuclear One – ANO1

Three parallel feedwater flow paths:

- Startup flow control valves (6" air operated globe valve)
- Low load control valve (10" air operated globe valve)
 - LL/SU valves stop when main block opens / interlock
- Main feedwater block valves (>55%)



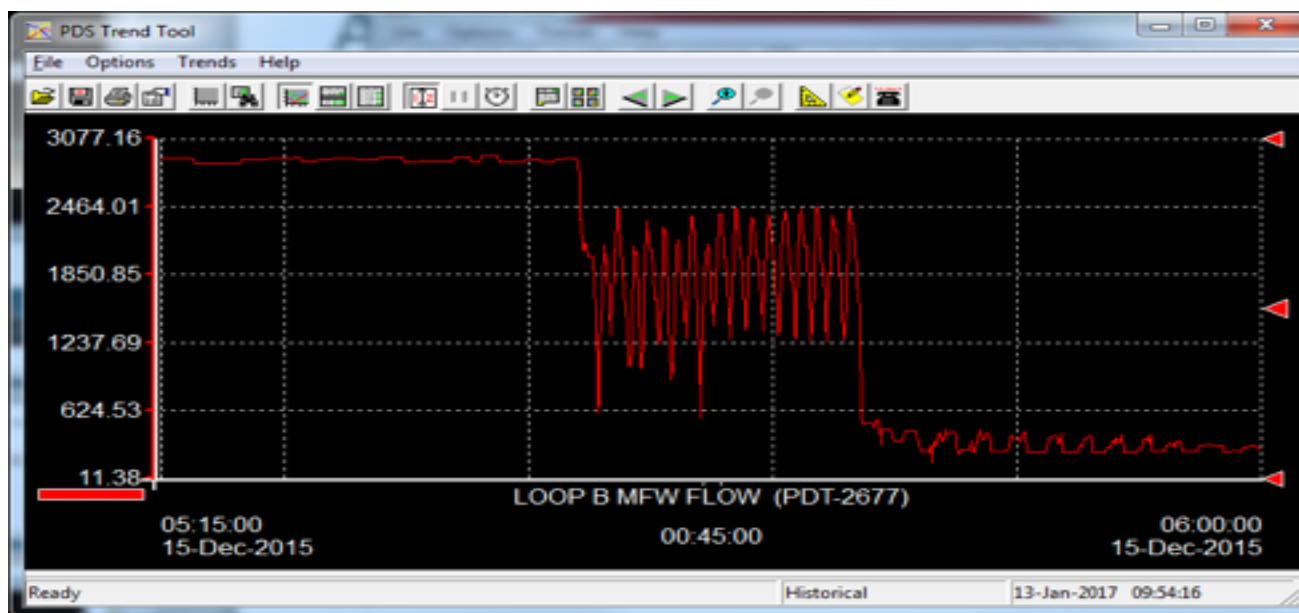
Arkansas Nuclear One – ANO1

The event - December 15, 2015:

During a plant downpower to replace an EH power supply, CV-2672 B low load control valve failed to close. Subsequently, CV-2674 B low load block valve began to close and caused a loss of feed to E-24B OTSG. The reactor was manually tripped due to loss of feed and EFW actuated.

Arkansas Nuclear One – ANO1

- ICS signal to begin closing B low load valve failed (equipment)
- Operators placed low load valves in manual but left the startup valves in automatic (human performance)
- Operators tried to manually close B low load valve to 90% but saw no immediate valve movement



Arkansas Nuclear One – ANO1

- Another crew had handled similar transient correctly in 2014
- Operations representative on root cause team was a former simulator instructor
- Assumption made regarding “deadband” on low load valve
- Theory was tested in the simulator ...

