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Special Inspection Team (SIT) Exit Meeting

Braidwood Dual Unit Shutdown

September 30, 2010

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Welcome

Gary Shear
Acting Director
Division of Reactor Projects
NRC Region III

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Meeting Agenda

- Introductions
- Background
- NRC Special Inspection Scope & Results
- Conclusions
- Exelon Comments
- Closing Remarks
- Public Questions and Comments

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Introductions - NRC

- Gary Shear, Acting Director, Division of Reactor Projects
- Richard Skokowski, Chief, Division of Reactor Safety
- John Jandovitz, Project Engineer, Division of Reactor Projects (SIT Lead)
- Néstor Féliz Adorno, Reactor Inspector, Division of Reactor Safety (SIT Member)
- Meghan Thorpe-Kavanaugh, Reactor Engineer, Division of Reactor Projects (SIT Member)

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Introductions - Exelon

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Description of Event

Richard Skokowski
Branch Chief
Division of Reactor Safety

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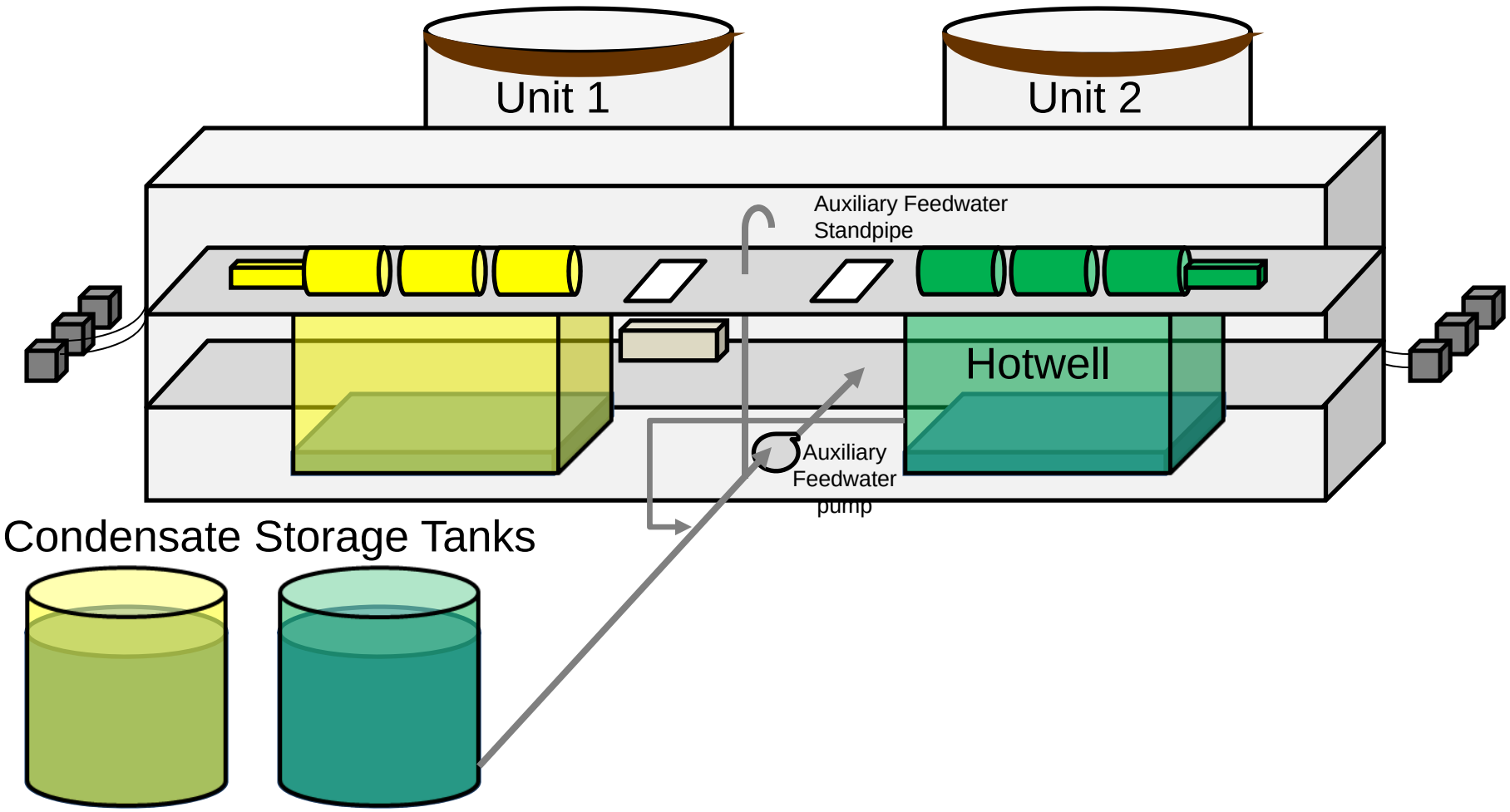
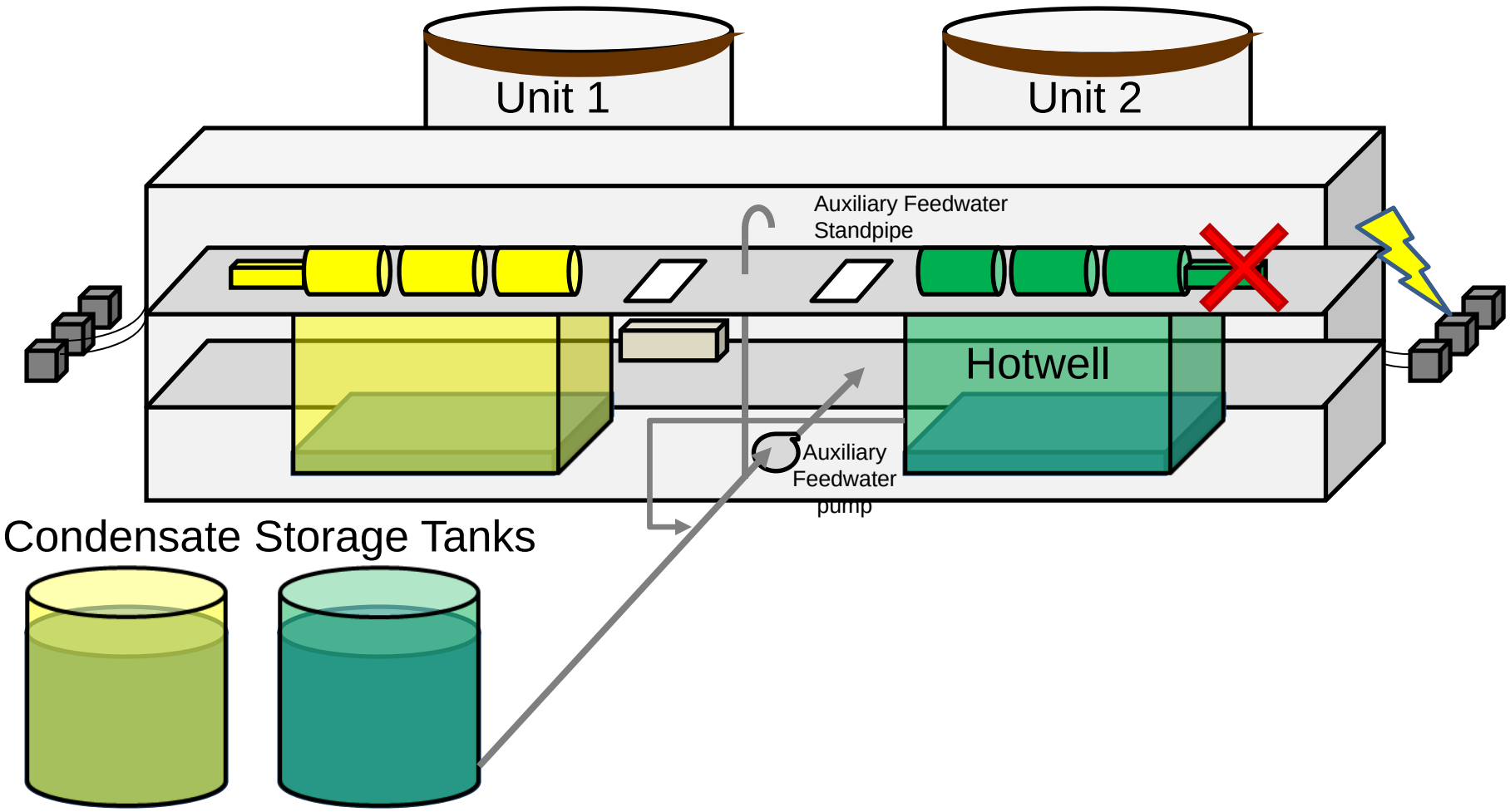
Background

