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Identification And Analysis Of Human And Organizational Factor Issues In Event Investigations: Key Findings From State Of Practice Survey

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In 2022, the NEA (Nuclear Energy Agency) Committee on Nuclear Safety Installations (NEA-CNSI), under the directive of the Working Group on Human and Organizational Factors (WGHOF), initiated the collaborative project, 'Good practices for investigators on identifying HOF (Human and Organizational Factor) issues from event analysis processes'. The project runs until 2025 and has as a main goal to compile a catalogue of practices useful for identifying HOF issues during the event investigation process. A first main activity in the project was to develop a detailed questionnaire to capture information about the practices used to identify and analyze HOFs in event investigation processes (Park and Solberg, 2023). The questionnaire was distributed electronically in December 2022. It contained questions about the practices related to forming the event investigation team, initial preparation, and plan of investigation, questions about the information to be gathered and the analysis methods and tools used, questions about the practices related to cause determination and root cause review, and questions about the practices related to event investigation report review and approval and dissemination of findings. These questions corresponded to 'Planning', 'Information gathering', 'Analysis', and 'Sharing and feedback' activities, respectively, which were identified as cornerstones of an event investigation process based on (Park and Solberg, 2023). It is noted that these cornerstones were originally suggested as major activities stated in IEEE Standard 1707-2015 (IEEE, 2015). Thirty-one responses were received from 11 NEA member countries, including Canada, Czech Republic, Finland, France, Hungary, Japan, Korea, Netherlands, Slovenia, Sweden, and Switzerland. Responses received represented practices used both in licensees (n = 26) and by regulators (n = 5). The findings from the survey will be published in a report summarizing the main results of the activities conducted in the collaborative project in 2022-2023 (Park and Solberg, 2024) Key findings extracted from this report are summarized below.

Key findings related to planning:

- Rules or a pre-defined catalog generally specify which kinds of events should be investigated. These include HOF or safety culture events.
- HOF specialists and senior managers are not always involved in the event investigation team when an event is suspected to be caused by or otherwise related to HOF issues. Furthermore, HOF-related training is not often required for event investigation team members who are not HOF specialists. These findings indicate that there is room for improvement based on current recommendations about the composition of the event investigation and their training (NEA, 2011).
- Most respondents did indicate that event investigation teams have the authority to conduct their work without interference, which is important when an event involves HOF issues (NEA, 2011).

Key findings related to information gathering and analysis:

- A broad range of information is gathered during an event investigation. Record review and interviews are generally used for this purpose. However, approximately half of the respondents indicated that guidelines and procedures are not in place to ensure the accuracy and ethical processing of information in line with industry standards (IEEE, 2015), indicating room for improvement.
- Information gathering was indicated to be most extensive in consideration of the present event. However, many respondents also reported collecting information about similar or analogous events, indicating that extent of condition is considered, as recommended by practice guidelines (IEEE, 2015). Around 40% of respondents indicated that information is also collected about previous success cases, i.e., where similar tasks were carried out successfully, where similar situations did not result in failure.
- Of the methods used to analyze events and extract HOF issues, HPES (Human Performance Enhancement System) or a variation of this method was most frequently identified as being used. The most frequently identified event analysis tools used were those comprised in the HPES method (e.g., barrier analysis, ECF charting, change analysis, task analysis). Methods such as MORT (Management Oversight and Risk Tree Analysis) and ASSET (Assessment of Safety Significant Event Team) were also indicated to be in use, but to a lesser extent. HPES is suited to analyze events that involve human factors, while MORT and ASSET were developed to analyze events with managerial and organizational issues. Thus, it is indicated that the event analysis methods most frequently used in practice are better oriented towards identifying human factors issues than organizational factor issues.
- Less than half of respondents indicated that there are guidelines to identify the tasks, actions, and decisions carried out by human operators that are important for explaining or understanding the progression of the event. Similarly, only half of the respondents representing licensees indicated that criteria were used for identifying human errors. (The availability of such criteria was higher among regulatory respondents.) Accordingly, findings indicate that there is room for improvement in establishing guidelines and criteria for identifying and analyzing human errors.
- Only about half of the respondents indicated that organizational or broader cultural aspects are considered as a factor contributing to human error, also indicating room for improvement.

Key findings related to sharing and feedback:

- About 60 percent of licensee respondents and 40 percent of regulatory respondents indicated having guidelines and processes in place to determine if an event investigation has been properly completed.
- Once complete, an event investigation report is often published. Respondents indicated that this most often only internally (within the organization where the event occurred). Distribution to reactor vendors and main suppliers occurs occasionally, but rarely to the public.

The findings from the questionnaire, summarized above, provide important insights about the event investigation practices currently used in NEA project member organizations. In 2024, a second main activity of the collaborative project, a comparison study, will be undertaken to help identify good practices from different possible approaches to investigating an event. The information derived from both activities will contribute to the main deliverable of the project, i.e., a catalogue of good practices that are useful for identifying HOF issues during the event investigation process, anticipated to be delivered in 2025.

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References

IEEE, 2015. IEEE recommended practice for the investigation of events at nuclear facilities, IEEE Std. 1707-2015.

NEA, 2011. Identifying and overcoming barriers to effective consideration of human and organisational factors in event analysis and root cause analysis: Workshop Proceedings, NEA|CSNI|R(2010)8, OECD Publishing. https://www.oecd-nea.org/jcms/pl_18948.

Park, J., Solberg, E. 2023. Development of detailed questions for investigating the status of human and organizational factor (HOF) issue identifications from event investigation processes, Proceedings of the 33rd European Safety and Reliability Conference. Brito, M. P., Aven, T., Baraldi, P., Čepin, M., Zio, E. (Ed.), Southampton, U.K., 2-7 September 2023.

Park, J., Solberg, E. 2024 (anticipated). State of practice report on the identification and analysis of human and organizational factors in event investigations. NEA summary report.