

Fuel Cycle Operating Experience Report FY2023

1. Introduction

The objective of the U.S. Nuclear Regulatory Commission (NRC) Fuel Cycle Operating Experience (OpE) report is to provide an analysis that identifies trends in operational data and to make recommendations to improve our regulatory programs.

By systematically reviewing operational data and assessing its significance, the NRC is focused on providing insights that can inform future inspections and licensing reviews, provide timely and effective communication to stakeholders, and apply the lessons learned to regulatory decisions and programs.

The scope of this assessment is fiscal year (FY) 2023 and includes data from previous years for trending purposes.

2. Data Assessment

2.1 *Reported Events*

Fuel cycle facilities operational events are reported in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), Part 40.60 "Reporting Requirements," 10 CFR 70.50 "Reporting Requirements," and 10 CFR Part 70, appendix A, "Reportable Safety Requirements." Safeguards and security information is not included in this data set. Appendix A, table 1 shows the total number of reported events (prior to performing any screening¹) for operating fuel cycle facilities since 2012.

There were 23 reported events in FY2023, one licensee retracted one event after determining that the event did not meet the reporting requirement threshold. Inspectors followed up on retracted reports to determine if the retraction was correct, and to determine if other violations related to the event may have occurred. The single retracted report (EN56372) related to the declaration of a site area emergency. This event was correctly retracted because the site area emergency declared was unrelated to the NRC licensees' activities.

Additionally, six events were reported under 10 CFR 70 Appendix A (c), "Concurrent Reports." Concurrent reports are required to be submitted to the NRC when an event will be part of a press release or is required to be reported to other government agencies. Therefore, the six concurrent reports are not included in the data analysis. Although concurrent reports are not included in the data analysis, they can be related to violations as inspection staff follows up on these reports. This occurred in FY2023 when two SL-IV NOV's were issued related to event

¹ The data screening process determines the appropriate performance area, safety significance, and contributing factors. Events are further screened in this report to remove concurrent reports, retracted events, etc.

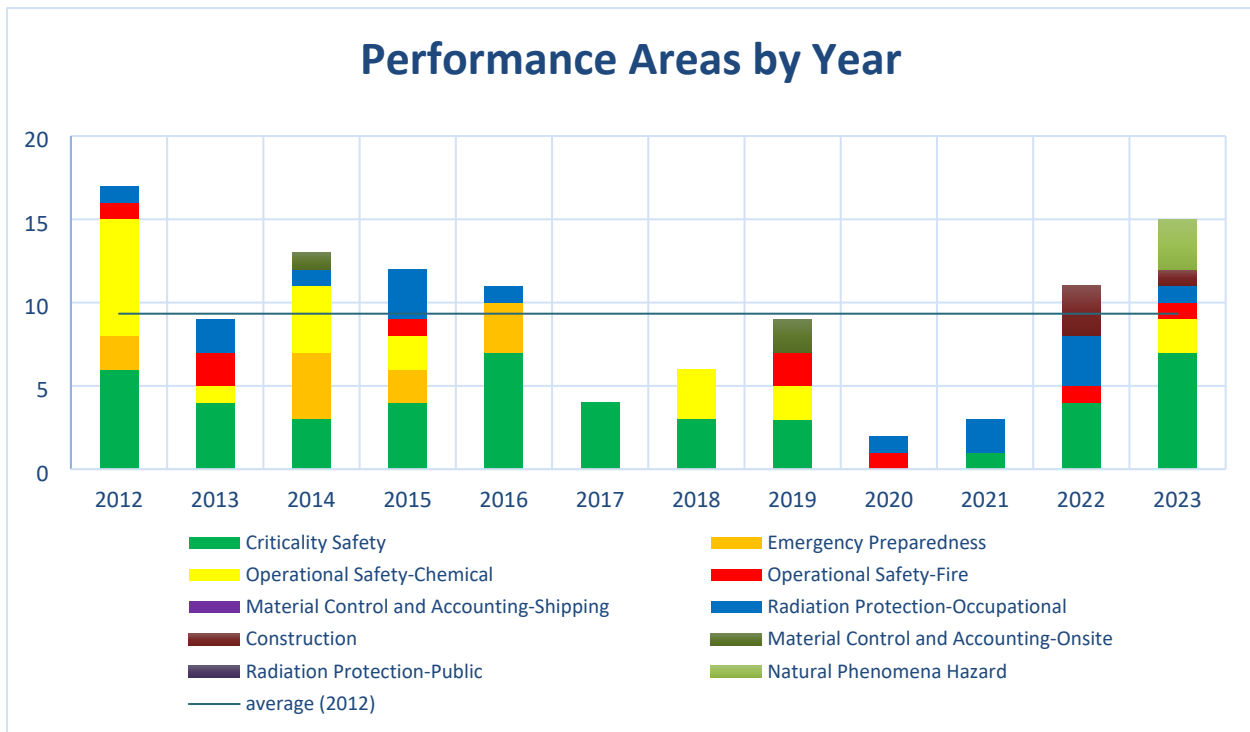
notification EN56326 (a concurrent report) for failure to follow standard operating procedures which is a condition of the licensee’s license.

