# Surveillance Frequency Control Program Implementing Insights

**Zhiping Li[a,b], Mary Anne Billings[b]**
[a] Ameren Missouri, Fulton, United States of America
[b] STP Nuclear Operating Company, Wadsworth, United States of America

**Abstract:** Risk Informed Technical Specification (RITS), Initiative 5b provides a risk-informed method for licensee control of Surveillance Frequencies. Revision 1 of NEI 04-10, "*Risk-Informed Method for Control of Surveillance Frequencies,*" in April 2007 provides guidance for implementation of a generic Technical Specifications improvement that establishes licensee control of surveillance frequencies for the majority of Technical Specifications surveillances. Since Limerick received NRC's approval in 2006 for its "5b" submittals, many other nuclear power plants also implemented this program. The Callaway's LAR for "5b" was approved in July 2011. However, as of December 2017, Callaway has implemented only two surveillance interval extensions. In this paper, some insights and lessons learned from the implementing of Surveillance Frequency Control Program will be discussed.

**Keywords:** PRA, Risk-Informed Application, Surveillance Frequency Control Program

## 1. INTRODUCTION

Risk Informed Technical Specification (RITS), Initiative 5b provides a risk-informed, performance-based approach for licensee control of Surveillance Frequencies. Revision 1 of NEI 04-10 (Reference [1]), "*Risk-Informed Method for Control of Surveillance Frequencies*," in April 2007 provides guidance for implementation of a generic Technical Specifications improvement that establishes licensee control of surveillance frequencies for the majority of Technical Specifications surveillances. Surveillance Test Interval (STI) change requests using a risk-informed, performance-based approach are supported by the Nuclear Regulatory Commission's (NRC's) Regulatory Guide (RG) 1.174 (Reference [2]) and 1.177 (Reference [3]). Probabilistic Risk Assessment (PRA) methods are used to determine the risk impact of the revised intervals. Sensitivity studies are performed on important PRA parameters. Since Limerick received NRC's approval in 2006 for its "5b" submittals, many other nuclear power plants also implemented this program. The Callaway's LAR for "5b" was approved in July 2011. However, as of December 2017, Callaway has implemented only two surveillance interval extensions. In this paper, some insights and lessons learned from implementing of the Surveillance Frequency Control Program will be presented. A case study for ESFAS STRIDE will also be presented.

## 2. LESSONS LEARNED SHARED BY THE NUCLEAR INDUSTRY

Reference [4], "*Nuclear Power Plant Risk-Informed Surveillance Frequency Control Program Implementation – Lessons Learned*", shares lessons learned at the ANS PSA 2013 meeting. The author, Mr. Liming, has about 100 plant STRIDEs development and implementation experiences. Reference [4] provides valuable information in the Surveillance Frequency Control Program (SFCP). It shares lessons learned associated with Surveillance Test Risk-Informed Documented Evaluation (STRIDE) PRA case study development and implementation, but also includes insights about associated STRIDE DA and IDE development and implementation. It outlines a proposed framework for practical implementation of an RI-SFCP. This paper addresses both qualitative and quantitative aspects relating to STRIDE implementation.

Loren Heistand shared NextEra experience with RITS 5B implementation in 2017 at EPRI's Configuration Risk Management Forum (CRMF) (Reference [5]). The lessons shared by Heistand are quoted as below:

- Fleet specific interfaces and processes require considerable attention to update with lessons learned/feedback
- Screening step is low/no value add. It is redundant to evaluation step. Simple go-no-go determination, then proceed directly to evaluation and if there is an issue regarding benefit or other barrier to implementation then convene IDP for decision
- Early involvement of system engineering and plant staff in development of procedures is necessary. STI Changes start out slow due to sites not being familiar with the program and benefits
- Change the same/similar surveillances at all NEE sites to streamline evaluation process, effectively use resources
- Industry is not consistent in SFCP ownership: more fleets/sites have Engineering owning (G&O) the program with Operations as support
- There is demonstrated lack of understanding of the SFCP procedure/process causing a lack to drive STI changes

In this presentation (Reference [5]), NextEra's future work of its SFCP can be summarized as (1) change the SFCP ownership to Program Engineering from Operations with Operations, PRA, ER and Maintenance to be support and perform roles; (2) Streamline the SFCP Process ; (3)Establish an SFCP working team at corporate.

