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| Department of Technical Cooperation (TC) End-of-Mission Report |

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| **Report Title:** | **Root Cause Analysis Training Course, Task Number 3.10.2** |
| **Project Number:** | **IRA 2013** |
| **Project Title:** |  |
| **Name of Expert:** | **Ms. Marija Josefa Esteban**  **Mr. Ladislav Kiss**  **Mr. Milorad Dusic** |
| **Dates of Mission:** | **7 - 11 October 2017** |
| **Counterpart:**  *Please provide full contact details for the Institute and main counterpart* | **Mr. M. H. Raji**  **TAVANA Head of Nuclear Engineering Department** |

**Terms of reference:**

*Describe the specific objectives of the assignment and the duties to be performed by the expert as they relate to the objectives.*

The objective of the Training Course was to enhance the Feedback of Operating Experience in Bushehr Nuclear Power Plant by providing training in the performance of Root Cause Analysis (RCA) of Incidents. Items to be covered by the training course included:

* Introduction to RCA methods
* Introduction to RCA analysis techniques, practical examples and exercises for each tool
* Typical in-house RCA process (resources, staff training, skills and experience, committees, typical model/workflow, management review…)
* Assessment of RCA report by independent organization; Independent RCA process (RCA performed by independent organization)
* Software for RCA

**Duties performed by the expert:**

*Describe the work carried out to meet the terms of reference as set out above. Please include any technical, logistical, administrative and other problems encountered, and any other considerations of importance. Please include also the Agenda and List of persons met.*

*NOTE: Figures, tables and annexes should be mentioned in the body of the text and should be numbered in the order in which reference is made to them (e.g. Fig.1, Fig. 2, Table 1, Table 2, Annex 1, Annex 2, etc.). All attachments should be clearly labeled.*

The Expert Mission was conducted in accordance with the Agenda prepared jointly by the IAEA and the counterpart before the mission. In accordance with the Agenda, the following presentations were made by the external experts:

* Mr. Milorad Dusic;
  + Case Study – setting the scene
  + Basic Concepts and Benefits of Root cause Investigation
  + Overview of RCA Methods and Tools
  + Overview of Precursor Analysis
  + Overview of Transient Analysis
  + Latent Weaknesses and Root Causes
* Ms. Maria Josefa Esteban;
  + Detailed Analytical Techniques
  + Event and Causal Factor Chart
  + Change Analysis, Barrier Analysis, Hazard barrier Target Analysis, Fault Tree Analysis
  + Interview Techniques
  + Role and Qualification of RCA Investigator
  + Management Oversight and Risk Tree Overview
  + Safety Culture, Leadership and Good Management Practices
  + Corrective Action Programme
  + Reactor Oversight Process
* Mr. Ladislav Kiss;
  + Corrective Action Program in Slovakia
  + RCA Quality Assessment
  + Assessment of Corrective Action Programme Process Effectiveness
  + RCA Report Example
  + Equipment Investigation Techniques
  + Apparent cause Evaluation
  + Other Investigation Methods
  + Practical Check-lists

Several Root Cause Analysis techniques were presented as well as international experience in event investigation and implementation of corrective action programmes. Each lecture was followed by extensive discussions. Apart from presentations by lecturers, a number of case studies were performed with active participation of all participants. As for the software for RCA it has been emphasised that most software which is commercially available is only a tool to help you in writing the final report and making sure that all elements of an investigation have been covered. Determination of the root cause is always within the domain of an analyst.

**Conclusions**:

*An assessment of the results and impact of the expert’s mission, relevant conclusions, including an evaluation of the degree of success in solving the problems encountered. Provide an analysis and description of any additional training, expert services and equipment that are considered to be necessary if the project’s objectives are to be met. Suggestions or recommendations made concerning future work should take into account the advisory role of the IAEA and the limitation on funds that may exist.*

The participants were from the Bushehr Nuclear Power Plant and from the Technical and Scientific Support Organization TAVAN. All together there were more than 30 participants; all of them very actively participated in the training course discussions. Due to the limited knowledge of English of some participants, a translation from English into Farsi and vice versa was conducted throughout duration of the training course. The training course was well received by all participants as was evident from their active participation and expression of satisfaction after the course.

During the course it has been emphasised that for successful event investigation process a full management support is essential and that some, can also be limited training, in RCA methods is necessary also for the high level management in order for them to better understand the RCA process.

**Recommendations**:

NOTE*: Each group of recommendations is a separate table. Please enter each recommendation in a separate row in the table. To enter a new row within each table, press the "TAB" key.*

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| **Recommendations to the Counterpart Institution and National Counterpart:** |

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| Feedback of Operating Experience is a crucial element of safe operation of nuclear power plants and therefore it is highly recommended to continue building a dedicated team in the utility as well as in the technical support organization for RCA. Management should also be given a limited training in order to better understand the importance of RCA in order to provide support for those efforts when necessary. |

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| **Recommendations to the Government:** |

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| The Government should continue to support efforts in Bushehr Nuclear Power Plant and in the technical support organization TAVANA in building effective teams for the analysis of the Feedback of Operation Experience. |

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| **Recommendations to the Agency:** |

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| The IAEA should continue to support Iran in nuclear power plant safety activities through the established, dedicated TC projects. |