Reported events considered as occupational hazards or personal health related issues, such as certain unplanned medical treatments caused by personal health issues (e.g., low blood sugar, heart attacks), and non-radiological or non-chemical exposure events (e.g., a pinched finger or a fall), are not included in the data analysis.

After screening out the events based on the criteria above, a total of 15 FY2023 events remained for analysis. **Attachment A**, Table 2 shows the resulting number of reported events per year after screening the data since Calendar Year (CY)2012.

Each event is categorized into 1 of 10 performance areas (Criticality Safety, Radiation Protection – Public, Radiation Protection – Occupational, Emergency Preparedness, Operational Safety – Fire, Operational Safety – Chemical, Material Control and Accounting – Shipping, Material Control and Accounting – Onsite, Construction, and Natural Phenomena Hazard).

Figure 1 illustrates the number of events per year by performance area and shows the average number of events per year since CY2012.



* Prior to FY2022, Material Control and Accounting events were not broken out into shipping or onsite, and Radiation Protection events were not broken out into Occupational and Public.

** Events reported in the figure for 2021 are for a partial year (9 months) as we transitioned to fiscal year reporting in 2022.

Figure 1 – Events per year by performance area

Nine violations were issued related to the FY2023 reported events. Nuclear safety violations are assessed in section 2.3 of this report.

In the previous OpE Report (FY2022), staff stated that the safety significance of two apparent violations related to item(s) relied-on for safety (IROFS) construction barriers (EN 55770 and EN 55956) that occurred in FY2022 was still being evaluated. In FY2023, the safety significance of both apparent violations was determined to be SL-II. A notice of violation and proposed imposition of civil penalty was issued to the licensee. The unresolved item opened in FY2022 to assess whether certain non-construction vehicles require IROFS construction barriers is still under review.

The evaluation of an operational safety event from CY2020 regarding a fire and resultant fatality at a licensee's supercompactor concluded in January 2024. The licensee reported this industrial safety event to OSHA and as a concurrent report to the NRC in accordance with appendix A to 10 CFR Part 70. In determining the severity level of the violations, the NRC considered a number of factors, including but not limited to provisions of the NRC Enforcement Policy, case-specific facts, and the enforcement action already taken by OSHA. The NRC's evaluation of the significance of the violations focused on the radiological consequences of the event. The NRC determined that four SL-IV violations of NRC requirements occurred. Although these violations occurred prior to the period assessed in this report (FY2021 to FY2023), this report acknowledges the resolution of this operational safety event.

More information regarding FY2023 violations can be found in section 2.3 "Inspection Findings", and **Enclosure 2** provides a summary table of the inspection findings for FY2023 presented in this report.

2.2 *Part 21 Reports and CFSI*

The staff reviewed the data for 10 CFR Part 21 reports received during FY2023, including those related to Counterfeit, Fraudulent, and Suspect Items (CFSI). There were no Part 21 reports pertaining to fuel cycle facilities identified.

