



USNRC Operating Experience Process:

Regulatory Application of Insights from Key Events

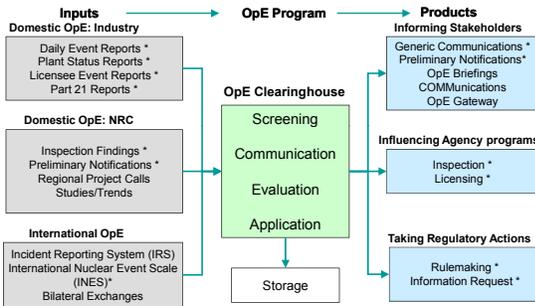
March 2011 Regulatory Information Conference

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Reactor OpE Overview



* = Publicly Available Information

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H. B. Robinson – Reactor Scram, Safety Injection, and Alert Declaration Due to Complications from Fire

Summary

- H.B. Robinson Steam Electric Plant is a 710 MW (2339 MWt) three loop Westinghouse Pressurized Water Reactor in Hartsville, SC.
- On March 28, 2010 an automatic reactor trip from full power occurred with a Safety Injection, loss of a Reactor Coolant Pump, EDG automatic start, and grounds on both "A" and "B" DC trains as a result of electrical faults and subsequent fires on a non-safety related 4 kV bus.





Equipment Issues with Robinson Event

- Failure of non-safety related 4 kV cable
- Failure of breaker to open to isolate fault
- Uncontrolled cooldown resulting in safety injection due to loss of non-vital buses
- Isolation of CCW to RCP thermal barrier heat exchanger
- Failure of VCT level inst. to swap charging pump suction to RWST on low level
- Grounds on both DC buses

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Root Causes

- 4 kV cable installed in 1986 did not meet system specification requirements
- Control power to feeder bkr unavailable for ~ 17 months – condition not recognized
- Simulator training simulated worst case scenario but did not include the more likely trip from full power – operators didn't recognize that cooldown was abnormal for given conditions

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Root Causes (cont.)

- Simulator did not reflect CCW isolation on loss of power to bus
- EOPs did not direct verification of RCP seal cooling
- Condition of electric plant not verified before attempting normal restoration – resulted in re-energizing fault causing 2nd fire and grounds on DC buses

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NRC Actions

- Reactive Inspection (SIT) initiated and upgraded to AIT
- OpE process review & actions
- IN 2010-09 issued to highlight cause of circuit breaker failure
- INES Level 2 rating posted
- IN 2010-09 and Preliminary Notification of Event at Robinson posted to IAEA operating experience website

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NRC Actions (cont)

- OpESS 2010-02 issued as guide for inspectors reviewing simulator training
- AIT Report identified 14 potential issues which were finalized in 2 White Findings and 5 Green Findings
- When considered with subsequent issues, results placed Robinson in the Degraded Cornerstone column of the Action Matrix

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Use of International OpE

- International Operating Experience reviewed and evaluated to the same criteria as domestic OpE
- Primary considerations are safety significance and generic applicability to U.S. reactors
- Sources of international OpE include INES, IRS, and communication with international counterparts

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NRC Response to 2006 Forsmark 1 Loss of Safety-Related Electrical Power

- Grid transient and unanalyzed common cause failure of UPS inverters resulted in LOOP and loss of 2 of 4 trains of Emergency AC
- Remaining 2 trains of Emergency AC were vulnerable to the same failure mode
- INES Level 2
- IN 2006-18 issued within one month

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Forsmark 1 – Loss of Safety-Related Electrical Power

- Internal OpE Summary
- Issue for Resolution
- Multiple management briefings
- IN 2006-18 supplement 1 issued a year later when more information was known
- Participation in int'l DIDEISYS task group
- Input to OECD/NEA paper on response

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Use of International OpE

- During 2010, 7 of 23 reactor-related Information Notices made use of international operating experience
- Issues included:
 - construction experience with cable installation,
 - ventilation system design issues, and
 - the potential for common cause failure of variable frequency recirculation pumps

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Conclusion

- International sharing of operating experience is a two-way street
- The rest of the world benefits from the ability to review causes and lessons-learned from significant U.S. events
- International events can have implications for safety at U.S. reactors so we pay attention to this operating experience
- Generic Communications – Use this valuable source of OpE – to prevent events

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Questions & Comments

Please visit us at www.nrc.gov

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BACKGROUND SLIDES

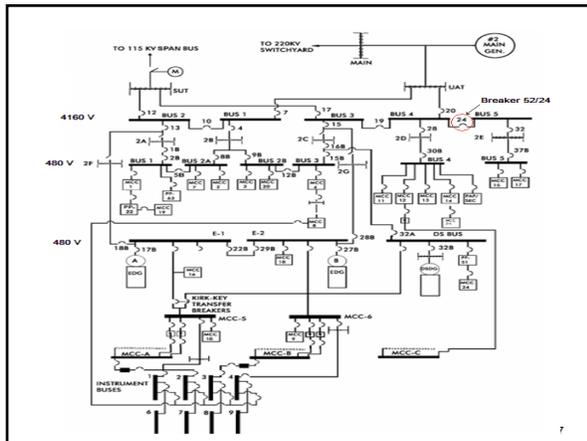
ADDITIONAL INFO FOR Q&A

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BACKGROUND ON ASP EVALUATION OF ROBINSON EVENT OF MARCH 28

- Accident Sequence Precursor (ASP) program provides basis for safety performance measure of ZERO significant precursors of a nuclear reactor accident
- Signif Precursor → Event w CCDDP/ Δ CCDDP \geq 1E-3
- No Significant Precursors identified in 2010, but...
- New information received Dec 2010 on Robinson Event indicated the event may be a potential significant precursor
- Office of Research staff analysis continues to analyze the event for a final determination.





INES Ratings

