

BWR MSIV Leakage Optimization

NRC Pre-Submittal Meeting
December 6, 2018



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Agenda

- Introductions
- Meeting Objectives
- Project Purpose / Background Information
- Scope of Technical Specification Changes
 - MSIV Leak Rate Changes (All)
 - TSTF-551 (Quad Cities, Dresden)
 - Bypass Leakage (Nine Mile Point 2)
 - Leakage Collection System (FitzPatrick)
- Detailed Review of Proposed LAR Submittals
 - Quad Cities and Dresden
 - Nine Mile Point Unit 2
 - Fitzpatrick
- Overview of Licensing Schedule and Outage Needs
- Summary and Wrap-up

Introductions

Project Manager

John Massari

Project Technical Lead

Shane Gardner

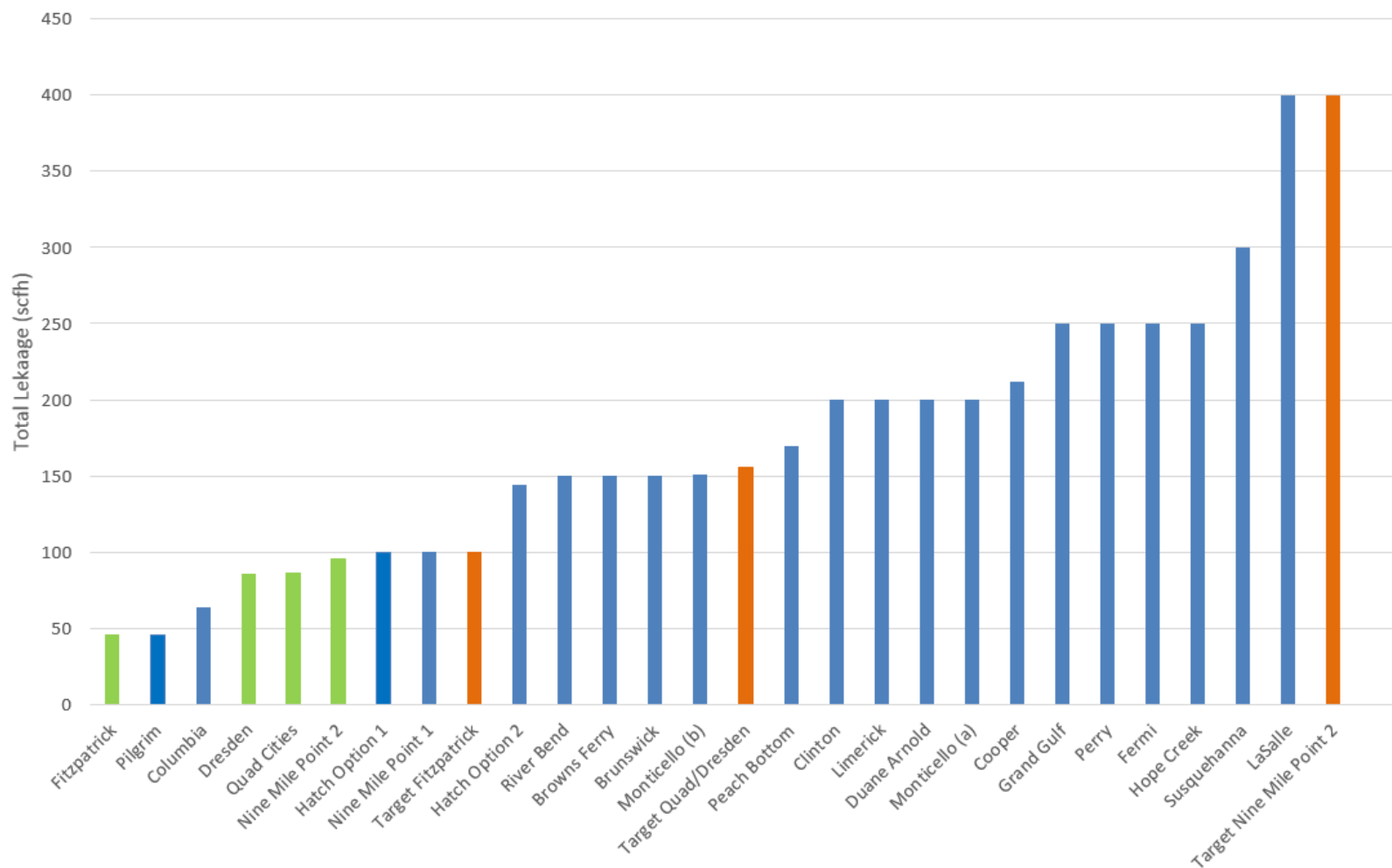
| Site | Licensing Lead | Technical Lead |
|-------------------|--------------------|--|
| Quad Cities | Rebecca Steinman | Jason Hawman Chong Zhou (drawdown analysis) |
| Dresden | Mitch Mathews | Dan Lee |
| Nine Mile Point 2 | Ron Reynolds | Tom McMahon |
| FitzPatrick | Christian Williams | Katherine Leaveck |

