

Robinson Nuclear Plant March 28, 2010 Event Review



Nuclear Regulatory Commission
May 12, 2010



Introduction

- Participants
- Purpose
 - ◆ Event overview
 - ◆ Event Review Team
 - ◆ Corrective actions
 - ◆ Lessons being shared with fleet/industry
 - ◆ Summary

Event Overview

Tom Natale
Event Review Team Member



Event Overview

- Event Initiated at 1852
 - ◆ Procedure flow
 - ◆ Equipment challenges
 - ◆ Operator response/actions
- Timeline Review

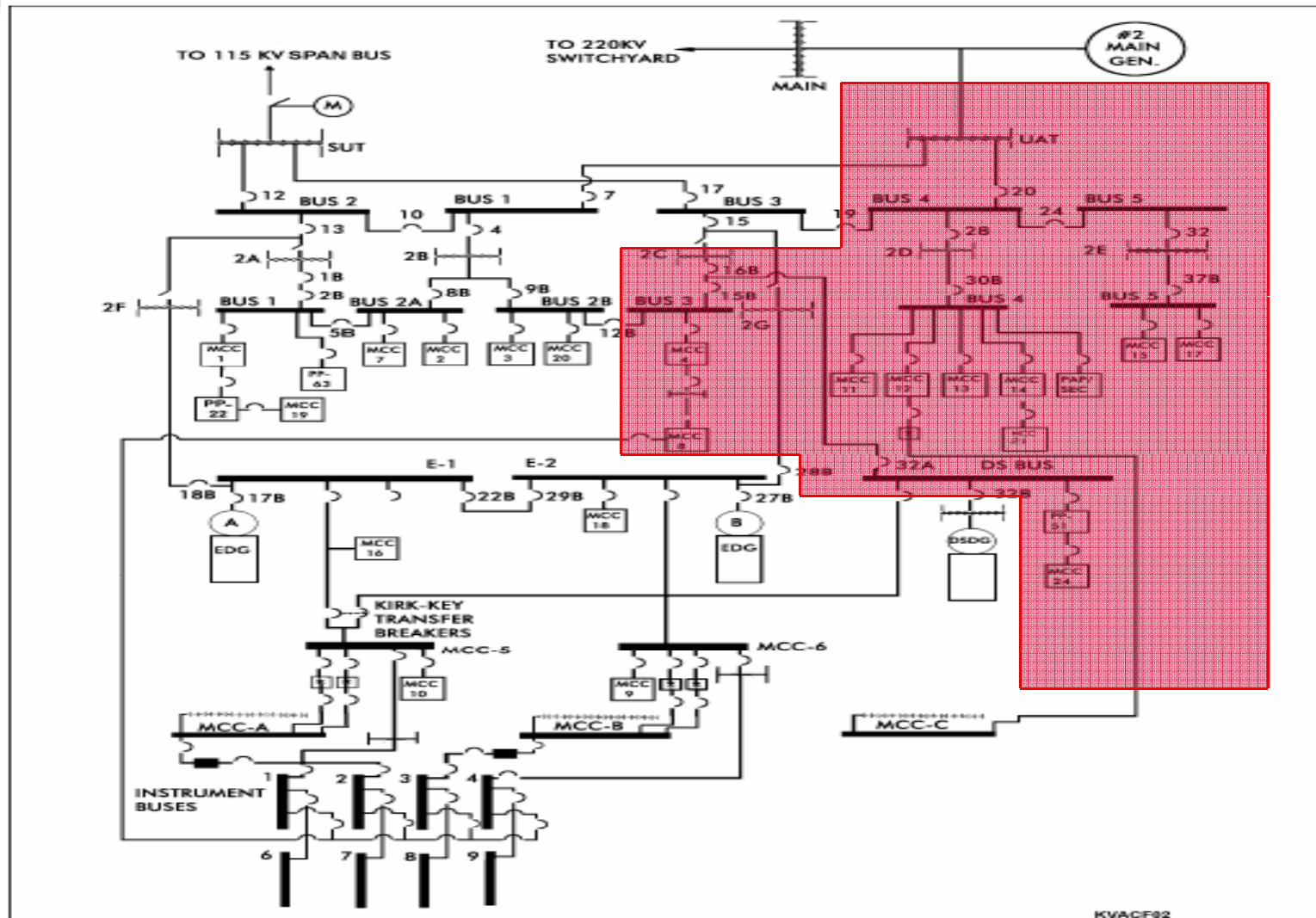
Event Overview

4KV SYSTEM LOADS KVAC-FIGURE-5

4160 V BUS NO. 1	REACTOR COOLANT PUMP "A" 52/1 MAIN FEEDWATER PUMP "A" 52/3 CIRCULATING WATER PUMP "A" 52/2 CONDENSATE PUMP "A" 52/6 HEATER DRAIN PUMP "A" 52/5 STATION SERVICE TRANSFORMER 2B 52/4 BUS 1 AND 2 TIE BREAKER 52/10
4160 V BUS NO. 2	REACTOR COOLANT PUMP "C" 52/14 STATION SERVICE TRANSFORMER 2A and 2F 52/13
4160 V BUS NO. 3	STATION SERVICE TRANSFORMER 2C and 2G 52/15
4160 V BUS NO. 4	REACTOR COOLANT PUMP "B" 52/27 MAIN FEEDWATER PUMP "B" 52/26 CIRCULATING WATER PUMP "B" 52/23 CONDENSATE PUMP "B" 52/22 HEATER DRAIN PUMP "B" 52/25 STATION SERVICE TRANSFORMER 2D 52/28 BUS 3 AND 4 TIE BREAKER 52/19 4160 V BUS 5 52/24
4160 V BUS NO. 5	CIRCULATING WATER PUMP "C" 52/33 STATION SERVICE TRANSFORMER 2E 52/32



