



U.S. NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Public Meeting
Safety Evaluation of EPRI Technical
Report on Valve Susceptibility to
Stem-to-Disk Separation

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January 21, 2022



Background

- ASME OM Code ISTC-3700 requires valves with remote position indication to be exercised and verified that valve operation is accurately indicated once every 2 years.
- 10 CFR 50.55a(b)(3)(xi) requires when exercising the valve to meet ISTC-3700 in ASME OM Code (2012 Edition) that valve operation is supplemented with other positive indications (for example, changes in temperature, flow, etc.)
- ASME OM Code Case OMN-28 allows valves that have been determined to be not susceptible to stem-to-disk separation to have their 2-year ISTC-3700 test interval extended to a 12-year interval.



EPRI Technical Report (TR) 3002019621 Susceptibility of Valve Applications to Failure of the Stem-to-Disk Connection

- EPRI reviewed 43 years of operating experience (OE) valve failures, and identified 226 stem-to-disk failures.
- 10 common stem-to-disk designs were identified.
- Several methods to obtain direct indication of proper valve operation were presented.
- Several lessons learned were reported that can reduce the number of valve failures.
- Failure rate of 5.3 per year was based on safety and non-safety-related valves.



NRC Safety Evaluation (SE) for EPRI TR 3002019621

- NRC SE presents historical background on development of ASME OM Code. Highlights include:
 - ASME BPV Code, Section XI, 1973 Summer Addenda, added test requirements for valves.
 - Definition of valve exercising - Exercising is the demonstration based on direct or indirect visual or other positive indication that the moving parts of a valve function satisfactorily.
 - Exercise Test - The necessary valve stem or disk movement shall be established by exercising the valve while observing either an appropriate indicator which signals the required change of valve stem or disk position, or indirect evidence, such as changes in system pressure, flowrate or temperature which reflect stem or disk position.



NRC Safety Evaluation (SE) of EPRI TR 3002019621 (cont'd)

- NRC staff completed informal search of INPO IRIS database and found 65 additional valve failures.
- NRC staff believes that the failure rate is much higher based on the following:
 - INPO reporting rules changing through the years
 - Some failures captured in attached documents and may be missed by key word search
 - Not all non-safety-related valve failures entered into database
 - Valves found failed during routine scheduled preventive maintenance (PM) might not be entered into INPO system
 - NRC staff search of INPO database was limited. More failures might be found with other key word searches.



NRC SE Review Sample Conditions

- Each valve that has been determined to be not susceptible to stem-to-disk separation must have a documented engineering evaluation and justification entered into the applicable IST Program Plan.
- For those valve designs that rely on a weld to secure the stem-to-disk connection and operate under high system vibration conditions, additional justification for relying on the welded connection must be prepared, when applicable.
- Certain valve types may need evaluation and documenting of lessons learned from past OE concerning system conditions (such as vibration and valve operation), with justification of PM measures, such as disassembly, inspection, and refurbishment, when appropriate.



NRC SE of EPRI TR 3002019621 Summary

- EPRI TR 3002019621 represents a comprehensive study of the failure rate of various valve designs in operating nuclear power plants over 43 years.
- The study provides many lessons learned and recommends actions to preclude future valve failures.
- NRC staff finds the use of EPRI TR 3002019621, with the conditions discussed in the SE, to be acceptable as part of the implementation of ASME OM Code Case OMN-28.



Questions?