BLUE WAVE AI LABS

THE RIC

USING LICENSING DATA FOR PURPOSE

March 11-13, 2025

NUCLEAR AI INSIGHTS

- "Augmented Intelligence"
  - Human decision-making
- Discrete solutions – system boundaries
- Defense in depth
- Working within existing systems

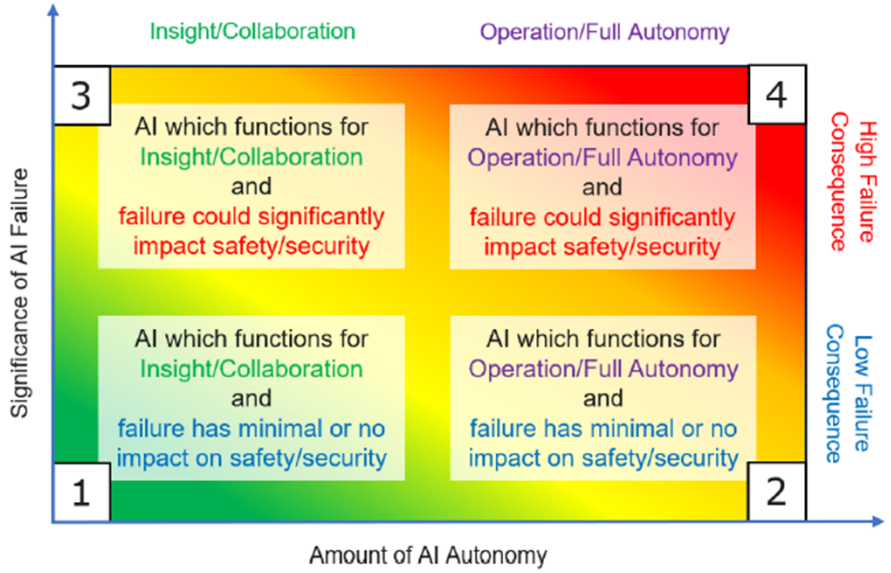


Figure 1. Categorizing AI failure significance and AI autonomy

Credit: Considerations For Developing AI Systems in Nuclear Applications, September 2024 – CNSC, ONR, NRC

BLUE WAVE NUCLEAR CORPUS

Public Sources

- NRC ADAMS
- IAEA
- OSTI
- Halden Reactor Project
- ….

Other

- EPRI
- INPO
- NEI
- ….

Focus on 50.59

1. 10 CFR 50.59 regulation
2. 10 CFR 72.48 regulation
3. NRC Regulatory Guide1.187, Revision 3, Guidance for Implementation of 10 CFR 50.59, Changes, Tests, and Experiments, June 2021
4. Regulatory Guide 3.72, Revision 1, Guidance for Implementation of 10 CFR 72.48, Changes, Tests, and Experiments, September 2020
5. NEI 96-07, Revision 1, Guidelines for 10 CFR 50.59 Implementation, November 2000
6. NEI 96-07, Appendix B, Guidelines for 10CFR72.48 Implementation, January 2001
7. NEI 96-07, Appendix D, Revision 1, Supplemental Guidance for Application of 10 CFR 50.59 to Digital Modifications, May 2020
8. NEI 96-07, Appendix E, User's Guide for NEI 96-07, Revision 1, Guidelines for 10 CFR 50.59 Implementation, October 2011
9. NEI 12-04, Revision 2, Guidelines for 10CFR72.48 Implementation, September 2018
10. NRC INSPECTION MANUAL, PART 9900 10 CFR GUIDANCE, 10 CFR 50.59 | CHANGES, TESTS AND EXPERIMENTS, 03/13/01
11. IMC-0335, Changes, Tests and Experiments, INSPECTION MANUAL CHAPTER 0335, 01 February 2021, ML20325A180
12. + MANY OTHERS

Plant Specific

1. 10 CFR 50.59 and 10 CFR 72.48 Procedure
2. Plant Licensing Basis
   a. Plant License issued by NRC with Technical Specifications (Tech Specs) [Public document on NRC website]
   b. Technical Specification Bases [Public document on NRC ADAMS]
   c. Technical Requirements Manual (TRM)
   d. Updated Final Safety Analysis Report (UFSAR) [Regularly updated on NRC ADAMS]
   e. Quality Assurance Program Manual (QAPM) [Public document on NRC ADAMS]
   f. Fire Protection Plan (with Fire Hazards Analysis)
   g. Emergency Plan (E-Plan)
   h. Environmental Protection Plan
   i. Security Plan [Safeguards Information (SGI)]
   j. Core Operating Limits Report (COLR)
   k. Offsite Dose Calculation Manual (ODCM)
   l. NRC Orders (and exemptions that have been granted) [Public document on NRC ADAMS]
3. Plant procedures
4. Plant records, i.e., engineering changes, reports, licensing correspondence, etc. Plant's vendor, of fuel or plant design, drawings, topical reports, and calculations that would be "Incorporated by Reference" in the plant's documents.
5. Plant's 50.59 Screening guidance document.
6. Historical 50.59/72.48 documents (screens, evaluations, and the final license amendment applications)