Joe Harnden shared Palo Verde Nuclear Generation Station (PVNGS) Risk Informed Tech Specs 5B Project in 2012, 2013, and 2014 at EPRI's CRFM (References [6], [7], [8]). The lessons learned from PVNGS 5b project can be summarized as:

- Data gathering requires coordination and support from multiple organizations
- Resource issues were a problem at many STARS plants for STRIDE development and review
- Assigning manager level project leadership at PVNGS has helped with resource issues
- Use of different PRA software tools placed extra burden on contractor
- Surveillance Requirements are commonly split up amongst multiple Tests
- Surveillance Tests commonly test multiple Surveillance Requirements
- Some components may get modeled with an extension multiple times in the cumulative RITS 5B PRA model due to multiple Surveillance Requirements are performed on the same components, even though the true net change is a single test interval for that component
- This inter-relationship results in processing multiple STRIDEs as a package and/or splitting up coverage in Surveillance Tests

## 3. INSIGHTS AND LESSONS LEARNED AT CALLAWAY ENERGY CENTER

The Callaway Energy Center (CEC)'s LAR for "5b" was approved in July 2011. Callaway has implemented two surveillance interval extensions: Weekly Inspection of NK large Stationary Batteries in 2014, and Trip Actuating Device Operational Test (TADOT) in 2016. Callaway is working on its third STRIDE - Integrated Engineered Safety Features Actuation System (ESFAS) Testing. This STRIDE is scheduled to be approved and implemented in 2018. The insights and lessons learned at Callaway are very similar to those from the nuclear industry.

CEC's Surveillance Activities are governed by the Surveillance Program Administration procedure, APA-ZZ-00340 (Reference [9]). This procedure includes four appendices, which are Appendix 1, Surveillance Frequency Control Program; Appendix 2, Surveillance Test Risk Informed Documented Evaluation (STRIDE) Process; Appendix 3, STI List Control; and Appendix 4, Surveillance Frequency Control Program STI List.

The first insight through CEC's 5b project is that Manager level project leadership is very helpful with resource issue. At Callaway, the chairperson of the IDP and the 5b project leader is an operations manager. The second insight is that this program needs support from operations and engineering department as well as PRA department. Since the data gathering requires coordination and support from multiple organizations, it is very important to get support from the onsite senior leadership teams. The third lesson learned at CEC is that the ownership and the responsibilities needs to be clear in order to have an effective program. The risk management department at Callaway used to be the owner of the SFCP and the SFCP coordinator. Callaway has made a few changes in the program ownership and responsibilities which helps a lot in the program management. After released the non-PRA related burden, PRA engineers can mainly focus on the STRIDE PRA assessment. Some changes are provided in Table 1 for information.

Another insight/lesson we learned through the development of CEC's third STRIDE – ESFAS testing is that coordination from Engineering SME and PRA engineers plays a critical role in the ESFAS test interval extension evaluation. The integrated ESFAS testing satisfies multiple surveillance requirements. Each ESFAS test procedure satisfies multiple individual surveillance requirements from both the Technical Specifications and FSAR Chapter 16. Due to the number of surveillance requirements impacted by this change, and a large number of components would be impacted, it would be very hard for PRA engineers to identify all the functions impacted in this surveillance test. In order to save risk margin for the SFCP to implement more STIs, the engineering SME split the ESFAS surveillance into smaller surveillances. With developing some new surveillance procedures, several functions will not be impacted and no need to be included in the PRA assessment. A comparison of the incremental risk assessment results of the draft STRIDE prepared in 2012 to those of the preliminary STRIDE prepared in 2018 is given in Table 2. It can be seen that with the engineering SME's help, the incremental risk for CDF reduced about 50% and for LERF reduced more than 90%. This can save risk margin to implement more STIs as needed in the future.

As for STRIDE selection and prioritization, our experience tells us that it requires at least coordination from operations, system engineer and surveillance coordinator. It is desirable to develop and implement an objective process for selecting and prioritizing target STRIDEs. At a minimum, STRIDE selection and prioritization should be based on the following two factors [4]:

- Potential Cost-Benefit of STRIDE Implementation (initially identified by station disciplines that perform the surveillance)
- Potential Impact on Plant Nuclear Safety (risk)

## 4. CONCLUSION

This paper provides insight and lesson learned from CEC's SFCP development and implementation as well as the lessons learned for the RI-SFCP from the nuclear industry. The author would be very happy if this paper can provide a little help to the nuclear utilities for their SFCP development and implementation in any way.