- August 16, 2010 – Braidwood unexpectedly experienced a dual unit shutdown.
- NRC resident inspectors maintained safety focus on safe shutdown operations and operator response to the event.
- August 17, 2010 – NRC initiated a Special Inspection Team because the event involved unexpected system interactions and the resultant risk determination.
- Special Inspection Team was onsite August 17-27.

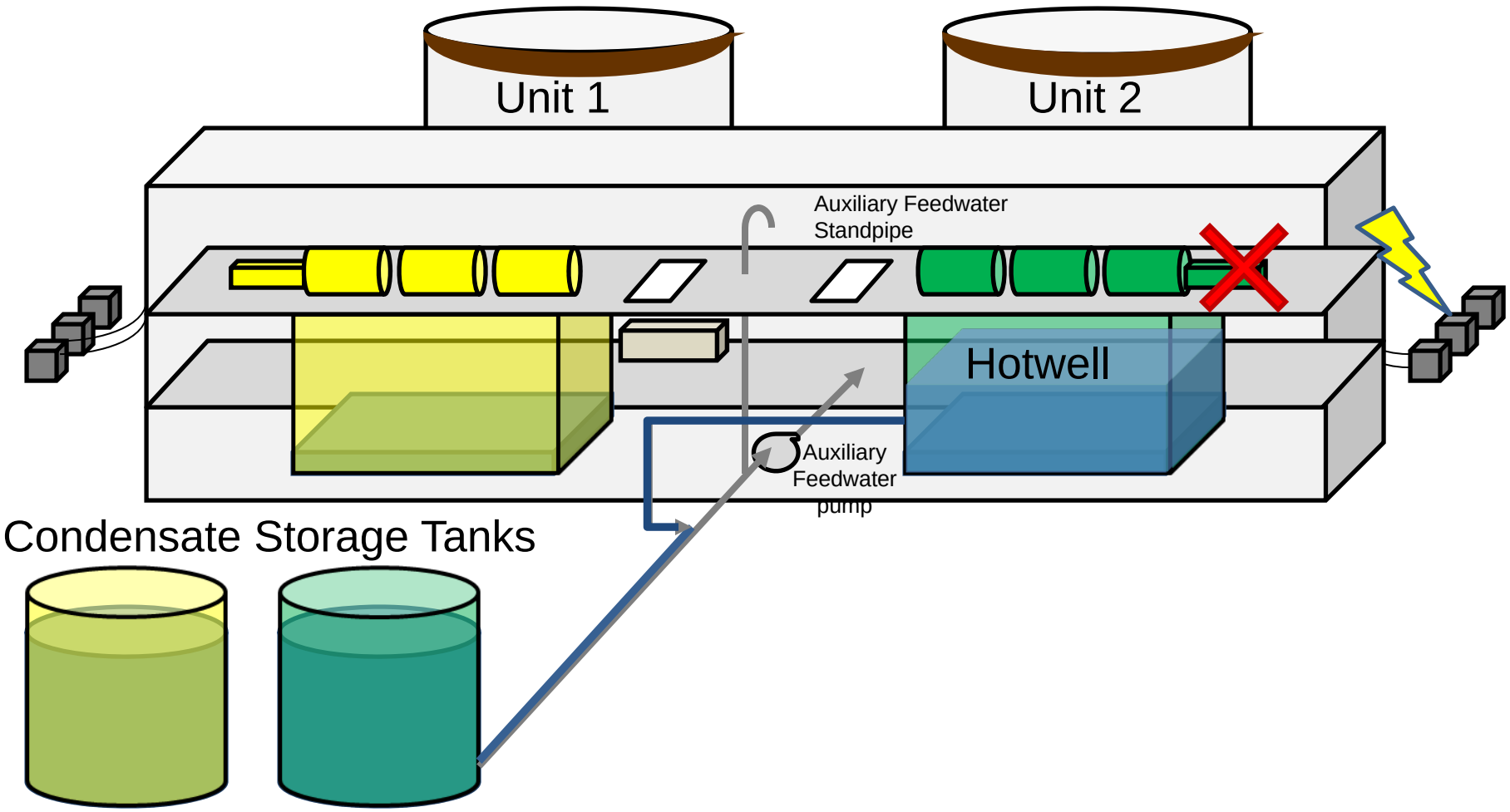
Braidwood Unit 1 (Yellow) and Unit 2 (Green) operating normally



