Exelon BWR Fleet MSSV/SRV

Testing Frequency Relief Request

NRC Pre-Application Meeting
June 4, 2019

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Introductions
Purpose and Agenda

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Attendees

Craig Shinafelt – Fleet Program Engineer	Exelon
Philip Twaddle – SRV Subject Matter Expert	Exelon
David Neff – Principal Regulatory Engineer	Exelon
William Reynolds – Engineering Manager	Exelon
Mark DiRado – Senior Engineering Manager	Exelon
Thomas Basso - Director Engineering	Exelon
Bret Collier – Engineering Consultant	RC Engineering

Purpose

Brief the NRC on proposed Inservice Testing Relief Requests by covering the following:

- Extension of test intervals for Group-of-One SRV/MSSVs from 24 months to 48 months, based upon past performance.
- Extension of test intervals for certain population of OMN-17 SRV/MSSVs to 8 years, based upon past performance.
- Exelon's Best Practices for SRV/MSSVs Maintenance and Inspections, Testing, and Trending
- The Process used to forecast SRV/MSSV setpoint drift, based upon past performance.
- Benefits to minimizing dose exposure and maximizing system integrity.

Agenda

- Current Class 1 Relief Valve Frequency Requirements - Craig Shinafelt
- Current Exelon BWR SRV/MSSV Testing Frequency Requirements - Craig Shinafelt
- Best Practices - Philip Twaddle
- The Process - Craig Shinafelt
- Relief Request Impacts - Craig Shinafelt
- Relief Request Duration - Craig Shinafelt
- Relief Request Submittal – David Neff

Current Class 1 Relief Valve Frequency Requirements

The testing frequencies for ASME Class 1 Main Steam Safety Valves (MSSV) and Class 1 Safety Relief Valves (SRV) are established in section I-1320 of Appendix I, of the ASME OM Code, which is incorporated by reference in 10CFR50.55a.

The ASME OM Code requires every Class 1 SRVs to be tested every 5 years with at least 20% of the valves in each “group” (preferably untested within the previously 5 years), tested every 24 months.

Current Class 1 Relief Valve Frequency Requirements

As an alternative to the ASME OM Code, Mandatory Appendix I requirements, ASME Code Case OMN-17 was developed which allows utilities to extend the Code required 5 year test interval to 6 years, provided the Owner Disassembles and Inspects (D&I) each valve following As-Found testing to verify that parts are free from defects resulting from time-related degradation or service-induced wear.

Current Exelon SRV/MSSV Testing Frequency Reqmts

This presentation discusses the testing requirements of the over-pressurization protection devices used at 6 of Exelon's BWR sites. At these 6 BWR sites, which contain 10 individual units, a variety of ASME Class 1 Pressure Relief Devices are utilized to provide over-pressure protection of their Main Steam Piping. The number of Pressure Relief Devices per unit vary as does the manufacture/style of each Pressure Relief Device.

All sites requesting relief, except one, utilize Code Case OMN-17 for their current IST 10-year intervals.

Best Practices

Four Pillars of Exelon SRV/MSSVs Best Practices

1) Spring Testing – includes physical dimension measurements and compression rate evaluation.
2) SRV/MSSVs Lapping Techniques and Tools.
3) SRV/MSSVs Set Pressure Adjustment Methodology Precision.
4) Target Rock SRV/MSSVs Average Delay Time Trending Performance Improvement.

Best Practices

As-Found Variation Reduced 34%

Exelon SRV Best Practices have reduced as-found set point drift and set point variation by 34% over the past 10 years when compared to the 8-year pre-Best Practices period of historical performance at one of our sites.

- Lapping improvements reduced variation 7%.
- Springs and set pressure methodology improvements reduced variation by 27%.

The Process

Having seen an increase in the reliability of our valves over the years as a result of Exelon's applied Best Practices, an independent analysis was performed to determine whether valve performance improved to a level that would support an increased test interval.

Keeping in mind that, typically, when utilities request the use of OMN-17, they simply include a statement in their Relief Request attesting to how, over the past few refueling outages, few if any SRV have failed to maintain their set pressure within their required tolerances.

In this case, Exelon has taken it a step further. . . .

The Process

Exelon has gone back 5 or more cycles, identified the actual As-Left set pressure as well as the As-Found set pressure, incorporated these values and dates into spreadsheets which not only calculates the valves "drift" but projects, through a simple linear extrapolation, when that valve could fall outside of its set pressure tolerance.

The next slide provides one example of a spreadsheet calculation.

The Process

Below is an example of one such calculation for set point drift projections, which shows the drift at -1.0, -5.5 and -8.8 psig for years 1, 5 and 8 respectively based on the measured As-Left, As-Found measured set pressures and time between test.

Dikkers Model G-471													
Serial #													
						As Left		As Found	Time Between Test			Drift	
160535		As Left/Found Date				7/18/2001		2/7/2006	1665	days		-5	psig per cycle
		As Left/Found Pressure				1164		1159	4.56	years		-0.003003	psig per day
		Comp ID										-1.096096	psig per year
		Name Plate Pressure				1165		1165				-5.48048	psig over 5 yr
												-6.576577	psig over 6 yr
								3% of set pressure=	34.95	psig		-8.768769	psig over 8 yr
					This valve would have failed after				30.97356	years		C1R10	

Based upon a +/- 3.0% set point tolerance, this valve is not expected to fall outside of tolerance until after 30.9 years.

The Process

Once the spreadsheet has calculated the drifts for each serial numbered valve over the period of interest, the results are condensed into a table, by refueling outage.

The Pass/Fail column indicates whether the valve was shown to be able to maintain its set point tolerance for greater than 8 years.

	Pass/Fail		Pass/Fail
P2R16	3/0	P3R16	
P2R17		P3R17	
P2R18		P3R18	3/3
P2R19	3/5	P3R19	4/2
P2R20	4/0	P3R20	3/0
P2R21	4/0	P3R21	5/0

In the example above, it shows that based upon the drift calculation, over the past two refueling outages all of the valves would have been able to maintain their set pressure tolerance for more than 8 years.

The Process

This same process was also utilized when considering the proposed Relief Request dealing with valves in a "Group-of-One", specifically those sole Target Rock 3-Stage Safety Relief Valves utilized in two of Exelon's BWR sites.

- At the first site, calculations have identified that every valve installed since 2012, would have been able to maintain its set pressure tolerance for greater than (4) years.
- At the second site, calculations have identified that every valve installed since 2011, would have been able to maintain its set pressure tolerance for greater than (4) years.

Relief Request Impacts

Potential dose savings are calculated based upon individual station historical dose calculations. Saving at a station range from 1.31 rem to 6.5 rem over a 10-year period.

In addition to the dose savings, a reduction in the number of valves that are required to be tested during each outage will:

- Reduce Industrial Safety Concerns (Fewer heavy lifts)
- Reduced System Breaches (Fewer FME zones)
- Reduced number of activities with potential for spreading radioactive contamination
- No impact to PRA risk as a result of increased service time

Relief Request Duration

Exelon plans to request that these Relief Request be approved for the remaining licensed life of the plant.

Saves both time and effort for the Utility and Regulator by removing redundant future reviews and approvals.

Relief Request Submittal

Submittal to include 5 site specific Relief Requests to extend the testing interval from its current 5/6 year frequency to 8 years.

Submittal to include a combined, multi-unit, Relief Request to extend testing interval for Class 1 SRVs in a Group-of-One from the current ASME OM Mandatory Appendix I, 24 month frequency to a 48 month frequency.

Submittal are planned for early July 2019.

Questions?

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