**Table 1: Example of Responsibilities Changes in CEC's Surveillance Program Administration**

| | Responsibilities (Used to be) [10] | Responsibilities (Current) [11] |
|---|---|---|
| Work Management | Assigns an individual to perform the responsibilities of the Surveillance Coordinator | Assigns individuals to perform the responsibilities of the Surveillance Coordinator and SFCP Coordinator. |
| Surveillance Coordinator | 1. Develops and maintains the STI List and its controlling procedure<br>2. Participates on the IDP to assess possible STI changes<br>3. Implements EMPRV surveillance database updates in response to approved STRIDEs | 1. Participates on the IDP to assess possible STI changes<br>2. Implements EMPRV surveillance database updates in response to approved SRIDEs |
| SFCP Coordinator | | 1. Manages the SFCP<br>2. Coordinates the STRIDE process<br>3. Monitors performance and provides feedback to the IDP on failures of STs that have had their frequencies extended via this process<br>4. Participates on the IDP to assess possible STI changes<br>5. Coordinates IDP Member qualification and maintains/updates ID Membership letter on an annual or as needed basis |
| PRA Group | 1. Manages the SFCP<br>2. Develops and maintains this procedure appendix<br>3. Coordinates the STRIDE process<br>4. Develops and maintains PRA-ZZ-00100<br>5. Develops and maintains the appendices associated with APA-ZZ-00340, Surveillance Program Administration<br>6. Performs PRA analyses/assessments in support of proposed STI change evaluations<br>7. Participates on the IDP to assess possible STI changes<br>8. Monitors the performance and provides feedback to the IDP on failures of STs that have had their frequencies extended via this process | 1. Develops and maintains PRA-ZZ-00100, PRA Methodology for Evaluating Changes to Surveillance Test Intervals. [12]<br>2. Performs PRA analyses/assessments in support of proposed STI change evaluations<br>3. Participates on the IDP to assess possible STI changes. |

**Table 2: Comparison of the Incremental Risk Results of ESFAS STRIDEs**

| | ΔCDF | ΔLERF |
|---|---|---|
| Draft Results without SME involved in 2012 | 7.50E-07 | 2.40E-08 |
| Preliminary Results with SME's impacted functions assessment in 2018 | 4.11E-07 | 9.41E-10 |
| Change | -45.2% | -96.1% |

**References**

[1] Nuclear Energy Institute, "*Risk-Informed Technical Specifications Initiative 5b, Risk-Informed Method for Control of Surveillance Frequencies Industry Guidance Document*", NEI 04-10, Revision 1, (2007)

[2] U. S. Nuclear Regulatory Commission, "*An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis*", Regulatory Guide 1.174, Revision 2, (2011)

[3] U. S. Nuclear Regulatory Commission, "*An Approach for Plant-Specific, Risk-Informed Decision-Making: Technical Specifications*", Regulatory Guide 1.177, Revision 1, (2011)

[4] James K. Liming and C. Richard Grantom, "*Nuclear Power Plant Risk-Informed Surveillance Frequency Control Program Implementation – Lessons Learned*", ANS PSA 2013, (2000).

[5] Joe Harnden, "*STARS Risk Informed Tech Specs 5B Project – PVNGS Perspective*", PowerPoint Presentation, EPRI CRMF, (2012)

[6] Joe Harnden, "*STARS Risk Informed Tech Specs 5B Project – PVNGS Perspective*", PowerPoint Presentation, EPRI CRMF, (2013)

[7] Joe Harnden, "*PVNGS Risk Informed Tech Specs 5B Update*", PowerPoint Presentation, EPRI CRMF, (2014)

[8] Loren Heistand, "*Issues and Innovations in CRM and PRA: NextEra Experience with RITS 5B Implementation*", PowerPoint Presentation, EPRI CRMF, (2017)

[9] Callaway Energy Center, "*Surveillance Program Administration*", Revision 044, (2017)

[10] Callaway Energy Center, "*PRA Methodology for Evaluating Changes to Surveillance Test Intervals*", APA-ZZ-00340, Appendix 1, Revision 000, (2011)

[11] Callaway Energy Center, "*PRA Methodology for Evaluating Changes to Surveillance Test Intervals*", APA-ZZ-00340, Appendix 1, Revision 002, (2017)

[12] Callaway Energy Center, "*PRA Methodology for Evaluating Changes to Surveillance Test Intervals*", PRA-ZZ-00100, Revision 001, (2013)