Arkansas Nuclear One – ANO1

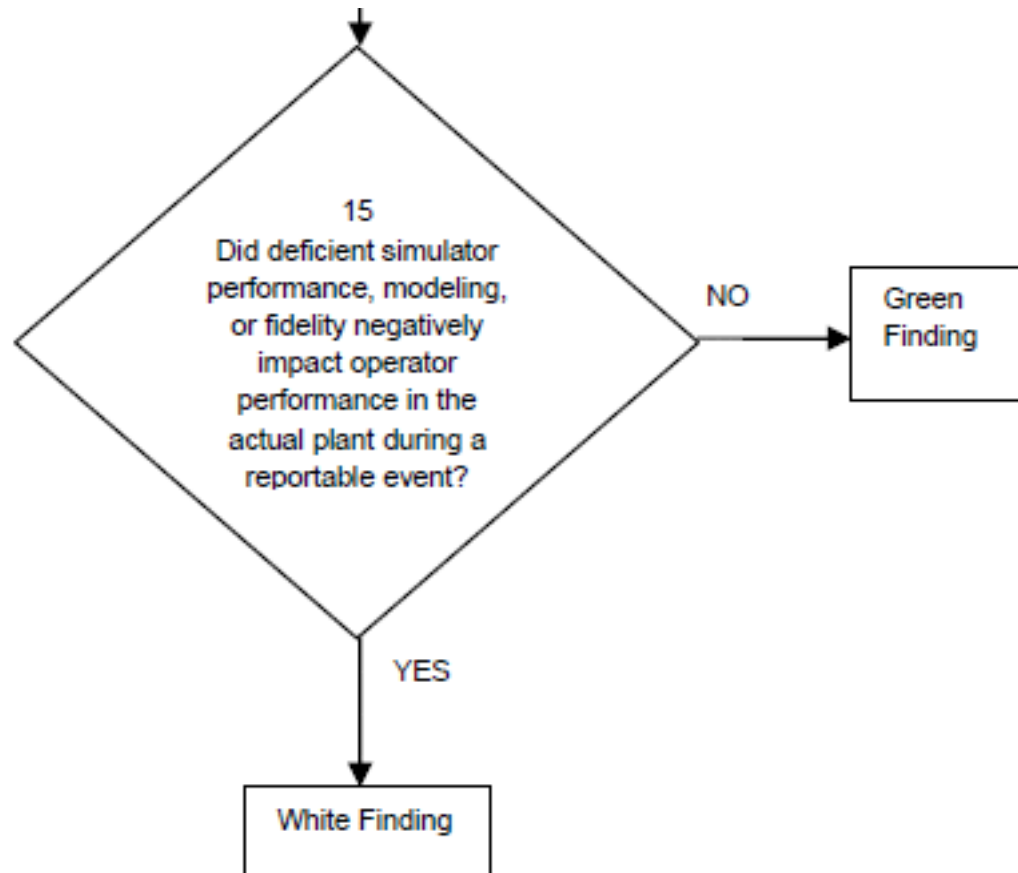
CR-ANO-1-2016-780

During the investigation ... it was identified that the Main Feedwater Low Load Control Valves have a dead-band that the crew was unaware of, which works as follows:

While opening, the LLCV reaches full open with a 93% demand, and when closing, does not begin to close until the demand signal is lowered below 93%.

During a review of LLCV performance in the simulator, it was discovered that the dead-band does not appear to be modeled properly in the simulator.

Arkansas Nuclear One – ANO1



Arkansas Nuclear One – ANO1

What actually happened:

- Event facts were not challenged by training management
- Simulator issue called out as contributing cause in RCE
- NRC resident requests meeting with training management
- QA audit determines simulator effectiveness unsat
- Accreditation prep team drafts SIF on simulator fidelity