Event Overview



Event Overview



Event Review Team

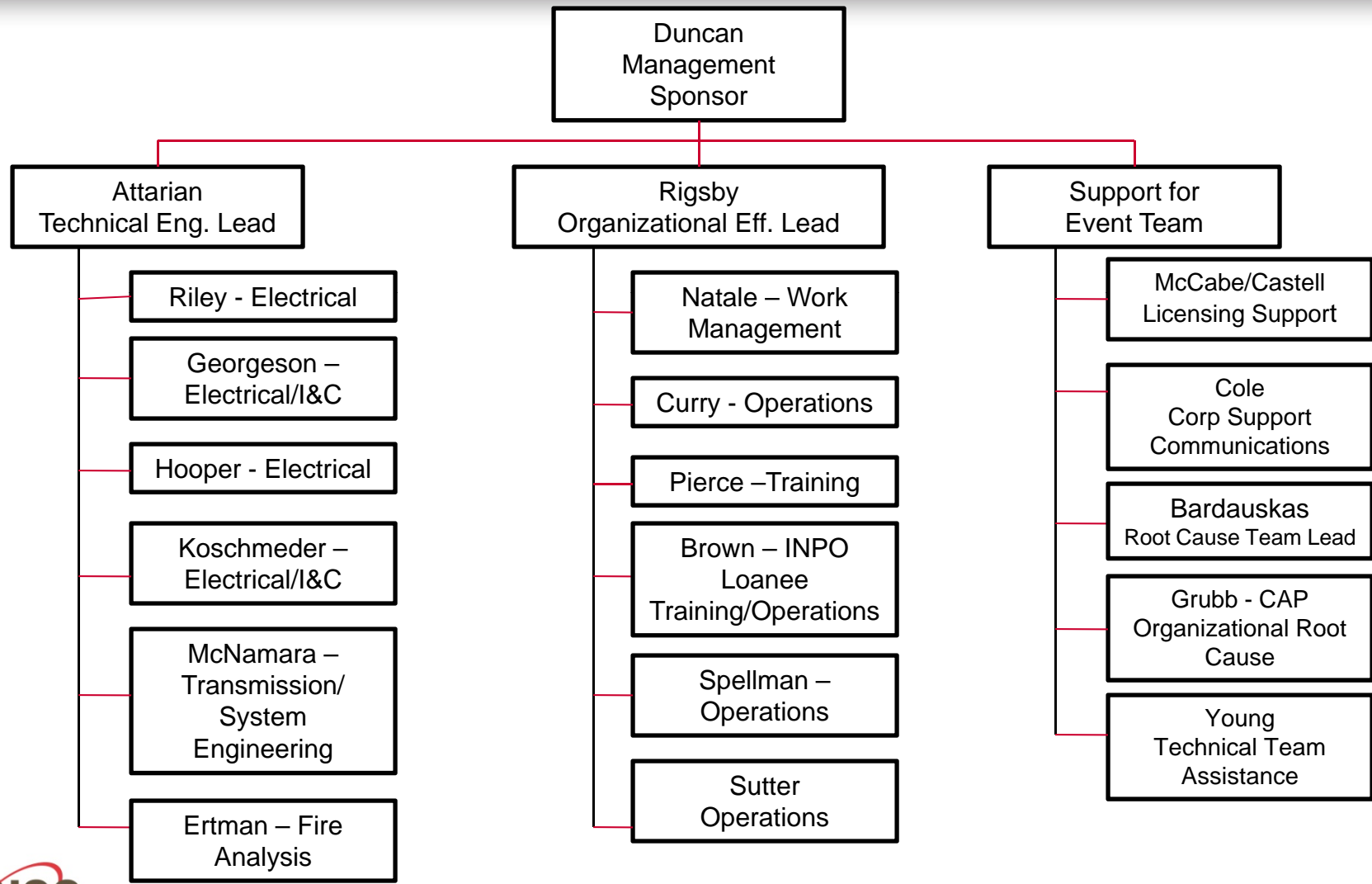
Bob Duncan
Team Lead



Event Review

- Event Response Team Makeup:
 - ◆ Bob Duncan (VP NOD) – Team Lead
 - ◆ Mark Rigsby (Manager, Site Support CR3)
Organizational Effectiveness Lead
 - ◆ George Attarian (Manager, Major Projects)
Technical Engineering Lead

Event Review



Event Review

- External Assistance
 - ◆ Fire Forensics – Richard Hanson and Associates
 - ◆ Fire Modeling – Hughes Associates
 - ◆ Breakers/Switchgear – Homewood Products, Westinghouse, Areva
 - ◆ Reactor Coolant Pump parameters – Westinghouse, Areva
 - ◆ Cables – EPRI
- Investigation Methods

Investigation Results: Operations

- Monitoring of Critical Safety Functions
 - ◆ Sub-criticality
 - ◆ Core cooling
 - ◆ Heat sink
 - ◆ RCS integrity
 - ◆ RCS inventory
 - ◆ Containment integrity

Investigation Results: Equipment

- Cable Modifications (1986)
 - ◆ Cable specifications
 - ◆ Cable installation/support
- Breaker 52/24
 - ◆ Control power fuse
 - ◆ Knowledge gap pertaining to control power circuit
 - ◆ Evaluation of work order

Investigation Results: Equipment

- VCT – RWST Auto Swap
 - ◆ Comparator jumper configuration
 - ◆ Post-maintenance testing
- Instrument Bus 3

Investigation Results: Operations

- Command and Control/Communication Challenges
 - ◆ Safety injection anticipation
 - ◆ RCS cooldown mitigation
 - ◆ Procedure utilization (APPs, AOP closure)
 - ◆ Status briefs/crew updates
 - ◆ MCR distraction management
 - ◆ Alert declaration

Investigation Results: Operations

- Additional Insights
 - ◆ Path 1 & foldout strategy
 - ◆ AOP-041
- Monitoring of Key Parameters
 - ◆ RCP seal cooling
 - ◆ FCV-626 closure
 - ◆ Volume control tank level
 - ◆ Charging pump suction swap-over
 - ◆ RCS temperature and pressure

Investigation Results: Organization

- Operator Training
- Site Event Response
- Organizational Effectiveness
- Operating Experience