2.3 *Inspection Findings*

This FY2023 OpE Report is the first report to incorporate data related to inspection findings. Findings from FY2023 will be the focus, but inspection findings from FY2021 and FY2022 are also included to provide context to the FY2023 results.

During FY 2023, the NRC performed a total of 63 nuclear safety inspections. There was a total of five non-cited violations (NCVs) and six notice of violations (NOVs). Minor violations and observations from these inspections were not included in this report. There was one escalated enforcement action (SL-III) issued during FY 2023. **Enclosure 2** provides a summary table of the inspection findings for FY2023 presented in this report.

The inspection findings are categorized by performance area as shown in **Figure 2**. These performance areas are consistent with the performance areas used to categorize event notifications.

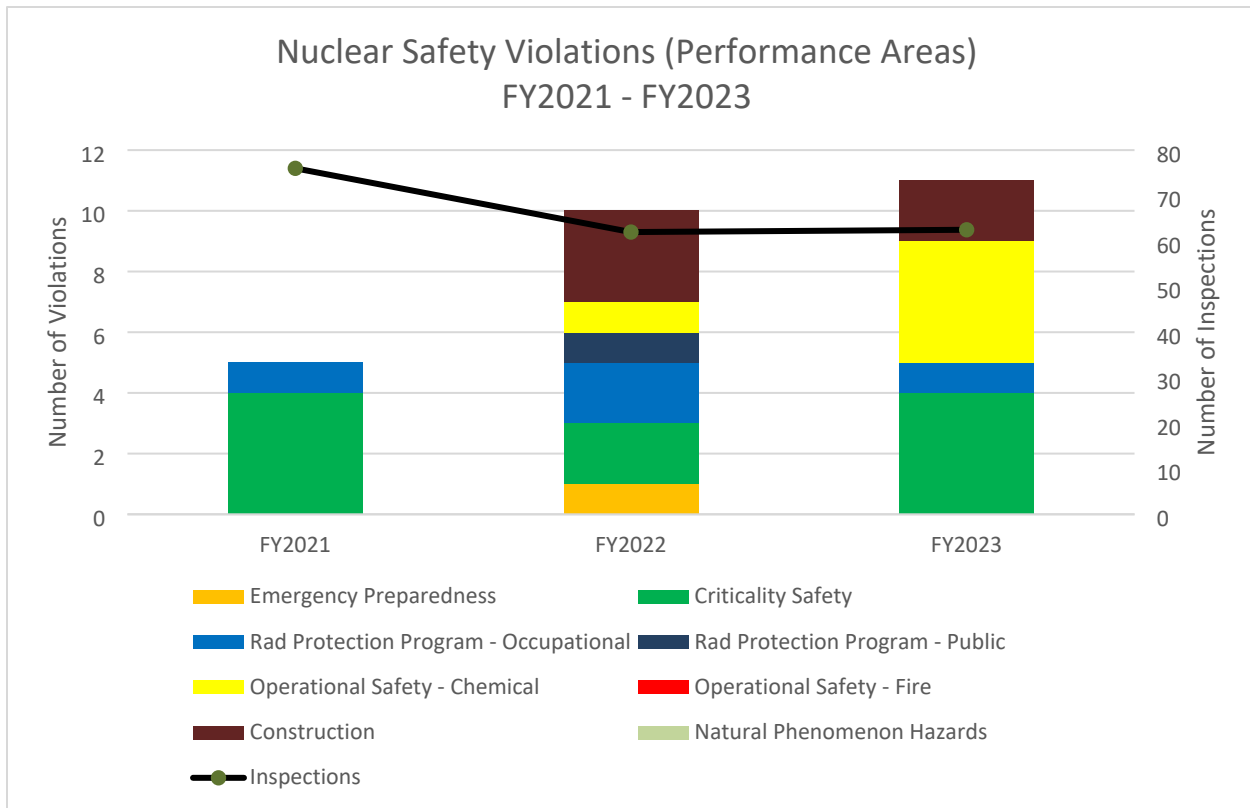


Figure 2 – Inspection Findings and Performance Areas FY2021 – FY2023

There was a total of three violations with escalated enforcement between FY2021 and FY2023. Two of the three occurred in FY2022 and were SL-II NOVs in the performance area of Construction. The licensee was issued a civil penalty due to the significant potential safety consequences of the two violations. More specifically, the licensee failed to establish barriers to protect an area of concern prior to bringing construction vehicles into the controlled access area (CAA). The violations did not result in any consequences or operational challenges to the facility, and plant system equipment was not damaged.