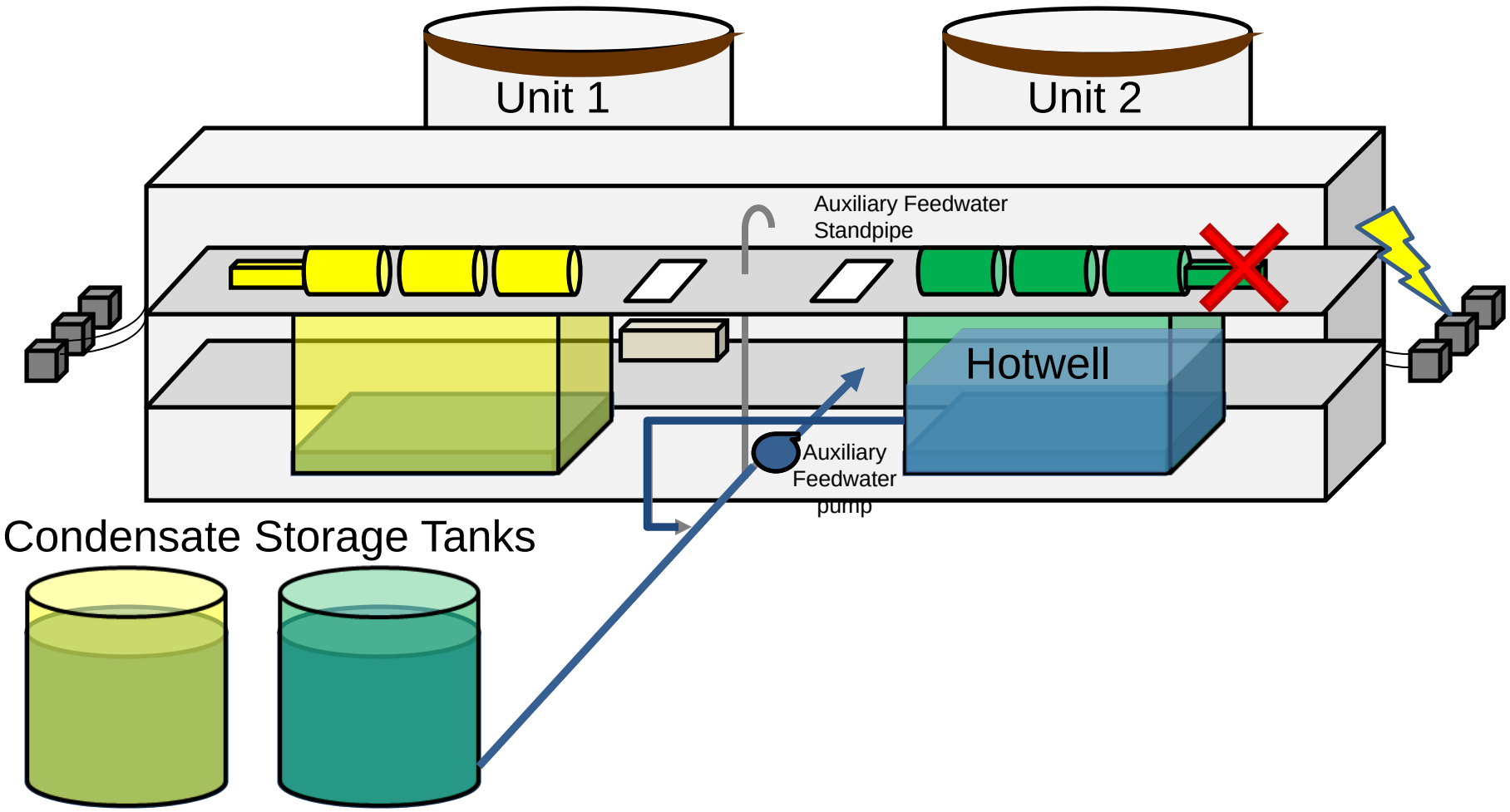
A piece of an air damper broke and caused a fault in the electrical system causing a Unit 2 turbine/generator trip and subsequent reactor trip



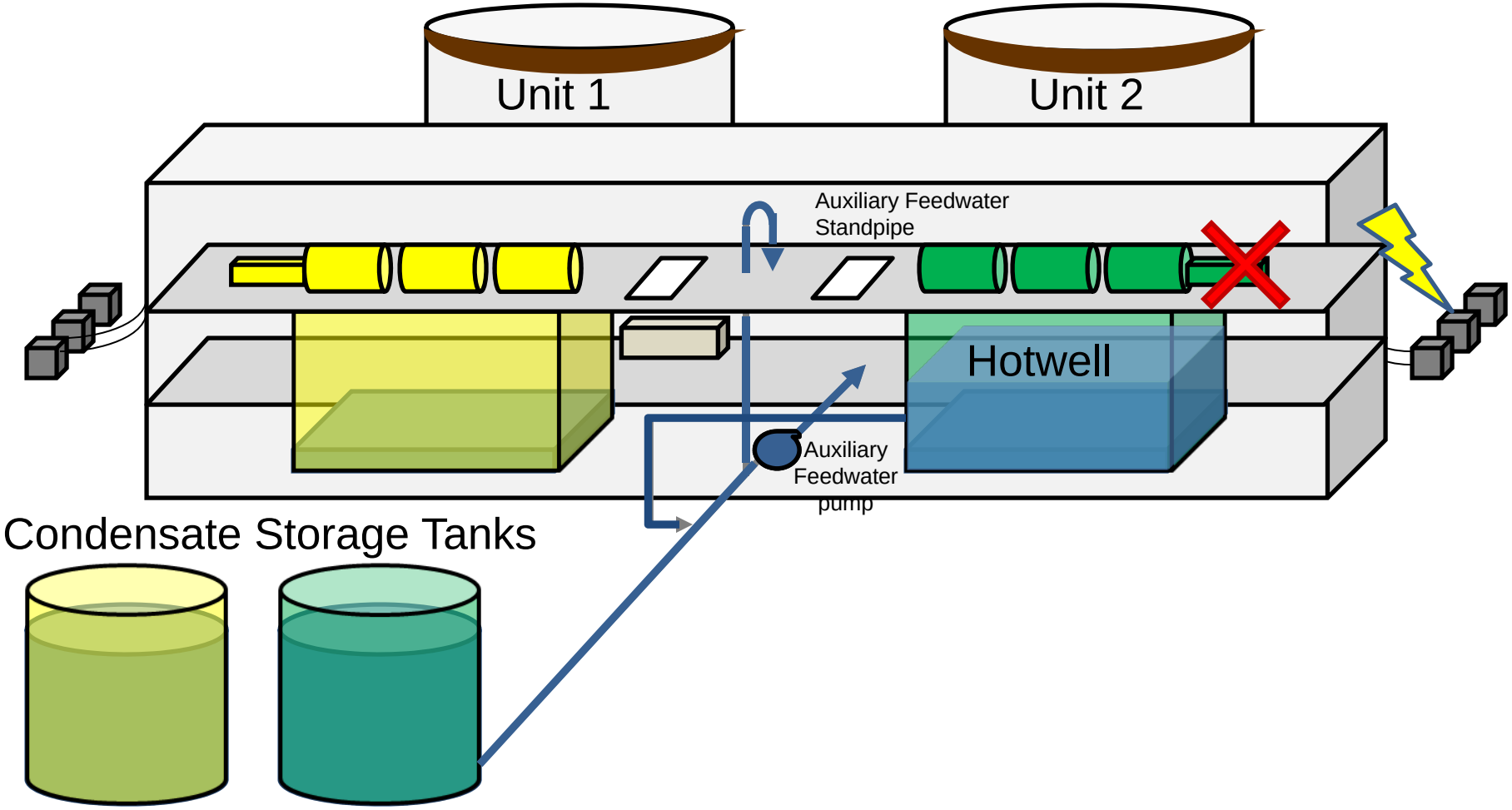
The Unit 2 Turbine Trip caused water in the hotwell to reject to a pipe leading to the Unit 2 Condensate Storage Tank, as designed