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Corrective Actions



Equipment

Warren Farmer
Manager RNP Engineering



Corrective Actions: Equipment

- Inspect RCP Seals (R)
- Inspect B Charging Pump (R)
- Replace UAT (R)
- Health Assessment of SUT (R)
- 4 KV Cable Extent of Condition Inspection (R)
- Fleet MV Cable Review

Corrective Actions: Equipment

- FCV-626 RCP Thermal Barrier Isolation Modification Implementation (R)
- Implement Modification for Battery Charger Auto-restart (R)
- Troubleshooting Instrument Bus 3 (R)
- Review and Conduct as Necessary PMTs on Past NUS Comparator Replacements (R)
- Develop Fleet Standard for PMT on Protection and Control Circuits
- Develop Configuration Document for NUS Modules

Operations

Scott Saunders
Plant General Manager



Corrective Actions: Operations

- Leadership Assessment (R)
- Crew Reconstitution (R)
- Training Actions (R)
- Command and Control (R)
- Key Parameter Monitoring (R)
- Fleet PGM Challenge of Start-up (R)

Procedures

Scott Saunders
Plant General Manager



Corrective Actions: Procedures

- CAPR to revise work management process to provide specific guidance for impact reviews of new Work Requests including:
 - ◆ Guidance for Operations impact reviews
 - ◆ Guidance for the Work Order prioritization
 - ◆ Clarification of expectations for what “Validation” of a deficiency entails
 - ◆ Guidance for conversion of Work Requests to Work Orders

Corrective Actions: Procedures

- EOP Foldout revision (R)
- AOP-041 Strategy (R)
- GP-004 Post-trip stabilization (R)
- AOP-024 Loss of instrument bus

Organization

Eric McCartney
Vice-President



Corrective Actions: Organization

- Review of Outstanding WR/WO (R)
 - ◆ Priority
 - ◆ Scope
 - ◆ Risk
- Training
 - ◆ Breaker control power
 - ◆ Breaker indicating lights

Corrective Actions: Organization

- Performance Improvement
 - ◆ Formalize follow up to Oversight and Fleet identified performance issues
 - ◆ Implement CR3 Performance Improvement Model across the fleet
- Equipment Performance
 - ◆ Case study employee and leadership training
 - ◆ Revise PMT strategy for risk informed application
- Organizational Response
 - ◆ Revise event response procedures to provide for a technical support response for both forced outage and non-forced outage events

Plant Design Changes

Warren Farmer
RNP Manager Engineering

Bob Rishel
Manager Probabilistic Safety Assessment



Plant Design Changes

- Event Related Risk Profile Improvements
 - ◆ Battery Charger Auto-load Modification **(R)**
 - ◆ FCV-626 Power Dependency Modification **(R)**
 - ◆ 4 KV Ground Detection Seal-In Circuit **(R)**
 - ◆ Dedicated Shutdown Diesel Auto-Start
 - ◆ ERFIS Seal Flow Annunciation
 - ◆ 2nd Start Up Transformer
 - ◆ Independent Emergency Power for Deep-Well Pumps

Plant Design Changes

- Additional Modifications for Overall Risk Profile Improvement
 - SW Cross-Connect Isolation Valve **(R)**
 - 4th AFW Pump

Fleet & Industry Lessons Learned

Chris Burton
Vice-President – Harris Plant

Wayne Gurganious
Director Fleet Training



Fleet & Industry Lessons Learned

- Operations
 - ◆ Stronger pursuit of abnormal plant conditions
 - ◆ Electrical systems fundamental knowledge
 - ◆ Crew composition considerations
- Training
 - ◆ Scenario design
 - ◆ Evaluation standards
- Procedures
 - ◆ EOP and AOP improvements

Operating Experience

- PWROG
- INPO
 - ◆ Issued Significant Event Notification
 - ◆ On-site during investigation
 - ◆ Post to Nuclear Network
- Chief Nuclear Officer
 - ◆ Shared insights with peers at INPO Executive Advisory Group conference