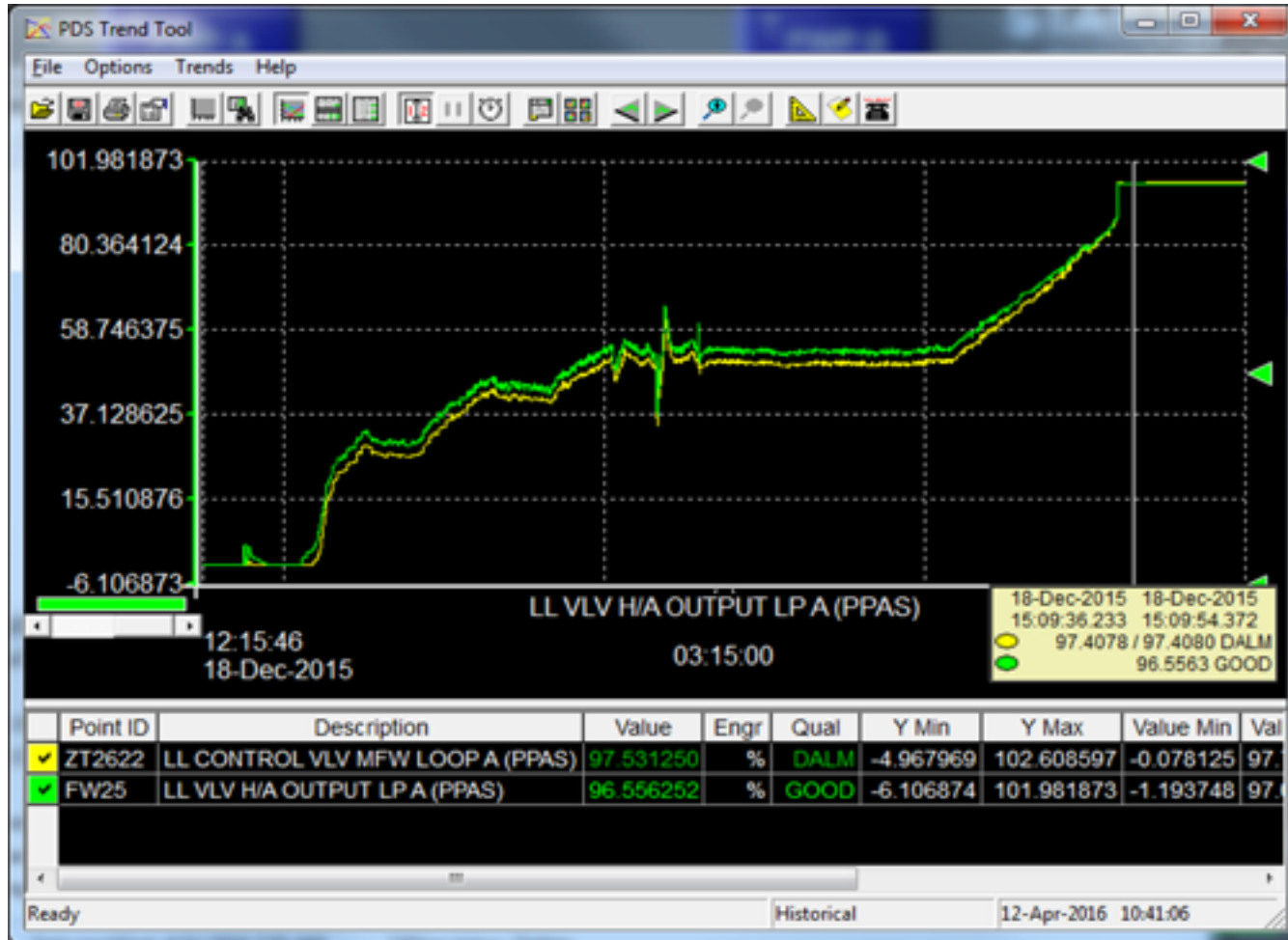
Arkansas Nuclear One – ANO1

What should have happened immediately – Event Facts:

- No significant deadband existed
- Valve moved minutes after demand lowered (stuck)
- Maintenance discovered that valve positioner had drifted 7% over the current fuel cycle

(discovered by training)

Arkansas Nuclear One – ANO1



Arkansas Nuclear One – ANO1

Two months later:

- Root cause is revised removing simulator as issue
- NRC agrees no simulator issue exists
- QA agrees to revise audit report and determines simulator effectiveness is satisfactory
- Accreditation prep team eliminates draft SIF from ASER

Arkansas Nuclear One – ANO1

Lessons Learned:

- Stay ENGAGED in simulator issues
- Be willing to challenge initial conclusions
- Understand small variations in plant performance will occur
 - Time in position
 - Calibration drift
 - Ambient temperature and vibration
 - Time in core life

Questions?