Meeting Objectives

- Present information to NRC to enable a clear understanding of the overall project and proposed site-specific License Amendment Request (LAR) submittals
 - QC/DRE – allowable main steam isolation valve (MSIV) leakage rate increase and partially adopt TSTF-551
 - NMP2 – allowable MSIV leakage rate increase and provision for increased Core Average Exposure (CAVEX)
 - JAF – Full Alternate Source Term (AST) implementation, allowable MSIV leakage rate increase, Main Steam Leakage Collection System (MSLCS) elimination, and provision for increased CAVEX
- Obtain feedback from the NRC on the proposed LARs to ensure high quality submittals and minimize the need for future RAs
- Mutual understanding of the proposed schedule and corresponding outage need date in order to ensure adequate NRC resource availability

2017 Benchmark of U.S. Fleet

MSIV TS Leak Rate at Required Test Pressure



Project Purpose / Background Information

Optimize AST LOCA analyses to increase MSIV local leak rate testing (LLRT) limits

- Revise fleet Control Room and Offsite dose analyses to incorporate revised methods and assumptions to create margin that allows for larger bypass leakage through the MSIVs
 - Reduce outage dose and increase safety due to reducing working in challenging conditions
 - Reduce number of reportable events from MSIV LLRTs due to crediting AST revised licensing basis
 - Provide outage cost savings due to having fewer MSIV LLRT failures and resulting rebuilds
- Plants already utilizing AST will continue to follow AST as specified in Regulatory Guide (RG) 1.183, as supplemented by Regulatory Issue Summary (RIS) 2006-04
- Fitzpatrick needs to incorporate a full implementation of RG 1.183, AST, as part of this project

Project Purpose / Background Information (cont'd)

- Partial adoption of TSTF-551 at Quad Cities and Dresden will eliminate unnecessary reporting under 10 CFR 50.72 and 10 CFR 50.73 of brief periods when secondary containment Surveillance Requirement (SR) pressure is not met, but the safety function is maintained
 - SR 3.6.4.1.3 revision in TSTF-551 already adopted at both sites
- Elimination of MSLCS from the FitzPatrick Technical Specifications (TS) will reduce maintenance costs and simplify the design basis dose analysis by conservatively treating MSIV leakage as ground-level release
- License Amendment Request is required for:
 - TS changes
 - Planned changes in analysis methodology

TS MSIV Leakage Limits

| Plant | Current MSIV TS Limits (scfh) | | Target MSIV TS Limits (scfh) | |
|-------------------|-------------------------------|-------|------------------------------|-------|
| | Line/Valve | Total | Line/Valve | Total |
| Quad Cities | 34 | 86 | 93.6 | 156 |
| Dresden | 34 | 86 | 93.6 | 156 |
| Nine Mile Point 2 | 24 | N/A | 200 | N/A |
| FitzPatrick | N/A | 46 | N/A | 100 |

NOTE: The current and target MSIV leak rate limits shown in this table are at the TS specified test pressure, which differs from site to site.

Scope of Technical Specifications Changes

MSIV Leak Rate Changes

- Numerical value of MSIV leakage limits in SR
- TS 5.5 leak rate testing and control room habitability descriptions, as needed, to address methodology changes or decoupling MSIV leakage from L_a
- TS 5.5 Primary Containment Leakage Rate Testing Program exception, as needed, to exclude MSIV leakage from L_a definition

TSTF-551 (Quad Cities, Dresden)

- Note to be added to SR 3.6.4.1.1
- No changes to TS 5.5.2, but will update TS Bases to reflect analysis

Bypass Leakage (Nine Mile Point 2)

- TS 3.6.1.3.11 to eliminate delayed drywell leakage (conservative change)

Leakage Collection System (FitzPatrick)

- TS 3.6.1.8 to eliminate the specification to align with dose analysis that no longer credits the system