Summary

Eric McCartney
Vice-President

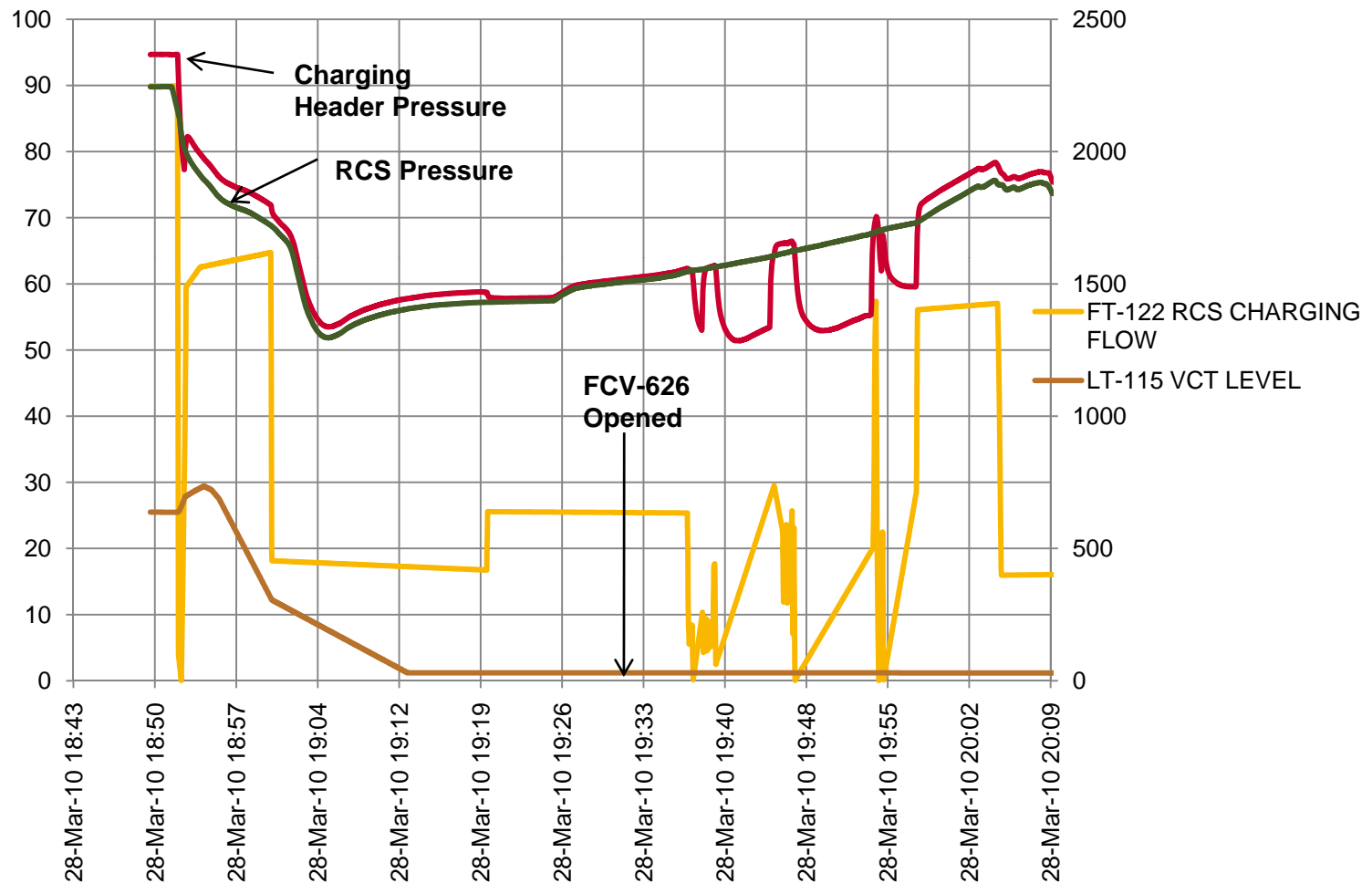
Jim Scarola
Sr. Vice-President and Chief Nuclear Officer



