



COURSE OVERVIEW NE0035 **Advanced Root Cause Analysis for Nuclear** **Performance Improvement**

Course Title

Advanced Root Cause Analysis for Nuclear Performance Improvement

Course Date/Venue

October 26-30, 2026/TBA Meeting Room, Royal Rose Abu Dhabi, a Curio Collection by Hilton Affiliated Hotel, Abu Dhabi, UAE

Course Reference

NE0035

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs



Course Description



This practical and highly-interactive course includes real-life case studies where participants will be engaged in a series of interactive small groups and class workshops.

This course integrates international nuclear industry best practices from IAEA, INPO, WANO, corrective action programs (CAP), operating experience (OE), human performance improvement (HPI) and nuclear event investigation methodologies. The emphasis is on identifying true organizational and technical root causes, developing effective corrective actions, preventing recurrence and strengthening nuclear safety culture.



Further, the course will also discuss the nuclear performance improvement framework and principles of root cause analysis; the nuclear event classification and human performance fundamentals; the nuclear operating experience (OE), investigation process and event investigation methodology; the fact-finding techniques, interview techniques, event reconstruction and data collection and analysis; the cause-and-effect relationships, cause and effect (fishbone) analysis, five whys method and event and causal factor charting (ECFC); and the change analysis, barrier analysis, advanced RCA methodologies and human error investigation.



During this interactive course, participants will learn the organizational root causes, safety culture assessment and corrective action development; the effectiveness reviews, trending and performance monitoring and writing high-quality RCA reports; the corrective action program (CAP) integration; and the regulatory and industry expectations.

Course Objectives/Outcomes & Benefits for the Participants

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an advance knowledge on root cause analysis for nuclear performance improvement
- Discuss nuclear performance improvement framework and principles of root cause analysis
- Apply nuclear event classification and explain human performance fundamentals
- Describe nuclear operating experience (OE), investigation process and event investigation methodology
- Carryout fact-finding techniques, interview techniques, event reconstruction and data collection and analysis
- Identify cause-and-effect relationships and apply cause and effect (fishbone) analysis, five whys method and event and causal factor charting (ECFC)
- Employ change analysis, barrier analysis, advanced RCA methodologies and human error investigation
- Apply organizational root causes, safety culture assessment and corrective action development
- Carryout effectiveness reviews, trending and performance monitoring and writing high-quality RCA reports
- Apply corrective action program (CAP) integration and review regulatory and industry expectations

Exclusive Smart Training Kit - H-STK®



*Participants of this course will receive the exclusive “Haward Smart Training Kit” (H-STK®). The H-STK® consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of advanced root cause analysis for nuclear performance improvement for nuclear performance improvement specialists, corrective action program (CAP) coordinators, operations, maintenance, engineering, human performance, quality assurance and nuclear safety personnel.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours

Certificate Accreditations

Haward's certificates are accredited by the following international accreditation organizations:

-  British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

-  The International Accreditors for Continuing Education and Training (IACET - USA)

Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Fee

US\$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:



Mr. Fred Louw, PGDip, MSc, BSc, is a **Senior Nuclear Specialist & Safety Consultant** with over **20 years** of extensive experience in **Radiation Safety/Protection, Radiation Physics, Nuclear Medicine, Radiation Oncology, Radiotherapy, Digital Image Protection, Operational Radiation Protection, Radiological Safety, Nuclear Engineering, Solar Energy, Energy Audit, Renewable Energy, Nuclear Power Plant, Root Cause Analysis for Nuclear Performance, Nuclear Medicine, Nuclear Security & Emergency, Energy Management System, Energy Audit & Conservation, Energy Efficiency & Management, Process Energy Efficiency, Energy Storage Systems, Diagnostic Radiology, Accident/Incident & Condition Reporting, Accident/Incident Investigation, Accident & Incident Prevention, HAZOP, SHEQ Management, Root Cause Analysis, Health Risk Assessment, Internal Emergency Planning, Emergency Response, Incident Investigation, Occupational Hygiene, Conventional Safety, OHSAS, Hazardous Chemical Substances, Quality Control & Assurance, OSH & COID Act, ISO 17025, ISO 90001, OSHAS 18001 and Radiation Protection Software** such as **IMBA, VARSKIN, RASCAL**, etc. Further, he is also well-versed in Strategic Leadership Skills, Project Management, Accounting Management, Human Resource Management, Communications & IT Management, Conflict Management, Database Development & Administration, Internal Auditing, Communication/Presentation Skills, Budgeting & Negotiation Skills, Report Writing, Labour Law, Statistical Analysis and SQL & Programing Languages. He is currently the **HSE Manager & Chief Scientist (Radiation Protection Specialist)** of **NECSA** wherein he manages the RP function by long term strategic leadership and short-term operational coordination and provide technical support as an RPS and HSE Consultant.