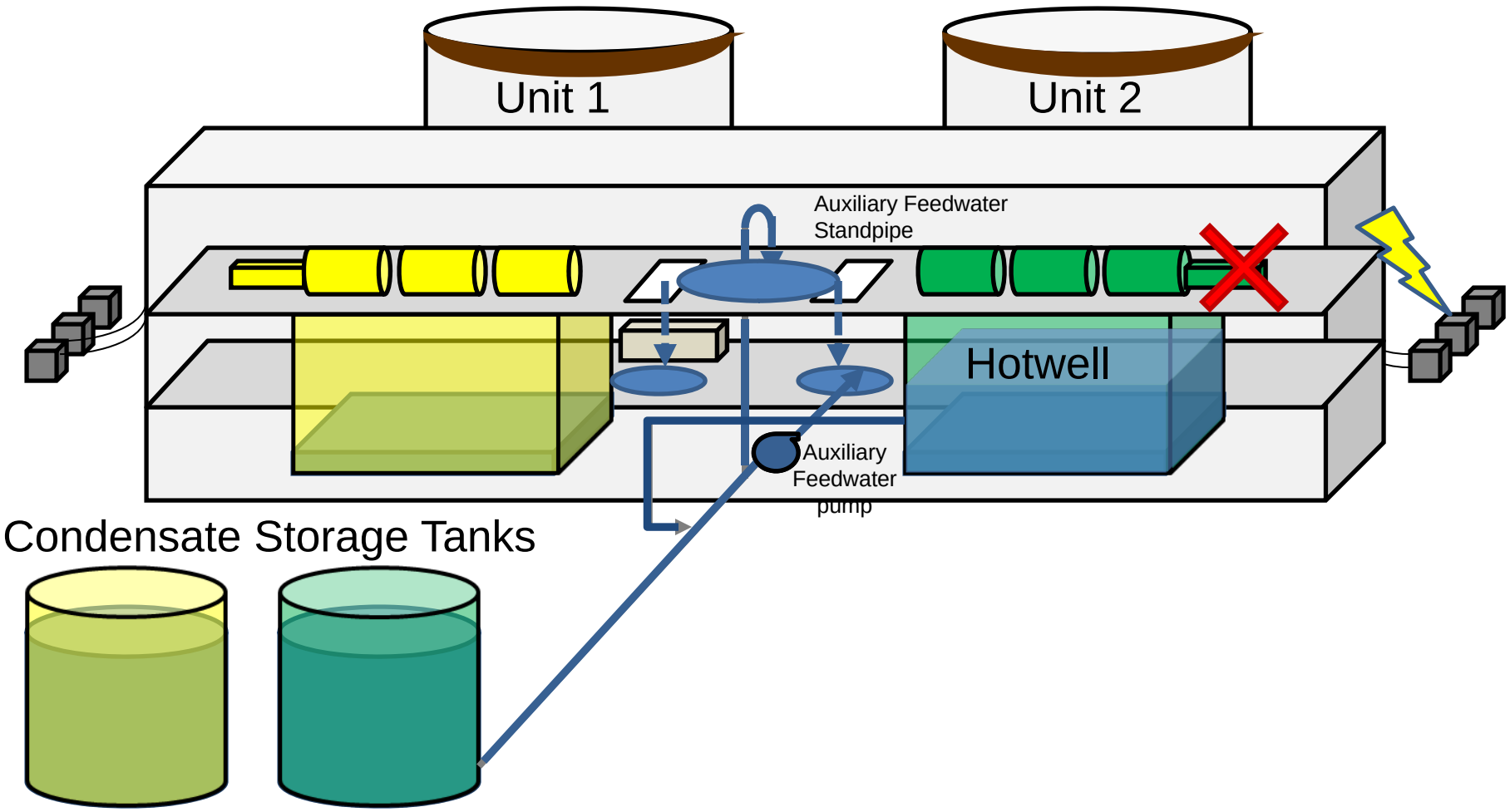
Auxiliary Feedwater pumps began injecting into the Steam Generators following the Unit 2 reactor trip, as designed



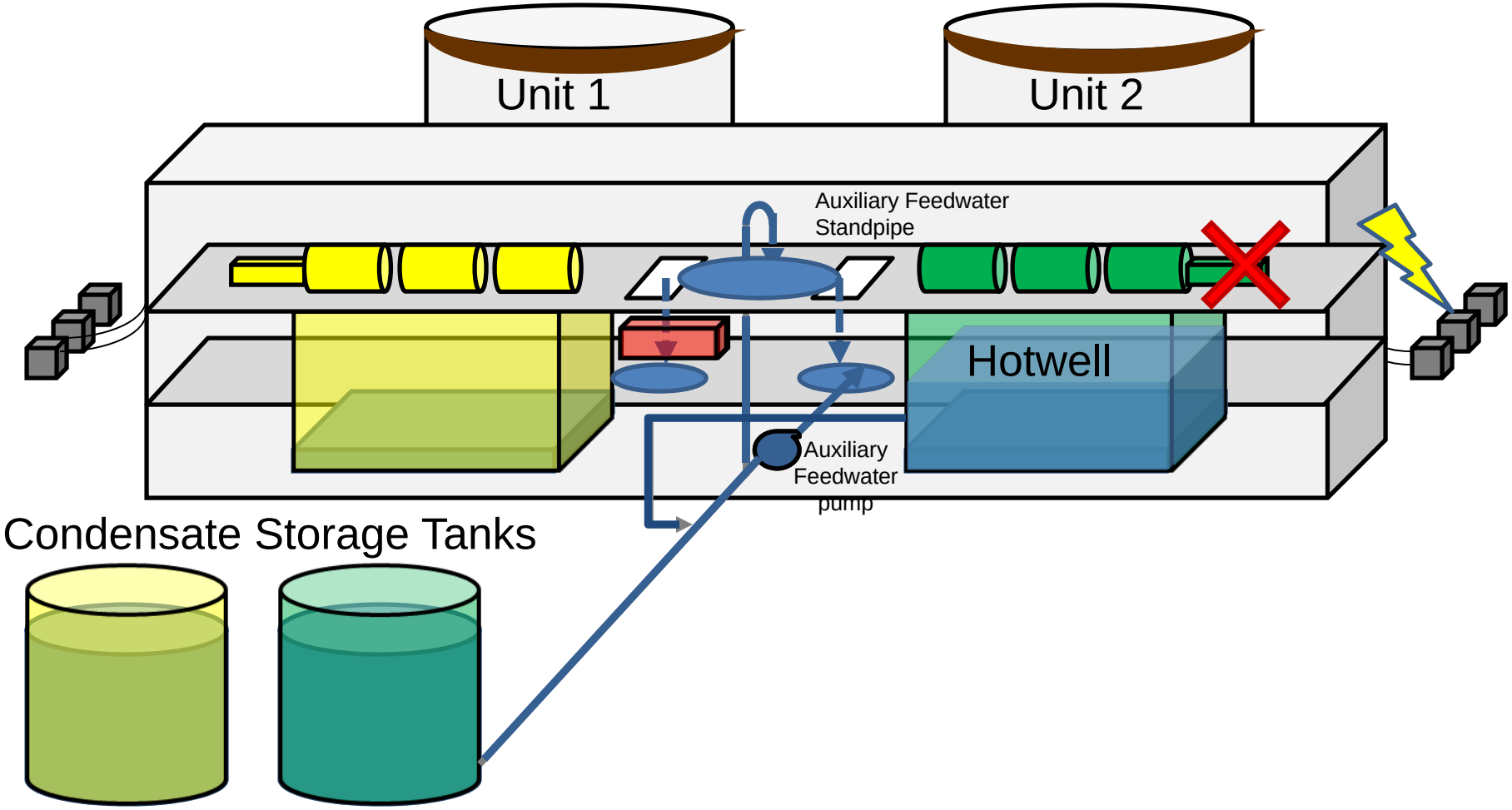
Water in the auxiliary feedwater header standpipe discharged onto the turbine deck