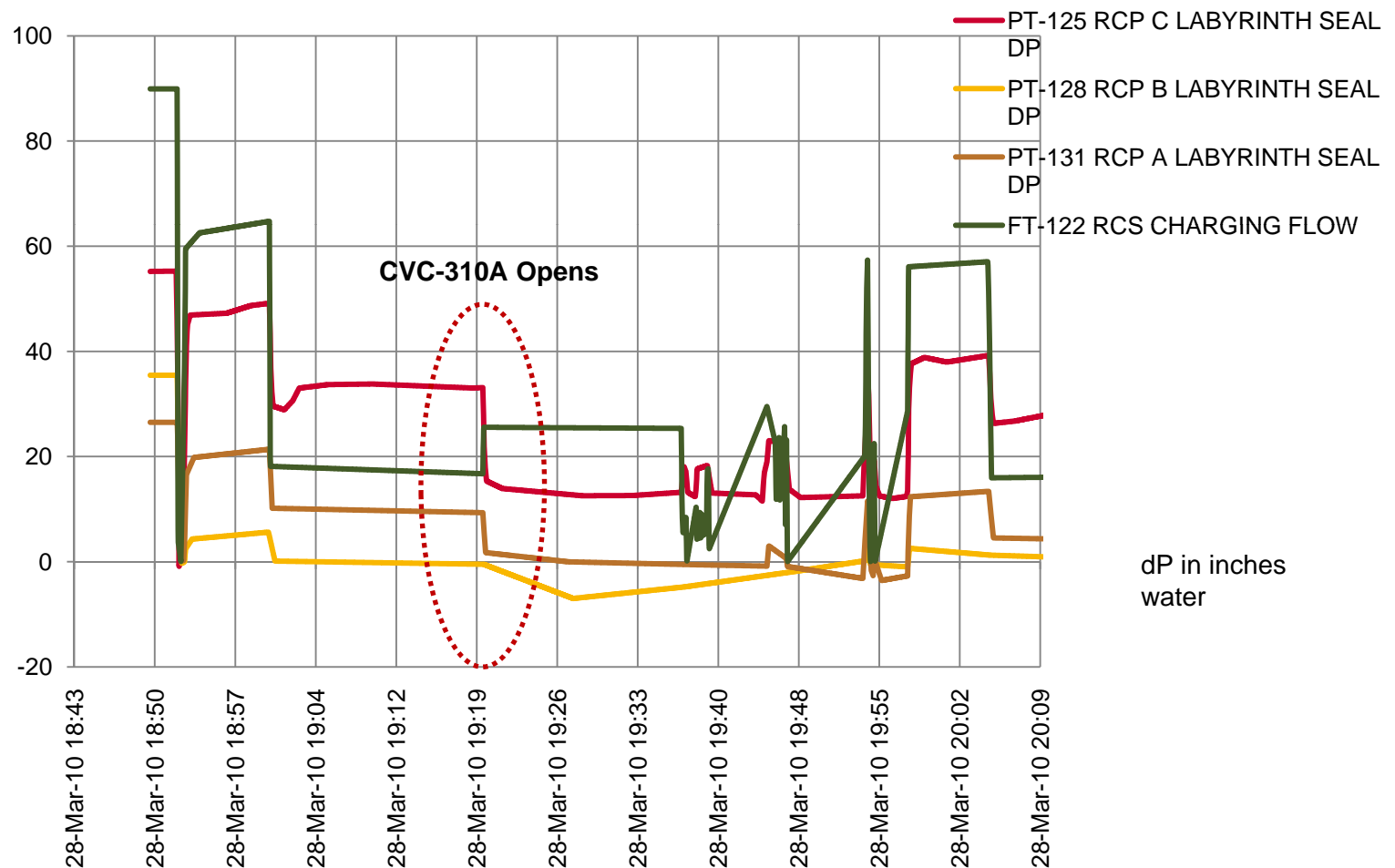
Appendices



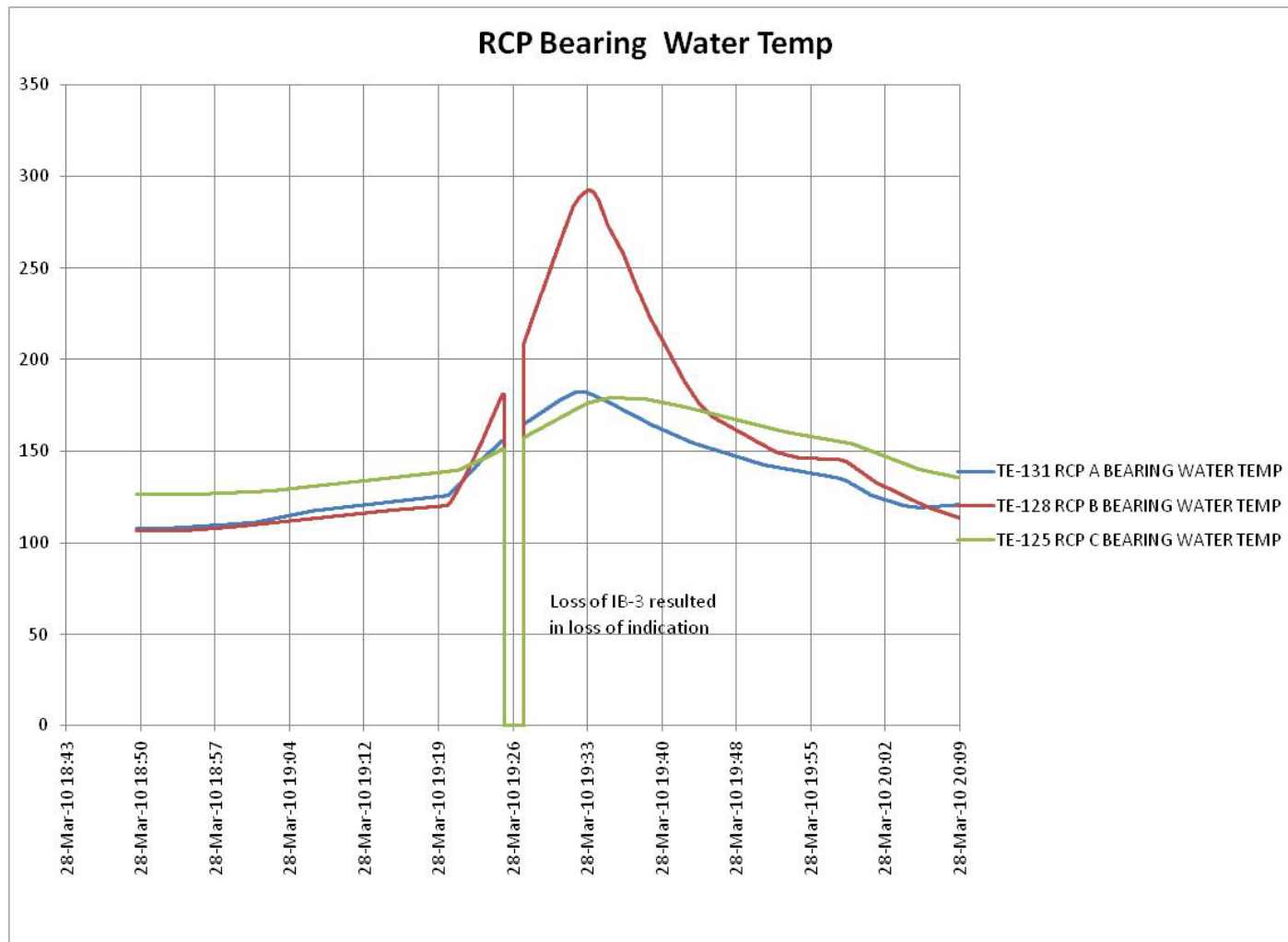