The single occurrence of escalated enforcement in FY2023 was an SL-III NOV in the performance area of Criticality Safety. This violation resulted in a civil penalty based on previous escalated enforcement action. More specifically, two engineered IROFS, an overflow drain line and an air gap, failed to perform their intended safety function (to prevent a criticality event by preventing liquid from entering the ventilation system) when uranium bearing organic solution was inadvertently transferred into an organic annular storage tank through a partially open valve. The violation did not result in any consequences or operational challenges to the facility, in that no criticality incidents occurred in which employees were exposed to radiation, and plant system equipment was not damaged.

No escalated enforcement resulted from the four nuclear safety reactive inspections in FY2023. Reactive inspections took place at three fuel cycle facilities in FY2023 and resulted in five SL-IV violations. Two violations were in the performance area of Construction, two violations were in

the performance area of Criticality Safety, and one violation was in the performance area of Operational Safety – Chemical Hazard.

3. Trending and Review

Factors beyond licensee performance influence the annual number of violations and screened events shown in **Table 2**, **Figure 1**, and **Figure 2**². An example of this is the change in the number of operating fuel cycle facilities year to year (e.g. Honeywell entered idle-ready status in CY2017 and came back online in CY2023). Therefore, any comparison of a specific year of operating data with other years of operating data should be understood in this context. Nonetheless, the overall number of fuel cycle facilities has remained relatively stable since CY2012, and therefore a semi-quantitative analysis is justified to identify significant trends.

Additionally, the review noticed a relationship between fuel cycle event notifications and violations. For example, of the 11 violations in FY2023, 9 are linked to event notifications. Therefore, many of the observations made in section 3.1 “Reported Events” are consistent with observations in section 3.2 “Inspection Findings”.

3.1 *Reported Events*

Twenty-three events were reported in FY2023. The total number of reported events increased by 15 percent in FY2023 compared to FY2022. The average total number of events reported annually since CY2012 is approximately 16. The total number of reported events in FY2023 is approximately 45 percent higher than average since CY2012. The average number of screened events reported annually since CY2012 is approximately nine. Fifteen screened events were reported in FY2023. The number of screened events reported increased by approximately 35 percent in FY2023 compared to FY2022 and is approximately 65 percent higher than the average number of screened events since CY2012.

Three of the 15 screened events in FY2023 were related to seismic events and one event was related to inclement weather. Most of these events did not result in consequences to the facilities, and none resulted in a violation. These events are relatively rare (there have been no seismic event reports since CY2012) and are not indicative of licensee performance. If these events are excluded from the analysis, the total number of screened events in FY2023 is identical to FY2022, and only slightly higher than the average year since CY2012. Also, the additional two fuel cycle facilities operating in FY2023 added several reported events to the total. Therefore, while the number of overall reported events and screened events have been increasing since CY2020 (the height of the pandemic), the staff considers that this increase is a

² Some factors include extended periods of reduced operation or shut down for multiple facilities between 2012 and 2019, and exemptions from certain radiological reporting requirements in 2017. For instance, in 2012, Honeywell ceased operations in response to a Confirmatory Order (EA-12-157). In late 2016 through early 2017, Westinghouse ceased operations to take corrective actions following an event involving unexpected uranium accumulation. Another example is Honeywell’s ramp down in operations in 2016 to enter idle-ready status in 2017. Honeywell restarted operations in FY2023, and American Centrifuge Plant (ACP) commenced operations FY2023. A potentially significant factor impacting reported events starting in 2020 is the effect of the COVID-19 public health emergency on licensee operations, including requesting and receiving exemptions to certain regulatory requirements.

return to pre-pandemic levels and does not represent a statistically significant increase suggestive of a decrease in licensee safety performance.