Detailed Review of Proposed LAR Submittal – Quad Cities & Dresden

New SGTS Secondary Containment Drawdown Calculation

- Required to fully implement TSTF-551, “Revise Secondary Containment Surveillance Requirements”
- GOTHIC v8.2 analysis to determine time that Secondary Containment is positive with respect to ambient pressure
- RG 1.183 requirements that lead to the four cases evaluated (summer, no wind; summer, with wind; winter, no wind; winter, with wind)
 - Assume ground-level release anytime Secondary Containment does not meet TS defined criteria for negative pressure
 - Evaluate high wind impact on ability to maintain negative pressure
 - Conservative ambient temperature assumption
- Conservative assumptions for heat transfer, initial temperatures, heat loads, etc. within the GOTHIC model

Detailed Review of Proposed LAR Submittal – Quad Cities & Dresden

Revise AST post-LOCA Dose Analysis (QDC-0000-N-1481 & DRE05-0048)

- Methodology changes:
 - Credit 50th percentile aerosol settling velocity in the main steam lines
 - Credit drywell spray
 - Remove credit for natural iodine and particulate deposition in containment
 - Credit deposition in horizontal main steam lines upstream of inboard MSIVs
 - Distribute leakage equally in all of the non-failed main steam lines
 - Add time dependent elemental iodine removal coefficients in the steam lines
 - Reduce MSIV and containment leakage by 50% at 24 hours
- Input changes:
 - Increase combined MSIV leakage from 150 scfh to 250 scfh (at P_a)
 - Reduce control room unfiltered inleakage from 400 cfm to 250 cfm
 - Remove credit for reducing L_a based on MSIV leakage

Detailed Review of Proposed LAR Submittal – Quad Cities & Dresden

Related Analysis Updates (50.59 scope)

- Technical Support Center (TSC) Dose Analysis (QDC-0000-N-1020 & DRE97-0190)
 - Updating Quad Cities TSC analysis to use AST methodology similar to that used at Dresden (i.e., LOCA model adjusted for TSC parameters)
 - Details not discussed in LAR because analysis not described in the UFSAR
- Environmental Qualification (EQ) and Vital Area (VA) Access Analyses
 - Preliminary evaluation is no impact
 - Per original AST approval, the existing methods are retained as TID

Detailed Review of Proposed LAR Submittal – Quad Cities & Dresden

TSTF-551 Proposed Technical Specification Changes

- Add note to SR 3.6.4.1.1
NOTE: Values in brackets are Quad Cities specific, the numerical value at Dresden is 0.25.

| Existing SR 3.6.4.1.1 | | Proposed SR 3.6.4.1.1 | |
|-----------------------|--|-----------------------|--|
| SR 3.6.4.1.1 | Verify secondary containment vacuum is \geq [0.10] inch of vacuum water gauge. | SR 3.6.4.1.1 | <p>-----NOTE-----</p> <p>Not required to be met for 4 hours if analysis demonstrates one standby gas treatment (SGT) subsystem is capable of establishing the required secondary containment vacuum.</p> <p>-----</p> <p>Verify secondary containment vacuum is \geq [0.10] inch of vacuum water gauge.</p> |

- Current SR 3.6.4.1.2 contains TSTF-551 change, no action required

Detailed Review of Proposed LAR Submittal – Quad Cities & Dresden

MSIV Leakage Proposed Technical Specification Changes

- SR 3.6.1.3.10 and corresponding Bases change

| Existing SR 3.6.1.3.10 | | Proposed SR 3.6.1.3.10 | |
|------------------------|---|------------------------|--|
| SR 3.6.1.3.10 | Verify the leakage rate through each MSIV leakage path is ≤ 34 scfh when tested at ≥ 25 psig, and the combined leakage rate for all MSIV leakage paths is ≤ 86 scfh when tested at ≥ 25 psig. | SR 3.6.1.3.10 | Verify the leakage rate through each MSIV leakage path is ≤ 93.6 scfh when tested at ≥ 25 psig, and the combined leakage rate for all MSIV leakage paths is ≤ 156 scfh when tested at ≥ 25 psig. |

- TS 5.5.12 – currently evaluating if L_a changes needed based on decoupling MSIV leakage from L_a

Detailed Review of Proposed LAR Submittal – Nine Mile Point 2

Revise AST post-LOCA Dose Analysis (H21C-106)

