FUKUSHIMA OPERATOR RESPONSE

Computer Based Training Module

ABSTRACT

This CBT addresses various operational, design, and emergency response issues associated with the accidents at the Fukushima Daiichi and Fukushima Daini nuclear plants in Japan, following the earthquake and subsequent tsunami on March 11, 2011. It also explores and develops the necessary background information to draw conclusions relative to any differences in the responses (to the events) between the two sites, focusing on the operational actions. Additionally, this module reviews the reaction of the plant leadership (at both sites) to the unfolding crisis following the complete loss of electrical power and other damage due to the event. The primary purpose is to inform nuclear plant workers of the difficulties and problems that arose during and following the events at Fukushima, as the plants struggled to recover, with a focus on technical leadership and processing decisions at the Daiichi and Daini sites. This module also provides background technical information in design margin and beyond design basis events such as the one that impacted Fukushima.

INTENDED AUDIENCE

Nuclear plant engineers and technicians from all disciplines and backgrounds (staff and management)

DURATION

- 4 hours (approx.)
- An additional 8-10 hours for reading materials provided within the CBT

TERMINAL LEARNING OBJECTIVES

1. Recall the chronological sequence of key events associated with the beyond-design-basis accidents (BDBA) at both Daiichi and Daini.
2. Recognize the process used to establish the design-basis requirements for earthquake and flooding at Daiichi.
3. Define beyond-design-basis events and the industry approach to mitigate their effects.
4. Recognize the progression and key thresholds of a beyond-design-basis event.
5. Summarize the long-term consequences of a nuclear accident resulting from a beyond-design-basis event.
6. Identify the differences between operating, design, and analytical design margins.
7. Describe two approaches to determining the ultimate design capability margins.
8. Understand the relationship between a beyond-design-basis event and margin (in the safety analysis).
9. Contrast the design/design basis differences at Daiichi and Daini.
10. Understand the system failures at Daiichi that led to the extensive damage of the reactors.
11. Assess leadership and team behaviors that can either breakdown or promote team effectiveness.
12. Describe why team effectiveness at Daini was different than that at Daiichi.
13. Explain a significant strategy for the successful outcome at Daini.
14. Explain how engineers and leaders at Fukushima made strategic decisions by using their technical competence under extreme conditions.
15. Analyze the effectiveness of innovations used to solve design problems at Daiichi and Daini.
16. Define the elements of a Safety Conscious Work Environment (SCWE) including definition, process, and disposition of safety concerns raised by employees.
17. Illustrate the key technical conscience principles, and how these principles can be impacted during beyond-design-basis events.
18. Understand the cultural differences between engineering ethics in the US and Japan.
19. Relate leadership behaviors lessons learned from Daiichi and Daini that apply to other case studies.
20. Recognize the challenges involved in the decommissioning of Daiichi and Daini.
21. Identify the political and regulatory impact of the accident on the US nuclear power industry and the nuclear industry as a whole.

KEY INDUSTRY DOCUMENTS

PUBLICLY AVAILABLE DOCUMENTS

1. NUREG-1409 (Backfitting Guidelines)
2. NUREG-2150 (A Proposed Risk Management Regulatory Framework-Apr 2012)
3. NUREG/CR-7230 (Seismic Design in US and Japan)
4. Station Blackout-Inside the Fukushima Nuclear Disaster and Recovery (Charles Casto)
5. Harvard Business Review Article-How the Other Fukushima Plant Survived
6. SCWE NRC Regulatory Issue Summary 2005-18
7. NRC Document: Flood Update Newsletter, ADAMS Accession No. ML12012A247
8. NRC Document: Daily Event Status for Fort Calhoun, ADAMS Accession No. ML12017A246
9. NUMUG 2012 CALL-The Impact of the April 27, 2011 Severe Weather Outbreak on TVA's Radiological Emergency Preparedness Program (Nuclear Utilities Meteorological User's Group)
10. NEI 12-06 Rev. 4 Diverse and Flexible Coping Strategies (FLEX) Implementation Guide
11. SMiRT-23 - Design Basis Vs. Beyond Design Basis Considerations for Operating Plants-August 2015

INPO DOCUMENTS

1. INPO 09-003 Systematic Management of Design and Operating Margins
2. INPO 11-005 Special Report at the Fukushima Daiichi Nuclear Power Station
3. INPO 15-005 Leadership and Team Effectiveness Attributes
4. INPO 10-005-Principles for Maintaining an Effective Technical Conscience
5. INPO Event Report 12-25 (Level 4) Fort Calhoun Flooding Lessons Learned
6. INPO Event Report 11-46- (Level 2) Rev 1