Figure 1 shows that on average since CY2012, Criticality Safety events are the most common, followed by Operational Safety – Chemical events, and Radiation Protection Program – Occupational events. This remained true in FY2023, except in the increase in Natural Phenomenon Hazard events. It is also relevant to note the increase in “Construction” performance area events over the past two fiscal years. All construction event notifications came from one licensee and are not indicative of an industry trend³. The inspection staff have already incorporated lessons learned from these construction performance area events into their inspection planning.

Both Operational Safety – Chemical event reports occurred because of Uranium Hexafluoride (UF₆) releases. Both occurred at the same facility but did not result in any consequences or operational challenges to the facility. One event resulted in an SL-IV NOV as a plant safety feature failed to perform its safety function when called upon to close a UF₆ cylinder valve on a fill spot during a release of UF₆.

In addition to the performance area analysis above, the staff also evaluates the contributing factors that led to the events (see **Figure 3**).

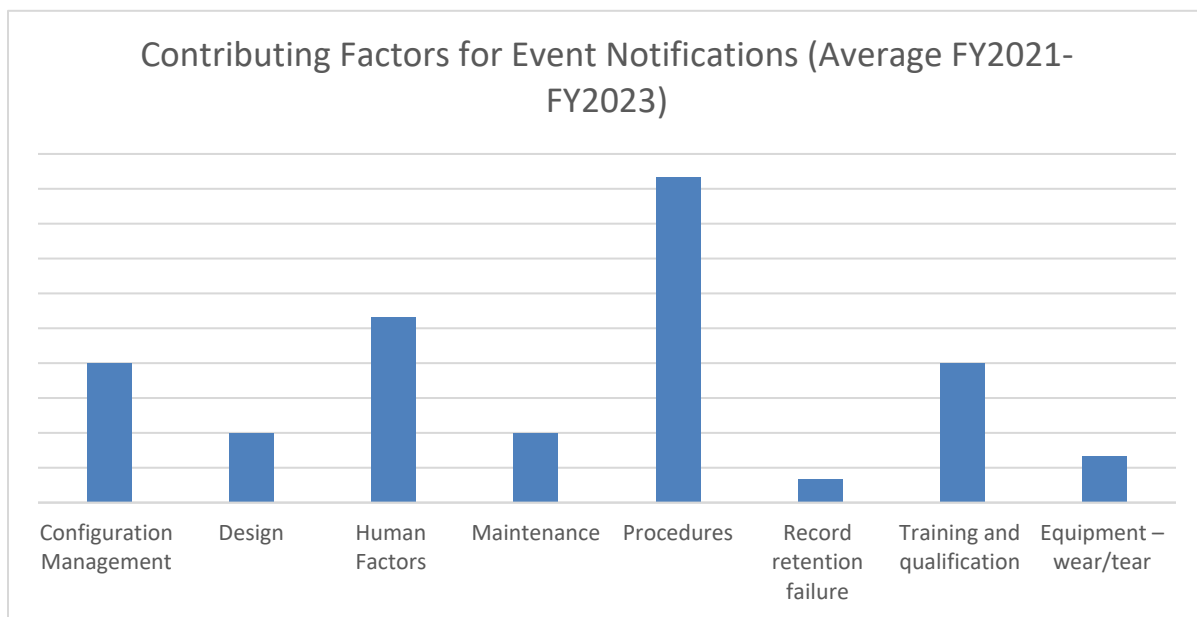


Figure 3 – Contributing factors leading to event notifications in Fuel Cycle Facilities (Average FY2021 – FY2022)

As stated in previous OpE Reports, the predominant contributing factor for most event reports is failure or degradation of management measures. The data presented in **Figure 3** is consistent

³ Industry has communicated plans to significantly increase construction activities in the coming years, and therefore it is possible that this will lead to an increase in construction related event notifications and violations.

with this observation and provides additional clarity regarding the specific management measures that most often contribute to events. Issues associated with configuration management, human factors, procedures, and training and qualification were the most prevalent contributing factors for event notifications during the period FY2021 to FY2023. Although human factors are not specifically identified as a management measure, the human factors issues identified were related to either failure to execute a procedure or an error in executing a procedure. Therefore, the management measures of configuration management, procedures, and training and qualification are recommended as continued areas of inspection focus.