During Mr. Louw's career life, he held significant positions such as the **Radiation Protection Officer (RPO), Nuclear Specialist, Radiation Protection Controller, Radiological Protection Consultant, Lead Investigator, Administrator, External Dosimetry Specialist, Medical Physicist, Team Leader and Instructor/Trainer** for international companies and agencies such as the South African Bureau of Standards (**SABS**) and Department Medical Physics Universitas Hospital and UFS just to name a few.

Mr. Louw has a **Post Graduate Diploma in Radiation Protection**, a **Master's degree in Radiation Protection** and a **Bachelor's degree in Physics & Applied Mathematics** from the **University of the Witwatersrand** and **University of Orange of the Free State** respectively. Further, he is a **Certified Instructor/Trainer, Certified Trainer/Assessor** by the **Institute of Leadership & Management (ILM)**, a **Registered Medical Physicist** and a **Registered Professional Natural Scientist**. Moreover, he is an active Chairman/member of South African Association for Physicist in Medicine and Biology (**SAAPMB**), a member of Southern African Radiation Protection Society (**SARPS**), Southern African Radiation Protection Association (**SARPA**), Health Physics Society of America, South African National INES Committee and International Radiation Protection Association (**IRPA**). He has further delivered various trainings, workshops, seminars, courses and conferences worldwide.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures
- 20% Practical Workshops & Work Presentations
- 30% Hands-on Practical Exercises & Case Studies
- 20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Learning Design & Customization

This course can be customized to the exact requirements of clients. Haward Technology is so proud of our huge capabilities in tailoring our courses to the training needs of our valued clients.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: Monday, 26th of October 2026

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0930	Nuclear Performance Improvement Framework Nuclear Safety Culture & Continuous Improvement • Performance Improvement Model in Nuclear Organizations • Corrective Action Program (CAP) • Operating Experience (OE) Program
0930 – 0945	Break
0945 – 1030	Principles of Root Cause Analysis Definition of Root Cause • Apparent Cause versus Root Cause • Direct, Contributing & Organizational Causes • Characteristics of High-Quality RCA
1030 – 1130	Nuclear Event Classification Nuclear Event Categories • Low-Level Events & Near Misses • Significant Adverse Conditions • Regulatory Reportable Events
1130 – 1215	Human Performance Fundamentals Human Error Precursors • Human Performance Tools • Individual versus Organizational Performance • Human Performance Improvement (HPI)
1215 – 1230	Break
1230 – 1330	Nuclear Operating Experience (OE) Internal Operating Experience • External Operating Experience (WANO, INPO, IAEA) • Lessons Learned Programs • Event Trending

1330 – 1420	Investigation Process Overview Event Response Process • Investigation Planning • Investigation Team Roles • Investigation Ethics & Objectivity
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day One

Day 2: Tuesday, 27th of October 2026

0730 – 0830	Event Investigation Methodology Investigation Planning • Investigation Scope • Investigation Boundaries • Investigation Deliverables
0830 – 0930	Fact Finding Techniques Physical Evidence • Documentary Evidence • Digital Records • Witness Statements
0930 – 0945	Break
0945 – 1100	Interview Techniques Interview Preparation • Cognitive Interview Methods • Managing Bias • Recording Interview Results
1100 – 1215	Event Reconstruction Timeline Development • Sequence of Events • Barrier Identification • Verification of Facts
1215 – 1230	Break
1230 – 1330	Data Collection & Analysis Performance Data • Maintenance History • Operations Logs • Equipment History
1330 – 1420	Cause-&-Effect Relationships Causal Factors • Contributing Factors • Failed Barriers • Organizational Influences
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Two

