NRC Staff Presentation

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Safety Significant Check Valves

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Safety Significant Check Valves

- Check valves are used in numerous safety applications in nuclear power plants.
- Many check valves were installed when the nuclear power plant was constructed and can be over 40 years old.
- Probabilistic risk assessments (PRAs) for nuclear power plants might not model all check valves in their evaluations of plant risk.
- Where included in risk evaluations, the check valve failure rates might be based on valves that have not experienced many years of aging.
- Potential common cause failure of entire safety systems by the failure of a single check valve might not be fully addressed by quantitative and qualitative safety studies for nuclear power plants.

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Check Valve Failure Examples

- IN 81-35, “Check Valve Failures”
- IN 82-08, “Check Valve Failures on Diesel Generator Engine Cooling System”
- IN 82-20, “Check Valve Problems”
- Bulletin 83-03, “Check Valve Failures in Raw Water Cooling Systems of Diesel Generators”
- IN 86-01, “Failure of Main Feedwater Check Valves Causes Loss of Feedwater System Integrity and Water-Hammer Damage”
- IN 88-70, “Check Valve Inservice Testing Program Deficiencies”

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Additional Check Valve Failure Examples

- NUREG-1352 (1990), “Action Plans for Motor-Operated Valves and Check Valves”
- IN 2000-21, “Detached Check Valve Disc Not Detected by Use of Acoustic and Magnetic Nonintrusive Test Techniques”
- NRC Inspection Report 05000281/202004, December 30, 2020, (ML20365A007) describing check valve failure causing loss of Auxiliary Feedwater System.
- Industry has issued numerous studies of check valve failures.

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Guidance for Safety Significant Check Valves

- ASME OM Code requires quarterly exercising of check valves in the IST Program where practicable.
- ASME OM Code, Appendix II, allows implementation of a condition monitoring program with general provisions.
- ASME guidance for acceptable intrusive and non-intrusive methods for monitoring internal check valve wear could be used to update the ASME OM Code requirements to avoid adverse impacts from check valve failures.

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Guidance for Safety Significant Check Valves

- An ASME OM initiative to address high risk check valves was recently abandoned in part due to licensees' inability to identify that population of valves in question.
- The NRC staff believes a review of plant drawings can identify those valves where failure would challenge defense in depth (e.g., cause a loss of function of multiple trains)
- ASME guidance for acceptable intrusive and non-intrusive methods for monitoring internal check valve wear could be used to update the ASME OM Code requirements to avoid adverse impacts from check valve failures.

QUESTIONS?