AI Solutions Require Large Quantities of High-Quality Data

50.59 SCREEN WORKFLOW

Activity Description

- The user fills in the description of the change, test, or experiment to the standard 50.59 screening Word document template of the plant.
- User uploads the Word document to the website at Gov Cloud.

Search Term Definition

- The screener proposes terms based on the Activity Description.
- User's terms are captured from Activity Description and included as well.
- The 50.59 Screener presents a Web form for modifying the search terms.
- User finalizes the list and sets it in priority order.

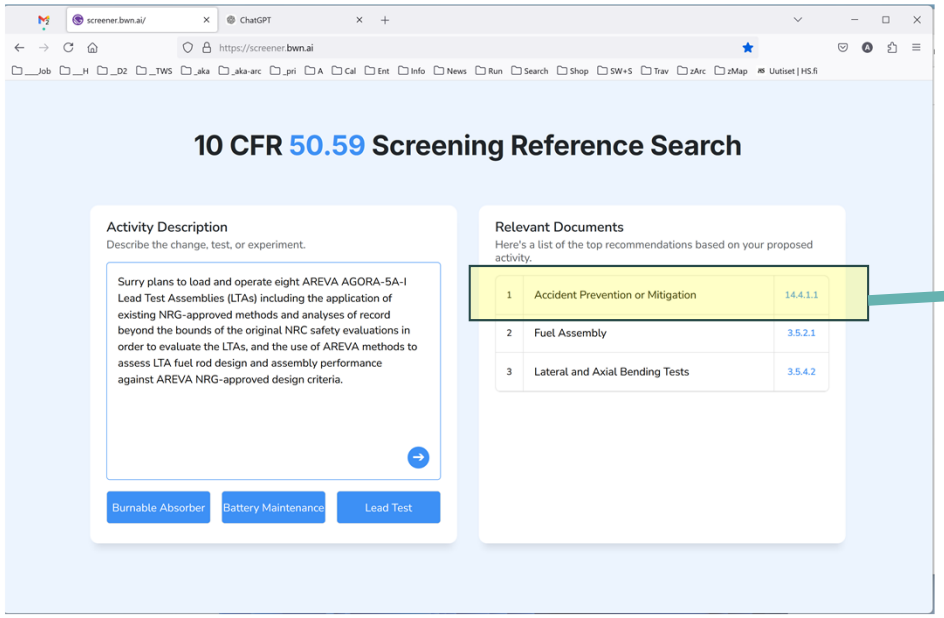
Reference Search

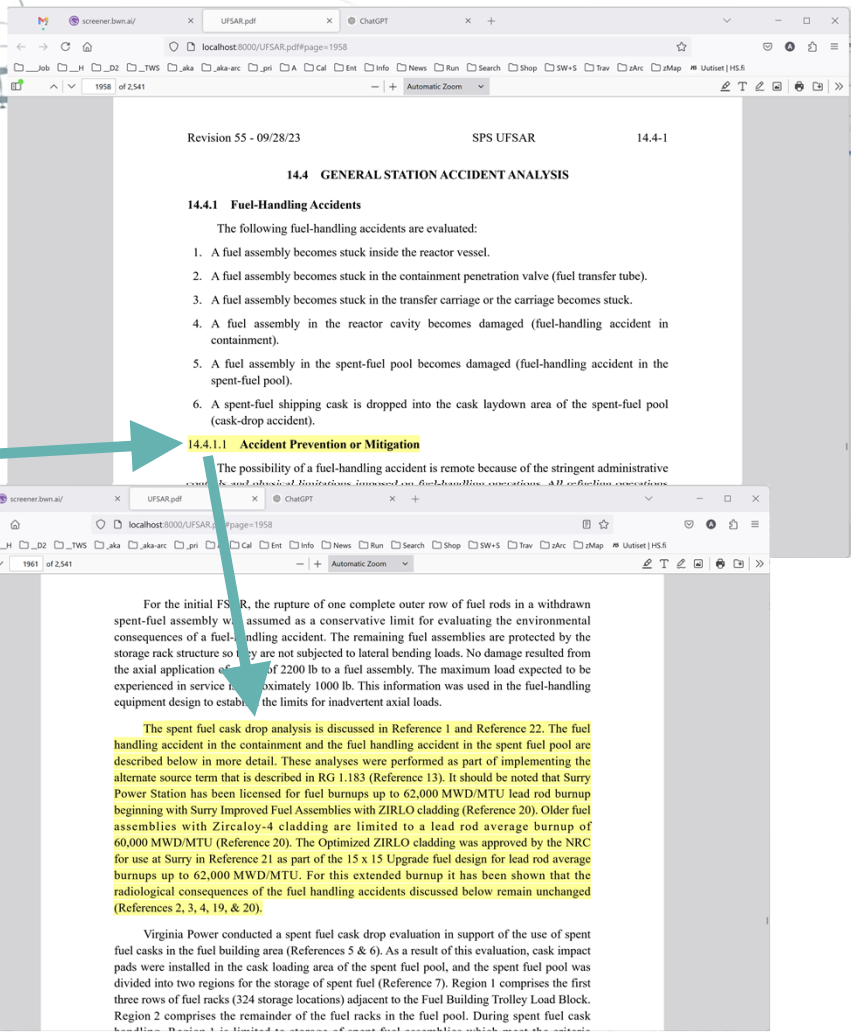
- The 50.59 Screener presents an interactive web form.
- Links are provided for the user to review the relevant sections of the reference documents.
- User can accept or reject the references.
- User can change the priority order of references.
- User choices are used for training the 50.59 Screener.