Day 3: Wednesday, 28th of October 2026

0730 – 0830	Cause & Effect (Fishbone) Analysis Ishikawa Diagram Construction • Categories of Causes • Brainstorming Methods • Validation of Causes
0830 – 0930	Five Whys Method Effective Questioning • Identifying True Causes • Avoiding Superficial Answers • Practical Nuclear Examples
0930 – 0945	Break
0945 – 1100	Event & Causal Factor Charting (ECFC) Building Event Charts • Identifying Missing Information • Barrier Failures • Event Logic
1100 – 1215	Change Analysis Expected versus Actual Conditions • Equipment Changes • Human Changes • Organizational Changes

1215 – 1230	Break
1230 – 1330	Barrier Analysis Physical Barriers • Administrative Barriers • Human Barriers • Defense-in-Depth
1330 – 1420	Advanced RCA Methodologies Apollo Root Cause Analysis • TapRooT® Concepts • Kepner-Tregoe Problem Analysis • Multi-Cause Investigations
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Three

Day 4: Thursday, 29th of October 2026

0730 – 0830	Human Error Investigation Error-Likely Situations • Human Error Precursors • Behavioral Analysis • Decision-Making Errors
0830 – 0930	Organizational Root Causes Leadership Factors • Management Systems • Communication Failures • Resource Management
0930 – 0945	Break
0945 – 1100	Safety Culture Assessment Nuclear Safety Culture Traits • Leadership Behaviors • Reporting Culture • Learning Organization
1100 – 1215	Corrective Action Development Corrective Actions to Prevent Recurrence (CAPR) • Immediate Corrective Actions • Long-Term Improvements • Corrective Action Prioritization
1215 – 1230	Break
1230 – 1330	Effectiveness Reviews Performance Indicators • Verification Methods • Validation of Improvements • Preventing Recurrence
1330 – 1420	Trending & Performance Monitoring Trend Analysis • Repetitive Events • Performance Indicators (KPIs) • Predictive Performance Monitoring
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Four

Day 5: Friday, 30th of October 2026

0730 – 0830	Nuclear Case Studies Equipment Failure Investigation • Human Performance Events • Maintenance Errors • Operational Events
0830 – 0930	Writing High-Quality RCA Reports Investigation Summary • Cause Statements • Corrective Actions • Executive Reporting
0930 – 0945	Break
0945 – 1100	Corrective Action Program (CAP) Integration Condition Reports • Significance Determination • CAP Workflow • Closure Requirements



1100 – 1215	Regulatory & Industry Expectations <i>IAEA Expectations • WANO Performance Improvement Principles • INPO Performance Improvement Guidance • Regulatory Compliance Considerations</i>
1215 – 1230	<i>Break</i>
1230 – 1345	Workshop: Complete RCA Investigation <i>Event Review • Evidence Collection • Cause Analysis • Corrective Action Development</i>
1345 – 1400	Course Conclusion <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course</i>
1400 – 1415	POST-TEST
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch & End of Course</i>

Practical Exercises Throughout the Course

Participants will complete practical nuclear industry exercises including:

- Nuclear event investigations
- CAP condition report reviews
- Event timeline reconstruction
- Barrier analysis workshops
- Human performance evaluations
- Operating Experience (OE) reviews
- Corrective action effectiveness evaluations
- Root cause report writing
- Team-based RCA simulations
- Full-scale case study based on realistic nuclear power plant scenarios

Learning Outcomes

Upon successful completion, participants will be able to:

- Apply internationally recognized Root Cause Analysis methodologies within a nuclear operating environment
- Conduct systematic investigations of operational, maintenance, engineering, and human performance events
- Distinguish between direct, contributing, apparent, and organizational root causes
- Use structured RCA tools such as five whys, fishbone, barrier analysis, change analysis, and event & causal factor charting
- Develop corrective actions that effectively prevent recurrence and strengthen organizational learning
- Integrate RCA findings into the corrective action program (CAP) and operating experience (OE) processes
- Evaluate the effectiveness of corrective actions using performance indicators and trending
- Produce investigation reports that meet the expectations of nuclear industry best practices and support continuous improvement and a strong nuclear safety culture

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-



Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org