3.2 *Inspection Findings*

The staff reviewed inspection findings from FY2021 – FY2023. There were significantly more findings in FY2022 and FY2023 compared to FY2021 (approximately double). This increase is consistent with the increase observed in reported events over the same period. Violations are counted in the same FY as the event regardless of when they are issued.

Figure 2 shows that over the past three fiscal years, Criticality Safety violations are the most common followed by Operational Safety – Chemical violations, and Radiation Protection Program – Occupational violations. A predominance of findings in these performance areas is consistent with operating experience data from event notifications over the past decade. Over the past two fiscal years there have been significantly more construction related violations, including escalated enforcement, than in any year going back to CY2012. As previously mentioned, the construction related violations impacted only one licensee, and do not suggest an industry wide negative safety trend in the performance area of construction.

Only 1 of the 11 inspection findings in FY2023 resulted in escalated enforcement (see **Figure 4**), an SL-III violation in the performance area of Criticality Safety with two examples. In FY2022, there were two instances of escalated enforcement out of the 10 inspection findings, two SL-II violations in the performance area of Construction. In FY2021 there were no instances of escalated enforcement. Nearly 90 percent of violations since FY2021 are SL-IV. There are no adverse escalated enforcement trends.

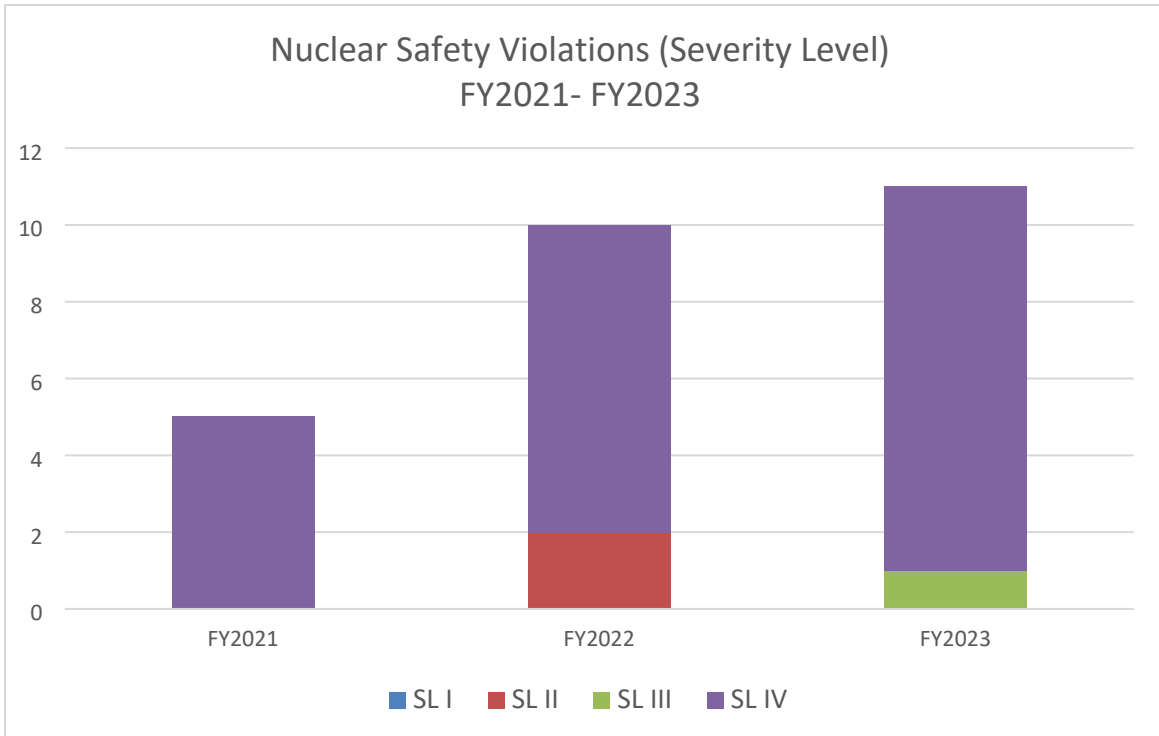


Figure 4 – Inspection Findings and Severity Level FY2021 – FY2023