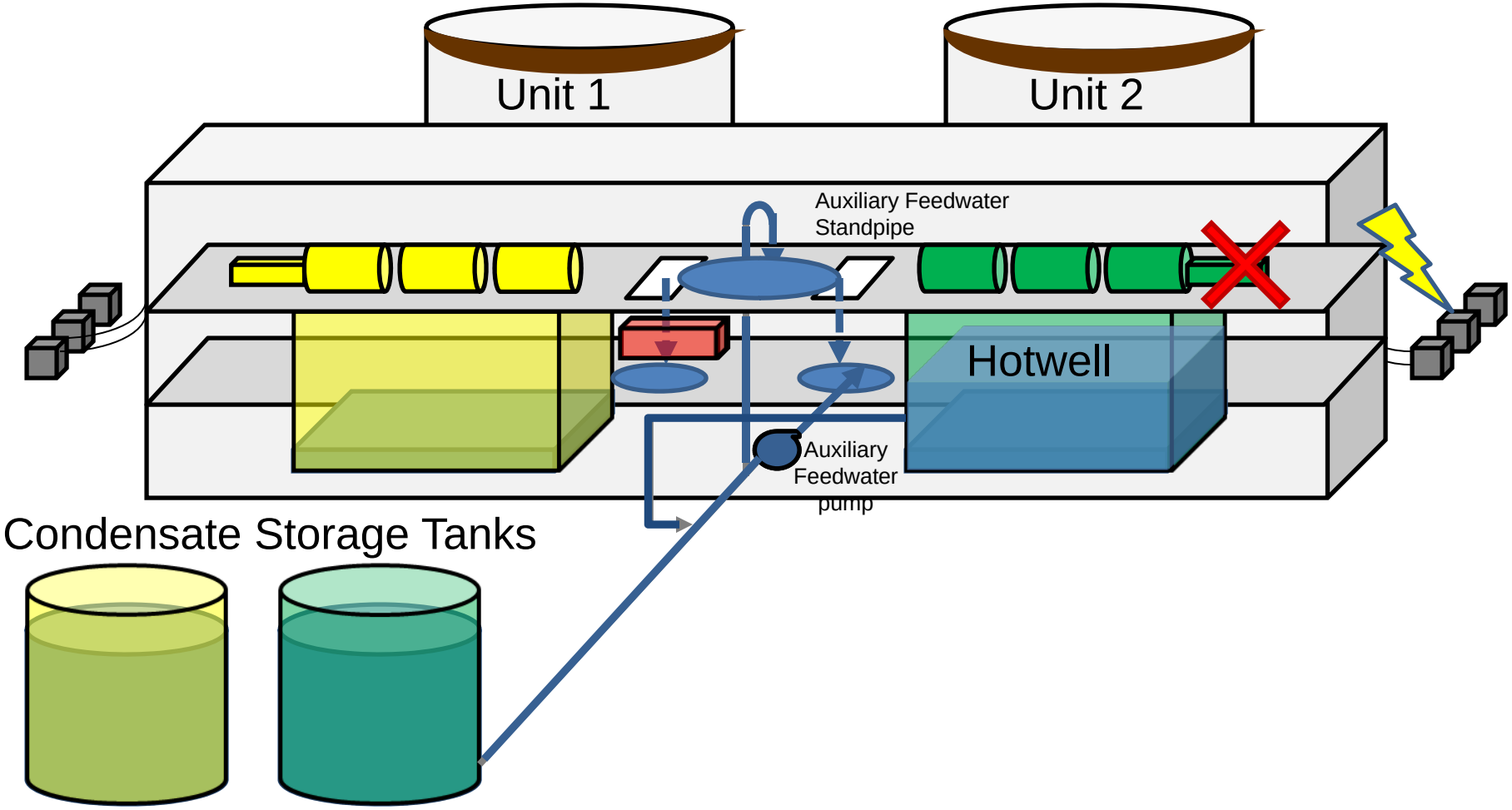
Water spilled to lower levels in the turbine building through various openings



