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Safety/Relief Valve Failure Mechanism

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Topics

1. Farley Pressurizer Safety Valve Failure
2. Operating Experience
3. NRC Staff Monitoring
4. Conclusion

Farley PSV Failure

- On September 28, 2023 (ADAMS # ML23271A132), Southern Nuclear submitted LER 2023-001 to report a test failure of Pressurizer Safety Valve 2A at Farley Unit 2.
- 2A PSV Crosby HB-86-BP safety valve was installed during 2R27 in fall 2020.
- On July 8, 2022, 2A PSV began leaking with elevated tailpipe temperatures and PRT parameters.
- Licensee monitored 2A PSV leakage during operating cycle.
- On June 14, 2023, Farley Unit 2 entered Mode 5 to conduct maintenance on 2A PSV.

Farley PSV Failure
(continued)

- On June 16, 2023, 2A PSV was removed and sent to vendor for TS 3.4.10 testing.
- On August 1, 2023, vendor reported that 2A PSV failed to lift during as-found testing.
- Vendor used in-situ device with 2A PSV lifting at about 2599 psig which is outside the acceptance criteria (2423 – 2510 psig).
- Vendor found leakage past the valve seat during testing.
- Licensee reported that the cause of 2A PSV failure to lift was excessive steam cutting of valve disc insert and nozzle.

Operating Experience

- At time of Farley PSV test failure, steam cutting was not commonly known as a failure mechanism for safety or relief valves failing to open.
- Searches by NRC staff and Farley licensee found only limited information on this failure mechanism.
- Hope Creek LER 2018-002-01 (ADAMS # ML18276A022) reported steam cutting found on pilot disc and valve seat for Target Rock Model 7567F two-stage SRV that lifted above acceptance band.
- Farley Unit 2 LER 2023-003 (ADAMS # ML23341A209) reported 2C PSV failed high with cause considered to be setpoint drift.

NRC Staff Monitoring

- As a result of the Farley 2A PSV test failure, the NRC staff has learned that safety and relief valve leakage can cause steam cutting of internal parts that might result in the valve lifting outside its acceptance band or fail to lift.
- NRC staff is monitoring operating experience for this failure mechanism of safety and relief valves.
- NRC staff will take additional actions if warranted.
- On February 7, 2024, NRC staff discussed the steam cutting issue affecting safety and relief valve performance with INPO.

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Conclusion

- Operating experience has revealed that seat leakage from safety and relief valves can cause steam cutting of internal valve parts.
- This failure mechanism that can cause safety and relief valves to lift high or fail to open is a potential safety concern.
- Licensees should be aware of the consequences of long-term seat leakage on the performance of safety and relief valves.
- NRC staff will continue to monitor operating experience and industry activities related to this failure mechanism for safety and relief valves.

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QUESTIONS?

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Acronyms

- ADAMS: Agencywide Documents Access and Management System
- ASME: American Society of Mechanical Engineers
- INPO: Institute of Nuclear Power Operations
- LER: Licensee Event Report
- NRC: U.S. Nuclear Regulatory Commission
- OE: Operating Experience
- PRT: Pressurizer Relief Tank
- PSIG: pounds per square inch gage
- PSV: Pressurizer Safety Valve
- ROP: Reactor Oversight Process
- SRV: Safety Relief Valve
- TS: Technical Specification
- WANO: World Association of Nuclear Operators