- Increase combined MSIV leakage from 96 scfh to 400 scfh; 200 scfh modeled in 2 lines
- Credit 50th percentile aerosol settling velocity in the main steam lines
- Adjust credit for drywell spray (reduced the time credited) and include natural deposition
- Credit deposition in horizontal main steam lines upstream & downstream of MSIVs
- Credit elemental iodine removal in horizontal main steam lines downstream of MSIVs to turbine stop valves in Seismic Category 1 piping
- Add time dependent elemental iodine removal coefficients in the steam lines
- Maintain a substantial margin to the dose limits

Proposed Technical Specification Changes

- TS 3.6.1.3.11 - eliminate delayed drywell leakage
- TS 3.6.1.3.12 – revise leakage rate

Detailed Review of Proposed LAR Submittal – Nine Mile Point 2

CAVEX

- Core burnup increased to allow margin for future core design optimization
- AST post-LOCA dose analysis is including a new core inventory for future usage
- Core design controls will be held to current design bases until the CAVEX change is fully implemented (under 50.59)

Related Analysis Updates (50.59 scope)

- TSC Dose Analysis
- Control room and SGTS filter decay heat
- Environmental Qualification (EQ) and Vital Area (VA) Access Analyses
 - Per original AST approval, these methods are retained as TID
 - A few analyses depend on MSIV leak rate, will be revised and all acceptance criteria addressed
- CAVEX Only
 - Non-LOCA AST Analyses (FHA, CRDA)
 - Suppression pool pH

Detailed Review of Proposed LAR Submittal – FitzPatrick

New AST post-LOCA Dose Analysis (Full Implementation)

- Increase combined MSIV leakage from 46 scfh to 100 scfh; 50 scfh max per line
- Credits changes similar to one's proposed for Quad Cities and Nine Mile Point
- Eliminate credit of Main Steam Leakage Collection System (MSLCS)
 - Does not involve alternate collection/treatment (no condenser credit)
- New GOTHIC based drawdown analysis

Proposed Technical Specification Changes

- TS 3.6.1.8 - eliminate to align with dose analysis that no longer credits the system
- TS 5.5.12 – address L_a changes based on decoupling MSIV leakage from L_a

Detailed Review of Proposed LAR Submittal – FitzPatrick

CAVEX

- Core burnup increased to allow margin for future core design optimization
- AST post-LOCA dose analysis is including a new core inventory for future usage
- Core design controls will be held to current design bases until the CAVEX change is fully implemented (under 50.59)

Related Analysis Updates (50.59 scope)

- TSC Dose Analysis
- Environmental Qualification (EQ) and Vital Area (VA) Access Analyses
 - Very minor impacts expected to MSIV and MSLCS changes
 - Will be addressed under 50.59
- CAVEX only
 - FHA (currently AST) unaffected by MSIV and MSLCS changes
 - CRDA, MSLB also unaffected by MSIV and MSLCS changes
 - Analyses are conservative and do not require update per RG 1.183 Section 1.3.2

Overview of Licensing Schedule and Outage Needs

- Goal is to implement at first outage opportunity for each site
- Submit LARs according to schedule outlined below
- Request NRC review and approval in 12 months

| Plant | LAR Submittal | NRC Approval | First Opportunity |
|-------------------|----------------|----------------|---------------------|
| Quad Cities | February 2019 | February 2020 | March 2020 Unit 2 |
| Nine Mile Point 2 | January 2019 | January 2020 | March 2020 |
| Dresden | September 2019 | September 2020 | October 2020 Unit 3 |
| Fitzpatrick | June 2019* | July 2020* | September 2020 |

* Fitzpatrick schedule is preliminary

Summary and Wrap-up

Summary

- NRC approval of the increased MSIV leakage limits will:
 - Reduce outage dose and increase safety due to reducing working in challenging conditions
 - Reduce number of reportable events from MSIV LLRTs due to crediting AST revised licensing basis
 - Provide outage cost savings due to having fewer MSIV LLRT failures and resulting rebuilds
- NRC approval of TSTF-551 for Quad Cities and Dresden will:
 - Eliminate unnecessary reporting under 10 CFR 50.72 and 10 CFR 50.73 of brief periods when secondary containment SR pressure is not met, but the safety function is maintained
- NRC approval of elimination of MSLCS from FitzPatrick TS will:
 - Provide reduced operator burden, dose, and maintenance costs
 - Simplify the design basis dose analysis by conservatively treating MSIV leakage as ground-level release

Recap of Actions

DISCUSSION