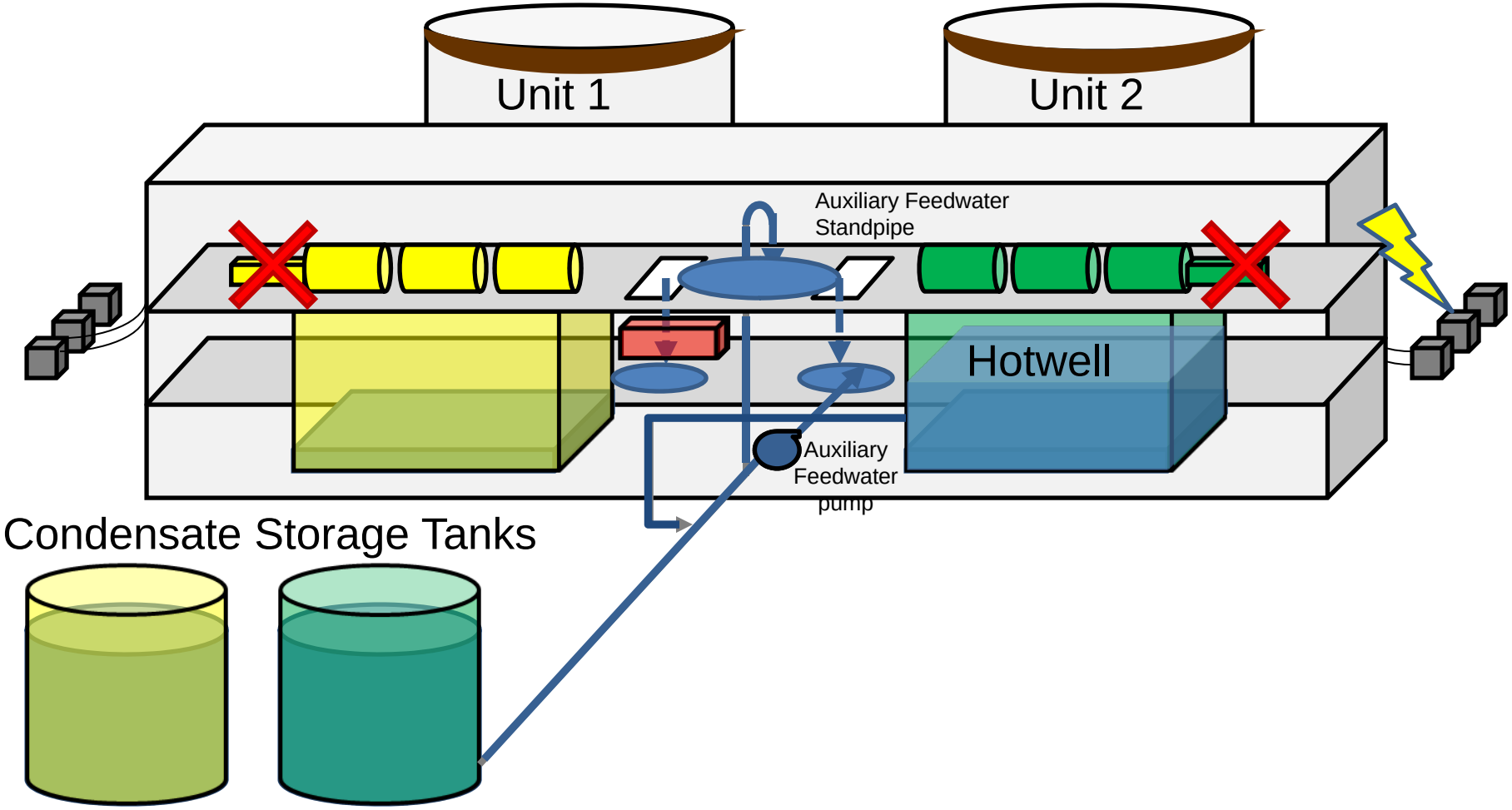
The water entered a non safety-related electrical cabinet that contained Unit 1 circulating water pump electrical circuits



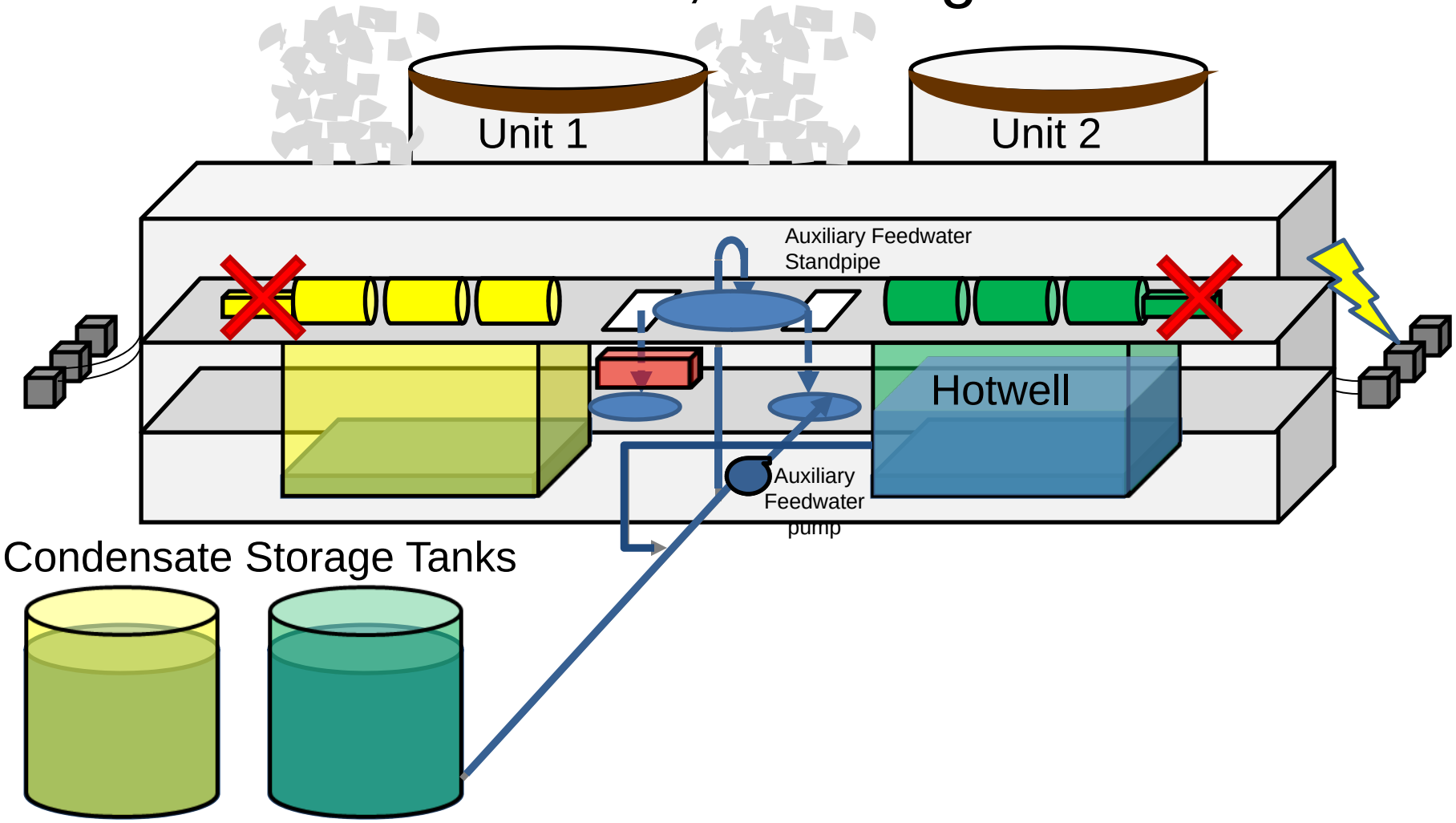
Circulating water pump circuits in the cabinet were damaged and caused 2 of the 3 Unit 1 circulating water pumps to trip off