One of the FY2023 reactive inspections was in the performance area of Construction. The reactive inspection resulted in two SL-IV NOV’s for failure to establish visual indication of the “No Swing Zone” and spotters prior to operating a construction crane within the CAA. The same licensee received two SL-II violations in FY2022 in the performance area of Construction for failure to establish barriers to protect an area of concern prior to bringing construction vehicles into the CAA. The similarity between these violations in the performance area of “Construction” in consecutive fiscal years at the same licensee is notable and is being tracked by inspection staff and will be evaluated as part of the Licensee Performance Review (LPR) process.

In addition to the performance area and safety significance analysis above, staff also evaluated the contributing factors that led to the violations (see **Figure 5**).

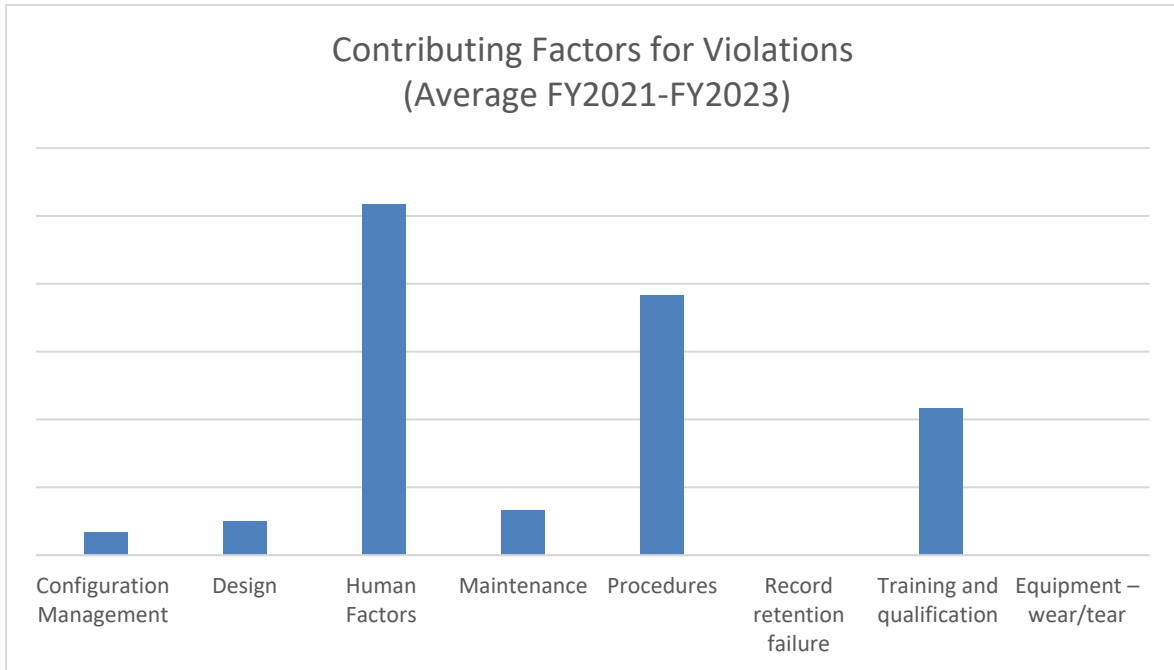


Figure 5 – Contributing factors leading to violations in Fuel Cycle Facilities (Average FY2021 – FY2022)

As with event notifications, the predominant contributing factor for most violations is failure or degradation of management measures. The data presented in **Figure 5** is consistent with this observation and provides additional clarity regarding the specific management measures that most often contribute to violations. Issues associated with human factors, procedures, and training and qualification were the most prevalent contributing factors for violations during the period FY2021 to FY2023. Although human factors are not specifically identified as a management measure, the human factors issues identified were related to either failure to execute a procedure, or an error in executing a procedure. Therefore, the management measures of procedures, and training and qualification are recommended as continued areas of inspection focus.