Seal Injection / Charging / VCT Level



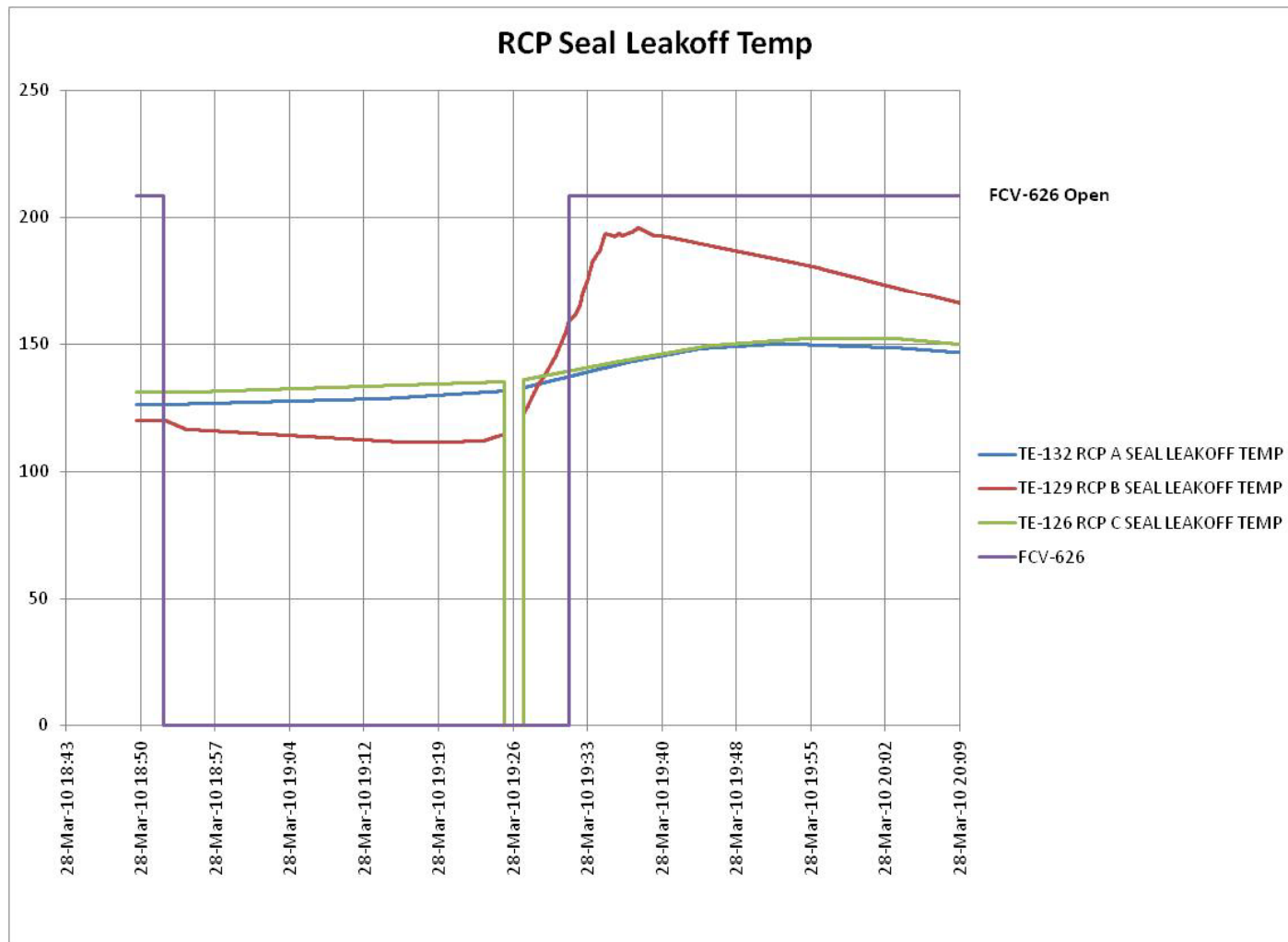
RCP Labyrinth Seal dP



RCP Bearing Water Temperature



RCP Seal Leakoff Temperature



RCS Temperature and Pressure