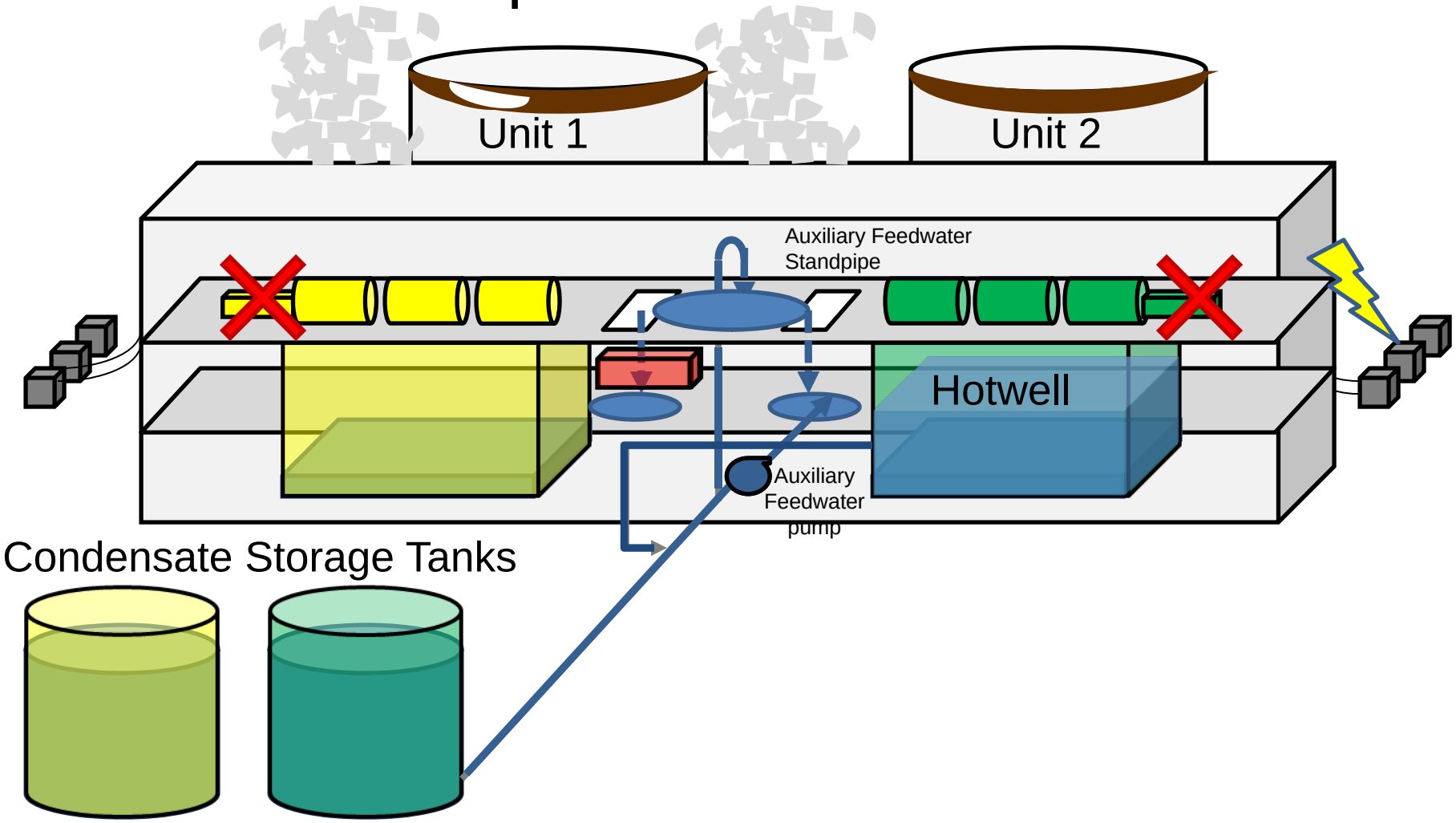
The loss of 2 circulating water pumps resulted in a loss of condenser vacuum, which caused the Unit 1 reactor to trip



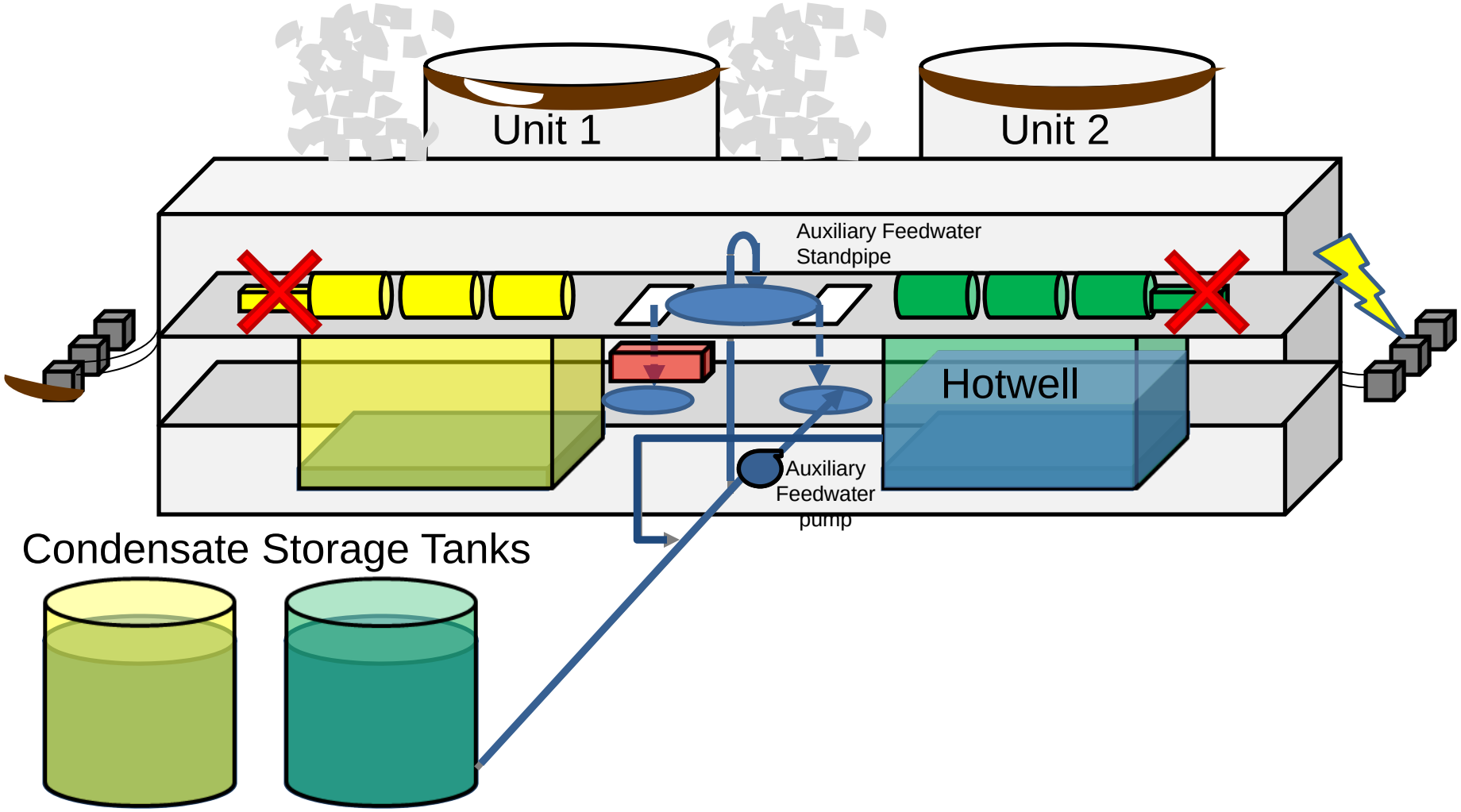
The condenser could not be used for decay heat removal, so main steam relief valves were used, as designed