4. Generic Issues

Data was screened for generic issues, and it was determined that no generic issues were identified during FY2023.

5. Conclusions

Based on the analysis above, the review group concludes that:

1. There were no identifiable trends of safety concern, based on the analysis of inspection findings and violations during FY2023.
2. Most violations issued in FY2023 are related to event notifications, therefore the results of the trending and review analysis are similar for event notifications and violations.

3. There is an increase in event notifications over the past year compared to the previous 12-month reporting period, but the increase is biased by an increase in natural phenomenon hazard events that are not linked to licensee performance. Additionally, the restart of operations at a fuel cycle facility in FY2023 that was not operating in FY2022, and the commencement of operations of a new Cat-II enrichment facility, increased opportunities for events to occur in FY2023. Therefore, the number of events is not significantly higher than an average year within the analyzed period when these factors are considered.
4. Event notifications and violations in the performance area of “Construction” have increased in FY2022 and FY2023 compared to the analyzed period. All construction event notifications and violations have been associated with one facility and are not indicative of an industry trend. The similarity of the events and violations in consecutive fiscal years by the same licensee is notable and is being tracked by inspection staff and will be evaluated as part of the LPR process.
5. There is an increase in violations over the past two fiscal years compared to FY2021, but the increase is consistent with the increase observed in reported events over the same period, and likely represents a return to average pre-pandemic levels.
6. Criticality Safety events and violations continue to be the most common, followed by Operational Safety - Chemical, and Radiation Protection Program - Occupational.
7. Failure or degradation of management measures continues to be the most common contributing factor to events and violations. In particular, the quality elements of configuration management, procedures (including human factors issues related to execution of procedures), and training and qualification are recommended as inspection focus areas.
8. Nearly 90 percent of violations over the past three fiscal years were of no or relatively inappreciable potential consequences. There have only been three violations with escalated enforcement, two SL-II violations in FY2022 and one SL-III in FY2023. There are no adverse escalated enforcement trends.

6. Recommendations

The OpE review group recommends the following actions:

1. Staff is currently performing an assessment of the changes made by the Smarter Inspection Program, and the information in this OpE report will be considered in that assessment.
2. The management measures of configuration management, procedures, and training and qualification are recommended as continued areas of inspection focus.

Attachment A: Summary Tables of Events

Total Number of Events Per Facility												
Facility	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021*	2022**	2023
Framatome	2	2	1	2	2	0	0	1	1	1	5	1
BWXT	2	1	0	3	1	1	1	2	1	1	0	4
Global Nuclear Fuels Americas	8	3	2	0	2	1	5	7	9	4	3	3
Honeywell Metropolis	10	7	12	5	0	0	0	0	0	0	0	3
Louisiana Energy Services/ URENCO USA	0	1	0	2	1	2	3	4	1	1	7	7
Nuclear Fuel Services	1	0	6	1	3	0	3	2	0	2	2	2
Westinghouse	2	0	0	1	2	1	3	5	2	1	2	1
American Centrifuge	0	0	0	0	0	0	0	0	0	2	0	3
Total number of events per year	25	14	21	14	11	5	15	21	14	12	20	23

Table 1: Total number of reported events at licensed facilities between 2012 and 2023

*Partial year report (January 2021 through September 2021)

**First fiscal year data reporting (October 2021 through September 2022)

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Screened Events	17	9	13	12	11	4	6	9	2	3	11	15

Table 2: Number of events after screening process between 2012 and 2023