COURSE OVERVIEW NE0035
Advanced Root Cause Analysis for Nuclear Performance Improvement

Course Title
Advanced Root Cause Analysis for Nuclear Performance Improvement

Course Date/Venue
September 14-18, 2026/Delma Meeting Room, Royal Rose Abu Dhabi, a Curio Collection by Hilton Affiliated Hotel, Abu Dhabi, UAE

3.0 CEUs (30 PDHs) AWARD

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, 14th of September 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, 15th of September 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, 16th of September 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, 17th of September 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, 18th of September 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*** *IAEA Expectations • WANO Performance Improvement Principles • INPO Performance Improvement Guidance • Regulatory Compliance Considerations*
1215 – 1230	*Break*
1230 – 1345	***Workshop: Complete RCA Investigation*** *Event Review • Evidence Collection • Cause Analysis • Corrective Action Development*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

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

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