Steam from the safety valves knocked off flashing covering an outdoor walkway at the top of containment



The dislodged flashing landed near the Unit 1 offsite power transformers but did not have an adverse affect



NRC Special Inspection Scope & Results

John Jandovitz
SIT Lead Inspector

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NRC Inspection Focus Areas

- Evaluate Exelon's performance during the event.
- Review component and equipment failures.
- Assess the amount of tritium in the steam release.

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Major SIT Activities

- Identify timeline of event
- Review Exelon's post-trip reports, confirm the adequacy of your assessment, planned corrective actions and restart readiness.
- Assess operator actions.
- Review the circumstances of the Unit 1 reactor building flashing that fell off during the relief valves steam release.
- Review the licensee's dose calculations for the release of tritiated steam.

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Major SIT Activities

- Review the circumstances surrounding equipment problems including:
  - Unit 2 main generator lockout relay actuation;
  - Water intrusion into motor control center 133V;
  - Unit 2 auxiliary feedwater flow control valve failed open;
  - Unit 1 main steam safety relief valve that remained opened following the reactor trip;
  - Unit 1 ‘C’ condensate booster pump seal failure;
  - Unit 1 essential service water high differential pressure condition; and
  - Unit 1 blown fuses on MCC 131X1A .

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Major SIT Activities

- Review the circumstances surrounding the water discharged to the turbine building floor from the Unit 2 auxiliary feedwater header standpipe including:
  - Measures used to control the water when it is spilled onto the floor;
  - Any historical issues with water discharged from this and the Unit 1 standpipe; and
  - Assess the adequacy of the auxiliary feedwater header standpipe design.

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Results of Special Inspection

- 4 preliminary Findings of very low safety significance.
  - 2 of the 4 have an associated Non-Cited Violation (NCV).
- 1 Licensee-Identified Violation.

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Finding – Procedure to Inspect and Clean the Service Water Intake Structure (forbays)

- Exelon procedures failed to establish adequate criteria to inspect and clean the service water intake structure.
- Service water header pressure was at its operability limit during this event.
- Procedure would have allowed additional time and foreign material before next cleaning.
- Intake structures were cleaned.

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Finding – Procedure to Inspect and Clean the Service Water Intake Structure

- Potential Violation of 10 CFR Part 50, Appendix B, Criterion V - failure of plant procedures to contain adequate criteria for service water intake structure inspect-and-clean activities to ensure that supported systems will be capable of performing their safety function.
- The Finding is of very low safety significance (Green).
- Cross-Cutting aspect: Human Performance, Decision-Making, Systematic Process (H.1(a)).

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Finding – MCC 131X1A Fuses

- Engineering identified in 2007 that fuses in this motor control center were undersized or of low margin and needed to be replaced with higher amperage fuses.
- Fuses failed in 2009 but were replaced with similar fuses.
- Fuses failed again in 2010 during this event.
- Higher amperage fuses were installed.

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Finding – MCC 131X1A Fuses

- Potential Violation of 10 CFR Part 50, Appendix B, Criterion XVI - failure to correct undersized or low margin fuses for MCC 131 X1A.
- Finding of very low safety significance (Green).
- Cross-Cutting aspect: Human Performance, Resources – Long Term Plant Safety (H.2(a)).

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Finding – Auxiliary Feedwater (AFW) suction header standpipe

- During certain plant operations, this system design allows water to be discharged to the turbine building floor where it flowed to lower elevations.
- It became an expected condition during unit trips and therefore not entered into the corrective action system when it happened.
- Hence, there was no evaluation of the impact of the discharged water to the plant.
- Resulted in a trip of Unit 1.
- Automatic condensate reject changed to manual.

AFW suction header stand-pipes

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Finding – AFW suction header standpipe

- Potential finding - failure to follow corrective action program procedure to identify, evaluate and correct a condition that adversely affected safe plant operations.
- Finding of very low safety significance (Green).
- Cross-Cutting aspect: Problem Identification & Resolution, Corrective Action Program – Low Threshold (P.1(a)).

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Finding – Reactor Building Flashing

- Reactor building flashing blown off during steam release and landed on and in the area of the offsite power equipment.
- In 2007, Exelon reviewed experience from another site where siding blown off by a steam release and caused a loss of offsite power.
- The evaluation of that event was inadequate since it did not address previous Braidwood flashing failures and vulnerability of offsite power from debris.
- Flashing has been restrained until permanent solution developed.

Finding – Reactor Building Flashing

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Finding – Reactor Building Flashing

- Proposed Finding - failure to adequately evaluate operating experience in accordance with plant procedures for effects of reactor building flashing falling on offsite power equipment.
- Finding of very low safety significance (Green).
- Cross-Cutting aspect: No cross-cutting aspect was identified since it is not considered to reflect current performance.

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Potential Licensee Identified Violation of TS 3.3.9 – Boron Dilution Protection System

- The licensee found they failed to enter LCO 3.3.9, “Boron Dilution Protection System” within the Tech Spec Action Statement.

- Once identified, licensee took immediate actions to correct.

Conclusions

Richard Skokowski

Exelon Comments

Closing Remarks

Gary Shear

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Closing Remarks

- The NRC promptly conducted an extensive and inspection to ensure that Exelon identified problems prior to re-start of both units.
- Plant safety was not compromised.
- The steam released from the plant contained a very small amount of tritium. It posed no threat to public health and represented a fraction of NRC's radiation air release limits for the plant.

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Closing Remarks (cont.)

- The SIT identified four findings of very low significance to plant safety.

- The NRC will continue to monitor the performance of the Braidwood plant through our inspection program implemented by two resident inspectors who work at the plant every day and specialists in Region III and NRC Headquarters Office.

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Public Questions & Comments

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Questions/Comments

Contact the NRC Region III Office of Public Affairs, 630-829-9500

- Viktoria Mitlyng
- Prema Chandrathil