Drafting 50.59 Screen

- An interactive web form walks the user through the plant specific 50.59 screen template.
- System proposes the answers and content for each section.
- User can either accept the answers and content or edit them.
- Finally, the user can download the completed draft 50.59 screen Word Document for review.

SEARCH CAPABILITIES




Revision 55 - 09/28/23 SPS UFSAR 14.4-1

14.4 GENERAL STATION ACCIDENT ANALYSIS

14.4.1 Fuel-Handling Accidents

The following fuel-handling accidents are evaluated:

1. A fuel assembly becomes stuck inside the reactor vessel.
2. A fuel assembly becomes stuck in the containment penetration valve (fuel transfer tube).
3. A fuel assembly becomes stuck in the transfer carriage or the carriage becomes stuck.
4. A fuel assembly in the reactor cavity becomes damaged (fuel-handling accident in containment).
5. A fuel assembly in the spent-fuel pool becomes damaged (fuel-handling accident in the spent-fuel pool).
6. A spent-fuel shipping cask is dropped into the cask laydown area of the spent-fuel pool (cask-drop accident).

14.4.1.1 **Accident Prevention or Mitigation**

The possibility of a fuel-handling accident is remote because of the stringent administrative

For the initial FSAR, the rupture of one complete outer row of fuel rods in a withdrawn spent-fuel assembly was assumed as a conservative limit for evaluating the environmental consequences of a fuel-handling accident. The remaining fuel assemblies are protected by the storage rack structure so they are not subjected to lateral bending loads. No damage resulted from the axial application of 2200 lb to a fuel assembly. The maximum load expected to be experienced in service is approximately 1000 lb. This information was used in the fuel-handling equipment design to establish the limits for inadvertent axial loads.

The spent fuel cask drop analysis is discussed in Reference 1 and Reference 22. The fuel handling accident in the containment and the fuel handling accident in the spent fuel pool are described below in more detail. These analyses were performed as part of implementing the alternate source term that is described in RG 1.183 (Reference 13). It should be noted that Surry Power Station has been licensed for fuel burnups up to 62,000 MWD/MTU lead rod burnup beginning with Surry Improved Fuel Assemblies with ZIRLO cladding (Reference 20). Older fuel assemblies with Zircaloy-4 cladding are limited to a lead rod average burnup of 60,000 MWD/MTU (Reference 20). The Optimized ZIRLO cladding was approved by the NRC for use at Surry in Reference 21 as part of the 15 x 15 Upgrade fuel design for lead rod average burnups up to 62,000 MWD/MTU. For this extended burnup it has been shown that the radiological consequences of the fuel handling accidents discussed below remain unchanged (References 2, 3, 4, 19, & 20).

Virginia Power conducted a spent fuel cask drop evaluation in support of the use of spent fuel casks in the fuel building area (References 5 & 6). As a result of this evaluation, cask impact pads were installed in the cask loading area of the spent fuel pool, and the spent fuel pool was divided into two regions for the storage of spent fuel (Reference 7). Region 1 comprises the first three rows of fuel racks (324 storage locations) adjacent to the Fuel Building Trolley Load Block. Region 2 comprises the remainder of the fuel racks in the fuel pool. During spent fuel cask

The relevant sections are permanently highlighted in the pdf.